Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
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Major Cannon of Great Britain and America from 1780-1880 as a Model to Promote the Concept of 'Living History'

Curriculum Unit 81.02.04
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> Hail to the skillful cunning hand!
>
> Hail to the cultured mind!
>
> Contending for the world's command,
>
> Here let them he combined. [1]

It is our primary endeavor to arrange a meeting of the skillful hand and the cultured mind in order to make the study of history a more moving experience. It is our belief that a practical work experience, directly related to the material to be studied and taught, will bring meaningful activity to subject matter usually relegated to reading and lecture only, within the classroom environment. Activity is life.

In our unit we will present an abbreviated historical segment and a practical work experience directly related to this segment. Our historical segment is entitled, 'Major Cannon of Great Britain and America from 1780 to 1880'; our related practical work experience is 'How We Made a British 3-Pound Field Piece in the Industrial Arts Department's Shops'. We believe that this approach, if tailored or geared to any subject will enhance the study and teaching of that subject area, by breathing the life of activity into it.

For us, it was a sort of putting the cart before the horse experience We built the 3-pound field piece first. We found that while building it and even after completion, we had answered so many student questions, that we had taught a history class on the cannon. It was then that we realized that, if we had previously done a historical segment on the cannon, all would have been much more organized and structured.

The most important element for the production of a unit promoting the concept of 'Living History' is coordination. This will involve advanced planning on the part of the instructors of the Industrial Arts department and the instructors of the History department. The instructors of the Industrial Arts department must be informed of the overall scope of the historical material to be taught over a defined period of time, such as a semester or trimester (etc.). This will facilitate the planning of practical work experiences or projects directly related to the historical blocks or segments of instruction to be presented. Coordination will insure

that the work experience is a continuation of the historical block.

Our approach to the concept of 'Living History may seem a little simplistic, but we consider it to be workable. Our strategy is simply taking a course of history, isolating a particular artifact important to the historical development of that course and which can be reproduced within the Industrial Arts' shops and doing it. That's what it is all about. Life is doing rather than mere reading and listening.

Pre/Post Test I

General directions: Respond to the following questions as indicated below. The correct answers can be found at the end of the historical segment.

I. Answer true or false to the following.
1. The six-pounder is loaded from the back.
2. Shell is a solid cannon ball made of all iron or lead.
3. Grape shot is good to eat.
4. Shot was used for battering down walls.
5. The howitzer could lob an explosive shell over high walls.
6. The mortar has a long, slender barrel.
7. The rocket was the major weapon of the period from 1780-1880.
8. The 10-inch Rodman was a fine American gun.
9. The gun/howitzer could not shoot straight like the six-pounder.
10. Rifling was performed on the outside of the cannon barrel.

II. Circle the correct answer from those given below. Choose either a, b, c, or d.
1. Lt-Col. William Congreve invented
    a. bullets
    b. the single trail carriage
    c. the ram rod
    d. the Star Spangled Banner
2. Black powder is made of all the following except
    a. sulfer
    b. silicon
    c. potassium nitrite
    d. carbon
3. The bore of the six-pounder is
    a. rifled
    b. painted a reddish color
    c. smooth
    d. shot over walls
4. The mortar is mounted on
    a. a split trail carriage
    b. a bed
    c. a sling cart
    d. a single trail carriage
5. Sea coast cannon were usually
    a. quite small

b. held in the hand and fired
c. fired rockets
d. quite large

6. The gun/howitzer was
   a. mounted on a bed of steel
   b. able to shoot straight as well as lob exploding shells
   c. designed by T. J. Rodman
   d. made by Napoleon
7. The 3-inch Ordnance rifle
   a. had a 6-inch bore
   b. was called a Parrott gun
   c. had a 3-inch bore
   d. was a smooth bore cannon
8. The mountain howitzer
   a. could be taken apart in three sections
   b. a giant sea coast cannon
   c. was mounted on a single block of wood
   d. was used as a rocket launcher
9. Windage is
   a. rifling in the bore of a cannon
   b. the space between the cannon ball and the bore
   c. another name for srapneI
   d. a heavy projectile
10. Another name for a solid cannon ball is
    a. shot
    b. shell
    c. a tin can
    d. srapnel

Part I—Major Cannon of Great Britain and America from 1780-1880

"The gun is the rallying point of the detachment, its point of honor, its flag, its banner. It is that to which men look, by which they stand, with and for which they fight, by and for which they fall. As long as the gun is theirs, they are unconquered, victorious; when the gun is lost, all is lost." [2]

In this section, we will explore the development of types of cannon, British and American from 1780 through 1880. Field guns, Howitzers, mortars, rockets, seacoast cannons, gun Howitzers, rifle guns and mountain Howitzers will be discussed. At least one piece from each family of cannon referred to above will be isolated and examined in detail. A sketch will accompany each of these particular cannon in order to give the reader a visual representation of those set apart for study.

Webster defines a cannon or gun as, "a piece of ordnance on a carriage or other mounting for throwing projectiles by the force of some explosive with high muzzle velocity and with a comparatively flat trajectory." [3] Ordnance is military supplies, including weapons. The cannon, then, has two parts that are major; the barrel and the carriage or mounting.

The first cannon to be discussed is the British Six-Pound (6 lb.) Field Piece. It is a field gun. It was designed as a split trail, having two side sections with the cannon barrel resting between them. The pattern came from Europe; and there in the hands of a skilled General, it could be quite deadly to a foe, The barrel weighs approximately 800 pounds, with a bore diameter of three and one-half (3 1/2) inches. The bore is the large hole drilled along the steel barrel, the size of the cannon ball. The space between the cannon ball and the bore, which allows the cannon ball to be rammed all the way to the back of the cannon is called windage. The tighter or smaller the windage, the more accurate an artillerist could place a cannon ball. If the windage is too tight the cannon ball could get stuck in the barrel when rammed to the base.

The 6 pounder is a smooth bore cannon, meaning that the bore is smooth from the breach to the muzzle. It is enough to say that the breach is the back end of the cannon barrel and the muzzle is the front. A smooth bore is not accurate beyond 500 yards because of windage. The balls fly out straight, but wind and gravity causes them to veer off target.

Fig. C

Six-Pounder—Split Trail

(figure available in print form)

Six-Pounder—Single Trail

(figure available in print form)

The 6 lb. field piece fires a ball of iron or lead called the cannon ball which weighs six pounds. To fire the piece a gun crew of about six soldiers are used for each gun. Each soldier has a number 1-6 and one or two specific jobs to do. Each must also wait in a certain spot.

This crew is led by the gun captain, who is the immediate boss and makes sure of the safety of the crew, as well as the performance of jobs. He obtains orders from the general to fire, cease fire, and for replacement of soldiers killed or wounded by the enemy while they were around their guns. Wars during the period 1780-1880 were no saturday afternoon picnics. The guns had to be close to the enemy, between 100 to 500 yards. The further away they were, the less damage was done. The closer to the enemy they were, the more deadly they were.

The 6 lb. field piece is a muzzle loader. That is a cannon or weapon loaded only from the front. A paper bag filled with the right amount of black powder is called a powder charge. This powder charge, if tied to a cannon ball, is called a cartridge. Does Dirty Harry use cartridges in his 44 magnum? Yes, only his powder charge is carried in a new brass case and what shoots out of his gun is called a bullet, instead of a great cannon ball.

Black powder is make of potassium nitrite, sulfer and carbon mixed together. In a granular blend, it was the propellant and explosive used in cannons and warfare from 1780-1880. The fact is that gun powder in this unchanged form was used hundreds of years before our starting date of 1780.

For a 6 lb. field piece or 6-pounder, 1/2 lb. to 1 lb. of black powder would be used. The heavier the powder charge, the greater the distance the shot could travel. Another name for a cannon ball is shot. What is shot and shell? They were both used in the 6 Lb. field piece as well as in other cannon. Shot is another name for a solid cannon ball made of all iron or lead. Shell is a hollow cannon ball with a chamber filled with gun powder. This can be timed to explode by using a fuse.

A fuse is a paper or wood dowel that is hollow and packed with a gun powder like mixture that will not explode. It burns from one end to the other in specific lengths of time. For example, one inch of fuse may take five seconds to reach the charge and fire. At the end of that time the flame touches the hidden powder charge and explodes the cannon ball into the face of the enemy. If his horse was smart he would run the other way. No body said it was fun to be shot at. If the enemy came a little closer the gunner or the person in charge of the gun would take a knife and cut the fuse to 3 seconds or 2 seconds. During the Civil War certain fuses could and were cut to 0.0 seconds, which means that the shell left the muzzle of the gun an d exploded in the face of the oncoming enemy. The result of this was horrible, often taking off heads, arms and blinding many of the foe, who were unlucky.

Fig. F

(figure available in print form)
(figure available in print form)
The shot was used for battering down walls, forts and to a smaller degree, army troops. Here the cannon ball had limitations. For the cannon ball had to strike a person directly to do damage. At closer range a deadlier concept had to be devised and was. This was grape shot.

Like a bunch of ripe grapes, eight or more lead or iron balls were packed into a sack or bag. When fired from the six-pounder, the balls would scatter, bounce around in the barrel and fly out in many directions causing damage where ever they struck. Instead of one ball hitting the enemy, many balls could knock down many troops.

In order to load the 6 pounder a powder bag is placed into the muzzle first, followed by a 3 inch stuffing of paper called a wad. Lastly a cannon ball or grape shot is added. A long rod is used (it is a few feet longer than the barrel) to ram this entire charge to the base at the breach. This rod is called a ram rod. A small hole about 3/16 inches wide is drilled in the breach. .It is called the vent. The vent is filled with gun powder. Fire, when touched to the vent, would ignite the cannon.

Being once a British colony, it was only natural for the new American nation to copy the British 6-pounder. The only real difference was the color of paint used. The British used gray paint while the Americans used a reddish brown. Most of the American parts were crude castings or stolen from the British armories. The 6 pounder was used in the American Revolution at such notable battles as took place at Yorktown and Saratoga.

The 6 pounder was used in Europe at Waterloo.

The 3 pounder, the 12 pounder and even the 24 pounder are just a few more of the field guns which saw use during this period. However, the 6 pounder remained the most popular and widely used between 1780 and 1880.

As we continue to describe the other family of cannon and individual ones selected to detail, the length of the discourse will be shorter as a great deal of the basics for all cannon of the period, were included with the previous.

Fig. D

Navy Gun

(figure available in print form)
Howitzer
(figure available in print form)
We will now take a look at the Howitzer. Though it was invented by the Dutch in the seventeenth century, the value of the howitzer was soon recognized universally and quickly adopted by the armies of Europe.

The forces of Great Britain introduced the howitzer to the New World in about 1760. After the American Revolution, howitzers from the 12-pounder to the 10-inch were adopted by the American military.

The value of the Howitzer was that it had the capacity to fire a larger and heavier projectile than could've fired from a field piece (such as the 6-pounder) of the same calibre, with a higher trajectory. It was also a lighter and more mobile weapon.

Because the howitzer was a high-angled weapon of low velocity, its trajectory was high. It could lob an explosive shell over hills, walls of forts and even enemy troops. The howitzer's barrel is shorter than that of the 6-pounder (previously mentioned). The explosive shells used were often larger than the solid shot used in field guns, therefore, it was necessary to cast thinner walls or sides for the barrel of the howitzer.

Srapnel, a hollow iron sphere filled with bullets and a bursting charge of gun powder, was fired from guns as well as howitzers. This shrapnel was used only by the British during the Napoleonic Wars. "Between thirteen and nineteen per cent of the ammunition of field guns was shrapnel, and field howitzers carried as much as fifty per cent." [4] This capacity to utilize shrapnel made the howitzer more effective, as the spreading of bullets could compensate for errors of the gun.

The howitzer owed its mobility to a rugged two-wheeled carriage with a relatively short trail which permitted the wide arc of elevation needed for it. This carriage was usually designed as a split trail. See figure D (Fig. D) for a sketch of a howitzer.

Next, we shall discuss the mortar; a dissident type of cannon.—It has a short, fat and very heavy barrel, with many inches of even feet of metal between the bore and the outside of the barrel. The mortar is mounted on a bed; a pair of wooden cheeks held together by transoms. The bed has no wheels, therefore, it was transported in a special wagon or sling cart. When used aboard ships, the mortar was attached to a revolving platform, that it might be turned easily.

The purpose of the mortar is to shoot an exploding shell at a very high angle, 45 degrees or more. Mortars

were highly regarded as siege artillery. An explosive shell fired into the air, curved to drop within the defenses of the enemy. As the mortar barrel can withstand heavy powder charges, the distance of a shell was governed by the amount of powder put into the barrel.

Fig. B

Mountain Howitzer

(figure available in print form)
13-inch Mortar
(figure available in print form)
Mortars are of various sizes. They range from the small English Coehorn of 1780, with a three inch bore and a barrel only twelve inches long; to the United States 13-inch bore Seacoast Mortar of 1860.

The English Coehorn was small' it could be used by a crew of two people. It fired baseball sized shells high into the air. If the fuse was set correctly, the bomb or shell would explode when it hit the ground. Sometimes, the bomb would hit the ground and not explode right away. When this happened, most lucky soldiers would run, fall to the ground or find some immediate place of safety.

The mortar bed of the Coehorn was small; and made from a single block of wood. It was always fired from its bed at a fixed angle of 45 degrees.

The 13-inch Seacoast is a monster cannon with a 300 pound round shell which landed on many southern cities during the Civil War. One 300 pound shell could help destroy massive brick buildings similar to the numerous brick schoolhouses built around the east coast during the late 1800's.

The most famous sea coast mortar had a name. It was called 'The Dictator'; and was used by a Connecticut artillery regiment. This giant mortar is now located in front of the-State Capitol building in Hartford, Connecticut. (Fig. B) has a 13-inch Seacoast Mortar.

The mortar was very effective in combination with other weapons. In the late 1840's its capabilities as siege artillery became more apparent. A system was developed where the mortar became a type of clearing or shovel instrument. This system consisted of, "battering a wall with solid shot to break a section up and then firing explosive shell in order to get rid of the fragments which were by then smothering the effect of shot; this technique became known in later years as the 'pick and shovel' method, the shot acting as the pick and the shell as the shovel. The mortar was the shovel artillery used." [5] The shot of course was delivered from a gun, (such as the 6 pounder).

We give a brief description of the rocket here, only because in this present time period, it has superceded ordnance-fired projectiles and become the principle artillery weapon. It is also the older of the two.

Fig. E

(figure available in print form)
ROCKET
(figure available in print form)
Early rockets had a case or outer shell made of wood, paper or papier-mache, filled with gunpowder, or some other propellant. Stability in flight was usually made possible by a long stick fixed bo the case at the rear. As fireworks they were beautiful, however, they were ineffective as weapons.

Important innovations, during the period of our study, were made principally by three men; Congreve, Boxer and Hale. It was many years however, before the rocket or missile (as it is now called) received its status as the predominate weapon of modern times.

It was Congreve that introduced the rocket as a viable and possible war instrument. It was he that placed the rocket in an "iron case fitted with two kinds of heads, one which was used when the rocket served as either a shell or solid shot and the other when it was employed as a carcass, or incendiary shell." [6] He also provided drills for the effective use of rockets which failed because of stability problems, due to weather and terrain conditions.

Though Boxer strengthened the bodies of his rockets and improved their accuracy; and Hale's rockets were considered superior in construction, they were all doomed to failure as reliable weapons due to problems of stability and rapid deterioration. Thus the rocket faded as a viable weapon during the period from 1780 through 1880, in order to return in this century, as the weapon of our times. (See Fig. E)

The fifth cannon to be discussed is the seacoast cannon. These cannon could become quite large; too large to be used in the field. They could protect harbors from attacking ships, and dragged close to enemy forts where they could knock down the massive walls. Some of these cannon had a bore of eight to fifteen inches and could weigh as much as 50,000 pounds. The shells, for these giants were about 300 pounds and used 40 pounds of black powder to fire each cartridge.

Many of these super sized cannon had carriages made of metal, instead of wood. This was another European triciation. The utilization of iron for the carriage made it work better in the rain, plus, the enemy shot would bounce off, rather than destroy the carriage. Many men were required for the operation of these mammoth weapons.

The fine American sea coast cannon, the 10-inch Rodman, is an example of a true American gun. Thomas Jefferson Rodman invented a new method of casting big guns. "This involved casting the gun round a water-cooled core. The inner walls thus solidified first and became compressed by the contraction of the outer layers of metal as it cooled down slowly, thus providing greater circumferential strength," [7] This made the bore itself much stronger and so it could fire many more shots.

Fig. G

(figure available in print form)
"When the United States Ordnance Board recommended the conversion of smooth bores to rifled cannon they also stipulated that all heavy cast-iron guns should in future be manufactured on the principle proposed by Captain T. J. Rodman." [8]

Rodmans defended Washington during the Civil War, and the 15-inch variety remained in America's service till the end of the nineteenth century. See figure A (Fig. A) as an example of the seacoast cannon.

The next piece was considered a new concept in artillery. It became so successful, after its trials in France, that the English copied it. The Americans loved the artillery piece so much, that they could not wait to steal and recopy the French barrel pattern fast enough. By the middle of the Civil War, it was one of the most used artillery pieces on both sides of the conflict. This cannon was the 1857 Napoleon Gun/Howitzer.

The gun/howitzer is a combination gun and howitzer. It can fire straight and far with heavy powder charges,

but it can also be elevated to lob larger type exploding shells at an enemy. A commander now had greater versatility with this piece.

In 1792 Lt-Col. Sir William Congreve-invented the single trail, which in the year 1820 replaced most split trails in England. This important invention filtered into America in about 1840 in time for the American Civil War. Now, weight, cost and construction time could be reduced without sacrificing strength. A single trail is one wooden beam supporting the cannon barrel from the wheels to the ground. The gun/howitzer was designed as a single trail.

Another type of artillery shell was developed and often used with the Napoleon. This shell had no explosive charge. It was merely a tin can filled with 100 or more musket balls about one inch in diameter. When fired from a gun or gun/howitzer, it was more effective than grape-shot, scattering in more directions. It was simply called a cannister.

The guns that we have studied, thusfar, have been of smooth bore. Now, we will introduce the rifle gun to our list of ordnance. The rifle gun has a system of grooves cut inside of the bore of the gun. This system of grooves is called rifling.

“The object of rifling is to impart a twist to the projectile on leaving the bore, thereby giving it a rotational velocity which, increasing its steadiness in flight, extends its range and gives more accuracy.” [9] Though rifling was first performed on existing pieces, such as the six-pounder and the Napoleon Gun/Howitzer, only those made of iron were durable enough to be considered practical under battle conditions.

There were two major rifled guns that were considered standard during our period of study. They were the Parrott and the 3-inch Ordnance rifle. Both had an effective range of over 1,800 yards.

“The Parrott was designed by Robert P. Parrott in the 1850’s and patented in 1861. It consisted of a cast iron tube with a wrought iron band shrunk around the breech at the point of greatest pressure, from the charge within” [10] Though it had a bad reputation among many artillery men, it was much more accurate than the smooth bore cannons.

The 3-inch Ordnance rifle was even better than the Parrott gun. “Made of toughened wrought iron it had no need for a breech reinforcement, and so it tapered evenly from breech to muzzle; in a sleek line “ [11] This gun was widely appreciated and considered a work of art by many. It had a 3-inch bore and fired both, the ammunition designed for it, as well as that designed for the Parrott gun.

Finally we shall discuss the mountain howitzer. A howitzer need not be large. In the 1830’s, the need for a light cannon to go out west and down to Texas was apparent. France built one and the army of America followed with its own version of the mountain howitzer.

Here was a cannon that could be taken apart in three sections,; the barrel, the single trail and wheels. These sections could be packed on three mules in order to travel up and down canyons, cross rivers, and be assembled in a matter of minutes. This howitzer was used to shoot 2 1/2-inch cannon balls at either Mexicans, indians or Confederates; whoever the United States Army happened to be fighting at the time. Look at the water bucket in each cannon illustration and remember that in each illustration the bucket is the same size.

Fig. A

Seacoast Gun

(figure available in print form)

Rifle Gun

(figure available in print form)

This completes our section on major artillery pieces of the period 1780 through 1880. In addition to a brief look at the basic types of cannon of the time, we have presented a summary of the kinds of ammunition used. As you might have observed, the ordnance which we have studied may not have originated in the United States or Great Britain; however they were adopted and in many cases modified and claimed as their own. It can be truly be seen that the gun played a very important part in the history of both countries.

Answers-Pre/Post Test 1

I. Answer true or false to the following.

1. false
2. false
3. false
4. true
5. true
6. false
7. false
8. true
9. false
10. false

II. Circle the correct answer from those given below. Choose either a, b, c, or d.

1. b
2. b
3. c
4. b
5. d
6. b
7. c
8. a
9. b
10. a

Part 11-How We Made a British 3-Pound Field Piece in the industrial Arts Department's Shops

As technology advances and many basic skills become more relegated to automation's processes, a realistic sense of man's accomplishments can be lost forever to the general population. It is our experience that this historical sense can be revived and spread when the departments of History and industrial Arts coordinate and consult to produce a curriculum unit.

History provides a vast wealth of major artifacts for a period study. The various areas of industrial Arts affords graphic and mechanical experiences. A cooperative effort can result in a vital and moving unit of study.

As historical material material was fully presented in the first section; Part II will represent the working portion of the unit. Utilizing the three areas of industrial Arts (planning, wood and metals) we have isolated and constructed a cannon representative of the period of historical study we have chosen. This project, though larger than any scale or model previously done in our classroom, did undergo the same stages of development as any of a smaller scale.

The British Three-Pound Field Piece is one of the guns representative of the period extending from 1780 through 1880. It is very much like the 6-pounder but lighter, smaller and more mobile for use in the field.

We will plan, layout, cut and construct each of the elemental components, where possible. Assembling all parts, the results will be a British 3-Pounder. Each step of the process will be detailed simply, so that a carefully instructed, supervised and teacher-assisted group of students utilizing the equipment which industrial Arts classrooms provide can reproduce a full scale model themselves.

Fig. XIV

3 POUND CARRIAGE

(figure available in print form)

Pre/Post Test II

General directions: Respond to the following as indicated below.

Answers may be found at the end of Part II.

Name the parts of the gun carriage as indicated by the numbers in figure XIV (Fig. XIV).

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Answers-Pre/Post Test II

General directions: Respond to the following as indicated below.

Answers may be found at the end of Part II.

Name the parts of the gun carriage as indicated by the numbers in figure XIV (Fig. XIV)

1. *Axle Tree*
2. *Front Transom*
3. *Elevation Transom*
4. *Elevation Screw*
5. *Trail Transom*
6. *Cheeks*

I

(figure available in print form)

The Cheeks

The Cheeks are wooden planks which make up most of the body of the carriage for the British 3-Pound Field Piece. Two pieces of white oak measuring 3”x14 ”x8’ were used for the layout of the cheeks. These two pieces of oak were then layed out for cutting by the students and instructor of the drafting class. The cutting out of the cheeks was done on the band saw. After they were cut, rough filing was done in order to bring the overall dimensions of the cheeks to the specifications of 3”x9”x7 1/2’ as illustrated in figure 1 (Fig. 1). As this carriage was designed as a split trail, the two cheeks will have an angular separation of three degrees.

Layout for the holes in the cheeks to accommodate the Front Transom and the Trail Transom was next. For the front transom, the hole had to be one-half inch in diameter, and located two inches from the bottom of the front of the cheeks and five inches in from the edge. (See Fig. II). For the trail transom, the hole had to be 5/8 of an inch in diameter and located at the end of the cheeks; two inches from the top of the end edge and 7 inches apart. (See Fig. II). Drilling of these holes was done on the drill press of the wood shop by students and the instructor.

II

(figure available in print form)

III

(figure available in print form)

Front Transom

The Front Transom is a piece of wood positioned between the cheeks at the front end of the carriage. Its purpose is to support the front end of the barrel, called the Chace. The wood for the front transom is white oak, measuring 4”x8 1/2 ”x3”. Layout for the 3 inch radius is 4 1/4 inches on center. (See Fig. III, front view). The hole location is 3 1/2 inches on center and 1 1/4 inches up from the bottom edge. (See Fig. III, side view). The drilling of the 1/2 inch hole was done on the drill press and the cutting of the 3 inch radius was done on the band saw.

IV

(figure available in print form)

Trail Transom

A three degree separation of the cheeks is required to meet specifications for this split trail carriage. The trail transom is a piece of wood used to establish this 3’ separation of the cheeks, and also to establish the pivoting point at which the gun carriage is turned or carried. The wood for the trail transom was white oak, measuring 10 ”x11 1/2”x3”. The two hole locations had to be layed out on the edge of the wood; 3 inches from the end, 7 inches apart and on a 1 1/2 inch center line along the edge. These holes are 5/8 of an inch in diameter and are drilled all the way through from edge to edge on the drill press. Layout of the 3’ taper was then don on the Trail Transom, and then cut on the band saw. Layout for the cutting of the 10”x11 1/2”x3” piece to 10”x10”x3” was done, and cut on the band saw, thereby, splitting the 5/8 inch hole in half and establishing a 5/8 inch radius groove on the end 5/16 of an inch deep. This was necessary in order to provide a grooved slot for a bolt support. (See Fig. IV). This was done on the band saw. Layout for the Pintle hole is located on the trail transom; 5 inches on center and 8 inches from the top surface edge. Since the pintle hole is a tapered hole, diminishing from a 3 inch diameter to a 1 1/2 inch diameter, a 1 1/2 inch auger bit and brace was used to bore the 1 1/2 inch hole. A wood chisel and mallet was used to carve the 3 inch tapered hole, forming the diminishing pintle hole. (See Fig. IV).

V

(figure available in print form)
VI
(figure available in print form)

Blind Joint in Cheeks

A rectangular blind slot had to be layed out on the inside surface of the cheeks. The size of this blind slot is 4 inches long, 1 inch wide and 1 1/2 inches deep. The cutting of this slot was done with a router. Two holes for bolting had to be layed out for drilling The holes are 7 1/2 inches apart on center and 36 inches from the front end of the cheeks. A 5/8 inch drill was used to drill these holes on the drill press. (See Fig. V).

Elevation Transom

The Elevation Transom is that part of the carriage used to raise or lower the barrel for aiming. It is made of white oak with a one inch square thread nut inserted in the center, to carry the 1”x13” elevation screw. (See Fig. VI). The elevation screw is centered on the Ogee Ring of the barrel. A piece of white oak is cut 6”x12”x2 1/2” and then layed out for a 1 inch hole to be located 6 inches from one end on center and 2 inches down from the side edge on center. Drilling of the 1 inch hole is done on the drill press. Then layout for the Blind

Joint was done on each end. The depth was 1 1/2 inches, the length was 4 inches, and the thickness was 1 inch. The cutting was done on the band saw. A 1 inch square thread nut had to be inserted into the Elevation Transom. A wood chisel and mallet was used to cut out the four corners to accept the one inch square nut. The 13 inch Elevation Screw was then inserted to check balance and centering. The nut was then drilled and pinned to secure it in the Elevation Transom on the drill press. (See Fig. VI).

VII

(figure available in print form)

VIII

(figure available in print form)

The Front Transom, Elevation Transom and Trail Transom are bolted in place on the cheeks. (See Figs. VII and VIII). It is at this point that each transom is checked for proper fit, balance, and establishment of the 3 degree separation of the cheeks. The reproduction 3-pound British barrel was placed in position on the cheeks to locate position of the Trunnion slots on the cheeks, and also to locate the position for the Axle Tree. The carriage was then broken down for layout of Trunnion slot, and the Axle Tree on the cheeks. The Trunnions of the barrel set into slots on the cheeks and is locked in place with Cap Spans. The Cap Spans hold the barrel on the carriage when it is being fired or moved. The Axle Tree is bolted to the carriage which houses the wagon wheels so that the carriage is movable. (The main reason that the British field guns were so important, was mobility).

Trunnion and Axle Tree

The Trunnion slots' location is 14 inches to center of the Trunnion radius, and the radius is 1 1/8 inches. The location is layed out on the top edge of the cheeks and along the side. Cutting was then done on the bans saw. Rough and smooth filing was done to assure a proper fit.

IX

(figure available in print form)

X

(figure available in print form)

The Axle Tree location is layed out on the bottom edge of the cheeks, 13 1/2 inches in from the front end of the cheeks. A 5 inch slot 1 inch deep and three inches wide is layed out and cut on the band saw. This slot is for the Axle Tree. (See Fig. IX).

U Bolt, Lock Bolts, Cap Spans

The U Bolts secure the pivoting end of the Cap spans. It bolts to the bottom edge of the cheeks. It is 11 1/2 inches long and 3/4 of an inch in diameter. Soft or mild steel was selected and layed out for a 3 1/2 inch bend of 180 degrees on a 3/4 inch radius. The U Bolts also had to have a 3/4-10 National Coarse threads 4 inches long on the other end. After layout, one end of the rod was heated and forged to form the 180 degree bend. It was then cooled in water and hand threaded on the other end with a 3/4-10 N. C. Die. (See Fig. X). This was done by the instructor and students of the metal shop.

XI

(figure available in print form)

XII
(figure available in print form)

Lock Bolts

The Lock Bolts hold the pin which enables the Cap Spans to be lifted, so that the barrel can be removed or placed onto the carriage. It also holds the Axle Tree to the carriage. It is 15 inches long. 3/4 inch mild steel rod was selected and layed out for 5 inches of threads on one end and forging on the other end. The rod was heated and forged to a thickness of 3/8 of an inch; cooled in water and cut on the metal band saw into a diamond shape. A 5/16 hole was layed out and drilled on the drill press. A 3/4-10 N. C. die was used to make the hand threads on the other end 5 inches long. (See Fig. x).

Cap Spans

The Cap Spans were commercially casted without the holes for the U Bolt and the slot for the Lock Bolt. A 3/4 inch hole was layed out and drilled on the drill press at the pivot end of the Cap Spans. The 3/8 inch wide slot 1 1/2 inches long was layed out and milled on the Milling machine, with a 3/8 inch End mill cutter. (See Fig. X).

Axle Tree

The Axle is made of two pieces of angle iron measuring 2”x2” and 36 inches long. The angle irons are Arc-welded together to form a square tube 2”x2”x36”. The Axle Square ends or wheel Axles were layed out next. The wheel axles are square on one end in order to fit inside of a 2”x2”x36” square axle. The other end is tapered. Two pieces of mild steel 3 1/2 inches in diameter and 15 inches long was selected for this purpose. 3 inches on one end had to be layed out and milled square to fit inside of the axle. This was done on the milling machine. The tapered end was turned on a metal lathe to fit inside of the wagon wheel hub selected for this size carriage. A 1/4 inch hole was layed out and drilled 1 inch up on the wheel axle taper. Drilling was done on the drill press. The wheel axles were then arc-welded to the 2”x2”x36” axle, forming the Axle Tree. (See Fig. XI). For extra strength the axle tree was wrapped with white oak on three sides. A 5”x4”x36” piece of white oak was selected. It was layed out to have a 2”x2”x36” square, cut out of the center, to accept the 60 inch Axle Tree. The table saw with Da-do blade attachment was used to cut the 2”x2” square in the wood. The 3/4 inch holes for the Axle Tree to be bolted and mounted on the carriage with the Lock Bolts were layed out and drilled on the drill press. (See Fig. XII).

The carriage was then re-assembled with the Front Transom, Elevation Transom, Trail Transom, U Bolts, Lock Bolts, Cap Spans, Axle Tree and wagon wheels in place. To save on cost many of the decorations or decorative iron work was done by the metal shop teacher, as the students looked on. Painting of the carriage and various other metal parts were done by students and staff in the Industrial Arts department. (See Fig. XIII for the completed carriage)

The Reproduction 3-Pound British Barrel

This Reproduction Barrel was ordered for this project by a Gun Smith who specializes in artillery. The Basic parts of a barrel for the British 3-Pound Field Piece are as follows: (A) Muzzle, (B) Chace, (C) Trunnions, (D) Vent Hole, (E) Ogee Ring and (F) Cascable. There are few companies where barrels, parts, carriages and completed cannons can be ordered. Here are two:

Ashe Ordnance Works
P. O. Box 29
Glendale Springs, N. C. 28629
Dixie Gun Works
Union City, Tenn. 38261

There are other cannon projects which can be utilized that are not as involved or complex as this one but serve the purpose just as well.

XII

(figure available in print form)

XIII

(figure available in print form)

Notes

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1. Melvin L. Barlow, *History of Industrial Education in the United States* (Peoria, 1967), p. 36
2. Harold L. Peterson, *Round Shot and Rammers* (New York, 1969), p. 1
3. *Webster's Unabridged Dictionary* (Springfield, 1968)
4. Major-General B. P. Hughes, *Firepower: Weapons Effectiveness on the Battlefield, 1630-1850* (London, 1974), p. 34
5. Ian V. Hogg, A History of Artillery (London, 1974), p. 54
6. Colonel H. C. Rogers, *A History of Artillery* (New Jersey, 1975), p. 205
7. Brigadier O. F. G. Hogg, *Artillery: Its Origin, Heyday and Decline* (Hamden, 1970), p. 86
8. *Ibid* .
9. Hogg, *Artillery: Its Origin, Heyday and Decline* p.80
10 Peterson, *Round Shot and Rammers* p.94
11. *Ibid.* p. 95

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