Lacks Plates

ARTILLERY

FOR THE

UNITED STATES LAND SERVICE,

AS DEVISED AND ARRANGED BY

THE ORDNANCE BOARD.

WITH PLATES.

PREPARED UNDER THE INSTRUCTIONS OF THE

COLONEL OF ORDNANCE,

BY

BREVET MAJOR ALFRED MORDECAI,

OF THE U.S. ORDNANCE DEPARTMENT.

WASHINGTON:

J. AND G. S. GIDEON, PRINTERS.

1849.

ORDNANCE DEPARTMENT,

WASHINGTON, 16*th August*, 1849.

Hon. G. W. CRAWFORD,

Secretary of War:

SIR: During a number of years past the efforts of the Ordnance Corps have been directed, under the annexed orders of the War Department, to the preparation of a system of Artillery for the Land Service of the United States. I respectfully present for your approval the result of our labors, which, except in a few particulars, are now completed, and when sanctioned, will govern in all constructions by this Department, and establish uniformity therein.

I am, sir, most respectfully,

Your obedient servant,

G. TALCOTT,

Bvt. Brig. Gen., Col. of Ordnance.

WAR DEPARTMENT,

April 16*th*, 1839.

GENTLEMEN: You are hereby informed that you are associated on duty for the purpose of devising and arranging a uniform system of Artillery, and other supplies of every kind furnished for the military service by the Ordnance Department, for which purpose an appropriation was made at the last session of Congress.

In the execution of this duty you will prepare the necessary drawings, tables, and descriptions in detail, of all the articles of supply, which will be presented from time to time to the Secretary of War for examination and, when approved, for adoption into service.

You will assemble for this purpose at Washington as early as practicable. The time of meeting to be designated by Lieut. Col. Talcott.

Very respectfully,
Your obedient servant,
J. R. POINSETT,
Secretary of War.

Lieut. Col. GEO. TALCOTT,
Major R. L. BAKER,
Captain A. MORDECAI,
Capt. B. HUGER,
Ordnance Corps.

WAR DEPARTMENT,
August 16*th*, 1849.

The system of Artillery for the Land Service, prepared by the Ordnance Department, is approved, and will be adopted.

GEO. W. CRAWFORD,
Secretary of War.

WASHINGTON, *August*, 1849.

TO BRIG. GEN. GEO. TALCOTT,
Ordnance Department.

SIR: I have the honor to report that I have completed, as far as practicable at present, the duty assigned to me by your instructions of Oct. 14th, 1847, relative to "arranging, preparing, and publishing drawings of a uniform system of Artillery."

The arrangement of the details of this system has occupied a great part of the time and attention of the Ordnance Board since its organization in 1839, and these drawings have been prepared in conformity with their decisions, approved and adopted by the proper authority.

The PLATES show the forms and dimensions of the ordnance, and of the various gun carriages, wagons, equipments and implements for the service of the Artillery, together with the details required for their construction at the arsenals.

These plates are accompanied by an explanatory TEXT which contains the nomenclature of the parts, and describes the nature, dimensions and quantity of the materials for their construction, together with other particulars, relative to the manner of working these materials, which could not be exhibited in the plates.

The work is divided into separate parts for the purpose of facilitating the preparation and use of it, and also in order to admit, without inconvenience, such alterations and additions as future experience may suggest. With this view, the plates of each part, and the pages of the corresponding text, are numbered in a separate series, so that they may be bound in single parts, or in any convenient volume.

To avoid the necessity of frequently repeating, in the plates, the figures which are common to many parts of the work, (such as the dimensions of the heads and nuts of bolts, &c.,) those de-

tails are given, in tabular form, in appropriate parts of the text, according to a uniform system of classification which is explained in the beginning of PART SECOND.

The dimensions on the plates are expressed, in *inches* and *decimal parts*, by figures and marks of reference.

Some discrepancies, (almost unavoidable in so large a work,) may be observed between the dimensions measured by the scale and those indicated by the figures of reference; in such cases the latter are always to be taken as a guide.

PART 6 is deficient in the carriages for mounting columbiads, and PART 8, in the beds for heavy mortars, the arrangement of which has been recently committed, by the Ordnance Board, to Col. Huger.

I take pleasure in acknowledging here the highly valuable assistance which I have received, in the preparation and revision of this work, from Lieut. Col. Baker, of the Ordnance Department, commanding the Arsenal at Watervliet, and also from the master workmen at Watervliet and Washington Arsenals.

Respectfully, your obedient servant,

A. MORDECAI,
Capt. Ordnance, Bvt. Major.

NOTE.—In the plates which are colored, the nature of the material is denoted by the color, as follows:

WOOD - - - -	*Straw color.*
WROUGHT IRON - -	*Blue.*
CAST IRON - - -	*Neutral tint.*
STEEL - - - -	*Purple.*
BRASS - - - -	*Yellow.*
COPPER - - - -	*Light red.*
BRONZE - - - -	*Reddish yellow.*
LEATHER - - -	*Light brown.*
ROPE AND LINEN - -	*Greenish grey.*

CONTENTS.

ARTILLERY.

PART FIRST.

ORDNANCE

FOR

THE LAND SERVICE.

1848.

PART FIRST.

ORDNANCE.

The following are the kinds and calibres of ordnance used in the land service of the United States.

Kind of Ordnance.		Calibre.	Material.	No. of Plate.
Guns	Field	6-pounder	Bronze	I.
		12-pounder		II.
	Siege and garrison	12-pounder	– –	III.
		18-pounder	– –	IV.
		24-pounder	Iron –	V.
	Seacoast	32-pounder	– –	VI.
		42-pounder	– –	VII.
Howitzers	Mountain	12-pounder	– –	VIII.
	Field	12-pounder	Bronze	IX.
		24-pounder		X.
		32-pounder	– –	XI.
	Siege and garrison	8-inch	– –	XII.
		24-pounder	– –	XIII.
	Seacoast	8-inch	– –	XIV.
		10-inch	– –	XV.
Columbiads		8-inch	Iron –	XVI.
		10-inch		XVII.
Mortars	Light	8-inch	– –	XVIII.
		10-inch	– –	XIX.
	Heavy	10-inch	– –	XX.
		13-inch	– –	XXI.
	Stone mortar	16-inch	Bronze	XXII.
	Coehorn	24-pounder		
	Eprouvette	24-pounder	Iron	

A 12-inch columbiad, of cast iron, has also been tried and promises favorable results.

Nomenclature and description of ordnance.

The forms and dimensions of the several pieces of ordnance are shown in the Plates referred to in the last column of the preceding table.

Cannon made of bronze are commonly called *brass* cannon.

The *cascable* is the part of the gun in rear of the base ring; it is composed generally of the following parts: the *knob*, the *neck*, the *fillet*, and the *base of the breech*.

The curves of the knob and neck of the cascable are constructed in the manner represented in *Plate* 1.

The drawing of each piece gives the length, A B, of the knob and neck together, the diameter C D of the fillet, the greatest diameter of the knob and the smallest diameter of the neck. Parallel to A B, at a distance from it equal to one-third of the greatest semi-diameter of the knob, draw the lines *m o* and *n p;* take A I, equal to twice *o p*, and from the centre I describe the arc L A K; from the same centre, with a radius equal to *o p*, describe an arc cutting the lines *m o*, *n p*, in *m* and *n*, and from the centres *m* and *n*, with the radius *m* I or *n* I, describe the arcs K *r*, L *h*.

Draw *a b* parallel to A B, at a distance from it equal to half the smallest diameter of the neck of the cascable, intersecting the line *m n* produced, in *a;* find the centre *f* of a circle passing through the points *m*, *a* and C, and draw *f g* perpendicular to *a b* which it intersects at G; an arc of a circle having its centre in the line *f g* and passing through the points C and G, will be tangent to the line *a b* and to the arc L E *h*.

The *base of the breech* is a frustum of a cone, or a spherical segment, in rear of the breech.

The *base ring* is a projecting band of metal adjoining the base of the breech and connected with the body of the gun by a concave moulding.

The *breech* is the mass of solid metal behind the bottom of the bore, extending to the base of the breech.

The *reinforce* is the thickest part of the body of the gun, in front of the base ring; if there is more than one reinforce, that which is next to the base ring is called the *first reinforce;* the other, the *second reinforce.* In some howitzers, instead of a reinforce, there is a *recess* in the metal around the chamber, next to the base ring.

The *reinforce band* is at the junction of the first and second reinforces in the heavy howitzers and columbiads.

The *chase* is the conical part of the gun in front of the reinforce.

The *astragal* and *fillets*, in field guns, and the *chase ring* in other pieces, are the mouldings at the front end of the chase.

The *neck* is the smallest part of the piece, in front of the astragal or the chase ring.

The *swell of the muzzle* is the largest part of the gun in front of the neck. It is terminated by the muzzle mouldings, which, in field and siege guns, consist of the *lip* and the *fillet.* In the seacoast guns and heavy howitzers and columbiads, there is no fillet. In field and siege howitzers and in mortars a *muzzle band* takes the place of the swell of the muzzle.

The *face* of the piece is the terminating plane perpendicular to the axis of the bore.

The *trunnions* are cylinders, the axes of which are in a line perpendicular to the axis of the bore, and in the same plane with that axis.

The *rimbases* are short cylinders, uniting the trunnions with the body of the gun. The ends of the rim bases, or the *shoulders of the trunnions*, are planes perpendicular to the axis of the trunnions.

The *bore* of the piece includes all the part bored out, viz: the cylinder, the chamber (if there be one) and the conical or spherical surface connecting them.

The *chamber*, in howitzers, columbiads and mortars, is the smaller part of the bore, which contains the charge of powder. In howitzers and columbiads, the chamber is cylindrical; it is united with the large cylinder of the bore by a conical surface; the angles of intersection of this conical surface with the cylinders of the bore and chamber are rounded (in profile) by arcs of circles. In the 8-inch siege howitzer, the chamber is united with the cylinder of the bore by a spherical surface, in order that the shell may, when necessary, be inserted without a sabot.

A conical chamber which is joined to the cylinder of the bore by a portion of a spherical surface, (as in the 8-inch and 10-inch light mortars,) is called a *Gomer chamber.*

The *bottom of the bore* is a plane perpendicular to the axis, united with the sides (in profile) by an arc of a circle the radius of which is one-fourth of the diameter of the bore at the bottom. In the columbiads, the heavy seacoast mortars, the stone mortar and the eprouvette, the bottom of the bore is hemispherical.

The *muzzle*, or mouth of the bore, is chamfered to a depth of 0.15 inch to 0.5 inch, (varying with the size of the bore,) in order to prevent abrasion and to facilitate loading.

The *true windage* is the difference between the true diameters of the bore and of the ball.

The axis of the *vent* is in a plane passing through the axis of the bore, perpendicular to the axis of the trunnions. In guns, and in howitzers having cylindrical chambers, the vent is placed at an angle of 80° with the axis of the bore, and it enters the bore at a distance from the bottom equal to one-fourth the diameter of the bore.

The diameter of the vent is *two-tenths* of an inch, in all pieces except the eprouvette in which it is *one-tenth.*

The vents of brass guns are bored in *vent pieces* which are screwed into the gun; they are made of pure wrought copper, hammered and annealed. The form and dimensions of the vent

piece are shown in Plate 1. The length of the screw varies according to the thickness of metal at the vent, so that the cylindrical head of the vent piece shall enter the gun about .25 inch deep on the front side.

The *lock piece* is a block of metal at the outer opening of the vent, in some pieces of ordnance, to facilitate attaching a lock to the cannon; the centre of its upper surface is usually in the natural line of sight, or below that line.

The *natural line of sight* is a line drawn in a vertical plane through the axis of the piece, from the highest point of the base ring to the highest point in the swell of the muzzle, or to the top of the *sight*, if there is one.

The *natural angle of sight* is the angle which the natural line of sight makes with the axis of the piece.

The *dispart* is the difference of the semi-diameters of the base ring and the swell of the muzzle, or the muzzle band; it is therefore the tangent of the natural angle of sight, to a radius equal to the distance from the rear of the base ring to the highest point of the swell of the muzzle, the sight, or the front of the muzzle band, as the case may be.

The *preponderance* of the breech of a gun is the excess of weight of the part in rear of the trunnions over that in front; it is measured by the weight which it is necessary to apply in the plane of the muzzle to balance the gun when suspended freely on the axis of the trunnions.

The *handles* of a gun are placed with their centres over the centre of gravity of the piece.

Table of weights of the several kinds of ordnance, and the preponderance of the breech in guns and howitzers.

Kind of ordnance.		Calibre.	Weight.	Preponderance.	Natural angle of sight.
			Lbs.	Lbs.	° ′
Guns	Field	6-pounder	884	33	1 00
		12-pounder	1,757	60	1 00
	Siege, garrison and seacoast	12-pounder	3,590	200	1 30
		18-pounder	4,913	200	1 30
		24-pounder	5,790	255	1 30
		32-pounder	7,195	466	
		42-pounder	8,465	440	
Howitzers	Mountain	12-pounder	220	30	0 37
	Field	12-pounder	788	51	1 00
		24-pounder	1,318	112	1 00
		32-pounder	1,890	125	1 00
	Siege and garrison	8-inch	2,614	460	1 00
		24-pounder	1,476	70	1 00
	Seacoast	8-inch	5,740	380	
		10-inch	9,500	450	
Columbiads		8-inch	9,240	350	1 23
		10-inch	15,260	470	1 21
Mortars	Light	8-inch	930		
		10-inch	1,852		
	Heavy	10-inch	5,775		
		13-inch	11,500		
	Stone mortar	16-inch	1,500		
	Coehorn	24-pounder	164		
	Eprouvette	24-pounder	220		

ARTILLERY.

PART SECOND.

CARRIAGES

FOR THE SERVICE OF

FIELD ARTILLERY.

1848.

PART SECOND.

FIELD CARRIAGES.

As a uniform system has been adopted for making the bolts, rivets, nails, &c., used in Artillery carriages, descriptions will here be given of those parts of which the elements are the same in all carriages.

The descriptions are accompanied by Tables, showing the classification of these elementary parts, and the manner in which they are designated, when referred to in the descriptions of the carriages.

TABLE OF BOLTS, NUTS, AND WASHERS.—Plates I and II.

Nos.	1	2	3	4	5	6	7	8	9
BOLTS.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Diameter of bolt	0.375	0.5	0.625	0.75	1.	1.125	1.25	1.375	1.5
Diameter of head A.	.85	1.1	1.4	1.7	2.3	2.5	2.75	3.	3.25
Diameter of head B.	1.	1.25	1.5	1.875	2.5	2.75	3.	3.5	3.75
Diameter of head C. D. H.	0.7	0.875	1.06	1.25	1.625				
Diameter of head E.	.75	1.	1.25	1.5	2.	2.25	2.5	2.75	3.
Diameter of head F. G.	1.125	1.5							
Thickness of head A. B. E. F. G.	0.3	0.375	.5	.6	.75	.8	.9	1.	1.1
Thickness of head C. D. H.	.25	.3	.35	.4	.5				
Chamfer of head, A. E. F.	.1	.125	.16	.19	.25	.28	.31	.344	.375
Length of square, under the heads A. B. C. D.	.375	.5	.625	.75	1.	1.125	1.25	1.375	1.5
Usual length of thread cut	.75	1.	1.25	1.5	2.	2.25	2.5	2.75	3.
Number of threads to the inch	13	13	13	10	8	8	8	7	7
NUTS — Square	.75	1.	1.25	1.5	2.	2.25	2.5	2.75	3.
NUTS — Thickness	.375	.5	.625	.75	1.	1.125	1.25	1.375	1.5
NUTS — Chamfer	.1	.125	.16	.19	.25	.28	.31	.344	.375
NUTS — Diagonal	1.06	1.41	1.77	2.12	2.83	3.16	3.54	3.87	4.24
WASHERS — Diameter	1.25	1.6	2.	2.45	3.15	3.5	4.	4.375	4.75
WASHERS — Thickness	0.125	.125	.125	.19	.19	.19	.25	.25	.25
WASHERS — Width of chamfer	.1	.1	.12	.16	.16	.17	.23	.25	.25
WASHERS — Depth of chamfer	.06	.06	.06	.1	.1	.1	.125	.125	.125

Remarks.

In the preceding table, the *No.* indicates the size of the bolt, and the *Letter* the form of the head, as follows:

A. Bolt with round (cylindrical) head, chamfered; the part of the stem next to the head is square.

B. Round head, not chamfered; to be let into wood; square under the head.

C. Countersunk head; bolt square under the head.

In all the countersunk heads of bolts, rivets, and nails, the same slope is preserved, (5 to 8,) in order that the holes for them may be all countersunk with the same tool.

D. Convex, or rose head; square under the head.

E. Square head, chamfered; round under the head.

These bolts are intended to be used where the nuts are fixed by being let into wood; to facilitate the entrance of the bolt, it is pointed; the points are not included in the tabular lengths of such bolts.

F. Round head, chamfered; applied to wood, without a washer; round under the head.

G. Round head, not chamfered; to be let into wood; round under the head.

H. Countersunk head; bolt round under the head.

Bolts F. and G. are called *rivet bolts*, being designed to prevent wood from splitting; they are applied only to large timbers, in which it is necessary to provide for tightening the rivets when the wood has shrunk.

The depth of the chamfer on heads and nuts is equal to its width on the face.

The slant depth of the threads is equal to the distance between them; thus making a V thread, of which the angle is 60°.

Nuts that are let into wood are not chamfered.

The diagonals of square nuts are given in the table, because it is often convenient to know in what space a nut can turn.

Washers for the heads of bolts have square holes in them; those for nuts have round holes. These holes are about 0.04 inch larger than the bolts.

The drawings and tables show the forms and dimensions of special bolts, nuts and washers, which are not included in the above table.

MANNER OF MAKING BOLTS, &c.—*Rolled iron* is used for making nearly all bolts, nuts and washers. The heads of small bolts may be made by *upsetting* the stem in a suitable heading tool; those of large bolts are made of round iron, about twice the diameter of the bolt. If the bolt is not more than eight inches long, the body may be drawn down out of the same piece as the head; if longer, the head and about four inches of the body are made in one piece, to which round iron of the proper size is welded for the remaining part of the bolt. The point should be annealed; it is swaged a little smaller than the body, as the metal is raised in cutting the thread.

Round heads are turned; square heads filed or ground.

In the tables of bolts for carriages, the *lengths* of bolts A, D, E, F, having chamfered or rose heads, are exclusive of the thickness of the heads; those of other bolts, B, C, G, H, which are countersunk or let into wood, include the thickness of the head. When the head is oblique, the length is measured in the axis of the bolt.

Bolts are *milled* to the lengths given in the tables, the ends being made slightly convex.

Nuts should be annealed, after the holes are punched, to facilitate cutting the thread; they are finished with the file, or better with the grindstone.

Washers are punched out of flat iron of the proper thickness, and chamfered in the lathe.

Rivets.—Plate II.

		Nos.	1	2	3	4
Diameter of body			In. 0.2	In. 0.25	In. 0.375	In. 0.5
Diameter of head	B		–	.75	1.125	1.5
	C. D		–	.5	.7	.875
	H		.75			
Thickness of head	B		–	.2	.25	.375
	C. D		–	.2	.25	.3
	H		.125			
BURRS	Diameter		.75	.75	1.125	1.5
	Thickness		.125	.2	.25	.375
	Exterior diameter of countersink		.3	.45	.6	.7
	Depth of countersink		.1	.15	.17	.25

Remarks.

The heads and bodies of all rivets are round.

B. Head not chamfered; to let into wood.

C. Countersunk head; to let into iron.

D. Rose head; resting on iron.

H. Rose head; resting on wood.

Rivets are best made, like small bolts, by forging the heads and stems out of the same piece of iron. The head is sometimes formed by welding a ring of iron on the end of the round iron which forms the body of the rivet.

The lengths of rivets, as given in the tables, are somewhat greater than the neat lengths required, as they are cut off after having been driven.

Wrought Nails.—Plate II.

Nos. - -	1	2	3	4
	In.	In.	In.	In.
Body; diameter or thickness - - - -	.25	.3	.375	.5
Heads C. D. { Diameter - - - -	.5	.6	.7	.875
Heads C. D. { Thickness - - - -	.2	.25	.25	.3

Remarks.

C. Denotes a square nail, with countersunk head.

D. Round nail, with rose head.

The points of these wrought nails are wedge shaped, about two diameters long.

Cut Nails.

Nos. - -	2*d.*	3*d.*	4*d.*	6*d.*	8*d.*	10*d.*	12*d.*	20*d.*
Length - Inches	1.	1.25	1.5	2	2.5	3	3.5	4
Number in 1 lb. -	550	450	340	150	100	60	40	25

Spikes are large nails, *wrought* or *cut;* the size is designated by the length in inches.

Bellows nails and *clout nails* are short wrought nails, with large heads, slightly convex; they are used chiefly for nailing leather, canvass, &c., on wood.

Bellows nails 1.13 in. long, 0.1 in. thick, with heads .75 in. to 1 inch in diam., should weigh about 120 to 1 lb.

Tacks are classed by the length in inches, or by the weight of 1,000, in ounces.

Sprigs, brads, finishing nails, are classed by the length in inches.

Wood Screws.

Wood screws are classed by the length in inches, and by the No., which indicates the size of the wire, or body of the screw.

The following table of dimensions, derived from measurements of the screws made by the New England Screw Company, at Providence, Rhode Island, will be found convenient for reference.

No.	Diameter of body.	HEAD.		Number of threads to 1 in.	REMARKS.
		Diameter.	Thickness.		
	In.	In.	In.		
3	0.10	0.20	0.06	24	The length of thread cut is two-thirds the length of the screw.
4	.11	.22	.065	24	
5	.13	.26	.075	20	
6	.15	.30	.08	20	
7	.16	.32	.085	18	
8	.17	.34	.09	14	
9	.19	.38	.095	13½	
10	.20	.40	.10	13	
11	.21	.42	.11	12	
12	.22	.44	.12	11	
13	.23	.46	.13	11	
14	.24	.48	.14	10	
15	.25	.50	.15	10	
16	.26	.52	.16	9½	
17	.27	.54	.17	9	
18	.28	.56	.18	8½	
20	.30	.60	.20	8	
21	.32	.64	.21	8	
22	.35	.70	.22	7½	
24	.38	.76	.24	7	
26	.40	.80	.26	7	

Chains.—Plate II.

No.	Thickness of iron.	LINKS.			Proof weight.	REMARKS.
		Kind.	Length.	Width.		
	In.		In.	In.	Lbs.	
1	0.15	Twisted.	1.1	0.6	400	All chains are welded.
2	.2		1.25	.75	800	
3	.25		1.6	1.1	1,200	
4	.25	Straight.	2.	1.	1,500	
5	.375		3.	1.5	2,500	
6	.5		3.	1.75	5,000	
7	.625		3.4	2.25	6,500	

Rings.—Plate II.

Designation.		Thickness of wire.	Exterior diameter of ring.	REMARKS.
		In.	In.	
No. 1	A.	0.2	1.4	Welded.
	B.	.2	1.	Coldshut.
No. 2	A.	.25	1.5	Welded.
	B.	.25	1.25	Coldshut.

These are the rings most commonly used in field and siege carriages, with the chains Nos. 1, 2, and 3. For other rings, see the drawings and descriptions of the carriages to which they belong.

Eye Pins.—Plate II.

There are three sizes of eye pins used in field and siege carriages, as follows:

Nos. - -	1	2	3
	In.	In.	In.
Diameter of stem -	0.3	0.375	0.5
Diameter of eye -	.25	.3	.375

Sheet metals and Wire.

The thickness of sheet copper is usually indicated by the weight of a square foot in ounces; but, for uniformity and convenience, all sheet metals and metallic wires will be designated by *Nos.* corresponding with the thickness, as indicated by the ordinary iron wire gauge. These gauges may not exactly agree with each other, but the following table shows very nearly the thickness corresponding with the several Nos.

No.	Thickness.	No.	Thickness.	No.	Thickness.	No.	Thickness.
	In.		In.		In.		In.
1	0.313	9	0.161	17	0.057	25	0.023
2	.292	10	.143	18	.052	26	.02
3	.271	11	.125	19	.047	27	.018
4	.25	12	.113	20	.042	28	.016
5	.233	13	.1	21	.037	29	.014
6	.216	14	.088	22	.031	30	.012
7	.2	15	.075	23	.028		
8	.18	16	.063	24	.025		

General remarks relative to wood work of artillery carriages.

In dressing the wood, when there is no defect on the heart side, take off the surplus, as much as possible, from the sap side.

In joining two pieces of wood together, to form one beam, (such as the stock of a gun carriage,) put the heart sides out, and cover the inner sides and the dowels with a good coat of white lead.

If the fibre of the wood is not straight, turn the greatest convexity upwards, in such pieces as gun carriage stocks, tongues and rails of chassis, which are supported chiefly at the ends; in pieces which are supported in the middle, as the hounds of limbers, and the side rails of caisson and other field carriages, turn the convexity of the fibres downwards.

For parts which are worked in pairs, (cheeks, side rails, &c.,) use, for each pair, pieces of timber the fibres of which have nearly the same curvature. In the cheeks of all gun carriages place the heart side inwards; in the hounds and side rails, &c., turn the heart side out.

In the stocks and cheeks of gun carriages, turn the end which comes from the butt of the tree towards the head of the carriage. In other pieces, the butt forms generally the larger end of the piece, or that which requires the greatest strength.

The tenons and other surfaces of wood which come together, in framing the work, should have a coat of white lead; and this should be applied also to the inner surfaces of rondelles, washers, and other irons which are put on before the wood work is painted.

If the wood work is to be painted immediately, it should have a priming coat before the irons are put on; if not, it should receive a good coat of linseed oil.

Bolt holes should be accurately bored, so as to render unnecessary the pernicious practice of burning them out with a hot iron, to admit the bolts. The holes for bolts that are square under the head, are squared with the chisel to the requisite depth.

Bolt holes and bolts should be well greased with tallow softened with neatsfoot oil, before the bolts are put in place.

The inner surfaces of holes for elevating screws and pintles should be painted.

In cutting out the axle body of a carriage, to form a bed for the iron axletree, the depth of the cut should always be a little less (from .05 inch to .1 inch) than that of the iron, in order that the under straps may bind the axletree into its place and not bear on the wood alone.

FIELD GUN CARRIAGES.—Plates III to IX.

There are three gun carriages for the service of field artillery, viz:

One for the 6-pounder gun and the 12-pounder howitzer;

One for the 24-pounder howitzer;

One for the 12-pounder gun and the 32-pounder howitzer.

These carriages all consist of similar parts, differing only in their dimensions, as shown in the drawings.

In the following instructions the parts are enumerated nearly in the order in which they are put together.

The dimensions of bolts, rivets, nails, and screws, are given in tabular form at the end.

WOOD WORK.

One stock, (WHITE OAK.) The stock may be made of one or two pieces; generally of two, put together with dowels.

In order to allow of the necessary depression of the piece, the head of the stock is hollowed out, with a radius equal to that of the howitzer in front of the trunnions.

The edges of the stock are rounded with a radius of .8 inch between the rondelles and the trail plate, and the lower edges are

rounded in like manner, from the rear of the axle body to the lunette plate.

Two dowels, (TOUGH WHITE OAK,) for stocks, in two pieces.

Two cheeks, (WHITE OAK.) The cheek patterns are made to include the trunnion plates on top, as shown in the drawings, and the wood is afterwards marked off by the iron itself, for fitting on the trunnion plate.

One axle body, (WHITE OAK.) To be made of a quartered stick, free from heart. The heart side is turned towards the trail of the carriage. The lower edges are rounded in their whole length; the upper edges on the outside of the cheeks only. In the 6-pounder carriage these roundings have a radius of .6 inch; in the other carriages, .8 inch.

IRONS.

Two trail handles.

Two bolts and *two nuts*, for trail handles.

One lock chain bolt. It holds the eye plate of the lock chain and keeps the two parts of the stock together.

One eye plate for lock chain. For convenience, this plate and the lock chain are not put in place until after the other irons; the bolt being then taken out for the purpose.

One lock chain. The chain is the same for all field carriages, except in the number of links, as shown in Plate III. The *links* are No. 5; there are *three rings* and *one toggle.*

One lunette. The plate tapers regularly from near the eye to the point, and is bent on a former to the required shape. The edges are chamfered .15 inch.

The ring of the lunette, in the half of its circumference next to the end, is plated with steel on the under side; the piece of steel, which is shaped like a horse shoe, is about .5 in. thick in the middle, tapering to .25 in. at the ends; it covers the part of the lunette which bears on the pintle hook, and it extends up into the corresponding part of the eye.

One trail plate. Plate iron No. 6; chamfered on the upper edges .15 in. It is fixed to the lunette by *two rivets;* the lunette and trail plate are fastened to the stock each by *six nails*, and by the pointing ring bolts.

The trail of the stock is rounded at the sides, down to the width of the lunette and trail plate.

One large pointing ring and plate. The ring and plate are connected together by a *rivet* passing through a stud in the plate, on which the ring can turn, so as to lie flat on the trail plate; the heads are riveted cold and filed off smooth.

Two bolts for the large pointing ring plate.

Two nuts, octagonal.

One small pointing ring. The edges of both pointing rings are slightly rounded, and the upper edges of the plates are chamfered .15 inch.

Two bolts for small pointing ring. *Two nuts*, octagonal.

Two wheel guard plates. The edges chamfered .15 in. Each plate is fastened to the stock by *five nails.*

Two prolonge hooks. The edges of the hooks are rounded; the plates are chamfered .15 inch; the hooks are fastened to the stock, each by *four nails.*

One stop, for rammer and sponge. The edges of the part that is nailed to the stock are chamfered .15 inch; the other edges are rounded. The stop is fastened to the under side of the stock, across the middle line, by *four nails.*

One ear plate, for worm. The outer edges are chamfered .15 inch; the plate is fastened under the stock, on the left of the centre line, by *two nails.*

One key, for ear plate, attached to the stock by a chain and eye pin.

One key chain, consisting of *five links* No. 1, and *two rings* No. 1, B.

One eye pin, No. 1, for the key chain.

One eye plate, for sponge and rammer chains. The edges are chamfered .15 in.; the plate is fastened under the stock by *two screws*.

Two chains and hasps, for sponges and rammers. The chains consist of flat links made of hoop iron No. 16, connected by loops made of iron wire No. 7; they are attached to the double eye plate; the edges of the hasp are chamfered .15 inch.

Two stud plates, for the turnbuckles. The edges are chamfered .15 in.; the studs are riveted into the plates; the plates are fastened to the sides of the stock, each by *two nails*.

Two turnbuckles, for implements. They are made of *brass*, and are riveted on the studs of the hasp plates. Care must be taken that the turnbuckle plays freely through the slot in the hasp, in order that the hasps may be quickly and easily fastened up when the implements are in place.

Two trunnion plates. They are forged straight, with a regular taper, and are bent on an iron former. After the part in rear of the trunnion holes is bent, all the holes may be marked and finished, except that for the lower end of the key bolt, which is drilled after the front part of the plate is bent. The trunnion plate is let into the cheek on the upper side; for this purpose the wood is marked by the iron, for each cheek. It is fitted cold, but is slightly warmed when about to be fastened on the cheek. The part of the plate about the trunnion hole is left a little thicker than the finished dimension requires; and after the trunnion plate is bolted to the cheek the cap square is put on, and the trunnion holes of both cheeks are reamed in a lathe, at the same time, to the proper size, either before or after the cheeks are joined to the stock. The upper edges of the plate are chamfered .15 inch, up to the junction with the cap square, and the cheek is chamfered down to the width of the trunnion plate.

The trunnion plates are fastened each by *five bolts*, and by the *nails* mentioned in the Tables.

Two chin bolts. } The edges of the heads above the cap square
Two key bolts. } are chamfered .1 inch.

Six cheek bolts.

Two bevel washers, for chin bolts.

Four washers, for cheek bolts.

Ten nuts, for chin, key, and cheek bolts.

Two cap squares. The upper edges are chamfered .15 inch.

Two eye pins, No. 1, riveted into the cap squares; the riveting is countersunk .15 inch, and filed smooth.

Two cap square chains; each consisting of *five links* No. 2, and *two rings* No. 2, B.

Two eye pins, No. 2, for cap square chains; screwed into the outside of the cheeks.

Two cap square keys.

Two key chains; each of *five links* No. 1, and *two rings* No. 1, B.

Two eye pins, No. 1, for key chains; screwed into the outside of the cheeks.

Two D *rings*, for handspikes; fastened near the head of the cheeks, each by *two staples*, with eyes in which the ring turns; the staples are driven through the cheeks and clinched on the inside.

One linstock socket. Sheet iron No. 10; edges chamfered .15 inch; it is fastened outside of the right cheek by *six nails.*

Six rondelles, (CAST IRON.) They are placed between the cheeks and the stock, and the assembling bolts pass through them; the two in rear have tenons which are let into the wood. They should be faced in the lathe, to the exact thickness required.

Three assembling bolts, for the cheeks and stock.

One washer hook, for lock chain; placed under the head of the middling assembling bolt, on the right cheek.

Two washer hooks, for handspikes; held by the rear assembling bolt, on the outside of each cheek.

Three washers and *three nuts*, for assembling bolts; the nut for the rear bolt is octagonal.

One axletree. The axletree for the 6-pounder carriage is forged in two equal parts which are welded together; that for the 24-pounder howitzer and for the 12-pounder gun carriage, being of the same size in the whole length of the body, is forged in one piece. The *stop* in the centre is dovetailed into the body. The edges of the under side of the body are rounded about .1 inch.

Two under straps. The edges of the under side are chamfered .15 inch. The front ends of the straps are turned over, to form rings for holding the implement hooks; the strap on the right cheek carries the single hook for a sponge, on the outside of the cheek; that on the left cheek carries the sponge hook and the ring for the handle of the worm, the hook being on the outside.

One axle strap. The bottom edges are chamfered .15 in.; those of the eye for the sponge bucket are rounded.

Three bolts, for the axle strap. The heads are let in flush with the stock on top. In the 6-pounder carriage, the front bolt, being oblique to the bottom of the stock, has a *bevel washer* under the nut.

Three nuts for these bolts.

Two axle bands, for the ends of the wooden body. The square edge is turned towards the shoulder washer. The bands are made a little smaller than the axle body, and shrunk on at a low heat; they are fastened each with *three nails.*

One box for elevating screw, (CAST BRASS.) The metal is composed of thirty parts of copper, six of zinc, and one of tin. The upper edges are chamfered .15 inch; the plate of the box lies on the stock, the part which projects below being let into the wood.

Two bolts, for elevating screw box.

Two washers and *two nuts* for these bolts.

One elevating screw. The handles are forged in one piece; the centre part is bored out to form a collar for the upper end of the screw; the hole for this purpose is countersunk .2 inch at top.

To prevent the handles from turning on the screw, a pin .2 inch thick is driven into a hole bored at the junction of the collar with the head of the screw; or three notches may be cut in the edge of the collar, for the same purpose. The head is then riveted into the countersink of the collar, (and also into the notches,) and turned off smooth.

Two shoulder washers, for the axletree. They are heated nearly red, and shrunk on.

Two linch washers.

Two linch pins.

Two wheels. No. 1, for the 6-pounder carriage; No. 2, for the 24-pounder howitzer and the 12-pounder gun carriages.

Table of bolts, rivets, nails and screws, for 6-pounder gun carriage.

DESIGNATION.	Number.	Kind.	Length.	WASHERS. Head	WASHERS. Nut.	REMARKS.
Bolts.			In.			
For lock chain plate -	1	No. 4. A.	7.95	–	1	
" assembling the cheeks & stock	1	do.	16.35	1	1	
	1	do.	16.4	–	1	
	1	No. 5. A.	16.7	–	–	Nut octagonal.
" trail handles - -	1	No. 3. A.	7.18	–	–	
	1	do.	7.33	–	–	
" trunnion plates. chin bolts	2	No. 4.	14.6	–	2	Plate VI.
key bolts	2	do.	11.45	–	–	Plate VI.
cheeks	2	No. 4. A.	13.25	–	–	
	2	do.	10.3	–	2	
	2	do.	8.85	–	2	
" axle strap - - -	1	No. 4. B.	6.75	–	1	Bevel washer; nut octagonal.
	2	do.	9.00	–	–	
" large pointing ring	2	No. 3. H.	5.65	–	–	Nuts octagonal.
" small ditto - -	2	do.	7.2	–	–	Nuts octagonal.
" box for elevating screw - - - -	1	No. 3. C.	9.5	–	1	
	1	do.	9.55	–	1	
Rivets.						
For lunette and trail plate	2	No. 3. B.	2.0	Heads chamfered.		
Nails.						
For trunnion plates	12	No. 2. D.	4.0			
	8	No. 2. C.	3.0			
" lunette - - - - -	6	do.	3.5			
" trail plate - - - - -	6	do.	3.5			
" wheel guard plate -	10	do.	3.0			
" prolonge hooks - -	8	do.	2.5			
" ear plate for worm -	2	do.	2.5			
" turnbuckle plates -	4	do.	3.0			
" axle bands - - -	6	No. 1. C.	.75			
" sponge&rammer stop	4	do.	2.0			
" linstock socket - -	6	do.	2.0			
Screws.						
For eye plate of sponge and rammer chain	2	No. 20	3.0			

Table of bolts, rivets, nails and screws, for 24-pounder howitzer and 12-pounder gun carriages.

DESIGNATION.	Number.	Kind.	LENGTHS.		WASHERS.		REMARKS.
			24-pdr. how'zer	12-pdr. gun.	Head	Nut.	
Bolts.			In.	In.			
For lock chain plate - -	1	No. 5. A.	10.0	10.5	–	1	
" assembling the cheeks and stock	1	do.	19.25	20.05	1	1	
	1	do.	19.3	20.1	–	1	
	1	do.	19.35	20.15	–	–	Nut octagonal
" trail handles - -	1	No. 3. A.	7.8	8.2	–	–	
	1	do.	8.3	8.7	–	–	
" trunnion plates. chin bolts	2	No. 5.	17.15	17.5	–	2	Plate IX.
key bolts	2	do.	13.75	14.25	–	–	Plate IX.
cheeks	2	No. 5. A.	15.5	16.1	–	–	
	2	do.	12.4	12.6	–	2	
	2	do.	10.25	11.25	–	2	
" axle strap - -	1	No. 4. B.	6.45	6.5	–	–	Nut octagonal
	2	do.	9.35	9.90	–	–	
" large pointing ring	2	No. 3. H.	5.7	6.6	–	–	Nuts octagonal.
small do. -	2	do.	7.7	8.3	–	–	Nuts octagonal.
" box of elevating screw - - -	1	No. 3. C.	10.45	11.25	–	1	
	1	do.	10.5	11.3	–	1	
Rivets.							
For lunette and trail plate	2	No. 3. B.	2.0	2.0	Heads chamfered.		
Nails.							
For trunnion plates -	12	No. 2. D.	4.0	–			
	8	No. 2. C.	3.0	–			
	16	No. 2. D.	–	4.0			
	12	No. 2. C.	–	3.0			
" lunette - - - -	6	do.	3.5	3.5			
" trail plate - - - -	6	do.	3.5	3.5			
" wheel guard plate -	10	do.	3.0	3.0			
" turnbuckle plates -	4	do.	3.0	3.0			
" prolonge hooks - -	8	do.	2.5	2.5			
" ear plate for worm	2	do.	2.5	2.5			
" axle bands - - -	6	No. 1. C.	.75	.75			
" sponge&rammer stop	4	do.	2.0	2.0			
" linstock socket - -	6	do.	2.0	2.0			
Screws.							
For eye plate of sponge and rammer chain	2	No. 20	3.0	3.0			

WHEELS.—Plate X.

There are two Nos. of wheels for field carriages. No. 1 is used for the 6-*pounder gun carriage*, the *caisson*, the *forge*, the *battery wagon*, and for the *limbers* of all field carriages.

No. 2, for the 24-*pounder howitzer* and the 12-*pounder gun carriages*, only.

These wheels are both of the same kind and height, and they are fitted to the same axle tree arm; they differ only in the dimensions of some of their parts, and consequently in their strength and weight.

WOOD.

One nave, (OAK or WALNUT.) After the nave is turned, two stay bands are put on, for driving the spokes.

Fourteen spokes, (TOUGH YOUNG OAK.) The heart side of the wood is made the back of the spoke. The body of the spoke has an oval shape, which facilitates turning it by machinery. The tenon in the felly is round; it is shorter than the depth of the felly, in order that the latter may always bear on the shoulder of the spoke.

Seven fellies, (OAK.) The inner edges are rounded with a radius of .4 inch.

Seven dowels, (OAK.)

IRONS.

Two brow bands. } The inner edges on the side next to the
Two end bands. } spokes are slightly chamfered, to facilitate the driving; the bands are warmed, and driven on, in place of the stay bands, after the tire has been put on; each band is fastened by *three nails.*

One tire. Hoop tire, heated and shrunk on; the bolt holes are then bored and countersunk.

Seven tire bolts, seven washers, and *seven nuts.* The bolts should be a little larger than the holes in the fellies.

One nave box, (CAST IRON.) The castings should be of even thickness, so that the box may be easily set concentric with the circumference of the wheel. The box is driven in hard, and fastened, if necessary, with wooden wedges in the large end of the nave.

Bolts and nails for one wheel.

DESIGNATION.	Number.	Kind.	LENGTH.		Washers for Nuts.
			No. 1.	No. 2.	
			In.	In.	
Tire bolts - - - - - -	7	No. 2. H.	4.35	4.75	7
Nails for nave bands - - -	12	No. 1. C.	1.5	1.5	

LIMBER.—Plates XI and XII.

The same limber is used for all the field carriages, viz: the gun carriages, the caisson, the forge, and the battery wagon.

WOOD WORK.

One axle body, (WHITE OAK.) The lower edges are rounded with a radius of .6 inch, except the part under the pintle hook; the upper edges, outside of the hounds, are rounded .4 inch.

Two hounds, (WHITE OAK.) The upper edges are rounded with a radius of .4 in., to the distance of 17.15 inches from the front end; also, 3.5 inches in rear of the rear foot board, and from the ammunition chest stay to the rear end. The lower edges are rounded with the same radius, from the splinter bar to the under strap, and from the rear end to the under strap; the ends are chamfered .4 inch.

One fork, (WHITE OAK.) The upper edges are rounded, on the outer sides, like those of the front part of the hounds; the lower edges are rounded with a radius of .4 inch, between the splinter bar and the axle body.

One splinter bar, (WHITE OAK.) The front of the splinter bar is straight. The ends, outside of the hounds, taper equally on the upper and under sides; they are rounded to an oval shape. The upper edges are rounded .4 inch, between the hounds and fork; the lower edges are chamfered .4 inch between the outsides of the hounds, where the roundings of the ends begin.

The top of the splinter bar is notched square into the bottom of the fork, .25 inch being cut out of each piece. Between the branches of the fork, the splinter bar is notched .5 inch deep, (.25 inch deeper than the notches for the fork,) in order to admit the pole. The hounds rest on the splinter bar, the top of which is notched .1 inch on the rear side, to fit the slope of the under side of the hounds.

Four foot board brackets, (WHITE OAK.) Wood not easy to split is selected for them; their front edges are chamfered .25 inch. They are fastened to the hounds and fork, each by *two wood screws*, the heads of which are sunk into the wood.

Two foot boards, (WHITE OAK.) The upper edges, the sides and ends are rounded with a radius of .2 inch; the front foot board is fastened by *three nails* in each bracket; the rear foot board by *eight nails*. The foot boards are nailed on after the splinter bar, the under straps and the pintle hook are in place.

One pole, (TOUGH WHITE ASH, or YOUNG OAK.) The top of the pole is straight in its whole length, the taper in depth being on the under side alone.—See Plate XI.

One pole prop, (TOUGH WHITE OAK.) It is turned in the lathe, to fit the socket and ferrule.

IRONS.

Four rivets, for hounds. One at each end of the hound; the heads and burrs let into the wood.

Four washer plates, for stay pins of ammunition chest. They are let into the upper and under sides of the hounds, at the holes for the stay pins, and are fastened, each by *two nails*.

One axletree. The lower edges are rounded with a radius of .1 inch. The axletree is forged in two unequal parts, on the longer of which the stop is jumped on and welded, before the two parts are joined; or, it may be made in three parts, the middle piece being forged with the stop on it and then welded to the arms, which may be turned either before or after the parts are joined together.

One pintle hook. The outer edges of the plate are chamfered .2 inch; the hook is fastened to the rear of the axle body by three bolts, two of which pass through the holes in the stop on the iron axletree; the top of the plate is let in flush with the upper surface of the axle body. The inside of the cylindrical part of the hook is plated with steel, by welding a wedge shaped piece of steel into a slit in the iron and spreading it over the inner surface of the hook.

Three bolts, for pintle hook.

One stay plate, for ammunition chest. The outer edges are chamfered .15 inch. The plate is inserted between the branches of the fork; the foot, which is bent square to the plate, is fastened on the under side of the fork with *two nails*, and the plate is held also by the upper bolt of the pintle hook, to which it serves as a washer. The upper edges of the mortise in the plate are rounded .1 inch.

Two washers and *three nuts*, for pintle hook bolts.

One pintle key, attached to the rear of the axle body by a chain and eye pin.

One key chain, composed of *eight links*, No. 3, and *two rings*, No. 2. A.

One eye pin, No. 3, for key chain.

One tar bucket hook. The edges of the plate are chamfered .1 inch; it is fastened to the front of the axle body by *two nails.*

Two bolts, for connecting the axle body and hounds.

Two washers and *two nuts*, for the same. The nuts are let into the axle body from the top.

Two under straps. The outer edges are chamfered .15 inch.

Four bolts, for under straps; *four nuts* for these bolts.

Two axle bands. They are shrunk on the ends of the axle body at a low heat, not sufficient to burn the wood, and they are fastened, each by *three nails.*

Two end bands, for splinter bar. They are put on warm, and are fastened to the splinter bar, each by *two rivets* made of .25 inch wire riveted at both ends.

Two bolts, for the hounds and splinter bar.

Four washers and *two nuts*, for the same.

One eye plate for pole prop socket. The eye is riveted into the plate, in a square hole countersunk .15 inch on the upper side. The plate is let into the lower side of the splinter bar its whole thickness.

Two middle bands, for splinter bar. The bottom plate is chamfered .15 inch. The top plate is let into the under side of the fork, flush with the lower surface of the notch which rests on the splinter bar.

Four trace hooks. Two in the end bands and two in the middle bands.

One fork strap. The edges are chamfered .15 inch.

Two bolts, for splinter bar and fork. They pass through the fork strap, the middle bands, and the eye plate for the pole prop.

Two nuts, for these bolts.

One pole prop socket. After the exterior of the socket is turned, the ring is closed in the eye plate. The upper end of the prop is then driven hard into the socket, and fastened by *one rivet.*

One ferrule, for pole prop; fastened to the prop by *one rivet*.

One pole prop chain, consisting of *one ring*, No. 1, A; *ten links*, No. 2, and *one straight link*, of the same size as No. 2, welded into the eye of the toggle.

One toggle, for pole prop chain.

One eye pin, for pole prop chain. The eye pin is like No. 1, but the stem has no screw thread cut on it; it is made long enough to pass through the splinter bar, and is riveted into a *burr* let into the upper side of the bar.

Two stay pins, for ammunition chest. The edges of the head are chamfered .1 inch. The drawing in Plate III. gives the lengths of the stay pins for the limber and for the caisson; the position of the hole for the key is determined by the thickness of the hound or rail, so that the hole may just clear the under side of the wood, when the ammunition chest is in place.

Two keys, for stay pins of ammunition chest.

Two key chains, each consisting of *five links*, No. 1, and *two rings*, No. 1, B.

Two eye pins, No. 1, screwed into the under side of the hounds.

One rivet, for the large end of the pole. The head is let into the upper side of the pole, and the *burr* into the under side, at 3.5 inches from the end.

One pole bolt; two washers and *one nut*, for the same. The bolt passes through the fork and the pole, at 11 inches from the front end of the fork.

One pole strap and ring. The strap is fastened on the front end of the pole by *three rivets.*

Two pole chains. Each consists of *nine links*, No. 5, and is connected with the ring of the pole strap by an open (lapped) *ring*.

One muff, for pole yoke. The muff is formed on a mandril of the size of the pole at the part which it is to fit; a ring is welded on it, to form the shoulder, and the whole is finished in the lathe.

One collar, for pole yoke. It is composed of two parts which are connected together by the two bolts that hold the supporting branches of the pole yoke; the holes in the lower half collar are tapped, and the bolts are screwed into them; the edges of the circular part are chamfered .15 inch, and those of the straight parts are rounded with a radius of .1 inch.

Two branches, of pole yoke. Each branch is forged in two parts which are welded together near the collar; the sliding ring is then put in place, and the button is welded on the small end.

Two sliding rings, for pole yoke.

Two bolts, for the collar and branches. They have hexagonal heads and are without nuts, being screwed into the lower branch of the collar.

One washer, for the muff. It fits on the muff, against the front side of the collar; the front edge of the washer is chamfered .12 inch.

One key, for pole yoke. It passes through the muff and the pole, in front of the washer; the key has a hole at the lower end for a leather keeper.

Two shoulder washers.

Two linch washers.

Two linch pins.

Two wheels. No. 1.

One ammunition chest.

Table of bolts, rivets, nails and screws, in the limber of field carriages.

DESIGNATION.	Number.	Kind.	Length.	WASHERS.		REMARKS.
				Head	Nut.	
Bolts.			In.			
For hounds and axle body	2	No. 3. E.	8.25	–	2	Nuts not chamfered.
" under straps - - -	4	No. 3. B.	4.56	–	–	
" pintle hook - -	2	No. 4. C.	6.9	–	2	
	1	do.	12.7	–	–	
" hounds & splinter bar	2	No. 3. D.	6.13	2	2	
" fork and splinter bar	2	do.	6.5	–	–	
" pole and fork - - -	1	do.	9.13	1	1	
" pole yoke - - - -	2	No. 3.	1.75	–	–	Head hexagonal; no nut.
Rivets.						
For hounds - - - - -	4	No. 2. B.	2.75	–	4	
" pole - - - - - -	1	No. 3. B.	3.5	–	1	
" pole strap - - - -	3	No. 2.	2.5	–	–	Wires riveted at both ends.
" end bands of splinter bar - - - - -	4	do.	2.5	–	–	
" pole prop socket - -	1	do.	1.75	–	–	
" pole prop ferrule - -	1	do.	2.13	–	–	
Nails.						
For stay plate - - - -	2	No. 2. C.	2.0			
" tar bucket hook - -	2	No. 1. C.	2.5			
" stay pin plates - -	8	do.	.75			
" axle bands - - -	6	do.	.75			
" foot boards - - -	4	do.	4.25			
	4	do.	3.5			
	12	do.	2.25			
Screws.						
For foot board brackets	4	No. 16.	2.0			
	4	No. 14.	1.25			

AMMUNITION CHEST.—Plates XIII and XIV.

WOOD WORK.

Two ends. } (BLACK WALNUT, CHERRY, or BEACH.) Each
Two sides. } in one piece. The ends and sides are dovetailed together and fastened with *sixteen cut nails.* There is a rabbet at the top to receive the edges of the cover lining, and another at the bottom. The upright corners are rounded with a radius of .5 inch.

One principal partition, (WALNUT or OAK.) It is let into grooves in the middle of the sides, and it is traversed by the assembling bolt.

One bottom, (WALNUT or OAK.) The bottom may be in one or two pieces; if in two, they should be joined together, nearly in the middle of the width, with a tongue and groove and strongly glued. The bottom is let in, its whole thickness, into the sides and ends, and fastened to them with *eighteen cut nails;* it is also fastened to the principal partition by *four wood screws.*

One frame for cover, (WALNUT,) consisting of *two ends* and *two sides,* joined by tenons and mortises and fastened at each corner by a *wooden pin* .25 inch thick.

One panel for cover, (POPLAR or WHITE PINE.) It is joined by tongue and groove to the cover frame; the tongue on the end is worked out of the thickness of the panel; that on the side is formed of a piece of hard wood let into grooves in both the panel and frame.

One cover lining, (POPLAR or WHITE PINE.) It is fastened on the inside of the cover by *sixty copper tacks.*

IRONS.

Seven corner plates, viz: *four* for the ends and sides, *two* for the ends and bottom, and *one* for the front side and bottom. They are made of sheet iron No. 12 or 13; the parts which go under the bottom are let into the wood their whole thickness; the edges of the other parts are chamfered .1 inch. The plates are fastened with *eighty-six wood screws.*

One assembling bolt. It passes through the principal partition and through the back stay; its front end holds the turnbuckle for fastening the hasp.

One turnbuckle, (BRASS.) It turns freely on the neck of the assembling bolt, the head of which is riveted over the turnbuckle.

One washer plate, for assembling bolt. It is let into the front side of the box and fastened by *two wood screws.*

One back stay. The edges of the upright part are chamfered .1 inch. The foot is let in flush with the bottom of the chest. The stay is fastened to the back of the chest by the assembling bolt and *four wood screws*, and to the bottom, by *two wood screws.*

Two front stays. The outer edges are chamfered .1 inch. The feet are let in flush with the bottom of the chest. Each stay is fastened by *two rivets* and *three wood screws* in the front of the chest, and *one wood screw* in the bottom.

Two hinges. The outer edges of the back strap are chamfered .1 inch; the foot of it is let into the bottom of the chest. The cover strap is let in, its whole thickness, at the front end and .35 inch at the joint; the cover lining is cut out to fit it. A notch .15 inch deep is cut in the back of the chest for the hinge to lie in. The hinges are fastened to the chest, each by *one rivet* and *four wood screws* in the back, *one wood screw* in the bottom, and *one rivet* and *five wood screws* in the cover.

Two hinge plates, fastened on the back edge of the cover, each by *two wood screws.*

One hasp. The outer edges are chamfered .1 inch. The strap is let into the cover of the chest like the hinge straps, and is fastened by *one rivet* and *five wood screws.*

One hasp plate, fastened to the front edge of the cover by *two wood screws.*

Two handles. The outer edges of the flat parts are chamfered .1 inch. The handles are fastened to the chest each by *two rivets.*

The heads of all the rivets in the body of the chest are let into the wood on the inside, and they are covered by round *washers* 1.75 inch diameter, made of sheet copper No. 24, which are let into the wood over the rivet heads and fastened each by *four copper tacks.*

One cover, (SHEET COPPER, No. 24,) fastened to the edges of the wooden cover by *two hundred and sixteen copper tacks.*

Note. The foregoing description refers especially to the ammunition chest for gun carriages and for the caisson. The chests for the limbers of the forge and battery wagon differ from this in some few particulars which will be mentioned in the descriptions of those carriages.

For an account of the interior arrangement of the chests for the various carriages, see PART 12.

Table of bolts, rivets, nails and screws, in one ammunition chest.

DESIGNATION.	Number.	Kind.	Length.	REMARKS.
			In.	
For assembling bolt - -	1	No. 2.	20.75	See Plate XIV.
Rivets.				
For front stays - - - -	4	No. 2. B.	2.0	
" hinges - - - - -	4	do.	2.0	
" hasp - - - - -	1	do.	2.0	
" handles - - - - -	8	No. 3. B.	2.0	
Nails.				
For sides and bottom - -	34	8d.	–	Cut nails.
" cover lining - - -	60	–	1.0	Copper tacks.
" copper covering - -	216	–	.75	Copper tacks.
" rivet washers - - -	60	–	.75	Copper tacks.
Screws.				
For corner plates - - -	56	No. 12.	.75	
" side and bottom plate	14	do.	.75	
" end and bottom plates	16	do.	.75	
" washer plate for bolt	2	do.	.75	
" hasp - - - - - -	5	No. 14.	1.0	
" hasp plate - - - -	2	do.	1.0	
" hinge plates - - -	4	do.	1.0	
" hinges - - - -	2	do.	.75	
	8	do.	1.0	
	10	do.	1.25	
" back stay - - - -	6	do.	1.25	
" front stays - -	6	do.	1.0	
	2	do.	.75	
" bottom and partition	4	No. 16.	2.0	

CAISSON.—Plates XV and XVI.

WOOD WORK.

All the parts are of WHITE OAK. Tough young wood should be selected, especially for the middle and side rails and for the stock.

One middle rail. The front end has a tenon on the upper side which is inserted in a notch in the bolster of the front foot board. The edges of the rear end and the upper edges of the rail are rounded with a radius of .2 inch, up to the rear foot board. The lower edges of the rail, in rear of the axle body, are rounded with a radius of .4 inch, except the part which rests on the rear assembling bar.

Two side rails. The upper edges are rounded with a radius of .2 inch, behind the foot boards. The lower edges are rounded with a radius of .4 inch, from the under strap to each end. The edges of the rounded ends are chamfered .4 inch.

One cross bar. It is joined by tenon and mortise to the side rails, and is notched .25 inch deep, over the stock. The lower edges are rounded with a radius of .2 inch, between the rails. The upper edges are chamfered .4 inch, between the side rails and the ends of the foot board bolster.

One bolster, for front foot board. It is fastened on the middle of the cross bar by the stock stirrup bolts.

One front foot board. The upper front edge is rounded with a radius of .6 inch; the lower front edge is chamfered .4 inch, between the bolster and the side rails. The upper edges of the rear side and of the ends are rounded with a radius of .2 inch.

This foot board is fastened to the rails and cross bar by *four bolts* and *two nails.*

One rear foot board. The upper edges of the sides and ends are rounded with a radius of .2 inch. The board is fastened to the rails by *six nails.*

One axle body. It is notched out in the middle 1 inch deep, to receive the middle rail; at the shoulder for the side rail it has a tenon, fitting in a notch in the rail. The upper edges of the shoulders for the middle and side rails are rounded with a radius of .6 inch, to the distance of 1 inch from the rails; the upper edges of the axle body, between these shoulders and outside of the side rails, are rounded .4 inch; the lower edges are rounded .6 inch. The lower corners of the mortise for the end of the stock are rounded with a radius of .6 inch.

One stock. The rear end of the stock is let in, its full width, .4 inch into the front of the axle body. The upper edges are rounded .25 inch on a length of 7 inches in front of the cross bar; from that point to the lunette plates, the width is reduced .4 inch on each side, at top and bottom, and the sides are rounded, retaining the full width in the middle of the stock; between the lunette plates, this rounding tapers down to the width of the iron. The lower edges of the stock are rounded with a radius of .6 inch, from the rear end to the rear of the wheel guard plate; from that point they are rounded .25 inch, to the distance of 7 inches in front of the cross bar, where the rounding of the sides begins.

IRONS.

One middle assembling bar. The two ears in the middle of the bar serve as stay plates for the ammunition chests; their edges, above the bar, are chamfered .1 inch. The upper edges of the bar, between the rails, and the outer edges of the feet by which it is attached to the side rails, are chamfered .15 inch. It has a slot for the axe blade, on the right of the middle rail. The bar is set even with the top of the rails, and is bolted to each rail; the bolt in the middle rail passes through the axle strap.

Two bolts, two washers and *two nuts*, for the middle assembling bar and side rails.

One carriage hook. The edges of the head are chamfered .1 inch. The plate is let in flush with the under side of the middle rail; it is fastened by the stays and the foot bolt of the spare wheel axle.

This hook is intended to take a carriage which may have lost its limber.

One rear assembling bar, to support the spare wheel axle. The edges of the ends, over the side rails, are chamfered .15 inch. The bar has a slot, for carrying a pick axe, on the left of the middle rail. It is fastened to the side rails by two bolts, and to the middle rail by the stays of the spare wheel axle.

Two bolts, *two washers* and *two nuts*, for the rear assembling bar and side rails.

One bridle, for rear end of middle rail. The edges of the ends, which are bent over the rail, are chamfered .1 inch. The plate, through which the stays of the spare wheel axle pass, is let in flush with the slope of the middle rail. The ends are fastened to the sides of the rail by *four nails.*

One spare wheel axle. The axle consists of the *body* and *two ribs* which are connected with the body by a *washer* and *three rivets.* The shoulder on the body and a cylindrical bearing for the washer are first turned; the washer is warmed and shrunk on against the shoulder; the ribs are put in place and riveted, and the edges of the body and side bars are then turned, with a taper corresponding to that of the arm of the carriage axle.

The upper edges of the sides, in rear of the washer, are chamfered .1 inch. The lower extremity of the foot is let in flush with the upper surface of the middle rail; the part which is supported by the slope of the rail is not let in. The axle is fastened by two stays and one foot bolt.

One chain and toggle, for spare wheel axle.

Two stays, for spare wheel axle. The bolt hole in the head of one of them is square; in the other, round.

The stays pass through the bridle of the middle rail, through the round notches in the plate of the carriage hook and through the rear assembling bar.

Two nuts, for the stays.

One stay bolt, connecting the stays with the spare wheel axle.

One nut, for stay bolt.

One foot bolt, for spare wheel axle. It passes through the foot of the axle and through the carriage hook. *One nut* for this bolt.

Three foot board bolts, fastening the front foot board to the side rails.

One lock chain bridle. The edges of the plates are chamfered .15 inch.

The bridle is fastened under the front end of the left side rail, by two of the foot board bolts; the straight side is turned outwards. Before the bridle is put in place the large ring of the lock chain is hooked in it.

One lock chain. Plate III.

Two washers and *three nuts*, for foot board bolts.

One lock chain hook. Like the tar bucket hook for the limber, Plate III. It is fastened on the outside of the left side rail by *two nails.*

One axletree. Like that for the 6-pounder gun carriage.

Two under straps. The edges of the sides are chamfered .15 inch; those of the ends .5 inch.

Four bolts, for under straps. The heads are let in flush with the upper surface of the side rails. *Four nuts* for these bolts.

Two axle bands, fastened on the ends of the axle body, each by *three nails.*

One rivet, for the stock. It is placed between the two lunette bolts; the head and burr are let into the sides of the stock.

One lunette. Plate IV. The lower side of the eye is plated with steel, like that for the gun carriage. The edges of the plates are chamfered .15 inch. The bolt holes in the lower plate are square.

The lunette is fastened to the stock by two bolts and *twelve nails*, six in each plate.

Two lunette bolts. *Two nuts* for the same.

One key plate for spare pole. The outer edges of the ears are chamfered .15 inch; the inner edges are rounded .1 inch. The plate is fastened on the under side of the lunette by the front lunette bolt.

One spare pole key. The edges of the handle are chamfered .1 inch. It is attached to the left side of the stock by a chain and eye pin.

One key chain; consisting of *eleven links*, No. 1, and *two rings*, No. 1, A.

One eye pin, No. 1, for the key chain. It is screwed into the left side of the stock.

Two wheel guard plates. Plate IV. The edges are chamfered .15 inch. They are fastened to the stock, each by *five nails.*

One stock stirrup. The outer edges of the sides are chamfered .15 inch; those of the ends, .5 inch.

Two bolts, for stock stirrup. They pass through the front foot board and its bolster. *Two washers* and *two nuts* for these bolts.

One axle strap. The outer edges are chamfered .15 inch.

One spare pole ring. It is held by the axle strap. The straight bar of the ring is lodged in a groove made in the middle of the axle body, in rear of the iron axle tree. The edges of the broad part, on which the pole hangs, are rounded.

Three bolts, for the axle strap. The head of the front bolt rests on the middle assembling bar; those of the other bolts are let in flush with the top of the middle rail. *Three nuts* for these bolts.

Eight washer plates, for stay pins of ammunition chests. They are let into the side rails, on the upper and under sides, at the holes for the stay pins, and are fastened, each by *two nails.* The front plates, on the upper side of the rails, are partly covered by the rear foot board.

Four stay pins, like those for the limber, except in the length and in the position of the key hole; for which see Plate IV.

Four keys, for stay pins.

Four key chains; each consisting of *five links*, No. 1, and *two rings*, No. 1, B.

Four eye pins, No. 1, for key chains. They are screwed into the middle of the thickness of the rails, on the under side.

One ring bolt, for spare handspike. The outer edges of the ring are chamfered .1 inch; the inner edges are rounded .1 inch. The ring is on the right side of the middle rail. *Two washers* and *one nut* for the ring bolt.

One key plate, for spare handspike. The outer edges are chamfered .15 inch. It is fastened on the right side of the middle rail by *two nails.*

One key plate, for the shovel handle; fastened on the inside of the right side rail by *two nails.* The upper surfaces of both key plates are .25 inch below the top of the rails.

Two keys, for handspike and shovel.

Two key chains; each of *five links*, No. 1, and *two rings*, No. 1, B.

Two eye pins, No. 1, for key chains. They are placed .65 inch below the upper surface of the rails.

Two staples, for tool handles, driven into the top of the axle body in front of the iron axletree; one for the shovel handle, near the right side rail; the other for the handle of the pickaxe, on the left of the middle rail.

Two shoulder washers.

Two linch washers.

Two linch pins.

Two wheels, No. 1,

Two ammunition chests, like the one on the limber.

Bolts, rivets and nails for caisson.

DESIGNATION.	Number.	Kind.	Length.	WASHERS.		REMARKS.
				Head	Nut.	
Bolts.			In.			
For middle assembling bar	2	No. 3. A.	3.75	–	2	
" spare wheel axle { stays	2	No. 3.	8.2	–	–	Plate XVI.
" spare wheel axle { stay bolt	1	No. 3. D.	3.35	–	–	
" spare wheel axle { foot bolt	1	do.	4.95	–	–	
" rear assembling bar	2	do.	4.45	–	2	
" foot board and right side rail	1	do.	5.47	1	1	
" foot board and lock chain bridle	1	do.	5.8	1	–	
	1	do.	5.43	1	–	
" lunette	1	do.	5.4	–	–	
	1	do.	6.2	–	–	
" stock stirrup	2	do.	6.0	2	–	
" axle strap	1	do.	8.73	–	–	
	1	No. 3. B.	8.47	–	–	
	1	do.	5.13	–	–	
" understraps	4	do.	5.38	–	–	
" spare handspike ring	1	No. 3.	5.0	1	1	Plate XVI.
Rivets.						
For the stock	2	No. 3. B.	4.25	–	2	
Nails.						
For bridle of middle rail	4	No. 1. C.	0.75			
" foot boards	8	do.	2.25			
" lock chain hook	2	do.	2.5			
" axle bands	6	do.	.75			
" stay pin washers	16	do.	.75			
" key plates { handspike	2	do.	2.0			
" key plates { shovel	2	do.	2.0			
" lunette plates	12	No. 2. C.	3.5			
" wheel guard plates	10	do.	3.0			

TRAVELLING FORGE.—Plates XVII to XXI.

Body and bellows house.

WOOD WORK.

Note.—Oak will be understood to designate white oak.

Two side rails, (oak.) The outer edge of the under side is rounded with a radius of .3 inch from the under strap to each end; the inner edge of the under side is rounded in like manner, from the under strap to the middle cross bars, and also in rear of the rear middle cross bar. The outer edge of the upper side, in front and in rear of the bellows house, is rounded with the same radius; the edges of the ends are chamfered .5 inch.

The notches for the tenons of the axle body, the mortises for the cross bars and studs, and the rabbets for the coal box and for the sides of the bellows house, are shown in Plate XVII.

One front cross bar, (oak.) The lower edges of the front side are rounded .3 inch, between the rails and the stock; the upper edges of the same side are rounded .2 inch. The cross bar rests on the stock and its lower side is made sloping, to correspond with the slope of the stock and side rails; it is fastened to the side rails by *two wooden pins* .5 inch thick, placed .5 inch clear of the inside of the rail.

One middle cross bar, (oak,) in front of the axle body. The lower side is cut with a slope like the front cross bar. The lower edges are rounded .3 inch, between the rails and the stock. The bar is notched on the upper side in front, for the air back of the forge; in rear, it has a notch for the tenon of the middle rail, and a rabbet for the ends of the floor boards. It is fastened to the stock by one bolt, and to the side rails by *four wooden pins*, like those for the front cross bar.

One middle cross bar, (OAK,) in rear of the axle body. The lower side slopes with that of the middle rail. The lower edge of the front side is rounded .3 inch, between the rails and the stock; the upper and lower edges of the rear side are rounded .3 inch. On the front of the upper side there is a notch for the rear end of the middle rail, and a rabbet for the ends of the floor boards. The bar is fastened to the side rails by *two wooden pins*, .5 inch thick, placed .75 inch clear of the inside of the rails.

One rear cross bar, (OAK.) The lower edges and the upper rear edge are rounded with a radius of .3 inch. It is fastened to the side rails by *two wooden pins*, like the preceding.

The upper surface of the front cross bar is flush with that of the side rails; the others are .5 inch below the side rails, being even with the floor and with the top of the middle rail.

One middle rail, (OAK.) The lower edges, in rear of the axle body, are rounded .3 inch. The rail is notched out 1.25 inch deep for the axle body, and is also let into it the same depth; the ends are let into the middle cross bars, to which they are fastened by *two screws* in each bar.

One axle body, (OAK.) The lower edges are rounded with a radius of .6 inch; the upper edges, outside of the rails, .4 inch. The axle body is notched out 1.25 inch deep, for the middle rail, and it is framed into the side rails with tenons which fit into notches in the rails. On the front side, there is a mortise for the end of the stock; the lower corners of this mortise are rounded with a radius of .6 inch.

One stock, (OAK.) The lower edges are rounded with a radius of .6 inch, from the rear end to the rear of the wheel guard plate; the upper edges are rounded .25 inch, under the fire place, and on a length of 7 inches in front of the front cross bar. The front end of the stock is finished like the caisson stock. The stock is let into the axle body .4 inch.

Four floor boards, (OAK, or other hard wood.) The floor is even with the top of the middle rail; the boards are fastened to the middle cross bars, each by *two wood screws* in each end.

Four corner studs, (OAK.) The outer edges are rounded .3 inch. The studs are joined by tenons and mortises to the side rails and plates, to which they are fastened with *one wooden pin*, .38 inch thick, in each end.

One front end board, for iron room, (OAK, or other hard wood.) It is mortised into the front corner studs and fastened to them by *two wooden pins* .25 inch thick.

Two side studs, (OAK,) fastened to the side rails and plates like the corner studs.

Two plates, (OAK,) framed on the upper ends of the studs.

One front end stud, (OAK.) It is mortised into the front end boards of the iron room and of the roof. A slit is cut in the middle of the stud, for the bellows hook to work in.

Two end boards, for roof of bellows house, (WALNUT or OAK.) They are set flush with the ends of the plates, and are let into rabbets in the corner studs. They are fastened to the plates by *one wood screw* in each end on the top; the front board is also fastened to the corner studs by *one screw* in each end, and the rear board by *two screws* in each end.

Two roof bows, (OAK or WALNUT.) They are let into notches .2 inch deep, on the inside of the plates, and they are fastened to the plates by *one screw* in each end, on the top.

Two side linings, (OAK or WALNUT,) for iron room, fastened by *two nails* to each stud.

One rear end piece, for iron room. It is dovetailed into the side linings.

Two groove cleats, (OAK,) for cover of iron room. They are fastened with *one screw* to each stud, .5 inch above the side linings. The front ends are notched over the front board of the iron room.

One sliding cover, for iron room, (WHITE PINE or POPLAR.) It consists of about *six boards*, fastened to *two battens* by *thirty-six nails*. The battens project .5 inch beyond the boards at the front end, and rest in notches cut for the purpose in the top of the front end board of the iron room. The cover slides in the grooves formed by the side linings and the cleats.

Two braces, for supporting the bellows, (OAK.) They are framed into the corner and side studs, by means of notches cut in the braces and studs, and they are fastened by *six screws*, one in each stud. The braces are flush with the middle stud on the outside, and they project .75 inch over the studs on the inside; in the upper side of this projecting part, a rabbet .75 inch wide and .5 deep is cut, for the ends of the bellows arms to rest in.

One cap for coal box, (OAK.) It is let in on the under side of the rear end board of the roof, to which it is fastened by *five wood screws*. It projects .5 inch in rear of the end board and covers the opening at the top of the coal box.

Ten boards, for sides of bellows house, (WHITE PINE.) They are tongued and grooved, the groove being on the lower side; a small bead is worked at the joints. They fit into rabbets in the corner studs, the side rails and the plates, to all of which they are fastened with *cut nails*.

Seven cover boards, for the roof, (WHITE PINE.) They are tongued and grooved. They may be worked straight and bent on the roof bows and the end board, to which they are fastened with *cut nails;* or, they may be worked to the proper curve out of thick boards.

One prop, for the stock. Like the pole prop of the limber.

One bellows pole, (HICKORY, OAK, or ASH.) The handle, from the small end to the iron strap, is round.

IRONS.

One axletree, like that for the 6-pounder gun carriage.

Two axle bands, fastened each by *three nails*.

Two under straps. The outer edges of the sides are chamfered .15 inch; those of the ends, .5 inch.

Four bolts, for under straps. *Four washers* and *four nuts* for these bolts.

Two rivets, for the front end of the stock.

One lunette, Plate IV. It is like that for the caisson, except that the plates have each an additional bolt hole, (the one in the lower plate being square,) and that the rear bolt hole in the upper plate is .88 inch square, and in the lower plate .63 inch round, in order to receive the *vice bolt* which secures the vice to the stock. See the drawing of the vice: PART 10, Plate VIII.

The *front lunette bolt*, (Plate XX,) holds the prop for supporting the forge when it is unlimbered.

One middle bolt and *twelve nails*, for lunette.

Three nuts, for lunette bolts.

One socket,
One ferrule,
One chain and toggle,
} For forge prop. They are like those for the pole prop of the limber.

One eye pin, No. 1, for the chain; it is screwed into the under side of the stock.

One stock stirrup. The edges are chamfered like those of the under straps. It is fastened by two bolts, the heads of which are let into the upper side of the front cross bar.

Two bolts, for stock stirrup. *Two nuts* for the same.

One bolt, for the middle cross bar and stock. The head is let into the upper side of the cross bar. *One washer* and *one nut* for this bolt.

One axle strap. The edges chamfered like those of the under straps.

Two bolts, for axle strap. *Two nuts* for the same.

Two wheel guard plates, like those for caisson, Plate IV; they are fastened each by *five nails.*

Two stud plates, for coal box. They are let in flush with the back of the rear corner studs of the bellows house, to which they are fastened, each by *one rivet* and *one screw.*

Two keys, for coal box.

Two key chains; each consists of *four links* No. 1, and *two rings* No 1, B.

Two eye pins, No. 1, for key chains. They are screwed into the rear corner studs.

One lock chain hook, Plate III; fastened to the left side rail by *two nails.*

One hook, for bellows pole; like the lock chain hook. It is fastened to the front corner stud, on the right side, by *two nails.*

One staple, for bellows pole; driven into the rear corner stud, on the right side. The hook and staple carry the bellows pole when travelling.

Two front stay plates, for bellows arms. They are fastened to the braces, at the upper ends of the rabbets for the bellows arms, each by *three screws.*

Two rear stay plates, for bellows arms. They are fastened to the braces, at the lower ends of the rabbets, after the bellows is put in place, each by *two bolts* and *two thumb nuts.*

One front, for bellows house, (RUSSIA SHEET IRON, No. 24.) It has a hole for the wind pipe to pass through, and a slit for the bellows hook corresponding with that in the front end stud. It is bent towards the front, at the bottom, about an inch under the sheet of iron which covers the cross bar and is nailed down with the latter; it is also fastened to the front studs and front roof board with *iron tacks.*

One sheet iron cover, for front middle cross bar, (SHEET IRON, No. 24;) fastened to the cross bar with *iron tacks.*

One guard, for the stock, (SHEET IRON, No. 24.) It is bent over the top of the stock, between the two front cross bars, and fastened on the sides by *eighteen iron tacks.*

One stud, for bellows pole. It is riveted into an upright stay, the outer edges of which are chamfered .1 inch. The stay is fastened to the front roof board and to the front middle cross bar, by *two screws* in each.

One cover, for roof, (SHEET COPPER, No. 24.) It is fastened on the edges of the roof boards by *copper tacks.*

One fire place, (PLATE IRON.) The upper plate of the back is of iron No. 11; the other plates, No. 8. The lower back plate is cut out in the middle, to fit the air back of the forge; the lower part of it is bent under the bottom plate of the fire place. The two side plates are bent behind the back plate and under the bottom; the right side plate is cut down in the middle, for convenience in managing the fire. The front plate is bent at each end, inside of the side plates, and also under the bottom. The bottom plate rests on the flanges formed by the four side plates; it has two holes bored in it, to let off the water. All these plates are riveted together, where they lap over each other.

One air back, (CAST IRON.) It consists of a box and a back plate, which are joined together by *four bolts;* the joints are made air tight by inserting sheet lead between the plates. The bolts have no nuts; they are screwed into holes tapped in the front plate of the box, which is reinforced at the corners for this purpose; these holes are not bored quite through the plate. The air back is fastened to the back plate of the fire place by bolts passing through holes in the ears.

Five bolts, for fastening the air back to the fire place. The heads of the bolts are behind the air back. *Five nuts* (octagonal) for these bolts.

One hook, for forge bucket; like the lock chain hook. It is riveted to the back of the fire place on the left side.

One plate, for front cross bar. It is bent down on the inside of the cross bar and riveted to the front of the fire place. The plate is fastened to the cross bar by two bolts, and to the side rails by one bolt in each.

Two plates, for side rails. They are bent down on the inside of the rails, the length of the fire place, and are riveted to the side plates of the fire place. They are fastened to the side rails, each by three bolts.

These three plates support the fire place and fasten it in its proper position. The dimensions of the fire place are so arranged as to leave a vacant space between these plates and the cross bar and side rails, to prevent scorching the wood.

Ten bolts, for the cross bar and side rail plates.

Eight washers and *ten nuts*, for these bolts.

One lock chain bridle. It is like that of the caisson, (Plate III,) except that the diameter of the bolt holes is .5 inch. It is fastened by the two front bolts in the left side rail.

One brace, for fire place. It is forged in two parts, each half being made out of one piece of iron, and welded together in the middle of the rod. The outer edges of the plates are chamfered .1 inch. The brace is fastened to the back of the fire place and to the front end board of the roof, by *two rivets* in each.

One strap, for bellows pole. The outer edges of the strap are chamfered .1 inch. The strap has an eye for the stud on which the bellows pole works, and a hook for the chain. It is fastened to the pole by *two rivets* and *three screws.*

One chain, for bellows pole; formed of *two links*, one of which is fastened in the hook.

Two shoulder washers, for axletree.

Two linch washers.

Two linch pins.

Two wheels. No. 1.

Bellows.

WOOD WORK.

Three bellows planks, (POPLAR.) They are formed each of two pieces, joined together by a tongue of hard wood inserted in a groove in each piece; the outer edges of the upper and lower planks are chamfered .3 inch. The middle and lower planks have square wind holes, covered by the valves.

Two cross heads, (POPLAR.) They are fastened to the middle plank, each by *six screws*. The outer edges are chamfered .3 inch. The hole for the wind pipe is bored .1 inch above the joint between the upper cross head and the middle plank; the upper plank is hollowed out at the inner opening of the hole, so as not to obstruct it.

Two ribs, (POPLAR OR WHITE PINE.) Each rib consists of two side pieces, one end piece and one cross bar, halved on to each other, glued together and fastened with *eight clout nails* in each rib.

Two valves, (CHERRY OR POPLAR.) The valve has a *batten* which is fastened on with *eight nails*, to prevent warping. The outer edges of the valve and the batten are chamfered .3 inch.

Four cleats, (POPLAR.) They are fastened, with *four screws* in each, to the middle plank, over the ends of the bellows arms; the outer sides are cut sloping, so that the ribs may rest fair on them when the bellows is closed.

IRONS.

Six butt hinges, (WROUGHT IRON.) They are let into the upper and lower bellows planks and the cross heads, and are fastened to them, each by *six screws*.

Two arms. They are let into the middle plank to which they are fastened, each by *two rivets* and *four screws*. The edges of the projecting ends of the arms are slightly rounded.

One hook. The outer edges of the plates are chamfered .1 inch; the hook is rounded. It is fastened to the lower plank by *three rivets* and *four screws;* the rivets are placed in the three holes nearest to the junction of the plates.

One wind pipe. It consists of the following parts: 1. An *elbow,* (BRASS,) which is screwed into the wind hole of the bellows; the screw has ten threads to the inch. 2. A *collar,* (BRASS,) which is screwed on to the elbow and connects it with the lower part of the pipe; the screw has six threads to the inch. 3. A *joint pipe,* (BRASS,) which has a flanch that rests on a shoulder inside of the collar, so that the latter may be turned round without turning the joint pipe. 4. A *bent pipe,* (SHEET COPPER, No. 18,) which is riveted and soldered to the joint pipe, after the latter has been put into the collar. This pipe is bent in two directions, in order that, when the smaller end is inserted in the hole provided for it in the air back of the fire place, the pipe may not interfere with the movements of the bellows hook.

LEATHER.

Four hinges, for the ribs. They connect the ribs with the cross heads, and are fastened to them with *copper tacks.*

Two hinges, for the valves, (BAG LEATHER, OR DEER SKIN with the hair on.) They cover the lower sides of the valves, and are fastened to them by *forty-one copper tacks,* and to the planks by *eleven copper tacks.*

Two valve straps, to regulate the opening of the valves. They are fastened to the top of the battens and to the bellows planks with *ten copper tacks.*

One bellows leather. It is cut wide enough to allow the bellows to open about 17 inches; it is fastened to the edges of the planks with *bellows nails* and to the edges of the ribs with *clout nails.* The joints between the outer planks and the cross heads are also covered with strips of leather fastened with *bellows nails.*

Safes, or narrow strips of leather, are put on, under the heads of the nails and around the openings made for the bellows arms to pass through.

To put the bellows in its place, (the coal box being removed from the back of the bellows house,) take out the two stay plates at the lower ends of the rabbets in the braces; put the projecting ends of the upper bellows arm in the rabbets, and slide them up until the ends of the lower arm come into their places; put on the stay plates and fasten them down with the thumb nuts. Screw the brass elbow pipe into its place, through the hole in the sheet iron front of the bellows house; put in the copper pipe and screw up the collar which connects it with the elbow pipe.

Coal box.

WOOD WORK.

The box is made of WALNUT, OAK, CHERRY, or other hard wood.

Two sides. } The ends may be advantageously cut with the
Two ends. } grain of the wood running vertically. The sides and ends are rabbeted half their thickness, to let into each other, and are fastened with *cut nails.*

One bottom. It is let in, its whole thickness, into rabbets in the sides and ends and fastened with *cut nails.*

One top piece. The projecting corners, at the back of the box, are notched out .5 inch, to let the box go into the rabbets in the rear studs of the bellows house. The top is fastened on with *seven wood screws.*

One lid. It projects .5 inch over the front of the box. It has a *clamp* two inches wide, framed on each end with three tenons, to prevent the lid from warping.

IRONS.

Four corner plates, (SHEET IRON, No. 12 or 13.) The back plates are let in, their whole thickness, into the back and the ends; they are fastened each by *seventeen screws* and by the rivet for the end strap. The front plates are let into the ends only; they are chamfered .15 inch on the front side, and they are fastened each by *fourteen screws*, one of which passes through the end strap.

Two end straps. The outer edges of the plate are chamfered .1 inch. These straps serve to fasten the coal box in its place, for which purpose the end of each, next to the back of the box, is bent square and has a hole to receive the stud on the rear of the bellows house. The straps are fastened to the ends of the box, each by *one rivet* and *two screws*, and by the handles.

Two handles. The ends, which are tapped, pass through holes in the end straps and are fastened inside of the box, by *two washers* and *two nuts* to each handle.

One stud plate, for turnbuckle. The stud is riveted into the plate, which is let into the front of the box and fastened by *two rivets.*

One turnbuckle, (BRASS,) riveted on the stud.

One hasp and strap. The outer edges of the hasp and of the strap are chamfered .1 inch. The strap is fastened on the inside of the lid by *one rivet* and *three screws.* As the strap is not let into the lid, a notch is cut for it in the front of the box.

One cover, (SHEET COPPER, No. 24,) in two pieces. It is fastened on the top of the box with *sixty-nine copper tacks*, and on the lid, with *one hundred and sixteen copper tacks.*

Two hinges. The outer edges are chamfered .1 inch. They are fastened on the outside of the copper covering, each by *one rivet* and *five screws* to the top piece, and by *one rivet* and *three screws* to the lid.

Limber chest.

THE WOOD WORK is like that of the ammunition chest, except in having no principal partition across the middle.

IN THE IRON WORK: Omit the assembling bolt, washer plate and turnbuckle of the ammunition chest, and the four screws in the bottom and principal partition. Add *one hasp staple and plate*, (Plate XIX,) which is let into the front of the chest and fastened by *two rivets*, No. 2. B, two inches long.

The *back stay* has no bolt hole at the upper end; it is fastened by *one rivet*, No. 2. B, two inches long, in the lower hole on the back, and by *six wood screws*, No. 14; two of 1.25 inch and two of 1 inch in the back of the chest, and two of .75 inch in the bottom.

The heads of the rivets are not covered with copper washers, as they are in the ammunition chest.

This chest carries the tools for the forge. For the interior arrangment and manner of packing the tools, see PART 12.

Bolts and rivets for travelling forge.

DESIGNATION.	Number.	Kind.	Length.	WASHERS.		REMARKS.
				Head	Nut.	
Bolts.			In.			
For under straps - - -	4	No. 3. D.	5.25	4	–	
" lunette { middle bolt -	1	do.	5.87	–	–	
" lunette { prop bolt -	1	No. 3.	4.85	–	–	Plate XIX.
" lunette { vice bolt - -	1	do.	6.55	–	–	Part 10. Pl. VIII.
" stock stirrup - - -	2	No. 3. B.	4.18	–	–	
" stock and middle cross bar - - - - - -	1	do.	8.25	–	1	
" axle strap - - - {	1	do.	4.68	–	–	
" axle strap - - - {	1	do.	7.82	–	–	
" front cross bar - - -	2	No. 2. D.	3.84	–	2	
" right side rail - - {	1	do.	3.84	–	1	
" right side rail - - {	1	do.	3.94	–	1	
" lock chain bridle - {	1	do.	4.2	–	–	
" lock chain bridle - {	1	do.	4.3	–	–	
" side rails - - - {	2	do.	4.16	–	2	
" side rails - - - {	2	do.	4.4	–	2	
" air back - - - - -	4	No. 2. E.	3.9	4	–	No nuts.
" air back and fire place	5	do.	1.2	–	–	Nuts octagonal.
" stay plates for bellows	4	No. 1. D.	2.4	–	–	Thumb nuts.
" handles for coal box -	4	No. 3.	–	–	4	Plate XIX.
Rivets.						
For the stock - - - -	2	No. 3. B.	4.25	–	2	
" stud plates for coal box	2	No. 2. B.	2.25	–	–	
" brace for fire place {	2	do.	2.0	–	–	
" brace for fire place {	2	No. 2.	.5	–	–	Wire riveted at both ends.
" bellows pole - - -	2	do.	1.5	–	–	
" bellows arms - - -	4	No. 2. B.	2.0	–	–	
" bellows hook - - -	3	do.	2.25	–	–	
" coal box { hinges - -	4	do.	2.0	–	–	
" coal box { handles -	2	do.	2.0	–	–	
" coal box { hasp - -	1	do.	2.0	–	–	
" coal box { stud plate	2	do.	2.0	–	–	
" fire place - - - - -	59	3-10 in.	.6	–	–	Plate XX.

Nails and screws for travelling forge.

DESIGNATION.	Number.	Kind.	Length.	REMARKS.
Nails.			In.	
For lunette	12	No. 2. C.	3.5	
" wheel guard plate	10	do.	3.0	
" axle bands	6	No. 1. C.	.75	
" lock chain hook	2	do.	2.5	
" bellows pole hook	2	do.	2.0	
" sliding cover of iron room	36	–	1.25	Wrought nails.
" lining boards of iron room	12	8d.	–	Cut nails.
" roof and sides	272	4d.	–	Cut nails.
" coal box	50	6d.	–	Cut nails.
" bellows	617	–	1.13	Bellows nails.
	46	–	1.0	Clout nails.
	361	12 oz.	.75	Copper tacks.
	32	20 oz.	1.0	Copper tacks.
" cover of roof and coal box	500	12 oz.	–	Copper tacks.
" sheet iron on front of bellows house and cross bar	169	12 oz.	–	Iron tacks.
" sheet iron guard, under fire place	18	do.	–	Iron tacks.
Screws.				
For BELLOWS HOUSE. braces	6	No. 14.	2.0	
groove cleats	6	do.	2.0	
ends of roof	4	do.	2.0	
	6	No. 12.	1.25	
roof bows	4	No. 14.	2.0	
cap for coal box	5	do.	2.0	
middle rail	4	do.	2.0	
floor boards	16	do.	2.0	
" stay plates for bellows	6	do.	2.0	
" stud plates, for coal box	2	No. 16.	2.0	
" bellows pole stud	4	No. 14.	1.5	
" bellows pole	3	do.	1.0	
" BELLOWS cross heads	12	No. 20.	3.0	
arms	8	No. 14.	1.5	
cleats	16	do.	1.5	
hook	4	do.	1.5	
hinges	36	do.	1.25	
" COAL BOX front corner plates	26	No. 12.	.75	
rear corner plates	34	do.	.75	
hinges	16	No. 14.	1.0	
hasp	3	do.	1.0	
handle plates	4	do.	1.0	
top	7	do.	2.0	

BATTERY WAGON.—Plates XXII to XXV.

WOOD WORK.

Body of the wagon.

Two lower side rails, (OAK.) The outside lower edges are rounded with a radius of .4 inch, except at the axle body and front cross bar; the inside lower edges are rounded .4 inch, except at the two front cross bars. The upper edges are rounded only in rear of the rear cross bar. The edges of the ends are chamfered .4 inch.

Five cross bars, (OAK.) The lower edges of the middle cross bars are rounded .4 inch, between the rails, except the middle parts of the two which bear on the stock. The lower edges and the upper outer edges of the end cross bars are rounded .4 inch. The end cross bars have rabbets for the ends of the floor boards. The cross bars are joined, with tenons and mortises, to the side rails, and fastened to them by a *wooden pin* .5 inch thick, in each end.

Three floor boards, (POPLAR OR WHITE PINE.) They are joined together with tongue and groove. They are fastened to the cross bars, each by *three nails* in each end and *two nails* in each middle bar.

One axle body, (OAK.) It is framed to the side rails like those of the caisson and forge. It has a mortise on the front side, to receive the end of the stock. The upper edges are rounded with a radius of .6 inch, between the side rails and the mortise plate, and .4 inch outside of the rails. The lower edges are rounded .6 inch, except at the mortise plate. The ends are chamfered .25 inch.

Two upper side rails, (OAK.) The lower edges on the outside are rounded .25 inch; those of the inside are rabbeted .25 inch, for the sides to fit in. The ends have round tenons for the collars of the side stays.

The upper rails rest on the top of the side studs, which are mortised into the rails and fastened with rivets. (See IRONS.)

Two sides, (WHITE PINE.) They are made, generally, of one piece each; if in two pieces, they are joined by tongue and groove, the tongue on the lower piece which should be the widest. They are let into the rabbets in the upper rails and are riveted to the side studs.

Two ends, (WALNUT.) They are held by iron grooves which are fastened to the sides of the wagon body.

One stock, (OAK.) The upper edges are chamfered .6 inch, between the cross bars and in front of the mortise plate; the lower edges are rounded .6 inch, from the mortise plate to the rear of the wheel guard plate. The edges and sides of the front part are rounded in the same manner as those of the forge stock. The rear end is let into the axle body .5 inch; it is sloped in such a manner as to bring the tenon into the middle of the depth of the axle body. The stock is let in .25 inch into the front cross bar, and is bolted to the second and third cross bars.

Two cleats, for the till, (WHITE PINE.) They are fastened to the ends of the body, on the right side, each by *three screws*.

One bottom, for the till, (WHITE PINE.) It is laid on the cleats.

One side, for the till, (WHITE PINE.) It is let into grooves in the ends of the wagon body, and is fastened to the edge of the bottom of the till by *eleven cut nails*.

Two sides, for forage rack, (OAK or ASH.)

Three bars, for forage rack, (OAK or ASH.) The edges of the sides are rounded; those of the ends are chamfered .2 inch. The bars are mortised into the sides and are fastened by *six wooden pins*, .5 inch thick.

WOOD WORK.

Wagon cover.

Two side rails, (OAK.)

Two end rails, (WALNUT or OAK.) The upper edges of the outside are rounded .25 inch, between the end studs and the side rails; the lower edges of the same side are rounded .25 inch. The end rails are dovetailed into the side rails to which they are fastened by joint bolts. They are rabbeted on the inside upper edge, for the end boards.

Two end studs, (WALNUT or OAK.) The outer edges are rounded .25 inch. The studs are mortised into the end rails, to which they are fastened with *wooden pins* .25 inch thick. The upper ends are riveted to the end bows of the cover.

Two end boards, (WALNUT.) They are let into the rabbets on the inside of the end rails, and are fastened each by *two screws* in the side rails, (on top,) *two screws* in the rabbet of the end rail, and *three screws* in the end stud.

One ridge pole, (WALNUT or OAK.) The lower edges are rounded .25 inch. It is dovetailed into the end studs and let into the end boards, its whole depth.

Nine cover boards, (WHITE PINE.) They are (better) dressed out to the proper curve, without being bent, and are tongued and grooved. They are fastened to the end boards with *thirty-six cut nails,* to the end bows with *thirty-six rivets,* and to the middle bows with *thirty-six screws.*

IRONS.

Wagon body.

Two rivets, for the lower rails. They are placed at the rear ends of the rails; the head and burr are let into the wood, on the upper and lower sides.

Eight side studs. Their outer edges are chamfered .1 inch. The upper ends are let into mortises in the upper side rails.

The front and rear side studs are fastened to the lower rails by the assembling bolts, one stud of each pair having a square bolt hole, the other a round one. They are fastened to the sides of the wagon, each by two bolts, and to the upper rails, each by one bolt; these bolts also hold the grooves for the ends of the wagon body. Each of the rear studs has an eye for the ring of the forage rack chain; the edges of the eye are rounded.

The middle studs are fastened to the lower rails, each by one bolt, one of which is the turnbuckle bolt. To give room for the nuts of these bolts to turn, the floor boards are hollowed out a little, on the under side, at each bolt. These studs are fastened to the sides, each by *three rivets;* those on the right side of the wagon are fastened to the upper rails, each by *one rivet;* the forward stud on the left side is fastened to the upper rail by the hook for the cover strap, and the rear stud on the same side, by the eye pin for the hasp.

One spare stock hook. The outer edges are chamfered .1 inch. It is fastened to the rear stud, on the right side of the wagon, by the assembling bolt and the lower groove bolt.

One button for spare stock. The outer edges are chamfered .1 inch. It is fastened above the spare stock hook, by the middle groove bolt.

One spare stock stirrup. The outer edges are chamfered .1 inch. It is fastened to the front stud, on the right side of the wagon, by the two lower groove bolts.

The hook and stirrup carry a spare stock (ironed) for the battery wagon; the nut which holds the button may be loosened, if necessary for turning the button, in order to take out the stock.

Four grooves, for wagon ends, (SHEET IRON, No. 7.) The outer edges are chamfered .15 inch. The grooves are fastened to the sides of the wagon body, at the ends, each by three bolts which also hold the front and rear side studs.

Two assembling bolts, for lower side rails. They pass through the end cross bars, lengthways; *two nuts* for these bolts.

Twelve bolts, for grooves and side studs. The heads are countersunk in the bottom of the grooves; *twelve nuts* for these bolts.

Three bolts for middle side studs; *three washers* and *three nuts* for the same.

One turnbuckle bolt; one washer and *one nut* for the same.

One turnbuckle, (BRASS,) riveted on the head of the bolt.

One hook, for cover prop. The outer edges are chamfered .1 inch. It passes through the upper side rail and the forward middle stud, on the left side of the wagon, and is riveted on a *burr* let into the inside of the rail.

One eye pin, for cover hasp. It passes through the upper rail and the rear middle stud, on the left side, and is riveted on a *burr* let into the inside of the rail.

Two stays, for the upper rails. The outer edges are rounded .1 inch. The stays are riveted to the ends of the wagon body, and their rings are fastened on the round tenons at the ends of the rails by *four screws*.

Two end studs. The outer edges are chamfered .1 inch. The studs are fastened to the ends of the wagon, each by *three rivets*, one of which passes also through the stay. The front end stud is fastened to the front cross bar by *one bolt*, the head of which is let into the bottom of the cross bar. The lower end of the rear stud forms a bolt which passes through the rear cross bar. *One washer* and *two nuts* for these bolts.

One mortise plate. The outer edges are chamfered .1 inch. The plate is fastened on the front of the axle body by *eight screws.*

One axletree, like that of the 6-pounder gun carriage.

Two under straps. The outer edges are chamfered .15 inch.

Four bolts, for under straps. The heads are let into the upper side of the rails. *Two nuts* for these bolts.

One bolt, for front end of right side rail. *Two washers* and *one nut* for the same.

Two bolts, for lock chain bridle; at the front end of the left side rail. The head of one of these bolts is let into the rail.

One lock chain bridle, like that of the caisson. Plate III.

One lock chain. Plate III.

One washer and *two nuts,* for bolts of lock chain bridle.

One lock chain hook; fastened to the left side rail by *two nails.*

Two rivets, for the front end of the stock.

One lunette, like that for the caisson. Plate IV.

Two bolts and *twelve nails,* for lunette. *Two nuts* for lunette bolts.

Two wheel guard plates, like those for caisson. Plate IV. They are fastened to the stock, each by *five nails.*

One stock stirrup; outer edges chamfered .15 inch.

Two bolts, for stock stirrup. Their heads are let into the upper side of the front cross bar. *Two nuts* for these bolts.

Two bolts, for connecting the stock with the forward middle cross bars. Their heads are let into the middle floor board. *Two washers* and *two nuts* for these bolts.

Two washer plates, for the side rails. They are let into the outside of the rails, at the rear ends, and are fastened each by *two screws;* the holes in these plates are .75 inch square, to receive the square parts of the forage back bolts.

Two forage rack chains. Each chain consists of *one ring, thirty-two links* No. 4, and *one hook;* the ring is welded into the eye of the rear stud on the wagon body.

Two forage rack bands. The outer edges are chamfered .1 inch. They are fastened to the sides of the forage rack, each by *one rivet* and *eleven screws.*

Four washer plates, for sides of forage rack. The edges of the outside washers are chamfered .1 inch. The inside washers are let into the wood. They are fastened by *four rivets,* two for each pair of washers.

Two forage rack bolts. Two washers and *two nuts* for the same.

Two shoulder washers, for axletree.

Two linch washers.

Two linch pins.

Two wheels, No 1.

Wagon cover.

Four corner squares. Their outer edges are chamfered .1 inch. They are fastened on the inside corners of the cover frame by *sixteen screws.*

Two end bows. The lower ends are inserted in mortises in the cover rails and are held by the joint bolts. The cover boards and the end studs are riveted to these bows, as before mentioned. The heads of the rivets rest on the wood, and the rivetings are countersunk in the bows.

Four joint bolts, for cover frame. They pass through the cover rails and the end bows; the heads are let into the rails, the bolts being turned in with a screw driver. *Four nuts* for these bolts are let into the end rails of the cover from the under side.

Two middle bows. The ends are inserted in mortises in the cover rails, to which they are fastened by *four rivets;* the heads of the rivets are let in on the inside of the rails. The cover boards are fastened to each of these bows by *two screws* in each board; the heads of the screws are countersunk on the inside of the bows.

Two plates and staples, for cover prop and hasp. The edges of the plates are chamfered .1 inch. The staples are riveted into

the plates which are fastened to the left cover rail, each by *one rivet* and *one screw;* these rivets are the same that fasten the left ends of the middle bows.

One cover prop. The outer edges are chamfered .1 inch. It is fastened into the front staple on the left side of the cover. The prop keeps the cover closed, by means of the turnbuckle bolt; it also serves to raise the cover and keep it open, the slot at the lower end of the prop resting for that purpose on the hook in the upper rail of the wagon body.

One hasp. The outer edges are chamfered .1 inch. It is fastened into the rear staple on the left side of the cover, and serves for locking up the wagon body, by putting a padlock into the eye of the pin over which the hasp falls.

Three hinges. One of the hinge plates is made with a bar; the other has an eye which is coldshut round the bar. The edges of the plates are chamfered .1 inch. They are fastened on the right side of the wagon; the eye plates each with *two rivets* to the cover rail, and the other plates each with *two bolts* to the upper rail of the body.

One roof covering, (CANVAS.) The canvas should be very strong and in one piece, if practicable; or else in three pieces, with the seams running lengthways of the cover; it should be well painted, (in the same manner as tarpaulins,) and the cover boards should have a coat of paint before the canvas is nailed on.

The canvas is fastened with *copper tacks* to the cover rails and to the end boards, as represented in the plates; a strip of canvas is also nailed on the end rails, to cover the joints between them and the ends of the body.

Pieces of leather are nailed on, before the canvas, over the hinges and the staple plates, to protect the canvas from being rubbed by those irons. Strips of leather are put on under the heads of the tacks which fasten the canvas.

Limber chest.

This chest is like that for the limber of the forge, with the addition of *one principal partition*, (WALNUT,) which is placed parallel to the sides of the chest and slides in *two grooves*, (SHEET IRON, No. 13,) which are fastened to the ends of the chest, each by *five screws*, No. 14, .75 inch long; the outer edges of the grooves are rounded; the screw holes are countersunk in the bottom of the grooves.

The battery wagon carries tools, spare parts of carriages, spare harness and other stores for the service of a battery in the field.

For the interior arrangement of the body and limber chest, see PART 12.

Bolts for battery wagon.

DESIGNATION.	Number.	Kind.	Length.	WASHERS.		REMARKS.
				Head	Nut.	
			In.			
For assembling the lower rails	1	No. 4. A.	40.3	–	–	
	1	do.	39.75	–	–	
" middle side studs	3	do.	4.68	–	3	
" end grooves and side studs	6	No. 1. C.	2.7	–	–	
	4	do.	2.07	–	–	
	2	do.	2.45	–	–	
" lunette	1	No. 3. D.	4.75	–	–	
	1	do.	6.2	–	–	
" front of right lower rail	1	do.	5.1	1	1	
" lock chain bridle	1	do.	5.45	1	–	
	1	No. 3. B.	5.38	–	–	
" front end stud	1	do.	5.88	–	–	
" under straps	4	No. 4. B.	7.0	–	–	
" stock stirrup	2	do.	6.15	–	–	
" stock and cross bars	2	do.	10.68	–	2	
" hinges	6	No. 1. B.	2.67	–	–	
" joints of cover frame	4	No. 1.	4.0	–	–	Nuts not chamfered.
" rear end stud	1	No. 3.	3.75	–	–	
" turnbuckle	1	No. 4.	4.68	–	1	See Plate XXIV.
" forage rack	2	do.	6.8	–	2	

Rivets, nails and screws for battery wagon.

DESIGNATION.	Number.	Kind.	Length.	Burrs.	REMARKS.
Rivets.			In.		
For lower rails	2	No. 3. B.	4.5	2	
" stock	2	do.	5.25	2	
" middle bows and right cover rail	2	do.	2.5	2	
" middle bows and staple plates	2	do.	2.5	–	
" hinges	6	do.	2.5	–	
" side and end studs	18	No. 3. D.	1.88	18	
" right side studs and upper rails	2	do.	2.5	2	
" washers of forage rack	4	No. 2. D.	2.0	–	
" forage rack bands	2	No. 2.	4.5	–	Wire riveted at both ends.
" end studs and cover bows	4	do.	3.0	–	
" end bows & cover boards	36	No. 1. H.	1.0	–	
" hook for cover prop	1	No. 3.	2.13	1	Plate XXIV.
" eye pin for hasp	1	do.	2.13	1	
Nails.					
For floor boards	36	No. 1. C.	2.5		
" lock chain hook	2	do.	2.5		
" lunette plates	12	No. 2. C.	3.5		
" wheel guard plates	10	do.	3.0		
" cover boards and ends	36	4d.	–		Cut nails.
" side of till	11	8d.	–		
" canvas covering	264	12 oz.	–		Copper tacks.
Screws.					
For the mortise plate	8	No. 14.	1.25		
" upper rails and stays	4	do.	1.0		
" washers for forage rack bolts	4	do.	1.0		
" cleats for till	6	do.	1.5		
" corner squares of cover	12	do.	1.25		
	4	do.	1.0		
" forage rack bands	22	do.	1.0		
" ends of cover	14	No. 16.	1.5		
" hasp plates	2	do.	2.0		
" middle bows and cover boards	36	No. 12.	.75		

BILLS OF TIMBER FOR FIELD CARRIAGES.

The following tables show the dimensions and kind of timber required for each part of the field carriages.

All the timber (except what is directed to be split out) should be sawed to the given dimensions. If the parts which are directed to be got more than one in a length should be cut in single pieces, the length of the rough timber should be increased, at the rate of about one inch to the foot; but in all cases the contents of the piece are estimated by the dimensions given in the table.

The *oak* timber should be of the best quality of white oak, tough, straight-grained, sound, and free from centre heart, sap, knots, splits, warps, or other defects. The axle bodies are got from quartered sticks, free from centre heart.

The *walnut* should be of the best quality of black walnut.

The *poplar* should be of the best yellow poplar.

The walnut, poplar, and white pine, must be all clear stuff, free from sap and centre heart.

The *hickory* must be tough, young, and straight-grained, and free from centre heart.

In making bills for getting out timber, the fractional dimensions should be expressed in vulgar fractions.

Bills of timber

NAMES OF PARTS.	No. of pieces.	DIMENSIONS OF EACH PIECE. FINISHED. Long.	Wide.	Thick.	ROUGH. Long.	Wide.	Thick.
GUN CARRIAGES.		In.	In.	In.	In.	In.	In.
For 6 pr. gun and 12 pr. howitzer. Stock	2	92.1	8.25	3.8	100	9.25	4.5
Cheeks	2	34.	12.5	2.8	40	13.5	3.5
Axle body	1	45.9	6.	5.	50	7.	6.
For 12 pr. gun and 32 pr. howitzer. Stock	2	99.1	10.	5.08	108	11.	5.75
Cheeks	2	45.75	14.85	3.25	50	16.	4.
Axle body	1	45.9	6.	6.	50	7.	7.
For 24 pounder howitzer. Stock	2	99.1	9.2	4.83	108	11.	5.75
Cheeks	2	40.75	14.38	3.1	50	16.	4.
Axle body	1	45.9	6.	6.	50	7.	7.
WHEELS.							
Nave. No. 1	1	13.75	11.	Round	16	14.	Round
Nave. No. 2			12.	Do.			
Spokes. No. 1	14	26.25	2.75	1.3	32	3.5	2.
Spokes. No. 2				1.5			
Fellies. No. 1	7	24.3	5.7	2.95	27	7.	3.5
Fellies. No. 2			6.				
LIMBER.							
Axle body	1	45.82	8.	5.25	50	9.	6.
Hounds	2	51.7	3.5	2.5	56	4.5	3.25
Fork	1	35.25	8.25	3.	40	9.25	4.
Splinter bar	1	66.05	3.38	2.75	72	4.25	3.5
Brackets	4	8.55	2.3	1.6	–	–	–
Front foot board	1	43.55	8.	0.85	46	8.75	1.13
Rear foot board	1	43.55	4.5	.85	46	5.	1.13
Pole. Large end	1	125.	3.25	3.25	132	4.5	4.5
Pole. Small end			2.25	2.25		3.25	3.25
Pole prop	1	25.25	1.87	Round	30	2.25	2.25
AMMUNITION CHEST.							
Ends	2	20.	16.	1.	22	17.	1.31
Sides	2	42.	16.	1.	44	17.	1.31
Principal partition	1	18.5	14.75	1.	22	17.	1.31
Cover frame. Sides	2	44.	3.25	1.4	69	3.75	2.
Cover frame. Ends	2	19.5	3.25	1.75			
Bottom	1	40.75	18.75	1.	44	20.	1.31
Pannel for cover	1	38.5	16.5	1.75	42	17.5	2.
Cover lining	1	40.5	18.5	0.25	42	20.	0.5

for field carriages.

CONTENTS OF ROUGH TIMBER.		Kind of wood.	REMARKS.
Each piece.	Total.		
Sup. feet.	Sup. feet.		
28.90	57.80	Oak.	
13.12	26.24	Do.	2 or 3 to be got in one length.
14.58	14.58	Do.	2 in one length.
	98.62		
47.44	94.88	Do.	
22.22	44.44	Do.	2 in one.
17.01	17.01	Do.	Do.
	156.33		
47.44	94.88	Do.	
22.22	44.44	Do.	Rough timber, the same as for 12 pr. carriage.
17.01	17.01	Do.	
	156.33		
17.09	17.09	Do.	Butt cuts, bored with $1\frac{1}{2}$ in. auger.
1.55	21.70	Do.	Split from butts of tough, straight-grained wood.
4.59	32.13	Do.	May be in planks 5 or 6 fellies in length, and 7 in. or 11 in. wide.
	70.92		
18.75	18.75	Do.	2 in one.
5.68	11.36	Do.	Do.
10.27	10.27	Do.	Do.
7.43	7.43	Do.	Do.
–	–	Do.	Obtained from cuttings of other pieces.
3.14	3.14	Do.	2 in one.
1.86	1.86	Do.	Do.
14.11	14.11	Oak or ash	Taken from the butts of tough, straight wood.
1.05	1.05	Hickory.	To be split out.
	67.97		
3.40	6.80	Walnut.	4 in one length.
6.80	13.60	Do.	2 in one.
3.40	3.40	Do.	4 in one.
3.59	7.18	Do.	2 pieces, each 69 inches long.
8.00	8.00	Oak.	2 in one length; or in 2 pieces, each 11 in. wide.
10.21	10.21	Poplar.	2 or 3 in one piece.
2.91	2.91	Poplar.	Do. Do.
	52.10		

Bills of timber for field carriages—

NAMES OF PARTS.	No. of pieces.	DIMENSIONS OF EACH PIECE.					
		FINISHED.			ROUGH.		
		Long.	Wide.	Thick.	Long.	Wide.	Thick.
CAISSON.		In.	In.	In.	In.	In.	In.
Middle rail	1	68.4	5.	4.	76	5.75	4.75
Side rails	2	72.3	4.25	2.5	78	5.	3.25
Stock	1	78.1	5.	4.	84	6.	4.75
Axle body	1	45.7	5.	5.	50	6.	6.
Cross bar	1	35.	3.5	2.25	40	4.	3.
Foot board bolster	1	12.	3.5	1.	14	4.	1.25
Front foot board	1	37.55	6.7	1.75	42	7.5	2.13
Rear foot board	1	37.55	4.25	1.	42	5.	1.25
FORGE—*Body.*							
Side rails	2	87.9	4.	3.	96	4.75	3.75
Middle rail	1	45.5	4.	3.5	50	4.75	4.25
Stock	1	83.9	5.	4.	90	6.	4.75
Axle body	1	45.76	6.25	5.	50	7.25	6.
Front cross bar	1	36.	3.1	3.	40	3.5	3.5
Rear middle cross bar	1	36.	3.	3.	40	3.5	3.5
Front middle cross bar	1	36.	9.	3.13	40	10.	3.5
Rear cross bar	1	36.	2.5	2.5	40	3.	3.
Floor boards	4	43.5	7.	1.	48	8.	1.25
Roof bows	2	38.	3.	1.	42	9.	1.25
Corner studs	4	31.25	3.	2.	36	3.5	2.5
Side studs	2	31.25	2.5	2.	36	3.	2.5
Plates	2	42.	2.5	2.	46	3.	2.5
Front end stud	1	19.5	5.	1.	22	6.	1.25
Front of iron room	1	36.	8.5	1.	40	9.5	1.25
Rear of iron room	1	32.	2.	1.	36	3.	1.25
Lining of iron room	2	40.5	7.5	0.75	44	8.5	1.
Cleats for grooves	2	41.5	1.5	0.75	44	2.	1.
Braces	2	44.25	3.25	1.75	48	4.	2.
Front end of roof	1	38.	9.	1.5	42	10.	1.75
Rear end of roof	1	38.	11.	1.5	42	12.	1.75
Cap for coal box	1	33.	2.	1.	36	2.5	1.25
Boards for sides	10	39.	5.9	0.5	42	7.	0.75
Boards for roof	7	43.	6.5	.5	46	7.	.75
Boards for sliding cover	6	32.	7.25	.5	36	8.	.75
Prop for stock	1	25.25	1.88	Round	30	2.25	2.25
Bellows pole	1	53.	1.63	Do.	57	2.	2.

Continued.

CONTENTS OF ROUGH TIMBER.		Kind of wood.	REMARKS.
Each piece.	Total.		
Sup. feet.	Sup. feet.		
14.41	14.41	Oak.	
8.79	17.58	Do.	
16.62	16.62	Do.	
12.50	12.50	Do.	2 in one length.
3.33	3.33	Do.	In plank, 2 in length and 2 or 3 in width.
.48	.48	Do.	In plank, 10 in one piece.
4.65	4.65	Do.	2 in one length.
1.82	1.82	Do.	Do.
	71.39		
11.87	23.74	Oak.	
7.01	7.01	Do.	2 in one length.
17.81	17.81	Do.	
15.10	15.10	Do.	2 in one.
3.40	3.40	Do.	Plank, 2 in length and 2 in width.
3.40	3.40	Do.	Do. Do. Do.
9.72	9.72	Do.	Do. 2 in one piece.
2.50	2.50	Do.	Do. 6 in one piece.
3.33	13.32	Do.	Do. 2 in one.
3.28	6.56	Do.	Do. 2 in one.
2.19	8.75	Do.	Do. 4 in one.
1.88	3.75	Do.	Do. 6 in one.
2.39	4.78	Do.	Do. 6 in one.
1.14	1.14	Do.	Do. 8 in one.
3.30	3.30	Do.	Do. 2 in one.
0.94	.94	Do.	Do. 8 in one.
2.59	5.18	Do.	Do. 2 in one.
0.61	1.22	Do.	Do. 6 in one.
2.67	5.34	Do	Do. 4 in one.
5.10	5.10	Walnut.	Do. 2 in one.
6.13	12.25	Do.	Do. 2 in one.
0.78	.78	Do.	Do. 8 in one.
1.53	15.30	White pine.	Do. 3 in one length.
1.68	11.75	Do.	Do. Do.
1.50	9.	Do.	Do. Do.
1.05	1.05	Hickory.	Split out.
1.58	1.58	Do.	Do.
	193.77		

Bills of timber for field carriages—

NAMES OF PARTS.	No. of pieces.	DIMENSIONS OF EACH PIECE.					
		FINISHED.			ROUGH.		
		Long.	Wide.	Thick.	Long.	Wide.	Thick.
FORGE—*Bellows.*		In.	In.	In.	In.	In.	In.
Upper and lower planks	4	31.	14.	1.5	34	15.	2.
Middle plank	2	41.	14.	1.75	44	15.	2.
Cross heads	2	28.	3.	2.38	32	3.5	3.
Ribs. Sides	4	32.25	2.75	.75	36	3.	1.
Ribs. Ends	2	28.	2.75	.75	32	3.	1.
Ribs. Cross bars	2	28.	2.	.75	32	2.25	1.
Cleats	4	7.	2.75	.75	–	–	–
Valves	2	8.	8.	.5	9	9.	0.75
Battens for valves	2	8.	4.	.4	9	4.5	.75
Coal box.							
Sides and top piece	2	33.	22.5	1.	36	24.	1.38
Ends	2	14.	22.5	1.	16	24.	1.38
Lid	1	32.5	12.9	0.9	36	14.	1.25
Clamps for lid	2	12.9	2.	0.9	14	2.5	1.25
Bottom	1	32.	14.	1.	36	15.	1.31
BATTERY WAGON—*Body.*							
Lower side rails	2	111.25	5.75	3.25	116	6.5	4.
Upper side rails	2	103.8	2.25	2.	108	3.	3.
Stock	1	99.	5.	5.	108	6.	6.
Axle body	1	45.86	5.25	5.25	50	6.25	6.25
Front cross bar	1	36.5	5.	4.25	40	5.5	5.
Front middle cross bars	2	36.5	3.75	3.25	40	4.25	4.
Rear middle cross bar	1	34.5	3.25	2.	38	4.	2.5
Rear cross bar	1	36.5	3.25	3.	40	4.	3.5
Floor boards	3	99.25	10.5	1.	106	11.5	1.25
Sides of body	2	101.4	20.	1.	108	21.5	1.38
Side of till	1	99.6	10.5	1.	104	11.5	1.25
Bottom of till	1	99.1	9.	1.	104	10.	1.25
Cleats for till	2	10.	1.25	1.	–	–	–
Ends of body	2	35.7	22.	1.	40	24.	1.38
Forage rack sides	2	31.5	5.	1.6	36	5.5	2.
Forage rack bars	3	42.2	2.75	.75	46	3.25	1.
Cover.							
Side rails	2	103.8	2.	2.	108	3.	3.
Ridge pole	1	103.8	2.	2.	108	3.	3.
End rails	2	38.5	2.	2.	42	3.	3.
End studs	2	13.5	2.	1.	18	2.5	1.5
End boards	2	39.	12.5	1.	42	13.5	1.25
Roof boards	9	103.8	5.5	0.5	108	7.	0.75

Continued.

CONTENTS OF ROUGH TIMBER.		Kind of wood.	REMARKS.
Each piece.	Total.		
Sup. feet.	Sup. feet.		
7.08	28.32	Poplar.	3 or 4 in one.
9.17	18.34	Do.	2 or 3 in one.
2.33	4.66	Do.	Scantling; 4 in one piece.
0.75	3.00	Do.	May be got in boards 12 inches wide and 11 feet long, making 2 sets.
0.67	1.34	Do.	
0.50	1.00	Do.	
–	–	Do.	Obtained from cuttings of the ribs.
0.42	.84	Walnut.	A board 13.5 inches wide and 9 feet long makes 12 of each.
0.21	.42	Do.	
	57.92		
8.28	16.56	Walnut.	May be in one plank 8 feet 8 inches long, or in two of half that length.
3.68	7.36	Do.	
4.37	4.37	Do.	2 or 3 in one piece.
.30	.60	Do.	A plank 9 ft. long, 10 in. wide makes 32 clamps.
4.91	4.91	Oak.	2 or 3 in one piece.
	33.80		
20.94	41.88	Oak.	
6.75	13.50	Do.	
27.00	27.00	Do.	
13.56	13.56	Do.	2 in one length.
7.64	7.64	Do.	2 or 3 in one.
4.72	9.44	Do.	Do.
2.64	2.64	Do.	Do.
3.88	3.88	Do.	Do.
10.58	31.74	Wh. pine.	
22.25	44.50	Do.	
10.38	10.38	Do.	
9.02	9.02	Do.	
–	–	Do.	Obtained from cuttings of sides of body.
9.20	18.40	Walnut.	2 in one.
2.75	5.50	Oak.	4 in one plank.
1.03	1.03	Do.	6 in one board.
	240.11		
6.75	13.5	Oak.	
6.75	6.75	Do.	
2.63	5.25	Do.	2 in one piece.
0.47	.94	Do.	12 in one piece.
4.91	9.82	Walnut.	2 in one.
3.94	35.44	Wh. pine.	
	71.70		

Bills of iron for field gun carriages.

NAMES OF PARTS.	FOR 6 POUNDER GUN.			FOR 24 PR. HOWITZER.		
	Wide.	Thick.	Long.	Wide.	Thick.	Long.
	In.	In.	In.	In.	In.	In.
2 trail handles	1.5	0.625	20.	1.5	0.625	20.
2 bolts for handles	1.	Round	12.	1.	Round	12.5
1 lock chain bolt..... head	1.5	Round	4.	2.	Round	2.5
1 lock chain bolt..... body				1.	Round	7.0
1 eye plate for lock chain	3.25	.375	3.5	3.25	.375	3.5
1 lock chain	.375	Round	170.	.375	Round	190.
1 toggle for lock chain	1.5	.5	4.	1.5	.5	4.
1 axletree .....(draft.)						
1 lunette .....(draft.)						
1 steel for lunette	1.	.375	2.5	1.	.375	2.5
1 trail plate	5.5	.2	18.	6.	.2	18.
1 large pointing ring	2.	1.	6.	2.	1.	6.
1 plate for large pointing ring	2.	1.25	4.5	2.	1.25	4.5
1 rivet for large pointing ring	.5	Round	2.	.5	Round	2.
*2 bolts for large pointing ring	.625	Round	12.8	.625	Round	12.9
1 small pointing ring	1.5	1.5	7.	1.5	1.5	7.
*2 bolts for small pointing ring	.625	Round	15.9	.625	Round	16.9
2 wheel guard plates	5.	.25	10.	5.	.25	10.
2 prolonge hooks	2.	.75	11.	2.	.75	11.
1 stop for rammer and sponge	3.75	.2	5.25	3.75	.2	6.75
1 ear plate for worm	3.75	.25	4.5	3.75	.25	4.5
1 key for worm	1.	.375	2.75	1.	.375	2.75
1 eye plate for implement chain	1.375	.25	4.	1.375	.25	4.
2 implement chains loops	.2	Round	56.	.2	Round	72.
2 implement chains flat links	1.375	.05	36.	1.375	.05	48.
2 stud plates	1.	1.	7.	1.	1.	7.
2 studs	.5	Round	1.5	.5	Round	1.5
2 hasp plates	1.75	.25	11.	1.75	.25	11.
2 trunnion plates...(draft) or	2.5	1.5	20.	3.	1.5	28.
*4 end pieces for trunnion plates	2.75	.5	44.	3.	.5	52.
2 chin bolts..... head	1.5	.75	7.	2.	1.	7.
2 chin bolts..... body	.75	Round	23.	1.	Round	29.0
2 key bolts..... head	1.5	.75	7.	2.	1.	7.
2 key bolts..... body	.75	Round	17.	1.	Round	22.5
6 cheek bolts..... head	1.5	Round	12.	2.	Round	18.0
6 cheek bolts..... body	.75	Round	46.8	1.	Round	60.0
2 washers for chin bolts	2.5	.875	4.	2.75	1.	4.
2 cap squares.....(draft) or	2.5	1.25	18.	3.	1.25	22.
2 cap square keys	1.5	.38	5.5	1.75	.38	6.
2 D rings	.5	Round	27.	.5	Round	27.
4 staples for D rings	.75	.375	16.	.75	.375	16.
1 linstock socket	3.75	.15	6.	3.75	.15	6.

Bills of iron for field gun carriages.

NAMES OF PARTS.	6 POUNDER GUN.			24 PR. HOWITZER.		
	Wide.	Thick.	Long.	Wide.	Thick.	Long.
	In.	In.	In.	In.	In.	In.
3 assembl'g bolts { No. 5 { head.	2.	Round	2.5	2.	Round	7.5
3 assembl'g bolts { No. 5 { body	1.	Round	14.	1.	Round	54.
3 assembl'g bolts { No. 4 { head.	1.5	Round	4.			
3 assembl'g bolts { No. 4 { body	.75	Round	27.5			
1 washer hook for lock chain...	1.5	.5	3.	1.5	.5	3.
2 handspike hooks.... { plates..	1.5	.5	6.	1.5	.5	6.
2 handspike hooks.... { hooks.	.5	Round	8.	.5	Round	8.
*2 understraps.....	2.75	.5	50.	3.	.5	52.
2 implement hooks.....	.5	Round	48.	.5	Round	52.
*1 axle strap.....	2.75	.5	28.75	3.	.5	30.75
3 bolts for axle strap .. { head.	1.5	Round	6.	1.5	Round	6.
3 bolts for axle strap .. { body.	.75	Round	16.	.75	Round	17.
1 bevel washer for axle strap bol	1.5	.5	1.			
2 axle bands.....	1.5	.25	45.	1.5	.25	48.
2 bolts for elevating screw box..	.625	Round	20.5	.625	Round	24.0
1 elevating screw.....	2.	Round	15.	2.	Round	15.
1 handle for elevating screw....	2.5	1.75	6.	2.5	1.75	6.
2 shoulder washers.....	1.25	.5	26.	1.25	.5	26.
2 linch washers.....	1.	.5	18.	1.	.5	18.
2 linch pins.....	1.25	.75	8.5	1.25	.75	8.5
8 nuts No. 3.....	1.25	.625	10.	1.25	.625	10.
17 nuts No. 4.....	1.5	.75	25.5			
3 nuts No. 4.....	–	–	–	1.5	.75	4.5
14 nuts No. 5.....	–	–	–	2.	1.	28.
2 washers No. 3.....	2.	.125	4.	2.	.125	4.
8 washers No. 4.....	2.5	.19	20.			
8 washers No. 5.....	–	–	–	3.25	.19	26.
16 nails No. 1.....	.25	.25	26.5	.25	.25	26.5
32 nails No. 2, C.....	.3	.3	94.5	.3	.3	94.5
12 nails No. 2, D.....	.375	Round	45.	.375	Round	45.
3 key chains, No. 1.....	.15	Round	33.75	.15	Round	33.75
2 cap square chains, No. 2.....	.2	Round	27.5	.2	Round	27.5
6 rings No. 1, B.....	.2	Round	18.	.2	Round	18.
4 rings No. 2, B.....	.25	Round	13.	.25	Round	13.
5 eye pins No. 1.....	.875	Round	7.75	.875	Round	7.75
2 eye pins No. 2.....	1.	Round	5.	1.	Round	5.
1 box for elevating screw.....	Cast brass.					
2 turnbuckles for implements...	Do.					
6 rondelles.....	Cast iron.					

For the 12 *pounder gun carriage* the bill of iron is the same as for the 24 pounder howitzer, with the exception of the items marked *, the dimensions of which for the 12 pounder gun are as follows:

NAMES OF PARTS.	Width.	Thickness.	Length.
	In.	In.	In.
2 bolts for large pointing ring	0.625	Round	14.7
2 bolts for small pointing ring	.625	Round	18.1
4 trunnion plates, (end pieces)	3.25	.5	60.
2 understraps	3.2	.5	56.
1 axle strap	3.2	.5	30.75

Bill of iron for field carriage wheels.

NAMES OF PARTS.	No. 1, 6 POUNDER.			No. 2, 12 POUNDER.		
	Wide.	Thick.	Long.	Wide.	Thick.	Long.
One wheel.	In.	In.	In.	In.	In.	In.
2 brow bands	1.25	0.25	70.	1.25	0.25	75.5
2 end bands	1.5	0.25	56.	1.5	0.25	64.
12 nails No. 1	0.25	0.25	19.5	0.25	0.25	19.5
1 tire	2.75	0.5	180.	2.75	0.625	180.
7 tire bolts	0.5	Round	35.	0.5	Round	37.8
7 washers	1.625	0.125	12.0	1.625	0.125	12.0
7 nuts	1.	0.5	7.	1.	0.5	7.
1 nave box, (cast iron)						

Bill of iron for one field carriage limber.

NAMES OF PARTS.	Width	Thickness.	Length.
	In.	In.	In.
4 rivets for hounds	0.375	Round	11.
4 washer plates	1.5	.125	12.
1 pintle hook	(draft.)		
3 bolts for pintle hook	.75	Round	27.
1 stay plate	2.75	.5	6.5
1 pintle key	1.625	Round	9.
1 tar bucket hook	1.	.25	5.
2 bolts for axle body and hounds	.625	Round	21.5
4 under strap bolts	1.25	Round	13.
2 under straps	2.5	.5	46.
2 axle bands	1.25	.25	42.
2 end bands for splinter bar	1.5	.5	14.

Bill of iron for one field carriage limber—Continued.

NAMES OF PARTS.	Width.	Thickness.	Length.
	In.	In.	In.
2 bolts for hounds and splinter bar	1.	Round	9.
1 eye plate for pole prop socket	1.75	0.5	6.
1 eye for pole prop socket	1.5	.625	2.5
2 middle bands	1.5	.625	11.
4 trace hooks	1.	.5	22.
1 fork strap	1.75	.375	12.
2 splinter bar and fork bolts	1.	Round	9.5
1 pole prop socket	3.	.625	6.
1 ferrule	1.25	.25	6.
1 toggle for pole prop chain	.5	.25	2.
2 stay pins	1.25	.5	6.
2 keys for stay pins	1.	.25	6.
1 pole rivet No. 3	.5	Round	3.5
1 pole bolt	1.	Round	6.
1 pole strap and ring	1.5	.5	12.
2 pole chains No. 5	.375	Round	130.5
2 lapped rings for pole chains	.5	Round	12.
1 muff for pole yoke	4.25	.25	9.
1 collar for muff	.5	.5	9.5
2 half collars for pole yoke	1.5	.625	12.
2 branches for pole yoke	1.25	1.25	12.
	.75	Round	30.
2 sliding rings for pole yoke	1.	1.	6.
2 bolts for collar and branches	1.	Round	5.
1 washer for muff	.3	.3	10.
1 key for pole yoke	.5	.5	2.
2 shoulder washers	1.25	.5	26.
2 linch washers	1.	.5	18.
2 linch pins	1.25	.75	8.5
1 axletree (draft.)			
1 middle piece for axletree	3.5	2.5	10.
3 nuts No. 4	1.5	.75	4.5
11 nuts, No. 3	1.25	.625	13.75
2 washers No 4, and 4 burrs No. 2	2.5	.188	6.50
8 washers No. 3	2.	.125	16.
2 burrs No. 3	1.25	.25	2.25
9 rivets No. 2	.25	Round	19.25
16 nails No. 1	.25	.25	27.5
2 nails No. 2	.3	.3	4.25
2 chains No. 1	.15	Round	25.
1 chain No. 2	.2	Round	27.5
1 chain No. 3	.25	Round	28.
5 rings No. 1	.2	Round	16.5
2 rings No. 2	.25	Round	10.
2 eye pins No. 1	.875	Round	3.5
1 eye pin No. 3	1.	Round	2.75

Bill of iron for one ammunition chest.

NAMES OF PARTS.	Width.	Thickness.	Length.
	In.	In.	In.
2 corner plates	9.	0.1	12.
5 corner plates	15.5	0.1	35.
1 assembling bolt { body.	0.5	Round	18.
1 assembling bolt { head.	1.	Round	3.
1 nut for assembling bolt	1.	0.5	1.
1 washer plate for assembling bolt	1.5	0.1	2.5
3 stays { uprights..	1.5	0.375	21.
3 stays { feet	1.5	1.5	12.
2 hinges	1.5	0.75	44.
3 hinge and hasp plates	1.13	0.1	7.5
1 hasp	1.75	0.75	4.
1 hasp strap	1.5	0.75	11.
2 handles	0.75	Round	50.
4 plates for handles	1.	1.	24.
8 rivets No. 3	0.5	Round	20.
9 rivets No. 2	0.375	Round	18.
1 cover (sheet copper.)	25.	No. 24	48.
1 turnbuckle (cast brass.)			

Bill of iron for one caisson.

NAMES OF PARTS.	Width.	Thickness.	Length.
	In.	In.	In.
1 middle assembling bar.. { ends	3.	0.5	32.5
1 middle assembling bar.. { middle piece.	6.	0.5	6.
2 bolts for do	1.	Round	6.
1 carriage hook	1.5	1.5	16.
1 rear assembling bar	3.	0.5	45.
2 bolts for do	1.	Round	7.
1 bridle	2.3	0.25	8.25
Spare wheel axle. { 1 body	4.25	1.25	18.
{ 2 ribs	1.	1.	27.
{ 1 washer	5.75	0.5	5.75
{ 3 rivets	0.25	Round	8.5
{ 1 chain	0.375	Round	23.5
{ 1 toggle	1.25	0.625	2.5
{ 2 stays	1.5	0.75	11.
{ 1 stay bolt	1.	Round	2.75
{ 1 foot bolt	1.	Round	3.125

Bill of iron for one caisson—Continued.

NAMES OF PARTS.	Width.	Thickness.	Length.
	In.	In.	In.
3 foot board bolts	1.	Round	12.
1 lock chain bridle	1.5	0.75	5.
1 lock chain	0.375	Round	136.
1 toggle for lock chain	1.5	0.5	4.
1 lock chain hook	1.	0.25	5.
1 axletree (draft.)			
2 under straps	2.5	0.5	42.
4 bolts for do	1.25	Round	20.
2 axle bands	1.5	0.25	36.
2 rivets for stock	0.5	Round	7.5
2 burrs do	1.125	0.25	2.25
1 lunette draft, or.	3.5	1.	38.
2 bolts for do	1.	Round	8.5
1 key plate for spare pole	2.	0.5	9.
1 key for do	1.25	0.625	6.
2 wheel guard plates	4.	0.25	10.
1 stock stirrup	2.5	0.5	21.
2 bolts for do	1.	Round	9.
1 axle strap	2.5	0.5	21.
1 spare pole ring	1.5	0.625	10.
1 bolt for axle strap, (No. 3, D)	1.	Round	5.5
1 Do. Do. (No. 3, B)	1.25	Round	11.25
8 washer plates	1.5	0.125	24.
4 stay pins	1.25	0.5	12.
4 keys for do	1.	0.25	12.
1 ring bolt	1.	1.	6.5
2 key plates for shovel and handspike	3.5	0.25	6.
2 keys	1.	0.25	4.
2 staples for tool handles	0.375	Round	21.
2 shoulder washers	1.25	0.5	26.
2 linch do	1.	0.5	18.
2 linch pins	1.25	0.75	8.5
23 nuts No. 3	1.25	0.625	28.75
10 washers No. 3	2.	0.125	20.
22 nails No. 2	0.3	0.3	74.75
32 do. No. 1	0.25	0.25	35.5
7 chains No. 1	0.15	Round	102.5
14 rings No. 1	0.2	Round	49.
7 eye pins No. 1	0.875	Round	12.25

Bill of iron for one travelling forge.

NAMES OF PARTS.	Width.	Thickness.	Length.
Body.	In.	In.	In.
1 axletree.....draft.			
2 axle bands.....	1.5	0.25	38.
2 under straps.....	2.5	0.5	42.
4 bolts for under straps, No. 3, D.....	1.	Round	16.
2 rivets for stock.....	0.5	Round	7.5
1 lunette.....draft, or.	3.5	1.	38.
1 prop bolt for lunette.....	1.5	Round	3.5
1 middle bolt for lunette.....	1.	Round	4.
1 socket for prop.....	3.	0.625	6.
1 ferrule for prop.....	1.25	.25	6.
1 toggle for prop chain.....	0.5	.25	2.
1 stock stirrup.....	2.5	.5	22.
2 bolts for stock stirrup.....	1.25	Round	8.5
1 bolt for middle cross bar.....	1.25	Round	5.5
1 axle strap.....	2.5	0.5	18.
2 bolts for axle strap.....	1.25	Round	9.75
2 wheel guard plates.....	4.	0.25	10.
2 stud plates for coal box.....	2.	.15	10.
2 studs.....	0.625	Round	2.8
2 keys for coal box.....	.375	Round	6.
1 lock chain hook.....	1.	0.25	5.
1 bellows pole hook.....	1.	.25	5.
1 bellows pole staple.....	0.375	Round	7.5
4 stay plates.....	2.625	0.25	12.
4 bolts for stay plates.....	0.75	Round	8.
4 thumb nuts for stay plates.....	1.	0.375	10.
1 front of bellows house.....sheet iron.	28.	No. 24	37.5
1 cover for middle cross bar..sheet iron.	11.75	No. 24	32.
1 guard for stock.....tin or sheet iron.	6.	No. 24	17.
1 stud for bellows pole.....	1.25	1.25	3.
1 stay for bellows pole..... { foot.....	1.25	1.25	3.
1 stay for bellows pole..... { upright..	1.25	0.5	26.
1 cover for roof.....sheet copper.	22.5	No. 24	88.
1 upper plate of back.....sheet iron.	13.25	No. 11	31.
1 lower back plate.....sheet iron.	26.25	No. 8	31.
2 side plates.....sheet iron.	8.	No. 8	31.
1 front plate.....sheet iron.	8.	No. 8	34.
1 bottom plate.....sheet iron.	13.8	No. 8	30.75
1 air back.....cast iron.			
4 bolts for air back.....	0.5	Round	21.6
5 bolts for fire place and air back.....	0.75	0.75	12.
1 hook for forge bucket.....	1.	.25	5.
1 plate for front cross bar....sheet iron.	4.5	No. 8	37.5
2 plates for side rails.....sheet iron.	4.5	No. 8	51.5

Bill of iron for one travelling forge—Continued.

NAMES OF PARTS.	Width.	Thickness.	Length.
Body—Continued.	In.	In.	In.
10 bolts for plates	0.75	Round	35.
1 lock chain bridle	1.5	0.75	5.
1 lock chain	0.375	Round	155.
1 toggle for lock chain	1.5	0.5	4.
1 brace for fire place	0.5	Round	13.
2 plates for brace	2.	0.25	8.
1 strap for bellows pole	1.25	1.	12.
1 chain for bellows pole	0.375	Round	24.
2 shoulder washers	1.25	0.5	26.
2 linch washers	1.	.5	18.
2 linch pins	1.25	.75	8.5
Bellows.			
6 butt hinges.....3 in. × 3 in.			
2 arms	1.5	0.5	64.
1 elbow for windpipe.....cast brass.			
1 collar for windpipe.....cast brass.			
1 joint pipe for windpipe.....cast brass.			
1 bent pipe.....sheet copper.	6.	No. 18	20.
1 hook for bellows	1.5	0.375	20.
Coal box.			
2 front corner plates.....sheet iron.	10.	No. 12	18.
2 rear corner plates	10.	No. 12	22.5
2 end straps	2.	0.5	18.
2 handles	1.25	Round	18.
1 stud plate for turnbuckle	2.25	0.15	4.
1 stud for turnbuckle	0.875	Round	1.75
1 hasp	1.75	0.75	4.
1 hasp strap	1.5	.75	8.
1 cover.....sheet copper.	18.5	No. 24	36.5
2 hinges	1.5	1.	8.
2 hinge straps	1.5	0.75	16.
Vice.			
2 jaws	2.	1.375	26.
steel for jaws	0.75	0.5	8.
1 screw	2.5	Round	8.
1 handle	0.75	Round	12.
1 washer	0.625	0.375	7.
1 strap	1.25	.375	10.5
1 key	1.5	.375	2.5
1 gib	0.625	.375	2.5
2 joint plates	2.5	.5	8.
1 bolt for joint plate, No. 4, D	1.	Round	2.5

Bill of iron for one travelling forge—Continued.

NAMES OF PARTS.	Width.	Thickness.	Length.
	In.	In.	In.
1 spring for vice.....steel.	1.	0.25	4.
1 stay for foot of vice.....	2.	1.	5.
1 vice bolt.....	2.	1.	5.
15 nuts No. 3.....	1.25	0.625	18.75
15 nuts No. 2.....	1.	.5	15.
8 washers No. 2, and 2 burrs.....	1.625	.125	15.
7 washers No. 3.....	2.	.125	14.
10 nails No. 1.....	0.25	.25	15.75
22 nails No. 2.....	.3	.3	74.75
4 rivets.....	0.25	Round	6.88
22 rivets.....	.375	Round	41.
1 chain No. 1.....	.15	Round	18.
1 chain No. 2.....	.2	Round	27.5
5 rings No. 1.....	.2	Round	17.5
3 eye pins No. 1.....	.875	Round	5.25

Bill of iron for one battery wagon.

NAMES OF PARTS.	Width.	Thickness.	Length.
	In.	In.	In.
8 side studs.....	1.625	0.5	160.
1 spare stock hook and button.....	1.5	1.	10.
1 spare stock stirrup.....	1.25	0.375	20.5
4 grooves.....	3.75	.15	89.
2 assembling bolts..... { head..	1.5	Round	3.25
2 assembling bolts..... { body.	0.75	Round	74.6
12 bolts for grooves and side rails.....	.375	Round	38.
3 bolts for middle side stud.....	1.25	Round	9.75
1 turnbuckle bolt.....	1.25	Round	4.
1 turnbuckle.....cast brass.			
1 hook for cover prop.....	1.25	Round	2.5
1 eye pin.....	1.25	Round	2.5
2 stays for upper rail..... { ends.	1.	1.	18.
2 stays for upper rail..... { body.	1.	0.375	64.
2 end studs.....	1.625	.5	40.
1 mortise plate.....	5.25	.25	7.75
1 axletree.....draft.			
2 under straps.....	2.5	.5	42.
4 bolts for under straps.....	1.5	Round	16.

Bill of iron for one battery wagon—Continued.

NAMES OF PARTS.	Width.	Thickness.	Length.
	In.	In.	In.
1 bolt for right side rail	1.	Round	4.
2 bolts for lock chain bridle. { No. 3, D.	1.	Round	4.
2 bolts for lock chain bridle. { No. 3, B.	1.25	Round	3.5
1 lock chain bridle	1.5	0.75	5.
1 lock chain	0.375	Round	200.
1 toggle for lock chain	1.5	0.5	4.
1 lock chain hook	1.	.25	5.
1 lunette.....draft, or.	3.25	1.	38.
2 bolts for lunette	1.	Round	8.5
2 wheel guard plates	4.	0.25	10.
1 stock stirrup	2.5	.5	22.
2 bolts for stock stirrup	1.5	Round	7.
2 bolts for middle cross bars	1.5	Round	11.
2 forage rack chains	0.25	Round	296.
2 forage rack hooks	1.	0.375	7.
2 forage rack bands	1.	0.125	75.
2 forage rack bolts	1.25	Round	9.
2 shoulder washers	1.25	0.5	26.
2 linch washers	1.	.5	18.
2 linch pins	1.25	.75	8.5
Wagon cover.			
4 corner squares	1.5	.25	32.
2 end bows..... { middle pieces.	1.	1.	16.
2 end bows..... { ends	1.	0.25	96.
4 joint bolts	0.625	Round	10.
2 middle bows	1.5	0.25	103.
2 staples	0.375	Round	5.5
1 cover prop..... { handle..	2.	0.75	6.
1 cover prop..... { prop....	1.5	.375	18.
1 hasp	1.25	.25	4.5
3 hinges	5.5	.375	20.
6 bolts	0.625	Round	13.5
34 rivets	.5	Round	83.
6 rivets	.25	Round	17.
22 nuts No. 1	.75	0.375	16.5
7 nuts No. 3	1.25	.625	8.75
16 nuts No. 4	1.5	.75	24.
6 washers No. 3	2.	.125	10.
8 washers No. 4	2.5	.188	20.
12 burrs	1.125	.25	13.5
8 washer plates	3.75	.15	12.75
2 nails No. 1	0.25	.25	5.25
22 nails No. 2	.3	.3	74.75

Summary bills of iron for field carriages.

Kind of carriage.	Width.	Thickness.	Length.	Weight.	REMARKS.
	In.	In.	Feet.	Lbs.	
6 PR. GUN CARRIAGE.	0.15	Round	2.81	0.18	For chains No. 1.
	0.2	Round	8.50	.90	2.3 feet for chains No. 2.
	0.25	Round	1.1	.18	
	0.375	Round	18.	6.62	
	0.5	Round	7.2	4.70	
	0.625	Round	4.10	4.18	
	0.75	Round	10.86	15.96	
	0.875	Round	0.65	1.30	
	1.	Round	2.58	6.73	
	1.5	Round	2.17	12.78	
	2.	Round	1.46	15.28	Hammered.
	0.25	0.25	2.21	.46	
	0.3	0.3	7.87	2.36	
	.75	0.375	1.33	1.25	Hammered.
	1.0	0.375	0.23	.29	
	1.0	0.5	1.5	2.52	
	1.0	1.0	0.58	1.94	
	1.25	0.5	2.16	4.53	
	1.25	0.625	0.84	2.20	Hammered.
	1.25	0.75	0.7	2.20	
	1.375	0.05	3.0	.70	
	1.375	0.25	0.33	.38	
	1.5	0.25	3.75	4.72	
	1.5	0.375	.46	.86	
	1.5	0.5	1.16	2.92	Hammered.
	1.5	0.625	1.66	5.22	Hammered.
	1.5	0.75	3.3	12.47	Hammered.
	1.5	1.5	.59	4.46	Hammered.
	1.75	0.25	.93	1.36	
	2.0	0.125	.33	.27	
	2.0	0.75	.93	4.68	
	2.0	1.	.5	3.36	Hammered.
	2.0	1.25	.38	3.19	Hammered.
	2.5	0.188	1.66	2.60	
	2.5	0.875	.33	2.42	
	2.5	1.25	1.5	15.75	Hammered; or 2 drafts for cap squares.
	2.5	1.5	1.66	20.91	Hammered; or 2 drafts for trunnion plates.
	2.5	1.75	.5	7.35	Hammered.
	2.75	0.5	10.23	47.26	
	3.25	0.375	0.39	1.23	
	3.75	0.15	.5	.95	
	3.75	0.2	.44	1.11	

Summary bills of iron for field carriages—Continued.

Kind of carriage.	Width.	Thickness.	Length.	Weight.	REMARKS.
	In.	In.	Feet.	Lbs.	
6 PR. GUN CARRIAGE—Continued.	3.75	0.25	0.38	1.19	
	5.	0.25	.83	3.48	
	5.5	0.2	1.5	5.53	
				136.00	2 drafts for axletree.
				28.00	1 draft for lunette.
				404.93	
	1.0	0.375	0.21	.26	Steel for lunette.
				17.00	4 small rondelles } Cast
				13.00	2 large rondelles } iron.
				30.00	
				8.00	Brass box of elevat'g screw.
				.42	Brass for turnbuckles.
				8.42	
24 POUNDER HOWITZER CARRIAGE.	0.15	Round	2.81	0.18	For chain No. 1.
	0.2	Round	9.80	1.03	2.3 feet for chains No. 2.
	0.25	Round	1.08	.18	
	0.375	Round	19.6	7.21	
	0.5	Round	7.54	4.93	
	0.625	Round	4.50	4.59	
	0.75	Round	1.42	2.08	
	0.875	Round	0.65	1.30	
	1.0	Round	15.83	41.32	
	1.5	Round	0.5	2.94	
	2.0	Round	3.58	37.48	Hammered.
	0.25	0.25	2.21	.46	
	0.3	0.3	7.88	2.36	
	0.75	0.375	1.33	1.25	Hammered.
	1.0	0.375	0.23	.29	
	1.0	0.5	1.5	2.52	
	1.0	1.0	0.58	1.94	
	1.25	0.5	2.16	4.53	
	1.25	0.625	0.84	2.20	Hammered.
	1.25	0.75	0.71	2.23	
	1.375	0.05	4.0	.92	
	1.375	0.25	0.33	.37	

Summary bills of iron for field carriages—Continued.

Kind of carriage.	Width.	Thickness.	Length.	Weight.	REMARKS.
	In.	In.	Feet.	Lbs.	
24 POUNDER HOWITZER CARRIAGE—Continued.	1.5	0.25	4.0	5.04	
	1.5	0.5	1.08	2.72	Hammered.
	1.5	0.625	1.66	5.22	Hammered.
	1.5	0.75	0.37	1.39	Hammered.
	1.5	1.5	0.59	4.46	Hammered.
	1.75	0.25	0.93	1.36	
	1.75	0.375	3.5	7.70	
	2.0	0.125	0.33	.28	Hammered.
	2.0	0.75	0.92	4.63	
	2.0	1.0	4.0	26.88	Hammered.
	2.0	1.25	0.38	3.19	Hammered.
	2.5	1.75	0.5	7.35	Hammered.
	2.75	1.	0.33	3.04	
	3.0	0.5	11.23	56.59	
	3.0	1.25	1.84	23.18	Hammered; or 2 drafts for cap squares.
	3.0	1.5	2.33	35.22	Hammered; or 2 drafts for trunnion plates.
	3.25	0.188	2.57	5.24	
	3.25	0.375	0.30	1.22	
	3.75	0.15	0.5	.94	
	3.75	0.2	0.57	1.43	
	3.75	0.25	0.38	1.19	
	5.0	0.25	0.83	3.48	
	6.0	0.2	1.5	6.04	
				200.	Draft for axletree.
				37.	Draft for lunette.
				567.10	
	1.0	0.375	0.21	0.26	Steel for lunette.
				17.	4 small rondelles } Cast
				13.	2 large rondelles } iron.
				30.	
				8.	Brass for box of elevating screw.
				.42	Brass for 2 turnbuckles.
				8.42	

Summary bills of iron for field carriages—Continued.

Kind of carriage.	Width.	Thickness.	Length.	Weight.	REMARKS.
	In.	In.	Feet.	Lbs.	
12 PR. GUN CARRIAGE.	0.15	Round	2.81	0.18	For chains No. 1.
	0.2	Round	9.80	1.03	2.3 feet for chains No. 2.
	0.25	Round	1.08	.18	
	0.375	Round	19.60	7.21	
	0.5	Round	7.54	4.93	
	0.625	Round	4.73	4.82	
	0.75	Round	1.42	2.08	
	0.875	Round	0.65	1.30	
	1.0	Round	15.83	41.32	
	1.5	Round	0.5	2.94	
	2.0	Round	3.58	37.48	Hammered.
	0.25	0.25	2.21	.46	
	0.3	0.3	7.88	2.36	
	0.75	0.375	1.33	1.25	Hammered.
	1.0	0.375	.23	.29	
	1.0	0.5	1.5	2.52	
	1.0	1.0	.58	1.04	
	1.25	0.5	2.16	4.53	
	1.25	0.625	0.84	2.20	Hammered.
	1.25	0.75	0.71	2.23	
	1.375	0.05	4.00	.92	
	1.375	0.25	0.33	.37	
	1.5	0.25	4.00	5.04	
	1.5	0.5	1.08	2.72	Hammered.
	1.5	0.625	1.66	5.22	Hammered.
	1.5	0.75	.37	1.39	Hammered.
	1.5	1.5	.59	4.46	Hammered.
	1.75	0.25	.93	1.36	
	1.75	0.375	.5	1.10	
	2.0	0.125	.33	.28	Hammered.
	2.0	0.75	0.92	4.63	
	2.0	1.0	4.00	26.88	Hammered.
	2.0	1.25	0.38	3.19	Hammered.
	2.5	1.75	0.5	7.35	Hammered.
	2.75	1.0	0.33	3.04	
	3.0	1.25	1.84	23.18	Hammered; or 2 drafts for cap squares.
	3.0	1.5	2.33	35.22	Hammered; or 2 drafts for trunnion plates.
	3.2	0.5	7.23	38.86	
	3.25	0.188	2.17	4.42	
	3.25	0.375	0.30	1.22	
	3.25	0.5	5.00	27.30	
	3.75	0.15	0.5	.94	

Summary bills of iron for field carriages—Continued.

Kind of carriage.	Width.	Thickness.	Length.	Weight.	REMARKS.
	In.	In.	Feet.	Lbs.	
12 PR. GUN CARRIAGE—Continued.	3.75	0.2	0.57	1.43	
	3.75	0.25	0.38	1.19	
	5.0	0.25	0.83	3.48	
	6.5	0.2	1.5	6.54	
				200.	Draft for axletree.
				42.	Draft for lunette.
				574.08	
	1.0	0.375	.21	0.26	Steel for lunette.
				17.	4 small rondelles } Cast
				13.	2 large rondelles } iron.
				30.	
				8.	Brass for box of elevating screw.
				.42	Brass for 2 turnbuckles.
				8.42	
WHEEL No. 1.	0.5	Round	2.93	1.91	
	0.25	0.25	1.63	0.34	
	1.0	0.5	0.58	0.97	
	1.25	0.25	5.83	6.12	
	1.5	0.25	4.67	5.88	
	1.625	0.125	1.00	0.68	
	2.75	0.5	15.00	69.30	In one piece; for tire.
				85.20	
				15.5	Cast iron for nave box.
WHEEL No. 2.	0.5	Round	3.15	2.06	
	0.25	0.25	1.63	0.34	
	1.0	0.5	0.58	0.97	
	1.25	0.25	6.29	6.60	
	1.5	0.25	5.33	6.72	
	1.625	0.125	1.00	0.68	
	2.75	0.625	15.00	86.55	In one piece; for tire.
				103.92	
				15.5	Cast iron for nave box.

Summary bills of iron for field carriages—Continued.

Kind of carriage.	Width.	Thickness.	Length.	Weight.	REMARKS.
	In.	In.	Feet.	Lbs.	
LIMBER.	0.15	Round	2.08	0.13	For chains No. 1.
	0.2	Round	3.67	.38	2.3 feet for chains No. 2.
	0.25	Round	4.95	.80	2.33 feet for chains No. 3.
	0.375	Round	11.8	4.34	
	0.5	Round	1.30	.85	
	0.625	Round	1.80	1.83	
	0.75	Round	4.75	6.98	
	0.875	Round	0.30	.60	
	1.0	Round	2.69	7.02	
	1.25	Round	1.08	4.41	
	1.625	Round	0.75	5.18	
	0.25	0.25	2.3	.48	
	0.3	0.3	1.19	.35	
	0.5	0.25	0.17	.07	
	0.5	0.5	0.95	.80	
	1.0	0.25	0.93	.78	
	1.0	0.5	3.33	5.59	Hammered.
	1.0	0.1	0.5	1.68	Hammered.
	1.25	0.25	4.19	4.40	Hammered.
	1.25	0.5	2.67	5.60	
	1.25	0.625	1.15	3.01	
	1.25	0.75	0.71	2.23	Hammered.
	1.25	1.25	1.0	5.25	
	1.5	0.125	1.0	.63	
	1.5	0.5	2.17	5.46	Hammered.
	1.5	0.625	2.12	6.67	Hammered.
	1.5	0.75	.38	1.43	
	1.75	0.375	1.0	2.20	
	1.75	0.5	0.5	1.47	
	2.0	0.125	1.33	1.11	
	2.5	0.188	0.54	.85	
	2.5	0.5	3.84	16.12	
	2.5	1.5	0.5	6.30	
	2.75	0.5	0.54	2.49	
	3.0	0.625	0.5	3.15	
	3.5	2.5	0.84	24.69	Hammered; middle piece for axletree.
	4.25	0.25	0.75	2.67	
				120.	2 drafts for axletree.
				25.	Draft for pintle hook.
				283.	
	1.0	0.375	0.21	0.26	Steel for pintle hook.

Summary bills of iron for field carriages—Continued.

Kind of carriage.	Width.	Thickness.	Length.	Weight.	REMARKS.
	In.	In.	Feet.	Lbs.	
AMMUNITION CHEST.	0.375	Round	1.5	0.55	
	0.5	Round	3.16	2.06	
	0.75	Round	4.13	6.07	
	1.0	Round	0.25	.65	
	1.0	0.5	0.08	.13	
	1.0	1.0	2.00	6.72	
	1.5	0.375	1.73	3.26	
	1.5	0.75	4.58	17.31	
	1.5	1.0	0.2	1.00	
	1.5	1.5	1.0	7.56	
	1.75	0.75	0.33	1.45	
	15.5	0.1	4.0	20.50	
				67.26	
	25.0	No. 24	4.	9.50	Sheet copper for cover.
				0.21	Brass for turnbuckle.
CAISSON.	0.15	Round	8.53	0.50	For chains No. 1.
	0.2	Round	4.08	0.43	
	0.25	Round	0.71	.11	
	0.375	Round	15.04	5.53	
	0.5	Round	0.63	.41	
	0.875	Round	1.02	2.04	
	1.0	Round	4.49	11.71	
	1.25	Round	2.61	10.67	
	0.25	0.25	2.92	.61	
	0.3	0.3	6.23	1.87	
	1.0	0.25	1.75	1.47	
	1.0	0.5	1.5	2.52	
	1.0	1.0	2.79	9.37	Hammered.
	1.125	0.25	0.19	.18	
	1.25	0.5	3.18	6.68	
	1.25	0.625	3.1	8.12	Hammered.
	1.25	0.75	0.70	2.20	Hammered.
	1.5	0.125	2.0	1.26	
	1.5	0.25	3.0	3.78	
	1.5	0.5	0.33	.83	
	1.5	0.625	.83	2.61	Hammered.
	1.5	0.75	1.33	5.02	Hammered.
	1.5	1.5	1.33	10.05	

Summary bills of iron for field carriages—Continued.

Kind of carriage.	Width.	Thickness.	Length.	Weight.	REMARKS.
	In.	In.	Feet.	Lbs.	
CAISSON—Continued.	2.0	0.125	1.67	1.40	
	2.0	0.5	0.75	2.52	
	2.31	0.25	0.69	1.33	
	2.5	0.5	7.0	29.40	
	3.0	0.5	6.46	32.55	
	3.5	0.25	0.5	1.47	
	3.5	1.0	3.17	37.27	Hammered; or 2 drafts for lunette.
	4.0	0.25	0.84	2.82	
	4.25	1.25	1.5	26.77	
	5.75	0.5	0.48	4.63	
	6.0	0.5	0.5	5.04	
				136.	2 drafts for axletree.
				369.17	
FORGE.	0.15	Round	1.5	0.09	For chain No. 1.
	0.2	Round	3.75	.38	2.3 feet for chain No. 2.
	0.25	Round	0.57	.93	
	0.375	Round	19.48	7.17	
	0.625	Round	0.24	.24	
	0.5	Round	3.51	2.29	
	0.75	Round	4.58	6.73	
	0.875	Round	0.58	1.16	
	1.0	Round	1.88	4.90	
	1.25	Round	3.48	14.23	
	1.5	Round	0.3	1.76	
	2.5	Round	0.67	10.96	
	0.25	0.25	1.32	.28	
	0.3	0.3	6.23	1.88	
	0.5	0.25	.17	.07	
	0.625	0.375	.79	1.89	
	0.75	0.75	1.0	.63	
	1.0	0.25	1.25	1.05	
	1.0	0.375	0.84	1.06	
	1.0	0.5	2.75	4.62	
	1.25	0.25	0.5	.52	
	1.25	0.375	0.88	1.38	
	1.25	0.5	4.31	9.05	
	1.25	0.625	1.56	4.08	Hammered.
	1.25	0.75	0.7	2.20	
	1.25	1.0	1.0	4.20	Hammered.

Summary bills of iron for field carriages—Continued.

Kind of carriage.	Width.	Thickness.	Length.	Weight.	REMARKS.
	In.	In.	Feet.	Lbs.	
FORGE—Continued.	1.25	1.25	0.5	2.62	
	1.5	0.25	3.17	4.00	Hammered.
	1.5	0.375	1.88	3.55	
	1.5	0.5	5.66	14.26	
	1.5	0.75	2.42	9.14	Hammered.
	1.5	1.0	0.66	3.32	Hammered.
	1.625	0.125	1.25	.85	
	1.75	0.75	0.33	1.45	Hammered.
	2.0	0.15	0.84	.84	
	2.0	0.125	1.17	.98	
	2.0	0.25	0.67	1.12	
	2.0	0.5	1.5	5.04	
	2.0	1.0	0.83	5.58	Hammered.
	2.0	1.375	2.17	20.03	Hammered.
	2.25	0.15	0.33	.37	
	2.5	0.5	7.5	31.50	
	2.625	0.25	1.0	2.20	
	3.0	0.625	0.5	3.15	Hammered.
	3.5	1.0	3.17	37.27	Hammered; or 2 drafts for lunette.
	4.0	0.25	0.84	2.82	
	10.	No. 12	3.4	12.5	Sheet iron.
	13.25	No. 11	2.58	14.25	Sheet iron.
	27.	No. 8	7.5	122.00	Sheet iron.
	28.	No. 24	5.	11.85	Russia sheet iron.
				136.	2 drafts for axletree.
				530.44	
	0.75	0.5	0.67	.84	Cast steel.
	1.0	0.25	0.33	.27	Spring steel.
				36.5	Cast iron air back.
				6.	Brass for windpipe.
	22.5	No. 24	7.33	15.75	Sheet copper; in 2 sheets 44 in. long.
	18.5	No. 24	3.04	5.25	Sheet copper.
	20.	No. 18	0.05	1.90	Sheet copper.
				22.90	

Summary bills of iron for field carriages—Continued.

Kind of carriage.	Width.	Thickness.	Length.	Weight.	REMARKS.
	In.	In.	Feet.	Lbs.	
BATTERY WAGON.	0.25	Round	26.08	4.25	24.7 feet for chains No. 4.
	0.375	Round	20.3	7.47	
	0.5	Round	6.92	4.52	
	0.625	Round	1.92	1.95	
	0.75	Round	6.22	9.14	
	1.0	Round	1.38	3.60	
	1.25	Round	2.60	10.63	
	1.5	Round	3.11	18.31	
	0.25	0.25	0.44	.09	
	0.3	0.3	6.23	1.88	
	0.75	0.375	1.38	1.29	
	1.0	0.125	6.25	2.62	
	1.0	0.25	8.41	7.06	
	1.0	0.375	5.92	7.46	
	1.0	0.5	1.5	2.52	
	1.0	1.0	2.84	9.54	Hammered.
	1.125	0.25	1.12	2.11	
	1.25	0.25	0.38	.40	
	1.25	0.375	1.71	2.68	
	1.25	0.5	2.18	4.58	
	1.25	0.625	0.73	1.91	Hammered.
	1.25	0.75	0.71	2.23	Hammered.
	1.5	0.25	11.25	14.17	
	1.5	0.375	1.5	2.83	
	1.5	0.5	0.33	.83	
	1.5	0.75	2.47	9.32	Hammered.
	1.5	1.0	0.83	4.18	
	1.625	0.5	16.67	45.50	
	2.0	0.125	0.83	.70	
	2.0	0.75	0.5	2.52	
	2.5	0.188	1.67	2.62	
	2.5	0.5	5.33	22.38	
	3.5	1.0	3.17	37.27	Hammered; or 2 drafts for lunette.
	3.75	0.15	8.48	16.02	
	4.0	0.25	0.83	2.79	
	5.25	0.25	0.65	2.87	
	5.5	0.375	1.66	11.50	
				136.00	2 drafts for axletree.
				417.74	
				0.21	Cast brass for turnbuckle.

Remarks on the bills of iron.

The iron in the foregoing bills is to be *rolled iron*, when not otherwise specified. It should be of the best quality, neatly rolled, and clear of fag ends.

Rolled iron of good quality may also be substituted for some of the hammered iron; but the latter is to be preferred for all the bars thus designated in the bills.

As the manufacturers of iron use common fractions for the dimensions of bars, the bills for their use should be made out accordingly, in vulgar fractions, instead of decimals.

The *drafts* of pieces which are to be hammered in peculiar shapes are represented in PLATE XXIX. These shapes should be of the full dimensions given in the drafts.

The draft for the axletree of the limber represents one of the arms which are to be welded to a middle piece containing the stop. Another method of making this axletree is to have one of the arms forged sufficiently long to weld the stop on it, before it is joined to the other arm. In that case the middle piece for the axletree will be omitted in the bill of iron.

Formers for iron work.—Plates XXX, XXXI, XXXII.

The *formers* for shaping the irons of field carriages are represented in the plates, together with a *vice* for forming the heads of bolts, and *clamps* for bending some of the irons.

For the *gun carriages*, the formers for the 6 pounder irons only are drawn. Those for the other gun carriages can be readily made from these, by referring to the drawings of the irons peculiar to those carriages. PLATE IX.

The formers are made of cast iron. They have flanges, with holes in them, for securing them to blocks of wood, by means of

bolts or nails. Most of the formers are represented as furnished with clamps and keys for holding down one part of the iron whilst the other is shaped and hammered. These clamps are not absolutely necessary in all cases; they may be used or omitted, at the discretion of the master workman.

The formers for trunnion plates and cap squares represented in PLATE XXXI differ from those given in PLATE XXX, for the same pieces. Both kinds are given, as patterns of the formers used at different Arsenals; either of them may be adopted, according to the mode of working which may be thought most convenient.

Vice for heading bolts—Plate XXX.

This vice is intended for forming the heads of those bolts which are made by upsetting the iron for the head.

It consists of a fixed jaw A, of cast iron, which is fastened to a wooden bench B by two bolts, No. 5, E. and a moveable jaw C which is held against the fixed jaw by means of a lever acted on by the foot of the workman. The jaws contain the dies for forming the head of the bolt. The bed or lower part of the piece A is bored out, to receive the cylindrical part of the cast iron guide D, which contains the screw for supporting the lower end of the bolt and regulating its length. This guide is fastened to the underside of the bed A by 4 bolts, No. 3, E. which pass through the circular flanch F.

The brass nut N of the screw is let into the lower part of the guide D, and is fastened there by a pin.

The screw is inserted from the top of the guide, and it passes through a circular plate or box G, which has a feather fitting into a slot in the screw, so that this plate serves as a handle for turning the screw; for this purpose holes are bored in the edge of the plate, to insert a pin for turning it.

CORRECTIONS—*Part second.*

Page 12—after *one lock chain bolt*, &c.; add: "*one washer and one nut*, for the same."
" 29—7th line, for "*eighty-six*," read "*ninety-six*."
" 29—10th line, add: "*one nut*, for this bolt."
" 30—7th line, for "*two*" read "*four*."
" 31—in the table of screws, 2nd line, for "14," read "20."
" 31—in the table of screws, 3rd line, for "16," read "20."
" 32—5th line from the bottom, for "*four*," read "*five*."
" 35—18th line, for "*two*," read "*four*."
" 35—6th line from the bottom, for "*one*," read "*two*;" and for "*It is*," read "*They are*."
" 46—after the 14th line, add: "*One lock chain*, Plate III."
" 59—6th line, for "*two*," read "*four*."
" 59—4th line from the bottom, for "*back*," read "*rack*."
" 62—strike out all the first paragraph, after the word "*forge*," in the first line.
" 63—3d line from bottom, last column, insert "1."

ARTILLERY.

PART THIRD.

CARRIAGES

FOR THE SERVICE OF

SIEGE BATTERIES.

1848.

PART THIRD.

SIEGE CARRIAGES.

Gun carriages.—Plates I to V.

There are three gun carriages for the service of siege artillery, viz:

One for the 12-pounder gun.

One for the 18-pounder gun.

One for the 24-pounder gun and the 8-inch howitzer.

These carriages are similar to each other in their construction, differing only in their dimensions, as shown in the plates.

In mounting the 8-inch howitzer on the 24-pounder gun carriage, a quoin is used instead of the elevating screw, the howitzer being too short to rest on the screw.

A table of bolts, rivets, nails and screws, follows the nomenclature and description of the parts of the carriages.

Wood work.

WHITE OAK is used for all these carriages. See the general remarks on wood work of artillery carriages: PART 2, page 10.

Those roundings of the wood which are not shown in the plates are given in the description of the parts.

One stock. It is made of two pieces, put together with dowels. The edges are rounded with a radius of 1.5 inch, except at the place of the rondelles and the trail plate, as in the field carriage. The head of the stock is hollowed out, with a radius equal to that of the gun in front of the trunnions, in order to allow the gun to be depressed. *Two dowels*, for the stock.

Two cheeks. The pattern of the cheek includes the trunnion plate, on the upper edge; the part to be cut off, for fitting the trunnion plate, is marked by means of the plate itself. The lower corners are rounded with a radius of .4 inch, where the iron work allows it.

One axle body. The notches for the stock and the cheeks to fit in, are shown in the drawings. The corners are rounded with a radius of 1.25 inch, except at the axle strap, where the rounding is .4 inch. The corners of the ends are chamfered .2 inch.

One breech bolster. It should be made of a piece of wood which will not split easily. The upper corners are rounded with a radius of .6 inch; the ends, with 1.5 inch.

Irons.—Plates IV and V.

One assembling bolt, for the stock. *Two washers* and *one nut* for the same.

One manœuvring bolt. It is square, and is cut at each end with the thread No. 5.

Two collars, for manœuvring bolt. They are made of sheet iron welded, and are formed on a mandril, to go over the diagonal of the bolt; they are turned on the exterior, and the ends are faced in the lathe.

Four washers, for manœuvring bolt. Two of them have square holes, to fit the body of the bolt; these are applied to the sides of the stock, and they are let into the wood a little, on the front side, so as to be perpendicular to the axis of the bolt. The other two washers have round holes, to fit bolts No. 5, and their edges are rounded, instead of being chamfered; they are applied to the outer ends of the collars.

Two nuts, No. 5, for the manœuvring bolt.

Six rondelles, (CAST IRON.) They are placed between the stock and the cheeks; the assembling bolts pass through them. The

two in rear, through which the lock chain bolt passes, have each two tenons which are let into the stock and cheeks. The rondelles should be faced and turned to the proper size and thickness.

Two assembling bolts. *Four washers* and *two nuts* for the same.

One assembling eye bolt, for the lock chain. The square under the head of this bolt is in the right cheek, and one diagonal of it is parallel to the bottom of the cheek. The screw on the bolt is cut with the thread No. 7. The ring of the lock chain is welded in the eye of the bolt. *One washer*, No. 9, for the head of this bolt. *One washer* and *one nut*, No. 7.

One lock chain—Plate IV. It consists of a chain, (No. 7,) to which the shoe is attached; another chain, (No. 7,) for the toggle, and a drag chain, (No. 5,) which connects the first chain with the eye bolt. When the shoe is no longer required to act on the wheel, the toggle is loosened by knocking off the ring, and the wheel runs over the shoe, which is then drawn by the drag chain, until it can be hooked up.

One shoe. The under side of the shoe is faced with a plate of steel, which is welded and riveted to the iron.

One key, for the shoe. It passes through the holes in the ears of the shoe, on the inside of the felly, to keep the wheel from slipping off.

Two trunnion plates. They are bent on a former, and they are warmed when applied to the cheeks. They are fastened by the several bolts which pass through the width of the cheeks, and also by two bolts in the heads of the cheeks. The cheeks are chamfered down to the width of the trunnion plates.

Two chin bolts. The edges of the heads are chamfered .1 inch. *Two bevel washers* and *two nuts* for these bolts. The washers are made to fit in the outer angles of the understraps.

Two key bolts. The edges of the heads are chamfered .1 inch. *Two nuts* for these bolts.

Four cheek bolts. *Four washers* and *four nuts* for the same.

Two travelling trunnion bolts—Plate V. The heads are chamfered .1 inch. These bolts, with the trunnion plates, form a support for the trunnions of the gun in its travelling position. *Two washers* and *two nuts* for the trunnion bolts. The washers and nuts are all No. 7, although the bolts in the 18-pounder and 24-pounder carriages are No. 9.

Two trunnion plate bolts. The nuts for these bolts are let into the heads of the cheeks, from the inside.

Two cap squares. The upper edges are chamfered .15 inch.

Two cap square chains. Each chain consists of *six links*, No. 3, and *two rings*, No. 2, A.

Four eye pins, No. 3, for cap square chains. Two of them are riveted into the cap squares; the other two are screwed into the sides of the cheeks.

Two cap square keys.

Two key chains, each of *five links*, No. 2, and *two rings*, No. 2, B.

Two eye pins, No. 2, for key chains. They are screwed into the sides of the cheeks.

One axle tree—Plate IV. The stop in the middle of the upper side is dovetailed into the body. The lower corners are rounded with a radius of .1 inch.

Two understraps. The exterior edges are chamfered .15 inch. The straps are put on warm.

One axle strap. It serves as a washer to the two bolts which connect the stock with the axle body.

Two bolts, for the stock and axle body. Their heads are let into the upper side of the stock. *Two nuts* for these bolts.

Two axle bands. They are put on warm, and they are fastened to the axle body, each by *three nails.*

One lock chain hook. It passes through the axle body on the right side of the carriage. *Two washers* and *one nut* for the bolt of the hook.

One hook, for the shoe. It is screwed into the right cheek of the carriage.

These hooks carry the lock chain and shoe when they are not in use. See Plates XI and XII.

One cheek plate, for the shoe. It is fastened with *three wood screws*, on the right cheek of the carriage, to protect the wood from the friction of the shoe, in travelling.

One box, for the elevating screw, (BRASS.)

The composition of the metal is the same as that for the box of the screw of field carriages.

The under part of the box is let into the wood, the plate resting on the upper side of the stock.

Two bolts, for the box of the elevating screw. Their heads are countersunk in the plate. *Two washers* and *two nuts* for these bolts.

One elevating screw. The head is fastened on in the same manner as in the screw for field carriages; the tenon on the upper end of the screw is 1.5 in. diameter. The handles are screwed into the head; the screw is .75 inch diameter and .88 in. long.

One strap staple. It is driven into the middle of the stock, on the under side; it projects .25 inch clear of the stock, and serves to confine a leather strap 22 inches long and 1.5 inch wide. When the gun is in its travelling position, the elevating screw is inverted in its box, and this leather strap is buckled round one of the handles, to prevent the screw from turning. See Plate XII.

Two wheel guard plates. They are fastened to the stock, each by *six nails.*

One lunette. The pintle hole is reinforced by a *rondelle*, which is fastened to the upper side of the lunette plate with *three rivets.* This rondelle is let into the under side of the stock, its whole thickness.

The rear end of the plate has an eye, to receive the hook of the lashing chain on the limber. See Plate XII. The outer corners of the plate are chamfered .2 in; those of the eye are rounded.

Two lunette bolts. *Two washers* and *two nuts.* The heads of the bolts are countersunk in the under side of the lunette plate.

One trail plate. The part under the stock, which rests on the sweep bar of the limber, is reinforced by a guard plate which is fastened to the trail plate with *six rivets.* This inner plate is let into the stock. The trail plate is bent on a former; it is applied warm, and is fastened to the stock by *twenty-nine nails.*

Two bolster bolts. The heads are let into the upper side of the bolster, and they are hollowed out to correspond with the curvature of the wood. *Two washers* and *two nuts* for these bolts.

Two shoulder washers, for the axle tree. They are shrunk on the axle arms, against the ends of the wooden body.

Two linch washers.

Two linch pins.

Two wheels.

Bolts, rivets, nails and screws for siege gun carriages.

DESIGNATION.	Number.	Kind.	LENGTH.			WASHERS.	
			12-p'r.	18-p'r.	24-p'r.	Head.	Nut
Bolts.			In.	In.	In.		
For the stock	1	No. 7, A.	12.2	13.85	14.75	1	1
" cheeks and stock	2	Do.	25.1	27.7	29.9	2	2
" lock chain	1	No. 9.*	25.1	27.7	29.9	1	1
" manœuvring collars	1	No. 7.†	20.6	21.1	21.4	2	2
" trunnion plates and cheeks	2	No. 7, A.	20.65	21.2	21.8	–	2
	2	Do.	18.9	19.3	20.1	–	2
	2	No. 3, E.	5.	5.	5.	–	‡
" chin bolts	2	No. 7. §	23.2	23.3	24.25	–	2
" key bolts	2	Do. ††	18.3	18.8	19.5	–	–
" travelling trunnion bolts	2	Do. ‖	17.3	–	–	–	2
	2	No. 9. ‖	–	17.5	18.	–	2
" stock and axle body	1	No. 5, B.	17.45	17.45	17.45	–	–
	1	Do.	17.1	17.1	17.1	–	–
" box of elevating screw	1	No. 4, C.	12.2	12.2	12.2	–	1
	1	Do.	12.35	12.35	12.35	–	1
" lunette	2	Do.	12.15	12.15	12.15	–	2
" breech bolster **	2	No. 4, B.	15.8	16.1	16.45	–	2
" lock chain hook	1	No. 4. ††	8.63	8.63	8.63	1	1
Rivets. For trail plate	6	No. 3, C.	0.9	1.15	1.15	–	–
" lunette	3	Do.	1.5	1.5	1.5	–	–
Nails. For trail plate	29	No. 3, C.	3.5	3.5	3.5	–	–
" wheel guard plates	12	No. 2, C.	3.	3.	3.	–	–
" axle bands	6	No. 1, C.	2.5	2.5	2.5	–	–
Screws, for cheek plate	3	No. 12.	1.5	1.5	1.5	–	–

* Nut and its washer, No. 7. † Two nuts, No. 5.—See Plate IV. ‡ Nuts not chamfered.

§ Bevel Washers—Plate IV. ‖ Plate V—Washers and nuts, No. 7. ** Plates I, II, and III.

†† Plate IV.

WHEEL.—PLATE VI.

Wood work.

One nave,
Fourteen spokes, } WHITE OAK.
Seven fellies.

The corners of the fellies are rounded with a radius of .8 inch, except at the rear of the spokes, where the rounding is .3 inch.

Seven dowels. They are round, tapering a little towards the ends.

Iron work.

Two brow bands, } The inner edge of the band, on the side
Two end bands. } next to the spokes, is slightly rounded, to prevent it from chafing the nave when it is driven on. The outer edge of the end band, on the thickest side, is chamfered .15 inch. Each band is fastened with *three nails.*

One tire. Hoop tire, shrunk on in the usual manner.

Seven tire bolts. *Seven washers* and *seven nuts* for the same.

One nave box, (BRASS.) It is fastened with wooden wedges.

Bolts and nails for one wheel.

Designation.	Number.	Kind.	Length.	Washers for nuts.
			In.	
Tire bolts.....	7	No. 4, H.	5.94	7
Nails for nave bands.....	12	No. 1, C.	2.	–

LIMBER.—PLATES VII AND VIII.

Wood work.—(WHITE OAK.)

One fork. In rear of the axletree, the corners are rounded with a radius corresponding to the difference of width of the wood and the iron, where it does not exceed 1 inch. In front of the axle tree, the lower corners are rounded with a radius of 1 inch, up to the splinter bar; the upper corners are rounded with a radius of .8 inch, in front of the sweep bar.

Two hounds. The corners are chamfered .5 inch, except where the iron work is applied. The upper surface of the hounds is in the same plane with that of the fork, for a length of 16.2 inches from the rear end; from that point it slopes towards the front, the under side being straight.

One splinter bar. It is straight on the front side. The ends are rounded, outside of the hounds; the corners of the middle part are chamfered .5 inch, as shown in the drawing.

One pole. It is straight on the upper side, the taper being on the lower side, beginning at the splinter bar. It is connected with the fork by two bolts.

One leading bar. It has an oval shape, corresponding with that of the bands, as shown in Plate VIII.

Irons.—Plate VIII.

One bolt, for the head of the fork. It serves as a rivet for the fork, in front of the pintle. *Two washers* and *one nut* for the same.

One axletree, like that for the gun carriage. It is let into notches on the under side of the fork and the hounds, so that the upper surfaces of these pieces may be in the same plane.

One pintle plate. The holes in the plate are perpendicular to its upper surface. The form and dimensions of the pintle hole

are determined by those of the pintle. The plate is fastened to the fork by *seven nails* and by two of the axle strap bolts.

One sweep bar. The centre of the circular part is in the axis of the pintle hole. The ends are turned down square, over the outside of the hounds, and fastened by a bolt through each of the ears thus formed. The sweep bar is also fastened to the fork by two of the axle strap bolts, and to the hounds by two of the bolts which hold the understraps.

Two bolts, for the ears of the sweep bar. *Two washers* and *two nuts* for the same.

One axle strap. The corners of the under side are chamfered .15 inch. The rear end has an eye for the lashing chain. The strap is put on warm, and is fastened to the fork by six bolts and by the pintle.

One lashing chain. It consists of *four rings* and *one hook;* the first ring is welded into the eye of the axle strap.

Six bolts, for the axle strap. Two of them pass through the pintle plate, two through the sweep bar, and two through the fork in front of the sweep bar. *Two washers* and *six nuts* for these bolts.

Two understraps, fastening the hounds to the axle tree. The lower corners are chamfered .15 inch. The understraps are put on warm, and they are fastened to the hounds, each by two bolts, one of which passes through the sweep bar.

Four bolts, for the understraps. *Two washers* and *four nuts* for the same.

One pintle. The upper, conical part is turned. The shoulder and the shank should be fitted accurately in the mortises, both in the pintle plate and in the wooden fork. *One nut* for the lower e l of the pintle.

Two end bands, for the splinter bar. Their edges are chamfered .1 inch. They are put on hot, and are fastened each by *two rivets*

Two middle bands, for splinter bar. The upper plates are let into the front ends of the fork, and the bands are fastened by the bolts which connect the splinter bar and fork.

Four trace hooks, for the splinter bar. They are welded into the loops of the bands.

One bridle, for the front end of the fork. The outer corners are chamfered .15 inch. It is fastened by the two bolts which connect the fork and the splinter bar.

Two bolts, for the splinter bar and fork. *Two nuts* for the same.

Two bolts, for the splinter bar and hounds. *Four washers* and *two nuts* for the same.

One bridle, for the middle of the fork. The outer corners are chamfered .15 inch. It is fastened to the fork, at the rear end of the pole, by *four nails*.

One rivet, for the rear end of the pole. *One burr* for the same.

One eye plate, for the front end of the pole. It is let into the middle of the pole, and is fastened by two bolts, one ferrule, and one clasp.

Two pole chains. Each chain consists of *nine links*, No. 6, *one S link*, (coldshut,) and *one ring*, which is welded into a hole in the eye plate.

One ferrule, for the end of the pole. The corners are chamfered .15 inch. It is put on hot, at the same time that the eye plate is put in place.

One pole clasp. The corners are chamfered .15 inch. The ends form two ears through which the clasp bolt passes, one of them being tapped to receive the thread of the bolt. The clasp is fastened also by one of the eye plate bolts.

One clasp bolt. The head is hexagonal. It has no nut, being screwed into the tapped ear of the clasp.

Two bolts, for the eye plate of the pole. *Three washers* and *two nuts* for the same.

Two bolts, for the pole and fork. *Four washers* and *two nuts* for the same.

One middle band, for the leading bar.

A hook, for fastening the leading bar to the eye plate of the pole, is welded into the rear loop of the band, and a *double trace hook* into the front loop. The band is fastened to the leading bar by *two rivets*.

Two end bands, for leading bar, like those for the splinter bar. They are fastened each by *two rivets*. They have also *two trace hooks*, like those on the splinter bar.

Two axle shoulder washers,
Two linch washers,
Two linch pins,
Two wheels.
} Like those on the gun carriage.

Bolts, rivets and nails for limber of siege carriages.

DESIGNATION.	Number.	Kind.	Length.	WASHERS. Head.	WASHERS. Nut.	REMARKS.
Bolts.			In.			
For pintle plate.....	2	No. 4, C.	8.15	–	–	
" sweep bar, axle strap.....	2	Do.	8.4	–	–	
" sweep bar, hounds.....	2	Do.	4.43	–	2	
" sweep bar, understraps....	2	Do.	6.38	–	–	
" hounds and understraps.	2	No. 4, D.	5.8	2	–	
" fork and axle strap.....	2	Do.	7.85	2	–	
" splinter bar and hounds..	2	Do.	7.72	2	2	
" splinter bar and fork....	2	Do.	8.8	–	–	
" pole and fork.....	2	Do.	11.15	2	2	
" fork.....	1	Do.	10.35	1	1	
" pole and eye plate.....	1	No. 2, D.	3.75	1	1	
" pole clasp and eye plate.	1	Do.	4.	–	1	
" pole clasp.....	1	No. 2.	1.5	–	–	Hexag'l head, No nut.
Rivets.						
For pole.....	1	No. 3, B.	4.75	–	1	
" splinter bar bands.....	4	No. 2.	3.5	–	–	Wire riveted at both ends.
" leading bar bands.....	6	Do.	3.5	–	–	
Nails.						
For pole bridle.....	4	No. 2, C.	3.	–	–	
" pintle plate.....	7	No. 3, C.	3.	–	–	

MORTAR WAGON.

This wagon is designed for the transportation of siege mortars and their beds, or of siege guns, or large shot and shells. It has the same limber as the siege gun carriage.

Wood work.—Plate IX.

WHITE OAK is used for all the wood work.

Two middle rails. They are framed together, and form the stock of the wagon. The upper corners are rounded with a radius of .6 inch, on the inside, from the breech bolster to the pintle hole, except at the front cross bar; on the outside, they are rounded in their whole length, including the front end. The lower corners are rounded in like manner, except at the axle body.

One front transom. It is placed between the middle rails, in front of the pintle plate, and is fastened by two dowels. The grain of the wood runs in the same direction as that of the rails.

Two dowels. They are round; they pass through the front transom into the rails.

One middle transom. It is placed between the front cross bar plate and the assembling bar; its ends have wedge-shaped tenons which are let into the middle rails, on the inside.

One rear transom. It is placed between the middle rails, and rests on the axle body; its tenons are let into the inner sides of the rails. The top of the transom is sloped towards the rear, and hollowed out, with a radius of 10 inches, to form a bolster for supporting the breech of the gun. The corners of this sloping surface are rounded with a radius of .6 inch.

Two side rails. The upper corners are rounded with a radius of .6 inch, except the inner corners, opposite to the windlass, where the rounding is .4 inch. The lower corners are rounded .6 inch, except at the axle body. The ends are chamfered .75 inch.

One rear cross bar. It is let into the rear of the middle rails, and its ends are let into the side rails. The lower corners are chamfered .5 inch, between the rails.

Six middle cross bars. They are placed between the middle rails and the side rails, and are let into both. The lower corners are chamfered .5 inch.

Two front cross bars. They rest on the assembling bar, and are let into the middle and side rails their full size.

Two bottom planks. The upper corners are rounded with a radius of .6 inch. They are fastened to the front and rear cross bars, each by one bolt, and to the other cross bars by two nails in each.

One axle body. The upper corners are rounded with a radius of .6 inch. The lower corners are rounded with a radius of 1.25 inch, except under the middle rails, where the rounding is .4 inch. The corners of the ends are chamfered .2 inch. There are two circular cuts in the upper side of the axle body, for the roller handspikes to lie in.

The drawings of the axle body show the manner in which the middle and side rails are notched into it.

One windlass. The corners of the middle part are rounded with a radius of 1 inch. The other parts are turned in the lathe.

Two handspikes, for working the windlass.

One muzzle bolster. It is intended to support the neck or the muzzle of the gun, when the wagon is loaded with one. The upper part is hollowed out for this purpose. The upper corners, and those of the ends, are rounded with a radius of .6 inch. The bolster is fastened to the middle rails and to the front transom by *five iron dowels.*

Six stakes. They support a strong frame which is placed on the wagon, for carrying balls. This frame is made of 4 planks, 12 inches wide and 1.25 thick, dovetailed together and strengthened by iron corner plates.

Irons.—Plate X.

One assembling bar. It passes through the middle rails, under the front transom and cross bars, and is traversed by the bolts of the cross bar plate.

Two handspike hooks. The corners of the plate are chamfered .15 inch. They are fastened to the outside of the middle rails, against the front cross bars, each by *two nails.*

One assembling bolt. It passes through the rails, the rear transom, and the two middle cross bars which are over the axle body. *Two washers* and *one nut* for this bolt.

One eye plate, for the lashing chain. It is placed between the middle rails, in rear of the pintle hole, and is fastened by a bolt.

Two bolts, for the front ends of the middle rails. One of them passes through the front transom, the other through the eye plate. *Four washers* and *two nuts* for these bolts.

Two manœuvring staples. They are driven into the under side of the middle rails, in rear of the eye plate bolt.

Two cross bar plates. They are placed over the front and rear cross bars, and are bolted to them and to the rails.

Twelve bolts, for cross bar plates. *Nine washers* and *twelve nuts* for the same.

One lock chain bridle. The loop is rounded; the edges of the plates are chamfered .15 inch. It is fastened under the left side rail by two bolts, one of which is the bolt which fastens the cross bar plate to the rail.

One bolt, for the lock chain bridle. *One nut* for the same.

One lock chain and shoe, } Like those on the gun carriage:
One key, for the shoe. } Plate IV.

One trail plate. It is fastened under the front ends of the middle rails by *eleven nails.*

One lunette. The square plate, which reinforces the upper side of the lunette, is fastened to the lower plate by *four rivets*, which are countersunk in both plates.

The corners of the under side of the lunette are chamfered .15 inch.

The reinforce plate is let into the under side of the middle rails, and the lunette plate is also let in, to the depth of .25 inch.

One bridle, for the pintle to bear against. The upper corners are chamfered .15 inch. It is placed on the upper side of the middle rails, over the lunette plate. The part which is turned downwards, perpendicular to the plate, is let into the rear end of the front transom.

Three bolts, for the lunette and bridle. *Three nuts* for the same.

Two wheel guard plates, like those for the gun carriage, Plate IV, except that they are bent to fit the rounding of the rails. They are fastened to the middle rails, against the front cross bars, each by *six nails.*

One axle tree, like that of the gun carriage.

Two understraps. The outer corners are chamfered .15 inch. The straps are put on warm; they are fastened to the side rails, each by two bolts.

Four bolts, for the understraps. Their heads are let into the upper side of the rails. *Four nuts* for these bolts.

Four bolts, for the middle rails and axle body. Their heads are let into the upper side of the rails. *Four nuts* for these bolts.

Two axle straps. The outer corners are chamfered .15 inch. They serve as washers to the four bolts just mentioned.

One breech hurter. It is let into the middle rails, on the upper and inner sides, in rear of the lodgment for the breech of the gun, and it is fastened by *four nails.*

Six stake sockets. The outer corners are chamfered .15 inch; the inner corners are slightly rounded. They are bolted on the outside of the side rails; the middle socket opposite to the middle

cross bar; the ends of the others opposite to the inside of the front and rear cross bars.

They receive the stakes which support the sides of the frame for carrying shot. The sockets and the stakes have holes through them for pins, to prevent the stakes from being lost.

Ten bolts, for stake sockets. *Ten washers* and *ten nuts* for the same.

Two lock chain hooks. They take the places of two bolts in fastening the front and middle stake sockets on the left side. *Two washers* and *two nuts* for the same.

One tarbucket hook, like that for the limber of field carriages. It is fastened on the outside of the left side rail, near the rear end, by *two nails.*

Four roller plates, for handspike sockets on the windlass. The outer edges are chamfered .15 inch. The edges of the holes are rounded. The plates are fastened on the square part of the windlass, each by *eight nails.*

Two roller bands. They are let into the ends of the roller, and fastened each by *three nails.*

Two journal boxes, (BRASS.) They are let into the ends of the windlass their whole depth. For this purpose an annular mortise is made in the wood, and, after the box is driven in, the wood on the inside of it is removed to the depth of 1.75 inch, which is occupied by the journal.

Two journals, for the windlass. They are cylindrical, with necks which are riveted into the oval plates on the outside of the rails. By unscrewing the nuts which confine these plates, the journals may be taken out and the windlass removed, when necessary.

Two oval journal plates. The outer edges are chamfered .15 inch.

Two circular journal plates. They are fastened on the inside of the rails, each by *two nails* and by the two bolts which fasten the oval plates.

Four bolts, for journal plates. *Four nuts* for the same.

Two roller hooks. They are driven into the windlass at 5.5 inches from the centre, projecting 1.6 inch in the clear. They are designed to fasten the ends of the rope which is wound on the windlass.

Two handspike straps. The middle part is round. The plates are fastened on the small end of the handspike by *two rivets*. The strap forms a loop to hang the end of the handspike on the hook.

Two shoulder washers, for the axle tree,
Two wheels,
Two linch washers,
Two linch pins.
} Like those for the gun carriage.

Bolts, rivets and nails for mortar wagon.

DESIGNATION.	Number.	Kind.	Length.	WASHERS. Head.	WASHERS. Nut.
BOLTS.			In.		
For the rails and rear transom	1	No. 4, A.	41.2	1	1
" middle rails, front transom and eye plate	2	Do.	13.75	2	2
" front cross-bar plate, lock chain bridle	1	No. 4, C.	7.4	–	–
" front cross-bar plate, right side rail	1	Do.	7.	–	1
" front cross-bar plate, middle rails	2	Do.	8.55	–	2
" front cross-bar plate, bottom planks	2	Do.	5.13	–	–
„ rear cross-bar plate, side rails	2	Do.	8.13	–	2
„ rear cross-bar plate, middle rails	2	Do.	7.55	–	2
„ rear cross-bar plate, bottom planks	2	Do.	5.3	–	2
" lunette and bridle	2	Do.	7.95	–	–
" lunette and bridle	1	Do.	7.75	–	–
" lock chain bridle	1	No. 4, B.	7.	–	–
" under straps	4	Do.	7.95	–	–
" axle straps	4	Do.	14.65	–	–
" stake sockets	10	No. 3, D.	5.13	–	10
" stake sockets and lock chain hooks	2	No. 3.*	5.13	–	2
" roller journal plates	4	No. 3, C.	5.2	–	–
RIVETS.					
For lunette plate	4	No. 3, C.	2.		
" two handspike straps	4	No. 2.	2.5		
NAILS.					
For trail plate	11	No. 3, C.	3.5		
" handspike hooks	4	No. 2, C.	2.5		
" wheel guard plates	12	Do.	3.		
" breech hurter	4	Do.	3.		
" bottom planks	12	Do.	3.25		
" tar bucket hook	2	No. 1, C.	2.5		
" roller journal plates	4	Do.	2.5		
" roller bands	6	Do.	2.		
" handspike sockets	32	Do.	2.		

* Plate X.

Bills of timber for siege carriages.

NAMES OF PARTS.	No. of pieces.	DIMENSIONS OF EACH PIECE.						CONTENTS OF ROUGH TIMBER.		REMARKS.
		FINISHED.			ROUGH.					
		Long.	Wide.	Thi k.	Long.	Wide.	Thick.	Each piece.	Total.	
GUN CARRIAGES.		In.	In.	In.	In.	In.	In.	Sup. feet.	Sup. feet.	
12-PDR Stock	2	121.	10.5	6.08	130.	11.5	7.	72.67	145.34	
12-PDR Cheeks	2	49.85	17.8	4.2	55.	19.5	5.5	40.96	81.92	
12-PDR Axle body	1	42.5	8.5	7.5	48.	9.5	8.5	26.92	26.92	
12-PDR Bolster	1	10.55	6.	5.25	14.	6.5	6.5	41.07	41.07	7 in one piece, 8 ft. long.
									295.25	
18-PDR Stock	2	123.	10.5	7.08	132.	11.5	8.	84.33	168.66	
18-PDR Cheeks	2	53.1	18.35	4.5	60.	20.	5.75	47.92	95.84	
18-PDR Axle body	1	42.5	8.5	7.5	48.	9.5	8.5	26.92	26.92	
18-PDR Bolster	1	11.8	6.	6.	14.	6.5	6.5	4.11	4.11	7 in one.
									295.53	
24-PDR Stock	2	123.	10.5	7.68	132.	11.5	8.75	92.24	184.48	
24-PDR Cheeks	2	53.65	18.95	5.	60.	20.5	6.25	53.39	106.78	
24-PDR Axle body	1	42.5	8.5	7.5	48.	9.5	8.5	26.92	26.92	
24-PDR Bolster	1	13.	6.	6.	16.	6.5	6.5	4.70	4.70	7 in one.
									322.88	
ONE WHEEL.										
Naves	1	16.5	14.5	Round	19.	16.	Round	26.53	26.53	
Spokes	14	26.25	3.6	2.	32.	4.25	2.5	2.36	33.04	
Fellies	7	25.4	4.25	4.	28.	8.	4.5	7.	49.00	Plank, 8 or 12 in. wide.
									108.57	

Bills of timber for siege carriages.

NAMES OF PARTS.	No. of pieces.	DIMENSIONS OF EACH PIECE. FINISHED. Long.	Wide.	Thick.	ROUGH. Long.	Wide.	Thick.	CONTENTS OF ROUGH TIMBER. Each piece.	Total.	REMARKS.
LIMBER.		In.	In.	In.	In.	In.	In.	Sup. feet.	Sup. feet.	
Fork	1	54.7	10.	6.25	60.	11.	7.25	33.23	33.23	
Hounds	2	46.45	4.25	3.	50.	5.	3.75	6.51	13.02	
Splinter bar	1	66.	3.5	3.25	70.	4.	3.75	7.29	7.29	
Pole... Large end.	1	137.	4.5	4.5	142.	5.5	5.5	22.25	22.25	
Pole... Small end.			3.	3.		4.	4.			
Leading bar	1	62.	3.5	3.	70.	4.	3.75	7.29	7.29	
									83.08	
MORTAR WAGON.										
Middle rails	2	132.25	7.1	4.75	142.	8.	5.75	45.36	90.72	
Front transom	1	23.4	6.4	3.15	28.	7.	3.75	5.10	5.10	4 in one piece.
Middle transom	1	3.95	4.	3.12	–	–	–	–	–	Obtained from cuttings of other timber.
Rear transom	1	3.95	6.7	5.9	–	–	–	–	–	
Side rails	2	85.42	6.7	4.	92.	7.5	5.	23.96	47.92	
Rear cross bar	1	36.05	4.	2.5	42.	4.5	3.	3.94	3.94	6 in 1 plank; 9 in. wide
Middle cross bars	6	13.7	4.	2.5	16.	4.5	3.	1.5	9.0	12 in 1 plank; 9 in. wide
Front cross bars	2	10.9	4.	1.75	14.	4.5	2.5	1.09	2.18	12 in 1 plank; 9 in. wide
Bottom planks	2	71.6	7.	1.38	78.	8.	2.	8.67	17.34	
Axle body	1	42.4	7.5	6.7	48.	9.5	8.5	26.92	26.92	
Windlass	1	31.4	6.	6.	36.	6.5	6.5	10.56	10.56	2 in one piece.
Muzzle bolster	1	10.2	6.	5.	12.	6.5	6.5	3.52	3.52	8 in one.
Stakes	6	18.	3.	2.63	20.	3.5	3.25	1.58	9.48	12 in 1 pl'k; 7 in. wide.
Handspikes	2	51.25	3.25	Round	56.	4.	4.	6.22	12.44	Hickory.
									239.12	

Bills of iron for siege gun carriages.

NAMES OF PARTS.	Width	Thickness.	LENGTH.		
			12-pr.	18-pr.	24-pr.
	In.	In.	In.	In.	In.
1 stock assembling bolt. Head	2.5	Round	3.5	3.5	3.5
1 stock assembling bolt. Body	1.25	Round	8.2	9.85	10.75
1 manœuvring bolt	1.25	1.25	20.	20.5	20.8
2 collars for manœuvring bolt	4.	0.5	14.75	14.75	14.75
2 washers for manœuvring bolt	3.5	0.375	7.	7.	7.
2 washers for manœuvring bolt	3.5	.25	7.	7.	7.
6 rondelles.....cast iron.					
2 assembling bolts. Heads	2.5	Round	7.	7.	7.
2 assembling bolts. Bodies	1.25	Round	42.2	47.4	51.8
1 lock chain bolt. Head	3.	Round	4.	4.	4.
1 lock chain bolt. Body	1.5	Round	21.1	23.7	25.9
1 ring, For lock chain	0.75	Round	10.5	10.5	10.5
2 rings, For lock chain	.625	Round	15.5	15.5	15.5
1 ring, For lock chain	.5	Round	7.5	7.5	7.5
15 links No. 5., For lock chain	.375	Round	97.5	97.5	97.5
18 links No. 7., For lock chain	.625	Round	127.1	127.1	127.1
1 toggle, For lock chain	2.	0.75	7.	7.	7.
1 shoe.....draft.					
1 steel for shoe	5.75	0.375	9.5	9.5	9.5
1 key for shoe	1.	.5	4.5	4.5	4.5
2 trunnion plates.....drafts.					
4 end pieces for trunnion plates	4.	0.625	38.		
4 end pieces for trunnion plates	4.25	.625	–	41.5	
4 end pieces for trunnion plates	4.75	.625	–	–	40.5
2 chin bolts. Heads	2.5	1.25	18.	18.	18.
2 key bolts.. Bodies	1.25	Round	76.8	77.2	81.0
2 bevel washers for chin bolts	3.75	2.	4.5	4.5	4.5
4 cheek bolts.. Heads	2.5	Round	14.	14.	14.
4 cheek bolts.. Bodies	1.25	Round	63.1	65.	67.8
2 travelling trunnion bolts. Heads	2.5	1.25	11.		
2 travelling trunnion bolts. Heads	2.75	1.5	–	11.	11.
2 travelling trunnion bolts. Bodies	1.25	Round	26.6		
2 travelling trunnion bolts. Bodies	1.5	Round	–	27.	28.
2 trunnion plate bolts	0.625	Round	14.	14.	14.
2 cap squares.....drafts.					
2 cap square chains, No. 3	0.25	Round	42.	42.	42.
2 rings, No. 2, A	.25	Round	8.	8.	8.
4 eye pins, No. 3	1.	Round	4.	4.	4.
2 cap square keys	1.75	0.5	7.	7.	7.
2 key chains, No. 2	0.2	Round	27.5	27.5	27.5
2 rings, No. 2, B	.25	Round	7.	7.	7.

Bills of iron for siege gun carriages—Continued.

NAMES OF PARTS.	Width	Thickness.	LENGTH.		
			12-pr.	18-pr.	24-pr.
	In.	In.	In.	In.	In.
2 eye pins No. 2	1.	Round	3.5	3.5	3.5
1 axletree draft.					
2 understraps	4.	0.75	36.75		
	4.25	.75	–	37.5	
	4.75	.75	–	–	37.5
1 axle strap	3.	.625	11.	11.	11.
2 bolts for axle body. Heads	2.	Round	6.	6.	6.
2 bolts for axle body. Bodies	1.	Round	26.5	26.5	26.5
2 axle bands	1.5	0.375	60.	60.	60.
6 nails for axle bands	0.25	.25	16.	16.	16.
1 lock chain hook	1.25	Round	6.	6.	6.
1 hook for shoe	1.	Round	2.	2.	2.
1 cheek plate	1.5	0.125	6.	6.	6.
1 box for elevating screw brass.					
2 bolts for box	0.75	Round	27.5	27.5	27.5
1 elevating screw	2.375	Round	19.	19.	19.
1 head for elevating screw	3.5	2.	3.5	3.5	3.5
4 handles for elevating screw	1.125	Round	26.	26.	26.
1 strap staple	0.25	Round	5.	5.	5.
2 wheel guard plates	6.5	0.25	13.	13.	13.
12 nails for wheel guard plates	0.3	0.3	38.	38.	38.
1 lunette draft.					
1 rondelle for lunette	5.	0.625	5.	5.	5.
3 rivets for rondelle	0.375	Round	4.	4.	4.
2 bolts for lunette	.75	Round	27.3	27.3	27.3
1 trail plate	9.	0.5	39.	39.	39.
1 reinforce for trail plate	5.75	.5	9.	9.	9.
6 rivets for trail plate	0.375	Round	6.9	6.9	6.9
29 nails for trail plate	.375	0.375	105.	105.	105.
2 bolster bolts. Heads	1.5	Round	5.	5.	5.
2 bolster bolts. Bodies	0.75	Round	23.6	24.2	24.9
2 axle shoulder washers	1.5	0.625	29.	29.	29.
2 linch washers and hooks	3.5	.625	11.5	11.5	11.5
2 linch pins	1.5	.75	10.	10.	10.
8 washers No. 4	2.5	.188	20.	20.	20.
13 washers No. 7	4.	.25	52.	52.	52.
1 washer No. 9	4.75	.25	4.75	4.75	4.75
2 nuts No. 3	1.25	.625	2.5	2.5	2.5
7 nuts No. 4	1.5	.75	10.5	10.5	10.5
4 nuts No 5	2.	1.	8.	8.	8.
14 nuts No. 7	2.5	1.25	35.	35.	35.

Bill of iron for one siege carriage wheel.

NAMES OF PARTS.	Width.	Thickness.	Length.
	In.	In.	In.
2 brow bands	1.5	0.375	92.
2 end bands	1.75	.375	73.
12 nails for bands	0.25	.25	25.5
1 tire	4.	.75	186.
7 tire bolts	0.75	Round	52.
7 washers	2.5	0.188	17.5
7 nuts	1.5	.75	10.5
1 nave box.....brass.			

Bill of iron for one siege carriage limber.

NAMES OF PARTS.	Width.	Thickness.	Length.
	In.	In.	In.
1 axletree.....draft.			
1 pintle plate.....draft.			
7 nails for pintle plate	0.375	0.375	22.
1 sweep bar	4.	.75	48.
2 bolts for sweep bar and hounds	0.75	Round	11.86
1 axle strap	2.75	0.625	64.
1 lashing chain	0.5	Round	25.
1 hook for lashing chain	1.5	0.5	6.
4 axle strap bolts, No. 4, C	0.75	Round	39.1
2 axle strap bolts, No. 4, D	1.25	Round	8.
2 understraps	3.	0.625	36.
2 understrap bolts, No. 4, C	0.75	Round	15.75
2 understrap bolts, No. 4, D	1.25	Round	6.5
1 pintle	2.5	2.5	11.5
1 nut for pintle	2.5	1.25	2.5
2 end bands for splinter bar	2.5	0.625	22.
2 middle bands for splinter bar	2.5	.625	17.
4 trace hooks for splinter bar	0.75	Round	46.
1 bridle for end of fork	2.	0.5	16.
5 heads of bolts, No. 4, D	1.25	Round	10.
1 fork bolt—body	0.75	Round	6.35
2 bolts for splinter bar and fork—bodies	.75	Round	9.6
2 bolts for pole and fork—bodies	.75	Round	14.3
2 bolts for splinter bar and hounds	1.25	Round	8.
1 pole bridle	1.75	0.5	16.
4 nails for pole bridle	0.3	.3	12.5
1 pole rivet	.5	Round	3.

Bill of iron for one siege carriage limber.—Continued.

NAMES OF PARTS.	Width.	Thickness.	Length.
	In.	In.	In.
1 burr for pole rivet	1.125	0.25	1.125
1 eye plate for pole	5.5	1.	10.
2 pole chains	0.5	Round	150.
1 ferrule for pole	2.	0.2	10.
1 pole clasp	2.5	.5	10.
1 clasp bolt	1.	Round	1.5
2 bolts for eye plate and pole	1.	Round	4.5
1 middle band for leading bar	2.5	0.625	12.
1 hook for middle band	1.	Round	12.
1 double trace hook	0.75	Round	21.
2 end bands for leading bar	2.5	0.625	22.
2 trace hooks for leading bar	.75	Round	23.
10 rivets for bands	.25	Round	35.
2 axle shoulder washers	1.5	0.625	29.
2 linch washers and hooks	3.5	.625	11.5
2 linch pins	1.5	.75	10.
3 washers, No. 2	1.625	.125	5.
16 washers, No. 4	2.5	.188	40.
2 nuts, No. 2	1.	.5	2.
19 nuts, No. 4	1.5	.75	28.5

Bill of iron for one mortar wagon.

NAMES OF PARTS.	Width.	Thickness.	Length.
	In.	In.	In.
1 assembling bar	3.75	0.75	38.55
2 handspike hooks	1.5	.5	7.
1 assembling bolt.. Head	1.5	Round	2.5
1 assembling bolt.. Body	0.75	Round	37.2
1 eye plate	3.	1.5	3.5
2 bolts for middle rails.... Heads	1.5	Round	5.
2 bolts for middle rails.... Bodies	0.75	Round	19.5
2 manœuvring staples	.625	Round	26.
2 cross bar plates	3.375	0.5	88.
12 bolts for cross bar plates	0.75	Round	67.06
1 lock chain bridle	2.5	0.625	6.
1 bolt for lock chain bridle	1.5	Round	3.5
1 ring	0.75	Round	10.5
2 rings	0.625	Round	15.2
1 ring	.5	Round	7.5
22 links No. 7. For lock chain	.625	Round	143.
15 links No. 5.	.375	Round	97.5
1 toggle	2.	0.75	7.

Bill of iron for one mortar wagon—Continued.

NAMES OF PARTS.	Width.	Thickness.	Length.
	In.	In.	In.
1 shoe.....draft.			
1 steel for shoe.....	5.75	0.375	9.5
1 key for shoe.....	1.	.5	4.5
1 trail plate.....	8.	.5	9.6
1 lunette.....	6.	.75	9.
1 reinforce plate for lunette.....	4.	.75	5.
4 rivets for lunette.....	0.375	Round	8.
1 bridle for pintle.....	5.	0.3	11.
3 bridle and lunette bolts.....	0.75	Round	28.15
2 wheel guard plates.....	6.5	0.25	13.
1 axletree.....draft.			
2 understraps.....	2.75	0.5	62.
4 understrap bolts.....	1.5	Round	12.
2 axlestraps.....	2.5	0.5	20.
4 axle strap bolts.. { Heads.....	1.5	Round	10.
4 axle strap bolts.. { Bodies.....	0.75	Round	42.
1 breech hurter.....	2.	2.	6.
6 stake sockets.....	2.5	0.375	72.
10 bolts for stake sockets.....	1.	Round	35.
2 lock chain hooks.....	1.25	Round	10.
1 tar bucket hook.....	1.	0.25	5.
4 roller plates.....	5.5	0.3	43.
2 roller bands.....	1.25	0.2	34.5
2 journal boxes.....brass.			
2 journals.....	1.625	Round	13.
2 oval journal plates.....	6.5	0.3	7.25
2 circular journal plates.....	6.	.3	12.
4 bolts for journal plates.....	0.625	Round	25.3
2 roller hooks.....	.75	Round	10.
2 axle shoulder washers.....	1.5	0.625	29.
2 linch washers and hooks.....	3.5	.625	11.
2 linch pins.....	1.5	.75	10.
2 handspike straps.....	1.5	.375	13.
2 rivets for handspike straps.....	0.25	Round	5.
12 washers, No. 3.....	2.	0.125	24.
15 washers, No. 4.....	2.5	0.188	37.5
16 nuts, No. 3.....	1.25	.625	20.
27 nuts, No. 4.....	1.5	.75	40.5
44 nails, No. 1.....	0.25	.25	96.34
32 nails, No. 2.....	.3	.3	100.86
11 nails, No. 3.....	.375	.375	39.82

Summary bills of iron for siege gun carriages.

Width	Thickness.	12-POUNDER.		18-POUNDER.		24-POUNDER.		REMARKS.
In.	In.	Feet.	Lbs.	Feet.	Lbs.	Feet.	Lbs.	
0.2	Round	2.29	.24	2.29	.24	2.29	.24	For chains No. 2.
0.25	Round	5.17	.84	5.17	.84	5.17	.84	3 feet 6 inches for
0.375	Round	9.03	3.32	9.03	3.32	9.03	3.32	chains No. 3.
0.5	Round	.62	.40	.62	.40	.62	.40	
0.625	Round	13.05	13.31	13.05	13.31	13.05	13.31	
0.75	Round	7.40	10.88	7.46	10.96	7.52	11.05	
1.0	Round	3.	7.83	3.	7.83	3.	7.83	
1.125	Round	2.17	7.18	2.17	7.18	2.17	7.18	
1.25	Round	18.57	75.95	17.12	70.01	18.11	74.07	
1.5	Round	2.18	12.84	4.64	27.33	4.91	28.92	
2.0	Round	.5	5.23	.5	5.23	.5	5.23	
2.375	Round	1.58	23.32	1.58	23.32	1.58	23.32	Hammered.
2.5	Round	2.04	33.37	2.04	33.37	2.04	33.37	
3.0	Round	.33	7.77	.33	7.77	.33	7.77	
0.25	0.25	1.33	.28	1.33	.28	1.33	.28	
0.3	0.3	3.17	.95	3.17	.95	3.17	.95	
0.375	0.375	8.75	4.11	8.75	4.11	8.75	4.11	
1.	0.5	.38	.64	.38	.64	.38	.64	
1.25	0.625	.21	.55	.21	.55	.21	.55	
1.25	1.25	1.67	8.77	1.71	8.97	1.73	9.08	
1.5	0.125	.5	.31	.5	.31	.5	.31	
1.5	0.375	5.0	9.45	5.0	9.45	5.0	9.45	
1.5	0.625	2.42	7.62	2.42	7.62	2.42	7.62	
1.5	0.75	1.71	6.46	1.71	6.46	1.71	6.46	
1.75	0.5	.58	1.70	.58	1.70	.58	1.70	
2.0	0.75	.58	2.92	.58	2.92	.58	2.92	
2.0	1.0	.67	4.50	.67	4.50	.67	4.50	
2.5	0.188	1.67	2.62	1.67	2.62	1.67	2.62	
2.5	1.25	5.33	55.95	4.42	46.41	4.42	46.41	Hammered.
2.75	1.5	–	–	.93	12.89	.93	12.89	Hammered.
3.0	0.625	.93	5.86	.93	5.86	.93	5.86	
3.5	0.25	.58	1.70	.58	1.70	.58	1.70	
3.5	0.375	.58	2.56	.58	2.56	.58	2.56	
3.5	0.625	.96	7.04	.96	7.04	.96	7.04	
3.5	2.	.29	6.82	.29	6.82	.29	6.82	
3.75	2.	.38	9.57	.38	9.57	.38	9.57	
4.0	0.25	4.33	14.54	4.33	14.54	4.33	14.54	
4.0	0.5	1.23	8.26	1.23	8.26	1.23	8.26	
4.0	0.625	3.17	26.63	–	–	–	–	In one piece.
4.0	0.75	3.06	30.84	–	–	–	–	In one piece.
Forward.....		–	423.13	–	377.84	–	383.69	

Summary bills of iron for siege gun carriages—Continued.

Width	Thickness.	12-POUNDER.		18-POUNDER.		24-POUNDER.		REMARKS.
In.	In.	Feet.	Lbs.	Feet.	Lbs.	Feet.	Lbs.	
Forw'd.	–	–	423.13	–	377.84	–	383.69	
4.25	0.625	–	–	3.46	30.86	–	–	In one piece.
4.25	0.75	–	–	3.13	33.52	–	–	Do.
4.75	0.25	.40	1.60	.40	1.60	.40	1.60	Do.
4.75	0.625	–	–	–	–	3.38	33.70	Do.
4.75	0.75	–	–	–	–	3.13	37.46	Do.
5.	0.625	.42	4.41	.42	4.41	.42	4.41	
5.75	0.5	.75	7.24	.75	7.24	.75	7.24	
6.5	0.25	1.08	5.89	1.08	5.89	1.08	5.89	
9.0	0.5	3.25	49.14	3.25	49.14	3.25	49.14	In one piece.
5.75	0.375	0.79	–	0.79	–	0.79	–	Steel for shoe.
Drafts.....		–	26.3	–	29.2	–	36.14	2 trunnion plates.
		–	16.	–	17.7	–	20.45	2 cap squares.
		–	222.	–	222.	–	222.	1 axletree.
		–	16.5	–	16.5	–	16.5	1 lunette.
		–	21.5	–	21.5	–	21.5	1 shoe.
			793.71	–	817.4	–	839.72	
Cast iron..		–	43.5	–	43.5	–	43.5	2 rondelles.
		–	52.5	–	52.5	–	52.5	4 rondelles.
		–	96.	–	96.	–	96.	
Cast brass...		–	15.37	–	15.37	–	15.37	Box for screw.

Summary bill of iron for one siege carriage wheel.

Width.	Thickness.	Length.	Weight.	REMARKS.
In.	In.	Feet.	Lbs.	
0.75	Round	4.33	6.36	
0.25	0.25	2.12	.44	
1.5	0.375	7.66	14.48	
1.5	0.75	.87	3.29	
1.75	0.375	6.08	13.37	
2.5	0.188	1.46	2.29	
4.	0.75	15.5	156.24	
			196.47	
Cast brass.....			24.	Nave box.

Summary bill of iron for one siege carriage limber.

Width.	Thickness.	Length.	Weight.	REMARKS.
In.	In.	Feet.	Lbs.	
0.25	Round	2.92	.47	
0.5	Round	14.83	9.70	
0.75	Round	15.58	22.90	
1.0	Round	1.5	3.91	
1.25	Round	2.71	11.08	
0.3	0.3	1.04	.31	
0.375	0.375	1.83	.86	
1.0	0.5	.17	.28	
1.125	0.25	.09	.08	
1.5	0.5	0.5	1.26	
1.5	0.625	2.42	7.62	
1.5	0.75	3.21	12.13	
1.75	0.5	1.33	3.91	
2.	0.2	.83	1.11	
2.	0.5	1.33	4.46	
2.5	0.188	3.33	5.23	
2.5	0.5	.83	3.48	Hammered.
2.5	0.625	6.08	31.92	Hammered.
2.5	1.25	.21	2.20	
2.5	2.5	.96	20.16	Hammered.
2.75	0.625	5.33	30.75	
3.0	0.625	3.	18.90	
3.5	0.625	.96	7.05	Hammered.
4.0	0.75	4.	40.32	
5.5	1.	.83	15.34	
			222.00	Draft for axletree.
			36.50	Draft for pintle plate.
			513.93	

Summary bill of iron for one mortar wagon.

Width.	Thickness.	Length.	Weight.	REMARKS.
In.	In.	Feet.	Lbs.	
0.25	Round	.42	0.06	
0.375	Round	8.79	3.23	
0.5	Round	.62	.40	
0.625	Round	17.46	17.81	
0.75	Round	17.87	26.27	
1.	Round	2.92	7.62	
1.25	Round	.83	3.39	
1.5	Round	2.75	16.20	
1.625	Round	1.08	7.46	
0.25	0.25	8.03	1.68	
0.3	0.3	8.40	2.53	
0.375	0.375	3.32	1.56	
1.	0.25	.42	.35	
1.	0.5	.37	.62	
1.25	0.2	2.89	2.43	
1.25	0.625	1.67	4.37	
1.5	0.375	1.08	2.04	
1.5	0.5	.58	1.46	
1.5	0.625	2.42	7.62	
1.5	0.75	4.21	15.91	
2.	0.125	2.	1.68	
2.	0.75	.58	2.92	
2.	2.	.50	6.72	
2.5	0.188	3.12	4.90	
2.5	0.375	6.	18.90	
2.5	0.5	1.67	7.01	
2.5	0.625	.50	2.62	Hammered.
2.75	0.5	5.17	23.88	
3.	1.5	.29	4.38	
3.375	0.5	7.33	41.56	
3.5	0.625	.92	6.56	
3.75	0.75	3.21	30.33	
4.	0.75	.42	4.23	
5.	0.3	.92	4.63	
5.5	0.3	3.58	19.83	
6.	0.3	1.	6.04	
6.	0.75	.75	11.34	
6.5	0.25	1.08	5.89	
6.5	0.3	.60	3.93	
8.	0.5	.80	10.75	
			222.00	Draft for axletree
			21.50	Draft for shoe.
			584.61	
5.75	0.375	0.79	5.72	Steel for shoe.
			3.5	Brass, for two journal boxes.

Remarks on the bills of iron.

The general remarks on the bills of iron, in PART 2, *page* 92, apply also to the bills of iron for siege carriages.

The *drafts* of pieces which are to be hammered to peculiar shapes are represented in PLATE XIII, together with some of the *formers* required for shaping the iron work.

As most of the formers for siege carriages, such as those for trunnion plates, cap squares and understraps, are made in the same manner as the formers for similar parts of field carriages, it is not considered necessary to represent them separately. Their shapes and dimensions are easily deduced from the drawings of the irons themselves, and of the formers for field carriages.

ARTILLERY.

PART FOURTH.

CORRECTION—*Part Third.*

Page 7—Line "*rivets* for trail plate," for "0.9," read "1.15."

FIELD AND SIEGE CARRIAGES.

1848.

PART FOURTH.

ARTILLERY HARNESS.

The construction of the field carriages requires a harness different, in some respects, from that of common wagons. The limber having no sweep bar, the pole is supported directly by the wheel horses, by means of a chain which connects the hames with the pole yoke of the limber; and, in order to diminish the weight at the end of the pole, the leading bars are dispensed with, the traces of the leaders being attached to those of the wheel horses.

The same harness is perfectly adapted also to the siege carriages; but, as these are arranged for draught in the ordinary manner, common wagon harness may be used with them, if necessary.

Black leather is used for the harness, when not otherwise specified; it should be of the best quality, and the strongest leather is selected for the parts which are exposed to the greatest strain, such as traces and breeching. The leather is sewed with strong waxed thread, in double stitch, with about eight stitches to the inch. The seam along an edge is .15 inch or .2 inch from the edge. The awls should be small for the thread. The ends of the thread should be well fastened before they are cut off.

Straps, or other pieces which have buckles or iron loops attached to them, are generally doubled on a length equal to twice their width, to receive the buckle or loop, which is fastened by two seams. The double end is shaved down.

Standing loops are placed close to the buckles. Their ends are shaved down, brought together, and fastened between the two parts of the strap, if it is doubled.

The tongue holes for buckles are made with a punch corresponding to the size of the tongue. Their distance apart is generally equal to the width of the strap, and the first hole is at double that distance from the end of the strap. This end is shaved down and reduced in width, to facilitate its entrance into the buckle.

The buckles, loops, rings and hooks are of wrought iron japanned, (black.) The buckles are all made with rollers.

NOTE.—A *layer* is a piece of leather sewed upon another piece, to strengthen it.

A *chape* is a piece used to fasten a buckle or a loop to a strap, or other piece of leather.

A *billet* is a strap which enters a buckle.

A *safe* is a piece of leather placed under a buckle, &c., to prevent it from chafing.

Head gear.—Plate I.

The head gear is made of strong, black bridle leather, not less than .1 inch thick.

HALTER. *One crown piece*, having a billet at each end, for the buckles of the cheek straps.

Two cheek straps. Each of them is sewed to a square *iron loop*, and has at the upper end a *buckle*, with *one standing* and *one sliding loop.*

One brow band, having a loop at each end, through which the crown piece passes.

One nose band, sewed to the same loop as the cheek straps.

Two chin straps. They are double, and are sewed to the loops of the cheek straps, and also to another *square iron loop* in rear.

One throat strap. It is made double and sewed to the last mentioned iron loop; its upper end is formed into a loop to receive the throat lash.

One throat lash, with *one buckle, one standing* and *one sliding loop* on the left side. It passes through the loops in the brow band and the throat strap.

One chain, (common halter chain.) It consists of about 65 links, No. 1, connected by *two rings* and a *swivel*. It is fastened by a ring to the loop which connects the chin straps of the halter. The other end of the chain has a *toggle* and a *loose ring*, to hitch with. Whole length of chain, 4½ feet.

BRIDLE. *One crown piece.* It is split at each end, so as to form, at one end, *two billets* for the buckles of the cheek straps, and at the other, one billet and one buckle strap, with a *buckle* and a *standing loop*, for the *throat lash.*

One brow band, formed into a loop at each end for the crown piece to pass through.

Two cheek straps. Each of them is sewed at the lower end into an *iron loop*, and has at the upper end a *buckle*, with *one standing* and *one sliding loop*, to fasten it to the crown piece. *Two billets* for attaching the bit to the loops of the cheek straps. Each billet has a *buckle* with *one standing* and *one sliding loop.*

Two reins. Each rein is sewed to a *billet*, which has a *buckle*, a *standing* and a *sliding loop*, for attaching it to the bit. The short rein is on the near side, and has a *buckle*, a *standing* and a *sliding loop*, for the billet of the long rein.

THE BIT. It is made of iron, tinned. The *bars* are riveted into the *cheek pieces.* There may be different degrees of severity in the curve of the *port mouth;* that represented in the plate being the most severe. The width of the bit, between the cheeks, also varies for three sizes, viz: 4⅞ inch, 5 inch, and 5¼ inch; about three-fifths being of the medium size.

The *curb chain* consists of 19 links, diminishing in size from the middle towards each end. It is attached by an *S* to the right cheek piece, and by a *hook* to the left.

Driver's Saddle.—Plate I.

THE TREE. The frame is made of beech, and consists of the *pommel*, the *cantle* and *two side bars*, which are notched into the pommel and cantle. The frame is covered with *canvas*, which is glued on and painted.

The iron parts are: *Two pommel plates.* The upper one is fastened by *six rivets* passing through both plates; the lower one by two additional *rivets* in each end, one of which holds one end of the stirrup bar. *One cantle plate,* fastened on the under side of the cantle and the side bars by *ten rivets.*

Two stirrup bars. The front end fastened to the pommel by one of the rivets of the lower pommel plate; the rear end fastened to the side bar by *one rivet.* The *stay* is formed of a piece of iron bent round the stirrup bar, and fastened to the side bar by *one rivet.* There is a roller on each side of the stay, for the stirrup and girth billets to pass over.

Two loops, with rollers; one fastened to the pommel, the other to the cantle, by two of the rivets which hold the plates. The saddle tree is covered with hemp webbing and strong tow linen, stretched on and nailed to the tree.

LEATHER PARTS. The *seat* is covered with black upper leather, and stuffed with deer's hair. *Two skirts* are sewed, with welts, to the cover of the seat. *Two iron loops,* for holster straps, are fastened to the front of the saddle by leather loops which pass through slits in the skirts, and are nailed to the tree.

Two inner skirts, or flaps, nailed to the side bars, protect the pad from being chafed by the stirrup and girth leathers. The *pad* is made of russet sheep skin, lined with strong linen, and faced with black sheep skin; it is stuffed with deer's hair, and quilted.

Two iron loops, for cloak straps, are fastened by leather loops which are nailed to the under side of the cantle.

One billet, for the collar strap, is sewed to the upper loop on the pommel.

Two girth billets, and *two billets* for the trace loops, are sewed on the stirrup bars, behind the middle stay.

Two stirrup leathers pass over the stirrup bars in front of the stay; the *buckle*, with *one standing* and *one sliding loop*, is sewed to the thin end of the strap, which is doubled and stitched, on a length of 8 inches, where it passes through the eye of the stirrup.

The *girth* is of thick black leather. It has a *buckle* and a *standing loop* fastened to each end by a layer.

The pommel and the cantle are plated with *sheet brass*, No. 20, fastened with brass tacks.

Valise Saddle.—Plate I.

THE TREE. The frame is made like that of the driver's saddle, except in its dimensions.

The *lower pommel plate* is fastened by *ten rivets*, six of which also hold the *upper plate*. These plates have holes in them for the shank of the bridle hook. The hole in the upper plate is square; that in the lower, round.

The *cantle plate* is fastened under the cantle with *eight rivets*.

The *hook* for the reins is fastened to the top of the pommel by a *nut*. The end of the shank should be riveted over the nut.

Two loops, for the collar strap and the crupper, are fastened to the pommel and cantle, as in the driver's saddle. *Four oval rings*, for the valise straps, are fastened by staples which are driven into the tree; two of them in the side bars and two in the cantle.

The *seat* and the *pad* are formed as in the driver's saddle, but the seat is not stuffed. The *skirts* are joined in a similar manner to the cover of the seat.

The *girth* is of leather, and is sewed to the off skirt of the saddle; it has a *buckle* and *two loops*, fastened to it by a layer. A *billet* for the girth is sewed to the near skirt.

Two billets, for the trace loops, pass through the skirts, and are nailed to the side bars.

Two valise straps, each with a *buckle*, a *standing* and a *sliding loop*.

A *billet* for the collar strap is sewed to the iron loop on the pommel.

The *crupper strap* is double. It is sewed to the iron loop on the cantle, and has another *loop*, with a roller, attached to the rear end, for the back strap of the crupper to pass through, so that the same crupper may fit both saddles.

Valise.—Plate I.

The valise is made of black bridle leather, and lined with cotton ticken. The lining is pasted to the inside of the valise; it is sewed round the borders of the outer cover, forming a pocket which has an opening in the middle. The *inner flap* is held down by a *strap* passing through *six staples* of iron wire, No. 12, and fastened by a *buckle* and *loop*; a strip of leather is stitched over the inner ends of the staples.

The ends of the valise are double.

The *cover* is fastened down by *three billets* and *three buckle straps* and *loops*. The *handles* are of leather, rounded and sewed into the ends. *Two loops*, 1 inch wide, for the valise straps to pass through, are sewed to the bottom of the valise.

Whip.—Plate I.

The *stock* is of hickory or of raw hide, about 30 inches long. It is covered with braided leather. A *loop* for the hand is fastened to the butt of the whip.

The leather should be well fastened together at the small end. A *lash* of thread is tied on, and not plaited in with the leather.

Leg Guard.—Plate II.

The *body* is made of stout kip leather; *two layers* are stitched to the upper and lower parts. The *under strap*, to pass under the foot, is sewed to the bottom. *Four leg straps*, each with a *buckle* and a *loop*, are fastened to the body of the leg guard, under the plate. The billet ends of these straps pass through slits in the body.

The *plate* is of iron .1 inch thick, and is fastened to the body with *five rivets*.

Draught Harness.—Plates II and III.

THE COLLAR. The *rim* is made of bridle leather, and stuffed with uncut rye straw. The *belly*, made of upper leather, in two pieces, is stuffed with straw cut into pieces not longer than ¼ inch. The collar is made open at the top, and the size is regulated by *two buckle straps* and *two billets* sewed to the open ends. A *pad*, made of black sheep skin, stuffed with deer's hair, protects the neck of the horse from being chafed by these straps.

THE HAMES are made of iron, and painted black. The *branches* have studs forged on them to receive the bolts of the *joint loops* for the trace tugs; these loops turn freely on the bolts. *Two links*, for supporting the breast strap, are welded into the eyes of the bolts.

Two rings, for the trussing straps, are welded into the rectangular eyes at the upper ends of the branches. The branches are joined together, at the lower ends, by a *clasp* which is made fast to the off branch. The *chain* and *toggle*, for connecting the pole yoke with the hames, are fastened to the hames clasp. See PART 2, Plate XII.

Two leather safes are sewed round the branches, under the joint loops, to protect the collar from being chafed by the trace tugs.

Two trace tugs, made of four layers of leather, .63 inch thick, are stitched into the joint loops and into *two loop rings* through which the traces pass.

Two trussing straps, each with *one buckle*, *one standing* and *one sliding loop*, pass through the rings in the upper ends of the hames. They are used for trussing up the harness.

One hames strap, with a *buckle* and *two loops*, connects the two branches together at the top.

One collar strap, having *one buckle* and *one loop*, passes round the hames strap, and is buckled to the billet on the pommel of the saddle, to keep the collar in place.

THE TRACES, for the wheel and the leading harness, are alike, except in the length of the leather part.

The leather trace is made of three layers of leather, making a thickness of .63 inch. An *iron loop* is fastened to each end with *three rivets*, .25 inch thick.

The trace chains are made of iron .3 inch diameter. The front chain has *five links* and a *toggle*. The rear chain has *fourteen links*, *four rings*, (oval,) and a *toggle*.

Two trace loops. The loop is formed by doubling the leather. It has at the upper end a *buckle* and a *standing loop*, by means of which it is connected with the billet on the saddle. At the lower end of each trace loop is an *iron loop*, to which the belly band is sewed. The *belly band* is made in two parts, one being a billet, and the other having a *buckle* and a *standing loop*.

One loin strap, for supporting the traces. It is the same for the wheel and the leading harness, except in length. A *layer* is sewed under the middle of the wheel loin strap, forming a loop through which the back strap of the crupper passes. Each end of the loin strap is buckled into a *loop*, like those just described, through which the trace passes.

THE CRUPPER. The *dock* is made of a piece of leather, 3.5 inches wide and 14 inches long, which is doubled and rounded,

without being stuffed. A *buckle* and a *standing loop* are sewed to each end. The *body* of the crupper is split, at the rear end, into two billets which connect it with the buckles of the dock. At the other end are a *buckle* and *four loops* for the billet of the back strap. A *layer*, 10 inches long, is sewed on the body, leaving an opening for the hip strap to pass through; a short *layer* is inserted, under the first, in rear of this opening. The *back strap* is sewed in under the first layer in front of the opening for the hip strap. The back strap, passing through the loop in the middle of the loin strap, and through the iron crupper loop on the saddle, returns to the buckle on the body of the crupper. A *sliding loop* holds the two parts together, near the saddle.

Breeching.

The breech strap is made of thick harness leather. A *layer*, also of stout leather, is stitched on the outside of the strap. A *buckle* and *three standing loops* are fastened, at each end, by both these pieces of leather, which are turned back three or four inches and stitched down. *Two iron loops* are fastened by chapes sewed to the breech strap.

Four tugs, for the hip straps, are fastened to the breech strap; two of them in the buckles, and two in the iron loops. These tugs are made double, and have each a *buckle* and *three standing loops* attached to them. A *safe* is sewed to the inside of each tug, to prevent it from chafing the horse.

The hip strap is made in one piece, split at each end into two billets which buckle into the tugs of the breech strap.

The breast strap is made of three layers put together in such a manner as to make the strap .63 inch thick in the middle, and .5 inch at the ends, where it is buckled to the breech strap. The breast strap is supported by the iron loops on the hames, and by the trace loops attached to the saddle. An *iron loop*, with an eye for the pole chain hook, slides on the middle part of the

breast strap; it is covered with leather, to prevent it from chafing the strap.

The *pole chain hook* is like the trace hook of the limber; it is welded into the eye of the sliding loop, and forms a direct connection between the pole and the breeching, independently of the collar and hames.

Plate III represents the harness of each horse complete. It shows the manner in which the parts are put together, and also the manner of hitching the horses to the carriage.

Harness required for each horse.

PARTS.	WHEELERS.		LEADERS.	
	Near side.	Off side.	Near side.	Off side.
Halter	1	1	1	1
Bridle	1	1	1	1
Driver's saddle	1	–	1	–
Valise saddle and valise	–	1	–	1
Collar and hames	1	1	1	1
Traces, wheel	2	2	–	–
Traces, leading	–	–	2	2
Trace loops and belly band	1	1	1	1
Loin straps and trace loops, wheel	1	1	–	–
Loin straps and trace loops, leading	–	–	1	1
Crupper	1	1	1	1
Breeching, hip strap and breast strap	1	1	–	–
Leg guard	1	–	–	–
Whip	1	–	1	–

Dimensions of the principal leather parts of artillery harness, with the number and size of buckles.

	PARTS.	Number.	Width	LENGTH.		BUCKLES.	
				Cut.	Finished.	No.	Width
			In.	In.	In.		In.
HALTER.	crown piece	1	1.25	30	30	–	–
	cheek straps	2	1.25	12.5	8	2	1.25
	brow band	1	1.25	21	15	–	–
	nose band	1	1.25	18.5	14	–	–
	chin straps	2	1.25	12	5.25	–	–
	throat strap	1	1.25	13.5	6.25	–	–
	throat lash	1	1.	44	42	1	1.
BRIDLE.	crown piece	–	1.75	–	31	–	–
		1	–	44			
	throat lash	–	.75	–	42	1	.75
	brow band	1	1.	23	16	–	–
	cheek straps	2	1.	12.5	8	2	1
	bit billets	2	1.	12	9	2	1
	reins, long	1	1.	60	60	–	–
	reins, short	1	1.	42	40	1	1
	billets for reins	2	1.	9	9	2	1
DRIVER'S SADDLE.	flaps	2	7.	14		–	–
	skirts	2	15.5	24.5		–	–
	billet for collar strap	1	1.25	10	8	–	–
	girth billets	2	1.25	17	15	–	–
	trace loop billets	2	1.25	17	15	–	–
	stirrup leathers	2	1.5	64	56	2	1.5
	girth	1	2.5	45	45	2	1.25
VALISE SADDLE.	skirts	2	11.	15	15	–	–
	girth billet	1	2.5	26	26	–	–
	girth	1	2.5	41	41	1	1.5
	trace loop billets	2	1.25	18	18	–	–
	billet for collar strap	1	1.25	10	8	–	–
	crupper strap	1	1.25	11	5	–	–
	valise straps	2	1.	37	35	2	1.
VALISE.	body	1	18.	25		–	–
	ends	2	6.25	7.25		–	–
	inner flap	1	4.	16		–	–
	strap for flap	1	.88	18	18	1	.88
	cover	1	.10	20.3		–	–
	buckle straps	3	.88	4	2	3	.88
	billets for buckle straps	3	.88	7.5	7.5	–	–

Table of dimensions—Continued.

PARTS.		Number.	Width	LENGTH.		BUCKLES.	
				Cut.	Finished.	No.	Width
			In.	In.	In.		In.
Leg Guard.	body	1	17	20.5		–	–
	foot strap	1	.88	14	14	–	–
	leg straps	4	.75	26	24	4	.75
Collar and Hames.	collar billets	2	1.	11	11	2	1.
	trace tugs	2	1.75	17	7	–	–
	trussing straps	2	1.	34	32	2	1.
	hames strap	1	1.25	21	18	1	1.25
	collar strap	1	1.25	15	9	1	1.25
Traces and Straps.	wheel traces	2	1.75	50	50	–	–
	leading traces	2	1.75	96	96	–	–
	trace loops	2	1.25	21	9	2	1.25
	belly band	1	1.25	31	25	1	1.25
	loin straps, wheel	1	1.25	16	13	–	–
	loin straps, leading	1	1.25	48	48	–	–
	loin straps, layer	1	1.25	60	60	–	–
	loin straps, loops	1	1.25	6	6	–	–
		2	1.25	23	10	2	1.25
Crupper.	dock	1	3.5	14	14	2	0.88
	body	1	1.75	20	20	1	1.25
	layer for body	1	1.25	10	10	–	–
	back strap	1	1.25	31	31	–	–
Breeching.	breech strap	1	2.5	48	42	2	1.75.
	layer for breech strap	1	1.75	50	42	–	–
	tugs	4	1.25	13	6	4	1.25
	safes	4	2.25	6	6	–	–
	hip strap	1	2.5	48	48	–	–
	breast strap	1	1.75		150	–	–

ARTILLERY.

PART FIFTH.

GUN CARRIAGE AND EQUIPMENTS

FOR THE SERVICE OF

MOUNTAIN ARTILLERY.

1848.

PART FIFTH.

MOUNTAIN ARTILLERY.

The artillery for mountain service is a light 12-pounder howitzer, with a carriage, adapted to transportation on pack horses. For occasional draught, when the roads permit, the carriage is furnished with shafts, which are used with the same saddle that carries the pack. See Plate VI.

The gun and the shafts are packed on one horse, and the carriage on another.

The ammunition is packed in small chests, two of which form a load for one horse.

Two chests, like those for the ammunition, contain a set of carriage-maker's tools, for repairs.

A portable forge, an anvil and other smith's tools, adapted chiefly to shoeing horses, are packed in two chests, and form also the load of one horse.

GUN CARRIAGE.

Wood work.—Plate I.

One stock, (WHITE OAK.) It is made of two pieces, put together with *two dowels*. The head of the stock is hollowed out, in two cylindrical surfaces, to form a bed for the howitzer, the trunnions being lodged in the sides of the stock.

The corners are rounded with a radius of 1 inch, where they are not covered by the irons.

One axle tree, (TOUGH HICKORY.) It is made of two pieces, which are bolted and riveted together, having an iron skean between them. The lower corners are rounded with a radius of 1 inch; the upper corners, outside of the stock, are rounded .4 inch.

Irons.—Plate II.

Two assembling bolts, for the middle and trail of the stock. *Four washers* and *two nuts* for the same.

One assembling bolt, for the head of the stock. *Two washer hooks* (drag hooks) and *one nut* for this bolt.

Two trunnion plates. Their outer corners are chamfered .1 inch, from each end up to the cap squares. They are fastened each by *three bolts* and *three nails.* The sides of the stock are dressed down to the width of the trunnion plates.

Two chin bolts, } The edges of the heads, above the cap
Two key bolts. } square, are chamfered .1 inch. *Four nuts* for these bolts.

Two trunnion plate bolts. *Two nuts* for the same.

Two cap squares. Their upper edges are chamfered .1 inch. An *eye pin* for the chain is riveted to each cap square.

Two cap square chains. Each chain consists of *five links*, No. 1, and *two rings*, No. 1, B.

Two cap square keys.

Two key chains. Each consists of *three links*, No. 1, and *two rings*, No. 1, B.

Four eye pins, No. 1, for the cap square chains and the key chains. They are screwed into the sides of the stock.

Two handspike hooks, screwed into the sides of the stock, near the head.

Two staples, for handspike straps. They are driven into the sides of the stock near the trail, and serve to hold *two leather straps* with buckles, by means of which the handspike and the sponge and rammer are fastened on the carriage. The handspike is carried on the left side; the sponge and rammer on the right side.

One lunette. The plate forms a shoe for the trail; its edges are chamfered .15. The part which is turned up, above the end of

the stock, forms a pointing ring for the handspike. The outer and inner corners of this ring are slightly rounded.

The lunette plate is fastened to the stock by *six nails* and by *two rivets*, which are riveted into the trail plate, on the upper side of the stock.

One trail plate. The edges are chamfered .1 inch. It has an oblong opening for the lower end of the pointing handspike to pass through, into the hollow made for it in the stock. The rear end of the trail plate is bent upwards, and it is fastened to the lunette plate by *two rivets*, which also serve to fasten, on the rear of the lunette, a *knee* containing a hole for the key, by means of which the shafts are connected with the gun carriage.

The trail plate is fastened to the stock by *six nails* and by the two rivets which pass through the lunette plate.

One handspike staple. It is driven into the stock, through two holes in the trail plate, and serves to confine the lower end of the handspike when it is used for pointing.

Two friction plates. They are let into the sides of the stock, against the washers of the trail assembling bolt, and are fastened each by *two nails.*

These plates are designed to protect the stock from being chafed by the supporting bar on the rear of the shafts, when the carriage is limbered up.

One box, for the elevating screw. The upper edges are chamfered .15 inch. The lower projecting part of the box is let into the stock, and it is fastened by two bolts.

Two bolts, for the elevating screw box. *Two washers* and *two nuts* for the same.

One elevating screw. It is finished in the same manner as the screw for a field carriage. The screw has 10 threads to an inch.

One axle skean. It is a plate of iron placed between the two pieces of wood which form the axletree, and extending through its whole length, between the linch pin holes. It is fastened by

one bolt and four rivets, two of which pass through the ferrules on the ends of the axletree.

One bolt, for the middle of the axletree. *Two washers* and *one nut* for the same.

Two rivets, for the axle arms. *Four burrs* for the same. The burrs are let in flush with the wood.

Two ferrules, for the axle arms. They are let into the wood their whole thickness, forming solid caps for the ends of the axletree, to which they are fastened, each by *one rivet*. The linch pins pass through them. Pieces of wood are inserted in the spaces left between the two parts of the axletree, outside of the linch pin holes.

Two axle bands. The outer corners are chamfered .1 inch. They are put on hot, and are fastened to the axletree, each by *two nails.*

Two understraps. Their lower corners are chamfered .1 inch. They are fastened by the chin bolts, key bolts and trunnion plate bolts.

Two linch pins. The stem is round; the corners of the head are slightly chamfered.

Two wheels.

WHEEL.—PLATE I.

Wood work.

One nave. Twelve spokes. Six fellies and *six dowels.* All of WHITE OAK.

Irons.

Four nave bands. The corners are slightly rounded. The bands are fastened, each by *three nails.*

One tire, fastened by six bolts.

Six tire bolts. Six washers and *six nuts* for the same.

One nave box, (BRASS.) It is driven into the nave, and made fast by wooden wedges.

SHAFTS.—PLATE II.

Wood work.

Two shafts, (TOUGH OAK OR ASH.) They are flat on the top and bottom, and rounded on the sides.

One cross bar, (OAK.) It is joined to the shafts by tenon and mortise, the tenons passing through the shafts. The corners are chamfered .5 inch, where they are not covered by the irons. A sloping notch is cut in the rear of the middle part, for the trail of the stock to rest in.

Irons.

One cross bar plate. The corners are chamfered .1 inch. It is fastened to each shaft by *one bolt, two rivets* and *two screws,* and to the cross bar by *seven screws.*

One supporting bar. It is attached to the shafts by the bolts and rivets which fasten the cross bar plate. The middle part of the bar is bent upwards, at right angles, to form a loop which fits on the stock of the gun carriage. The corners of the bar are slightly chamfered.

Two bolts, for the cross bar plate. *Two nuts* for the same.

One key, for connecting the shafts with the trail of the gun carriage. It is attached to the cross bar plate by a chain and eye pin.

One key chain. It consists of *eight links,* No. 1, and *two rings,* No. 1, A.

One eye pin, No. 1. It is riveted into the cross bar plate.

Two staples, for the shafts. The branches pass through the shafts and are riveted into *four burrs* on the upper side.

In attaching the shafts to the gun carriage the supporting bar is laid on the trail plate, near the handspike staple, and the knee in rear of the lunette rests on the cross bar plate, the holes for the key in these two pieces corresponding with each other.

Implements.—Plate III.

One handspike, (HICKORY OR OAK.) At the small end it has a *strap* fastened by *two rivets*, forming a loop by which to hang the handspike on its hook. At eight inches from the other end there is a *stop* like that on the handspike of a field carriage. A *loop of rope* fastened in two holes at the middle of the handspike serves to assist in placing the gun on the pack saddle.

One sponge and rammer. The *staff* (ASH) has a tenon at one end for the rammer head, which is fastened by one wooden pin, and at the other for the sponge head, fastened by two pins. The rammer head is countersunk at the end, to avoid striking the fuze in ramming a shell. The neck has a *copper band*, fastened by *three nails.*

Near the rammer head an *eye pin* is riveted into the staff, for the purpose of attaching the implement to the carriage, and in the middle of the staff is a *loop of rope*, like that in the handspike, and for a similar use.

Bolts, rivets, nails and screws for the mountain howitzer carriage.

DESIGNATION.	Number.	Kind.	Length.	WASHERS. Head.	WASHERS. Nut.	REMARKS.
GUN CARRIAGE.						
Bolts.			In.			
For the stock, trail	1	No. 4, D.	5.53	1	1	Nuts .63 in. thick.
For the stock, middle	1	Do.	8.88	1	1	Nuts .63 in. thick.
For the stock, head	1	Do.	12.63	–	–	Nuts .63 in. thick.
" trunnion plates	2	Do.	9.2	–	–	
" chin bolts	2	No. 4.	12.1	–	–	Plate II.
" key bolts	2	Do.	7.8	–	–	Plate II.
" axletree	1	No. 2, D.	5.47	1	1	
" box of elevating screw	1	No. 1, C.	7.	–	1	
" box of elevating screw	1	Do.	8.	–	1	
Rivets.						
For lunette and trail plate	2	No. 3, C.	5.6	–	–	
" axletree arms	2	No. 3, B.	3.75	–	4	
" ferrules	2	No. 2.	3.	–	–	
" handspike strap	2	Do.	2.	–	–	
Nails.						
For lunette plate	6	No. 2, C.	2.5			
" trunnion plates	6	No. 1, C.	2.			
" trail plate	6	Do.	2.			
" friction plates	4	Do.	1.5			
" axle bands	4	Do.	1.5			
ONE WHEEL.						
Bolts, for tire	6	No. 1, H.	–	–	6	
Nails, for nave bands	12	No. 1, C.	2.			
SHAFTS.						
Bolts, for plate	2	No. 2, D.	3.15	–	–	
Rivets, for supporting bar	4	No. 2, B.	3.			
Screws, for plate	11	No. 14.	1.5			

AMMUNITION CHEST.—PLATE III.

Wood work.

Two ends, } They are made of POPLAR, each in one piece.
Two sides, } The ends and sides are dovetailed and glued together. The bottom is let into the sides and ends, and fastened by nails.
One bottom. }

One panel, } for the cover. (POPLAR OR WHITE PINE.)
Two clamps, }

The panel is joined to the clamps by three tenons, glued and fastened with wooden pins.

Two beckets, for the handles. (OAK, or other hard wood.) Their outer corners are rounded .15 inch. They are fastened to the chest, each with *four screws.* The handles are loops of inch rope.

Irons.

One brace. It is made of round iron flattened at the ends and bent at right angles. It is fastened to the back of the chest by *one screw,* and to the front by a rivet, which also fastens the turnbuckle stud plate.

One stud plate. The stud for the turnbuckle is riveted into the plate, which is let into the front of the chest and fastened by *one rivet* and *one screw.*

One turnbuckle, (BRASS.) It turns freely on the stud which is riveted over the turnbuckle.

Four corner plates. They are made of sheet iron, No. 18, and fastened to the chest, each by *ten screws.*

Two hinges. The short straps are let into the underside of the cover to which they are fastened, each by *four screws.*

The outer corners of the long straps are chamfered .1 inch. The straps pass round the bottom of the chest, and are fastened each by *nine screws* and by the two rivets which hold the lashing chain.

Two lashing chains, for attaching the chest to the pack saddle. Each chain consists of *four links;* it is fastened to the chest by a *bridle* which is held by *two rivets* passing through the hinge strap.

One hasp. The strap is let into the underside of the cover and fastened to it by *four screws.*

One covering, of stout linen. It is well painted, and is fastened on, after the wood has been painted, with *copper tacks.* A strip of leather is put under the heads of the tacks.

Two leather loops, for a linstock. They are fastened to the front of the chest, each by *four screws.*

Interior divisions.

Sixteen cleats, (POPLAR.) Eight on each side of the chest. They are glued on and fastened to the sides; the long cleats by *four nails* in each; the others by *one screw* and *two nails* each.

Rivets, screws, and nails for one ammunition chest.

DESIGNATION.	No.	Kind.	Length.	REMARKS.
			In.	
Rivets, for hinges	4	No. 2, B.	1.4	
Rivets, brace	1	No. 2.	1.	Wire riveted.
Screws, for corner plates	40	No. 7.	0.63	
Screws, " linstock straps	8	Do.	.63	
Screws, " hinges	12	No. 9.	.75	
Screws, " hinges	14	Do.	.63	
Screws, " hasp	2	Do.	.75	
Screws, " hasp	2	Do.	.63	
Screws, " stud plate	1	Do.	.63	
Screws, " brace	1	No. 12.	.75	
Screws, " brackets	4	Do.	.75	
Screws, " brackets	4	No. 14.	1.25	
Screws, " interior divisions	8	No. 7.	.63	
Nails, for the linen cover	160	–	.75	Copper tacks.
Nails, " interior divisions	48	3d.	–	Cut nails.

AMMUNITION.—PLATE III.

The ammunition for the mountain howitzer consists of shells, spherical case shot and canisters, all of which are *fixed;* the cartridge and the projectile being attached to the same sabot. The forms and dimensions of the sabots and of the finished ammunition are shown in the plate.

Spherical case shot are fixed in the same manner as shells.

The canister is filled with musket balls.

The charge of powder is 8 ounces, for all kinds of ammunition. The fuze holes of shells and spherical case shot are stopped with tow, and the fuze is inserted at the time of loading the piece.

The fuze is the same as for other shells for field service.

PACK SADDLE.—PLATE IV.

ASH or BEACH is suitable for the wood work.

Two arcs, for the frame. They are made each of three pieces, halved together, glued and fastened by *six screws* in the front arc, and *eight screws* in the rear arc.

Two transoms. They have circular notches for the trunnions of the gun to lie in. They are fastened to the arcs by bolts which traverse their whole length, and by *one screw* in each end.

One cross bar. It is let into the transoms .38 inch, and is fastened to them by *two screws* in each end. A circular notch is cut in it, of the same depth as that in the front arc.

Two inner side bars. They are let into notches on the inside of the arcs, and the inner surfaces of the bars are curved to correspond with the form of the arcs. They are fastened to the arcs by *three screws* in each end.

Two outer side bars. They are mortised into the arcs. Each of these bars has a piece of leather nailed on the outside, where the lashing rope passes round it, for securing the pack on the saddle.

Two round bars. They connect the lower ends of the arcs, to which they are joined by round tenons and mortises, and fastened by *one screw* in each end. This screw serves also to strengthen the bearing notch for the ammunition chest.

Two arc plates. They are fastened on the outside of the arcs, each by *two rivets* and by the assembling bolts. They have hooks at each end, for attaching the lashing chains of the ammunition and tool chests. Each plate has a *staple* riveted to it in the middle. To the staple on the front plate a wooden button is strapped, to hook the bridle on. The crupper strap is attached to the staple on the rear plate.

Two assembling bolts. They pass through the transoms, connecting the front and rear arcs together. *Two nuts* for these bolts. The heads and nuts are octagonal.

Four staples, for confining the lashing straps. They are fastened to the arcs by *two nuts* in each.

Four billets, for lashing straps. They are fastened near the head of the arcs, each by *one screw* and a staple.

Four buckle straps, for the same. They are fastened to the inside of the arcs, at the lower end, each by *one screw.*

Two buckle straps, for the billets of the shoulder straps. They are fastened to the front arc, each by *one screw* and *two nails.*

One cover, (bridle leather.) It is stretched over the inner side bars and nailed to the inside of the arcs. A strip of thin leather is put under the heads of the nails. Two flaps, of harness leather, are sewed to the lower ends of the cover.

Two thill straps. They pass over the round bars and form loops for the shafts of the gun carriage.

One lining, (thick black leather.) It is nailed to the inside of the arcs and sewed to the flaps of the cover, below the round bars.

Six girth billets. They are sewed to the lining, three on each side of the saddle.

Four iron loops, for the breeching and breast straps. They are held by leather loops which are sewed to the lining.

One girth, (strong hemp webbing.) It has three buckles sewed to each end, with leather loops.

One pad. The upper side is made of sheep skin; the lining, of strong canvass. It is stuffed with straw and deer's hair and stitched in the usual manner. The pad is fastened to the lining of the saddle with ten leather thongs.

Bolts, rivets, nails and screws for the pack saddle.

DESIGNATION.	Number.	Kind.	Length.	REMARKS.
			In.	
Assembling bolts	2	No. 1.	17.75	Head and nut octagonal.
Rivets, for arc plates	4	No. 2, B.	1.4	
Rivets, " staples	8	-	1.25	Wire, No. II.
Screws, for transoms	4	No. 20.	3.	
Screws, " cross bar	4	No. 16.	2.5	
Screws, " round bars	4	Do.	2.5	
Screws, " side bars	12	No. 14.	1.25	
Screws, " arcs	14	Do.	1.	
Screws, " front buckle straps	2	Do.	1.	
Screws, " lashing straps	8	Do.	1.	
Nails, for the leathers	320	10 oz.	-	Iron tacks.

HARNESS.—PLATE V.

The same harness is used for the packs and for draught, except that the lashing girth and lashing rope are not required for the latter purpose.

The harness is made of black leather, like that for field artillery.

Bridle.

One crown piece. One end is split into two billets, and the other into a billet and buckle strap, for the throat lash and cheek pieces.

One buckle and *one standing loop*, for the throat lash.

One buckle and *loop*, attached to the top of the crown piece, for the billets of the winker straps.

One brow band. It is formed into a loop at each end, through which the crown piece passes.

Two cheek straps. Each strap has *two buckles* and *five standing loops.* The upper end of the strap is buckled to the billet of the crown piece; the lower end passes through the ring of the bit.

Two winkers. They are sewed to the cheek straps and supported at the front part by *two straps* which are fastened in the buckle at the top of the crown piece.

One leading rein. It is sewed into the ring on the right end of the bit, and passes through the other ring. A *wooden button* is sewed into a loop at the loose end of the rein, with a leather washer inside of it.

One bit. It consists of a *bar* and *two rings*, made of iron and tinned.

Halter.

The halter and its chain are like those used for the field artillery.

Crupper.

The dock, with a *buckle* and *loop* at each end, by which it is connected with *the body* of the crupper, the rear end of the latter being split into two billets for that purpose.

The back strap. It is sewed to the crupper and passes through the staple on the rear arc plate of the saddle. *One buckle*, with *three standing loops* and a *sliding loop*, for the billet of the back strap.

The loin strap passes between the back strap and the body of the crupper. The ends are two billets to which the breeching is buckled.

Breeching.

The breech strap. To each end of it is sewed a *side strap*, with a *buckle* and *four standing loops.* These side straps pass through two iron loops on the pack saddle, or through the staples in the shafts, when the harness is used for draught.

Two buckle straps. Each strap has a *buckle* and *three standing loops.* It is fastened to the breech strap by an *iron loop* and a *chape.* A *safe* is sewed under each strap, its whole length.

These buckle straps receive the billets of the loin strap which support the breeching.

Breast Strap.

The breast plate. A *billet strap*, with a *buckle* and *three loops*, is sewed to each end of the breast plate. These billets are buckled into the front iron loops on the pack saddle, or into the staples on the shafts, when the harness is used for draught.

Two shoulder straps. They are sewed to the breast plate, which they support by means of the buckle straps on the front of the pack saddle.

Lashing Girth.

This is a broad piece of thick leather, to each end of which an *iron hook* is securely fastened.

The lashing rope is a piece of 2½ inch rope, 10 feet long, which is used, with the lashing girth, to secure the pack on the saddle. The ends of the rope are served with twine.

PACKS.—PLATE VI.

The figures in the plate show the manner in which the load of each horse is attached to the pack saddle, and also the arrangement of the gun carriage and harness when adjusted for draught.

FORGE.—PLATE VII.

The *hearth* is of sheet iron, No. 13, bent into a hollow form and riveted to an iron *frame.* The *back* of the hearth is bent under the bottom and riveted to it. The *border* of the hearth is bent round the back, and is riveted to it and to the frame. The *back* of the fire-place is of sheet iron, No. 13, connected with the back of the hearth by *two brass hinges,* which are riveted to each. The *edges* of both the back pieces are stiffened by strips of sheet iron riveted to them. An *air back* is formed by a piece of sheet iron, No. 7, bent hot into a convex shape and riveted to the inside of the back plate of the fire-place. A *button,* turning on an axis which is riveted to the outside of the back plate, serves to fasten this plate to a stud in the front border of the hearth, when the pack is turned down on its hinges.

The frame is supported by *three legs,* which are connected with it by bolts, so that they can be folded up close to the frame. The front leg is divided into two branches, which are bolted to *two eye pieces* that are riveted to the sides of the frame. The two other legs are connected together by a cross bar, with a nut at

each end. This bar supports also the fork in which the bellows handle works. The legs of the frame have round tenons at the lower ends, with shoulders which rest on three socket plates attached to the side of the forge chest, for the forge to stand on when set up for use.

The bellows handle is a bent bar of iron with a wooden head. It is attached to a *fork* which fits in a square hole in the cross bar joining the rear legs of the frame. The lower end of the handle is hooked into a *connecting rod* attached to the rear end of the bellows; it is fastened to this rod by a sliding *catch* which is secured by a thumb screw. When the bellows is dismounted, this rod is hooked into an eye on the upper side of the bellows, to keep it closed.

THE BELLOWS. The frame consists of an *upper*, a *lower*, and a *middle plank*, (walnut) and *two ribs*, (poplar,) connected by a *cross head*, as in a common smith's bellows. There are valves in the middle and the lower plank.

A *bar* of iron, attached to the middle plank, terminates in two journals, which support the bellows, fitting in the joints of the rear legs of the frame of the forge.

The *nozzle*, of sheet iron, is inserted into the cross head, above the middle plank. It enters into an *iron pipe* which is attached to the rear of the forge back by means of a *bridle* bolted to the back plate of the hearth.

A *handle* is attached to a *plate* which is fastened on the upper bellows plank. A *leaden weight* of one pound is attached to the inside of the lower plank by the rivets which hold the eye plate on the connecting rod.

The *bellows leather* (calfskin) is fastened to the planks by small bellows nails, in the manner represented in the plate.

THE FORGE BUCKET is of sheet iron, stiffened with a band at top, and furnished with a handle.

THE ANVIL is fitted into a *block* of tough oak, or other hard wood, and fastened by an *iron pin*. The block has a *band* round the top. *Two rings* fastened by *staples* serve for handles.

THE COAL SACK is made of strong leather. It is 14 inches in diameter and 18 inches high; it is closed at the top by a leather strap passing through slits in the sack. Weight of sack filled with charcoal, 24 lbs.

TOOL CHESTS.

Chests for the forge and smith's tools.

The forge and the smith's tools are packed in two chests, which are alike, except in the interior divisions. The forge chest alone has socket plates, for the legs of the forge to stand on.

WOOD WORK, (WALNUT.) *Two ends* and *two sides*, dovetailed together. *One bottom* let into the ends and sides and fastened by *thirty-two nails*. *One lid*, made with two *end clamps*, like that of the ammunition chest.

IRONS. *Four corner plates*, of sheet iron, No. 18, fastened each by *eighteen screws*, 0.63 inch, No. 7.

Two handles. The straps are turned under the bottom of the chest. They are fastened each by *one rivet* and *four screws.*

Two hinges. The short strap is fastened to the inside of the lid by *one rivet* and *three screws.* The long straps are bent under the bottom of the chest and fastened, each by *three rivets* and *eleven screws.* Two of these rivets hold the *bridle for the lashing chain*, which is placed at the same distance from the bottom as in the ammunition chest.

One hasp. The strap is let into the inside of the cover and fastened with four screws.

One hasp staple and *plate.* The staple is riveted into the plate, which is fastened to the box with *two rivets.*

One linen covering, like that of the ammunition chest.

Three socket plates, fastened on the back of the forge chest, each by *four screws*. They have holes in them for the legs of the frame of the forge to stand in, when it is mounted for use.

Contents of the forge chest and manner of packing. Plate VII.

The legs are folded up close to the frame, and the back of the fire-place is turned down on the hearth and fastened by its catch.

The bellows is closed and fastened by the connecting rod, the handle being detached.

The fire-place and *frame* are placed against the back of the chest, the hearth outwards. They are kept in place by a clamp which fits, over the top of the frame, into an iron staple fastened by two screws to the back of the chest.

The *bellows* is placed on its side, with its top against the front of the chest. One journal goes into a hole in a cleat screwed to the bottom. The nozzle is supported by a notched board which is framed into a cleat screwed on the bottom of the chest, and it is held fast by a buckle strap passing through a staple in the board. A clamp, with a hole for the upper journal, goes across the top of the bellows, and is held by staple plates screwed to the front and back of the chest.

The bellows handle hangs on a cleat in the front of the box, towards the right hand, the hook downwards.

One wrench, (for nuts Nos. 1 and 4,) in two iron brackets on the right end of the chest, near the front.

One hand hammer, } With handles.
One riveting hammer. }
One fore punch, } On same handle.
One creaser. }
} Placed upright near the wrench.

Ten pounds of horse shoe nails, in two strong linen bags, packed in tow, in the vacant space to the right of the bellows.

Contents of smith's tool chest and manner of packing.
Plate VII.

The forms of the tools and some of their principal dimensions are represented in the plate. Most of them are lighter than those of the same kind which accompany the travelling forge, and which are represented in the plates of PART 10.

The anvil and its block are placed in the bottom of the chest; the head of the anvil in a mortise made in a cleat screwed on the bottom. The block rests also on a notched cleat screwed on the bottom, and it is fastened by a leather strap and buckle to an iron staple in the bottom of the chest.

One water bucket, (iron,) on the anvil block, resting on a moveable cleat which is hollowed out to fit the block and the bucket.

One pair shoeing pincers,
One vice.
} In a wooden cleat, on the front of the chest.

One nailing hammer,
One shoeing hammer,
One splitting chisel.
} In iron brackets, against the front of the chest.

One pair tongs,
One pritchel,
} In a triangular cleat, in the left front corner.

One hardie,
One clinching iron,
One shoeing knife.
} In a wooden rack, on the left end.

One poker,
One shovel,
One rake,
One nail punch.
} In two wooden racks, on the back of the chest.

One buttress, hung on two hooks in the front of the upper shovel rack, and held fast by a wooden button.

One toe knife, in two cleats, on the back of the chest, near the top.

One rasp, } In two racks, on the back of the chest, near
One square file. } the left end.

Two flat files, fastened by two cleats and a button to the inside of the lid.

Ten pounds of horse shoe nails, in two bags; one on the bottom at the left end, the other in the water bucket.

Arrangement for transportation.

The forge chest and its tool chest are carried by one horse, on the same kind of pack saddle that is used for the other parts of the equipments; except that these chests, being larger than the ammunition chests, require longer lashing straps to go round them.

The weight of each of the chests packed is about 100 pounds.

The bags of horse shoe nails should be distributed in the two chests so as to equalize and adjust the weight on each side. They should be packed in tow, to prevent injury to the tools.

The coal sack is strapped on the top of the pack saddle, between the tool chests.

Carriage maker's tools.

The tools and stores for the use of carriage makers, in repairing the carriages and equipments, are packed in two chests, which are like those for the ammunition, but without the interior divisions.

The hasp and *hasp staples* are like those of the forge chest.

The two chests are designated by the letters A and B.

List of carriage maker's tools and stores.

CHEST A.	CHEST B.
1 claw hatchet,	1 hand axe,
1 nailing hatchet,	1 claw hatchet,
2 firmer chisels, ½ and ¾ inch,	1 nailing hatchet,
1 trying square,	2 firmer chisels,
1 bevel,	1 firmer gouge,
2 augers, ½ and ⅝ in., and one handle,	1 pair compasses,
1 riveting hammer,	1 trying square, six inches,
1 hand saw,	1 scriber,
1 jack plane,	1 riveting hammer,
1 screw driver	1 mallet,
1 rule, (two feet,)	3 gimlets,
3 gimlets,	1 screw driver,
2 hand saw files,	1 wood rasp,
2 wood files, twelve inch,	1 oil stone,
2 sickles,	6 brad awls,
1 gunner's gimlet,	2 sickles,
1 priming wire,	1 gunner's gimlet,
1 gunner's pincers,	1 priming wire,
2 papers of sprigs, 1 inch and 1½ in.,	2 papers tacks, 8 oz. and 12 oz.,
2 papers of tacks, 8 oz. and 12 oz.,	½ lb. twine,
60 wood screws, ¾ inch, No. 9,	25 leather thongs,
2 lbs. sash cord,	36 wood screws, 1½ in. & 1 in., No. 14.
½ lb. twine.	12 do. 2 in., No. 16.
	12 nuts, No. 1; 2, No. 2; 6, No. 4.
	12 washers, No. 1.

The sickles are fastened to the front and back of the chests, (inside,) with small cleats at the necks and points. The other articles are securely packed in tow, the edges of the cutting tools being carefully wrapped up, to prevent injury.

Each chest packed weighs about 45 pounds.

Bill of timber for mountain howitzer carriage, &c.

NAMES OF PARTS.	Number of pieces.	DIMENSIONS OF EACH PIECE.			REMARKS.
		Length.	Width	Thick-ness.	
Gun carriage body.		In.	In.	In.	
Stock	2	66.	9.	7.	Oak.
Axletree	2	44.	5.	3.	Young, tough hickory.
Two wheels.					
Nave	2	11	9.	Round	Oak.
Spokes	24	20.	2.5	1.5	Do.
Fellies	12	21.	5.5	2.5	Do.
One pair of shafts.					
Shafts	2	72.	3.	2.25	Ash.
Cross-bar	1	33.	3.5	2.25	Do.
One ammunition chest.					
Sides and ends	2	44.	11.	1.	Poplar.
Bottom	1	36.	7.	1.	Do.
Cover and partitions	1	66.	8.	1.	Do.
One pack saddle.					
Arcs	1	50.	12.	1.25	Ash or beach.
Transoms	1	20.	12.	1.75	Do.
Cross bar	1	14	6.	1.25	Do.
Side bars	1	42.	12.	0.75	Do.
Round bars	2	20	1.5	1.5	Hickory.
One handspike	1	50	2.5	2.5	Hickory.

Bill of iron for mountain howitzer carriage, &c.

NAMES OF PARTS.	Width	Thickness.	Length.	Weight.	REMARKS.
Gun carriage body.	In.	In.	In.	Lbs.	
Cap square and key chains	0.15	Round	25.	0.13	Chains No. 1.
Rivets No. 2, nails No. 1, & staples	.25	Do.	54.	0.73	
Nails No. 2	.3	Do.	18.	0.36	
Handspike staple, bolts No. 1, and rivets No. 3	.375	Do.	44.	1.35	
Implement hooks, and bolt No. 3	.625	Do.	11.	0.94	
Bolts No. 4	.75	Do.	84.	10.30	
Eye pins No. 1	.875	Do.	7.	1.16	
Elevating screw	1.75	Do.	11.	7.34	Hammered.
Nuts No. 1	0.75	0.375	1.5	0.12	Do.
Handspike strap and linch pins	1.	0.5	16.	2.24	
Washers No. 1	1.25	0.125	2.5	0.11	
Axle bands	1.25	0.2	34.	2.38	
Cap square keys	1.25	0.25	3.	0.26	
Nut No. 3	1.25	0.625	1.25	0.27	
Heads of key and chin bolts	1.25	0.75	16.	4.20	Hammered.
Nuts No. 4	1.5	0.75	11.	3.47	
Ferrules for axletree	2.	0.25	15.	2.10	
Washer hooks	2.	0.375	8.	1.68	
Understraps	2.	0.5	36.	10.08	
Handles for elevating screw	2.	1.25	5.	3.50	
Trunnion plates and cap squares	2.25	1.	42.	26.46	Hammered.
Washers No. 4	2.5	0.188	10.	1.31	
Knee of lunette	2.5	1.	4.	2.80	Hammered.
Trail plate	4.	0.2	12.5	2.80	
Axle skean	4.	0.375	38.	15.96	
Lunette	4.	0.5	18.	10.08	
				112.13	
Box for elevating screw	–	–	–	3.0	Cast brass.
Two wheels.					
Band nails No. 1	0.25	Round	48.	0.65	
Tire bolts No. 1	0.375	Do.	42.	1.29	
Brow bands	0.75	0.125	96.	2.50	
Nuts No. 1	0.75	0.375	10.	0.78	
End bands	1.	0.2	82.	4.59	
Washers No. 1	1.25	0.125	15.	0.65	
Tires	2.00	0.375	240.	50.40	
				60.86	
Nave boxes	–	–	–	10.0	Cast iron.

Bill of iron for mountain howitzer carriage, &c.

NAMES OF PARTS.	Width	Thickness.	Length.	Weight.	REMARKS.
	In.	In.	In.	Lbs.	
Shafts.					
Key chain	0.15	Round	12.	0.06	Chain No. 1.
Rivets No. 2	0.25	Do.	12.	0.16	
Staples	0.375	Do.	26.	0.80	
Bolts No. 2	0.5	Do.	7.	0.38	
Key	0.75	Do.	4.	0.49	
Supporting bar	1.	0.5	48.	6.72	
Cross bar plate	2.75	0.25	30.	5.78	
				14.39	
Ammunition chest.					
Chains, and rivets No. 2	0.25	Round	43.	0.60	
Hinges and hasp strap	1.	0.375	38.	4.00	
Bridles and brace	1.	0.5	4.	0.56	
Hasp	1.	0.625	3.5	0.61	
Turnbuckle plate	1.5	0.1	3.5	0.15	
Corner plates	2.4	No.18.	40.	1.35	Russia sheet iron.
				7.27	
Turnbuckle	–	–	–	0.10	Cast brass.
Pack saddle.					
Staples and rivets	0.25	Round	12.	0.16	
Bolts	0.375	Do.	37.	1.13	
Nuts	0.75	0.375	1.25	0.10	
Arc plates	1.25	0.2	36.	2.52	
				3.91	

ARTILLERY.

PART SIXTH.

CORRECTIONS—*Part Fifth.*

Page 2—9th line from the bottom, for "*two handspike hooks*, screwed into the sides," read "*one sponge and rammer hook*, screwed into the right side."

" 3—4th line from the bottom, for "10," read "5."

" 11—16th line, for "*nuts*," read *rivets*."

" 11—after the 16th line, insert: "*Four notch plates*. They are let into the bearing notches of the arcs, and are fastened, each by *four screws*, 1 inch, No. 14."

" 23—last line, for "*iron*," read "*brass*."

1848.

PART SIXTH.

BARBETTE CARRIAGES.

The carriages used for mounting the following pieces of ordnance, in barbette batteries, are similar to each other in their construction, viz: For the 12-pounder, 18-pounder, and 24-pounder siege and garrison guns; the 32-pounder and 42-pounder sea-coast guns; the 8-inch and 10-inch sea-coast howitzers.

The plates show the form and the dimensions of these carriages and of their parts, in detail, with the exception of the carriage for the 10-inch howitzer. This has not been engraved, as but few of these carriages will probably be made. The carriage is like that for the 42-pounder gun, with such obvious variations in width, &c., as are required by the differences in the general dimensions of the gun and howitzer.

Each of these barbette carriages consists of a *gun carriage* and a *chassis*, or traversing carriage.

The timber for garrison and sea-coast carriages (barbette and casemate) should be, as far as possible, free from centre heart. In pieces of very large size, which cannot be procured free from heart, it is better that the heart should be nearly central, and it must be perfectly sound. When circumstances render it necessary to make these parts of two pieces, instead of one, they should be joined with dowels and fastened together by a number of rivet bolts, according to the length of the piece. See also the remarks relative to the wood work of artillery carriages: PART 2, page 10.

The roundings of the corners of the wood work of these carriages are shown in the plates.

WHITE OAK is used for all the wood work.

GUN CARRIAGES.—PLATES I TO VII.

Wood work.

Two uprights, } These pieces form the *cheeks* of the carriage;
Two braces. } they are joined together by two tenons and mortises; the circular cut for letting in the trunnion plate is traced by the trunnion plate, after the cheek is framed.

One front transom. The corners are rounded, and the transom is let into the cheeks, as represented in the drawing.

One middle transom. The ends are let into the braces, the full size of the transom.

One rear transom. It is connected by tenons and mortises with the braces, and by two dowels with the transom and axle tie. The transom is notched out, on the lower side, to fit the tongue of the chassis. If the hole for the elevating screw comes over the transom, a notch is cut out of the front of the transom, or a hole is bored obliquely through the front part of it, (as represented in the sections of the transom and tie,) in order to let off any water which may enter the screw hole.

One transom and axle tie. It is connected with the rear transom by *two dowels*, and is let into the bottom of the middle transom.

One elevating bed. It is connected with the transom and axle tie by *two dowels*, and is let into the rear of the middle transom. The elevating bed of the 8-inch howitzer carriage is made higher than the others, in order to allow the handles of the elevating screw to clear the middle transom.

One axle body. The roundings of the corners are shown by the drawings of the wood work and of the irons; the ends are chamfered .15 inch.

The axle body is notched into the transom and axle tie, as represented in the plates.

In putting this carriage together, the uprights and braces are first assembled, forming the two cheeks, in which the trunnion holes are cut. The rear transom, the tie, the middle transom, and the elevating bed, are then joined together and assembled with the cheeks, (the front transom being inserted at the same time,) after which the axle body is put in its place.

Irons.—Plates VI and VII.

Two trail rivet bolts. Their heads are let into the upper side of the braces. *Two washers* and *two nuts* for the same.

Two rivet bolts, for uprights. *Four washers* and *two nuts* for the same.

Two cheek bolts. *Two flat washers* for the heads of these bolts; *two beveled washers*, (CAST IRON;) *two nuts.*

One lunette. The plate is let into the under side of the transom and axle tie, and it is fastened by the rear transom and tie bolt.

Four assembling bolts. Two through the front transom, one through the middle transom, and one through the rear transom. *Eight washers* and *four nuts* for these bolts.

For calibres above the 24-pounder, there are *two additional bolts*, one for the middle transom and one for the rear transom, with *four washers* and *two nuts.*

One bolt, for the rear transom and tie. The head is let into the bottom of the notch in the rear transom, .1 inch more than the thickness of the head. *One washer* and *one nut* for this bolt.

In the 8-inch howitzer carriage, there are *two* of these bolts, with *two washers* and *two nuts.*

One bolt, for the rear transom and tie and the bed plate of elevating screw. The head is let in like the preceding. *One nut* for this bolt.

One bolt, for elevating bed plate. *One washer* and *one nut.* For the 8-inch howitzer, there are *two bolts*, *two washers*, and *two nuts.*

One bed plate, for elevating screw. It is the same for all the carriages except the 8-inch howitzer. See Plate VI.

One nut, for elevating screw, (BRASS.) *Four handles* for the same, screwed into the nut.

One elevating screw. The screw has a slot in nearly its whole length, which fits on a feather in the bed plate; so that by turning the nut, the screw is worked up and down, without turning round.

One axle tree. Plate VI.

Two axle stirrups, *Two bridles. Four nuts.* } The stirrups are made of such a length as to leave an opening of about .25 inch between the bridle and the shoulders of the stirrup, in order to allow for the shrinking of the axle body.

One clamp washer, for 12 and 18-pounder carriages; or,

One axle and tie brace, for the larger calibres.

Two axle and tie bolts. The heads are underneath the axle body, resting on the clamp washer, or on the brace.

One double washer and *two nuts*, for these bolts.

One bolt, for middle transom and tie. In the 12 and 18-pounder carriages, this bolt has *two washers;* in the other carriages, except the 8-inch howitzer, it has but one washer, as the brace takes the place of a washer under the nut. In the 8-inch howitzer carriage, it has no washer, the head of the bolt being let into the top of the middle transom, in order to clear the handles of the elevating screw. *One nut* for this bolt.

Two manœuvring bolts, with *collars*, *cheek plates*, *nuts*, and *washers*—Plate VII. In the 12, 18, and 24-pounder carriages, there is a cheek plate and a collar on the front end of the bolt only; in the other carriages, each end of the bolt has a cheek plate and a collar and a washer. Each of the cheek plates is fastened by

one wood screw and by the manœuvring bolt. The washers at the outer ends of the collars are rounded, instead of being chamfered, on the edges.

The bolts are made of square iron, and the corners are flattened with the hammer.

The collars are welded on a mandril, and turned on the outside.

Two manœuvring staples. They are driven hard into the under side of the braces.

Two trunnion plates. Plate VII.

Four bolts, for trunnion plates. *Four nuts* for the same.

The nuts are let into the cheeks from the inside, and the mortise is closed with a piece of wood.

Two rollers, (CAST IRON.) Plate VI. The pipe for the axle tree is reamed out and faced at the ends; the octagonal part is dressed by a gauge.

The rollers are of two sizes; one for the 12, 18, and 24-pounder carriages, and one for the larger calibres.

Two shoulder washers, for the axle tree. They are let in .2 inch into the ends of the axle body; they are applied hot and shrunk on.

Two linch washers.

Two linch pins.

Two wheels. They are alike for all the carriages.

WHEEL.—PLATE VI.

WOOD.—*Ten spokes.* They are driven in hard, nearly to the bottom of the sockets in the nave.

IRONS.—*One nave,* (CAST IRON.) The octagonal opening in the nave should be dressed out by a gauge, so that the rollers and naves may fit together indiscriminately.

One tire. The tire is shrunk on the wheel, in the usual manner, before boring the nail holes.

Ten tire nails.

CHASSIS.—PLATES VIII TO XII.

Wood work.

Two rails.

Two hurters,
Two counter hurters.
} Wood not easily split is selected for them. They are notched into the top of the rails, and fastened each by *two nails.*

One front transom,
One middle transom,
One rear transom,
One tongue.
One prop.
} The drawings show the manner in which the transoms are connected with the rails and tongue.

Irons.—Plate XII.

Two rail plates. They are let into the outside of the rails, .2 inch below the top, and they are fastened to the rails, each by two bolts and *fifteen wood screws.*

Four rail plate bolts. Four washers and *four nuts.*

Four rivets and four burrs, for hurters and counter hurters.

Six rivet bolts, for front and middle transoms. *Six washers* and *six nuts.*

One friction plate. It is let in flush with the lower surface of the front transom, and fastened by the two transom and rail bolts, and by *ten nails.*

In the chassis for carriages above the 24-pounder, a *transom and tongue brace* is connected with the friction plate.

Two bolts, for the hurters and rails. *Four washers* and *two nuts.*

Two bolts, for front transom and rails. *Two nuts* for the same.

Two bolts, for middle transom and rails. *Two washers* and *two nuts.*

In chassis for 32-pounder and heavier calibres, there are *four* of these bolts, with *four washers* and *four nuts.*

Four bolts, for counter hurters, rails and fork plates. *Four nuts* for these bolts.

Two fork sockets. They are made of plate iron welded on a mandril; the ends are filed to the proper slope, so as to fit against the fork plate when the axis of the socket is vertical. The sockets are driven hard into their mortises.

Two fork plates. They are fastened to the under sides of the rails, each by *six nails* and three bolts.

Two bolts, for rear transom and fork plates. The heads are let into the upper side of the transom. *Two nuts* for these bolts.

One manœuvring loop. Fastened to the rear end of the tongue by *two nails* and *one bolt*. *One nut* for loop bolt.

One bolt, for front transom and tongue. The head of this bolt is 2.25 inches diameter; it is let into the transom in the bottom of the pintle hole. *One washer* and *one nut* for this bolt.

Two bolts, for the tongue and the middle and rear transoms. The heads are let into the upper side of the tongue. *Two washers* and *two nuts* for these bolts.

Two prop plates, fastened to the prop, each by *two nails.*

One prop bolt. One key for this bolt.

Two forks. They may be made from hammered shapes, or of bar iron, of which the two parts are welded together to form the stem.

The stem is finished with the file, to fit in the sockets indiscriminately; the corners are slightly rounded.

Two fork bolts. Two nuts, octagonal. The heads of the fork bolts are elongated, to serve for manœuvring bolts.

Two traverse wheels, (CAST IRON.) The hole for the bolt is reamed out, and the hub is faced to the proper thickness.

For chassis of 32-pounder and heavier calibres, add:

Four pipes, (CAST IRON.) The ends should be faced in the lathe, to the proper length.

Two pipe bolts. Four washers and *two nuts.*

PINTLE CROSS, BOLSTER AND TRAVERSE CIRCLE.

In permanent batteries, the pintle is fixed in a block of stone, and the traverse circle is an iron plate, set also on stone.

For temporary batteries, the pintle is attached to a wooden bolster, which is covered by a circular cast iron plate, and attached by four bolts to a wooden cross picketed firmly into the ground.

The traverse circle is formed of planks pinned to sleepers and fastened by pickets, or secured to string pieces which connect the traverse circle with the pintle cross.

The two kinds of pintle are shown in Plate XII.

Plate XIII represents a 12-pounder gun carriage, mounted on a wooden pintle block and platform.

Plate XIV represents a 32-pounder gun carriage, mounted on a stone pintle block and traverse circle.

Nails and screws for barbette carriages.

DESIGNATION.	Number.	Kind.	Length.
GUN CARRIAGE.			
Nails, for tire of 2 wheels	20	No. 4, C.	4.5
Screws, for cheek plates, 12, 18, and 24-p'rs	2	No. 20.	2.5
Screws, " " 32 p'r, 8-in. & 42-p'r	4	Do.	2.5
CHASSIS.			
Nails, for hurters and counter hurters	8	No. 2, C.	3.5
Nails, " friction plate	10	Do.	3.5
Nails, " fork plates	12	Do.	3.5
Nails, " manœuvring loop	2	Do.	3.
Nails, " prop plates	4	Do.	2.5
Screws, for rail plates	30	No. 20.	2.5

Bolts and rivets for barbette carriages.

DESIGNATION.	Number.	Kind.	LENGTH.			WASHERS.	
			12-p'r.	18-p'r.	24-p'r.	Head.	Nut.
			In.	In.	In.		
GUN CARRIAGE.							
For connecting the uprights and braces	2	No. 5, A.	28.	28.	–	2	2*
	2	No. 6, A.	–	–	29.3	2	2*
" manœuvring collars	2	No. 5.†	21.38	21.38	–	2	2
	2	No. 6.†	–	–	22.25	2	2
" assembling the cheeks	4	No. 5, A.	25.28	27.28	28.98	4	4
" axle body and tie	2	Do.	16.36	16.36	16.36	–	1‡
" elevating bed plate	1	Do.	16.94	16.94	16.94	1	–
" middle transom and tie	1	Do.	18.88	18.88	–	1	1
" middle transom and brace	1	Do.	–	–	19.19	1	–
" rear transom and bed plate	1	No. 5, B.	21.3	21.22	21.13	–	–
" rear transom and tie	1	Do.	20.47	20.47	20.3	–	1
" trunnion plates	4	No. 4, E.‖	4.	4.	4.5	–	–
" rivet bolts, for uprights.	2	No. 4, A.	16.88	16.88	17.63	2	2
" rivet bolts, for braces	2	No. 2, G	12.	12.	12.63	–	2
CHASSIS.							
For hurters and rails	2	No. 5, A.	14.83	14.83	15.83	2	2
" middle transom and rails	2	No. 5, B.	16.19	16.19	17.19	–	2
" front transom and tongue	1	Do.§	13.25	13.25	14.25	–	1
" middle transom & tongue	1	Do.	18.19	18.19	19.19	–	1
" rear transom and tongue	1	Do	14.19	14.19	15.19	–	1
" rear transom & fork plates	2	Do.	8.6	8.6	8.6	–	–
" counter hurters, rails,	2	No. 5.**	12.75	12.75	13.75	–	–
and fork plates	2	Do.**	16.55	16.55	17.55	–	–
" front transom and rails	2	Do.**	15.9	15.9	16.9	–	–
" rail plates	4	No. 2, C.	6.63	6.63	7.63	–	4
" manœuvring loop	1	No. 2, B.	9.9	9.9	10.9	–	–
" prop	1	No. 2. **	8.35	8.35	9.35	–	–
Rivet bolts, front transom.	4	No. 2, F.	8.63	8.63	8.63	–	4
Rivet bolts, middle "	2	Do.	6.63	6.63	7.63	–	2
RIVETS for hurters and counter hurters	4	No. 4, B.	6.	6.	7.	–	4††

* Bevel washers. † Plate VII. ‡ Double washer. ‖ Nuts not chamfered.
§ Head 2.25 inches diameter. ** Plate XII. †† Burrs.

Bolts and rivets for barbette carriages.

DESIGNATION.	Number.	Kind.	LENGTH.			WASHERS.	
			32-p'r.	8-inch how'r.	42-p'r.	Head.	Nut.
GUN CARRIAGE.			In.	In.	In.		
For connecting the uprights and braces	2	No. 7, A.	31.35	31.35	32.45	2	2*
" manœuvring collars	2	No. 7.†	27.25	27.25	28.	2	2
" assembling the cheeks	6	No. 5, A.	33.2	33.2	35.48	6	6
" axle body and tie	2	Do.	16.44	16.44	16.41	–	1‡
" elevating bed plate	1	Do.	16.94	–	16.94	1	–
	2	No. 4, A.	–	18.7	–	2	–
" mid. transom and brace	1	No. 5, A.	20.88	–	21.7	1	–
	1	No. 5, B.	–	20.7	–	–	–
" rear transom and bed plate	1	Do.	21.13	–	21.	–	–
" rear transom and tie	1	Do.	20.3	21.3	20.2	–	1
	1	Do.	–	21.65	–	–	1
" trunnion plates	4	No. 5, E.§	5.	5.	5	–	–
Rivet bolts, for uprights	2	No. 5, A.	18.38	18.38	19.13	2	2
Rivet bolts, for braces	2	No. 2, G.	14.13	14.13	14.63	–	2
CHASSIS.							
For hurters and rails	2	No. 5, A.	16.8	16.8	17.8	2	2
" pipes	2	Do.	52.68	52.68	54.88	2	2
" middle transom and rails.	4	No. 5, B.	19.19	19.19	21.19	–	4
" front transom and tongue	1	Do.‖	15.19	15.19	16.19	–	1
" tongue and brace	1	Do.	12.5	12.5	13.5	–	–
" middle transom & tongue	1	Do.	21.19	21.19	23.19	–	1
" rear transom and tongue.	1	Do.	16.19	16.19	17.19	–	1
" rear transom & fork plates	2	Do.	9.6	9.6	9.6	–	–
" counter hurters, rails,	2	No. 5.*	14.75	14.75	15.75	–	–
and fork plates	2	Do.*	18.55	18.55	19.55	–	–
" front transom and rails.	2	Do.*	17.85	17.85	18.85	–	–
" rail plates	4	No. 2, C.	8.63	8.63	9.63	–	4
" manœuvring loop	1	No. 2, B.	11.9	11.9	12.9	–	–
" prop	1	No. 2.*	10.35	10.35	11.35	–	–
Rivet bolts for front and middle transoms	6	No. 2, F.	10.63	10.63	10.63	–	6
RIVETS for hurters and counter hurters	4	No. 4, B.	8.	8.	9.00	–	4††

* Bevel washers. † Plate VII. ‡ Double washer. § Nuts not chamfered.
‖ Head 2.25 inches diameter. ** Plate XII. †† Burrs.

Bill of timber for one 12-pounder or one 18-pounder barbette carriage.

NAMES OF PARTS.	No. of pieces.	DIMENSIONS. FINISHED. Long.	Wide.	Thick.	ROUGH. Long.	Wide.	Thick.	CONTENTS OF ROUGH TIMBER. Each piece.	Total.	REMARKS.
GUN CARRIAGE.		In.	In.	In.	In.	In.	In.	Sup. feet.	Sup. feet.	
Uprights	2	42.9	15.75	4.5	52.	17.	5.5	33.76	67.52	2 in one piece.
Braces	2	73.	11.4	4.5	83.	12.5	5.5	39.62	79.24	Do.
Front transom. 12-pr.	1	16.4	11.	8.	23.	12.	9.	17.25	17.25	4 or 6 in one.
Front transom. 18-pr.	1	18.4								
Mid. transom. 12-pr.	1	16.4	8.	7.	23.	9.	8.	11.5	11.5	Do.
Mid. transom. 18-pr.	1	18.4								
Rear transom. 12-pr.	1	16.4	12.	9.3	23.	13.	10.25	21.28	21.28	Do.
Rear transom. 18-pr.	1	18.4								
Transom and axle tie	1	72.5	10.	7.	82.	11.	8.	50.11	50.11	
Elevating bed	1	23.7	7.	5.	28.	8.	6.	9.33	9.33	
Axle body	1	30.6	8.	7.5	35.	9.	8.5	18.59	18.59	3 or 4 in one.
Spokes for two wheels.	20	17.33	3.5	3.5	22.	4.25	4.25	2.76	55.20	6 in one.
									330.02	
CHASSIS.										
Rails	2	136.54	11.	6.	148.	12.5	7.5	96.35	192.70	
Hurters	2	10.63	6.	3.8	28.	7.	5.25	7.14	14.28	4 or 6 in one.
Counter hurters	2	13.03	6.	4.55						
Front transom	1	43.	8.	8.	48.	9.	9.	27.	27.	2 or 3 in one.
Middle transom	1	43.	8.	6.	48.	9.	7.	21.	21.	Do.
Rear transom	1	36.6	8.	7.	42.	9.	8.	21.	21.	Do.
Tongue	1	178.54	9.	7.	192.	10.5	8.5	119.	119.	
Prop	1	33.	7.	3.	36.	8.	4.	8.	8.	4 in one.
									402.98	

Bill of timber for one 24-pounder barbette carriage.

NAMES OF PARTS.	No. of pieces.	DIMENSIONS. FINISHED. Long.	Wide.	Thick.	ROUGH. Long.	Wide.	Thick.	CONTENTS OF ROUGH TIMBER. Each piece.	Total.	REMARKS.
GUN CARRIAGE.		In.	In.	In.	In.	In.	In.	Sup. feet.	Sup. feet.	
Uprights	2	43.65	16.5	4.75	52.	17.75	5.75	36.85	73.70	2 in one piece.
Braces	2	74.5	12.	4.75	83.	13.	5.75	43.09	86.18	Do.
Front transom	1	19.6	11.	8.	24.	12.	9.	18.	18.	4 or 6 in one.
Middle transom	1	19.6	8.	8.	24.	9.	9.	13.5	13.5	Do.
Rear transom	1	19.6	13.	9.8	24.	14.	11.	25.66	25.66	Do.
Transom and axle tie	1	73.75	10.	8.	84.	11.	9.	57.75	57.75	
Elevating bed	1	23.75	8.	5.	28.	9.	6.	10.5	10.5	4 or 6 in one.
Axle body	1	32.6	8.	7.5	36.	9.	8.5	19.12	19.12	3 or 4 in one.
Spokes for two wheels	20	17.33	3.5	3.5	22.	4.25	4.25	2.76	55.20	6 in one.
									359.61	
CHASSIS.										
Rails	2	136.46	12.	7.	148.	13.5	8.5	117.93	235.86	
Hurters	2	10.63	7.	3.8	28.	8.	5.25	8.16	16.32	4 or 6 in one.
Counter hurters	2	13.03	7.	4.55						
Front transom	1	45.	8.	8.	51.	9.	9.	28.68	28.68	2 or 3 in one.
Middle transom	1	45.	8.	7.	51.	9.	8.	25.5	25.5	Do.
Rear transom	1	36.6	8.	7.	42.	9.	8.	21.	21.	Do.
Tongue	1	178.46	10.	8.	192.	11.5	9.5	145.66	145.66	
Prop	1	33.	8.	3.	36.	9.	4.	9.	9.	4 in one.
									482.02	

Bill of timber for one 32-pounder or one 8-inch howitzer barbette carriage.

NAMES OF PARTS.	No. of pieces.	DIMENSIONS. FINISHED. Long.	Wide.	Thick.	ROUGH. Long.	Wide.	Thick.	CONTENTS OF ROUGH TIMBER. Each piece.	Total.	REMARKS.
GUN CARRIAGE.		In.	In.	In.	In.	In.	In.	Sup. feet.	Sup. feet.	
Uprights	2	45.25	17.	5.5	54.	18.25	6.75	46.19	92.38	2 in one piece.
Braces	2	74.75	13.5	5.5	84.	14.5	6.75	57.09	114.18	Do.
Front transom	1	22.3	11.	8.	27.	12.	9.	20.25	20.25	4 or 6 in one.
Middle transom	1	22.3	9.7	8.	27.	11.	9.	18.56	18.56	Do.
Rear transom	1	22.3	13.	11.	27.	14.	12.	31.5	31.50	Do.
Transom and axle tie.	1	73.75	10.	9.	84.	11.	10.	64.16	64.16	
Elevating bed { 32-pr..	1	23.8	9.	5.	28.	10.	6.	11.66	11.66	4 or 6 in one.
Elevating bed { 8-inch.	1	23.8	9.	7.	28.	10.	8.	15.55	15.55	Do.
Axle body	1	36.9	8.	7.5	42.	9.	8.5	22.31	22.31	3 in one.
Spokes for two wheels.	20	17.33	3.5	3.5	22.	4.25	4.25	2.76	55.20	6 in one.
Total.. { 32-pr..	–	–	–	–	–	–	–	–	430.20	
Total.. { 8-inch.	–	–	–	–	–	–	–	–	434.09	
CHASSIS.										
Rails	2	136.	13.	8.	148.	14.5	9.5	141.57	283.14	
Hurters	2	10.63	8.	3.8	} 28.	9.	5.25	9.19	18.38	4 or 6 in one.
Counter hurters	2	13.03	8.	4.55	}					
Front transom	1	51.3	10.	8.	57.	11.	9.	39.19	39.19	2 in one.
Middle transom	1	51.3	10.	9.	57.	11.	10.	43.54	43.54	Do.
Rear transom	1	40.9	8.	8.	48.	9.	9.	27.	27.	Do.
Tongue	1	179.	11.	9.	192.	12.5	10.5	167.70	167.70	
Prop	1	33.	9.	3.	36.	10.	4.	10.	10.	4 in one.
									588.95	

Bill of timber for one 42-pounder barbette carriage.

NAMES OF PARTS.	No. of pieces.	DIMENSIONS. FINISHED. Long.	Wide.	Thick.	ROUGH. Long.	Wide.	Thick.	CONTENTS OF ROUGH TIMBER. Each piece.	Total.	REMARKS.
GUN CARRIAGE.		In.	In.	In.	In.	In.	In.	Sup.feet.	Sup. feet.	
Uprights	2	46.	17.75	6.	55.	19.	7.25	52.61	105.22	2 in one piece.
Braces	2	77.	14.	6.	87.	15.	7.25	65.70	131.40	
Front transom	1	23.6	12.	8.	28.	13.	9.	22.75	22.75	4 or 6 in one.
Middle transom	1	23.6	10.5	8.	28.	11.5	9.	20.12	20.12	Do.
Rear transom	1	23.6	14.	11.	28.	15.	12.	35.	35.00	Do.
Transom and axle tie.	1	75.05	10.	10.	85.	11.	11.	71.42	71.42	
Elevating bed	1	24.6	10.	5.	29.	11.	6.	13.29	13.29	4 or 6 in one.
Axle body	1	39.15	8.	7.5	45.	9.	8.5	23.90	23.90	3 in one.
Spokes for two wheels.	20	17.33	3.5	3.5	22.	4.25	4.25	2.76	55.20	6 in one.
									478.30	
CHASSIS.										
Rails	2	135.9	14.	9.	148.	15.5	10.5	167.27	334.54	
Hurters	2	10.63	9.	3.8	28.	10.	5.25	10.20	20.40	4 or 6 in one.
Counter hurters	2	13.03	9.	4.55						
Front transom	1	53.5	10.	8.	60.	11.	9.	41.25	41.25	2 in one.
Middle transom	1	53.5	10.	10.	60.	11.	11.	50.41	50.41	Do.
Rear transom	1	41.1	8.	8.	48.	9.	9.	27.	27.	Do.
Tongue	1	178.9	12.	10.	192.	13.5	11.5	207.	207.	
Prop	1	33.	10.	3.	36.	11.	4.	11.	11.	4 in one.
									691.60	

Bill of iron for one 12*-pr. or one* 18*-pr. barbette gun carriage.*

NAMES OF PARTS.	Wide.	Thick.	Long.	REMARKS.
	In.	In.	In.	
2 trail rivet bolts	0.5	Round	27.	
2 rivet bolts for uprights—Heads	1.5	Round	4.	
2 rivet bolts for uprights—Bodies	0.75	Round	27.78	
12 heads for bolts No. 5	2.	Round	36.	
2 cheek bolts—bodies	1.	Round	48.	
2 bevel washers	–	–	–	Cast iron.
1 lunette	4.	1.5	14.	
4 assembling bolts—bodies—12-pr.	1.	Round	85.12	
4 assembling bolts—bodies—18-pr.	1.	Round	93.12	
1 rear transom and tie bolt—body	1.	Round	16.47	
1 bed plate bolt—body	1.	Round	17.3	
1 bed plate bolt—body	1.	Round	12.94	
1 bed plate for elevating screw	4.	1.	9.5	
	2.	1.	10.5	
1 nut for elevating screw	–	–	–	Cast brass.
1 elevating screw	2.375	Round	21.	
1 axletree	–	–	–	Draft.
2 axle stirrups	2.	0.75	40.	
2 bridles	2.	0.75	22.	
1 clamp washer	3.	.5	15.5	
2 bolts for axle and tie—bodies	1.	Round	24.72	
1 double washer	3.	1.	4.5	
1 bolt for middle transom and tie—body	1.	Round	14.88	
2 manœuvring bolts—Heads	2.	Round	6.	
2 manœuvring bolts—Bodies	1.	1.	34.	
2 collars	4.	0.5	14.25	
2 cheek plates	3.25	0.25	19.5	
2 manœuvring staples	0.75	Round	30.	
2 trunnion plates	4.5	0.5	47.25	
4 trunnion plate bolts	1.5	1.5	12.	
2 rollers	–	–	–	Cast iron.
4 axle washers	1.5	0.5	62.	
2 linch pins	1.5	0.75	10.	
2 washers No. 2	1.625	0.125	3.25	
4 washers No. 4	2.5	0.188	10.	
18 washers No. 5	3.25	0.188	57.5	
2 nuts No. 2	1.	0.5	2.	
10 nuts No. 4	1.5	0.75	15.	
14 nuts No. 5	2.	1.	28.	
2 wheels—2 naves	–	–	–	Cast iron.
2 wheels—2 tires	4.5	0.875	272.	In two pieces.
2 wheels—20 nails	0.5	0.5	95.	

Bill of iron for one 24-pounder barbette gun carriage.

NAMES OF PARTS.	Wide.	Thick.	Long.	REMARKS.
	In.	In.	In.	
2 trail rivet bolts	0.5	Round	28.25	
2 rivet bolts for uprights—Heads	1.5	Round	4.	
2 rivet bolts for uprights—Bodies	0.75	Round	29.26	
2 cheek bolts—Heads	2.25	Round	6.5	
2 cheek bolts—Bodies	1.125	Round	50.6	
2 bevel washers	–	–	–	Cast iron.
1 lunette	4.	1.5	14.	
10 heads of bolts No. 5	2.	Round	30.	
4 assembling bolts—bodies	1.	Round	100.	
1 rear transom and tie bolt—body	1.	Round	16.3	
1 bed plate bolt—body	1.	Round	17.13	
1 bed plate bolt—body	1.	Round	12.94	
1 bed plate for elevating screw	4.	1.	9.5	
	2.	1.	10.5	
1 nut for elevating screw	–	–	–	Cast brass.
1 elevating screw	2.375	Round	21.	
1 axletree	–	–	–	Draft.
2 axle stirrups	2.	0.75	40.	
2 bridles	2.	0.75	22.	
1 axle and tie brace	3.	0.5	37.25	
2 axle and tie bolts—bodies	1.	Round	24.72	
1 double washer	3.	1.	4.5	
1 middle transom and tie bolt—body	1.	Round	15.19	
2 manœuvring bolts—Heads	2.25	Round	6.5	
2 manœuvring bolts—Bodies	1.125	1.125	35.75	
2 collars	4.	0.5	15.28	
2 cheek plates	3.5	0.25	19.5	
2 manœuvring staples	0.75	Round	30.	
2 trunnion plates	4.75	0.5	49.75	
4 trunnion plate bolts	1.5	1.5	12.	
2 rollers	–	–	–	Cast iron.
4 axle washers	1.5	0.5	62.	
2 linch pins	1.5	0.75	10.	
2 washers No. 2	1.625	0.125	3.25	
4 washers No. 4	2.5	0.188	10.	
11 washers No. 5	3.25	0.188	35.25	
6 washers No. 6	3.625	0.188	21.5	
2 nuts No. 2	1.	0.5	2.	
10 nuts No. 4	1.5	0.75	15.	
10 nuts No. 5	2.	1.	20.	
4 nuts No. 6	2.25	1.125	10.	
2 wheels—2 naves	–	–	–	Cast iron.
2 wheels—2 tires	4.5	0.875	272.	In two pieces.
2 wheels—20 nails	0.5	0.5	95.	

Bill of iron for one 32-pr. or one 8-in. how'r barbette gun carriage.

NAMES OF PARTS.	Wide.	Thick.	Long.	REMARKS.
	In.	In.	In.	
2 trail rivet bolts	0.5	Round	31.25	
14 heads of bolts No. 5, for 32-pr.	2.	Round	42.	
13 heads of bolts No. 5, for 8-in.	2.	Round	39.	
2 rivet bolts for uprights, bodies	1.	Round	28.76	
2 cheek bolts.. Heads	2.5	Round	7.	
2 cheek bolts.. Bodies	1.25	Round	54.7	
2 bevel washers	–	–	–	Cast iron.
1 lunette	4.	1.5	14.	
6 assembling bolts—bodies	1.	Round	165.2	
1 rear trans. & tie bolt, for 32-pr	1.	Round	16.3	
2 rear trans. & tie bolts, for 8-in	1.	Round	34.95	
1 bed plate bolt. For 32-pr..	1.	Round	17.13	
1 bed plate bolt. For 32-pr..	1.	Round	12.94	
2 bed plate bolts—for 8-inch Heads.	1.5	Round	4.	
2 bed plate bolts—for 8-inch Bodies.	0.75	Round	31.4	
1 bed plate for elevating screw	4.	1.	9.5	7. 5 for 8-inch.
1 bed plate for elevating screw	2.	1.	10.5	
1 nut for elevating screw	–	–	–	Cast brass.
1 elevating screw	2.375	Round	21.	
1 axletree	–	–	–	Draft.
2 axle stirrups and bridles	2.	0.75	62.	
1 axle and tie brace	3.	0.5	37.25	
2 axle and tie bolts—bodies	1.	Round	24.88	
1 double washer	3.	1.	4.5	
1 middle transom and tie bolt..	1.	Round	16.88	
2 manœuvring bolts Heads ..	2.5	Round	7.	
2 manœuvring bolts Bodies...	1.25	1.25	45.75	
4 collars	4.	0.5	29.	
4 cheek plates	4.25	0.25	39.	
2 manœuvring staples	0.75	Round	30.	
2 trunnion plates	5.5	0.5	54.75	
4 trunnion plate bolts	2.	2.	14.	
2 rollers	–	–	–	Cast iron.
4 axle washers	1.5	0.5	62.	
2 linch pins	1.5	0.75	10.	
2 washers No. 2	1.625	0.125	3.25	
2 washers No. 4—for 8-inch.	2.5	0.188	5.	
19 washers No. 5—for 32-pr.	3.25	0.188	60.75	
18 washers No. 5—for 8-inch.	3.25	0.188	57.5	
6 washers No. 7	4.125	0.25	24.5	
2 nuts No. 2	1.	0.5	2.	
4 nuts No. 4—for 32-pounder.	1.5	0.75	6.	
6 nuts No. 4—for 8-inch	1.5	0.75	9.	
18 nuts No. 5—for 32-pounder.	2.	1.	36.	
17 nuts No. 5—for 8-inch	2.	1.	34.	
4 nuts No. 7	2.5	1.25	10.	
2 wheels.. 2 naves	–	–	–	Cast iron.
2 wheels.. 2 tires	4.5	0.875	272.	In two pieces.
2 wheels.. 20 nails	0.5	0.5	95.	

Bill of iron for one 42-pounder barbette gun carriage.

NAMES OF PARTS.	Wide.	Thick.	Long.	REMARKS.
	In.	In.	In.	
2 trail rivet bolts	0.5	Round	32.25	
14 heads for bolts No. 5	2.	Round	42.	
2 rivet bolts for uprights, bodies	1.	Round	30.26	
2 cheek bolts.. Heads	2.5	Round	7.	
2 cheek bolts.. Bodies	1.25	Round	56.9	
2 bevel washers	–	–	–	Cast iron.
1 lunette	4.	1.5	14.	
6 assembling bolts—bodies	1.	Round	188.88	
1 rear transom & tie bolt, body	1.	Round	16.2	
1 bed plate bolt—body	1.	Round	17.	
1 bed plate bolt—body	1.	Round	12.94	
1 bed plate for elevating screw	4.	1.	9.5	
1 bed plate for elevating screw	2.	1.	10.5	
1 nut for elevating screw	–	–	–	Cast brass.
1 elevating screw	2.375	Round	21.	
1 axletree	–	–	–	Draft.
2 axle stirrups	2.	0.75	40.	
2 bridles	2.	0.75	22.	
1 axle and tie brace	3.	0.5	37.25	
2 axle and tie bolts—bodies	1.	Round	24.82	
1 double washer	3.	1.	4.5	
1 middle trans. and tie bolt—body	1.	Round	17.7	
2 manœuvring bolts.. Heads	2.5	Round	7.	
2 manœuvring bolts.. Bodies	1.25	1.25	47.25	
4 collars	4.	0.5	29.	
4 cheek plates	4.75	0.25	39.	
2 manœuvring staples	0.75	Round	30.	
2 trunnion plates	6.	0.5	55.	
4 trunnion plate bolts	2.	2.	14.	
2 rollers	–	–	–	Cast iron.
4 axle washers	1.5	0.5	62.	
2 linch pins	1.5	0.75	10.	
2 washers No. 2	1.625	0.125	3.25	
19 washers No. 5	3.25	0.188	60.75	
6 nuts No. 7	4.125	0.25	24.5	
2 nuts No. 2	1.	0.5	2.	
4 nuts No. 4	1.5	0.75	6.	
18 nuts No. 5	2.	1.	36.	
4 nuts No. 7	2.5	1.25	10.	
2 wheels.. 2 naves	–	–	–	Cast iron.
2 wheels.. 2 tires	4.5	0.875	272.	In two pieces.
2 wheels.. 20 nails	0.5	0.5	95.	

Bills of iron for barbette chassis, for 12-pounder, 18-pounder and 24-pounder carriages.

NAMES OF PARTS.	Width.	Thickness.	LENGTH.	
			12-pr. & 18-pr.	24-pr.
	In.	In.	In.	In.
2 rail plates	2.	0.25	220.3	218.94
4 bolts for rail plates	0.5	Round	30.52	34.5
4 rivets for hurters and counter hurters	0.5	Round	32.	36.
4 burrs for rivets	1.5	0.375	6.	6.
6 rivet bolts for transoms	0.5	Round	59.78	61.78
1 friction plate.. Middle	5.	0.5	8.	8.
1 friction plate.. Ends	3.5	0.5	33.5	34.5
15 heads of bolts No. 5	2.	Round	45.	45.
2 bolts for hurters and rails—bodies	1.	Round	21.66	22.66
2 bolts for front transom and rails—bodies	1.	Round	23.8	24.8
2 bolts for middle transom and rails—bodies	1.	Round	24.38	25.38
4 bolts for rails and fork plates—bodies	1.	Round	42.6	46.6
2 bolts for rear transom and fork plates—bodies	1.	Round	8.2	8.2
1 bolt for front transom and tongue—body	1.	Round	9.25	10.25
2 bolts for middle and rear transom and tongue—bodies	1.	Round	24.38	26.38
2 fork sockets	6.625	0.25	19.9	19.9
2 fork plates	8.	1.	19.	19.
1 manœuvring loop	2.	0.4	14.5	14.5
1 loop bolt	0.5	Round	11.4	12.4
2 prop plates	1.5	0.3	19.75	19.75
1 prop bolt	0.5	Round	9.85	10.85
1 key for prop bolt	0.75	0.125	1.5	1.5
2 forks	3.	1.25	66.	66.
2 fork bolts	2.375	Round	16.	16.
10 washers No. 2	1.625	0.125	16.	16.
9 washers No. 5	3.25	0.188	28.75	28.75
11 nuts No. 2	1.	0.5	11.	11.
17 nuts No. 5	2.	1.	34.	34.
28 nails No. 1	0.25	0.25	93.	93.
2 traverse wheels—cast iron.				

Bills of iron for barbette chassis, for 32-pounder, 8-inch and 42-pounder carriages.

NAMES OF PARTS.	Width.	Thickness.	LENGTH.	
			32-pr. & 8-inch.	42-pr.
	In.	In.	In.	In.
2 rail plates	2.	0.25	217.92	217.6
4 bolts for rail plates	0.5	Round	38.52	42.52
4 rivets for hurters and counter hurters	0.5	Round	40.	44.
4 burrs for rivets	1.5	0.375	6.	6.
6 rivet bolts for transoms	0.5	Round	75.78	75.78
1 friction place and brace. Middle	7.	0.5	8.	8.
1 friction place and brace. Ends	3.5	0.5	39.8	41.
1 friction place and brace. Brace	3.	0.5	35.83	35.83
20 heads of bolts No. 5	2.	Round	60.	60.
1 bolt for tongue and brace—body	1.	Round	8.5	9.5
2 bolts for hurters and rails—bodies	1.	Round	25.6	26.6
2 bolts for front transom and rails—bodies	1.	Round	27.7	28.7
4 bolts for middle transom and rails—bodies	1.	Round	68.76	76.76
4 bolts for rails and fork plates—bodies	1.	Round	50.6	64.6
2 bolts for rear transom and fork plates—bodies	1.	Round	11.2	11.2
1 bolt for front transom and tongue—body	1.	Round	11.19	12.19
2 bolts for middle and rear transom and tongue—bodies	1.	Round	29.38	32.38
2 bolts for pipes—bodies	1.	Round	97.36	101.76
2 fork sockets	6.625	0.25	19.9	19.9
2 fork plates	8.	1.	19.	19.
1 manœuvring loop	2.	0.4	14.5	14.5
1 loop bolt	0.5	Round	13.4	14.4
2 prop plates	1.5	0.3	19.75	19.75
1 prop bolt	0.5	Round	11.85	12.85
1 key for prop bolt	0.75	0.125	1.5	1.5
2 forks	3.	1.25	66.	66.
2 fork bolts	2.375	Round	16.	16.
10 washers No. 2	1.625	0.125	16.	16.
15 washers No. 5	3.25	0.188	48.	48.
11 nuts No. 2	1.	0.5	11.	11.
22 nuts No. 5	2.	1.	44.	44.
28 nails No. 1	0.25	0.25	93.	93.
4 pipes—cast iron.				
2 traverse wheels—cast iron.				

Summary bill of iron for one 12*-pr. or one* 18*-pr. barbette carriage.*

SIZE OF IRON.		GUN CARRIAGE.		CHASSIS.		TOTAL.		REMARKS.
Wide.	Thick.							
In.	In.	Feet.	Lbs.	Feet.	Lbs.	Feet.	Lbs.	
0.5	Round	2.25	1.47	11.96	7.82	14.21	9.29	
0.75	Round	4.82	7.08	–	–	4.82	7.08	
1.	Round	18.28	47.72	12.85	33.53	31.13	81.25	Add 8 in. for 18-pr
1.5	Round	.33	1.94	–	–	.33	1.94	
2.	Round	3.5	36.64	3.75	39.26	7.25	75.90	
2.375	Round	1.75	25.83	1.33	19.63	3.08	45.46	Hammered.
0.25	0.25	–	–	7.75	1.63	7.75	1.63	
0.5	0.5	7.92	6.65	–	–	7.92	6.65	
0.75	0.125	–	–	.12	.03	.12	.03	
1.0	0.5	.17	.28	.92	1.54	1.09	1.82	
1.0	1.0	2.83	9.50	–	–	2.83	9.50	
1.5	0.3	–	–	1.64	2.49	1.64	2.49	
1.5	0.375	–	–	.50	.94	.50	.94	
1.5	0.5	5.17	13.02	–	–	5.17	13.02	
1.5	0.75	2.08	7.86	–	–	2.08	7.86	
1.5	1.5	1.00	7.56	–	–	1.00	7.56	
1.625	0.125	.27	.18	1.33	.90	1.60	1.08	
2.0	0.25	–	–	18.36	30.84	18.36	30.84	
2.0	0.4	–	–	1.21	3.24	1.21	3.24	
2.0	0.75	5.17	26.05	–	–	5.17	26.05	
2.0	1.	3.20	21.50	2.83	19.02	6.03	40.52	
2.5	0.188	.83	1.30	–	–	.83	1.30	
3.0	0.5	1.30	6.55	–	–	1.30	6.55	
3.0	1.0	.37	3.73	–	–	.37	3.73	
3.0	1.25	–	–	5.5	69.30	5.5	69.30	
3.25	0.188	4.80	9.79	2.40	4.89	7.20	14.68	
3.25	0.25	1.62	4.42	–	–	1.62	4.42	
3.5	0.5	–	–	2.80	16.46	2.80	16.46	
4.0	0.5	1.19	7.99	–	–	1.19	7.99	
4.	1.0	.79	10.61	–	–	.79	10.61	
4.	1.5	1.16	23.41	–	–	1.16	23.41	
4.5	0.5	3.94	29.78	–	–	3.94	29.78	
4.5	0.875	22.67	299.69	–	–	22.67	299.69	2 pieces, 11 ft. 4 in.
5.	0.5	–	–	1.6	13.44	1.6	13.44	
6.625	0.25	–	–	1.62	9.0	1.62	9.0	
8.	1.	–	–	1.58	42.47	1.56	42.47	
			141.	–	–	–	141.	Draft for axletree.
			751.55	–	316.43	–	1067.98	Add 1.75 lb for 18p
Cast iron...		–	4.	–	–	–	4.	2 bevel washers.
		–	270.	–	–	–	270.	2 rollers.
		–	206.	–	–	–	206.	2 naves.
		–	–	–	130.	–	130.	2 traverse wheels.
		–	480.	–	130.	–	610.	
Cast brass....		–	11.	–	–	–	11.	Nut for screw.

Summary bill of iron for one 24-pounder barbette carriage.

SIZE OF IRON.		GUN CARRIAGE.		CHASSIS.		TOTAL.		REMARKS.
Wide.	Thick.							
In.	In.	Feet.	Lbs.	Feet.	Lbs.	Feet.	Lbs.	
0.5	Round	2.35	1.54	12.96	8.47	15.31	10.01	
075	Round	4.94	7.26	–	–	4.94	7.26	
1.0	Round	15.52	40.50	13.69	35.73	29.21	76.23	
1.125	Round	4.21	13.93	–	–	4.21	13.93	
1.5	Round	.33	1.94	–	–	.33	1.94	
2.	Round	2.5	26.17	3.75	39.26	6.25	65.43	
2.25	Round	1.08	14.31	–	–	1.08	14.31	
2.375	Round	1.75	25.83	1.33	19.63	3.08	45.46	Hammered.
0.25	0.25	–	–	7.75	1.62	7.75	1.62	
0.5	0.5	7.92	6.65	–	–	7.92	6.65	
0.75	0.125	–	–	.12	0.03	.12	.03	
1.0	0.5	.16	.27	.91	1.52	1.07	1.79	
1.125	1.125	3.14	13.34	–	–	3.14	13.34	
1.5	0.3	–	–	1.64	2.49	1.63	2.49	
1.5	0.375	–	–	0.5	.94	.5	.94	
1.5	0.5	5.16	13.	–	–	5.16	13.00	
1.5	0.75	2.92	11.03	–	–	2.92	11.03	
1.5	1.5	1.0	7.56	–	–	1.0	7.56	
1.625	0.125	.27	.18	1.33	.90	1.60	1.08	
2.0	0.25	–	–	18.25	30.66	18.25	30.66	
2.0	0.4	–	–	1.21	3.24	1.21	3.24	
2.0	0.75	5.17	26.05	–	–	5.17	26.05	
2.0	1.0	2.54	17.07	2.83	19.01	5.37	36.08	
2.25	1.125	.83	7.05	–	–	.83	7.05	
2.5	0.188	.83	1.30	–	–	.83	1.30	
3.0	0.5	3.10	15.62	–	–	3.10	15.62	
3.0	1.0	.37	3.73	–	–	.37	3.73	
3.0	1.25	–	–	5.5	69.30	5.5	69.30	
3.25	0.188	2.94	5.99	2.39	4.88	5.33	10.87	
3.5	0.25	1.62	4.76	–	–	1.62	4.76	
3.5	0.5	–	–	2.87	16.87	2.87	16.87	
3.625	0.188	1.8	4.10	–	–	1.8	4.10	
4.	0.5	1.27	8.53	–	–	1.27	8.53	
4.	1.0	.8	10.75	–	–	.8	10.75	
4.	1.5	1.17	23.61	–	–	1.17	23.61	
4.5	0.875	22.67	299.69	–	–	22.67	299.69	2 pieces, 11 ft. 4 in.
4.75	0.5	4.15	33.11	–	–	4.15	33.11	
5.	0.5	–	–	1.6	13.44	1.6	13.44	
6.625	0.25	–	–	1.66	9.23	1.66	9.23	
8.0	1.0	–	–	1.58	42.48	1.58	42.48	
			147.	–	–	–	147.	Draft for axletree.
			791.87	–	319.7	–	1111.57	
Cast iron...		–	6.	–	–	–	6.	2 bevel washers.
		–	270.*	–	130.†	–	400.	*2 rollers, †2 wh'ls
		–	206.	–	–	–	206.	2 naves.
		–	482.	–	130.	–	612.	
Cast brass...			11.	–	–	–	11.	Nut for screw

Summary bill of iron for one 32-pounder barbette carriage.

SIZE OF IRON.		GUN CARRIAGE.		CHASSIS.		TOTAL.		REMARKS.
Wide.	Thick.							
In.	In.	Feet.	Lbs.	Feet.	Lbs.	Feet.	Lbs.	
0.5	Round	2.60	1.70	14.96	9.78	17.56	11.48	
0.75	Round	2.50	3.67	–	–	2.50	3.67	
1.00	Round	23.51	61.36	27.52	71.82	51.03	133.18	
1.25	Round	4.56	18.65	–	–	4.56	18.65	
2.	Round	3.50	36.64	5.0	52.35	8.50	88.99	
2.375	Round	1.75	25.83	1.33	19.63	3.08	45.46	Hammered.
2.5	Round	1.17	19.14	–	–	1.17	19.14	
0.25	0.25	–	–	.77	.16	.77	.16	
0.5	0.5	7.92	6.65	–	–	7.92	6.65	
0.75	0.125	–	–	.14	.04	.14	.04	
1.0	0.5	.16	.27	.91	1.52	1.07	1.79	
1.25	1.25	3.81	20.00	–	–	3.81	20.00	
1.5	0.3	–	–	1.64	2.49	1.64	2.49	
1.5	0.375	–	–	.50	.94	.50	.94	
1.5	0.5	5.17	13.	–	–	5.17	13.	
1.5	0.75	1.33	5.02	–	–	1.33	5.02	
1.625	0.125	.27	.18	1.33	.90	1.60	1.08	
2.0	0.25	–	–	18.16	30.51	18.16	30.51	
2.0	0.4	–	–	1.21	3.24	1.21	3.24	
2.0	0.75	5.17	26.05	–	–	5.17	26.05	
2.0	1.0	3.87	26.00	3.67	24.66	7.54	50.66	
2.0	2.0	1.17	15.72	–	–	1.17	15.72	
2.5	1.25	.83	8.71	–	–	.83	8.71	
3.0	0.5	3.10	15.62	2.98	15.01	6.08	30.63	
3.0	1.	.44	4.44	–	–	.44	4.44	
3.0	1.25	–	–	5.5	69.30	5.5	69.30	
3.25	0.188	5.06	10.32	4.	8.16	9.06	18.48	
3.5	0.5	–	–	3.32	19.52	3.32	19.52	
4.0	0.5	2.42	16.26	–	–	2.42	16.26	
4.0	1.0	.79	10.62	–	–	.79	10.62	
4.0	1.5	1.17	23.61	–	–	1.17	23.61	
4.125	0.25	2.04	7.06	–	–	2.04	7.06	
4.25	0.25	3.25	11.60	–	–	3.25	11.60	
4.5	0.875	22.67	299.69	–	–	22.67	299.69	2 pieces, 11 ft. 4 in.
5.5	0.5	4.56	42.13	–	–	4.56	42.13	
6.625	0.25	–	–	1.66	9.23	1.66	9.23	
7.0	0.5	–	–	.67	7.88	.67	7.88	
8.0	1.0	–	–	1.58	42.48	1.58	42.48	
			205.	–	–	–	205.	Draft for axletree.
			934.94	–	389.62	–	1324.56	
Cast iron...		–	7.5*	–	50.†	–	57.5	*2 wash's, †4 pipes
		–	292.‡	–	130.‖	–	422.	‡2 rollers, ‖2 wh'ls
		–	206.	–	–	–	206.	2 naves.
		–	505.5	–	180.	–	685.5	
Cast brass....		–	11.	–	–	–	11.	Nut for screw.

Summary bill of iron for one 8-inch howitzer barbette carriage.

SIZE OF IRON.		GUN CARRIAGE		CHASSIS.		TOTAL.		REMARKS.
Wide.	Thick.							
In.	In.	Feet.	Lbs.	Feet.	Lbs.	Feet.	Lbs.	
0.5	Round	2.60	1.70	14.96	9.78	17.56	11.48	
0.75	Round	5.12	7.53	–	–	5.12	7.53	
1.0	Round	22.55	58.85	27.52	71.83	50.07	130.68	
1.25	Round	4.56	18.65	–	–	4.56	18.65	
1.5	Round	.33	1.94	–	–	.33	1.94	
2.0	Round	3.25	34.03	5.0	52.35	8.25	86.38	
2.375	Round	1.75	25.83	1.33	19.63	3.08	45.46	Hammered.
2.5	Round	1.17	19.14	–	–	1.17	19.14	
0.25	0.25	–	–	.77	.16	.77	.16	
0.5	0.5	7.92	6.65	–	–	7.92	6.65	
0.75	0.125	–	–	.14	.04	.14	.04	
1.0	0.5	.16	.27	.91	1.52	1.07	1.79	
1.25	1.25	3.81	20.00	–	–	3.81	20.00	
1.5	0.3	–	–	1.64	2.49	1.64	2.49	
1.5	0.375	–	–	.50	.94	.50	.94	
1.5	0.5	.52	1.31	–	–	.52	1.31	
1.5	0.75	.16	.60	–	–	.16	.60	
1.625	0.125	.27	.18	1.33	.90	1.60	1.08	
2.0	0.25	–	–	18.16	30.51	18.16	30.51	
2.0	0.4	–	–	1.21	3.24	1.21	3.24	
2.0	0.75	5.17	26.05	–	–	5.17	26.05	
2.0	1.0	3.71	24.93	3.67	24.66	7.38	49.59	
2.0	2.0	1.17	15.72	–	–	1.17	15.72	
2.5	0.188	.42	.66	–	–	.42	.66	
2.5	1.25	.83	8.71	–	–	.83	8.71	
3.0	0.5	3.10	15.62	2.98	15.01	6.08	30.63	
3.0	1.0	.37	3.73	–	–	.37	3.73	
3.0	1.25	–	–	5.5	69.30	5.5	69.30	
3.25	0.188	4.79	9.77	4.0	8.16	8.79	17.93	
3.5	0.5	–	–	3.32	19.52	3.32	19.52	
4.0	0.5	2.42	16.26	–	–	2.42	16.26	
4.0	1.0	.62	8.33	–	–	.62	8.33	
4.0	1.5	1.17	23.61	–	–	1.17	23.61	
4.125	0.25	2.04	7.06	–	–	2.04	7.06	
4.25	0.25	3.25	11.60	–	–	3.25	11.60	
4.5	0.875	22.67	299.69	–	–	22.67	299.69	2 pieces, 11 ft. 4 in.
5.5	0.5	4.56	42.13	–	–	4.56	42.13	
6.625	0.25	–	–	1.66	9.23	1.66	9.23	
7.0	0.5	–	–	.67	7.88	.67	7.88	
8.0	1.0	–	–	1.58	42.48	1.58	42.48	
			205.	–	–	–	205.	Draft for axletree.
			915.55	–	389.63	–	1305.18	
Cast iron...		–	7.5*	–	50.†	–	57.5	*2 wash's, †4 pipes
		–	292.‡	–	130.‖	–	422.	‡2 rollers, ‖2 wh'ls
		–	206.	–	–	–	206.	2 naves.
		–	505.5	–	180.	–	685.5	
Cast brass....		–	11.	–	–	–	11.	

Summary bill of iron for one 42-pounder barbette carriage.

SIZE OF IRON.		GUN CARRIAGE.		CHASSIS.		TOTAL.		REMARKS.
Wide.	Thick.							
In.	In.	Feet.	Lbs.	Feet.	Lbs.	Feet.	Lbs.	
0.5	Round	2.69	1.76	15.80	10.33	18.49	12.09	
0.75	Round	2.5	3.67	–	–	2.5	3.67	
1.0	Round	25.65	66.95	30.31	79.11	55.96	146.06	
1.25	Round	4.74	19.38	–	–	4.74	19.38	
2.0	Round	3.5	36.64	5.	52.35	8.5	88.99	
2.375	Round	1.75	25.83	1.33	19.63	3.08	45.46	Hammered.
2.5	Round	1.17	19.14	–	–	1.17	19.14	
0.25	0.25	–	–	7.75	1.63	7.75	1.63	
0.5	0.5	7.92	6.65	–	–	7.92	6.65	
0.75	0.125	–	–	.14	.04	.14	.04	
1.0	0.5	.17	.28	–	–	.17	.28	
1.25	1.25	3.94	20.68	–	–	3.94	20.68	
1.5	0.3	–	–	1.64	2.49	1.64	2.49	
1.5	0.375	–	–	.5	.94	.5	.94	
1.5	0.5	5.17	13.02	.92	2.32	6.09	15.34	
1.5	0.75	1.33	5.02	–	–	1.33	5.02	
1.625	1.25	.27	.18	1.33	.90	1.60	1.08	
2.0	0.25	–	–	18.13	30.45	18.13	30.45	
2.0	0.4	–	–	1.21	3.24	1.21	3.24	
2.0	0.75	5.17	26.05	–	–	5.17	26.05	
2.0	1.0	3.87	26.00	3.67	24.66	7.54	50.66	
2.0	2.0	1.17	15.72	–	–	1.17	15.72	
2.5	1.25	.83	7.05	–	–	.83	7.05	
3.0	0.5	3.10	15.62	2.99	15.01	6.09	30.63	
3.0	1.0	.37	3.73	–	–	.37	3.73	
3.0	1.25	–	–	5.5	69.30	5.5	69.30	
3.25	0.188	5.06	10.32	4.0	8.16	9.06	18.48	
3.5	0.5	–	–	3.42	20.11	3.42	20.11	
4.0	0.5	2.42	16.26	–	–	2.42	16.26	
4.0	1.0	.79	10.62	–	–	.79	10.62	
4.0	1.5	1.17	23.61	–	–	1.17	23.61	
4.125	0.25	2.04	7.06	–	–	2.04	7.06	
4.5	0.875	22.67	299.69	–	–	22.67	299.69	2 pieces, 11 ft. 4 in.
4.75	0.25	3.25	12.97	–	–	3.25	12.97	
6.	0.5	4.58	46.16	–	–	4.58	46.16	
6.625	0.25	–	–	1.66	9.23	1.66	9.23	
7.	0.5	–	–	.67	7.88	.67	7.88	
8.	1.0	–	–	1.58	42.48	1.58	42.48	
			213.	–	–	–	213.	Draft for axletree.
			953.06	–	400.26	–	1353.32	
Cast iron...		–	7.5*	–	49.†	–	56.5	*2 wash's, †4 pipes
		–	292.‡	–	130.‖	–	422.	‡2 rollers, ‖2 wh'ls
		–	206.	–	–	–	206.	2 naves.
		–	505.5	–	179.	–	684.5	
Cast brass....		–	11.	–	–	–	11.	Nut for screw.

Remarks on the bills of iron.

The bar iron in the above bills is all *rolled iron*, except that for the elevating screws, for which hammered iron is preferable.

No hammered *drafts* are required, except for the axle trees, the dimensions of which are readily obtained from the drawings of finished axle trees, and by reference to the drafts of those for siege carriages, PART 3. It is, therefore, considered unnecessary to represent the drafts for the barbette axle trees.

Formers are required for shaping the trunnion plates and forks of these carriages; but as these formers are similar to those for other carriages, of which numerous examples are given in the plates of PARTS 2, 3 and 7, and as their dimensions are easily deduced from the drawings of the finished irons, they are not represented in the plates of this part.

ARTILLERY.

PART SEVENTH.

CORRECTIONS—*Part Sixth.*

Page 10—in table of bolts for CHASSIS, 2d column, lines 9, 11, and 14, for "*," read "***;" and in line 10, for "*," read "B."
" 19—1st line of table, for "220.3," read "225.8."
" 19—1st line of table, for "218.94," read "224.44."
" 20—1st line of table, for "217.92," read "223.42."
" 20—1st line of table, for "217.6," read "223.1."
" 21—iron 2.0 by 0.25, for "18.36," read "18.80."
" 21—iron 2.0 × 0.25, for "30.84," read "31.61."
" 22— do. for "18 25," read "18.71."
" 22— do. for "30.66," read "31.43."
" 23 and 24— do. for "18.16," read "18.62."
" 23 and 24— do. for "30.51," read "31.28."
" 25— do. for "18.13," read "18.59."
" 25— do. for "30.45," read "31.22."
Make corresponding corrections in the total weights of wrought iron.

PART SEVENTH.

CASEMATE CARRIAGES.

The carriages for the 24, 32 and 42-pounder guns, and for the 8-inch columbiad, are similar to each other, differing only in their dimensions.

A special carriage is arranged for mounting the 24-pounder howitzer in the flanks of casemate batteries.

The general remarks relative to the wood work of barbette carriages apply also to casemate carriages.

Each of these carriages consists of a gun carriage and a chassis.

GUN CARRIAGE.—PLATES I TO V.

Wood work.

Two cheeks. Each cheek consists of two pieces, which are notched together and fastened by *two dowels*, as shown in the plates; the dowels are placed parallel to the short sides of the notches.

One front transom. The ends are joined to the cheeks with tenons and mortises. The top of the transom is hollowed out, to admit of elevating and depressing the gun; the edges are rounded with a radius of .5 inch.

One rear transom and slide. These may be made in one piece, but on account of the large size they are better made of two, or even of four pieces. The upper piece, which is the transom proper, contains the tenons which connect it with the cheeks; the lower piece is the slide, which bears on the chassis and is

notched out to fit the tongue; the notch is made .1 inch wider at the bottom than at the top; the transom and slide are joined together by *two dowels.*

Instead of cutting the notch out of the transom, it may be advantageously formed by adding on the bottom of the slide two transverse pieces of the depth of the notch, (2 inches,) fastened each by 6 nails, No. 3, C, thus forming the whole transom in four pieces, which are held together by the two bolts of the elevating bed plate and by two bolts for the rear transom and slide. If timber of the proper width is not at hand, the slide itself may be made of two pieces, which will be held together by the roller bolts, in addition to the four other bolts just mentioned.

One axle tree. Tough, young oak should be selected for it. The axle tree is let into notches in the cheeks; there is an interval of .1 inch between the bottom of the front transom and the top of the axle tree.

Two guides. They are fastened to the front transom and the axle tree, each by two bolts. They are cut to fit the flare of the cheeks and the understraps, as represented in the drawings; the inside of the guides being parallel to the axis of the carriage.

Irons.—Plate V.

The forms and dimensions of the iron parts of these carriages are fully exhibited in the plate.

Six cheek bolts, No. 5, B. Their heads are let into the upper sides of the cheeks. *Six washers and six nuts* for these bolts.

Two cheek bolts, No. 5, A. *Four washers* and *two nuts* for th same.

Two trunnion plates. They are made on formers which give them the proper set, to correspond with the flare of the cheeks.

Four bolts, for trunnion plates and understraps. *Four nuts* for the same.

One bed plate, for elevating screw, (CAST IRON.) The pattern is the same for all the carriages; the bolt holes are 13 inches apart for the 24-pounder, and 14 inches for other calibres; a *feather* of wrought iron is dovetailed in one side of the hole for the screw, to prevent the screw from turning when it is worked up or down. The holes for the shaft and the seat for the box of the elevating screw are reamed out.

One nut, for elevating screw, (BRASS.) The upper part of the nut forms a beveled wheel of 41 teeth, by means of which the screw is worked. To facilitate dressing out these teeth a groove, about .2 inch wide, is cut round the inner ends of the teeth, as represented in the drawing.

One elevating screw. A slot cut in the threads of the screw, to fit the feather in the bed plate, prevents the screw from turning with its nut; a stop is inserted in the lowest groove of the thread, in such a position as to prevent the screw from being turned out clear of the feather in the bed plate.

One pinion, (BRASS.) It has 15 teeth, fitting those of the beveled wheel on the nut. The pinion is connected with the shaft by means of a slot and feather.

One shaft, for the elevating screw. To prevent the shaft from working out of its place, a *set screw*, with a square head, is inserted in the projecting ear on the bed plate, and the point of the screw enters into a groove turned in the shaft.

One cheek washer, for the shaft, (not represented in the plate.) It is 3.5 in. diameter and .19 in. thick, with a hole 1.5 in. diameter. It is fastened on the outside of the right cheek, over the hole for the shaft, by *three screws*.

One handle, for the elevating screw, (CAST IRON.) It fits on a square, at the outer end of the shaft. *One washer* and *one nut* for the shaft, to keep the handle in place. The arms of the handle should be cast smooth, so as not to require turning in the lathe.

Two bolts, for elevating bed plate. They pass through the rear transom and the slide, the heads of the bolts being underneath the slide. *Two washers* and *two nuts* for these bolts.

Two bolts, for the rear transom and slide. The heads are let into the upper side of the transom. *Two washers* and *two nuts* for the same.

One roller, (CAST IRON.) The outer surface is turned, the ends are faced, and the interior is reamed out at each end to receive the shaft; a small oil hole is bored near each end of the roller. The length of the roller is equal to the width of the tongue of the chassis.

One roller shaft. It is accurately turned, to form journals for the roller; the ends are squared, forming shoulders for the eccentrics.

Two eccentrics, for the roller shaft. They are forged, each in one piece, and turned to the proper form. Each of them has a square hole for the shaft, and a round one for the handspike which works the eccentric.

Two roller bolts. Each bolt has an eye in which the journal of the eccentric turns. The bolts pass horizontally through the slide under the rear transom, in which they are placed so that the eyes shall just clear the rear of the slide, the axis of the bolts being 2.5 inches above the notch in the slide, which bears on the tongue of the chassis.

By means of a small handspike acting on the eccentrics, the trail of the carriage is lifted until the slide clears the tongue of the chassis .5 inch, and the roller is thus brought into action. A cylindrical groove is cut in the rear of the slide for the roller to lie in when in this position.

Two washers and *two nuts*, for the roller bolts.

Two trail handles.

Four assembling bolts; two through the front, and two through the rear transom. *Four washers* and *four nuts* for the same; the

trail handles serving as washers for the bolts that pass through the rear transom.

Eight axle skeans. Their outer surfaces are finished with the same curvature as that of the axle arms, and they are let in flush with the arms of the axle tree. The inner ends of the lower skeans and of the side skeans are confined by the axle straps; the upper skeans, by the shoulder plates. The outer ends are held by the axle bands, and the skeans are also fastened to the axle arms, each by *two nails.*

Two shoulder plates. They are let in flush with the shoulders of the axle tree, and fastened to them, each by *five nails.*

Two axle bands. They are let in flush with the surface of the axle arms, and are fastened to the arms, each by *four nails.* The ends of the skeans are turned up and lodged in notches in the outer edges of the bands.

The nails used for fastening the skeans, the shoulder plates and the bands, have round stems; they are, in other respects, like the nail No. 1, C.

Two understraps. They are fastened by the trunnion plate bolts.

Four bolts, for the guides. Two of these bolts pass through the front transom and two through the axle tree. The heads are on the inside of the guides. *Eight washers* and *eight nuts* for these bolts.

Two truck wheels, (CAST IRON.) They are reamed out and faced in the lathe.

Two linch pins.

CHASSIS.—PLATES VI to X.

Wood work.

The drawings show the form and dimensions of all the parts, the manner of framing them together, and the roundings of the edges.

Two rails. The rail is made in one piece, and the rabbet, for the wheel to run in, is cut out of the solid wood.

Two counter hurters. They are connected with the rails, each by *two dowels.*

One front transom.

One rear transom.

One tongue.

One prop. It is connected with the tongue by two tenons, and fastened by *two wooden pins.*

Irons.—Plate X.

Two bolts, for rear transom and rails. The heads are let into the upper side of the transom. *Two washers* and *two nuts* for these bolts. As the centre of the bolt hole is only about 1.25 in. from the box of the traversing wheel, it is necessary to cut off a segment of the washer, and also the corners of the nut, to let it turn, as is shown in the plans of the under side of the chassis.

Two bolts, for front transom and rails. *Two washers* and *two nuts* for these bolts. The heads of these bolts are on the under side of the transom. For a similar reason to that just given with regard to the rear transom and rail bolts, a segment of the washer is cut off, except in those for the 8-inch columbiad chassis, as shown in the plans of the underside of the front transom.

Two bolts, for counter hurters and rails. The head of the bolt is let into the bottom of the mortise for the rear traversing wheel,

so as to clear the rim of the wheel about .15 inch. *Two washers* and *two nuts* for these bolts.

Two rivet bolts, for the tongue. The heads are let into the upper side of the tongue. *One double washer* and *two nuts* for these bolts.

One bolt, for the front transom and tongue. The head is let into the upper side of the tongue. *One washer* and *one nut* for the same.

One bolt, for the tongue fork and front transom. The head is on the under side of the transom. *One washer* and *one nut* for the same.

One tongue fork. It is let in, its whole thickness, into the under side of the notch at the front end of the tongue, and is fastened by the two preceding bolts.

One front transom strap. It is let into the upper side of the tongue, its whole thickness, and is fastened by three of the bolts which pass through the front transom.

One bolt, for the rear transom and tongue.

One bolt, for the tongue and brace.

The heads of both these bolts are let into the upper side of the tongue.

One rear transom and tongue brace. It is fastened by the two preceding bolts. *Two nuts* for those bolts.

Eight journal boxes, for traverse wheels, (BRASS.) The box is let in, so that the axis of the wheel shall be in the plane of the underside of the transom.

Four traverse wheels, (CAST IRON.) The journals of these wheels are of wrought iron. A groove is made in the middle of the journal, to hold it in place, the wheel being cast on it. The journal is turned, and the wheel is also turned concentric with it, and faced in the lathe. Semi-circular mortises are cut in the front and rear transoms, for the traverse wheels to turn in.

Eight caps, for the journal boxes. They are fastened each by *two screws*, which also hold the boxes in place.

Two rail plates. They are fastened to the rails, each by *one bolt*, *four screws*, and *twenty-seven nails*. *Two washers* and *two nuts* for rail plate bolts.

One tongue. It is better forged in two parts, which are welded together to make the exact length.

Two tongue bolts. They connect the iron tongue and the fork. The bolt has a feather under the head to prevent it from turning when screwed up, and there is a corresponding slot in the bolt hole of the fork. *Two nuts* for these bolts.

One pintle, (CAST IRON.) The pintle should be cast sufficiently accurate and smooth not to require dressing over in the lathe. A wrought iron eye is cast in the head of the pintle, to facilitate drawing it out of the pintle hole of the embrasure.

Nails and screws for a casemate carriage.

Designation.	Number.	Kind.	Length.	Remarks.
GUN CARRIAGE.			In.	
Nails. For axle skeans.....	16	No. 1, C.	1.5	These nails have round stems.
" shoulder plates.....	10	Do.	1.5	
" axle bands.....	8	Do.	1.5	
" slides.....	12	No. 3, C.	4.5	
Screws, for cheek washer.....	3	No. 14.	1.25	
CHASSIS.				
Nails, for rail plates.....	54	No. 2, C.	2.5	
Screws. For rail plates.....	8	No. 20.	2.5	
" traverse wheel boxes	16	No. 24.	3.5	

Bolts for casemate carriages.

DESIGNATION.	Number.	Kind.	LENGTH.				WASHERS.	
			24-p'r.	32-p'r.	42-p'r.	8-in. col'd.	Head.	Nut.
			In.	In.	In.	In.		
Bolts for Gun carriage.								
For the cheeks.....	2	No. 5, B.	21.7	22.88	23.59	23.59	–	2
	2	Do.	18.2	18.98	19.49	19.49	–	2
	2	Do.	15.2	15.78	16.09	16.09	–	2
	2	No. 5, A.	26.88	28.08	28.78	28.78	2	2
" trunnion plates.....	4	Do.	27.5	28.7	29.4	29.4	–	–
" assembling. front transom	2	Do.	29.2	33.48	35.7	38.48	2	2
" assembling. rear "	1	Do.	32.1	37.15	39.38	38.8	–	–
" assembling. rear "	1	Do.	32.75	37.85	40.1	38.8	–	–
" guides & front transom	2	Do.	11.38	11.88	12.38	12.38	2	2
" guides and axle tree...	2	Do.	12.38	12.38	12.38	12.38	2	2
" elevating bed plate....	2	No. 4, A.	13.44	13.44	13.44	13.44	2	–
" rear transom and slide.	2	No. 4, B.	12.58	12.58	12.58	12.58	–	2
" roller.....	2	No. 4.*	–	–	–	–	–	2
Bolts for Chassis.								
For front transom and rails.	2	No. 5, A.	14.4	14.4	14.4	14.4	2	–
" front transom & tongue	1	Do.	14.75	14.75	14.75	14.75	1	–
" rear transom and rails.	2	No. 5, B.	16.15	16.15	16.15	16.15	–	2
" counter hurter and rails	2	Do.	12.3	12.3	12.54	12.79	–	2
" tongue, (rivet bolts)..	2	Do.	12.19	13.69	14.19	14.19	–	1†
" tongue fork.....	1	Do.	14.8	14.8	14.8	14.8	–	1
" tongue and brace.....	1	Do.	12.5	14.	14.5	14.5	–	–
" tongue & rear transom.	1	Do.	20.6	20.6	20.6	20.6	–	–
" rail plates.....	2	No. 2, C.	7.25	8.75	8.85	8.85	–	2
" iron tongue and fork..	2	No. 5.‡	3.	3.	3.	3.	–	–

* Plate V. † Double washer—Plate X. ‡ Plate X.

24-POUNDER HOWITZER CARRIAGE.

This carriage is designed for mounting the iron 24-pounder howitzer in the flanks of casemate batteries, for the defence of the ditch. It consists of a gun carriage and a chassis. The front part of the chassis lies on the sole of the embrasure, the interior opening of which is sufficiently large to admit the head of the carriage within the embrasure.

The wood work of the carriage and chassis is of WHITE OAK.

GUN CARRIAGE.

Wood work.

Two cheeks. The bottom of the trail has the same slope as the upper surface of the chassis on which it rests, and the bottom of the front part of the cheek is traced with reference to the same plane; the head of the cheek is perpendicular to the bottom; the end of the trail is vertical, and its upper side horizontal.

The corners of the upper side and the ends are rounded with a radius of .2 inch, where the irons permit it.

Irons.

Two trail handles. *Four washers* and *four nuts* for the same.

Two manœuvring rings. They are welded into the eyes of *two eye bolts* which pass through the cheeks. *Two nuts* for these bolts. The nuts are let into the inside of the cheeks; they are made circular, and are turned in with a forked screw driver.

Two trail plates. They are let into the rear ends of the cheeks, and are fastened each by *four nails.*

Two cheek bolts, for the trail. The heads are let into the bottom of the cheeks. *Two washers* and *two nuts* for these bolts.

Two trunnion plates. All the bolt holes in them are square.

Two bolts for the trunnion plates and cheeks. *Two washers* and *two nuts* for the same.

Four key bolts. They pass through the trunnion plates and the understraps. *Four nuts* for the same.

One front transom, (CAST IRON.) It has a tenon at each end, which is let into a notch in the bottom of the cheek, and one at the bottom, which serves for a guide to the carriage on the chassis.

One rear transom, (CAST IRON.) It has a tenon at each end, which is let into the cheek. The elevating screw passes through the middle of the transom, which is bored and countersunk to receive the box, the pinion and the shaft of the elevating apparatus; the upper surface of the box is let in flush with that of the transom. A feather is set into the lower part of the hole in the transom, to fit a slot in the screw which prevents it from turning with the box.

Recesses are left in the rear of the transom for the eccentrics and the flanch of the roller to lie in, when the roller is brought into action.

Three assembling bolts. Two of them pass through the rear transom, and one through the front. *Six washers* and *three nuts* for these bolts.

Two understraps. They are fastened to the bottom of the cheeks by the key bolts; they have square holes for the stems of the roller forks to pass through.

Two roller forks. The bolt hole in one branch of the fork has a slot for the feather under the head of the roller bolt. The stem is inserted in a square mortise in the bottom of the cheek of the carriage; it is kept in place by a key which passes through the cheek, close to the understrap.

Two rollers, (BRASS.) They have shoulders in the centre, to fit the opening of the forks.

Two fork bolts. The bolt has a feather under the head, like the fork bolt of the barbette carriage, to prevent it from turning. *Two nuts* for these bolts.

Two keys, for fastening the forks in the cheeks.

Two cap squares. They have mortises for the heads of the key bolts.

Four eye pins, No. 1, for the key chains. They are riveted into the cap squares, near the outer edges.

Four cap square keys.

Four key chains, each consisting of *six links*, No. 1, and *two rings*, No. 1, A.

One roller, for the trail, (CAST IRON.) It is turned and faced in the lathe. The flanches in the middle serve to guide the trail of the carriage on the chassis.

One journal, } for the roller. These parts are put to-
Two eccentrics, } gether like the similar parts of other casemate carriages. A segment is cut off from the eccentric, to give room for turning it in against the rear transom.

Two journal plates, (BRASS.) They are let into the inside of the cheeks, and fastened, each by *two screws.*

One roller handspike. It is made with two branches, to act on both eccentrics at the same time.

One elevating screw. A slot .3 in. wide is cut in the screw, to receive the feather in the transom which prevents the screw from turning.

One box, } for the elevating screw, (BRASS.) They are fit-
One pinion, } ted up like the similar parts of the elevating apparatus of other casemate carriages. The wheel on the box has 35 teeth, and the pinion 13 teeth.

One shaft. It is fitted to the pinion, as in the other elevating apparatus, and is retained in its place, in a similar manner, by a *set screw* in the transom, the point of which enters the groove cut in the shaft.

One handle. It is made like the handle of the elevating screw of the field gun carriage; it is fitted on the shaft with a tenon .6 in. square, and is held on by *a screw* in the end of the shaft.

One cheek washer. It is .12 in. thick, and is fastened on the outside of the right cheek, over the hole bored for the shaft, by *three screws.*

When this carriage is mounted on its chassis, in battery, the trail and the front transom bear on the chassis, the front wheels just clearing the rails; so that the recoil of the carriage is checked by its friction on the chassis. When the trail is raised, by the action of the eccentrics, the carriage rests on the roller and on the front wheels, and is thus easily worked by hand to or from battery.

CHASSIS.

Wood work.

Two rails. The inclination of the chassis is indicated by its height, at the pintle and at the traverse wheels, above the ground line; it is 3° 20′. The under part of the front end, which rests on the sole of the embrasure, is horizontal. The corners are rounded with a radius of .2 inch.

One front transom. It is fastened by *four dowels* .75 in. square and 1.5 in. long, and by the front assembling bolt.

Two middle transoms. They are framed, with tenons and mortises, into the rails, and fastened with *four wooden pins,* .75 in. diameter and 6 in. long, driven in from the under side.

One rear transom. It is fastened by *four dowels,* .5 inch diameter and 1.5 inch long, and by the rear assembling bolt. The transom is hollowed out in front, between the rails, for the flanches of the trail roller to lie in when the carriage recoils to the counter hurters.

Irons.

Three assembling bolts. *Six washers* and *three nuts* for the same.

One collar, for the middle assembling bolt.

One pintle plate. It is .5 in. thick, and is let into the upper side of the chassis.

One lower pintle strap. It is .5 in. thick, and is let into the lower side of the chassis.

Five bolts, for pintle plate and strap. Their heads are countersunk in the lower strap. *Five nuts* for these bolts. The nuts for the two rear bolts, which are in the track of the rollers for the carriage, are countersunk in the pintle plate; they are circular, and are turned in with a forked screw driver.

One hurter plate. It is let into the rear end of the front transom, and is fastened by *four screws.*

Two counter hurter plates. They are .25 in. thick; they are let in flush with the upper surface of the rails, and are fastened each by *four screws.*

Two counter hurters. They pass through square holes in the plates, and through the rails. *Two washers* and *two nuts* for the same.

One prop. The upper part is divided into two branches, which are bolted to the rails; the lower end forms a socket for the stem of the traverse wheel fork.

Two prop bolts. Their heads are let in flush with the upper side of the rails. *Two nuts* for these bolts.

One brace, for the prop.

One brace bolt. Its head is let into the upper side of the rear middle transom. *One nut* for the same.

One fork, for the traverse wheels. The stem is connected with the prop by two bolts, one of which also holds the lower end

of the brace. The branches which hold the traverse wheels are bent towards the axis of the pintle, so that the wheels may stand perpendicular to the radius of the traverse circle.

The radius of the circle described by the centre of the traverse wheels is ten feet.

Two bolts, for the fork and prop. *Two nuts* for the same.

The prop and the fork may be forged in one piece; in which case one of these bolts can be dispensed with.

Two traverse wheels, (CAST IRON.) They are necessarily made slightly conical; the diameter of the inner face is 5.95 inches; that of the outer, 6.05 inches.

Two fork bolts. They are made like those of the gun carriage rollers. *Two nuts* for the same.

One pintle. It is made of wrought iron. On the under side of the head are two slots, to facilitate drawing the pintle out of its hole, in the masonry of the embrasure.

Bolts, nails and screws, for 24-pounder howitzer carriage.

DESIGNATION.	Number.	Kind.	Length.	WASHERS. Head.	WASHERS. Nut.	REMARKS.
GUN CARRIAGE.			Inches.			
Bolts.						
For trunnion plates and cheeks	2	No. 5, A.	15.75	–	2	
" assembling the cheeks...	3	Do.	20.82	3	3	
" roller forks.....	2	No. 4, A.	4.25	–	–	
" trail of cheeks.....	2	No. 2, B.	9.65	–	2	
" key bolts.....	2	No. 5.	16.1	–	–	Plate XIII. Nuts round.
	2	Do.	15.64	–	–	
" trail handles.....	4	No. 4.	4.19	–	4	
" manœuvring rings.....	2	Do.	3.25	–	–	
Nails.						
For trail plates.....	8	No. 2, C.	2.			
Screws.						
For journal plates.....	4	No. 12.	1.5			
" cheek washer.....	3	Do.	1.25			
CHASSIS.						
Bolts.						
For assembling the rails.....	3	No. 5, A.	23.38	3	3	
" prop and fork.....	1	No. 4, A.	2.65			
	1	Do.	3.15			
" fork and traverse wheels.	2	Do.	4.15			
" pintle plate and strap..	1	No. 4, C.	5.9			
	2	Do.	6.25			
	2	Do.	5.9	–	–	Nuts round.
" prop.....	2	No. 4, B.	8.5			
" brace.....	1	Do.	5.75			
" counter hurters.....	2	No. 5.	8.19	–	2	Plate XIII.
Screws.						
For hurter plate.....	4	No. 14.	1.5			
" counter hurter plates....	8	No. 16.	2.			

Bill of timber for one 24 pounder casemate carriage.

NAMES OF PARTS.	No. of pieces.	DIMENSIONS. FINISHED. Long.	Wide.	Thick.	ROUGH. Long.	Wide.	Thick.	CONTENTS OF ROUGH TIMBER. Each piece.	Total.	REMARKS.
GUN CARRIAGE.		In.	In.	In.	In.	In.	In.	Sup. feet.	Sup. feet.	
Cheeks	2	53.5 66.	13.5 14.	4.75	132.	15.5	5.75	81.69	163.38	May be got in 4 pieces each 6 feet long.
Front transom	1	19.52	15.	5.	24.	16.5	6.	16.50	16.50	3 or 4 in one piece.
Rear transom	1	23.5	17.25	5.5	28.	18.5	6.5	23.38	23.38	Do. do.
Slide	1	22.5	17.25	7.22	28.	18.5	8.5	30.57	30.57	Do. do.
Axletree	1	48.5	7.65	6.	58.	9.	7.	25.37	25.37	2 in one.
Guides	2	34.75	5.	4.75	40.	7.	6.	11.66	23.32	2 or 3 in one.
									282.52	
CHASSIS.										
Rails	2	151.65	11.	10.	162.	12.5	11.5	161.71	323.42	
Counter hurters	2	14.75	5.	4.25	17.	6.	5.25	3.72	7.44	6 or 8 in one piece.
Front transom	1	40.	14.75	12.8	50.	16.5	14.5	83.07	83.07	2 in one.
Rear transom	1	59.5	15.	13.	68.	16.5	14.5	112.97	112.97	Do.
Tongue	1	186.15	11.	10.	200.	12.5	11.5	199.65	199.65	
Prop	1	23.5	11.	10.	27.	12.	12.	27.00	27.00	3 or 4 in one.
									753.55	

Bill of timber for one 32 pounder casemate carriage.

NAMES OF PARTS.	No. of pieces.	DIMENSIONS. FINISHED. Long.	Wide.	Thick.	ROUGH. Long.	Wide.	Thick.	CONTENTS OF ROUGH TIMBER. Each piece.	Total.	REMARKS.
GUN CARRIAGE.		In.	In.	In.	In.	In.	In.	Sup. feet.	Sup. feet.	
Cheeks	2	53.5 66.	14.1 14.6	5.5	132.	16.	6.5	95.33	190.66	May be in 4 pieces, each 6 feet long.
Front transom	1	22.26	15.	5.5	26.	16.5	6.5	19.36	19.36	3 or 4 in one piece.
Rear transom	1	26.4	17.25	5.5	30.	18.5	6.5	25.05	25.05	Do. do.
Slide	1	25.4	17.25	7.22	30.	18.5	8.5	32.76	32.76	Do. do.
Axletree	1	53.	7.65	6.	58.	9.	7.	25.37	25.37	2 in one.
Guides	2	34.75	6.	5.	40.	7.	6.	11.66	23.32	2 or 3 in one.
									316.52	
CHASSIS.										
Rails	2	151.65	12.5	10.5	162.	14.	12.	189.00	378.00	
Counter hurters	2	14.75	5.	4.25	17.	6.	5.25	3.72	7.44	6 or 8 in one piece.
Front transom	1	44.5	14.75	12.8	54.	16.5	14.5	89.71	89.71	
Rear transom	1	64.	15.	13.	72.	16.5	14.5	119.62	119.62	
Tongue	1	186.15	12.5	11.	200.	14.	12.5	243.05	243.05	
Prop	1	22.	11.	11.	27.	12.	12.	27.00	27.00	3 or 4 in one.
									864.82	

Bill of timber for one 42 pounder casemate carriage.

NAMES OF PARTS.	No. of pieces.	DIMENSIONS. FINISHED. Long.	Wide.	Thick.	DIMENSIONS. ROUGH. Long.	Wide.	Thick.	CONTENTS OF ROUGH TIMBER. Each piece.	Total.	REMARKS.
GUN CARRIAGE.		In.	In.	In.	In.	In.	In.	Sup. feet.	Sup. feet.	
Cheeks	2	53.5 66.	14.5 14.9	6.	132.	16.5	7.	105.87	211.74	May be in 4 pieces, each 6 feet long.
Front transom	1	23.56	15.	6.	28.	16.5	7.	22.46	22.46	3 or 4 in one piece.
Rear transom	1	27.7	17.25	6.	32.	18.5	7.	28.77	28.77	Do. do.
Slide	1	26.7	17.25	6.72	32.	18.5	8.	32.89	32.89	Do. do.
Axletree	1	55.05	7.65	6.	62.	9.	7.	27.12	27.12	2 in one.
Guides	2	35.5	6.	5.	40.	7.	6.	11.66	23.32	2 or 3 in one.
									346.30	
CHASSIS.										
Rails	2	151.65	13.	11.	162.	14.5	12.5	203.90	407.80	
Counter hurters	2	14.75	5.	4.25	17.	6.	5.25	3.72	7.44	6 or 8 in one.
Front transom	1	46.76	14.75	12.8	56.	16.5	14.5	93.04	93.04	
Rear transom	1	66.26	15.	13.	74.	16.5	14.5	122.94	122.94	
Tongue	1	186.15	13.	11.	200.	14.5	12.5	251.73	251.73	
Prop	1	21.5	11.	11.	27.	12.	12.	27.00	27.00	3 or 4 in one.
									909.95	

Bills of timber for one 8-inch Columbiad, and one 24-pounder Howitzer casemate carriage.

NAMES OF PARTS.	No. of pieces.	DIMENSIONS. FINISHED. Long.	Wide.	Thick.	DIMENSIONS. ROUGH. Long.	Wide.	Thick.	CONTENTS OF ROUGH TIMBER. Each piece.	Total.	REMARKS.
COL. GUN CARRIAGE.		In.	In.	In.	In.	In.	In.	Sup.feet.	Sup. feet.	
Cheeks	2	53.5 66.	14.5 14.9	6.	132.	16.5	7.	105.87	211.74	May be in 4 pieces, each 6 feet long.
Front transom	1	26.1	15.	6.	30.	16.5	7.	24.06	24.06	3 or 4 in one piece.
Rear transom	1	26.1	17.25	6.	30.	18.5	7.	26.97	26.97	Do. do.
Slide	1	25.1	17.25	6.72	30.	18.5	8.	30.83	30.83	Do. do.
Axletree	1	57.6	7.65	6.	62.	9.	7.	27.12	27.12	2 in one.
Guides	2	35.5	7.2	5.	40.	8.	6.	13.33	26.66	2 or 3 in one.
CHASSIS.									347.38	
Rails	2	151.65	13.	11.	162.	14.5	12.5	203.90	407.80	
Counter hurters	2	14.75	5.	4.25	17.	6.	5.25	3.72	7.44	6 or 8 in one.
Front transom	1	49.16	14.75	12.8	58.	16.5	14.5	96.36	96.36	
Rear transom	1	68.66	15.	13.	76.	16.5	14.5	126.27	126.27	
Tongue	1	186.15	13.	11.	200.	14.5	12.5	251.73	251.73	
Prop	1	21.5	11.	11.	27.	12.	12.	27.00	27.00	3 or 4 in one.
24-PR. HOW. CARRIAGE.									916.60	
Gun carriage—Cheeks.	2	44.	14.	3.25	50.	15.5	4.25	22.87	45.74	2 or 3 in one piece.
Chassis. Rails	2	151.	9.5	7.	161.	11.	8.5	104.53	209.06	
Chassis. Transoms	4	–	–	–	–	–	–	–	–	Obt'd from cuttings.

Bills of iron for casemate carriages.

NAMES OF PARTS.	Wide.	Thick.	Long.	REMARKS.
GUN CARRIAGES.	In.	In.	In.	
2 trunnion plates. 24-pounder	4.75	0.5	49.	
2 trunnion plates. 32-pounder	5.5	0.5	50.	
2 trunnion plates. 42-pounder	6.	.5	51.	
2 trunnion plates. 8-inch	6.	.5	54.	
2 under-straps. 24-pounder	4.75	.5	55.	
2 under-straps. 32-pounder	5.5	.5	55.	
2 under-straps. 42-pr. and 8-inch	6.	.5	55.	
1 bed plate for elevating screw.	–	–	–	Cast iron.
1 handle for elevating screw	–	–	–	Cast iron.
1 nut for elevating screw	–	–	–	Cast brass.
1 pinion	–	–	–	Cast brass.
1 elevating screw	2.375	Round	13.5	
1 shaft. 24-pounder	1.5	Round	20.	
1 shaft. 32-pounder	1.5	Round	22.	
1 shaft. 42-pounder & 8-inch.	1.5	Round	23.	
1 set screw	0.5	Round	2.	
1 cheek washer	3.5	0.188	3.5	
4 bolts No. 4. Heads	1.5	Round	8.	For bed plate and slide.
4 bolts No. 4. Bodies	0.75	Round	44.	For bed plate and slide.
1 roller	–	–	–	Cast iron.
1 roller shaft. 24-pounder	1.5	Round	13.25	
1 roller shaft. 32-pr. 42-pr. & 8-inch	1.5	Round	14.25	
2 eccentrics	3.25	Round	5.	
2 roller bolts. Heads	2.	1.25	8.	
2 roller bolts. Bodies	0.75	Round	30.	
2 trail handles	2.	0.75	28.	
20 bolts No. 5, heads	2.	Round	60.	Cheek bolts, assembling bolts, and guide bolts.
Ditto, bodies. 24-pounder	1.	Round	364.75	Cheek bolts, assembling bolts, and guide bolts.
Ditto, bodies. 32-pounder	1.	Round	396.6	Cheek bolts, assembling bolts, and guide bolts.
Ditto, bodies. 42-pounder	1.	Round	413.	Cheek bolts, assembling bolts, and guide bolts.
Ditto, bodies. 8-inch	1.	Round	416.5	Cheek bolts, assembling bolts, and guide bolts.
4 axle skeans	1.25	0.375	34.	
4 axle skeans	0.75	.375	42.	
2 shoulder plates	3.	.2	12.	
2 axle bands	1.25	.2	37.	
2 linch pins	1.5	.75	12.	
2 truck wheels	–	–	–	Cast iron.
2 truck handspikes	1.5	Round	84.	
1 roller handspike	1.	Round	34.	
7 washers No. 4	2.5	0.188	18.	
22 washers No. 5	3.25	0.188	70.	
7 nuts No. 4	1.5	0.75	10.5	
20 nuts No. 5	2.	1.	40.	
34 nails	0.375	Round	51.	

Bills of iron for casemate carriages—Continued.

NAMES OF PARTS.	Wide.	Thick.	Long.	REMARKS.
CHASSIS.	In.	In.	In.	
12 heads of bolts No. 5	2.	Round	36.	
2 bodies of bolts No. 5	1.	Round	24.3	Rear transom and rails.
2 Ditto	1.	Round	20.8	Front transom and rails.
2 Ditto. 24-pr. and 32-pr.	1.	Round	16.6	Counter hurters and rails.
2 Ditto. 42-pounder	1.	Round	17.08	Counter hurters and rails.
2 Ditto. 8-inch	1.	Round	17.58	Counter hurters and rails.
2 Ditto. 24-pounder	1.	Round	16.38	Tongue rivet bolts.
2 Ditto. 32-pounder	1.	Round	19.38	Tongue rivet bolts.
2 Ditto. 42-pounder & 8-in.	1.	Round	20.38	Tongue rivet bolts.
2 Ditto	1.	Round	21.6	Front transom & tongue.
1 Ditto	1.	Round	16.6	Rear transom & tongue.
1 Ditto. 24-pounder	1.	Round	8.5	Tongue and brace.
1 Ditto. 32-pounder	1.	Round	10.	Tongue and brace.
1 Ditto. 42-pounder & 8-in.	1.	Round	10.5	Tongue and brace.
1 tongue fork	draft.			
1 tongue	draft.			
2 tongue bolts	2.	Round	5.5	
1 front transom strap..... 24-pounder	3.	0.5	36.25	
1 front transom strap..... 32-pounder	3.	0.5	40.5	
1 front transom strap..... 42-pounder	3.	0.5	42.5	
1 front transom strap..... 8-inch	3.	0.5	45.5	
1 rear trans. & tongue brace. 24-pr. & 32-pr.	3.	.5	52.	
1 rear trans. & tongue brace. 42-pr. & 8-in.	3.	.5	51.5	
4 traverse wheels	–	–	–	Cast iron.
4 journals for traverse wheels.	2.	Round	26.5	Cast into the wheels.
8 journal boxes	–	–	–	Cast brass.
8 caps for journal boxes	2.	0.25	65.	
2 rail plates	5.	0.375	272.	In two pieces.
2 bolts for rail plates..... 24-pounder	0.5	Round	16.5	
2 bolts for rail plates..... 32-pounder	.5	Round	19.5	
2 bolts for rail plates..... 42-pr. & 8-in.	.5	Round	19.7	
54 nails for rail plates	.3	0.3	150.	
1 pintle	–	–	–	Cast iron.
1 eye for pintle	0.75	Round	13.5	Cast into the pintle.
2 washers No. 2	1.625	0.125	2.25	
8 washers No. 5	3.25	0.188	25.5	
1 double washer	3.25	0.188	9.25	
2 nuts No. 2	1.	0.5	2.	
14 nuts No. 5	2.	1.	28.	

Bill of iron for one 24-pounder howitzer casemate carriage.

NAMES OF PARTS.	Wide.	Thick.	Long.	REMARKS.
GUN CARRIAGE.	In.	In.	In.	
2 trail handles	0.75	Round	44.	
	.5	Round	16.	
2 manœuvring rings	.625	Round	22.	
2 eye bolts	2.	0.75	7.	
2 trail plates	3.25	.25	6.5	
8 nails for trail plates	0.3	.3	20.	
2 trail cheek bolts. Heads	1.	Round	4.	
2 trail cheek bolts. Bodies	0.5	Round	12.	
2 trunnion plates	3.25	1.	36.	
2 trunnion plate bolts. Heads	2.	Round	6.	
2 trunnion plate bolts. Bodies	1.	Round	35.5	
4 key bolts. Heads	2.	1.	16.	
4 key bolts. Bodies	1.	Round	53.5	
1 front transom	–	–	–	Cast iron.
1 rear transom	–	–	–	Cast iron.
3 assembling bolts. Heads	2.	Round	9.	
3 assembling bolts. Bodies	1.	Round	50.	
2 understraps	3.25	0.5	32.6	
2 roller forks	1.75	1.75	12.	
2 rollers	–	–	–	Cast brass.
2 fork bolts	1.5	Round	6.	
2 fork keys	0.5	Round	9.	
2 cap squares	3.25	1.	28.	
4 cap square keys	1.5	0.375	3.	
4 key chains No. 1	0.15	Round	45.	
8 rings No. 1, A	0.2	Round	28.	
4 eye pins No. 1	0.75	Round	6.	
1 roller for trail	–	–	–	Cast iron.
1 roller journal	1.375	Round	12.75	
2 eccentrics	3.25	Round	5.	
2 journal plates	–	–	–	Cast brass.
1 roller handspike	1.	Round	48.	
1 elevating screw	2.	Round	9.5	
1 nut for elevating screw	–	–	–	Cast brass.
1 pinion for elevating screw	–	–	–	Cast brass.
1 shaft for elevating screw	0.875	Round	10.5	
1 handle for elevating screw	2.	1.	6.	
2 washers No. 2	1.625	0.125	3.25	
4 washers No. 4, and 1 cheek washer	2.5	0.188	12.25	
8 washers No. 5	3.25	0.188	25.5	
2 nuts No. 2	1.	0.5	2.	
8 nuts No. 4	1.5	0.75	12.	
9 nuts No. 5	2.	1.	18.	

Bill of iron for one 24-pr. howitzer casemate carriage—Continued.

NAMES OF PARTS.	Wide.	Thick.	Long.	REMARKS.
CHASSIS.	In.	In.	In.	
3 assembling bolts. { Heads..	2.	Round	9.	
3 assembling bolts. { Bodies..	1.	Round	68.	
1 collar for middle bolt.....	3.	0.5	5.	
1 upper pintle strap..... {	12.	0.5	12.	
1 upper pintle strap..... {	3.	0.5	14.	
1 lower pintle strap.....	3.	0.5	44.	
5 bolts for pintle straps.....	0.75	Round	30.5	
1 hurter plate.....	2.5	0.188	3.	
2 counter hurter plates.....	3.25	0.25	10.	
2 counter hurters.....	2.5	2.	12.	
2 branches of prop.....	2.	1.	34.	
1 stem of prop.....	2.5	0.75	16.	
2 prop bolts	1.5	Round	9.	
1 brace for prop.....	2.5	0.5	33.	
1 brace bolt.....	1.5	Round	3.	
1 fork for traverse wheels.. {	2.5	0.75	37.	
1 fork for traverse wheels.. {	6.	0.75	7.	
2 fork and prop bolts.....	1.5	Round	5.	
2 traverse wheels.....	–	–	–	Cast iron.
2 bolts for wheels.....	1.5	Round	5.5	
1 pintle. { Body.....	3.	Round	25.5	
1 pintle. { Head.....	1.25	0.75	12.	
2 washers No. 4.....	2.5	0.188	5.	
6 washers No. 5.....	3.25	0.188	19.	
15 nuts No. 4.....	1.5	0.75	22.5	
3 nuts No. 5.....	2.	1.	6.	

Remarks on the bills of iron.

All the *bar iron* in the foregoing bills is rolled iron.

The *drafts* of the hammered iron are represented in PLATE XIV, together with some of the principal *formers* required for shaping the iron work.

Specimens of two kinds of formers for trunnion plates and understraps are given here, as in PART 2. Either kind may be used, as may be thought most convenient. The double formers serve for the plates of both cheeks, one former on each side; they are laid on blocks of wood hollowed out for the purpose.

Formers for parts of other carriages can be readily made after the examples given in the plate.

Summary bill of iron for one 24-pounder casemate carriage.

SIZE OF IRON.		GUN CARRIAGE.		CHASSIS.		TOTAL.		REMARKS.
Wide.	Thick.							
In.	In.	Feet.	Lbs.	Feet.	Lbs.	Feet.	Lbs.	
0.375	Round	4.25	1.56	–	–	4.25	1.56	
0.5	Round	.16	.10	1.37	0.89	1.53	.99	
0.75	Round	6.16	9.05	1.12	1.64	7.28	10.69	13.5 in. for pintle.
1.	Round	33.23	86.73	10.39	27.11	43.62	113.84	
1.5	Round	10.44	61.49	–	–	10.44	61.49	
2.	Round	5.00	52.35	5.66	59.33	10.66	111.68	26.5 in. for traverse
2.375	Round	1.12	16.53	–	–	1.12	16.53	wheels.
3.25	Round	.42	11.61	–	–	.42	11.61	
.3	.3	–	–	12.5	3.78	12.50	3.78	
.75	.375	3.5	3.29	–	–	3.5	3.29	
1.0	0.5	–	–	.16	.26	.16	.26	
1.25	0.2	3.08	2.59	–	–	3.08	2.59	
1.25	0.375	2.83	4.44	–	–	2.83	4.44	
1.5	0.75	1.87	7.06	–	–	1.87	7.06	
1.625	0.125	–	–	.19	.12	.19	.12	
2.	0.25	–	–	5.42	9.10	5.42	9.10	
2.	0.75	2.33	11.74	–	–	2.33	11.74	
2.	1.0	3.33	22.38	2.33	15.65	5.66	38.03	
2.	1.25	.66	5.54	–	–	.66	5.54	
2.5	0.188	1.5	2.35	–	–	1.5	2.35	
3.0	0.2	1.	2.01	–	–	1.	2.01	
3.0	0.5	–	–	7.35	37.04	7.35	37.04	
3.25	0.188	5.83	11.89	2.89	5.90	8.72	17.79	
3.5	0.188	.29	.64	–	–	.29	.64	
4.75	0.5	8.66	69.10	–	–	8.66	69.10	
5.	0.375	–	–	22.66	142.75	22.66	142.75	2 pieces, 11 ft. 4 in.
1 draft.		–	–	–	28.	–	28.	Tongue fork.
1 do.		–	–	–	83.	–	83.	Tongue.
			382.45	–	414.57	–	797.02	
Cast iron.....			54.5	–	–	–	54.5	Bed plate.
Do.....			11.5	–	–	–	11.5	Handle for screw.
Do.....			13.	–	–	–	13.	Roller.
Do.....			446.	–	–	–	446.	2 truck wheels.
Do.....			–	–	60.	–	60.	2 wheels ⟩ journals
Do.....			–	–	198.	–	198.	2 do. ⟩ includ'd
Do.....			–	–	92.	–	92.	Pintle; eye includ'd
			525.0	–	350.	–	875.	
Cast brass.....			12.	–	–	–	12.	Nut for screw.
Do.....			2.	–	–	–	2.	Pinion for screw.
Do.....			–	–	44.	–	44.	8 journal boxes.
			14.	–	44.	–	58.	

Summary bill of iron for one 32-pounder casemate carriage.

SIZE OF IRON.		GUN CARRIAGE.		CHASSIS.		TOTAL.		REMARKS.
Wide.	Thick.							
In.	In.	Feet.	Lbs.	Feet.	Lbs.	Feet.	Lbs.	
0.375	Round	4.25	1.56	–	–	4.25	1.56	
0.5	Round	.16	.10	1.62	1.05	1.78	1.15	
0.75	Round	6.16	9.05	1.12	1.64	7.28	10.69	13.5 in. for pintle.
1.	Round	35.88	93.64	10.77	28.10	46.65	121.74	
1.5	Round	10.68	62.90	–	–	10.68	62.90	
2.	Round	5.	52.35	5.66	59.33	10.66	111.68	26.5 in. for traverse
2.375	Round	1.12	16.53	–	–	1.12	16.53	wheels.
3.25	Round	.42	11.61	–	–	.42	11.61	
.3	0.3	–	–	12.50	3.78	12.50	3.78	
.75	0.375	3.5	3.29	–	–	3.5	3.29	
1.	0.5	–	–	.16	.26	.16	.26	
1.25	0.2	3.08	2.59	–	–	3.08	2.59	
1.25	0.375	2.83	4.44	–	–	2.83	4,44	
1.5	0.75	1.87	7.06	–	–	1.87	7.06	
1.625	0.125	–	–	0.19	.12	.19	.12	
2.	0.25	–	–	5.42	9.10	5.42	9.10	
2.	0.75	2.33	11.74	–	–	2.33	11.74	
2.	1.	3.33	22.38	2.33	15.65	5.66	38.03	
2.	1.25	.66	5.54	–	–	.66	5.54	
2.5	0.188	1.50	2.35	–	–	1.50	2.35	
3.	0.2	1.	2.01	–	–	1.0	2.01	
3.	0.5	–	–	7.70	38.81	7.70	38.81	
3.25	0.188	5.83	11.89	2.89	5.90	8.72	17.79	
3.5	0.188	.29	.64	–	–	.29	.64	
5.	0.375	–	–	22.66	142.75	22.66	142.75	2 pieces, 11 ft. 4 in.
5.5	0.5	8.75	80.85	–	–	8.75	80.85	
1 draft.....		–	–	–	28.	–	28.	Tongue fork.
1 do.....		–	–	–	83.	–	83.	Tongue.
			402.52	–	417.49	–	820.01	
Cast iron.....			54.5	–	–	–	54.5	Bed plate.
Do.....			11.5	–	–	–	11.5	Handle for screw.
Do.....			14.	–	–	–	14.	Roller.
Do.....			446.	–	–	–	446.	2 truck wheels.
Do.....			–	–	60.	–	60.	2 wheels } journals
Do.....			–	–	198.	–	198.	2 do. } includ'd.
Do.....			–	–	92.	–	92.	Pintle; eye includ'd.
			526.	–	350.	–	876.	
Cast brass.....			12.	–	–	–	12.	Nut for screw.
Do.....			2.	–	–	–	2.	Pinion for screw.
Do.....			–	–	44.	–	44.	8 journal boxes.
			14.	–	44.	–	58.	

Summary bill of iron for one 42-pr. or one 8-in. Columb'd carriage.

SIZE OF IRON. Wide.	Thick.	GUN CARRIAGE. Feet.	Lbs.	CHASSIS. Feet.	Lbs.	TOTAL. Feet.	Lbs.	REMARKS.
In.	In.							
0.375	Round	4.25	1.56	–	–	4.25	1.56	
0.5	Round	.16	.10	1.64	1.08	1.80	1.18	
0.75	Round	6.16	9.05	1.12	1.64	7.28	10.69	13.5 in. for pintle.
1.0	Round	37.54	97.98	10.98	28.65	48.52	126.63	
1.5	Round	10.77	63.43	–	–	10.77	63.43	
2.	Round	5.	52.35	5.66	59.33	10.66	111.68	26.5 in. for traverse
2.375	Round	1.12	16.53	–	–	1.12	16.53	wheels.
3.25	Round	.42	11.61	–	–	.42	11.61	
0.3	0.3	–	–	12.50	3.78	12.50	3.78	
0.75	0.375	3.5	3.29	–	–	3.50	3.29	
1.0	0.5	–	–	.16	.26	.16	.26	
1.25	0.2	3.08	2.59	–	–	3.08	2.59	
1.25	0.375	2.83	4.44	–	–	2.83	4.44	
1.5	0.75	1.87	7.06	–	–	1.87	7.06	
1.625	0.125	–	–	.19	.12	.19	.12	
2.0	0.25	–	–	5.42	9.10	5.42	9.10	
2.0	0.75	2.33	11.74	–	–	2.33	11.74	
2.0	1.0	3.33	22.38	2.33	15.65	5.66	38.03	
2.	1.25	.66	5.54	–	–	.66	5.54	
2.5	0.188	1.50	2.35	–	–	1.50	2.35	
3.0	0.2	1.	2.01	–	–	1.00	2.01	
3.0	0.5	–	–	8.08	40.72	8.08	40.72	
3.25	0.188	5.83	11.89	2.89	5.90	8.72	17.79	
3.5	0.188	.29	.64	–	–	.29	.64	
5.	0.375	–	–	22.66	142.75	22.66	142.75	2 pieces, 11 ft. 4 in.
6.	0.5	9.08	91.52	–	–	9.08	91.52	
1 draft.....		–	–	–	28.	–	28.	Tongue fork.
1 do.....		–	–	–	83.	–	83.	Tongue.
			418.06	–	419.98	–	838.04	
Cast iron.....			54.5	–	–	–	54.5	Bed plate.
Do.....			11.5	–	–	–	11.5	Handle for screw.
Do.....			14.	–	–	–	14.	Roller.
Do.....			446.	–	–	–	446.	2 truck wheels.
Do.....			–	–	60.	–	60.	2 wheels) journals
Do.....			–	–	198.	–	198.	2 do.) includ'd
Do.....			–	–	92.	–	92.	Pintle; eye includ'd
			526.	–	350.	–	876.	
Cast brass.....			12.	–	–	–	12.	Nut for screw.
Do.....			2.	–	–	–	2.	Pinion for screw.
Do.....			–	–	44.	–	44.	8 journal boxes.
			14.	–	44.	–	58.	

Summary bill of iron for one 24-pr. howitzer casemate carriage.

SIZE OF IRON.		GUN CARRIAGE		CHASSIS.		TOTAL.		REMARKS.
Wide.	Thick.							
In.	In.	Feet.	Lbs.	Feet.	Lbs.	Feet.	Lbs.	
0.15	Round	3.75	.37	–	–	3.75	.37	
0.2	Round	2.33	.32	–	–	2.33	.32	
0.5	Round	3.08	2.01	–	–	3.08	2.01	
0.625	Round	1.83	1.86	–	–	1.83	1.86	
0.75	Round	4.16	6.11	2.54	3.73	6.70	9.84	
0.875	Round	.87	1.74	–	–	.87	1.74	
1.0	Round	15.92	41.55	5.67	14.79	21.59	56.34	
1.375	Round	1.06	5.23	–	–	1.06	5.23	
1.5	Round	.50	2.94	1.87	11.01	2.37	13.95	
2.	Round	2.04	21.35	.75	7.85	2.79	29.20	
3.	Round	–	–	2.12	49.95	2.12	49.95	
3.25	Round	.42	11.61	–	–	.42	11.61	
0.3	0.3	1.66	.50	–	–	1.66	.50	
1.0	0.5	.17	.28	–	–	.17	.28	
1.25	0.75	–	–	1.	3.15	1.	3.15	
1.5	0.375	.25	.47	–	–	.25	.47	
1.5	0.75	1.	3.78	1.87	7.07	2.87	10.85	
1.625	0.125	.27	.18	–	–	.27	.18	
1.75	1.75	1.	10.29	–	–	1.	10.29	
2.0	0.75	.58	2.92	–	–	.58	2.92	
2.0	1.0	3.33	22.38	3.33	22.38	6.66	44.76	
2.5	0.188	1.02	1.60	.67	1.05	1.69	2.65	
2.5	0.5	–	–	2.75	11.55	2.75	11.55	
2.5	0.75	–	–	4.42	27.84	4.42	27.84	
2.5	2.	–	–	1.	16.80	1.	16.80	
3.0	0.5	–	–	5.25	26.46	5.25	26.46	
3.25	0.188	2.12	4.32	1.58	3.22	3.70	7.54	
3.25	0.25	.54	1.47	.83	2.26	1.37	3.73	
3.25	0.5	2.72	14.85	–	–	2.72	14.85	
3.25	1.0	5.33	58.20	–	–	5.33	58.20	
6.0	0.75	–	–	.58	8.77	.58	8.77	
12.0	0.5	–	–	1.	20.16	1.	20.16	
			216.33	–	238.04	–	454.37	
Cast iron.....			160.	–	–	–	160.	Front transom.
Do.....			200.	–	–	–	200.	Rear transom.
Do.....			12.	–	–	–	12.	Roller for trail.
Do.....			–	–	28.	–	28.	2 traverse wheels.
			372.	–	28.	–	400.	
Cast brass.....			15.	–	–	–	15.	2 rollers.
Do.....			.5	–	–	–	.5	2 journal plates.
Do.....			12.	–	–	–	12.	Nut for screw.
Do			2.	–	–	–	2.	Pinion for screw.
			29.5	–	–	–	29.5	

ARTILLERY.

PART EIGHTH.

CORRECTIONS—*Part Seventh.*

Page 11—5th line, add to the description of the *front transom*, that it is let into the inside of the cheeks, with tenons, like the rear transom.

A corresponding correction is required in the first edition of Plate XIII, PART 7.

1849.

PART EIGHTH.

MORTAR BEDS.

Siege mortar beds.—Plate I.

The beds for 8-inch and 10-inch siege mortars are similar to each other, differing only in their dimensions.

They consist of *two cheeks*, a *middle transom* and a *front transom*, of CAST IRON, all made in one piece.

Four manœuvring bolts, of wrought iron, are set in the mould, when the bed is cast.

The trunnion bed is accurately reamed, in the cheeks and transom.

Two cap squares, of wrought iron, are fastened to the cheeks, each by *two straps* held by *two bolts* passing through holes in the cheeks, and keyed on the outside.

A *bolster* (OAK) is fastened on the front transom by *two bolts* and *two nuts*. The bolster has a groove for the elevating quoin, which is placed in a direction perpendicular to the axis of the mortar.

Platform for siege mortars.—Plate II.

This platform is made of planks of oak, yellow pine, or other hard wood. It consists of *six sleepers* and *eighteen deck planks*.

The deck planks are held together by *four dowels* in one edge of each plank, which fit into four holes in the edge of the next plank. The holes for these dowels must be accurately bored in the positions assigned for them, so that any two planks may be

put together in laying down the platform. The dowels are made of hickory, or other hard wood, and they are put in with *fox wedges*, to hold them fast.

The front and rear planks and the sleepers are bored, to receive *eye bolts* of iron, one at each end of each sleeper, in order to prevent the deck from sliding on the sleepers.

Coehorn mortar bed.—Plate II.

The *bed* is made of a block of oak wood, in one or two pieces, strengthened by *two bolts*, No. 3, A, with *four washers* and *two nuts*.

Two cap squares are fastened to the bed, each by *two bolts*, No. 2, B, and *two nuts*.

Four handles are fastened to the bed by *four bolts*, No. 3, A, and *four nuts*.

Eprouvette mortar bed and platform.—Plate II.

The *bed plate* for the eprouvette mortar is of cast iron. It has a seat, with dovetailed sides, to fit the sole of the mortar.

The plate is let in, to the depth of 2 inches, into a *platform* of oak wood, formed of one or two pieces, strengthened by *two bolts*, No. 5, A, with *four washers* and *four nuts*.

This wooden platform is fastened with *four bolts*, No. 7, to a block of stone, of the same dimensions as the wood, which is sunk in the ground and firmly imbedded in masonry.

The platform must be set in such a manner that the bed shall be exactly horizontal, so that the axis of the mortar may stand at an elevation of 45°.

ARTILLERY.

PART NINTH.

MACHINES

FOR

SIEGE AND GARRISON SERVICE.

1849.

PART NINTH.

MACHINES.

Field and Siege Gin.—Plate I.

Wood work.

Two legs, (spruce or ash; straight-grained and free from knots.) The corners are rounded with a radius of .75 in., except those of the bevels for the pulleys, which are rounded .2 in.

The corners of the mortises for the braces are rounded with a radius of .1 in.

One pry pole, (spruce or ash.) It is round in its whole length.

Three cross bars, or braces, (oak.) The corners are rounded with a radius of .25 in.

When the gin is taken apart, for transportation, the braces are tied together, in the manner represented in the plate; holes are bored in the long brace, to receive the ends of the assembling pins of the other braces.

Six assembling pins, (oak.) They are .75 in. diameter; the ends are chamfered about .1 inch.

One windlass, (oak.) The corners of the mortises are rounded .15 inch. The roundings of the other parts are shown in the plate.

Five handspikes, (hickory or oak.) Like the manœuvring handspike—Part 10, Plate III.

Irons.

Six rivets and burrs, No. 2, B, for the tenons of the braces.

One tongue. It is fastened to the left leg of the gin with *three rivets*, the projecting part of the tongue being let into the wood.

Two head straps. The outer edges are chamfered .1 in. They are fastened on the head of the gin, each by *two rivets*, No. 3, and *eight screws*, 2 in., No. 14.

One assembling bolt, No. 4, A. *Two washers* and *one nut* for the same.

The nut washer is fastened to the left leg of the gin by two of the rivets which fasten the tongue. The washer for the head of the bolt is fastened to the right leg by *two screws*, 1½ in., No. 14.

Two sheaves, for fixed pulleys, (CAST BRASS.)

One sheave bolt.

Two oval washers, for the sheave bolt. They are fastened to the legs of the gin, each by *two screws*, 1½ in., No. 14.

One key, for sheave bolt. It has a hole for a leather keeper.

One key bolt, for fastening the pry pole to the legs of the gin.

One chain, for the key bolt. It consists of *eight links* No. 2, (not twisted,) and *two rings* No. 2, A.

One eye pin, No. 2, for the key chain.

Two journal boxes. The outer edges are chamfered .12 inch. The journal boxes are fastened to the legs, each by four bolts.

Eight bolts, No. 3, C, for the journal boxes.

Eight washers and *eight nuts* for the same.

Two gudgeons, for the windlass. The gudgeons and their collars are turned. The stem and the collar are let into the end of the windlass; they are driven in hard and fastened with a *key.* The holes for the keys should be bored so as to draw the gudgeon about the sixteenth of an inch. The keys are cut off flush with the wood and slightly riveted.

Four bands, for the windlass. The outer edges are chamfered .1 inch; the inner edges are slightly rounded, so as not to chafe the wood when they are driven on. The bands are fastened to the windlass, each by *four nails*, No. 1, C, 1½ in. long.

Two bands, for the legs. } Their outer edges are cham-
Three bands, for the pry pole. } fered .1 inch. They are fastened each by *two nails*, No. 1, C.

Three points, for the legs and pry pole. The stems are jagged and driven hard into the ends of the legs.

One handle, for the pry pole. *Two washers* for the handle are let into the pry pole and fastened each by *three screws*, 1¼ in., No. 14.

One tongue, for the pry pole. The edges are rounded .1 inch. The part which is let into the pry pole is rounded to the shape of the wood. It is fixed in the head of the pry pole by two rivets and burrs, No. 3, B.

One pulley block. It consists of a *sheave*, like those in the head of the gin; *two straps*, a *cross piece* and a *hook*, connected together by *three bolts* and *nuts*, as shown in the plate.

Bill of timber for field and siege gin.

PARTS.	No. of pieces.	DIMENSIONS OF EACH PIECE.			CONTENTS.		REMARKS.
		Long.	Wide.	Thick.	Each piece.	Total.	
		In.	In.	In.	Feet.	Feet.	
Legs.....	2	180	6.5	5.5	44.69	89.38	Spruce or ash.
Pry pole.....	1	180	5.5	5.5	37.81	37.81	Spruce or ash.
Windlass.....	1	68	9.	9.	38.25	38.25	Oak.
Braces. Upper...	1	48	4.75	2.75	4.35	4.35	Oak plank.
Braces. Middle..	1	72	4.75	2.75	6.53	6.53	Oak plank.
Braces. Lower..	1	102	4.75	2.75	9.25	9.25	Oak plank.
						185.57	

Bill of iron for field and siege gin.

PARTS.	Width.	Thickness	Length.	Weight.	REMARKS.
	In.	In.	In.	Lbs.	
Chain, No. 2	0.2	Round	42.	0.36	
Rivets and nails	.375	Round	129.	3.95	
Bolts, No. 3, and keys for gudgeons	.625	Round	71.	6.03	
Key bolt	.75	Round	10.	1.22	
Bolts, No. 5, eye pin and handle	1.	Round	27.	5.87	
Sheave bolt	1.25	Round	16.	5.45	
Bolts for pulley block	1.5	Round	8.	3.92	
Cross head for pulley block	2.5	Round	3.5	4.77	
Collars for gudgeons	0.5	0.5	16.	1.12	
Nuts, No. 3	1.25	.625	10.	2.18	
Bands	1.5	.25	212.	22.26	
Nuts, No. 4	1.5	.75	5.	1.57	
Hook for pulley block	1.75	1.75	12.	10.29	Hammered.
Washers, No. 3	2.	0.125	18.	1.26	
Bevel washer	2.	.625	3.	1.05	
Gudgeons and points	2.	2.	29.	32.48	
Oval washers	2.5	0.125	13.	1.14	
Head straps	2.5	.31	32.	7.	
Straps for pulley block	2.5	.5	30.	10.50	
Pry pole tongue	3.5	1.	12.	11.76	Hammered.
Journal boxes	3.5	1.75	24.	41.16	
Tongue plate	5.5	0.5	16.	12.32	Hammered.
				187.66	
Three sheaves for pulleys	–	–	–	24.	Brass.

GARRISON AND CASEMATE GINS.—Plates II and III.

These two gins are constructed in the same manner; they differ from each other only in their height and other corresponding dimensions, as shown in the plates.

Wood work.

Two legs, (SPRUCE or YELLOW PINE.) They are made round, except at the bevels for the journals of the windlass. Instead of working the bevel out of the same piece as the leg, it may be formed of another piece of timber which is fastened to the leg by two bands, in the manner represented in *Plate* II.

FIG. A, *Plate* II, shows an arrangement for forming the bevel for the windlass by means of a brass journal box bolted to the legs, as in the field and siege gin. The two last methods of arranging the journal boxes allow of using smaller timber for the legs than by the first method.

One pry pole, (SPRUCE or YELLOW PINE.)

Cleats, for steps, (OAK.) There are *six* on the casemate, and *eleven* on the garrison gin. They are fastened to the pry pole, each by *two nails*, No. 2, C. The pry pole is notched out to give a bearing for the inside of the cleat.

One windlass, (OAK.) It is turned in its whole length, and then partly squared near the ends, for the handspike mortises. The corners of the mortises are rounded .15 inch.

Irons.

Six bands, for the legs and pry pole. The edges are chamfered .12 inch. The bands are fastened each by *three nails*, No. 3, C, 2 in. long.

Two rivet bolts, No. 1, G. They pass through the legs, just below the journal boxes. The nuts are round and let into the wood.

Two braces. They are round in the middle and square near the bolt holes. They are fastened to the legs, each by *two bolts*, No. 5, with keys.

When the gin is dismounted the lower brace is fastened to the left leg, and the upper one to the right leg, by their bolts and keys.

Eight washers, for the brace bolts. They are round, and are let into the legs and fastened, each by *four nails.*

Four keys, for the brace bolts.

Four key chains. Each chain consists of *four links*, No. 1, and *two rings*, No. 1, B.

Four eye pins, No. 1, for key chains. They are screwed into the legs, above the bolt holes.

Three points, for the legs and pry pole. The stems are jagged and driven hard into the wood.

One handle, for the pry pole. The handle is driven into the wood and kept in place by *two washers* like those for the bolt holes in the legs.

One clevis and *one clevis bolt.* The bolt has a key hole at each end. It is fastened in the head of the pry pole by a *round pin* which is driven in perpendicular to the bolt and passes through a round notch cut in the middle of the bolt on the upper side.

Two keys, for the clevis bolt.

Two key chains. Each consists of *twelve links*, No. 1, and *two rings*, No. 1, B.

Two eye pins, No. 1, for the key chains.

Two journal boxes, (BRASS.) They are let into the legs and are fastened each by *four screws*, 2.5 inch, No. 20.

Two pawls, for the ratchets of the windlass. They are fastened to the legs of the gin by *two bolts*, No. 3, A. *Two washers* and *two nuts* for these bolts.

When the large journal boxes, represented in *Fig.* A, PLATE II, are used, they are fastened to the legs, each by *two bolts*, one of which holds the pawl. For these journal boxes the wind-

lass of the garrison gin must be four inches longer than for the others.

Two journals, for the windlass. They are let into mortises cut into the ends of the windlass, which are filled up with pieces of wood, after the journals are inserted. The parts let into the wood are square.

Six bands, for the windlass. The outer corners are chamfered .12 inch. The bands are driven on hard and fastened each by *four nails*, No. 3, C.

Two ratchets. They fit on hexagonal tenons made on the ends of the windlass, and they are fastened each by *four nails*, No. 3, C, 4.5 in. long.

Gin blocks.

They are made with one, two, three, or four sheaves, differing accordingly in the lengths of the bolts and cross heads, as shown in Plate III. The parts are as follows:

Two straps. The outer edges are chamfered .25 inch. The ends are bent over the cross heads.

Two cross heads. Each of them has an *eye* riveted into it. The ends are cut with screw threads, to connect them with the straps. *Four nuts* for the same.

One hook. It is welded into the eye of one of the cross heads.

The *partition*, between the sheaves, has two tenons at each end, which are let into the cross heads.

The *sheaves*, (CAST BRASS.)

One sheave bolt, No. 5, A. *One nut* for the same.

Bill of timber for one garrison gin.

NAMES OF PARTS.	No. of pieces.	DIMENSIONS OF EACH PIECE.			CONTENTS.		REMARKS.
		Long.	Wide.	Thick.	Each piece.	Total.	
		In.	In.	In.	Sup. feet.	Sup.ft.	
Legs and pry pole, large end	3	264.	9.	9.	113.21	339.63	Spruce.
Legs and pry pole, small end			6.5	6.5			
Bevel blocks.....	1	40.	10.	9.	25.	25.00	For 2 blocks.
Windlass.....	1	104.	11.	11.	87.39	87.39	Oak.
Cleats.....	11	12.	4.25	3.	1.06	11.66	Oak plank.

Bill of timber for one casemate gin.

NAMES OF PARTS.	No. of pieces.	DIMENSIONS OF EACH PIECE.			CONTENTS.		REMARKS.
		Long.	Wide.	Thick.	Each piece.	Total.	
		In.	In.	In.	Sup. feet.	Sup.ft.	
Legs. Large end..	2	180.	12.5	9.5	100.33	200.66	Spruce.
Legs. Small end..			6.5	6.5			
Pry pole Large end	1	180.	9.	9.	77.03	77.03	
Pry pole Small end			6.5	6.5			
Windlass.....	1	101.	11.	11.	84.88	84.88	Oak.
Cleats.....	6	12.	4.25	3.	1.06	6.36	Oak plank.

Bill of iron for one garrison or casemate gin.

PARTS.	Wide.	Thick.	Long.	W'ght	REMARKS.
	In.	In.	Feet.	Lbs.	
Key chains, No. 1	0.15	Round	7.5	0.52	This bill includes the materials for one double and one triple pulley block.
Rings	0.2	Round	2.5	0.27	
Rivet bolts, No. 1	0.5	Round	1.66	1.08	
Pin for clevis bolt	0.75	Round	0.41	0.60	
Eye pins	0.875	Round	0.83	1.66	
Bolts, No. 5, and pry pole handle.	1.	Round	3.33	8.69	
Bolts, No. 3, for pawls	1.25	Round	0.70	2.86	
Braces and clevis	1.5	Round	22.5	132.52	
Clevis bolt	1.75	Round	2.25	18.02	
Bolt heads, No. 5, and points for legs	2.	Round	4.	41.88	
Nails, No. 3	0.375	0.375	9.41	4.42	
Nuts, No. 1	1.	0.5	0.16	0.26	
Keys for braces	1.25	0.125	1.16	0.60	
Nuts, No. 3, and pawls	1.25	0.625	2.54	6.65	
Eyes for pulley blocks	1.25	1.25	2.	10.50	
Keys for clevis bolt	1.5	0.125	1.16	0.73	
Nuts, No. 4	1.5	0.75	0.75	2.83	
Hooks for blocks	1.75	1.75	1.83	18.83	Hammered.
Washers, No. 3	2.	0.125	0.33	0.27	
Middle bands for windlass	2.	0.25	14.58	24.49	
Collars for points	2.	1.	2.	13.44	
Journals	2.	2.	1.66	22.31	
Washers for handle	3.	0.188	0.5	0.94	
Washers, No. 5	3.25	0.188	2.16	4.40	
End bands for windlass	3.5	0.25	5.33	15.67	
Lower bands for legs	4.	0.25	5.08	17.06	
Cross heads for blocks	4.	1.25	2.33	39.14	Hammered.
Upper bands for legs	6.	0.25	4.12	20.76	
Partitions for blocks	8.	0.25	2.75	18.48	
Straps for blocks	8.	0.37	5.	50.40	
				480.28	
Two ratchets	–	–	–	39.	Cast iron.
Two journal boxes	–	–	–	13.	Cast brass.
Five sheaves	–	–	–	60.	Cast brass.
				73.	

Sling Cart.—Plates IV and V.

Wood work.

One axletree, (oak.) The lower corners are chamfered .5 inch, between the stirrups. The arms are rounded, to fit the nave boxes.

One bolster, (oak.) The upper corners are slightly rounded, where the iron work permits. The ends are chamfered .25 inch. An interval of .2 in. is left between the axletree and the bolster, to allow for the shrinking of the hounds and pole, which are let in between them.

One pole, (oak.) It is rounded for 32 inches from the small end. The lower corners of the remaining part, and the upper corners, in front of the hounds and between the hounds and axletree, are chamfered .5 inch.

Two hounds, (oak.) The inner corners are chamfered .5 inch, except where they are joined to the pole and axletree. The outside, in front of the axletree, is rounded with a radius of 4.25 inches.

One pole prop, (hickory.)

Irons.

One lower axle skean. It is let into the under side of the axletree, in its whole length. The ends are rounded, to conform to the shape of the axle arms.

Two upper skeans. They are let into the upper side of the axle arms and into the shoulders.

Six rivets, No. 3, for the axle skeans.

Two bands, for the ends of the axle arms. They are let into notches in the skeans, the ends of which are turned up, on the outside of the bands.

Two washer plates, for axle hooks. They are let into the rear of the axle tree and fastened each by *four nails* No. 3, C, 2.5 inches long.

Two axle hooks. *Two nuts* and *two washers*, No. 7, for the same.

Two washer plates, for bolster hooks. They are let into the front of the bolster and fastened each by *four nails*, No. 3, C, 2 inches long.

Two bolster hooks. *Two nuts* and *two washers*, No. 5, for the same.

The axle and bolster hooks serve for fastening the lashing chains or ropes, when the weight is slung, to relieve the pressure on the screw.

Two stirrups. They are let in flush with the surfaces of the bolster and axletree, which they hold together by means of *two bridles* and *four nuts*, No. 4.

One bed plate, for the hoisting screw, (CAST IRON.) The plate is let into the top of the bolster, and fastened by *two bolts*, No. 4, C, which pass through the bolster and axletree.

Two nuts, No. 4, for these bolts.

One hoisting screw. The lower part is square, and it passes through a square hole in the axletree to prevent the screw from turning. It has two hooks at the lower end, for hitching the chains by which the load is raised.

One nut for the screw, (BRASS.) It is made round, with two square feathers projecting on opposite sides.

One handle, for the screw. The branches are round; the socket hole has two square notches which fit on the projecting feathers of the nut, for the purpose of turning it.

Two rivets and *burrs*, No. 3, B, for the front end of the pole.

One pole strap. It forms an eye on the front end of the pole, for attaching the sling cart to a limber.

Three bolts, No. 2, A, for the pole strap. *Three nuts* for the same.

Twelve nails, No. 3, C, 2 inches long, for pole strap.

Two bolts, No. 5, B, for connecting the hounds with the bolster and axletree. Their heads are let into the top of the bolster. *Two nuts*, for the same.

Three bands, for the hounds and pole. Their outer corners are chamfered .1 inch. The inner corners are rounded, to prevent chafing the wood, when they are driven on. The bands are fastened each by *six nails*, No. 3, C, 2.5 inches long.

Two bolts, No. 4, A., for the hounds and pole. *Four washers* and *two nuts* for the same.

One cascable chain, for holding up the breech of a gun, or the front end of any weight, when slung. The chain consists of *sixteen links*, No. 5, *one ring*, and *one hook*. The ring traverses on the bar of the pole staple, to suit the different lengths of guns.

One pole staple. Two nuts and *two washers*, No. 4, for the same.

One eye pin, for pole prop socket. *Two washers* and *one nut*, No. 3, for the same.

One socket and *one ferrule*, for pole prop. Each of them is fastened to the prop by *one rivet*, No. 2.

One pole prop chain. It consists of *sixteen links*, No. 1, *one ring*, No. 1, A, and *one toggle*, like that for the limber of field carriages.

One eye pin, No. 1, for pole prop chain.

Two shoulder washers, for axletree.

Two linch washers, with drag hooks.

Two linch pins.

One sling chain, consisting of *sixty-nine links*, *one ring*, and *one hook.*

Two trunnion chains. Each chain consists of *four links*, *one small ring*, and *one trunnion ring.* The sling chain and the trunnion chain should be made of the best quality of iron, and welded with great care.

WHEEL.—Plate IV.

Wood work, (OAK.)

One nave, sixteen spokes, eight fellies, and *eight dowels.* The forms and dimensions of these parts are shown in the plate.

Irons.

Four nave bands. Their exterior corners are chamfered .12 in. They are fastened each by *three nails*, No. 3, C, 2 in. long.

One tire, made in one hoop.

Eight tire bolts, No. 4, C. *Eight washers* and *eight nuts* for the same.

Two nave boxes, (CAST IRON.) Plate V.

This sling cart is capable of transporting the heaviest pieces of ordnance. It is used with a field carriage limber.

Bill of timber for one sling cart.

NAMES OF PARTS.	No. of pieces.	DIMENSIONS OF EACH PIECE.			CONTENTS.		REMARKS.
		Long.	Wide.	Thick.	Each piece.	Total.	
		In.	In.	In.	Sup. feet.	Sup. feet.	
Axletree.....	1	102.	11.	9.	70.13	70.13	Oak.
Bolster.....	1	66.	9.	9.	37.13	37.13	Do.
Hounds.....	2	80.	9.	5.	25.	50.	Do.
Tongue { Large end. / Small end. }	1	198.	7.5 / 5.	6. / 5.	48.13	48.13	Do.
Two WHEELS. { Naves....	2	21.	19.	Round	41.34	82.68	Do.
Spokes..	32	48.	5.25	2.75	4.81	153.92	Do.
Fellies...	16	39.	9.	5.5	13.4	214.4	Oak plank.

Bill of iron for one sling cart.

PARTS.	Wide.	Thick.	Long.	Weight.	REMARKS.
	In.	In.	Feet.	Lbs.	
Pole prop chain, No. 1	0.15	Round	3.75	0.26	
Rings, No. 1	0.2	Round	0.31	0.03	
Rivets, No. 2	0.25	Round	0.50	0.08	
Chain, No. 5, and rivets, No. 3.	0.375	Round	9.06	3.33	
Pole rivets	0.5	Round	0.50	0.32	
Bolts, No. 4, chains & pole staple	0.75	Round	89.58	131.68	
Eye pin, No. 1	0.875	Round	0.14	0.28	
Bolts, Nos. 2 and 5, and rings	1.	Round	9.91	25.86	
Bolt heads, No. 4, and eye pin*	1.5	Round	1.	5.86	* Pole prop.
Screw handle	1.75	Round	5.33	42.69	
Bolt heads, No. 5	2.	Round	0.50	5.23	
Nails, No. 3	0.375	0.375	12.04	5.66	
Toggle for pole prop chain	0.5	0.25	0.16	0.06	
Axle washers, upper skeans, nuts No. 2, and chain hook.	1.	0.5	11.25	18.90	
Burrs for pole rivets	1.125	0.25	0.18	0.17	
Nuts, No. 3	1.25	0.625	0.10	0.26	
Bolster hooks	1.25	1.25	2.33	12.23	
Axle bands	1.3	0.2	2.50	2.17	
Nuts, No. 4	1.5	0.75	3.25	12.28	
Hook for sling chain	1.5	1.	1.33	6.70	Hammered.
Axle hooks	1.5	1.5	2.50	18.90	
Pole prop ferrule	1.75	0.375	0.66	1.45	
Linch pins	1.75	0.625	0.83	3.04	
Washers, No. 3	2.	0.125	0.33	0.27	
Bands for hounds and pole	2.	0.25	10.	16.80	
Brow bands for naves	2.	0.375	16.33	41.00	
Lower skean & stirrups, (in part)	2.	0.5	10.	33.60	
Bridles	2.	0.625	1.58	6.63	
Stirrups and pole straps	2.	0.75	4.83	24.34	
Nuts, No. 5	2.	1.	0.66	4.43	
Upper skeans	2.25	0.5	0.66	2.49	
Nuts, No. 7	2.25	1.25	0.37	3.49	
Washers, No. 4	2.5	0.188	4.58	7.19	
End bands for naves	2.5	0.375	13.82	43.52	
Lower axle skean—body	3.	0.5	3.41	17.18	
Hoisting screw, (in one piece)	3.	3.	3.83	115.81	Hammered.
Washers, No. 5	3.25	0.188	0.54	1.10	
Pole prop socket	3.5	0.625	1.25	9.18	
Socket of screw handle	3.5	2.25	1.	25.88	Hammered.
Washers, No. 7	4.	0.25	0.66	2.21	
Washers for axle & bolster hooks	4.5	0.375	2.33	13.18	
Two wheel tires	4.5	0.875	50.	661.00	In 4 pieces.
Lower axle skean—middle part.	6.	0.5	1.	10.08	
				1336.82	
Bed plate for screw	–	–	–	42.	Cast iron.
Nave boxes for two wheels	–	–	–	60.	
				102.	
Nut for hoisting screw	–	–	–	14.	Cast brass.

Hand Sling Cart.

This sling cart is very convenient for use at an Arsenal, or in siege or garrison service, for the transportation of light guns and mortars, or their carriages, heavy timber, &c., to short distances; or in embarking and disembarking stores. It should not be habitually used for weights of more than 4000 lbs., but it may serve occasionally for the transportation of a 24-pounder or a 32-pounder gun.

It is made entirely of iron, except the pole, which is of *oak*.

Body.

One axletree. The centre piece is forged separately, and welded to the arms; the projection for the hook is worked out of the same piece, and the upper strap which connects the pole with the axletree is welded to it.

One understrap, for the pole. It has two shoulders, between which the axletree is placed, and it is fastened by a *bolt*, No. 2, E, which is screwed into the under side of the axletree.

Three bolts, No. 3, D, for connecting the pole with the upper and lower straps.

Three nuts, for the same.

Two rivets, No. 3, B, for the rear end of the pole.

One pole strap and eye, for the front end of the pole. It is fastened to the pole by *six rivets,* No. 3.

The eye is used for connecting the sling cart occasionally with a limber, or for attaching a horse to it, whilst the pole is held up by hand.

One handle. It is retained in place by a shoulder on one side of the pole and a *key* on the other.

Two braces, made of round iron. The rear ends pass through the axletree; they have shoulders on the front side, and are fastened by *two nuts*, No. 3.

The front ends of the braces are flattened, and are fastened to the pole by *one bolt*, No. 2, A, and *one nut*.

One hook. It is fastened to the rear of the axletree by *one bolt*, No. 4, A, and *one nut*.

Two shoulder washers. Two linch washers. Two linch pins.

Wheel.

One nave, (CAST IRON.)

Ten spokes. The spoke is forged in two parts. The tenon of the nave end is round; the outer end is made with a plate or shoulder, to serve as a bearing for the tire.

One tire. It is shrunk on the ends of the spokes and fastened to them by *four rivets*, No. 3, in each spoke.

CASEMATE TRUCK.—Plate VII.

This truck is used for transporting guns in casemate galleries, or through posterns.

Wood work, (OAK.)

Two rails. The corners are rounded .5 inch; the ends, 1 inch.

Three transoms. The corners are rounded .5 inch.

The transoms are framed to the rails by tenons and mortises; they have notches on the upper side, for the gun to lie in.

One handle.

Irons.

One rear transom plate. It terminates at each end in an eye into which is welded a *ring*, for hooking a drag rope to the truck. The plate is let into the under side of the transom and rails, and fastened by *four nails*, No. 2, C, 3.5 in. long.

One front transom plate. It is made like that for the rear transom, except in having a swell in the middle, with a hole for the stem of the truck wheel fork. It is fastened to the transom with *six nails*, No. 2, C, 3.5 in. long.

Six bolts, No. 4, B, for the rails and transoms.

Six nuts for the same.

Two rear fork plates. They are fastened to the under side of the rails, each by *four nails*, No. 2, C, 3.5 in. long.

Two forks and *two bolts* for rear wheels. They are the same as the traverse wheel forks of the barbette chassis.

One fork socket, for the front wheel. It is made round, and let into the front transom.

One fork and *one bolt*, for front wheel; like the barbette traverse wheel fork, except that the upper part of the stem is conical, to allow the wheel to change its direction. There is a square shoulder, below the conical part, on which the fork plate fits. The fork bolt has no manœuvring tenon on the head.

One fork plate, for front wheel. It is round, with a square hole, to fit on the shoulder of the fork, and an eye to connect it with the tongue.

One tongue.

One tongue bolt, No. 4, A; *one nut* for the same.

Three truck wheels. The same as the traverse wheels of the barbette chassis.

Hand Cart.—Plate VII.

It is used for the transportation of light stores, in siege and garrison service.

Wood work, (oak or ash.)

One bolster, for the axletree.

Two lower side rails. They are bolted to the bolster. They are round in front of the props.

Three lower cross bars. They are joined to the side rails with tenons and mortises. The front bar is round and serves for a handle.

Two upper side rails and *two end rails*, halved together and fastened with *four screws.*

Six side studs and *six end studs.* They are framed into the rails and cross bars, and fastened with wooden pins.

Five boards, (hard wood,) for the bottom, sides and ends. The bottom is fastened to the bolster and the cross bars with *eighteen screws,* 1.5 inch, No. 14. The sides and ends are fastened to the inside of the studs, with *four screws* in each stud.

TWO WHEELS. *Two naves,* (GUM.) *Twenty-four spokes,* (OAK.) The tenons for the fellies are round. *Twelve fellies,* (OAK.)

Irons.

One axletree.

Two bolts, No. 2, B, for the axletree and bolster.

Two nuts, for the same.

Two props, fastened to the side rails each with *two bolts,* No. 1, D. *Four nuts* for these bolts.

Four nave bands, fastened each with *three nails.*

Twelve tire bolts, No. 1, C. *Twelve washers* and *twelve nuts.*

Two nave boxes. They are of wrought iron, welded, .13 inch thick, with small ribs on two sides. They are .25 in. shorter than the nave, to leave room for letting in the shoulder washers.

Two shoulder washers, 2 in. diameter, and .25 in. thick; let into the ends of the naves.

Two linch washers. Two linch pins

STORE TRUCK.—Plate VII.

This truck is used for moving boxes in store-houses, and in embarking and disembarking stores.

Wood work, (OAK.)

Two rails, which are rounded at the ends, for handles.

Four cross bars, framed into the rails and fastened by wooden pins.

Two bolsters, between the rails and the axletree. They are nailed on the under side of the rails.

Irons.

One shoe, fastened on the upper side of the rails by *four bolts*, No. 1, C. *Four washers* and *four nuts* for these bolts.

One axletree, fastened to the rails by *two bolts*, No. 1, C. *Two nuts* for these bolts.

Two guard plates, to prevent the load from touching the wheels. They are let into the rails, under the plates of the shoe, and are fastened by the two bolts which hold the axletree.

Two truck wheels, (CAST IRON.)

Two shoulder washers.

Two linch washers.

Two screws, with square heads. They are screwed into the ends of the axletree, in place of linch pins.

Two props, fastened to the rails each by *two bolts*, No. 1, B. *Four nuts* for these bolts.

LIFTING JACK.—Plate VIII.

This is a geared screw jack, for lifting heavy weights. When the weight is near the ground, it is lifted by means of the *foot* which is joined to the screw. By propping up the weight and putting a block of wood on the foot of the jack, the weight may be raised high enough to place the head of the screw under it, in order to raise it to a greater height, if required.

The *bed* is a block of OAK. It is strengthened by *two rivet bolts*, No. 2, A, with *four washers* and *two nuts.*

Two eye plates for the braces are let into the ends of the bed and fastened each by *two screws* of 2 in. and *one* of 1 in., No. 16. A notch is cut out of the middle of the bed, in order to let the foot of the screw come down, as near as possible, to the ground.

The *stand* is of cast iron. It has a slot in one side, for the foot of the screw to slide in. *Four points* are screwed into the bottom of the stand, to steady it on the wooden bed.

Two braces, made of round iron, are hooked into the eye plates on the bed, and fastened to the stand, at the upper end, by *two bolts*, No. 3, which are screwed into the cast iron.

The *screw* is of the same size and pitch as the elevating screw of the casemate carriage.

The *foot* is formed of the same piece as the body of the screw. A plate is fastened to the foot by *three screws* 1.5 inch, No. 14.

The *head* is screwed on and slightly riveted.

The *nut* and *pinion* are like those of the casemate elevating apparatus.

The *shaft* is kept in place by a *screw pin*, which is let into the projecting part of the stand.

The *crank* is kept on the shaft by a *nut*, No. 4. It has a *wooden handle* which is fastened on by a *washer* and *nut*, No. 2.

A *cap plate* is fastened on the head of the stand by *four bolts*, No. 1, screwed into the stand.

This plate prevents the nut of the screw from working up, when it is turned.

LEVER JACK.—Plate VIII.

The lever jack is an adjustable fulcrum for a long lever; it is designed for use in siege and garrison service.

The *stand* is made of OAK, and consists of *two uprights*, connected by a *transom* and a *bolt*, No. 4, A, and framed into a *bed*, or block of wood, to which they are fastened by wooden pins.

The *fulcrum* is an iron pin which is inserted in holes in the uprights of the stand, at any required height. The pin is fastened to the stand by a *chain*, consisting of *fifteen links*, No. 4, and *three rings*, No. 2, A, held by an *eye pin*, No. 1.

The LEVER is made of oak, 15 feet long.

Two plates of wrought iron, with notches to fit on the fulcrum pin, are fastened to the lever, near one end, by *six screws*, 2.5 inch, No. 16.

ARTILLERY.

PART TENTH.

CORRECTION—*Part Ninth.*

Page 18—after line 15, add, "*two tires.*"

FIELD, SIEGE AND GARRISON ARTILLERY.

1848.

PART TENTH.

IMPLEMENTS, EQUIPMENTS AND TOOLS.

The Plates of this part represent chiefly those implements, equipments and tools which are fabricated at the arsenals, for the service of field, siege and garrison artillery. It has not been thought necessary to present drawings of the ordinary tools which are procured by purchase for the use of the workmen, and which are embraced in the equipment lists.

For the implements, equipments and tools for the service of mountain artillery, see PART 5.

PLATE I.

RAMMER HEADS. They are made of beech, elm, or other tough wood. The corners of the large end are slightly rounded. The neck has a *band*, of sheet copper No. 18, fastened by *three copper nails*, .5 inch long.

The rammers for howitzers are countersunk, as shown in the plate, to receive the head of the fuze.

The head is bored for the tenon of the staff to which it is fastened with a *wooden pin*, .3 inch thick.

SPONGE HEADS. They are made of poplar, elm, &c. The head is bored for the tenon of the staff and fastened by *two wooden pins.*

SPONGES are made of woollen yarn, woven into a warp of hemp or flax thread, making a tissue about half an inch thick, which is sewed up in the form of a bag that fits the sponge head, to which it is fastened with *copper nails* 1 inch long, driven into the inner end of the block, near the staff; a strip of leather is put under the heads of the nails.

SPONGE COVERS. They are made of strong linen, or canvas, painted. The diameter of the bag is equal to that of the bore of the gun; the length is sufficient to allow of the mouth being drawn together, round the staff, by means of a *cord* inserted in a hem.

This length is:

For the 6-pounder sponge	9 inches.
" 12-pounder and 18-pounder sponges .	11 "
" 24-p'dr, 32-p'dr, and 42-p'dr sponges .	12 "

A *loop* of canvas, sewed to the bottom, serves to pull off the cover by. They are marked, in white, with the calibre of the gun to which they belong.

STAVES, for rammers and sponges, are made of tough ash. They are turned in the lathe, with tenons and shoulders where they enter the implement heads.

The rammer and the sponge for a field gun or howitzer, or a mortar, are attached to the same staff; for siege and garrison guns and howitzers, they are on separate staves.

For the coehorn mortar, the sponge is attached to the rammer staff which forms the sponge and rammer heads.

For the columbiads, separate woollen sponges are provided for wiping the chamber and the bore. For these pieces, stiff *hair brushes* are also used occasionally, in order to clean the bore and chamber more easily and thoroughly. The brushes are cylindrical, with hemispherical ends, made to fit the bore or chamber.

PLATE II.

LADLE HEADS. They are made in the same manner as rammer heads, and of the same kinds of wood.

All the implement heads should be perfectly seasoned, and should be saturated with linseed oil, to preserve them in service.

LADLES are made of sheet copper No. 18. The outer corners are rounded with a radius of 2 to 3.5 inches. The *bands* are

brazed together; the *scoop* is planished with a hammer to stiffen it. The ladle is fastened to the head with from 6 to 10 *copper nails*, 1 inch long.

STAVES for ladles are made like those for rammers and sponges; they are fastened to the heads with *wooden pins*.

Worms and staves.

WORMS are made of iron, twisted into the forms represented in the drawing; one for siege and garrison guns, the other for field guns.

The worm is fastened to its staff with *one iron rivet*, .25 inch thick.

STAVES for worms are made of ash, like those for rammers, &c.

PLATE III.

TRAIL HANDSPIKE, for field gun carriages. It is made of hickory, or tough oak. The *stop* is of iron; it has a shoulder under the head; the stem passes through the wood, and the point is clinched and filed down smooth. The *strap* is fastened by *one rivet*, .25 inch thick; it has an eye for the *ring*, which is made of wire .3 inch thick.

MANŒUVRING HANDSPIKE, for the service of siege and garrison carriages, gins, &c. It is made of hickory, or tough oak.

SHOD HANDSPIKE, for the service of garrison carriages and of mortars. It is made of hickory, or tough oak. The *shoe* is of iron, fastened to the wood with *three rivets*, No. 2 C; the point is roughed with a file.

TRUCK HANDSPIKE, for casemate carriages. It is made of round iron, tapered to fit the holes in the periphery of the gun carriage trucks.

ROLLER HANDSPIKE, for working the eccentric roller of the casemate carriage; made of round iron, tapered to fit the holes in the eccentrics.

It may be made with two branches, as represented in Plate XIII of PART 7.

CHOCK for casemate carriage. It is made of oak; the handle is fastened in with a round tenon. The chocks are used on both sides of the carriage; they are therefore made, in equal numbers, for the right hand and the left.

SPONGE BUCKET, for field gun carriages. It is made of sheet iron No. 13; the top and bottom are turned over the sides, and fastened each by *four rivets;* or the bottom may be fastened to the sides by a double fold, and stiffened with a hoop shrunk on above the seam.

The *float* is of wood, fastened by *two rivets* to a cross bar; it is put in before the top is fastened on. The *handle* of the float is fastened to it with *two rivets,* and it is connected with the bail of the bucket by a *chain* consisting of *seven links*, No. 1, (coldshut,) and *two rings*, No. 1, A. The *bail* is fastened to the bucket by *two ears*, each held by *three rivets.* A *toggle*, which is fastened to the bail by *two links* and a *swivel*, serves to attach the bucket to the eye of the axle strap on the gun carriage.

TAR BUCKET. The bucket is made of sheet iron No. 13, like the sponge bucket. The *cover* is fastened to the top by a rivet on which it turns, and it is kept closed by shutting over a stud riveted into the top. The *ears* are fastened to the bucket each by *three rivets;* a *ring*, for suspending the bucket on its hook, is connected with the ears by *two chains*, each consisting of *five links*, No. 3, and *one hook.*

WATER BUCKET, for the travelling forge and the battery wagon. The *staves* and the *bottom* are of oak; there are sixteen staves, and the bottom is made of not more than two pieces. *Three hoops*, made of hoop iron No. 16; each hoop is joined together with *two*

rivets, and fastened to the bucket with *two rivets*. *Two ears* let into the sides, and fastened each by *one rivet*. The *bail* has a *link* connected with it by a *swivel*.

WATER BUCKET, for garrison service. It is made in a similar manner with the preceding, except that the bail has no link and swivel attached to it.

PORTFIRE STOCK. It is made of oak or ash. The *socket* is of cast brass, fastened to the stock by *one brass rivet;* a circular plate of copper is fastened by a nail on the head of the stock, in the bottom of the socket. The *thumb screw*, for holding the portfire, is of brass; the inner end is slightly riveted, to prevent its being lost. The *hook* is of iron, driven into the stock and clinched.

LINSTOCK, made of oak, or ash. The *point* is of iron, fastened to the stock by *one rivet*, No. 2, which also holds the *ferrule*.

PLATE IV.

PROLONGE. It is made of $3\frac{1}{2}$-inch hemp rope, of four strands. A *toggle* is fastened to one end by *three rings* and a *thimble*, which is worked into the rope; another thimble holds a *hook* at the other end of the rope; the splice at each end is served with marline. *Two rings* are lashed to the prolonge with half-inch marline; for which purpose they have a straight side, which is made to fit the prolonge rope.

DRAG ROPE. A 4-inch hemp rope, with a thimble worked into each end; one of the thimbles carries a *hook*. *Six handles*, made of oak or ash, are put in between the strands of the rope and lashed with marline.

MEN'S HARNESS, made of 4-inch rope, with *two thimbles* and a *hook*, like the drag rope. *Six loops*, made of bag leather, are attached to the rope in pairs, by means of knots worked in the rope, or by leather collars sewed to the rope with strong twine.

BUDGE BARREL, for the service of garrison guns. It has *sixteen staves* of oak; the *bottom* is also of oak, made in not more than two pieces. *Four hoops*, of sheet copper No. 18, joined by *two rivets*, are fastened to the barrel each by *five copper rivets*. The *cover*, made of bag leather, is fastened under the upper hoop by *five copper nails*, the heads of which are on the inside, and by the rivets which hold the hoop. It is drawn together at the top by a double *cord* (five-eighths inch sash cord) passing through holes in the leather, at 1.5 inch from the top; each cord is six feet long. The ends of these cords pass through a conical *hood* of bag leather, which covers the mouth of the bag when drawn together, to protect it from rain, or from sparks of fire.

PASS BOX, for garrison guns. It is made of white pine; the sides and ends are dovetailed together; the bottom is let in between the sides and nailed to the sides and bottom. The top has a clamp framed to it at each end, with a tongue and groove, and fastened with nails; it has two 2-inch iron *butt hinges*, fastened each with *six screws;* a strong *hook and staple*, of brass or iron, keep it closed. A wooden handle is fastened diagonally on one end with *two* $1\frac{1}{2}$*-inch screws.*

QUOIN, for siege mortar beds. It is made of oak. The old pattern quoin represented in the plate is adapted to the old 10-inch mortar beds, which are still in service; the new pattern quoin is for the new 10-inch and 8-inch mortar beds, represented in PART 8, Plate I.

FORK, LADLES, TONGS. } For hot shot. These implements are made of iron, with wooden handles; their form and dimensions are shown in the plate.

The fork is used for drawing the shot out of the furnace; the ladles for carrying them to the gun; the tongs for picking up those which may have fallen on the ground.

PLATE V.

PORTFIRE CASE. It is made of russet sole leather. The *cover* rests on the top of the case when it is empty, and on the portfires when it is filled; it has *two flat loops* for the straps to pass through. There are *two round loops*, one on the case and one on the cover, to hold the portfire stock. *Two straps*, one with a *buckle*, (tinned,) the other a billet, are sewed to the case, forming a shoulder belt; the buckle strap has *two standing loops*.

TUBE POUCH. The sides and ends are made of russet sole leather. The *inner cover* has end pieces sewed to it which shut over the ends of the pouch. The *flap*, or outer cover, is of the same piece as the back; it is fastened down by a *strap* to a *brass button*, which is riveted to the bottom of the pouch. The *waist belt* passes through *two loops* sewed to the back of the pouch; it has a *buckle* and a *standing loop* at one end; the buckle is of tinned iron. Two small *loops* are sewed to the inside of the flap, for carrying the priming wire and gimlet.

HAVRESACK. It is made of russet bag leather. The front and back are connected by *gussets* which form the ends and bottom, and allow the bag to be folded flat. The *flap* is of the same piece as the back, and is fastened to the front of the bag by a *billet* and a *buckle strap*. A *billet* and a *buckle strap*, sewed to the back of the bag, form the shoulder belt. The buckles are of tinned iron.

THUMB STALL. Made of black buckskin; the pad is stuffed with hair.

VENT COVER, for guns that have no locks. It is made of black bridle leather; a *pin*, of copper or brass, fastened by two rivets, enters the vent, to prevent the cover from slipping. A *billet* and a *buckle strap*, with a black buckle, fasten it to the gun. The length of the billet must vary with the diameter of the piece at the vent; that in the plate is for a 6-pounder gun.

LOCK COVER. It is made of black bridle or harness leather. The cap which covers the lock is shaped wet, on a former. *Two billets* and *two buckle straps*, with black buckles, fasten it on the gun; the length of the straps being proportioned to the diameter of the piece.

Lock covers and *vent covers* are also made of sheet lead, and sometimes of malleable or annealed cast iron.

PRIMING HORN. The *bottom* is made of ash, dogwood, or other close grained wood; it is cupped on the outside to form a sort of funnel for filling the horn; the filling hole is stopped by a wooden *screw plug*, to which one end of the shoulder strap is sewed. The bottom is fastened to the horn with *four brass tacks*. The other end of the shoulder strap, (which is made of russet leather,) is sewed round the neck of the horn. The *stopper* is of wood, and is attached to a small leather strap sewed to the shoulder strap.

The priming horn is sometimes made with a *brass mouth-piece*, in the manner represented also in the plate.

CANNON LOCK. The lock represented in the plate is patented by Mr. E. Hidden. The drawing shows the lock as arranged for field guns, and for others that have no lock pieces.

The *seat* is of cast brass; it is attached to the gun, on the left side of the vent, by means of two steel *steady pins* and *one screw pin;* a small brass *roller* is set into the rear end of the seat for the lanyard to pass round.

The *hammer* is of brass, with a cone of hardened steel screwed into the head, and fastened by a rivet; the hole for the pin on which the hammer turns is oblong, so that the head of the hammer is drawn back by the same pull of the lanyard which causes it first to strike the primer on the vent.

The *lanyard* is a piece of sash cord .25 in. thick and 6 feet long; one end is secured to the shank of the hammer by a knot; the other end carries an iron *toggle*, which serves for a handle,

and also for a wrench to turn the screw pin that fastens the lock to the gun.

For guns that have lock pieces, the seat of the lock is made with a flanch to fit the side of the lock piece, to which it is fastened by *two bolts*, with thumb nuts.

GUNNER'S QUADRANT. It is made of well-seasoned mahogany or walnut. The *arc* is attached to the straight edge by a groove and three tenons, and is glued in. The *plummet* is a rifle ball fastened to a silk thread, which is hooked on a *brass screw pin* in the centre of the arc. When not in use the plummet is carried in a hole in the end of the straight edge, which is covered by a *brass plate* .1 in. thick, turning on a *brass screw*.

GUNNER'S PINCERS. They are made of iron, with steel jaws.

FUZE MALLET. It is turned, in one piece, out of dogwood, oak, or other hard wood.

FUZE SAW. A 10-inch tenon saw.

SHELL HOOKS. They are of iron, consisting of *two branches* joined together by a rivet, and connected, at the upper end, by *two small rings*, to a *handspike ring*.

SPATULA. Made of ash or hickory.

SPLINT. Made of white pine.

SCRAPER. The *scraper* and the *spoon* are made of steel; the handle, of iron.

POINTING WIRE. Iron wire, No. 7.

DREDGING BOX. Made of sheet copper No. 21. The top fits over the box, and is pierced with holes of the size of wire No. 21.

PLATE VI.

FUZE GIMLET. A common gimlet .2 inch diameter.

FUZE SETTER. It is made of brass; the bottom is cupped, to prevent it from slipping off from the head of the fuze.

FUZE AUGER. The *bit* is of steel, fastened into a wooden *handle;* at the lower end of the handle is a brass *socket,* with a bar, under which the graduated limb of the slider passes. The *slider* is of brass; it slides on the bit, and is fastened to it, at the required point, by a steel thumb screw. The position of the slider, which determines the depth to which the auger bores, is regulated by a *scale* attached to the slider by an iron screw.

SHELL PLUG SCREW. It is made of iron, and is used for extracting the corks or wooden plugs with which fuze holes are stopped.

PRIMING WIRE.
GUNNER'S GIMLET. } Made of steel wire No. 8.

VENT PUNCH. Steel wire No. 8, brazed into an iron head.

PORT FIRE CUTTER. It is made of steel. The *pin* is .25 inch diameter.

COPPER FUNNEL. Made of sheet copper No. 21. The upper edge is turned over to stiffen it.

COPPER HAMMER. It is made of cast copper, or of brass composition. The handle, of hickory.

TOW HOOK. It is made of round iron, with a hook at one end, and a small hammer welded to the other end. It is used for unpacking ammunition chests of field carriages.

POWDER MEASURES. They are made of sheet copper, from No. 16 to No. 20. The bottom is made with a flanch .1 inch deep, turned downwards, and it is brazed or soldered to the sides.

Interior dimensions of cylindrical powder measures.

Contents.	Diameter and height.	Contents.	Diameter and height.
Lbs. oz.	Inches.	Lbs. oz.	Inches.
0 1	1.337	2 0	4.240
0 2	1.685	2 8	4.571
0 4	2.122	3 0	4.857
0 8	2.673	4 0	5.346
1 0	3.368	4 8	5.560
1 4	3.628	6 0	6.120
1 8	3.855	8 0	6.736

FUZE EXTRACTOR. The inner *screw* and its *stem* are made of steel, and riveted into the *handle*, which is of iron. The stem is contained in a *hollow screw* of steel, which is worked up and down by means of an iron *nut* with *two handles;* the screw being prevented from turning by a slot and a *feather* in the frame; the nut is kept in place by 4 *iron set screws*, the points of which enter into a groove in the nut. The *frame* is of cast brass.

In using this fuze extractor, the inner stem is screwed into the fuze or plug to be extracted, by means of the upper handle, and it is lifted out by turning the nut of the hollow screw.

GUNNER'S CALLIPERS. They are made of sheet brass, with steel points. The two branches are connected together by a brass pivot, fastened on the upper side by a brass *washer* and *screw;* to prevent the screw from working loose, the upper end of the pivot and the hole in the washer are square.

Besides the graduations marked in the drawing, other useful data may be engraved on the reverse side of the callipers.

TANGENT SCALES. They are made of sheet brass No. 13. The bottom is cut to fit the base ring of the gun, and a flanch is brazed to one side of it, to form a base for steadying the scale.

The notches on the tangent scale indicate each quarter of a degree of elevation of the piece, by placing the scale on the base ring and using the highest point of the swell of the muzzle, (or the front of the muzzle band,) for the forward point of sight. The heights of these notches for each degree are given in the plate, from the following:

Table of tangents for field guns and howitzers.

DEGREE.	FOR GUNS.		FOR HOWITZERS.		
	6-pd'r.	12-pd'r.	12-pd'r.	24-pd'r.	32-pd'r.
° ′	Inches.	Inches.	Inches.	Inches.	Inches.
1 15	0.256	0.333	0.252	0.289	0.331
1 30	0.512	0.667	0.484	0.572	0.657
1 45	0.769	1.000	0.714	0.855	0.983
2 00	1.025	1.334	0.945	1.138	1.310
2 15	1.281	1.668	1.176	1.421	1.637
2 30	1.538	2.001	1.408	1.704	1.964
2 45	1.794	2.335	1.639	1.987	2.291
3 00	2.051	2.670	1.870	2.271	2.618
3 15	2.307	3.004	2.100	2.553	2.943
3 30	2.563	3.338	2.330	2.835	3.269
3 45	2.820	3.672	2.560	3.117	3.594
4 00	3.077	4.006	2.791	3.400	3.920

PENDULUM HAUSSE. This is an accurate tangent scale, derived from the Russian artillery service.

The *scale* is made of sheet brass No. 13. At the lower end is a brass bulb, filled with lead. The *slider* is of thin brass, and is retained in any desired position on the scale by means of a brass set screw with a milled head. The scale is passed through a slit in a piece of steel, with which it is connected by a brass screw, forming a pivot on which the scale can vibrate laterally; this slit is made long enough to allow the scale to take a vertical position in any ordinary cases of inequality of the ground on which the wheels of the carriage may stand. The ends of this piece of steel form two journals, by means of which the scale is supported on the seat attached to the gun, and is at liberty to vibrate in the direction of the axis of the piece. Thus, in any ordinary variations, either in the level of the wheels or in the elevation of the gun, the scale is kept in a vertical position by means of the weight in the bulb.

The *seat* is of iron, and is fastened to the base of the breech by 3 *screws*, in such a manner that the centres of the two journal notches shall be at a distance from the axis equal to the radius of the base ring.

A *muzzle sight*, of iron, is screwed into the swell of the muzzle of guns, or into the middle of the muzzle ring of howitzers. The height of this sight is equal to the dispart of the piece, so that a line from the top of the muzzle sight to the pivot of the tangent scale is parallel to the axis of the piece; consequently, the vertical plane of sight passing through the centre line of the scale and the top of the muzzle sight, will be also parallel to the axis, in any position of the piece; the tangent scale will, therefore, always indicate correctly the angle which the line of sight makes with the axis.

The seat for suspending the hausse on the gun must be adapted to each piece, according to the varying inclination of

the base of the breech to the axis. The hausse, the seat and the muzzle sight, are marked for the kind of gun to which they belong. The hausse, when not in use, is carried in a leather pouch suspended to a shoulder strap.

The drawing represents the hausse for a 6-pounder gun.

The graduations on the scale are the tangents of each quarter of a degree, to a radius equal to the distance between the muzzle sight and the centre of the journal notches, which are, in all cases, one inch in rear of the base ring.

Tangent scales for pendulum hausses for field guns and howitzers.

	FOR GUNS.		FOR HOWITZERS.			
	6-pdr.	12-pdr.	12-pdr.	24-pdr.	32-pdr.	
	In.	In.	In.	In.	In.	
Radius of base ring	5.15	6.5	5.0	6.0	6.9	
Dispart . .	1.025	1.33	0.9	1.125	1.3	Height of muzzle sight.
Tang. 1°	1.042	1.349	0.931	1.138	1.310	
2°	2.084	2.698	1.862	2.275	2.621	
3°	3.124	4.046	2.792	3.412	3.933	
4°	4.164	5.392	3.722	4.548	5.248	
5°	5.203	6.737	4.650	5.683	6.566	

PLATE VII.

MAUL. It is made of hickory, or other tough wood, with a *band* of iron on each end; the *handle*, made of ash, is fastened in with a wedge.

MORTAR TOMPION. It is made of two pieces of oak, or other hard plank, fastened together by nails and by an *eye pin* No. 2, for the *ring*, which is clinched on the inside.

PICK AXE. The axe is made of iron, with steel blade and point; the *handle*, of hickory or ash.

FELLING AXE. It is the common wood-cutter's axe, with strong, steel blade; the *handle* is of hickory.

SHOVEL. The blades of the best shovels are made of steel, with an iron *socket* for the handle, which is of hickory or ash. An *eye strap* with a *ring* is fastened with a *rivet*, to the handle of the shovel which is to be carried on the caisson.

HAND BILL, (or bill hook.) The *blade* is made of iron, with steel edges; it has a *shank* which passes through the handle and is riveted on the head; the *handle* is of hickory, walnut, &c.

SCREW JACK. This is a light jack, suitable for field service. The *stand* is of cast iron; it is hollow, and has an opening two inches diameter in the centre of the bottom. The *screw* is of wrought iron; it has a slot cut in nearly its whole length, to receive a *feather*, which is let into the neck of the stand, to prevent the screw from turning; the head of the screw is roughed, to prevent the weight from slipping off. The *nut* and *handles* are of wrought iron, in one piece; below the handles a groove is turned in the nut, to fit the inner edges of the cap plate. The *cap plate* is of wrought iron, made in two parts; it lies on the head of the stand, to which it is fastened by four screws; it keeps the nut down, when the handles are worked.

ANVIL, for the travelling forge. A common 100 lb. anvil.

SMITH'S SHOVEL, } Made of iron.
SMITH'S POKER. }

SMITH'S BROOM. The handle is of iron; the brush is made of hickory withes, which are inserted in a slit in the handle.

SMITH'S TONGS. They are made of various sizes, according to the dimensions given in the plate.

SHOEING BOX. It is made of white pine; it has a partition in the middle lengthways, and a small division for nails in one corner. The *handle* is a rod of round iron placed over the middle partition and fastened by two *screws* in each end, the ends of the rod being flattened for the purpose; a piece is cut out of the partition, to make room for the hand.

PLATE VIII.

SLEDGE HAMMER, } The faces and edges are of steel; the
HAND HAMMER, } handles of smiths' hammers, chisels,
NAIL HAMMER. } and punches, are made of hickory.

RIVETING HAMMER. Made of steel.

SHOEING HAMMER. The head is faced with steel; the body and claws are of iron.

CREASER. It is of steel, for cutting the creases in horse shoes.

FORE PUNCH. Of steel; for making the nail holes in horse shoes.

The creaser and fore punch may be fastened to the same handle.

CHISELS, for hot iron. There are two kinds; one with a straight cutting edge; the other rounding, being convex on one side and concave on the other. They are of steel.

CHISEL, for cold iron. It is made with a thicker blade than those for hot iron.

HARDIE. It is made of steel; the shank fits the square hole in the anvil.

BUTTRESS. The blade is of steel, welded to an iron rod; the *handle* is of wood, with a copper *ferrule.*

SHOEING KNIFE. A bent steel blade, sharpened on both edges, and fixed to a wooden handle, by a copper ferrule and a rivet. It may take the place of the buttress, in shoeing horses.

PRITCHELL. Of steel; for opening the nail holes in horse shoes.

CLINCHING IRON. For clinching horse shoe nails.

SHOEING PINCERS. Made of iron, with steel jaws.

VICE, for the travelling forge. The female screw, the thread of which is generally brazed in, is better cut out of the solid iron, by making the cylindrical nut open at both ends; the cap is fastened to it after the screw is cut.

The fixed jaw of the vice is fastened to the stock of the forge wagon by means of a *shackle*, which is connected by *two keys* with the head of the rear lunette bolt. This bolt also fastens under the stock a *step*, in which the lower end of the fixed jaw of the vice enters, and is secured by a nut.

TIRE CIRCLE. It is made of iron, with a wooden handle which has a copper ferrule.

BENCH STAKE. Made of iron, and faced with steel.

SMITH'S CALLIPERS. Made of iron.

DIE STOCK. Made of iron; the screw of steel. The V's for holding the dies occupy two-thirds of the length of the opening in the stock, to leave room for inserting the dies. The *dies* are of steel, for cutting bolts of 1 inch, $\frac{3}{4}$, $\frac{5}{8}$, $\frac{1}{2}$, and $\frac{3}{8}$ inch.

TAP WRENCH. Made of iron, with four holes for taps of various sizes.

NAIL CLAW. Made of iron.

BREECHING VICE. The *stock* and the *handle* are made of iron; the *screw* of steel. There are two holes in the plate for bolting the vice to a bench. The *jaws* are of steel. Each jaw is made in two pieces, the lower piece being a plate which is fastened with

two screws to the under side of the jaw, after it is put in place, to prevent it from dropping out.

FULLER. It is made of iron, with a steel face.

PLATE IX.

SET HAMMERS. They are faced with steel, and are of two kinds; one having a flat face; the other, half round.

HEADING TOOLS. They are made of iron, and faced with steel. The tools represented in the plate are arranged for making the bolts and nails most commonly required for repairs of field carriages.

SMITH'S PUNCHES. They are made of steel; three with wooden handles, and four hand punches. The tire punch is used for countersinking the holes for bolt heads in the tire of a wheel.

COLD CHISEL. A hand chisel, made of steel.

TIRE BAND, or *clip*. Made of iron; for holding a broken tire for temporary service. The thick ends are bent over the inside of the felly, and joined together by an iron link passed through the eyes. For convenience of packing they may be left straight, until required for use.

SCREW WRENCH. These wrenches for nuts are generally made of malleable cast iron by the tool makers. The opening of the jaws is regulated by turning the rough headed screw, which works in a nut that forms part of the moveable jaw.

HOLD FAST. Made of iron; for the use of carpenters and carriage makers.

Armorer's Tools.

Breeching wrench. Made of iron.

Soldering irons. The point is made of cast copper, fastened by two rivets to an iron stock, which is set in a wooden handle, having a copper ferrule at the small end.

Spring clamp. Made of steel; for holding small objects in a vice.

Wood clamp. For holding, in a vice, such parts of arms as might be bruised by the iron jaws of the vice. The clamp consists of two pieces of hoop iron, which are connected together by *two cross pieces* of iron fastened to them by two rivets at each end; *four iron jaws*, of the same width as the hoops, are fastened to their upper ends by eight rivets; *two wooden jaws*, lined with thick leather, the whole width of the clamp, are fastened to the inside of the iron jaws and the cross bars by 16 rivets.

Spring hook. Made of steel; used in taking out the main spring of a lock.

Hand screw driver. Blade of steel, with a wooden handle, having a ferrule at the small end.

Barrel scraper and wiper. Made of iron, in one piece; the springs of the scraper are of steel.

Straight edge. Made of steel.

Bayonet mandril. Of iron; for straightening and fitting the sockets of bayonets.

Riffler. It is made of a tapering piece of steel with square edges, which are cut in notches; the steel is then twisted into a round form; it is fastened into a wooden handle, with a copper ferrule. It is used for filing out screw holes in stocks of small arms.

Armorer's punches. Small steel punches, for driving out the wires of band springs, &c.

DRILL STOCK. For drilling small holes. The drill is inserted into a steel *stem*, on which *two wooden pullies*, (in one piece,) for the string of the drill bow, are fastened; the upper end of the stem turns in a *brass socket* attached to a wooden handle; the stem is retained in the socket by a small screw, the point of which enters a groove turned in the stem.

The *drill bow* may be made of a piece of elastic wood, or of a steel ramrod, about 24 inches long, with a *string* of catgut, raw hide, or leather.

DIE STOCK. For cutting small screws. The stock is of iron; the screw of steel. The shank may be inserted into a wooden handle, as represented in the plate; or the handle may more conveniently be formed of the same piece as the stock, about .6 inch diameter. The *dies* of steel are held in place by V's, as in the large die stock; they are made for cutting the lock screws of small arms.

REAMERS. They are made of steel, round on the back and flat inside; they are of six sizes, as shown by the table of dimensions in the plate; they all fit the same brace socket.

FLINT SCREW WRENCH. Made of a piece of a steel ramrod.

SPRING VICE. Made of steel. They are manufactured at the Armories for small arms.

BEVEL VICE. It is made of iron, and is used for holding certain kinds of work in the jaws of a bench vice.

OIL CAN. Made of copper or tin.

ARTILLERY.

PART ELEVENTH.

AMMUNITION AND PROJECTILES.

1849.

PART ELEVENTH.

AMMUNITION AND PROJECTILES.

The plates of this Part show the forms and dimensions of *Artillery projectiles* and of the *sabots*, and some other materials employed in preparing them for use; also of the *fixed ammunition* for field service.

Instructions in detail, relative to the strapping of shot and shells, and the putting up of fixed ammunition, are given in the chapter on laboratory work, in the Ordnance Manual. A few particulars, only, will be mentioned here in explanation of the plates.

For the *mountain howitzer ammunition* see PART 5.

Shot.—Plate I.

Solid shot are of the calibres of 6, 12, 18, 24, 32, and 42 pounders, for field, siege, and garrison service. 8-inch and 10-inch shot are used in proving mortars, sea-coast howitzers, and columbiads, and may be occasionally fired from the columbiads, in service.

Shot are made of good grey or mottled CAST IRON; they are moulded in sand, in order that they may be as solid as possible.

Canister and grape shot are also made of CAST IRON. Their dimensions are shown in the drawings of finished canisters and stands of grape.—Plate IV.

Shells.—Plate I.

All shells should be made of strong cast iron, sufficiently soft to be easily reamed at the fuze hole. They are moulded in sand. The *eyes* may be cored out, in the moulding, but they must be cleaned and dressed to the required dimensions. The fuze holes of all shells have the same taper, viz: .15 in. to 1 inch. They are accurately reamed to the required dimensions.

Shells for mortars are of the calibres of 8, 10, and 13 inch. The 8-inch mortar shells are used also for the siege howitzer. The cores of these shells are concentric with the exterior.

Shells for howitzers, columbiads, and long guns are reinforced at the fuze hole, in order to give a greater bearing for the fuze, to prevent its being driven in by the shock of the discharge. These fuze holes are designed to receive a plug, or bouching of wood or brouze, (according to the calibre and the charge,) which forms a case for a paper fuze.

Spherical case shot are also reinforced at the fuze hole. These shells, being very thin, should be made of the best and strongest iron, in order that they may not be broken in the gun.

Carcasses.—Plate I.

Carcasses are shells of the same dimensions as mortar shells of like calibre. They have three additional holes, like the fuze holes, for the issue of the flame from the incendiary composition with which they are charged.

Sabots.—Plate II.

POPLAR, LINDEN, or other light fine-grained wood, is used for making sabots and cartridge blocks. The wood should be dry and well seasoned. Sabots must be accurately turned to the given dimensions, which should be verified with proper gauges.

Sabots for field ammunition of all kinds, and for siege and sea-coast howitzer canisters are made of square scantling; those for

shells for siege and garrison guns, sea-coast howitzers and columbiads, are generally made of plank.

Cartridge blocks are made more conveniently of scantling.

Fuze plugs.—Plate II.

Fuze plugs are made of BEECH, or other hard close-grained wood. The wood should be perfectly seasoned and dried, so that it may not shrink after being worked. The plugs are turned full to the given exterior dimensions. The small fuze plug, represented in the plate, fits all the field shells and spherical case shot, except the 32-pdr. spherical case, which requires the large plug.

Strapped shot and shells.—Plate III.

Shot for field guns are attached to sabots by *two straps* of tin, passing over the shot and fastened to the sabot *by one nail* in each end; one of the straps passes through a slit cut in the middle of the other strap.

Shells for field howitzers, and spherical case shot for field guns and howitzers, are attached to sabots by *four tin straps* connected with *a ring* of tin which is placed over the fuze hole. The straps of shells for guns are fastened each with *one nail;* those for the 12-pounder field howitzer with *two nails*, and those for 32-pounder and 24-pounder howitzers, with *three nails.*

Strapped shells and spherical case, for 32-pounder and 24-pounder field howitzers, have *handles* made of cord, .25 inch thick, which is passed through holes in the sabot and fastened by a knot on the inside.

Shells for siege and garrison guns, and for columbiads and sea-coast howitzers, are attached to sabots in the same manner as shot for field guns. The fuze holes are placed in one of the angles, between the straps. The straps are fastened at each end by *three* or *four nails*, in the side and under the bottom of the

sabot. Shells for the columbiads and howitzers have *handles*, made of cord .38 in. thick, fastened to *two loops* of tin which are attached to one of the straps.

Canisters.—Plate IV.

Canisters are made of tin, with an iron plate at the bottom and a sheet iron cover. For field guns and howitzers the bottom plates are made of rolled iron; for other pieces, of cast iron.

Canisters for field guns and howitzers are nailed to sabots. Those for the 32-pounder and 24-pounder howitzers have handles of cord attached to the sabots.

Canisters for 8-in. siege and sea-coast howitzers are also attached to sabots. They have *handles* made of iron wire, fastened by a *loop* of sheet iron riveted to the cover of the sabot.

Canisters for siege and garrison guns have no sabots; the ends of the tin cylinder are cut in slits and turned over the bottom plate and the cover. The *handles* are of iron wire, like the preceding.

Grape.—Plate IV.

A stand of grape consists of nine grape shot, connected together by means of *two cast iron plates* and *two rings*, of wrought iron, joined by *a bolt* which passes through both plates and is fastened by a *nut*. The plates are countersunk, half their thickness, to serve as beds for the shot. *The handle* is of cord .38 in. thick, which is passed through two holes in the upper plate and fastened by a knot inside.

The stand of grape for 8-in. sea-coast howitzer is attached to a sabot, by means of the same bolt which holds the plates together, and which is made long enough to pass through the sabot.

Fixed Ammunition.—Plate V.

For field guns and for the 12*-pounder field howitzer*, all the ammunition is *fixed;* that is to say, the projectile and the charge of powder are attached to the same sabot.

For the 24*-pounder and the* 32*-pounder howitzer*, the projectile is attached to a sabot, and the charge of powder to a cartridge block, separated from the projectile. As two different charges are used for each of the howitzers, the cartridge blocks are of two sizes, in order that the finished cartridges may be of nearly the same length, so as to fill the chamber of the piece.

The cartridges for field ammunition are protected from injury, in transportation, by being covered with *cylinders and caps* of strong paper.

Plate V shows the form and dimensions of fixed ammunition for each kind and calibre of field ordnance.

Bill of timber for 100 *sabots.*

KIND OF SABOT.			DIMENSIONS.			CONTENTS.	REMARKS.
			Wide.	Thick.	Long.		
			In.	In.	In.	Sup.ft.	
For field guns.	Shot and spherical case	6-pdr.	4.	4.	180	20.	Poplar, linden or maple; clear stuff, and free from centre heart.
		12-pdr.	5.	5.	225	39.06	
	Canisters	6-pdr.	4.	4.	250	27.77	
		12-pdr.	5.	5.	250	43.40	
For field howitzers.	Shells	12-pdr.	5.	5.	345	59.79	
		24-pdr.	6.	6.	265	66.25	
		32-pdr.	6.	6.	265	66.25	
	Canisters	12-pdr.	5.	5.	470	81.60	
		24-pdr.	6.25	6.25	470	127.49	
		32-pdr.	6.75	6.75	500	158.20	
	Cartridge blocks. Small charge	24-pdr.	5.	5.	125	21.70	
		32-pdr.	5.	5.	225	39.06	
	Large charge	24-pdr.	5.	5.	75	11.63	
		32-pdr.	5.	5.	100	17.36	
For mountain howitzer	Shells		5.	5.	300	52.08	
	Canister				400	69.44	
For shells for siege and garrison guns	12-pdr.		5.	1.75	500	30.38	
	18-pdr.		5.5	1.75	550	36.76	
	24-pdr.		6.	1.75	600	43.75	
	32-pdr.		6.5	1.75	650	51.34	
	42-pdr.		7.	2.38	700	80.99	
Canisters for 8-in. siege or sea-coast howitzer			8.5	8.5	525	263.41	
Shells.	8-in. sea-coast howitzer and 8-in. columbiad		7.25	2.38	725	86.87	
	10-in. sea-coast howitzer		8.25	2.38	825	112.49	
	10-in. columbiad		9.	2.38	900	133.87	

ARTILLERY.

PART TWELFTH.

EQUIPMENT

OF GUN CARRIAGES AND WAGONS

FOR THE SERVICE OF

FIELD AND SIEGE BATTERIES.

1849.

PART TWELFTH.

EQUIPMENT OF FIELD BATTERIES.

INTERIOR ARRANGEMENT OF AMMUNITION CHESTS FOR FIELD GUNS AND HOWITZERS.

The principal divisions of a chest are designated as the *right half* and the *left half*, to a person facing the front of the chest.

The smaller divisions in each half, perpendicular to the sides, are designated as *first*, *second*, *third*, &c., from the principal partition, each way; the divisions parallel to the sides are designated as the *front*, *middle*, and *rear divisions*.

Ammunition chest for the 6*-pounder gun.*—Plate I.

Eight partitions, (POPLAR,) four in each half, perpendicular to the sides of the chest. The partitions are supported by *two strips* of wood at each end, forming a groove in which the partition slides; each strip is fastened to the side of the chest with *four copper nails*.

In the first division of the right half are *two bolsters*, for spherical case shot; one fastened to the principal partition by 3 *screws;* the other fastened to the first moveable partition by 3 *screws*.

One tray, for holding equipments, rests on the partitions in the left half of the chest. The tray has *two sides*, *two ends* and *one bottom*, (POPLAR OR WHITE PINE.) The sides and ends are

dovetailed together and fastened by 12 *nails;* the bottom is fastened to the ends and sides by 14 *brass screws.* Three finger holes are bored in the inside of the ends, to lift the tray by; and a hole is bored through the middle of the bottom, to let the air escape when the tray is lifted out.

Ammunition chest for the 12*-pounder gun.*—Plate I.

Six partitions, three in each half, perpendicular to the sides of the chest, supported as in the 6-pounder chest.

Four bolsters, for spherical case shot; one of them fastened to the principal partition with 3 *screws,* two fastened to the first partition in the right half with 3 *screws,* and one to the left side of the second partition, right half, with 3 *screws.*

The second and third partitions in the right half are made higher than the others, to suit the height of the canisters fixed.

Ammunition chest for the 12*-pounder howitzer.*—Plate II.

Six partitions, three in each half, supported like those of the 6-pounder chest.

Twenty-one bolsters, for the lower tier of shells and spherical case shot. They are cupped out to receive the balls, and have holes bored through the bottom, for the fuzes to lie in. They are placed in the bottom of the chest, three in each division, except the first one in the right half; they are fastened to the bottom, each by 4 *sprigs.*

Twenty-eight props, for the upper tier of shells and spherical case. Four of the props are placed in each division, except the first one in the right half. Two of them are fastened to each end of the chest, two to the left side of the principal partition, and two to the right side of the first partition in the right half, each by 6 *copper nails.*

The rest of the props are fastened in pairs to the moveable partitions, each by 6 *copper nails.*

Six props for canisters, (OAK,) in the first division of the right half; three fastened to the principal partition, three to the moveable partition, each with 3 *screws.*

Ammunition chest for the 24*-pounder howitzer.*—Plate II.

Eight linings, two in each of the front and rear divisions, fastened to the ends of the chest and to the principal partition, each by 6 *copper nails.*

Four long partitions, two in each half, parallel to the sides of the chest; they are supported by the end linings and by *two upright strips,* fastened to the ends and principal partition, each by 4 *copper nails.*

Two short partitions for canisters, in the rear division of the right half; each of them is supported by 4 *strips,* fastened to the back of the chest and to the long partition, each by 3 *copper nails.*

Seven short partitions, for shells and spherical case shot: two in each of the front divisions; two in the rear division of the left half, and one in the middle division of the right half. These partitions slide into grooves made each by *two upright strips,* which are fastened to the sides and to the long partitions, each by 4 *copper nails;* each partition is formed of two pieces which slip into the grooves, one over the other.

Thirty-three bolsters for shells and spherical case. Seven of them are fastened, at the bottom of the chest, to the end linings of the two front divisions, and the left rear division, and to the principal partition in the right middle division, each by 2 *screws.* Twenty-four of the bolsters are fastened in pairs on each side of the short partitions of the two front divisions and the left rear divisions; twelve to the lower half and twelve to the upper half of the partitions; each pair fastened by 3 *screws* which pass through

the bolsters and the partition. Two bolsters are fastened to the left side of the middle partition in the right half, one to the lower and one to the upper part of the partition, each by 2 *screws*.

Ammunition chest for the 32-pounder howitzer.—Plate II.

Six long partitions, three in each half; one parallel to the ends, and two parallel to the sides of the chest; each partition is supported by 4 *strips* fastened to the sides and ends of the chest, or to the other partitions, each by 5 *copper nails*.

Four short partitions, one in the front and rear division of each half, made in two pieces and fastened in the same manner as those of the 24-pounder howitzer chest.

Twenty-one bolsters for shells and spherical case. Seven of them are fastened, at the bottom of the chest, to the ends and cross partitions, each by 2 *screws*. Twelve bolsters are fastened in pairs, as in the 24-pounder howitzer chest, to the short partitions in the left half, and in the rear division of the right half. Two bolsters are fastened, in like manner, on the right side of the short partition in the right front division.

AMMUNITION CARRIED IN EACH CHEST.

KIND.	NO.	PLACE.
FOR 6-POUNDER GUN.		
Shot, fixed	35	In the left half, and in 4th and 5th divisions of right half.
Spherical case, fixed	5	In 1st division, right half.
Canisters, fixed	10	In 2nd and 3d divisions, right half.
Spare cartridges, 1¼ lb	2	On the spherical case.
Fuzes... 2 sec	2	In the fuze pouch, or in bundles in the tray.
Fuzes... 3 sec	5	
Fuzes... 4 sec	3	
Percussion primers	60	In the tube pouch, or in bundles in the tray.
Friction primers	40	
Priming tubes	20	
Slow match, yards	6	On the ammunition in right half.
Port fires	4	
FOR 12-POUNDER GUN.		
Shot, fixed	20	In left half, & in 4th division of right half.
Spherical case, fixed	8	In 1st and 2nd divisions, right half.
Canisters, fixed	4	In 3d division, right half.
Spare cartridges, 2½ lbs	2	On the spherical case.
Fuzes... 2 sec	2	In fuze pouch, or in bundles in the tray.
Fuzes... 3 sec	8	
Fuzes... 4 sec	3	
Fuzes... 5 sec	3	
Percussion primers	40	In tube pouch, or in bundles in the tray.
Friction primers	25	
Priming tubes	20	
Slow match, yards	6	On the ammunition in right half.
Port fires	4	
FOR 12-POUNDER HOWITZER.		
Shells, fixed	15	In 3d, 4th, and 5th divisions, right half.
Spherical case, fixed	20	In left half.
Canisters, fixed	4	In 1st division, right half.
Fuzes... 2 sec	17	In the fuze pouch, or in bundles, on the canisters, &c.
Fuzes... 3 sec	35	
Fuzes... 4 sec	18	
Percussion primers	50	In tube pouch, or in bundles, on the canisters, &c.
Friction primers	30	
Priming tubes	20	
Slow match, yards	6	On the canisters.
Port fires	4	

Ammunition in each chest—Continued.

KIND.	NO.	PLACE.
FOR 24-POUNDER HOWITZER.		
Shells, strapped	12	In left half.
Spherical case, strapped	8	In front and middle divisions of right half.
Canisters	3	In rear divisions of right half.
Cartridges.. Small charge..	23	12 in middle division, left half; 9 in middle division, right half; 2 on canisters.
Cartridges.. Large charge..	2	On canisters.
Fuzes.... 2 sec	6	As for 12-pounder howitzer.
Fuzes.... 3 sec	20	
Fuzes.... 4 sec	7	
Fuzes.... 5 sec	7	
Percussion primers	30	
Friction primers	20	
Priming tubes	10	
Slow match, yards	6	
Port fires	4	
FOR 32-POUNDER HOWITZER.		
Shells, strapped	8	Front and rear divisions of left half.
Spherical case, strapped	6	Rear divisions, and right front division of right half.
Canister	1	Left front division, right half.
Cartridges. Small charge...	15	1st division in each half.
Cartridges. Large charge ..	1	
Fuzes .... 2 sec	4	In fuze pouch, or in the middle divisions.
Fuzes .... 3 sec	14	
Fuzes .... 4 sec	5	
Fuzes .... 5 sec	5	
Percussion primers	20	In tube pouch, or in the middle divisions.
Friction primers	15	
Priming tubes	10	
Slow match, yards	6	In middle divisions.
Port fires	4	

Implements and equipments for field carriages.

KIND.	NO.	PLACE.
FOR A GUN OR HOWITZER CARRIAGE.		
Sponges and rammers	2	On the gun carriage.
Sponge covers	2	
Worm and staff	1	
Handspikes	2	
Sponge bucket	1	
Prolonge	1	
Linstock	1	
Lock	1	On the gun.
Lock cover	1	
Tar bucket	1	On the limber.
Watering bucket, (leather)	1	
Gunner's havresacks	2	In the implement trays, or in other vacant spaces in the ammunition chest.
Tube pouch	1	
Fuze pouch	1	
Vent punch	1	
Gunner's pincers	1	
Tow hook	1	
Tangent scale	1	
Thumb stalls	2	In the tube pouch.
Priming wire	1	
Lanyard for friction primers	1	
Gunner's gimlet	1	In the fuze pouch
Fuze plug reamer	1	
Tarpaulin, large	1	Strapped on the ammunition chest.
FOR A CAISSON.		
Felling axe	1	In the places provided for them on the caisson body.
Shovel, long handle	1	
Pick axe	1	
Spare handspike	1	
Spare pole	1	
Spare wheel	1	
Tow hooks	2	One in the limber chest, and one in a caisson chest.
Tar bucket	1	On the limber.
Watering bucket, (leather)	1	
Tarpaulin, large	1	Strapped on the limber chest.

Two pairs of straps for the tarpaulins are fastened with screws to the edges of the lid of the limber chest. The straps are 1.25 inch wide; the front straps, 24 inches long; the rear, 10 inches long, with buckles.

Screws and nails for interior of ammunition chests.

DESIGNATION.	Number.	Size.	Length.	Kind.
6-POUNDER GUN.				
Screws { For 2 bolsters for spher. case..	6	No. 14	1.25	Iron.
Screws { " tray.....	14	No. 12	1.	Brass.
Nails, for groove strips.....	128	3d	1.13	Copper.
12-POUNDER GUN.				
Screws { For 2 single bolsters.....	6	No. 14	1.25	Iron.
Screws { " 2 double do.....	3	No. 14	2.	Do.
Screws { " tray.....	14	No. 12	1.	Brass.
Nails, for groove strips.....	96	3d	1.13	Copper.
12-POUNDER HOWITZER.				
Screws { For 3 bolsters for canisters....	9	No. 14	1.25	Iron.
Screws { " 3 do.....	9	No. 14	1.5	Do.
Nails.. { For bottom bolsters.....	84	Sprigs	1.5	Do.
Nails.. { " upper bolsters and strips..	264	3d	1.13	Copper.
24-POUNDER HOWITZER.				
Screws { For 9 single bolsters.....	18	No. 14	1.5	Iron.
Screws { " 12 pairs double do.....	36	No. 14	2.	Do.
Nails, for linings and strips.....	216	3d	1.13	Copper.
32-POUNDER HOWITZER.				
Screws { For 9 single bolsters.....	18	No. 14	1.5	Iron.
Screws { " 6 pairs double do.....	18	No. 14	2.	Do.
Nails, for strips.....	200	3d	1.13	Copper.

Bill of boards for interior of ammunition chests.

DESIGNATION.	No. of pieces.	DIMENSIONS, (rough.) Length.	Width.	Thickness	Quantity.	KIND.
FOR 6-POUNDER GUN.		In.	In.	In.	Sup'l ft.	
Partitions	1	168	11.	0.625	8.02	Poplar.
Tray, bottom	1	22	20.	.75	2.29	Poplar,
Tray, sides	1	22	10.	.75	1.15	or white
Tray, ends	1	20	11.	1.	1.53	pine.
12-POUNDER GUN.						
Partitions	1	84	12.	0.75	5.25	Poplar.
Partitions	1	42	14.	.75	3.06	Do.
Tray, bottom	1	22	20.	.75	2.29	Poplar,
Tray, sides	1	22	7.5	.75	0.86	or white
Tray, ends	1	20	9.	1.	1.25	pine.
12-POUNDER HOWITZER.						
Partitions	1	120	15.5	0.75	9.69	Poplar.
Bolsters for lower tier	1	54	10.	2.	7.50	Do.
Props for upper tier	1	90	12.	1.	7.5	Do.
Bolsters for canisters	1	8	10.	1.5	1.87	Oak.
24-POUNDER HOWITZER.						
Partitions	1	96	15.5	0.75	7.75	Poplar.
Partitions	1	13	10.5	1.	.94	Do.
Partitions	1	96	8.25	1.	5.5	Do.
Linings	1	54	15.5	1.	5.81	Do.
32-POUNDER HOWITZER.						
Partitions	1	108	16.	1.	12.	Poplar.
Partitions	1	60	8.5	1.	3.54	Do.

EQUIPMENT OF TRAVELLING FORGES AND BATTERY WAGONS.

One forge and one battery wagon accompany each field battery. They are furnished with the tools and materials required for shoeing horses and for ordinary repairs and preservation of carriages and harness.

Other forges and battery wagons, equipped for the general service of the army, accompany the field park which contains the general supplies of ordnance stores.

The forge for the field battery is designated by the letter - A.
The forge for the field park " " - B.
The battery wagon for the field battery " - C.
The battery wagon for the field park " D.

EQUIPMENT OF A FORGE FOR A FIELD BATTERY.

Interior arrangement of the limber chest.—Plate III.

The chest is marked : FORGE A.

There are *five boxes* for tools and stores ; *one shoeing box*, and *one can* for oil.

The boxes are marked : A, Nos. 1, 2, 3, 4, 5.

They are made of white pine, .75 in. thick, with loose covers of the same thickness ; the covers have three $\frac{3}{4}$ in. holes bored in each end, to lift them by.

Two handles of double leather are nailed on the inside of the ends of the boxes, so as not to interfere with the covers.

The sides and ends of all the boxes for the forges and battery wagons are dovetailed together, and fastened with 8*d. nails ;* the covers are made with clamps on the ends.

Exterior dimensions of the boxes for FORGE A.

DESIGNATION.	Length.	Width.	Depth.	REMARKS.
	In.	In.	In.	
A, Nos. 1, 2, 3	17.8	13.25	7.5	No. 2 has a partition at 4.5 in. from one end.
A, No. 4.....	23.5	8.	6.5	A partition for oil can, at 5.25 in. from one end.
A, No. 5.....	39.8	9.8	6.5	
Shoeing box...	.....	.....	.....	See PART 10; Plate VII.

The *oil can* is made of tin, to hold one quart; it is five inches square and four inches high, with a neck for a cork, one inch diameter and .5 in. high, near one corner.

It is marked: A. SPERM OIL.

Boxes Nos. 1, 2, and 3 are placed in the bottom of the chest; No. 1 against the left hand; No. 2 in the middle.

No. 4 is placed on top of Nos. 1 and 2, against the left end and the back of the chest; the division for the oil can on the left hand.

No. 5 is placed on top of Nos. 1, 2, and 3, against the front of the chest.

The shoeing box is placed on No. 3, against the right end and the back of the chest.

The tools and stores in all the boxes, and in the forges and bat tery wagons, are securely packed with tow.

Contents of the limber chest.

SMITH'S TOOLS AND STORES.	PLACE.
100 lbs. horse shoes, Nos. 2 and 3.....	Box A, 1.
100 lbs. horse shoes, Nos. 2 and 3.....	Box A, 3.
50 lbs. horse shoe nails, Nos. 2 and 3..	Box A, 2; large division.
30 washers and nuts, No. 2.....	Box A, 2.
10 washers and nuts, No. 3.....	
4 washers and nuts, No. 4.....	
1 lb. nails, No. 1, C.....	
1 lb. nails, No. 2, C.....	
20 tire bolts.....	
5 keys for ammunition chests.....	
8 linch washers.....	
12 linch pins.....	
2 feet of chains, Nos. 1 and 2.....	
50 cold shut *S* links, No. 3.....	
12 cold shut *S* links, No. 5.....	
2 hand cold chisels.....	Box A, 4.
1 hardie.....	
12 files, assorted, with handles.....	
1 buttress.....	
2 hand punches; round and square...	
1 screw wrench.....	
1 hand screw driver.....	
1 hand vice.....	
1 pair smith's callipers.....	
4 taps... } Nos. 1, 2, 3, and 4.....	
4 prs dies }	
1 groce wood screws, 1 in., No. 14...	
1 quart can of sperm oil.....	
1 fire shovel.....	Box A, 5.
1 poker.....	
1 split broom.....	
1 hand hammer.....	
1 riveting hammer.....	
1 nailing hammer.....	
1 sledge hammer.....	
2 chisels for hot iron.....	
2 chisels for cold iron.....	
3 smith's tongs.....	
1 fore punch.....	
1 creaser.....	
1 fuller.....	
1 nail claw.....	
1 round punch.....	
1 tap wrench.....	
1 die stock.....	
4 nave bands, developed.....	
2 tire bands, developed.....	

Contents of the limber chest—Continued.

SMITH'S TOOLS AND STORES.	PLACE.
1 shoeing box	In the right end of the chest; on top.
1 shoeing hammer	In shoeing box.
1 pair pincers	
2 rasps, (12 inches.)	
1 shoeing knife	
1 toe knife	
1 pritchel	
1 nail punch	
1 clinching iron	
1 oil stone	
2 leather aprons	
1 iron square	Fastened on the inside of the chest cover with two copper clamps.
1 tar bucket	On its hook.

Contents of the forge body.

Box A, 6, of the same dimensions as A, 1, is carried in the iron room. To put this box in, or to take it out, loosen the thumb nuts and raise the rear of the bellows an inch.

TOOLS AND STORES.	PLACE.
1 water bucket, wood	On its hook.
1 anvil	On the fire place.
1 vice	On the stock of the carriage.
1 watering bucket, leather	On the vice.
250 lbs. bituminous coal	In the coal box.
1 coal shovel	
100 lbs. horse shoes, Nos. 2 and 3	Box A, 6; in iron room.
100 lbs. square iron, $\frac{1}{2}$ in. and $\frac{5}{8}$ in.	In the iron room. The bars not more than 3 feet long; the square iron in 2 bundles.
50 lbs. flat iron, $1\frac{1}{2}$ in. $\times \frac{5}{8}$ in., 1 in. $\times \frac{1}{2}$ in. and $1\frac{1}{2}$ in. $\times \frac{1}{4}$ in.	
50 lbs. round iron $\frac{3}{8}$ in.	
5 lbs. cast steel, $\frac{1}{8}$ in. square	
5 lbs. English blister steel	

NOTE.—100 lbs. of horse shoes, assorted, contain 90 shoes.
1 lb. horse shoe nails, No. 3, contains 140 nails.
1 lb. horse shoe nails, No. 2, contains 112 nails.

EQUIPMENT OF A BATTERY WAGON FOR A FIELD BATTERY.

Interior arrangement of limber chest.—Plate III.

The chest is marked: BATTERY WAGON, C.

The tools and stores are carried in *four boxes*, marked C, Nos. 1, 2, 3, and 4, respectively, and in *one oil can.*

The *boxes* are made of white pine .75 in. thick, with leather handles inside, and loose covers, like those of the limber chest of Forge A.

The covers of Nos. 1 and 2 are .75 in. thick; those of Nos. 3 and 4 are .5 in. thick.

Exterior dimensions of the boxes.

DESIGNATION.	Length.	Width.	Depth.
	In.	In.	In.
C, No. 1.....	17.8	13.25	7.5
C, No. 2.....	26.5	17.8	7.5
C, No. 3.....	39.8	9.8	6.25
C, No. 4.....	39.8	8.	6.25

No. 3 has a partition, at 5.25 from one end, for the oil can.

No 4 has two partitions perpendicular to the sides, making three divisions, 15.8 in., 10 in., and 11 in. long, respectively.

The *oil can* is like that for the limber chest of Forge A, and is marked: C, SPERM OIL.

Boxes Nos. 1 and 2 occupy the bottom of the chest; No. 1 against the left end.

Nos. 3 and 4 are placed on top of Nos. 1 and 2; No. 3 against the rear of the chest.

Contents of limber chest for battery wagon, C.

TOOLS AND STORES.	PLACE.
CARRIAGE MAKER'S TOOLS.	
2 hand saws	Fastened to the inside of chest cover
1 tenon saw, (14 in.)	
1 jack plane	Box C, 1.
1 smoothing plane	
1 brace, with 24 bits	
1 spoke shave	
1 gauge	
2 plane irons	
1 saw set	
1 rule, (2 feet)	
1 dozen gimlets	
1 pair compasses	
1 chalk line	
2 brad awls	
1 scriber	
1 dozen saw files, ($4\frac{1}{2}$ in)	
2 wood files, (10 in.)	
1 wood rasp, (10 in.)	
1 trying square, (8 in.)	
1 hand screw driver	
1 oil stone	Box C, 2.
1 broad axe	
1 hand axe	
1 claw hatchet	
1 claw hammer	
1 pair pincers, (small)	
1 table vice	
2 framing chisels, (1 in. and 2 in.)	
2 firmer chisels, ($\frac{3}{4}$ in. and $1\frac{1}{2}$ in.)	
2 framing gouges, (1 in. and $1\frac{1}{2}$ in.)	
3 augers & handles, ($\frac{1}{2}$ in. $\frac{5}{8}$ in. & $\frac{3}{4}$ in.)	
1 screw wrench	
1 felling axe, 1 adze, with handles	Box C, 3.
1 frame saw	
1 quart can of sperm oil	
SADLER'S TOOLS AND STORES.	
1 mallet	
1 clam	

Limber chest for battery wagon, C—Continued.

TOOLS AND STORES.	PLACE.
SADLER'S TOOLS AND STORES.—(Cont'd.)	
1 hammer	Box C, 4.
1 shoe knife	
1 half round knife	
1 pair shears	
1 sand stone	
1 rule, (2 feet)	
100 needles	
12 awls and handles	
2 punches	
1 pair pincers	
1 pair plyers	
1 claw tool	
1 creaser	
4 thimbles	
1 strap awl	
2 lbs. bees' wax	
3 lbs. black wax	
8 oz. bristles	
5 lbs. shoe thread	
2 lbs patent thread	
3 doz. buckles, (assorted, .75 in. to 1.5 in.)	
3000 tacks	
1 gunner's callipers	
2 shoe knives	
2 pairs scissors	
1 tar bucket	On its hook.

Interior arrangement of wagon body, C.—Plate V.

A TILL is placed at the back or right side of the wagon body, as described in PART 2, page 55.

AN AXE RACK extends along the whole length of the body, on the left side, 11 inches from the bottom; it is 2 in. deep and 1.5 in. wide, and is fastened to the side by the middle rivets of the side studs, and by 5 wood screws. The rack has notches, to hold three axes, a hatchet, and three hand bills.

Four boxes, for stores, marked: C, Nos. 5, 6, 7, and 8.

One box, marked: C, CANDLES.

Exterior dimensions of boxes for wagon body, C.

DESIGNATION.	Length.	Width	Depth.	REMARKS.
	In.	In.	In.	
C, Nos. 5 & 6	23.	18.5	11.25	Without covers .. } Made of hard wood, .75 in. thick.
C, No. 7....	23.5	20.25	14.	With loose cover. }
C, No. 8....	13.	13.	5.	Divided into four equal parts. } Made of white pine, with covers, hinges, and hasps; stuff .625 in. thick.
Candle box..	11.	6.5	5.5	..... }

Seven tin cans; two marked: C, NEATS' FOOT OIL; one marked: C, LINSEED OIL; one: C, TURPENTINE; two: C, OLIVE PAINT; one: C, BLACK PAINT.

Dimensions of cans.

KIND.	Capacity.	Diam.	Height.	REMARKS.
		In.	In.	
For neats' foot oil.....	2 gals.	8.	11.5	} Rounded tops and necks for corks.
" linseed oil & turpentine	1 gal.	6.	10.	}
" olive paint.....	25 lbs.	9.75	10.25	} Flat tops; opening covered with a piece of tin, soldered on.
" black paint.....	5 lbs.	7.	8.5	}

Two kegs, for grease; exterior dimensions:

Diam. at the bilge - -	10.5 inches.
Diam. at the heads - -	9.75 "
Height - - - -	12.5 "

Contents of the wagon body, C.

Box C, No. 5 is placed on the bottom of the wagon, next to the pile of harness which occupies the rear part of the body. Box No. 6 is on top of No. 5; No. 7 on the bottom of the wagon, in front of No. 5; No. 8 on top of No. 7. The candle box in No. 6.

TOOLS AND STORES.	PLACE.
1 gallon linseed oil	In 1 tin can }
1 gallon spirits turpentine	" 1 do. } Box C, 5.
50 lbs. olive paint	" 2 do. }
5 lbs. black paint	" 1 do. }
12 paint brushes	}
5 lbs. sperm or wax candles	In candle box }
4 rammer heads	}
4 sponge heads	}
12 sponges	} Box C, 6.
3 priming wires	}
3 gunner's gimlets	}
6 cannon spikes	}
3 dark lanterns	}
4 common lanterns	}
4 gallons neats' foot oil	In 2 tin cans. } Box C, 7.
50 lbs. grease	" 2 kegs. }
20 lbs. nails, (4d, 6d, 8d, 10d)	Box C, 8.
2 felling axes	} In the axe rack.
1 claw hatchet	}
2 hand bills	}
1 caisson stock	Under the till, against the side and rear of the wagon.
3 rammers and sponges	On the caisson stock, against rear end.
40 spokes	On the bottom; piled lengthwise against the front end.
24 fellies	On the spokes, crosswise.
1 grindstone, 14 in. × 4 in	} On the fellies, against the left side of the wagon.
1 arbor and crank for do	}
3 screw jacks	On the fellies, against the front and the till.

Contents of the wagon body, C—Continued.

TOOLS AND STORES.	PLACE.
10 wheel traces	In a pile occupying 30 inches at the rear end of the wagon, between the left side and the caisson stock, and up to the top of the till; the collars piled on each other, from the bottom.
10 leading traces	
6 collars	
16 girths	
16 whips	
6 bridles	
6 halters	
12 halter chains	
25 hames straps	
12 spare nose bags	On the harness.
6 pieces sash cord	
50 yards slow match	On box No. 7, to the left of No. 8.
1 elevating screw	On the pile of harness.
1 pole yoke	
1 side harness leather	Under the till, in front of the pile of harness, and against the caisson stock.
2 sides bridle leather	
1 prolonge	On box No. 7, in front of No. 8.
4 scythes	In the till, against the front end.
4 scythe stones	In the curve of the scythes.
6 spades	In the till; the bits against the rear end.
2 pick axes and 2 handles	Between the spade handles.
24 corn sacks	On the scythes.
2 tarpaulins, 5 feet square	On the corn sacks, against front end.
4 reaping hooks	Fastened to the ridge pole with a wooden clamp and a leather strap.
4 scythe sneaths	Fastened to the ridge pole with two leather straps and buckles.
1 spare stock for battery wagon	In the spare stock stirrup.
1 watering bucket	Tied to the forage rack.
Forage	In the forage rack.

EQUIPMENT OF A FORGE FOR THE FIELD PARK.

Interior arrangement of the limber chest.—Plate IV.

The chest is marked: FORGE B.

Four boxes for tools and stores; *one shoeing box; one tin can* for oil.

The boxes are marked B, Nos. 1, 2, 3, and 4, respectively. They are made like those for the Forge A.

Exterior dimensions of boxes for limber chest of Forge B.

DESIGNATION.	Length.	Width.	Depth.	REMARKS.
	In.	In.	In.	
B, No. 1.....	17.8	13.25	7.5	
B, No. 2.....	26.5	17.8	7.5	
B, No. 3.....	23.5	8.	6.5	Partition for oil can, 5.25 in. from one end.
B, No. 4.....	39.8	9.8	6.5	
Shoeing box, B.	.....	.....	.....	See PART 10; Plate VII.

The oil can is like that for Forge A; it is marked: B, SPERM OIL.

Boxes Nos. 1 and 2 occupy the bottom of the limber chest; No. 1 against the left end.

No. 3 is placed on top of Nos. 1 and 2, against the left end and the back of the chest.

No. 4, on top of Nos. 1 and 2, against the front of the chest.

The shoeing box, on No. 2, against the right end and the back of the chest.

Contents of limber chest of Forge B.

TOOLS AND STORES.	PLACE.
4 nuts and washers, No. 5	Box B, 1.
6 nuts and washers, No. 4	
10 nuts and washers, No. 3	
45 nuts and washers, No. 2	
2 lbs. nails, Nos. 1 and 2, C.	
20 tire bolts	
1 lb. rivets, for ammunition chests	
20 washers for bolt heads, Nos. 3 and 4.	
5 keys for ammunition chests	
1 pole prop socket and ferrule	
8 linch washers	
4 shoulder washers	
12 linch pins	
2 feet of chain, No. 2	
1 pintle hook	
1 cap square	
2 tire bands, (clips) developed	
2 heading tools, for bolts	Box B, 2.
1 heading tool, for nails	
2 tire punches, 1 round punch, 1 square punch } with handles	
1 square hand punch	
1 round hand punch	
1 centre punch	
1 key punch	
1 set hammer, flat	
1 set hammer, half round	
3 chisels, for hot iron, 2 chisels, for cold iron } with handles	
2 hand cold chisels	
3 smith's tongs	
1 nail claw	
1 tire circle	
1 bevel vice	
1 hardie	
1 fuller	
1 hand axe	
1 groce screws, 1 inch, No. 14	Box B, 3.
1 small hand vice	
1 hand screw driver	
6 taps, 6 pair dies } $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, and 1 in	
12 gimlets, assorted	
3 small punches	

Contents of limber chest of Forge B—Continued.

TOOLS AND STORES.	PLACE.
1 pair spring compasses	Box B, 3.
12 files, assorted, with handles	
1 iron wire gauge	
1 scribing awl	
1 pair callipers	
1 bevel	
1 trying square	
1 scriber	
1 buttress	
1 quart can of sperm oil	
4 nave bands, developed	In Box B, 4.
1 hand hammer	
1 riveting hammer	
1 nailing hammer	
1 sledge	
1 fore punch	
1 creaser	
1 screw wrench	
1 smith's shovel	
1 smith's poker	
1 split broom	
1 tap wrench, with 4 holes	
1 die stock	
1 tracing point	
2 augers, $\frac{3}{4}$ in. and 1 in., (with handles)	
1 framing chisel	
1 felling axe	
1 shoeing hammer	In shoeing box.
1 shoeing pincers	
2 shoeing rasps	
1 pritchel	
1 nail punch	
1 toe knife	
1 clinching iron	
1 hoof knife	
2 leather aprons	
1 oil stone	
1 iron square	Fastened to inside of chest cover.
1 tar bucket	On its hook.

Contents of forge body, B.

Boxes B, Nos. 5 and 6 of the same size as A, No. 1, are carried in the iron room. To put these boxes in place, loosen the thumb nuts and raise the rear of the bellows one inch.

TOOLS AND STORES.	PLACE.
1 water bucket	On its hook.
1 watering bucket, (leather)	On the vice.
1 anvil	On the fire place.
1 vice	On the stock of the forge wagon.
100 lbs. square iron, ($\frac{1}{2}$ to 1 inch)	In the iron room. Bars not more than 3 feet long. Square iron in 2 bundles.
50 lbs. flat iron, ($1\frac{1}{4} \times \frac{5}{8}$, $1 \times \frac{1}{2}$, $1\frac{1}{4} \times \frac{2}{10}$ $1\frac{1}{2} \times \frac{1}{4}$ in.)	
50 lbs. $\frac{3}{8}$ round iron	
10 lbs. cast steel	
5 lbs. English blistered steel	Boxes B 5 & B 6; half in each.
200 lbs. horse shoes, Nos. 2 and 3	
20 lbs. horse shoe nails, Nos. 2 and 3	
250 lbs. bituminous coal	In the coal box.
1 coal shovel	

EQUIPMENT OF A BATTERY WAGON FOR THE FIELD PARK.

Interior arrangement of limber chest.—Plate IV.

The chest is marked: BATTERY WAGON, D.

Two cleats of oak are fastened to the ends of the chest, each with *four screws*, 1.5 in. No. 14. The cleats are .75 inch thick, and 1.75 inch wide; their upper edges are 7.5 inches from the bottom of the chest.

Two boxes, marked D, Nos. 1 and 2, occupy the upper part of the chest, resting on the cleats; No. 1 against the back of the chest. They are made of white pine, .75 in. thick, with leather handles and loose covers, .5 in. thick.

Each of the boxes is 39.8 in. long outside, and 6.25 in. deep.

No. 1 is 8 inches wide; it has two partitions 5.25 inches from one end, and 7.5 from the other, in the clear.

No. 2 is 9.8 inches wide, with two partitions, 14 inches from one end, and 11.8 inches from the other end.

One oil can, like that for the limber chest of Forge A, marked: D, SPERM OIL.

Five wooden clamps, for saws, are fastened to the interior of the chest cover, with *twelve screws*.

Two brass clamps, for webs or blades of frame saw, fastened to the interior of the cover, each with *six nails*.

Contents of limber chest for Battery Wagon, D.

TOOLS AND STORES.	PLACE.
CARRIAGE MAKER'S TOOLS.	
1 set bench planes, (4)	Packed with tow in the bottom of the chest.
2 wood clamps	
2 oil stones	
1 broad axe	
1 hand axe	
1 felling axe	
1 hand hammer	
1 claw hatchet	
1 adze	
1 table vice	
1 holdfast	
4 framing chisels	
4 firmer chisels	
4 gouges	
1 frame saw	
2 screw wrenches	
6 augers and handles	
2 claw hammers	
1 saddler's mallet	
1 saddler's claw	
1 brace and 24 bits	Box D, 1.
1 pair pincers, small	
1 pair callipers	
2 spoke shaves	
2 gauges	
6 plane irons	
1 saw set	

Contents of limber chest for Battery Wagon, D—Continued.

TOOLS AND STORES.	PLACE.
1 trying square	Box D, 1.
1 bevel	
1 rule, (2 feet)	
1 dozen gimlets	
1 pair compasses	
1 chalk line	
2 brad awls	
1 scriber	
1 dozen taper files, (4½ inches)	
6 wood files	
2 wood rasps	
1 compass saw	
1 groce harness buckles	
10,000 tacks	
1 quart can sperm oil	
2 hand saws	Fastened to interior of chest cover, with wooden clamps.
2 tenon saws	
2 webs or blades for frame saw	Do. with brass clamps.
SADDLER'S TOOLS AND STORES.	
1 hammer	Box D, 2.
6 shoe knives	
1 half round knife	
1 pair shears	
3 sand stones	
1 rule, (2-feet)	
600 needles, assorted	
5 collar needles	
36 awls	
6 awl handles	
6 punches, (assorted)	
3 pair pincers	
6 pair plyers	
3 claw tools	
3 creasers	
3 strap awls	
1 gauge knife	
1 pair compasses	
6 thimbles	
1 lb. bristles	
3 lbs. bees wax	
5 lbs. black wax	
5 lbs. patent thread	
1 tar bucket	On its hook.

Interior arrangement of wagon body, D.—Plate VI.

A till, on the right side of the wagon, as described in PART 2, page 55.

An axe rack, on the left side of the wagon body, as in Battery wagon C.

Eight boxes, for tools and stores, marked: D, Nos. 3, 4, 5, 6, 7, 8, 9, 10, respectively.

One shoeing box, marked D.

Exterior dimensions of boxes for Battery Wagon, D.

DESIGNATION.	Length.	Width.	Depth.	REMARKS.
	In.	In.	In.	
D, Nos. 3 & 5.	23.5	20.25	14.	Made of hard wood .75 in. thick, with hinged covers, fastened with hooks.
D, No. 4.....	27.5	23.5	14.	
D, No. 6.....	19.5	19.5	10.5	
D, No. 7.....	31.5	19.5	8.	
D, No. 8.....	12.5	8.5	7.5	Made of white pine .625 inch thick; covers with hinges and hooks. No. 9 divided into 4 equal parts.
D, No. 9.....	13.	13.	5.	
D, No. 10....	14.5	6.	5.5	
Shoeing box...	.....	.....	.....	See PART 10, Plate VII.

Eight tin cans: Two of the capacity of *two gallons*, for NEATS' FOOT OIL and LINSEED OIL; three of *one gallon*, for the same oils, and for TURPENTINE; two, for *twenty-five pounds* each of OLIVE PAINT; and one, for *five pounds* of BLACK PAINT. They are made like those of the same capacity for Battery wagon C.

Two kegs, for grease; like those in Battery wagon C.

The *clamps* and other fixtures on the interior of the wagon cover, are mentioned in the list of contents.

Contents of wagon body, D.—Plate VI.

TOOLS AND STORES.	PLACE.
1 gun carriage stock, (ironed)..	On the bottom of the wagon, against the right side, resting on two blocks to clear the rammer stop; the lunette to the rear.
2 caisson stocks, (not ironed)..	Against the left side and rear of the wagon; one on the other, the lunette ends in front.
2 splinter bars.....	On the bottom, lying on each other against the caisson stocks and the rear of the wagon.
28 tire bolts, nuts, and washers.	On the bottom, against the front & right side
2 axletrees.....	On the bottom, against the gun carriage stock and the front end.
4 half tires.....	Between the axletrees and the splinter bars.
200 lbs. bar iron.....	In 5 bundles, not more than 3 feet long; on the half tires, against the front of the wagon.
50 lbs. steel.....	
3 pole yokes	On the bar iron, towards the front.
10 wheel traces.....	Piled on the bottom of the wagon, against the gun carriage stock and the till, and on the caisson stocks and splinter bars; occupying about 31 inches in length of the rear part of the wagon.
10 leading traces.....	
20 trace chains, staples, & rivets	
6 collars.....	
16 girths.....	
16 whips.....	
25 hames straps.....	
6 bridles.....	
6 halters.....	
12 halter chains.....	
3 sides harness leather.....	Trimmed and rolled up tight; on the axletrees and tires, in front of the pile of harness.
2 sides bridle leather	
30 lbs. rope, $2\frac{3}{4}$ in.....	Between the front ends of the caisson stocks and the bar iron.
12 nose bags.....	On the pile of harness.
5 yards slow match.....	
3 screw jacks	On the slow match.
2 elevating screws.....	
2 drag ropes.....	Coiled on the screw jacks.
1 grindstone and arbor.....	On the drag ropes.

Contents of wagon body, D.—Continued.

TOOLS AND STORES.	PLACE.
3 felling axes	In the axe rack.
3 hand bills	
3 gallons neats' foot oil	In 2 cans
50 lbs. grease	" 2 kegs
1 gallon spirits turpentine	" 1 can
	In box D, 3; placed on the caisson stocks & the rolls of leather, against the front of the pile of harness.
LABORATORY TOOLS.	
1 copper adze, with handle	In box D, 4; placed on the caisson stocks and rolls of leather, next to No. 3.
4 wooden bowls	
2 bench brushes	
1 pair callipers	
1 dredging box	
1 rocket mould	For 1.5 in. rockets.
1 set of formers	
1 set of drifts	
1 set of formers for cylinders and caps, each calibre	
4 copper funnels	
1 set shot and shell gauges	
3 gimlets	
1 copper hammer	
1 paste kettle	
1 lead ladle	
1 set stencils, for letters & fig's	
4 mallets	
1 set powder measures, 4 oz., 8 oz., 1 lb., and 2 lbs	
1 brass mortar & pestle, small	
1 set moulds for musket and rifle balls, and buck shot	
2 wooden mullers	
50 needles	
3 paste brushes	
3 copper pans, 10 or 12 in	
1 rule, (2 feet,) not folded	
2 sand stones	
1 spring balance, 30 lbs	
1 dozen scissors	
1 copper scoop, large	
3 do. small	
1 hair sieve	
2 hand screw drivers, large	
1 spatula	
6 thimbles	
1 gunner's callipers	

Contents of wagon body, D.—Continued.

TOOLS AND STORES.	PLACE.
6 priming wires	Box D, 4—Continued.
6 gunner's gimlets	
3 gunner's pincers	
1 tinner's furnace	
3 gallons linseed oil	In 2 cans, In box D, 5; placed on the pole
50 lbs. olive paint	" 2 cans, yokes and rope, between No. 4
5 lbs. black paint	" 1 can, and the front of the wagon.
2 tarpaulins, 5 feet square	On the gun carriage stock.
2 do. do.	Between the till and boxes Nos. 3, 4, and 5.
10 lbs. marline	On box No. 3.
6 sheep skins	On boxes Nos. 4 and 5.
ARMORER'S TOOLS.	
3 wire awls	Box D, 6; placed on top of No. 5, against the front of the wagon.
1 band set	
1 drill brace	
1 hand brace	
6 centre bits	
2 hand brushes	
1 bench brush	
1 pair callipers	
1 centre punch	
6 cold chisels	
6 stocker's chisels	
6 stocker's gouges	
1 pair compasses	
2 spring clamps	
2 wood clamps	
1 drill stock	
6 drills, assorted	
1 die stock	
1 set dies	
72 files, assorted	
12 file handles	
1 glue pot	
3 spring hooks	
3 bench hammers	
1 drawing knife	
3 pairs nippers	
3 pairs plyers	
12 reamers, assorted	
1 pair spring compasses	
1 riffler	

Contents of wagon body, D.—Continued.

TOOLS AND STORES.	PLACE.
ARMORER'S TOOLS—(Cont'd.)	
1 bench stake	Box D. 6—Continued.
1 hack saw frame	
6 hack saw blades	
4 armorer's punches	
6 screw drivers, brace	
1 rule, 2 feet	
2 armorer's tongs	
1 set screw taps	
1 breeching vice	
3 hand vices	
1 bevel vice	
1 breeching wrench	
1 tap wrench	
1 straight edge	
1 bayonet mandril	
2 soldering irons	
1 screw wrench	
2 oil cans, small	
1 pair tinner's shears	
1 brass scale, 1 foot	
1 flint screw wrench	
12 haversacks	Box D, 7; placed on top of No. 4, and against No. 6.
8 tube pouches	
8 thumb stalls	
15 yards linen canvas	
10 lbs. sperm or wax candles	In box D, 8, on top of No. 3.
20 lbs. nails, 4d to 10d	Box D, 9, on No. 3 and on the till.
1 set of shoeing tools	In shoeing box, on No. 3.
6 spades	In the till, on each other; the bits against the back of the wagon.
3 pick axes, without handles	In the till, between the spade handles.
3 handles for do	
24 pieces sash cord	
1 drill bow	In the till, lying on the bottom.
1 barrel wiper and scraper	
2 lbs. quick match	Box D, 10; in the left side of the till, in front of the spade handles.
10 lbs. shoe thread	In the till, in front of box No. 10.
3 dark lanterns	In the left side of the till, between the shoe thread and the front end.
4 common lanterns	

Contents of wagon body, D—Continued.

TOOLS AND STORES.	PLACE.
6 rammer heads 12 sponges	In the till; between the lanterns and the side of the wagon.
12 paint brushes	On box No. 10, and by the side of it.
6 rammer staves	In the wagon cover; 3 on each side of the ridge pole, secured with 2 wooden buttons, which are fastened to the ridge pole, each with 1 screw.
6 reaping hooks	Fastened to the ridge pole with a wooden clamp and a leather strap passing through a staple in the ridge pole.
1 cross cut saw, without handles. 1 pit saw, without handles.	In the wagon cover, laid on each other, and fastened by 2 wooden clamps; the teeth of the cross cut saw against the right cover rail; the handle end of the pit saw against the rear board of the cover.
4 handles for do	On the spade handles.

Bill of boards for packing boxes, for Forges.

DESIGNATION.	No. of pieces.	ROUGH DIMENSIONS. Length.	Width.	Thickness.	Quantity.	KIND.
FOR FORGE A.		In.	In.	In.	Sup.ft.	
Box A, 1. Bottom and top	1	38	14.25	1.	3.76	W. pine.
Sides and ends	1	72	7.5	1.	3.75	Do.
A, 2. Bottom and top	1	38	14.25	1.	3.76	Do.
Sides, ends, and partition	1	84	7.5	1.	4.37	Do.
A, 3. Bottom and top	1	38	14.25	1.	3.76	Do.
Sides and ends	1	72	7.5	1.	3.75	Do.
A, 4. Bottom and top	1	50	8.75	1.	3.04	Do.
Sides, ends, and partition	1	84	6.5	1.	3.79	Do.
A, 5. Bottom and top	1	84	10.5	1.	6.12	Do.
Sides and ends	1	108	6.5	1.	4.87	Do.
A, 6. Bottom and top	1	38	14.25	1.	3.76	Do.
Sides and ends	1	72	7.5	1.	3.75	Do.
					48.48	
FOR FORGE B.						
Box B, 1. Bottom and top	1	38	14.25	1.	3.76	Do.
Sides and ends	1	72	7.5	1.	3.75	Do.
B, 2. Bottom and top	1	56	19.	1.	7.39	Do.
Sides and ends	1	96	7.5	1.	5.	Do.
B, 3. Bottom and top	1	53	8.5	1.	3.13	Do.
Sides, ends, and partition	1	72	6.5	1.	3.25	Do.
B, 4. Bottom and top	1	84	10.5	1.	6.12	Do.
Sides and ends	1	108	6.5	1.	4.87	Do.
B, 5. Bottom and top	1	38	14.25	1.	3.76	Do.
Sides and ends	1	72	7.5	1.	3.75	Do.
B, 6. Bottom and top	1	38	14.25	1.	3.76	Do.
Sides and ends	1	72	7.5	1.	3.75	Do.
					52.29	

Bill of boards for packing boxes, for battery wagon, C.

DESIGNATION.	No. of pieces.	ROUGH DIMENSIONS. Length.	Width.	Thickness.	Quantity.	KIND.
FOR BATTERY WAGON C.		In.	In.	In.	Sup. ft.	
Box C, 1. Bottom and top	1	38	14.25	1.	3.76	White pine.
Box C, 1. Sides and ends	1	72	7.5	1.	3.75	Do.
C, 2. Bottom and top	1	56	19.	1.	7.39	Do.
C, 2. Sides and ends	1	96	7.5	1.	5.	Do.
C, 3. Bottom and top	1	84	10.5	1.	6.12	Do.
C, 3. Sides, ends, and partition	1	120	6.25	1.	5.21	Do.
C, 4. Bottom and top	1	84	8.5	1.	4.96	Do.
C, 4. Sides, ends, and partition	1	120	6.25	1.	5.21	Do.
C, 5. Bottom	1	25	19.5	1.	3.39	Hard wood.
C, 5. Sides and ends	1	90	12.5	1.	7.5	Do.
C, 6. Bottom	1	25	19.5	1.	3.39	Do.
C, 6. Sides and ends	1	90	12.	1.	7.5	Do.
C, 7. Bottom and top	1	50	21.5	1.	7.46	Do.
C, 7. Sides and ends	1	96	14.25	1.	9.5	Do.
C, 8. Bottom and top	1	30	14.	1.	2.92	White pine.
C, 8. Sides, ends, and partitions	1	84	5.	1.	2.92	Do.
C, CANDLES Bottom and top	1	24	7.	1.	1.16	Do.
C, CANDLES Sides and ends	1	40	5.5	1.	1.53	Do.
					88.67	

Bill of boards for packing boxes, for battery wagon, D.

DESIGNATION.	No. of pieces.	ROUGH DIMENSIONS. Length.	Width.	Thickness.	Quantity.	KIND.
FOR BATTERY WAGON D.		In.	In.	In.	Sup.ft.	
Box D, 1. Bottom and top	1	84	8.5	1.	4.96	White pine.
Box D, 1. Sides, ends, and partitions	1	120	6.25	1.	5.21	Do.
D, 2. Bottom and top	1	84	10.5	1.	6.12	Do.
D, 2. Sides, ends, and partitions	1	128	6.25	1.	5.55	Do.
D, 3. Bottom and top	1	50	21.5	1.	7.46	Hard wood.
D, 3. Sides and ends	1	96	14.25	1.	9.5	Do.
D, 4. Bottom and top	1	60	25.	1.	10.42	Do.
D, 4. Sides and ends	1	112	14.	1.	10.89	Do.
D, 5. Bottom and top	1	50	21.5	1.	7.46	Do.
D, 5. Sides and ends	1	96	14.25	1.	9.5	Do.
D, 6. Bottom and top	1	44	21.	1.	6.42	Do.
D, 6. Sides and ends	1	44	10.5	1.	3.21	Do.
D, 7. Bottom and top	1	70	21.	1.	10.21	Do.
D, 7. Sides and ends	1	112	8.	1.	6.22	Do.
D, 8. Bottom and top	1	30	9.	1.	1.87	White pine.
D, 8. Sides and ends	1	48	7.5	1.	2.5	Do.
D, 9. Bottom and top	1	30	14.	1.	2.92	Do.
D, 9. Sides, ends, and partitions	1	84	5.	1.	2.92	Do.
D, 10. Bottom and top	1	32	6.5	1.	1.44	Do.
D, 10. Sides and ends	1	45	5.5	1.	1.72	Do.
					116.50	

ARTILLERY.

PART THIRTEENTH.

INSTRUMENTS

FOR

VERIFYING THE DIMENSIONS

OF

ORDNANCE AND PROJECTILES.

1849.

PART THIRTEENTH.

INSPECTING INSTRUMENTS.

Ring gauges for shot and shells.—Plate I.

These gauges are made of STEEL, not hardened. They should be reamed with the greatest accuracy. The *handles* are of walnut, oak, or other smooth-grained wood. The *ferrules* of sheet brass, No. 13. The end of the shank is riveted in an iron burr. The exterior corners of the rings are slightly rounded. There is a large and a small gauge for each calibre; their dimensions are alike, except the diameters, which are given in the table annexed to the drawing.

Cylinder gauges, for shot and shells.—Plate I.

These gauges are made of CAST IRON, turned on the exterior, and reamed out to the diameter of the large ring gauge of each calibre. The dimensions are shown in the plate.

Ring gauges, for grape and canister shot.—Plate I.

They are made of STEEL, the large and small rings being cut out of the same piece. The exterior edges are rounded, for convenience in handling them. The tables in the drawing show the diameters of the rings for each kind and calibre.

SHELL CALLIPERS.

Callipers for measuring the thickness of shells at the bottom. Figs. A and B.—Plate I.

For greater convenience these callipers are made of two sizes; one for shells and spherical case shot, of not more than 8 inches diameter; the other, for 8 in. and 10 in. shells, for mortars and columbiads.

The thickness of 12 in., 13 in., or any special shells, may be measured by inserting a *graduated probe* in the fuze hole.

The callipers consist of a steel point which is screwed into a hollow iron stem, attached to a wooden handle, and an iron bow which turns on a pivot, and carries a steel slider.

The point connected with the handle is inserted in the fuze hole and pressed against the bottom of the shell inside, whilst the slider is brought against the bottom on the outside. The variations allowed in the thickness of metal are marked, for each kind and calibre of shell, on the socket of the slider.

The head of the slider is screwed on and slightly riveted. If the inner point becomes worn, it can be adjusted by putting a washer under the shoulder, where it is screwed into the stem.

The large callipers require separate points, for measuring mortar and columbiad shells; collars of corresponding thicknesses are put on the slide, to prevent the points from interfering with each other when the instrument is not in use.

Callipers for measuring the thickness of shells at the sides.

The callipers represented in *Fig.* C, PLATE I, are adapted to all shells not exceeding 10 inches diameter.

The graduated limb is an iron tube; it is inserted into a stationary head, which contains also a socket for the curved branch which enters the shell, its shoulder resting on the opening of the fuze hole. This branch or measuring point is made of steel, hardened; it is different for each kind and calibre of shell, as shown in the table, at the foot of the figure.

The graduated limb is prevented from turning in its socket by a screw on the upper side of the socket; the hole in the limb for this screw is oblong, so as to allow the limb to slide a short distance, by turning the screw in the end of the stationary head. The object of this motion is to adjust the limb, in case of the points becoming worn, &c., for which purpose a fixed mark of

adjustment for each calibre and kind of shell is made on the limb; for the common shells, on the upper side, and for spherical case below, corresponding with the other graduations on the limb. These graduations show, not the thickness of each shell, but the variations allowed in the thickness.

The sliding branch, which forms the exterior measuring point, is made of steel; it slides on the limb, and can be easily turned to one side for the purpose of inserting the fixed point in the shell; the thumb screw in this branch is intended for holding it fast when the instrument is not in use.

Fig. D, PLATE I, represents another kind of shell callipers which may be advantageously used for inspecting large shells. The drawing shows the dimensions of the callipers for 8 in. and 10 in. mortar shells. The instrument is made of sheet iron, or steel. It has two bent branches which turn on a pivot in the centre, and to one of which a graduated limb is attached; on this limb the socket of the other branch slides, and by its position indicates, in an obvious manner, whether the thickness of the shell is within the required limits. A sliding collar, fastened by a thumb screw, serves to adjust the length of the inner branch of the callipers; so that, when the collar rests on the outer opening of the fuze hole, the point of this branch shall be at the proper depth in the shell.

Gauges for fuze holes.

These gauges are made of steel. There is one gauge for each kind of shell, but all have the same taper, viz., 0.15 inch to 1 inch. The stem, or straight part of the gauge, is graduated and marked to show the thickness of the shell at the fuze hole. The tapering part is marked for the interior and exterior diameters of the fuze holes, for the several sizes of shells. The edges of this part are slightly rounded, so that the corners of the plate shall not touch the sides of the fuze hole.

Instruments for inspecting ordnance.

Star gauge.—Plate II.

This is an instrument for measuring the diameter of the bore of a gun, at any part.

The head is of cast brass, with four steel sockets for the measuring points. These sockets are fitted with great care; two of them are soldered fast into the head; the other two are moveable. The moveable sockets and points are pushed out by means of two inclined cylinders of steel, which are fastened to a steel stem, forming a conical slider. This slider tapers 0.35 in. in a length of 2.2 in.; so that by pushing the slider the 35th part of this length (about .06 in.) the distance between the moveable points is increased .01 in.

The slider is connected with a square steel rod, consisting of three parts which are screwed together, according to the length of bore to be measured. This rod slides through brass sockets soldered into a brass tube, which is also made in three pieces.

The tube is graduated, in inches and quarters, commencing at the measuring points, so as to indicate the distance of the latter from the muzzle of the gun.

The handle is of hard wood attached to a brass cylinder, or socket, through which the sliding rod passes. In the tube of the handle there is a slit, on the side of which a scale is marked, to indicate the movements of the measuring points. Each joint of the long tube has a mark, made on a small plate of silver, which shows the place of the zero on the scale, when the measuring points are adjusted to the true diameter of the bore. In this position the handle is fixed on the sliding rod by means of a screw clamp; each joint of the rod is roughed with a file, on the two lower sides, to prevent it from slipping in the clamp.

A *ring gauge*, of iron, for each calibre, is used for adjusting the instrument for use. As these gauges give the minimum diameter allowed for the bore, the fixed measuring points should be adjusted so as just to fill the ring gauge, or not to have a play of more than .02 inch.

A *rest*, in the form of a T, is placed in the mouth of the gun, to keep the instrument in the axis of the bore. This rest has three slides which can be adjusted to the different sizes of bore; the upright branch is moveable, for convenience of packing.

The star gauge, its points and rest, are packed in one box, and the ring gauges in another.

Plate III.

The cylinder staff.

This is a round staff made of mahogany, or other hard wood. It is in two parts, which are joined together by brass sockets and screws; each part has also a brass socket and screw at the outer end, to receive the *cylinder gauge*, *guide plate*, *measuring point* and *searcher*. The staff is graduated, in inches and tenths, on a strip of brass let into it, on one side. These graduations are arranged to read the distances from the extremity of the measuring point, when it is screwed on the staff.

The cylinder staff is supported, at the muzzle of the piece, by a *half tompion* of wood, having in the centre a groove of the size of the staff. The *rest* for the star gauge may be used also for this purpose.

The *cylinder gauge* is a hollow cylinder of wrought or cast iron, turned to the exact minimum (or true) diameter of the bore, as shown in the table of ring gauges, Plate II. The length of the cylinder is equal to its diameter. It has cross heads, at right angles to each other; one with a smooth hole of the same diameter as the cylinder staff; the other tapped for the screw of the staff socket.

The *guide plate* is of wrought iron, turned to the true diameter of the bore, and having a hole in the centre which is tapped to fit the screw of the staff socket. It is screwed on the staff, to keep the measuring point in the axis of the bore.

The *measuring point* is of steel, with a hole tapped to fit the screw of the cylinder staff, to which it is fixed, over the guide plate.

The *searcher* consists of four pointed steel prongs, fastened to a brass socket which fits on the cylinder staff.

Trunnion gauge.

The trunnion gauge is a ring gauge, made of steel. The inner circle has the true diameter of the trunnion; the outer one, that of the rimbase.

Trunnion square.

The trunnion square is formed of a bar and two legs, of seasoned mahogany, framed together with tenons and mortises. On the feet of the legs are two iron plates, the lower edges of which project .1 in. from the face of the square, and are dressed exactly in the same line, for the purpose of verifying the alignment of the trunnions. The distance between the inner surfaces of these plates corresponds with the true distance between the shoulders of the trunnions. Two iron guide plates are fastened with screws to the legs, perpendicularly to the face of the square. The distance of the lower edges of these plates from the bottom plate is equal to the semi-diameter of the trunnion, and their length, from the face of the square, is .2 in. greater than that semi-diameter. The length of the legs is equal to one-half the distance between them. The length of the feet is equal to that of the trunnion.

In the middle of the upper bar of the square is a steel slider, fitted into a brass groove, and furnished with a thumb screw to

hold it fast when required. This slider serves to verify the position of the axis of the trunnions, with reference to the axis of the bore, supposing the bore to be concentric with the exterior surface of the metal.

The Plate represents trunnion squares of two sizes; one for guns of greater calibre than 24-pounder; the other, for smaller calibres. The dimensions not expressed in the drawing are readily supplied by means of the foregoing directions.

For special use, at a foundry, trunnion squares may be made of cast iron, in one piece.

Trunnion rule.

This instrument is designed for measuring the distance from the rear of the trunnions to the rear of the base ring of guns and howitzers, or from the front of the trunnions to the face of the muzzle, in mortars.

The measuring rod is a tube, (it may be made of a musket barrel,) graduated in inches and tenths. It is attached to an iron socket, having mortises through which two iron squares slide, at right angles to each other; both these squares are fastened in any required position by the small set screw at the head of the socket. The large square is marked to be set in such a manner that when the upper branch rests on the top of the trunnion the head of the socket shall touch the rear line of the trunnion. The T square is graduated to be set so that when its head rests against the shoulder of the trunnion, and the side of the rod against the base ring of the piece, the rod shall be parallel to the axis of the bore. In this position the slider on the rod is brought up to the rear of the base ring and clamped with the thumb screw. This slider is furnished with a vernier for reading hundredths of an inch.

Standard scale.

This scale is made of brass; it is to serve as a standard for verifying the dimensions of other instruments and tools. For convenience in making measurements, it is furnished with two sliding heads made of brass, with steel points. One of these heads has a vernier for reading hundredths of an inch. They are steadied by small steel springs, and they are clamped, in any given position on the scale, by means of screws, with milled heads.

Measuring rule.

This rule is made of wood, intended for ordinary use in making the measurements required in inspections; should be close-grained and well seasoned. HOLLY is a suitable kind of wood for this purpose.

Callipers.

The callipers are made of iron, with steel points. Three brass washers are inserted between the branches and plates in which the pivot is riveted. The joint should be made stiff.

Vent gauges.

They are made of steel wire, fastened in wooden handles. The diameter of the small gauge is 0.195 in.; the large, 0.205 in.

Vent searcher.

This is a piece of steel wire, with a hook at the point, fastened into a wooden handle. It is used to detect cavities in the bore of the vent.