

MANUAL FOR THE  
INSTRUCTION OF  
CIVIL WAR  
PIONEER TROOPS



DUTIES, ORGANIZATION & EQUIPMENT  
OF INFANTRY PIONEERS

COMPILED FOR LIVING HISTORIANS,  
REENACTORS, AND EDUCATORS

BY

JAMES LANCEL MCELHINNEY

*"It is, however, of importance, when an army is moving, that pioneers and sappers accompany the advanced guard, to increase the number of practicable roads, to remove obstructions, throw small bridges across creeks, &c, if necessary, and secure the means of easy communication between the different corps of the army"*

Baron de Jomini

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## FOREWORD

My interest in Living History and reenacting has always focused on military engineering, partly because of my interest in the subject and partly because of how it informs my work as an artist: conducting surveys, making maps, and participating in the movement of men portraying Civil War soldiers at reenactments. Striving to achieve a useful level of authenticity, my research has led to some interesting information regarding the role, organization and equipage of the "pioneers". The following is a brief collection of data on the subject for use by reenactors interested in the role of pioneers and "acting engineer" infantry troops, 1861-1865.

James Lancel McElhinney,  
Valatie, New York, 2004

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PART ONE

HISTORY, ORGANIZATION,  
TOOLS, AND EQUIPMENT OF  
U. S. ARMY ENGINEERS  
AND PIONEER SOLDIERS  
IN THE AMERICAN  
CIVIL WAR OF 1861-1865

## **1. MILITARY ENGINEERING**

*"How now, Captain Macmorris? Have you quit the mines? Have the pioners given o'er?" (1)*

The Art of War embraces a variety of disciplines including Strategy, Tactics, Intelligence, Transportation and Engineering. Since antiquity, large armies have organized a portion of their forces to include men skilled in trades and professions that are useful in the successful accomplishment of construction and demolition tasks. These men are sometimes referred to as "sappers and miners", "pontoniers" and "pioneers", but all may be generally described as "engineers". Their duties included road and bridge-construction, fortification, mining and general construction, in camp, on the march and under fire, in the field. The purpose of these operations is the same as for all other branches of service, which is the defeat of the enemy. Building or improving roads and bridges speeds transportation that delivers mortal force to the enemy's front. Fortification and siege-works provide cover for an attacking force, while bringing it as near as possible to its target. Where the enemy is strongly entrenched, a direct assault by infantry may fail without the support of mining and demolition, or the construction of parallel saps to conduct an attacking force to a place from which the enemy's works can be taken by storm. Working under the covering fire of skirmishers, engineers remove or destroy obstacles from the path of the army's advance. Engineers contribute to military intelligence by means of reconnaissance, topographical surveys and producing maps required for strategic planning and tactical operations.

## **2. ORGANIZATION OF THE U. S. ARMY ENGINEERS, 1861-1865**

*"ARTICLE 63. The function of the engineers being generally confined to the most elevated branch of military science,*

*they are not to assume, nor are they subject to be ordered on any duty beyond the line of their immediate profession, except by the special order of the President of the United States; but they are to receive every mark of respect to which their rank in the army may entitle them respectively, and are liable to be transferred, at the discretion of the President, from one corps to another, regard being paid to rank."*

--The Articles of War, U.S. Army Regulations, 1861

Prior to the Civil war, the U.S. Army divided its engineering resources into two organizations; the Topographical Engineers, or "Topogs", and the Corps of Engineers, also known as "Sappers and Miners". Patterned after the French model, military engineering in the United States forces followed the teachings of Vauban and his followers under the leadership of French-trained officers like du Portail, Koszciusko and Bernard. In the post-Revolutionary War army, artillery and engineers were subject to the same chain of command. An independent branch of service—the engineers—was separated from the artillery at the same time that the U.S. Military Academy at West Point was established to provide proper military training and engineering skills to the officer corps.

The outbreak of sectional hostilities in 1861 required a growing army to organize more engineer support than could be provided by a few companies of regulars. Creating this added support occurred when number of volunteer engineer units were raised from New York, Michigan, Kentucky and Missouri. Where military operations could not benefit from these organizations, a regiment might be assigned to service as "acting engineers" or "pioneers". Loyal civilians -- often freed slaves --were taken into service and placed under the command of a qualified officer. At times when no officer or non-commissioned officer could be found with the necessary skills, supervision of the pioneers might go to a

civilian. Engineer regiments and companies attached to Army command were exempt from duties other than that of their "immediate profession".

They carried arms for their own protection, but were not expected to serve as line troops.\* Engineer regiments might be assigned to support Army operations, but their official orders came from departmental command behind the lines. The time required to process paperwork and approve orders often delayed the usefulness of engineers in situations requiring a rapid response. A solution to this administrative problem was found when Army of the Cumberland commander William S. Rosecrans assigned his chief engineer, Captain James St.Clair Morton, to organize a brigade of pioneers — infantrymen whose civilian professions suited them to perform engineer tasks, drawn from the ranks and organized into companies led by similarly skilled officers. Perhaps out of deference to brigade commander Morton's regular rank of Captain, the brigade's company officers were all lieutenants. Morton was later promoted to Brigadier General of Volunteers, but after a falling out with Rosecrans in 1863, he resigned his general's commission and was promoted to the regular rank of Major, in a post at the Engineer Bureau in Washington City, under Chief Engineer General John Barnard. Requesting a field assignment, the energetic Morton was assigned chief engineer, IX Army Corps. He was killed in action on June 17, 1864 at the head of IX Corps assault against Confederate trenches at Petersburg. Morton's creation, the Pioneer Brigade was designated the "Engineer Brigade" during the last year of the war, serving with distinction. In his memoir, General Hazen complained that while the Pioneer Brigade provided a useful service to the army, its existence caused morale to suffer. The best and brightest men in the ranks tended to be those selected as "extra duty" men, depriving their home units of their personal example.

### **3. DEFINING PIONEERS\***

*"Pioneers are soldiers selected from every regiment for mending the ways, removing obstacles, working on entrenchments and fortifications and for making mines and approaches."\**

--Beadle's Military Handbook, 1861

The term "pioneer" denotes one who goes before the rest, blazing trails and making way for others who follow. In military parlance, the word has long described soldiers engaged in road and bridge construction. A military "pioneer" is nothing more or less than any person in military service, whether or not they are enlisted, commissioned, or a civilian performing the tasks of a military engineer. Most pioneers were infantrymen serving in this capacity. The role of a pioneer soldier is that of an engineer soldier, except that pioneers are subject to the direct orders of field command, and their officers are not subject to the Articles of War, no. 63; Article XLVI, section 1357; Revised Regulations for the Army, 1861; or Article II, section 10 in the 1863 Regulations. Engineer supplement, Art. XLVI. Each corps provided a battalion of pioneers. These were divided into ten or twelve companies of eighty or one hundred men, based on the strength of those brigades from which they were drawn. The senior ranking lieutenant served as Lieutenant Colonel commanding the battalion, the next ranking lieutenant as Major, and the ranking lieutenant in each company served as Captain of that company. This model applied to non-commissioned officers. The ranking Sergeant served as Sergeant Major, etc. Unlike the Volunteer and Regular Engineer organizations, the Pioneers were directly subject to infantry command. When a company of pioneers was attached to a brigade, corps, division or army, its place in formations was adjoining and immediately following the skirmishers, in advance of the main force. They assumed

the same place in the advance of division, corps and army formations. Engineers, on the other hand, were placed at the center of a formation, with the artillery. It is an important distinction. As the war dragged on and attrition depleted the ranks of many a regiment, the mode of assigning and deploying pioneers changed, reflecting changes in unit strength and integrity. Methods differed between eastern and western commands, even after eastern commands had been given over to western commanders in 1864. Some of those differences are detailed in the following General Orders.

#### **4. ARMY OF THE CUMBERLAND PIONEERS**

*“General Orders Number 3*

*Headquarters XIV Army Corps, Department of the Cumberland, Bowling Green, November 3, 1862; (excerpt; emphasis added)*

*There will be detailed immediately, from each company of every regiment of infantry in this army, two men, who shall be organized as a pioneer or engineer corps attached to its regiment. Twenty men will be selected with great care, half laborers, half mechanics. The most intelligent and energetic lieutenant in the regiment, with the best knowledge of civil engineering, will be detailed to command, assisted by two non-commissioned officers. This officer shall be responsible for all equipage, and shall receipt accordingly.*

*Under certain circumstances, it may be necessary to mass this force: when orders are given for such a movement, they must be promptly obeyed...*

*The wagons attached to the corps shall carry all the tools and the men's camp-equipage. The men shall carry their arms, ammunition, and clothing.*

*Division Quartermasters will immediately make requisitions of chief quartermasters for the equipment, and shall issue to regimental quartermasters on proper requisition.*

*Equipage for Twenty Men--Estimate for a Regiment*

*Six Felling-axes*

*Six Hatchets*

*Two Cross-cut Saws*  
*Two Cross-cut Files*  
*Two Hand-Saws*  
*Four Hand-saw Files*  
*Six Spades*  
*Two Shovels*  
*Three Picks*  
*Six Hammers*  
*Two Half-Inch Augers*  
*Two Inch Augers*  
*Twenty lbs. Nails, assorted*  
*Forty lbs. Spikes, assorted*  
*One coil rope*  
*One wagon, with four horses or mules*  
*It is hoped that all regimental commanders will see the obvious utility of this order, and do all in their power to render it as efficient as possible.*  
*By command of Major-General Rosecrans.*  
*Arthur C. Ducat, Lieutenant Colonel and acting Chief of Staff*  
*Official:-----"-----A.A.A.G."*  
*--The Official Records, etc.*

## **5. ARMY OF THE POTOMAC PIONEERS**

On April 5, 1864, General Order # 15 called for a pioneer corps to be drawn from the ranks, based on the Army of the Cumberland model, with a few changes. Instead of two men per company, one man in fifty was drawn from the brigade's ranks based on his skill, energy and experience — a shift in method reflecting the attrition witnessed by many regiments in the Army of the Potomac. This reflects a tremendous concern for the mobility and celerity of engineering resources, despite the Army of the Potomac's being served by a brigade of engineers. As with the Army of the Cumberland, the pioneers traveled in advance of each brigade, division and corps. Instead of using wagons, tools were carried by panniered mules —

further evidence of the grim urgency that attended their duties.

*“GENERAL ORDERS NO. 15, Headquarters, Army of the Potomac, April 5, 1864*

*Excerpt:*

*"II. The following is established as the organization and equipment of the pioneer parties of this army:*

*First. The unit of organization will be by brigade. In each brigade 1 man shall be selected for every 50 men equipped for duty in it; for every ten men thus selected a corporal shall be detailed, and for every 20 a sergeant, and for each brigade 1 lieutenant.*

*For each division a first lieutenant of the old date or a captain shall be detailed to command the pioneers of the division, who will be a member of the division staff, and be furnished with a horse and equipments by the quartermaster's department.*

*The pioneers will be armed as they were in their regiments, and men and officers will be especially selected for fitness for the duty.*

*They will be excused from all guard and picket-duty and from ordinary fatigue details. The tools will be furnished in the following proportions, viz, five-tenths axes, three-tenths shovels, two-tenths picks and be carried on pack-mules during the march, each mule carrying the tools for 40 pioneers.*

*The quartermaster's department will provide the necessary mules and appropriate panniers for this service.*

*Brigade and division commanders are directed to give special attention to the prompt formation and equipment of their pioneer parties.*

*In camp, the pioneer parties will make the ordinary repairs to roads, bridges, &c. On the march, they will move at the head of the infantry column and promptly put in order all parts of the route where artillery and wagons have to pass, whether for their own command or for troops to follow.*

*Second. Corps commanders will cause 1 non-commissioned officer and 25 efficient men to be selected and placed under the chief quartermaster of the corps to serve as a mounted pioneer party to accompany the trains, and to be provided with 10 axes, 10 spades, and 5 picks. The horses and equipments for the pioneers for the trains will be furnished by the quartermaster's department.*

*By command of Major-General Meade:  
S. Williams, Assistant Adjutant General"*

--The Official records, etc.

## **6. IX ARMY CORPS ENGINEERS**

Until May 1864, IX Army Corps (AC) was a nominally independent organization under Ambrose Burnside's command. It possessed its own "acting engineer" forces, and would continue using these infantry regiments as a rotating engineer corps after IX Corps was placed under Meade's command in May, 1864. While IX AC was subject to G.O. no.15, Burnside, perhaps with Morton's encouragement, appears to have ignored it in practice. The following infantry regiments were assigned to engineer duty:

**35th Massachusetts Infantry**, assigned "Acting engineer troops" for the Overland Campaign, 1864

**48th Pennsylvania Infantry**, Mining beneath Elliot's Salient, July 1864.

**17th Michigan Infantry**, Construction of fortifications before Petersburg; June 1864-March 1865

## **7. SUMMARY**

Pioneers in the Federal Army were, with slight variations, drawn from the ranks of battalions in the ratio of:

**1861:**One man per (100 man) company for a regiment (Scott, Cooper, Viele)

**1862:**Two men per (100 man) company for a regiment; one brigade per army (Rosecrans and Morton)

**1864-65:**One man in fifty (Meade)

Variations include Burnside's IX Corps, and Sherman's army, where regiments served as engineer troops on a rotating basis. The use of pioneers increased as the war continued, requiring army commanders to invent new systems of providing pioneer support to operations in the field, differing from methods described in Scott's and Cooper's manuals, and anticipating changes that would appear in Upton's 1868 manual.

## 8. PIONEER INSIGNIA

1863 Army Revised Regulations, article LI, section 1585: *"Chevrons...For a Pioneer--two crossed hatchets of cloth, same color and material as the edging of the collar, to be sewed on each arm above the elbow in the place indicated for a chevron (those of a corporal to be just above and resting on the chevron), the head of the hatchet upward, its edge outward, of the following dimensions, viz: Handle--four and one-half inches long, one-fourth to one-third of an inch wide. Hatchet--two inches long, one inch wide at the edge."*



The specific contours of this insignia were not standard, and many variations are to be found. One interesting example is a metallic insignia (pp20) at Snake Creek Gap, near Resaca, Georgia. Illustrated in Civil War Relics of the Western Campaigns, by Charles S. Harris, page 212.

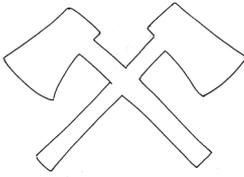
The two crossed hatchets are not identical; one of common pattern, the other resembling a shingle hatchet. It is uncertain how this was worn, but eyelets suggest that it was sewn to cloth, perhaps as a cap insignia.



*“Fatigue” 1865 Q.M.  
Manual; note the “doe foot”  
axe handle design*

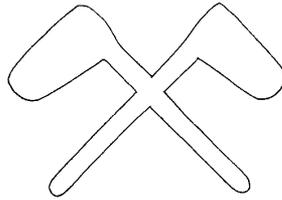
In the 1866 Quartermaster Report, the "Fatigue" uniform illustrated includes an 1858 forage cap with a yellow metal insignia that could portray crossed hatchets worn just above the visor.

Pioneer chevrons were required by regulation to be the same as the branch of service, but in the case of the Army of the Cumberland, infantry pioneers wore the device in yellow — the branch of service color designating engineers — and not blue, the branch of service color for infantry. Another color variant is the piping for engineer officer trousers. According to regulation they should be fashioned of gold bullion, for staff corps. New York State regulations specify buff piping for engineer officers but makes no mention of pioneer chevrons.



*Standard pioneer chevron pattern*  
*H: 3.5 inches;*  
*W: 5 Inches*

*Variant pioneer chevron pattern*  
*H:3.2 inches;*  
*W: 4.75 inches*



## **9. EQUIPAGE**

While tools were carried mostly in wagons, when pioneer troops faced tasks that were out of range of the wagon-train, they could and did carry tools slung on their backs. In his history of the Fifth Massachusetts Volunteer Infantry Regiment, Alfred S. Roe recalls members of the Tenth Connecticut at the battle of Whitehall, North Carolina on December 16, 1862

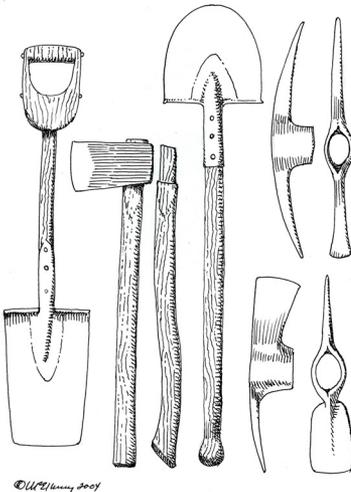
*..."with characteristic Yankee industry, anxious for something to do, four of their pioneers swam the river, its waters being ice cold, having their axes strapped upon their backs, and commenced felling trees into the stream"*

The Tenth Connecticut was one of those regiments that had its own pioneer contingent--men chosen from the ranks based on their ingenuity, energy and skill. It is entirely likely that their pioneers carried tools in army

contract-pattern slings. General J.G. Foster, who replaced Burnside as commander of the Department of North Carolina, led the expedition to Goldsboro that was engaged at Whitehall. Himself an engineer, Foster added to his column a force of contrabands serving as "pioneers". His official report of the expedition, Series I., vol 18, Chapter XXX, pages 54-59, gives:

*"much credit to Mr. H.W. Wilson, engineer, who, in charge of the pioneers and a force of contrabands, did most excellent service in building bridges, repairing roads, &c."*

None of the other reports, such as that of Colonel Leggett of the Tenth Connecticut, mentions the pioneers, except in reference to Wilson's presumably civilian force. Foster's language is ambiguous enough to suggest that it might have included military personnel. If so, their role was probably to supervise contraband laborers.



*Typical pioneer tools:  
l-r; spade; felling axe;  
doe-foot axe handle;  
common shovel; top:  
pickaxe; bottom: axe  
mattock*

## 10. PIONEER TOOLS

The US Army Quartermaster Reports describe tools recommended for use by the Army. Hand tools carried by military pioneers were no different than one would find on any farm or construction site. Tool patterns have changed little, but fabrication methods have changed drastically. Hand-forged axes will show evidence of hammer-welding and folding the metal to shape. Cast axe-heads will not, but surface porosity can betray a cast item. Selecting tools for reenacting purposes can best be directed by consulting Civil War period QM Reports and buying tools according to specification guidelines, given below.

### 1865 Quartermaster Specifications:

#### **Pick-Axes**

*“Pick-axes—to be of two sizes, 23 and 25 inches long, made of the best American iron and steel, the eye at the center, to be 2  $\frac{3}{4}$  inches by one and seven eighths inches outside, and inside 2  $\frac{1}{2}$  by one and five eighths inches in the clear; blade of the hoe end one and five eighths inches wide, and the pick end a square point; each end to be steeled 4 inches and polished bright, without lacquer or paint; to weigh 6  $\frac{1}{4}$  to 6  $\frac{1}{2}$  pounds”*

#### **Felling Axes**

*“Felling axes to be of three sizes, and to be made of the best American iron and steel; blade to be well steeled to the edge; for medium sized axe, length of blade 7  $\frac{3}{4}$  inches; width of pole (poll) 3 and seven sixteenths inches; thickness of pole, seven eighths of an inch; width on the edge, 4  $\frac{3}{4}$  to 5 inches; of eye 2  $\frac{3}{4}$  by  $\frac{3}{4}$  inches, oval in shape. The other sizes to correspond proportionally and with the above specifications, and to all average in weight 56 pounds to the dozen”.*

### **Hatchets**

*“To be of the best American iron and steel, well steeled at the edge; five and one eighth inches long; pole one and seven eighths inches long by five eighths of an inch in thickness; eye oval, 1 ½ by three eighths of an inch in size; blade 2 ¾ inches on the edge; weight 18 ounces*

### **Axe Handles**

*“To be made of good, seasoned hickory wood, 34 to 36 inches long, and free of knots or shakes”*

### **Spades**

*“Three sizes, Nos. 1, 2 and 3, made of the best American or Swedish bar iron, pointed with steel 5 inches deep from the cutting edge. No 2, plain back, medium size, length of blade 11 ¾ inches; width at top seven and an eighth inches; width of edge six and seven eighths inches; thickness of blade at top, No. 14 wire gauge; at edge and middle, No. 10 wire gauge; handle of ash wood, 2 feet 5 ½ inches long, secured at top, “D” with 2 iron rivets, and in the socket of the blade with 3 iron rivets. Weight, 3 ¾ to 4 ½ pounds.*

### **Shovels**

*Three sizes, 1 , 2 and 3; made of the best American or Swedish bar iron pointed with steel 5 inches deep from the cutting edge. No. 2, medium size, plain back, with “D” handle; blade 11 ½ inches long; 9 ½ inches wide at the bottom, eight and three eighths inches wide at the top; handle of ash wood 2 feet 5 ½ inches long, secured in the socket with 3 iron rivets; in top, through the “D: with 2 iron rivets. Weight 4 ½ pounds”*

### **From The Fort Snelling Manual—**

#### **Picket Shovel**

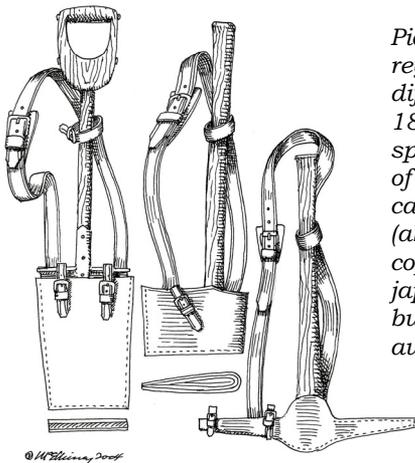
*Used by men on picket and guard duty to entrench themselves quickly and protect them from the sharpshooters of the enemy. To be made of No. 16 wire*



A full description of this army shovel and sling—both designed by Henry Benham, later commander of the Engineer Brigade, is found in the Fort Snelling manual. The entry is too lengthy to include in this text. Contact Historic Fort Snelling in Saint Paul, Minnesota for information.

## 11. TOOL SLINGS

When troops were moving at a distance from the supply wagons, they were able to carry tools by means of sling-carriages prescribed by Quartermaster Reports. Dover press reprinted the 1889 Quartermaster Manual, which illustrates a variety of tool-slings that are identical to those used during the Civil War, with a few changes. The '89 specifications call for a slightly longer sling-strap than is described in 1860's QM Manuals. One suggested



*Pioneer tools slung in regulation cases. The key difference between the 1865 and 1889 specifications is the length of the shoulder sling. Spade cases could either be sewn (above) or secured with copper rivets. All utilize japanned steel roller buckles. Drawing by the author.*

explanation is that added sling-length was due to the increased use of mounted infantry, a fact that I have yet to confirm. Please consult the attached copies of the 1865 QM Manual for correct dimensions. While official orders prescribe the movement of tools via wagon or mule-pannier, slings were undoubtedly used, like Colonel

Leggett's 10th Connecticut swimming the Neuse River with axes "strapped upon their backs." Specs are found on pages 39-40 of the 1865 (unpublished) Quartermaster Manual. The descriptions are very lengthy, and differ from the 1889 Quartermaster manual in the length of the shoulder strap which, in 1889 is 5 inches longer for most tools and calls for "black harness leather, where the 1865 manual calls for "stout harness leather, oak tanned"—not black.

## **12. MARKING AND LABELING**

The Quartermaster Reports specify tools by type, dimensions and construction. According to Luther Hanson, Curator at the Quartermaster Museum at Fort Lee in Petersburg, Virginia, no method of codifying inventories was employed prior to the 1870's and was not standardized until after the First World War. For instance, a claw hammer used during the Civil War did not have an inventory number, nor would it have borne any markings of that kind. Occasionally, a tool might show up with "US" stamped into the head, or burned onto the handle, but the practice was not widespread. Tools were requisitioned as needed, often from private sources, and sent to the field without being "gussied up". No system seems to have existed for identifying tools, such as was used for knapsacks and canteens, but I have seen no proof that it was ever done. To identify your tools, you might consider stenciling a company letter to the butt-end of the handle. Make it small and unobtrusive. Civil War photos often show field works strewn with tools, dropped at task's end by fatigue details, abandoned as just another encumbrance. Pioneer organizations took better care of their tools. They had to. An axe was as much of a weapon as a musket.

### **13. MAINTENANCE OF TOOLS**

Metal tools were required to have handles of sound, seasoned hickory. These were not varnished, but preserved with linseed oil. Living historians who wish to give their tools an authentic appearance, should remove any labels, brands and modern varnish from tool-handles and rub the wood with raw linseed oil -- available in hardware stores. QM reports call for the metal parts of tools to be painted black. This was a form of rust-prevention. Again, remove any paint or varnish from the metal and paint it with a glossy, oil based black enamel, like "Rustoleum". Use a brush. There was no spray-paint during the 1860's. An alternate method is to dip the tool-head directly into a can of paint and hang it to dry. Make sure all tool-heads are securely affixed to the handle, very important for safety. Make sure edged tools are kept sharp. Light oil can be applied to the bright steel at the edge.

### **14. CLOTHING**

Certain garments were both issued by military arsenals and procured from commercial contractors and vendors. Overalls were issued to engineer troops in the field. A photograph of a sap roller before Battery Wagner shows a working party of the 1<sup>st</sup> New York Engineers, one of whom is wearing coveralls. Engineer Coveralls are illustrated in the Dover reprint of the 1889 Quarter-master Manual, which appear to be very similar to the one being worn in the Morris Island photograph. The New York Military Museum in Saratoga Springs has a number of photographs of the Engineer Brigade practicing bridge building at Franklin's Landing on the Rappa-hannock. At least half of the men in the photograph are in shirtsleeves, wearing canvas duck "bib" overalls. A photograph in the Library of Congress portrays Colonel Barton Alexander wearing canvas duck leggings or "chaparejos", or "chaps". There is no record of chaps being purchased or issued by

the military. Such private purchase items were commonly available to outdoorsmen, farmers and woodsmen in 1861.

### **15. PERSONAL ITEMS**

Pioneer soldiers carried the same array of military and personal effects as any other soldier, but since they had a trade, they might possess other useful items, such as a belt-knife, clasp-knife, a whetstone and file for sharpening edged tools, and perhaps a folding Stanley ruler. They might be expected to carry the 19th-century equivalent of an all-purpose knife and a tape measure, things few construction workers today are ever without.

PART TWO

THE TACTICAL USE OF  
INFANTRY PIONEERS

## 1. THE PROBLEM WITH MANUALS

Absent from most wartime manuals, such as Hardee's and Casey's is any reference to methods for deploying pioneers, whether it be in harm's way or in Dress Parade formations. Some might wrongly assume that the absence of this information from wartime manuals is due to these tactics having been abandoned. In fact, detailed instructions regarding pioneers are found in Upton's post-war New System, etc. manual. In 1861, every military officer was expected to be knowledgeable in those methods detailed in Scott's Infantry Tactics for the regulars; and Samuel Cooper and Alexander McComb's A Concise System of Instructions and Regulations for the Militia and Volunteers for state troops. The new manuals, such as Hardee's and Casey's; or Gilham's in Virginia; Baxter's in Pennsylvania and Worthington's in Ohio omitted references to pioneer tactics, because they were not affected by new tactical systems and thus would continue to function, by default, as required. The fact that many commanders were ignorant of these tactics is evident in veterans' memoirs.\* Some states were more thorough than others in preparing manuals for their volunteers. New York State, for example, published an extensive new manual in 1858, including tactics for pioneers previously detailed in Scott's and Cooper's manuals. The following are excerpts:

### **Excerpts from the State of New York Militia Manual of 1858: *not italicized***

#### **“INSTRUCTION:**

The **sappers and miners** will be instructed and practiced in the drill of the light Infantry, and also of the artillery. **Staff Officers** of divisions and brigade will be instructed in all the arms, and **Regimental Staff Officers** in the arms of the regiment.

The Lieutenant-Colonel of each regiment will select two or more persons from **the sappers and miners**, or from the

corporals in the line, to act as markers in the exercise of the regiment. They will be carefully instructed by the Lieutenant Colonel in the duties required of them in the practice of the school of the battalion (in the cavalry, of the squadron and regiment), and they will be under the special direction of the Lieutenant Colonel during the manoeuvres

#### **POSTING:**

Commanding officers of regiments will have special care to see that the bands, the field music, the **Engineers or Pioneers**, and the colors and standards, are at all times properly posted.

#### **AT INSPECTIONS:**

The officers will form themselves in one rank, eight paces and the non-commissioned officers in one rank, six paces in advance of their respective companies, from right to left, in order of seniority; the **pioneers** and music of each company, in one rank, two paces behind the non-commissioned officers.

#### **AT DRESS PARADES:**

After bringing the regiment to "Order arms!, Parade Rest!", the adjutant takes post two paces on the right of the line; the Sergeant-Major two paces on the left. The music will be formed in two ranks on the right of the adjutant.

**The Pioneers, or Sappers and Miners**, four paces on the right of the music.

#### **IN REVIEW:**

The battalion being formed in the order of battle, at *shouldered arms*, the Colonel will command,

1. *Battalion, prepare for review!*
2. *To the rear, open order.*
3. *March!*

At the word *March*, the Field and Staff Officers dismount; the Company Officers and the color rank advance four

paces in front of the front rank, and place themselves to their respective places, in the order of battle. The color-guard replace the color-rank. The Staff Officers place themselves, according to rank, three paces on the right of the rank of company officers, and one pace from each other; the music takes post as at parade; **the Pioneers, or Sappers and Miners**, on the right of the music. The non-commissioned staff take post one pace from each other and three paces on the right of the front of the battalion.\*

### **THE BATTALION, IN COLUMN OF COMPANIES, RIGHT IN FRONT,**

Marching in common time and at *shouldered arms*; the Colonel four paces in front of the Captain of the leading company; the Lieutenant Colonel on a line with the leading company; the Major on a line with the rear company; the Adjutant on a line with the second company; the Sergeant-Major on a line with the company next preceding the rear, each six paces from the flank (left) opposite to the Reviewing Officer; the Staff Officers in one rank, according to the order of precedency, from the right, four paces in rear of the column; the music, preceded by the principal musician, six paces before the Colonel; **the Pioneers, or Sappers and Miners**, preceded by the Sergeant, four paces before the principal musician; the Quartermaster-Sergeant two paces from the side, opposite to the guides and in line with the **pioneers**.

### **AT STREET FIRINGS:**

At the command for street firing, in advance or retreat, whether as light infantry or infantry, the **engineers or pioneers** and music, will promptly place themselves between the eighth (or rear) company, and the company next preceding it in the column. They will form compactly in the ranks; the **engineers or pioneers** directly behind the seventh company (or company next to the rear company), and the music between them and the eighth (or rear) company”

## 2. VARIATIONS: PARADE AND REVIEW

*“The left of the pioneers will be posted on the right, their left four paces from the right of the field music. Pioneers may be assembled for dress parade at the Colonel’s direction; whereas pioneers will be assembled for all reviews”.*

--Scott’s Infantry Tactics

*“The music, preceded by the principal musician, six paces before the Colonel; the pioneers, preceded by a Corporal, four paces before the principal musician;..”*

--A Concise System &c., Samuel Cooper and Alexander McComb

*“The left of the pioneers will be posted ten paces from the right of the first battalion”*

--Torbert’s “Forms for Parade and Review for Brigades, Divisions and Corps”, 1864.

*“Should the battalion have a pioneer corps, it will be posted ten paces to the right of the front rank of the battalion, the band ten paces to its right. In marching in review, the pioneers will be ten paces in front of the Colonel, the band ten paces to their front”.*

--New System of Infantry Tactics, Upton, 1868

### NOTE:

For posting **Pioneers**, reference will be made to 1st Volume of Scott’s Infantry Tactics, pp 14,15,194. For posting pioneers and music in square, reference will be made to 2nd Volume of Scott’s Tactics, p.166; 2nd Volume Hardee’s Infantry Tactics, p.182. For the posting of music, pioneers & c., attention is likewise called to a close examination of the explanations of the various evolutions attached to each diagram of maneuvers in Scott’s Infantry Tactics. The manual of arms for sergeants, corporals, for reviewing sentinels, of the sword and sabre for officers; for

color salute, will be found in 1st Volume Scott's Infantry Tactics. pp. 179-189; 1st Volume Hardee's Infantry Tactics, pp 214-216.

### **3. MAP READING IN THE FIELD**

Cartography and mapmaking are as important to successful warfare as military discipline and reliable weapons. Tactical decisions depend entirely upon a thorough understanding of terrain. The Civil War occurred at a point in American history when the majority of the population was literate, as evidenced by the large numbers of letters and diaries written by soldiers. Surveying and map reading are activities with which many would have had some familiarity. The supply of maps for the army would have come from a variety of sources, including tourist, railroad and county maps. Commercially produced maps were widely available, often bound in pasteboard folders. Armies frequently became lost, even in familiar territory—such as Lee's movements at Frazer's Farm and Malvern Hill. Confusion stemming from the same road having two different names and a lack of reconnaissance were to blame for a delay that proved very costly in terms of lives and opportunities lost. The following will focus on map reading in the field and on the march.

### **4. MAP READING: ORIENTATION**

The first step for reading a map in the field requires the user to orient the map. "Orient" means "to face east", which is misleading because the common point of reference is North. Because the angle between True North and Magnetic North (angle of declination) varies with location and changes with time, one must compensate for the difference when using the map. Contemporary topographical survey maps show the angle of declination graphically in the margin. To orient the map, lay it on a flat surface and place a compass on top of it, aligning the

needle with Magnetic North by rotating the map under the compass until the needle is parallel to the line on the map indicating the angle of Magnetic North. The map is now oriented. The graphic representation of the terrain is aligned with the ground it portrays.

## **5. MAP READING: LOCATION**

The next step after orienting the map will be to locate one's position on the ground. Choose two visible landmarks, note compass headings from each to your position. Plot the headings on the map. Where they intersect should be your location. If no landmarks are visible, carefully note movements through close terrain, with compass and map in hand, until a landmark comes into view. Plot your location, and your progress in reverse to find your original location.

## **6. MAP READING: SCALE**

The next step will be to consult the bar scale indicated on the map. If one does not exist, measure the distance between two visible landmarks in the terrain, and use that measurement and its divisions as points of reference. Several methods are described in Mahan's Outpost, widely available in facsimile reprints from the original published by Wiley & Sons, NY, 1861.

*Next page.  
Author's map of Sayler's  
Creek showing elevation  
by hachure rather than  
contour. Note compass  
arrow & scale.*







**SELECTED CIVIL WAR MAP SYMBOLS**



**PIKE**



**SECONDARY ROAD**



**UNPAVED ROAD**



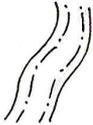
**TRAIL**



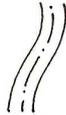
**PATH**



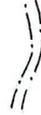
**GAME TRAIL**



**RIVER**



**STREAM**



**BROOK**



**GULLY**



**WOODS**



**SWAMP**



**CROPS**



**PINE WOODS**



**ELEV. HACHURE**



**ELEV. CONTOUR**

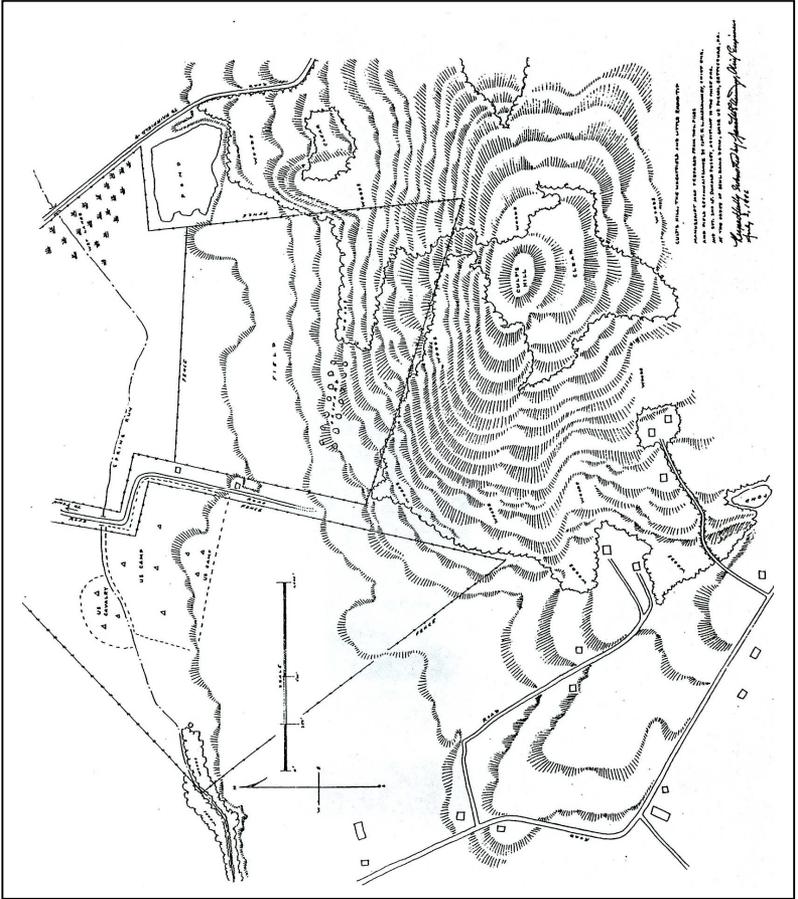


**FENCE LINE**



**BUILDING**

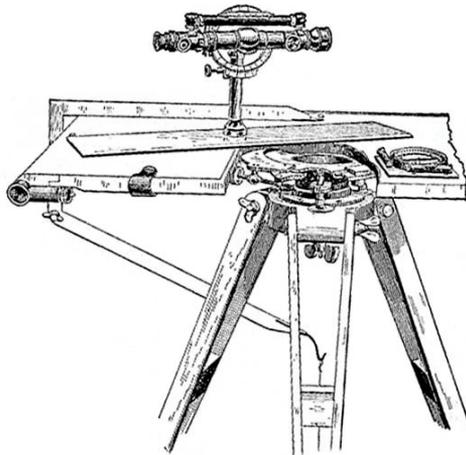
*Examples of cartographic iconography*



The author's manuscript map used at the 1996 Gettysburg reenactment site at Fairfield. Note the use of hachure to denote elevation

## 8. MAP MAKING AND RECONNAISSANCE

It is a misconception that the Corps of Topographical Engineers supplied the army with all of its maps. In fact, the Topographical Engineers, which was made up entirely of commissioned officers, was not a large organization before the Civil War. Authorized thirty-six members by Congress, its peacetime duties included exploration, mapping, and internal improvements. The latter consisted of river and harbor improvements, lighthouse construction, road building, and public works. The vast majority of the area mapped by the Corps before the Civil War was in the western territories. Civilian-produced maps were widely available for the states in the east, but because these maps often proved unreliable, prudence advised reconnaissance-based maps produced in the field. The ability to see the land in military terms, called "*coup de l'oeil militaire*," was usually acquired in a somewhat perilous manner. On the other hand, all graduates of West



*Plane table. Illustration from the 1917 Engineer Manual, in most respects not very different from the kind that would have been used by Civil War map-makers and civilian surveyors.*

Point had to pass a rigorous course in drawing and could translate their observations in the field into graphic terms. Some methods are discussed in D.H. Mahan's Outpost for making measurements in the field without a full complement of instruments. Pace and compass methods accounted for the majority of mapping, whereas more sophisticated instruments were used for mapping enemy works (from a distance) and laying out engineering projects.

PART III.  
APPENDICES

**1. FEDERAL CIVIL WAR ENGINEER ORGANIZATIONS:**  
*A PARTIAL LIST OF FEDERAL ENGINEER AND PIONEER UNITS:*

**Engineer Regiment of the West**, Col. Bissell, organized July 1861:

**1st Missouri Engineer Regiment**; Consolidation on February 17, 1864 of the 25<sup>th</sup> Missouri Infantry with the "Engineers of the West", aka "Bissell's Engineers" Mustered out July 22, 1865

**Gerster's Pioneer Company**, Missouri; October 1861-September 1862

**Wolster's Company of Sappers and Miners**, Missouri; 1861

**Baltz's Company of Sappers and Miners**, Missouri, 1861

**Howland's Independent Company of Engineers**, Michigan, 1861

**1st Michigan Engineers and Mechanics**, Col. Inness, "Inness's Engineers" Michigan 1861, saw action in Tennessee, later with Sherman in Georgia and the Carolinas.

**1st New York Volunteer Engineer Regiment**, "Serrell's Engineers" Col. Edward Wellman Serrell, later Bvt. Brig. General; Service against Fort Pulaski, with the Army of the South under Gen. Q. A. Gillmore, to 1864; with Army of the James, 1864-65. Detachment served in the Dept. of Florida and at the Battle of Olustee.

**2nd New York Engineers**, Col. Jas. Magruder, 1863; one company under H. Slosson transferred to the 15th New York Engineers "New York Sappers and Miners". Magruder served as Lt. Col.

**15th New York Engineers**, organized May 9, 1861 as infantry under Col. Macleod Murphy; converted to engineers, served in the Engineer Brigade, Army of the Potomac; a detachment under Capt. O'Keefe served under Gen. Al. Terry at the assault on Fort Fisher, NC; mustered out June-July, 1865

**50th New York Engineers** "Stuart's Engineers" organized July-Sept, 1861, as the 50th New York Infantry under Col. C.B. Stuart; converted to engineers on October 22, 1861; served in the Engineer Brigade, Army of the Potomac; mustered out June 1865, under Col. Wesley Brainerd

**Engineer Battalion, US Regular Army**

Three companies.

**Engineer Brigade, Army of the Potomac**, General Henry Benham; comprising the Engineer Battalion (regulars), the 15<sup>th</sup>, and 50<sup>th</sup> New York Engineer regiments

**IX Army Corps, Acting Engineer troops, 1864-1865**

*35th Massachusetts Infantry*, Col. Carruth

*48th Pennsylvania Infantry*, Col. Pleasants

*17th Michigan Infantry*, Col

**Army of the Cumberland--1862-63**

**Pioneer Brigade**, Brig. Genl. Jas. St. Clair Morton; Designated "Engineer Brigade" in 1864

**1st Kentucky Engineers**, also known as "Patterson's Engineers"; October 1861-January 1865

**Wrigley's Independent Company of Acting Engineers**, Philadelphia; November 1862-June 20, 1865

## **2. SUGGESTED READING**

Engineer Field Manual, U. S. Army 1918

Field Fortification, Dennis Hart Mahan, any edition, 1846-1861

Field Fortification, Francis J. Lippitt, 1872

Applied Principles of Field Fortification for Line Officers, J. A. Woodruff, 1909

Manual For Engineer Troops, Capt. J. C. Duane, 1862

"Military Collector and Historian", various authors, published quarterly by the Company of Military Historians, Westport CT

Military Topography, Captain C. O. Sherrill, 1912

Ordnance Manual, Lippincott & Co. 1862; numerous reprints

Revised Regulations for the Army, 1861, 1863; numerous reprints

### 3. SOURCES, by author

**Anonymous** Annals of the Army of the Cumberland by an officer, 1863

**Billings**, Hard Tack and Coffee

**Brainerd, Wesley**; Bridge Building in Wartime, edited by Ed Malles, University of Tennessee Press, 1997

**Braun, Robert A.**, Fredonia, Wisconsin, various articles and personal suggestions

**Cooling, Benjamin Franklin III** and **Owen, Walton H. II**; Mr. Lincoln's Forts, etc., White Mane Publishing, 1988

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**Eames, Captain H.E.**, Military Maps Explained, 1908, Franklin Hudson Publishing Co., Kansas City, MO

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**Charles S. Harris**; Civil War Relics of the Western Campaigns, page 212.

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**Epling, Jimmie**, "Pioneer Tools", Camp Chase Gazette

**Hanson, Luther**, Curator, Quarter-master Museum, Petersburg, VA for general information and photocopies of the 1865 (unpublished) Quartermaster Manual

**Harris, Charles S.**, Civil War Relics of the Western Campaigns

**Kautz, Augustus**, Customs of the Service, 1864, reprinted by Stackpole

**Francis A. Lord**, Civil War Collector's Encyclopedia,

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**Phisterer**, Volunteers of the State, State of New York  
**Quartermaster Dept.** Quartermaster Report, U. S. Army,  
1865, 1866, 1889

**Roe, Alfred S.**, History of the Fifth Massachusetts  
Volunteer Infantry

**Taylor, Frank H.**, Philadelphia in the Civil War, City of  
Philadelphia, 1913, reprinted 1991 by J.M. Santarelli

**War, United States Department of**, Official Records, etc.

**Westervelt, John H.** Diary of a Yankee Engineer, edited  
by Anna Palladino, Fordham University Press,

#### 4. NOTES

1) Gower to Macmorris; Henry V, act III, scene 2---  
William Shakespeare

2) The word "pioneer" may derive from the French  
word "pion", meaning a game-piece, obstacle, or war-  
machine — anything needing to be placed in position on a  
battlefield, siege or game-board. A pioneer would be a  
soldier whose job it was to move these contraptions by  
saps, mines or rigging. In short, they were what we today  
call "combat engineers".

3) excerpt from Beadle's The Military Hand-Book,  
1861

4) 1st Michigan Engineers saw action at Lavergne,  
Tennessee and 1st NY Engineers saw action at  
Secessionville, SC, Olustee, Florida and Chester Station,  
Virginia

## 5. GLOSSARY

**Abatis** (abba-tee) An obstacle in front of a fortified position made of trees with sharpened branches pointing outward.

**Balk** (bahk) Heavy beams used in building pontoon bridges

**Banquette** (bang-keŧ) A narrow elevated platform running behind the revettement of a work.

**Bastion** (bass chun) A four sided enclosure projecting the corner of a larger work beyond its normal plan.

**Birago** (Bee rah go) A type of bridge in which the roadway is suspended from a trestle, used for crossing waterways and defiles.

**Bomb-proof** An underground shelter built to protect troops from shelling

**Breastwork** Any defensive fortification behind which soldiers may find cover while fighting.

**Chess** The planks used to build a roadway across a pontoon bridge.

**Chevaux-de-Frises** (Shay-vo duh Freeze) A kind of obstacle made by attaching sharpened poles to a central log. Name translated literally; "Friesien Horses" (the Friesiens had no cavalry).

**Corduroy** Popular term for a wooden paving, made by laying saplings and smaller timber side by side, at a right angle to the direction of traffic, as distinct from a "plank" road.

**Counterscarp** The wall of the ditch in front of a fortified position below the glacis

**Coup de l'oeil militaire** (koo-d' oo-y mili-tare) Literally, a "military stroke (strategem) of the eye". The ability to see the military use of the land.

**Cremellaire** A zigzag design used in laying out trenches and works

**Dead-man** A buried log or beam to secure a heavy rope or cable used in bridge construction.

**Declination** The angle expressing the difference between magnetic north and true north.

**Degree** A unit of measure. The compass possesses 360, with 90 between each of the basic directions

**Embrasure** (Em-bray-shoor) The opening in a fortified wall, through which the muzzle of a cannon may pass and fire. Literally a “hug”.

**Entanglement** An obstacle against infantry created by making snares of cordage or telegraph wire, secured to stumps or trees

**Face** The wall or section of a fortified position built in the same direction.

**Fascine** (Fah-seen) Longitudinal bundles of brush bound into 12 foot lengths, fabricated logs from brush, for use in field construction. Also know as “faggots” when burned as fuel.

**Fraises** (Frazes) A line of sharpened stakes, set into the earth, often in a fortified ditch or embankment, as an obstacle against infantry

**Gabion** (Gay-bee-on) A four foot high cylinder made of woven brush and vines, placed and filled with earth for use in field construction.

**Gorge** The open part of a bastion or salient, facing the rear; the part of a three sided work that is not enclosed.

**Glacis** (Glai-sis) The inclined outer edge of a ditch in front of earthworks, triangular in section, slightly elevated above the natural surface of the terrain.

**Head Log** A wooden log or beam laid along the rampart of a work to afford protection from hostile small arms fire

**Lashing** Methods of securing parts of a structure to on another with cordage

**Loophole** An opening in a fortified wall through which small arms may be fired

**Military Crest** That part of inclined terrain just below the summit, which from the bottom appears to be the highest point. A suitable place for entrenching.

**Miner** A person expert in explosives and the construction of tunnels.

**Orientation** The process of aligning a map upon the ground it portrays; literally “to face east”.

**Palisade** A wall of pointed posts, usually about 12 feet high, set into the earth, side by side as a wall, or as part of a stockade.

**Pannier** A wicker basket or wooden box hung on either side of a pack frame, mounted on a horse or mule, upon which tools, weapons and bundles may be carried.

**Pioneer** A soldier skilled in construction and demolition who belongs to the detachment moving ahead of the battalion, to clear the way and throw up obstacles against the enemy; an infantryman acting as an engineer soldier.

**Pioneer Corporal** A staff non-commissioned officer in control of the pioneer detachment for a regiment. Like the Sergeant-Major and Ordnance Sergeant, the Pioneer Corporal is part of the regimental staff chain of command

**Plank Road** A muddy thoroughfare made passable by paving its surface with sawn planks, as distinct from a "corduroy" road.

**Plumb** True vertical, ascertained by hanging a pointed weight from the intersecting point of a tripod.

**Ponton** Also "pontoon". A flat bottomed boat, square stern and aft, used as supports for balk and chess bridges across waterways.

**Rampart** The upper surface of a fortified embankment, often inclined toward the front, in line with the surface of the glacis.

**Ravelin** (*Rahv*-lin) A triangular outer work, usually in front of the ditch surrounding a bastion

**Redan** (*Re-dahn*) Triangular enclosure built to cover a field piece and its crew.

**Revetment** (*Re-vet*-ment) Method of stabilizing the interior wall of an earthwork using either timber, lumber, gabions, fascines, sand bags and sod. A retaining wall.

**Rigging** Methods of positioning, moving and elevating heavy objects using cordage, block and tackle.

**Salient** (*Say-lee*-ent) Part of an entrenched line projected beyond the line, usually having two or three faces.

**Sap** A trench or covered way built to convey attacking troops as close as possible to the fortified target.

**Sapper** A soldier expert in digging trenches and covered ways under fire

**Sap Roller** An oversized gabion, usually with a smaller one inside, packed with wood, to protect sappers from small arms fire

**Scarp** The front face or wall of a work, behind the ditch.

**Slashing** An obstacle created by gathering a hedge of brush and branches at a distance before a fortified position.

**Stockade** A simple fortified enclosure made up of palisades; a prison pen.

**Stringers** Wooden rails placed under head-logs, the other end resting behind a trench; to protect men fighting in the trench from head-logs falling into the trench.

**Tennille** A line of inverted redans.

**Terreplein** (*Tar-plane*) Literally “open ground”. The platform of a rampart, for the cannon, behind the parapet.

**Topographical Engineers** An independent corps of officers, skilled in science, engineering, surveying and mapping who conducted the majority of western explorations, reconstituted in 1863 with the Army Corps of Engineers.

**Traverse** Part of an earthwork slightly higher or the same height as the rampart, running perpendicular to it, to limit collateral damage caused by artillery shells or enfilading fire.

**Trestle** A framework using triangular structures to elevate, reinforce, support and extend other structures, such as bridges, over dry defiles and waterways.

**Tripod** Three legged platform used to support plane tables, transits, vernier compasses, telescopes and other surveying equipment.

**Trou-de-loup** (*True d loo*) “Wolf pit” A conical hole with sharp stakes set points upward.