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UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
REGION ONE
RICHMOND, VIRGINIA

File reference:
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JUN 30 1953

Memorandum

To: The Director
From: Assistant Regional Director, Region One
Subject: Historical Research Report - Saratoga NHP

Submitted herewith is a copy of Historian Shedd's report, dated June 5, 1953, on "Construction of Cannon Carriages for Guns at Saratoga National Historical Park," Project No. 1, Priority No. 1 in the 1953 Fiscal Year Program. A copy of Superintendent Ellsworth's transmittal memorandum of June 8 also is attached.

Mr. Shedd's contribution by this report is in differentiation between field carriages and travelling carriages and presentation of data on the latter for use in preparing working drawing precedent to construction of such carriages for Saratoga National Historical Park.

(SIGNED)

Daniel J. Tobin
Assistant Regional Director

Attachment

Copy to: Supt., Saratoga NHP

Saratoga National Historical Park
Stillwater, New York

June 8, 1953

Memorandum

To: Regional Director, Region One
From: Superintendent, Saratoga NHP
Subject: Submission of Historical Research Report

Mr. Shedd has completed Historical Research Project Report
No. 1, Priority No. 1, A Report on the Construction of Cannon Carriages
For Guns at Saratoga National Historical Park.

His report is submitted herewith in triplicate.

(Sgd.) IVAN J. ELLSWORTH

I. J. Ellsworth
Superintendent

In triplicate
Enclosures
cc: Mr. Shedd

A REPORT ON THE CONSTRUCTION OF CANNON CARRIAGES FOR GUNS AT
SARATOGA NATIONAL HISTORICAL PARK

by

Charles E. Shedd, Jr.
Park Historian

June 5, 1953

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A REPORT ON THE CONSTRUCTION OF CANNON CARRIAGES
FOR GUNS AT SARATOGA NATIONAL HISTORICAL PARK

Introduction

Future development of Saratoga National Historical Park provides for the mounting on replica carriages of original cannon or similar types associated with the Saratoga campaign. Most important of these are the British guns captured in the second battle of Saratoga or surrendered by General John Burgoyne at the Convention of Saratoga, October 17, 1777. While American guns actually used at Saratoga have not been located or identified, it may be anticipated that guns of the period, of the types known to have been used by the colonists in the campaign, also will be displayed.

This report is a survey of the present and anticipated requirements of this area for cannon carriage replicas, including a compilation of descriptive material and plans which may be used in the construction of these replicas. All accessible sources were examined to determine if the ordnance used by both armies at Saratoga differed in any great degree from the general types of the Revolutionary period. This information, supplemented by material from 18th century sources on contemporary artillery, is presented on the following pages.

BRITISH GUN CARRIAGES

In determining the types of gun carriages used by the British army at Saratoga, there is nothing in the available material to indicate that these carriages differed from the standard English types of the period. Although it was necessary to fabricate provision carts in Canada before embarking on the invasion of the northern colonies,¹ there is no evidence that gun carriages were made there. As will be shown later, the German troops with Burgoyne brought their own artillery carriages from Europe, and it is probable that the British troops did the same.

The provision carts built in Canada proved almost worthless, due to shoddy workmanship and material, and were subject to frequent breakdowns.² No such difficulty with gun carriages is reported by the artillerymen with Burgoyne, although a hint that trouble may have been encountered is found in Colonel Barry St. Leger's report of his abortive expedition in the Mohawk Valley in the summer of 1777. St. Leger reported that during the siege of Fort Stanwix it was necessary to make new cheeks and axle-trees for his six pounder cannon, "those that were sent being reported rotten and unserviceable."³ It can not be determined with certainty that similar difficulty was experienced with the gun carriages with the main army of invasion, but as St. Leger drew his ordnance from the same sources as Burgoyne, it is possible that the British gunners at Saratoga were forced to make such repairs in the field. Artillery artificers were present to keep the guns ready for action.⁴

During the period of the American Revolution, British guns detailed to accompany armies in the field generally were mounted on two principal types of gun carriages, namely field and travelling carriages.

According to John Muller, who is cited extensively hereafter, field carriages were lighter and of smaller proportions than travelling carriages. The former's wheels were eight inches less in diameter than the latter's, and field carriages carried lighter guns, although they might have the same caliber as the heavier guns mounted on travelling carriages.⁵

Fortunately, it can be determined which type of carriage was used in Burgoyne's army. Lieutenant James M. Hadden of the Royal Artillery noted in his journal, under an entry just two days prior to the first battle of Saratoga, that the army's cannon were mounted "on travelling carriages."⁶ This is to be expected, as the guns were obviously destined to undergo severe travelling conditions, far from a source of replacement, and the utmost strength in the carriages was to be desired.

St. Leger's reference to "rotten" axle-trees provides another piece of useful information about the British gun carriages at Saratoga - that their axle-trees were constructed of wood, not iron. Although one British military writer of the late 18th century noted that "Most of the field carriages are now made with iron axletrees," he added that wooden axle-trees were still used, and appended a table of their dimensions to his work.⁷ This writer, incidentally, lumped field and travelling carriages in the same general description, so it may be surmised that the axle-trees of British gun carriages at Saratoga were of wood.

In addition, it seems probable that most if not all of the British gun carriages used in the Saratoga campaign were equipped with mule boxes. Lieutenant Hadden quotes a Brigade order issued by General Phillips, Burgoyne's chief of Artillery, in which officers were notified

that they were "on this day [September 14, 1777] to make a general survey of the Ammunition Waggon and Carts, to see that the Stores are all in order, and to instruct the Noncommissioned officers in what manner they are to be got at when wanted; the Arms of the Guns as well as their boxes and Vents, are to be examined to see that no dirt be lodged, or any obstacle to their service."⁸

In a set of construction plans for 18th century cannon carriage plans obtained for this study from Colonial National Historical Park, the English six-pounder carriage described on plan NHP-COL 10008 has an open end axle, affixed to the wheels by the standard linch pins and washers, but does not include nave boxes. Plan No. NM-COL 10016 for American gun carriages of the period does include cast-iron nave boxes, and it is probable that the boxes of the British guns at Saratoga were of similar design, especially so since both plans were based on John Muller's Treatise of Artillery, the definitive work on English guns of the latter part of the 18th century. Muller comments that iron boxes were preferable to brass, as they were cheaper and caused less friction.

TYPES OF BRITISH GUNS TAKEN AT SARATOGA

A listing of British ordnance captured in the second battle of Saratoga or surrendered by the Convention of October 17, 1777, included the following guns: two 24-pounders, four 12-pounders, eighteen 6-pounders, four 3-pounders, two 8-inch mortars and five Royal howitzers, (5-3/4 inch).⁹ While the 24-pounders might properly be classified as siege guns in determining the proper type of carriage, they were, as Burgoyne pointed out,

lighter than medium twelves and were "to all intents and purposes field artillery."¹⁰ These 24-pounders were, in fact, of a special design, one of which is on display at Saratoga National Historical Park, for the uncertain roads of North America. They proved to be unpopular with artillerymen, as their lack of weight in proportion to their caliber caused excessive recoil.¹¹

GERMAN GUN CARRIAGES

A portion of the artillery detachment with Burgoyne's army at Saratoga was composed of Hesse-Hanau artillerymen. Investigation shows that although the German contingent brought their own guns and gun carriages from Europe, these were left behind in Canada when Burgoyne's force invaded the northern colonies.

Captain Georg Pausch, commander of the German artillery, describes the loading of the regiment's artillery and stores aboard ship at Herrtenfelds, Holland, on May 26, 1776, prior to sailing for England to join the British service in America. Wrote Pausch:

"The cannons, together with the gun-carriages, were lowered into the hold of the ship on top of the ballast and barrels, but in such a way that many repairs will be necessary when we take them up again on account of the smallness of the space."¹²

Later, on June 17, Pausch and his artillery detachment were at Spithead, on the English channel, preparing to set sail for Quebec. Here, Pausch noted:

"All the transports, now in this roadstead, are being supplied with water and provisions for a quarter of a year; and, in order that there may be room on board for the men and ourselves, my six cannon, gun carriages, boxes, chests, two carts, one wagon, blacksmith's tools, horses, harnesses, ropes, tent poles and other necessities were put on board a smaller vessel of two masts, called the "Gloucester."¹³

In the months following their arrival in Canada, the German artillery learned to serve the guns of their English allies, in accordance with the English drill system. Finally, marching orders came from General Phillips, on June 7th, 1777. The order stated in part:

"You will start with the company of Hesse Hanau Artillery from Montreal on Tuesday, the 10th inst, cross the River at Longueuil. You will march, also, on the following day, to Chambly and St. John's. At this latter place, you will receive four field cannon, which will form, under your orders, the Artillery Brigade, and which will be attached to the left wing of the Army....

"The Artillery of Hanau, consisting of three field-cannon, are to be left at Montreal under the command of an officer who is to take charge until he receives other instructions."¹⁴

Finally, Pausch notes that "The army smithy is at St. John's. Two of my ammunition-wagons and all of my cannon, with the rest of the Artillery, are at Montreal. At the same town, also, are the chests of the officers and all the stores of clothing. I left wagon-master Kaiser and an artillery-man in charge. We are using English cannon."¹⁵

From the above, it can be concluded that all of the guns and, undoubtedly, the gun carriages, with Burgoyne's army were of English design and manufacture.

AMERICAN GUN CARRIAGES AT SARATOGA

Although at present this area has no American artillery of the Revolutionary War period, it is probable that future development will provide for the mounting of representative American Ordnance on replica field carriages.

A "Return of Ordnance and Store In Camp Near Stillwater, September 24, 1777" shows the following guns in use at Saratoga:¹⁶

Brass 8 - pounders	1
Brass 6-pounders	1
Brass 4-pounders	10
Iron 8-pounders	3
Iron 4-pounders	5
Iron 3-pounders	2

The above-mentioned listing of ordnance stores with the American army on Bemis Heights does not make any reference to gun carriages. However, meagre references indicate that prior to the opening of the Saratoga campaign in the summer of 1777, carriages were being fabricated in the Northern Department, the defenses of which were based on Fort Ticonderoga. The fact that these carriages were constructed by local artisans, with whatever materials were available, should be taken into consideration in any attempt to duplicate these types.

Writing from Fort Ticonderoga to General Horatio Gates, Major James Wilkinson, in a letter dated May 16, 1777, noted the general state of disorganization existing at the "Gibraltar of the North." Among the pressing shortages, Wilkinson stated "there is a total want of iron proper for mounting the artillery...." And later in the same letter, Wilkinson noted that:

"This garrison is considerably obliged to Major Stevens of the artillery, an active, honest, and industrious officer; he directs the laboratory, and will in a little time, if supplied with paper, fix ammunition enough for the troops. Your last campaign established a company of artificers under his direction, which you will now observe included in his return; they are an excellent set of hands, and will alone I think be able to prepare the wood work necessary for mounting the artillery destined for the post; but unless iron is furnished, this will be of no consequence."¹⁷

While many of the carriages mentioned by Wilkinson undoubtedly were for garrison guns, there apparently was a general lack of gun mountings and carriages in the Northern Department at the outset of the Saratoga campaign. In a letter to Gates, dated May 31, Wilkinson informed his

commander that "Ten pieces of ordnance have arrived which will be mounted, Major Stephens [sic] tells me, in five days; the rest are hourly expected; I shall pay strict attention to the preparation of the carriages." And, in the same note the young major announced that "Major Stephens has used all the large iron sent by Colonel Lewis, and begs more."¹⁸

It is probable that many of the gun carriages referred to by Wilkinson were field carriages, as a large number of the Ticonderoga cannon were evacuated in the hasty retreat from the fort on July 6. Most of the ordnance saved from the disaster at Ticonderoga were lost at Skenesborough when Burgoyne's fleet caught up with that portion of St. Clair's army which retreated by water. The loss of this equipment, gathered with so much effort at Ticonderoga, further complicated the construction of carriages for the guns still available to the Americans in the Northern Department.

There is evidence that even while Burgoyne was making his slow advance from Skenesborough to Fort Edward, construction of gun carriages for the American army was going forward.

In a letter written at Fort Edward on July 17, 1777, General Schuyler informed Washington of certain modifications in construction of carriages for the artillery. Schuyler wrote in part:

"....It is very true that we have a great plenty of horses in this part of the country, but as they are always drove two abreast, and never with such collars as are generally used in the artillery, I feared that it would be difficult to get them to draw, and have found it so much so with the two pieces which General Nixon has with him, that I have ordered the carriages which are now making for the cannon I have here, to be constructed so as to be drawn with horses abreast of each other...."¹⁹

While Schuyler was obviously referring to the limbers by which field carriages were drawn, it seems likely that gun carriages, too, were being constructed. It is improbable that gun carriages without limbers

would have been available, as limbers were necessary to haul field guns in the heavier calibers for any great distance. An exception was the galloper carriage for light guns, a gun carriage with shafts which permitted it to be drawn without a limber.

The same Major Stevens whom Wilkinson commended for his energy in supplying the artillery at Ticonderoga remained with the northern army until after the battles of Saratoga. Undoubtedly it was this officer and his company of artificers who carried out Schuyler's orders for new carriages.

In the construction of gun carriages by these American artisans English patterns were followed as closely as local conditions would permit. Although John Muller's Treatise on Artillery, the standard English work on the subject at the period, was not published in America until two years after Saratoga, British ordnance was familiar to the Americans who had served at the side of the Royal troops in the numerous colonial wars and expeditions prior to the outbreak of the Revolution. As one authority has stated, "British artillery was naturally a model for the arm in America."²⁰

This adherence on the part of American workmen and artillerymen to the British system simplified the problem of construction of gun carriages for American cannon of the Saratoga period. At the same time, local shortages or lack of skilled craftsmen should be borne in mind. Especially was this condition liable to exist in regard to the more intricate features of construction, such as iron work, elevating screws and maneuvering rings. Major Wilkinson, already quoted, indicated the pressing need for iron in the construction of carriages.

However, Muller's descriptions, basis for the carriage plans now in the park files, should be followed with respect to the American as well as British carriages, as any variations probably were due to local circumstances, such as availability of workmen and material, rather than to basic differences in design or construction.

CARRIAGE PLANS FROM COLONIAL NATIONAL HISTORICAL PARK

The cannon carriage plans forwarded to this area from Colonial NHP are for field carriages, as evident from a careful comparison of their dimensions with the tables and plans in Muller's Treatise. However, these plans can be converted readily to the construction of travelling carriages in the calibers needed at Saratoga NHP by reference to the tables of dimensions from Muller, which are included in this report. It was considered desirable to reproduce these tables extensively to simplify the problem of converting the existing plans to the proper measurements for travelling carriages. Two working sets of the carriage plans are in the park files, and for reasons of economy it was not thought necessary to reproduce them for inclusion with this report. However, for ready reference they are listed below by plan and subject.

In addition, a number of diagrammatic drawings have been included in the present report as an aid to clarification of the nomenclature of various parts of gun carriages not identified on plan sheets listed below.

GUN CARRIAGE PATTERNS (Procured from Colonial NHP)

<u>Plan Number</u>	<u>Type of Carriage</u>
N.M.-Col. 6076	American Gun Carriage: 1810
NHP-Col. 10016 (3 sheets)	English-American Gun Carriages for 3, 4, and 6 pounders
NHP-Col. 10008	6-Pounder Brass Gun & Carriage; English; Period 1764
NHP-Col. 10005-1-2 10005-2-2	5 3/4" Howitzer and Carriage (English) Plan of Elevating Screw
NHP-Col. 10010	English 10" Bronze Mortar, Period 1741 and Mortar Bed, Period 1764
No Number	Thor Borresen - Design for Revolutionary Gun Carriages, from French and English Carriages at old Fort Niagara, New York

TYPES OF WOOD USED IN CANNON CARRIAGE CONSTRUCTION

With reference to types of wood used in carriage construction, Muller states that "The cheeks and transom are always of dry elm, on account that this wood is very pliable, receives the nails better than any other, and does not split; yet I have seen some made of young oak, and am of opinion it is much stronger than elm, and I think may answer better."

In describing the wood used in carriage wheels, Muller further notes that "The nave is always made of elm, cut six months before it is used, and left in the bark all the while till it is used; the spokes are made of elm or young oak, and used as dry and well seasoned as possible; The felloes are likewise made of dry elm, or in default of which young beech split in two only will do as well, if not better; and the axle-tree is of dry elm, young oak, or young beech."²¹

TABLE OF DIMENSIONS FOR TRAVELLING GUN CARRIAGE CHEEKS²² *

(Table No. 1)

Nature of the Gun, /Caliber/		24	12	6	3
Length of the cheeks		13*	12*	11*	10*
Width of cheeks		5.8	4.6	3.6	3
Height of the plank		22	19	16	13
Height of the cheek	before (head)	20	17	14	11.5
	center	17	15	12	9.5
	trail	12	11	10	7.5
Head from the center		74	69	60	51.5
Length of the trail		16	15	12	10

* Length of cheeks in feet. Other dimensions in inches.

TABLE OF DIMENSIONS FOR AXLE-TREES OF TRAVELLING CARRIAGES²³

(Table No. 2)

Nature of the Gun, /Caliber/		24	12	6	3
Body	length	38.5	39	40	40.5
	width	7	6.5	6	5.5
	height	9	8.5	8	7.5
Arms	length	21	20.5	19	17.5
	body diameter	7	6.5	6	5.5
	linch diameter	5	4.5	4	3.5
Total length		61	60	78	76

*Muller's terminology has been altered here where it required clarification.

WHEEL DIMENSIONS FOR TRAVELLING GUN CARRIAGES²⁴

(Table No. 3)

Caliber		24	12	6	3
Wheel, diameter		58	58	58	58
Nave length		17.5	17	15.5	15
Diameter of nave	body	15	15	13	12.5
	middle	16	16	14	13
	linch	13.5	13.5	10	10
Fellies	width	5	4.5	4	3
	height	6.5	6	5.5	4.5
Spokes	width	2.3	2.2	2.1	2
	breadth	4.5	4	3.5	3

"The Span, or interval between the wheels, varies in different countries; even every country in England observes a different width, which is very inconvenient for those who travel in carriages. The artillery carriages are made like those in Flanders, which is four feet eight inches; but as the fellies are not of the same breadth in all wheels, we shall make the distance between the middle of the fellies five feet in all the carriages used by land....."²⁵

WHEEL PARTS AND NUMBER PER WHEEL²⁶

(See Fig. No. 1)

Table No. 4

<u>Part</u>	<u>Number per wheel</u>
A. Nave (hub of wheel)	1
B. Spokes	12
C. Fellies	6
D. Dowledges	6
E. Rivets for Dowledges	24
F. Streaks (Iron wheel rims)	6
G. Streak Nails	48
H. Nave Hoops	3
J. Nave Boxes	1

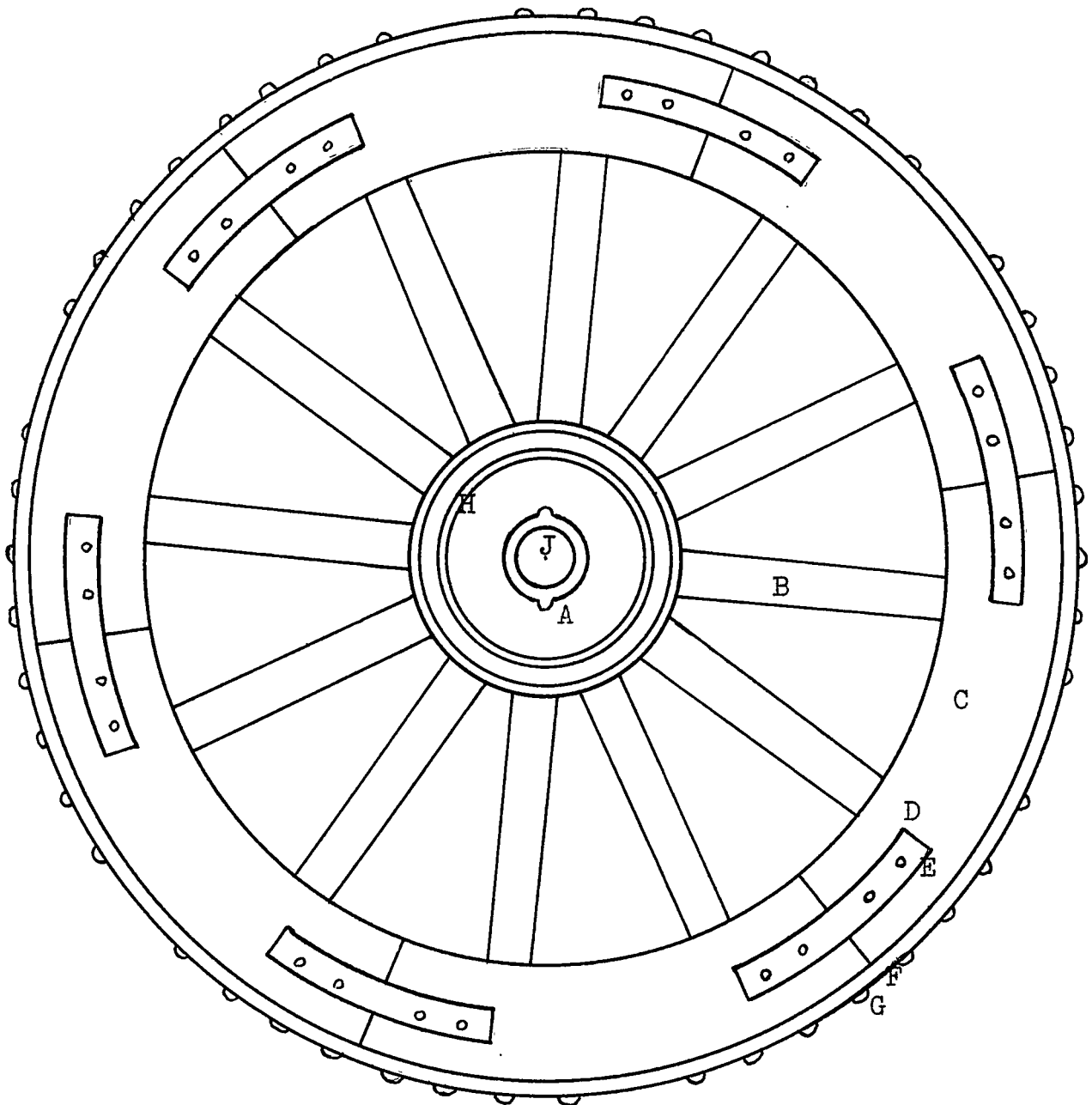


Fig. No. 1
Gun Carriage Wheel
See Tables 3 and 4, page 13

CONSTRUCTION OF A TRAVELLING CARRIAGE²⁸

(See Figure No. 2)

Below is a description of the method for laying out the plan of a travelling carriage, based on the tables of dimensions already cited in this report for 24, 12, 6 and 3-pounder cannon. This material is given as an aid to conversion of the existing carriage plans from field to travelling carriage dimensions.

On fig. 2, A b c d is the outline of the plank from which the cheek is to be cut. A B is the height of the cheek on its leading edge. Line B C is formed by adding the height of A B to the distance from the rear of the trunion of the piece to be mounted to the extremity of its cascable and carrying this sum from B to the point C where the edge of the plank is intersected.

From A as a center, draw an arc C D, using A C as radius, and make the given height of the cheek at the center serve as a chord on the arc. Line A D is then drawn. On line B C take B E, equal to A B, and set off E r and r S, each equal to half the diameter of the trunnions of the piece to be mounted. E S is then the width of the trunnion hole, the center of which is about a quarter of an inch below the line B C. From point r draw r F perpendicular to A D and on line A D set off line F H, which is equal to the breadth of the axle-tree to be set about one inch into the cheeks. On the side F H form a square and join the opposing corners of the square with diagonals. The point I where the diagonals intersect is the center of the axle. Using this center draw an arc with a radius of 29 inches, the radius of a travelling carriage wheel, to

represent the outer rim of the wheel. Draw a line from K on the wheel are, extending it to cut the cheek plank at two points M L, so as to make the line M L equal to the length of the trail as given in the dimension tables, for the various caliber guns. From line K M erect two perpendiculars, M N and L O, each equal to the given height of the trail. By drawing the lines C N, N O and D M, the figure of the cheek will be made.

The trail part M P is rounded. This is determined by dividing L O into four equal parts, L P being one of these parts. Draw line M P. At points M and P erect two perpendiculars, one on line D M, the other on line M P, and extend them to intersect at point Q. Take R, bisecting line M Q, as the center of an arc M P and draw the trail curve.

The mortise V of the center transom is determined by drawing a line through point C perpendicular to line K M. On this perpendicular, the segment C p is equal to one fourth of the shot diameter of the piece to be mounted,* and p q, the height of the center transom, is two diameters. Line p Z, the elevation of the bed transom is parallel to line K M. The breadth of the center transom, p x, is equal to one diameter of the shot.

The distance between the center transom and bed transom (x) is two diameters. The bed transom is a diameter square. The breast transom (Y) is a diameter broad and two diameters in height, with its sides parallel to the head A B and its top even with the bottom of the trunnion hole, and its rear edge beneath point S. The mortise of the trail transom is equal in length to the trail. It is one diameter high

*See table no. 5 for shot diameters.

and is parallel to the upper side N O, with the lower side touching at point P.

All the mortises are divided into two equal parts by horizontal lines; the upper part is sunk half an inch into the cheek; the two middle parts are recessed two thirds of the width of the cheek. The lower part is not recessed. Muller notes that the purpose of this method of recessing the transoms prevents moisture from penetrating the joints.

CONSTRUCTION OF A TRAVELLING CARRIAGE²⁹

(See Figure No. 3)

Draw the indefinite line A B, and on it locate the points C and D, the distance between these points being the distance from the center of the trunnions of the piece to be mounted to the rear edge of its base ring. Through C and D draw E F and K L at right angles to A B. D K and D L each equal to the radius of the base ring, and C E and C F equal to the radius of the second reinforce ring. The lines drawn through the points F L and E K determine the inside width of the carriage. Lines drawn parallel to F L and E K at a distance equal to the length of the trunnions determine the width of the cheeks Q P and R S.

On both sides of points E and F set off half the diameter of the trunnion to get the dimensions of the trunnion holes, m n. Draw the breast transom Y one diameter broad, with its rear edge in line with the fore edge of the trunnion holes. When the line C A is taken equal to line r B in the preceding figure no. 2, the line R Q at right angles to A B will determine the breast of the carriage.

Setting off on the line K L two diameters for the length of the cascable will locate the rear of the center transom, which is one diameter wide, as is the bed transom, X. The trail transom T is determined as in the preceding figure by the length of the trail. The pintle hole, oval in shape, is located in the center of the trail transom.

The bed, w, is a board one and one-half inches thick and a foot wide which is recessed into the bed and center transoms. The width of the axle-trees in various calibers has already been cited in the tables of dimension. Its fore part crosses the carriage cheeks on a line through the center of the trunnion holes.

Between the trail and center the cheeks are recessed about one-sixth of the width of the cheeks, beginning approximately one diameter from the trail and ending a diameter and a half from the center transom.

GENERAL DIMENSIONS FOR TRAVELLING GUN CARRIAGES

(see figure No. 2)

In order to compute the dimensions for carriages not described in the foregoing tables, the following instructions are given by Muller for estimating dimensions based on the diameter of the shot in the various calibers. The instructions are to be used in conjunction with figure No. 2.

"The length A d of the plank is 12 diameters of the shot and 7.5 feet besides; its height A b three diameters and three quarters; the height A B of the cheeks three diameters and a quarter; so that B b is half a diameter, the height D C at the center 70 parts of that diameter, divided into 24 equal parts....; the length of the trail is three diameters, and its height M N two; the breadth F H of the axle-tree is two diameters, and the rest of the dimensions depend on the size of the gun."³⁰

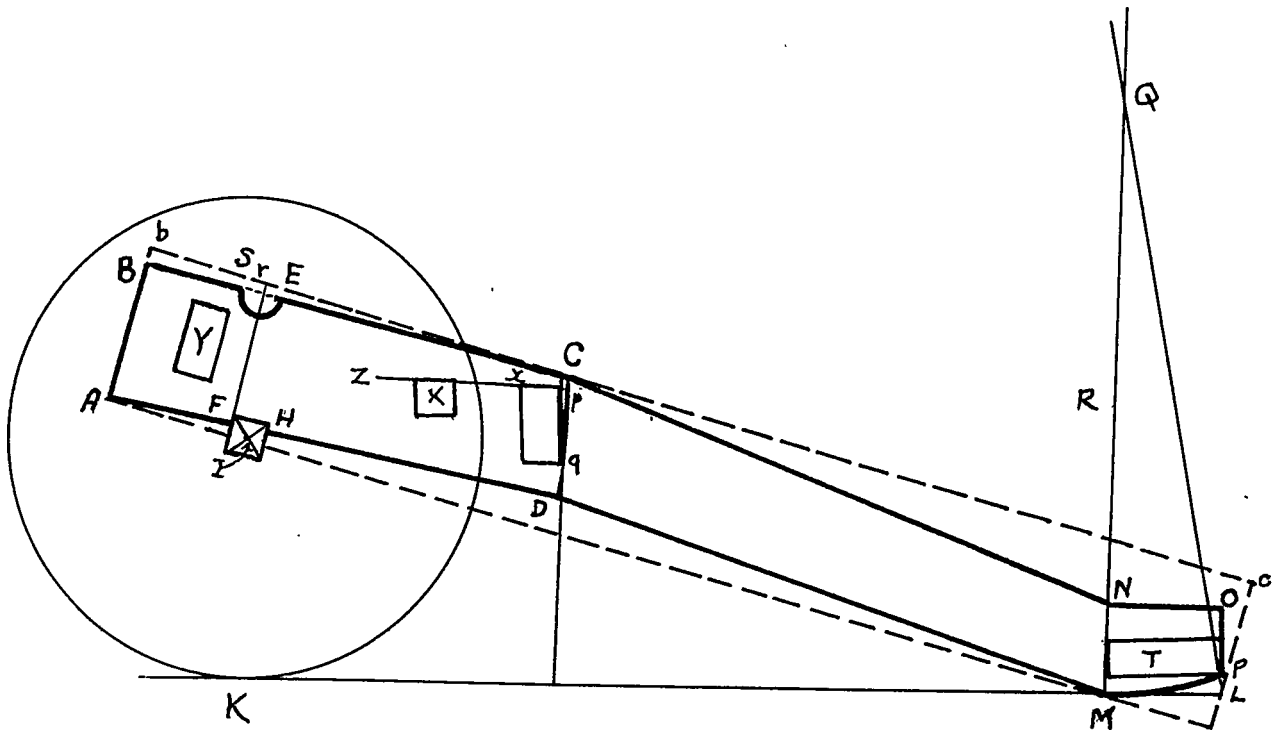


Fig. No. 2
Construction of a Travelling Carriage
See Page 14

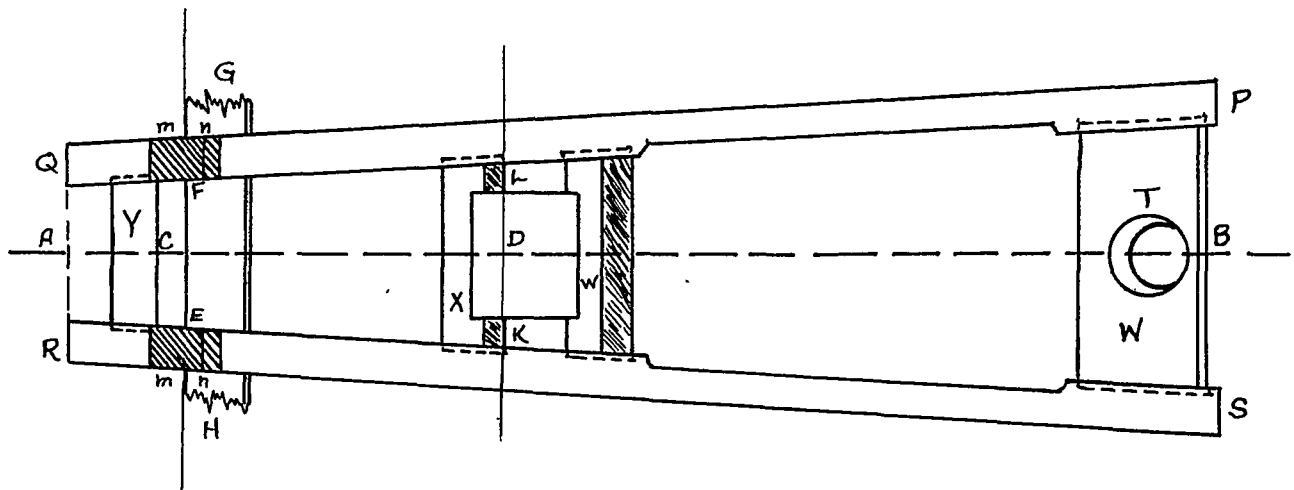


Fig. No. 3
Construction of a Travelling Carriage
See Page 16

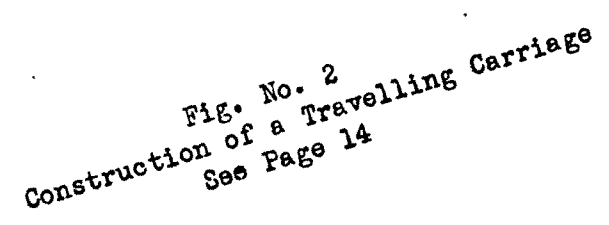


Fig. No. 2
Construction of a Travelling Carriage
See Page 14

To make use of the above instructions for determining the dimensions of gun carriage cheeks in various calibers, it is necessary to know the diameter of the shot. The following table, adapted from Muller, gives shot diameters from one to thirty-two pounds.³¹

(Table No. 5)

<u>Caliber of Gun</u>	<u>Diameter of Shot</u>
One Pounder	1.923 inches
Three Pounder	2.775 "
Four Pounder	3.053 "
Six Pounder	3.498 "
Eight Pounder	3.846 "
Nine Pounder	4.00 "
Twelve Pounder	4.403 "
Eighteen Pounder	5.040 "
Twenty-Four Pounder	5.547 "
Thirty-Two Pounder	6.105 "

IRON WORK FOR TRAVELLING CARRIAGES³²

(See Figure No. 4)

Listed below are iron parts to be included in construction of travelling gun carriages. For ready reference and comparison the numbers of these parts listed below and on figure No. 4 are identical to those shown but not identified, on carriage pattern NM-Col. 6076 which shows iron work in its relation to the wooden portions of the carriages.

(Table No. 6)

<u>Part Number</u>	<u>Part Name</u>	<u>Number per carriage</u>
1.	Trunnion Plate	2
2.	Cap Square	2
3.	Eye Bolt (fore)	2
4.	Eye Bolt (hind)	2
5.	Cap Square Joint Bolt	2
6.	Garnish Bolt	2
7.	Breast Transom Plate with Hook	2
8.	Center " " " "	2
9.	Trail " " " "	2
11.	Trail Plate with Rosette	2
12.	Side Strap (trail)	2
13.	Side Strap	2
14.	Breast, Bed, Center, Trail Transom Bolt	5
15.	Lashing Ring	2
16.	Maneuvering Ring	2
26.	Axle-tree Band	2

There is little variation in the sizes of iron work on travelling and field carriages. A few exceptions are cited in Muller's following discussion of field carriages. Sizes of iron work shown on the Colonial NHP plans are adaptable to all carriages.

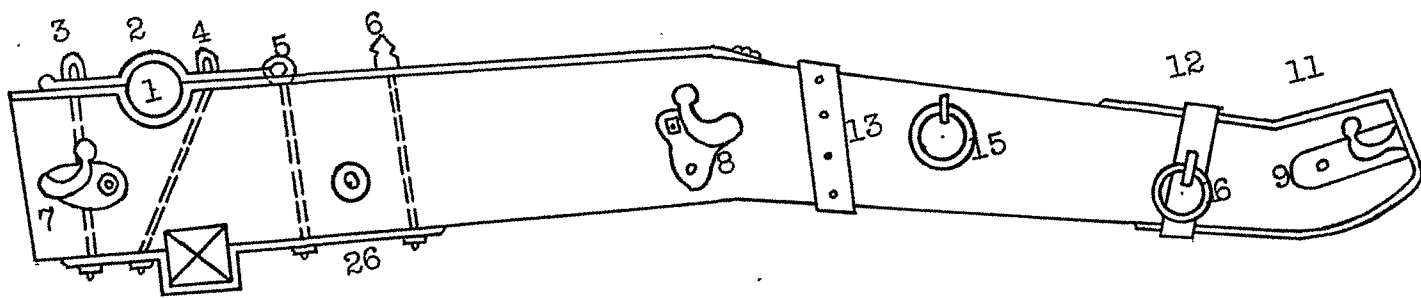


Fig. No. 4
Iron Work
See Page 18-Table No. 6, page 19

CONSTRUCTION OF FIELD CARRIAGES³³

It has been noted earlier in this report that, according to Lieutenant Hadden of Burgoyne's artillery, British guns used in the Saratoga campaign were mounted on "Travelling Carriages". Dimensions for this type of gun carriage have been cited above. The cannon carriage plans procured from Colonial National Historical Park are designed on the dimensions of field carriages rather than travelling carriages. The distinction between travelling and field carriages is primarily in regard to weight, size and wheel dimension, rather than details of construction. As Muller points out "As field pieces are shorter and much lighter than those above [guns of heavier caliber, mounted on travelling carriages], their carriages likewise observe the same proportion. They have the same form, but their wheels are only four feet two inches high...."

The cannon carriage plans already available, based on field carriage dimensions, can be converted to use for construction of travelling carriages by use of the tables of dimensions and construction plans previously cited from Muller's Treatise. For purposes of comparison, dimensions for field carriages are given below.

DIMENSIONS OF FIELD CARRIAGES⁵⁴

(Table No. 7)

Caliber of Guns		24	12	6
Length		108	106	94
Height	of the Plank*	15.6	14	12.4
Width		4.5	3.7	3
Cheeks, Height Before†		14.5	12.7	11
Height at	center	12	10.9	9.8
	trail	10	9.2	8.4
Length of the Trail		11	10.5	10
From Head to Center		50	45	40
Width Within‡	before	11.5	10.7	10
	behind	17	15	13

*Plank from which the cheeks are cut - see fig. 2

†Height of cheek on leading edge, line A B on fig. 2

‡Between cheeks at head and trail

DIMENSIONS OF FIELD CARRIAGE WHEELS³⁵

(Table No. 8)

Caliber of Gun		24	12	6
Wheels, height /diameter/		50	50	50
Length of Nave		15	13	12.7
Diameter of Nave	body	13	11	10.6
	middle	14	12	11.6
	linch	12	11	11
Fellows	height	4.7	4	3.6
	width	3.3	2.8	2.4
Spokes	width	2	1.8	1.7
	breadth	3.5	3.2	2.9

DIMENSIONS OF FIELD CARRIAGE AXLE-TREES³⁶

(Table No. 9)

Caliber of Gun		24	12	6
Length of Axle-tree		68	72	76
Body	length	39	40	42
	width	6	5.5	5
	height	8	7	6
Length of Arms		18	16	15.7
Diameter	body	6	5.5	5
	linch	4	3	3.5

VARIATIONS IN FIELD AND TRAVELLING CARRIAGES

In the construction of travelling and field carriages, there are several variations of detail which should be noted. There is no bed transom, X fig. 3, on the lighter field carriages, as an elevating screw is used to raise and lower the piece, rather than a wedge as employed with the heavier guns mounted on travelling carriages. Accordingly, Muller points out that the center transom is two diameters of the shot broad and one diameter thick. This center transom is placed in the middle of the height of the cheeks at the center. The neck of the gun's cascable meets the middle of the breadth of the transom, where the elevating screw is located.³⁷

Muller also notes that an ammunition locker or box two feet long is fixed to each side of the carriage. The upper surface of this box is level with, or not more than an inch above, the upper part of the axle-tree, extending from that point toward the trail. Depth of this locker is equal to the height of the axle-tree. Muller wrote:

"These lockers serve to hold shot upon a march, and are covered each by another box that slides on, and is fastened to be ready for firing at any time, without having recourse to the ammunition carts."³⁸

In regard to the iron work of the field carriages, the writer also stated;

"The iron work of these carriages is nearly the same as in the former travelling carriages only not so strong; and there is but one garnish bolt, which supports the fore part of the locker; and no garnish nail,....The eye bolt next to the joint bolt passes through the axle-tree band behind, and not before as in other carriages i.e. travelling carriages; the fore part of this band is only fastened by the fore eye bolt.

We have marked but one transom bolt at the center and one at the trail, though they make two at present in each of these places, which is superfluous....The draught hooks are placed to the breast transom plates, instead of fixing them to the axle-tree, as practical; because the horses draw with more strength when the hooks are nearly breast high. Lastly, instead of making the hooks to the trail transom plates, there are substituted nails about four inches long, which we imagine are much more convenient than the former. The washers have also hooks, to which are fastened the ropes by which the gunners draw the gun along."39

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June 5, 1963

APPENDIX⁴⁰

GLOSSARY OF TERMS APPLICABLE TO CONSTRUCTION OF 18TH
CENTURY CANNON CARRIAGES

CAPSQUARE - a jointed iron strap secured to the side pieces of a gun carriage which passes over the trunnions of the gun to fasten the gun in the trunnion holes. See part No. 2, fig. No. 4.

DOWLEDGES - Iron plates set into the inside surface of the fellows of a wheel over the joints of the fellows. Dowledges are fastened to the fellows with four iron pins, rivetted on the outside surface of the fellows. See part D, fig. No. 1.

DOWL PINS - Wooden pins, three inches long and one inch in diameter, in the middle of the joints of the fellows of a wheel to fasten them together.

DRAUGHT HOOKS - Iron hooks fastened on the outside of travelling carriage cheeks by means of staples rivetted on the inside of the cheeks.

DRAUGHT RINGS - Iron rings fixed to the side straps of a travelling gun carriage by staples rivetted on the inside. See part No. 16, fig. No. 4.

EYE BOLTS - Ring bolts passing through the capsquare plate. Iron keys passed through the eye bolts secure the capsquare plate firmly over the top of the trunnions of the mounted gun. See parts No. 3 and 4, fig. No. 4.

FELLOWS - The wooden sections of a wheel which form its circumference. Fellows are usually made of dry elm and there are six to a wheel. See part C, fig. No. 1.

FORE-LOCK KEY - A flat wedge-shaped iron piece which passes through the eye-bolts to fasten the capsquare firmly over the trunnions of the gun. The key is secured to the cheeks by a chain.

LINCH-PIN - An iron pin, approximately 5-3/4 inches long and 5/8 inches in diameter. It passes through the ends of the arms of an axle-tree to hold the wheels in place on the axle.

LINCH-CLOUT - A flat iron plate under the ends of the arms of an axle-tree to strengthen them, and to reduce the friction of the wheels against the axle.

NAILS - TYPES USED IN 18TH CENTURY CANNON CARRIAGES

1. GARNISH NAILS - In travelling carriages these have pointed, diamond-shaped heads and a narrow neck. They serve to fasten the plates to carriage cheeks from the end of the trunnion plates to five or six inches beyond the center of the carriage.
2. DIAMOND-HEADED - Small iron nails with flat diamond-shaped heads. These serve to fasten the head and trail plates on travelling carriages, in addition to the Garnish nails.
3. ROSE-BUDS - Small round headed nails driven into the center of the rosettes on the cheek plates.
4. COUNTER-SUNK - Nails with flat, round heads sunk into the cheek plates level with their surfaces.
5. STREAK-NAILS - Nails or spikes which fasten the streaks, or iron wheel rims to the fellows.
6. BOX-PINS - Small headless nails used to fix the nave boxes to the nave of a wheel.
7. STUBS - Nails driven on the outside of the nave hoops to fasten them to the nave.
8. FLAT-HEADED - Nails used to fasten the ammunition locker and all hinges of the carriage.
9. DOG NAILS - Nails with flat rounded heads and with a rounded shank next to the head.

NAVE - The part of a wheel in which the arms of the axle-tree move. The spokes are driven into it and supported by the nave. See part A, Fig. No. 1.

NAVE HOOPS - Flat iron rings or washers which bind the nave. There are generally three to each nave. See part H, fig. No. 1.

NAVE BOXES - Cast iron caps over each end of the axle arms. They serve to reduce the friction of the axle-tree against the nave.

PINTLE PLATES - Oval iron plates above and below the pintle hole in the trail transom of the carriage. These plates are nailed to the transom with diamond-headed nails.

SIDE STRAPS - In field or travelling carriages these are flat iron bands which go around the cheeks to strengthen them near the center tail where the wood is cut across the grain.

STREAKS - The iron bands or rims around the circumference of a wheel.

TRANSOMS - The cross pieces of a carriage which join the two cheeks. There are four in travelling carriages; at the trail, the center, the bed and the breast. See fig. No. 3.

TRANSON-PLATES - Iron plates, with hooks, fastened on the outside of the cheeks on each side, where the transoms are mortised into the cheeks. See parts 7, 8 and 9 on Fig. No. 4.

TRUNNION PLATES - Two iron plates in travelling carriages which cover the upper edges of the cheeks and go under the trunnion of the gun, between the trunnions and the trunnion holes.

WASHER - A flat, circular ring on the axle-tree, set between the linch-pin and the small end of the nave to prevent the rubbing of the nave against the linch pin. It also serves to reduce the friction of the nave.

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