



Guide to the  
ESSEX COMPANY BLACKSMITH SHOP  
c.1883

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Photo credits: Taken by Robert Lussier in the Essex Company Forge

Front cover: Blacksmiths Richard Wright and Steven Ash

Title page: The Ladder

Back Cover: Anvil

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## **The Essex Company Blacksmith Shop Collection**

The blacksmith shop was built in 1883 as part of the Essex Company Compound. The Company's blacksmiths fashioned and modified metal components to meet the Company's many needs throughout Lawrence. Items as small as nails and as large as the hinges on the main gates of the canal locks would have been made here.

The method used by the blacksmiths was fire welding, the only method known at that time for fusing and shaping metal. In the 1920's and 30's, electric welding became more common in larger industries; but smaller places like the Essex Company blacksmith shop most likely continued to fire weld for a number of years. Metal would be heated in the forge's coal fire and shaped on the anvil, using the smithing tools kept close at hand. The metal working tools you see in the blacksmith shop are original to the shop and were used by the Essex Company employees for many years.

The following pages illustrate some of the many tools and pieces of hardware that were found in the blacksmith shop. There are over a thousand items in the Essex Company Forge Collection, many of which are handmade. All played a part in the development and ongoing maintenance of the Essex Company property in Lawrence.

The artifacts you see in the blacksmith shop are a representative sample of these many items.



### 1—Strap Hinges

Strap hinges were used on large doors or gates. They would have been hand forged by the blacksmith, and likely made to order. There are various sizes and shapes of strap hinges. The hot iron was beaten into shape, using a variety of tools. We can see that the thickness changes throughout the hinge. These hinges would hold a gate approximately the size of those at the entry to the Compound's courtyard.

### 2—Square Headed Lag Bolts

These were used to secure wooden items, mostly heavy planking, and large timbers. There are a variety of sizes among the bolts in the Collection inventory. Some would have been purchased, not made here in the Essex Company forge. There were bolt manufacturers in Boston who specialized in these types of heavy bolts.



### 3—Plate Washers

This is a sampling of plate washers made of iron or steel. They are made square because the blacksmith started with a flat bar and the squares were easier to work with and easier to produce. Round washers emerged much later.



#### 4—Square-Headed Bolts

These were made here at the forge, and not commercially produced. The technique to make the square headed bolts is called “upsetting”. The blacksmith takes a steel rod and heats it enough to fashion a square at one end. The variety of sizes tells us they were made to order to fit the customer’s need. These are as small as 6”, going up to 18”, but could even be bigger. Bigger sizes may have been too large to make here at the Essex Company Forge. It is possible that the larger sizes were made at the Essex Company Machine Shop. It is obvious that they are made by hand because the head is not a perfectly formed square.



Some bolts were used to fit in a slot on a machine, or a sluice gate control, to lock it in place. Square headed bolts were the norm because they were easier to produce and work with. Today bolts of this nature are hexagon. When you turn a hexagon bolt with a hexagon wrench you turn it 60 degrees. When you turn a square bolt with a square wrench you had to turn it 90 degrees. This was a more difficult and less efficient process.

#### 5—Round -Headed Bolts

These round headed bolts look imperfect, so they were probably made here at the forge. These may have been used for mounting wood. The head is like a countersink, meaning the bolt would be flush with the surface and wouldn’t protrude above the surface it was bolted to.



#### 6—Spikes

These spikes have a chiseled end to drive it into the wood. Some others would have a diamond-shaped point, and others a flat point. The shaped point prevented the wood from splitting as the spikes were driven in. They were made here at the Essex Company forge.



## 7—Eye Bolts

These eye bolts were mostly all hand produced here at the forge. They were used for securing cables, and in some cases, securing chains. Many times they had pulleys attached to them. Various sizes were fashioned depending on the intended use. The blacksmith took the steel, drew it down to make it narrower, folded it up and looped it, then fire welded the 2 ends together. This added strength to the bolt. and was the only technique known in the late 1800's.

Take a look at the eye bolt sticking out of the forge. It is in the upper right corner of the exterior front wall.



## 8—A “Pin” for a Smaller Gate Hinge

This is a pin for a smaller gate hinge. We can see how it would fit into the hinge on item 1, although that particular hinge is made to a larger scale. This pin was punched and fire welded. The blacksmith would heat the metals to a high temperature and then beat them together to form a single piece.



## 9—Spike

This is the same as item 6 except the body of the spike is round stock as opposed to square. The length and diameter would vary depending on the function the spike was being fashioned for.



## 10—Hand Drills

Hand drills were used for cutting stone. These were likely made here at the forge, although hand drills were produced commercially at the time. They would get dull very easily. The blacksmiths would constantly have to sharpen and maintain the hand drills, probably on a weekly basis, for the workers building the canals and the dam. The process of cutting stone was tedious and dangerous. The mason would hold the drill with one hand and with the other hand he would strike the top of the tool with a hammer. He



would slowly rotate the drill, hitting the top with every rotation. It was literally a hand operated drill.

The larger drills would require 2 workers. One person would hold and slowly spin the drill while the other would strike it.

### 11—Hand Punches and Chisels

Hand punches and chisels were used in the blacksmith shop to puncture hot steel and some were used as part of the process of splitting stone. When ledge was to be dynamited, a worker would use the chisel to create a hole in the stone and then dynamite would be stuffed into the hole along with a fuse.

There are a variety of shapes and sized of hand punches and chisels in the Essex Company Forge Collection.



### 12—Teeth or Tines

These may have been used as part of a rake. There are several possible uses for these rakes, including dragging debris out of the canals. The irregularities tell us the tines are handmade. We can't tell if they were used in their current condition or if originally they were sharper and have just worn down over the years. We can tell these were made as replacement tines based on their threading and collars.



### 13—Wide Hand Chisels

The sharper chisels were used to shave wood and the wider, thicker ones were used to "face stone" which was the process of smoothing and evening off stone to be used as steps or window ledges.



## 14—Chain Links and Eye Links

Links were used in tasks like hitching chains to equipment, or to fasten items to each other. The oval shapes are chain links, linked together to create different lengths of chain. They were fire welded here at the forge.



## 15—Wood Drill/Wood Auger

At 4 feet long, this was probably used for drilling through large timbers or beams used in building the mills or the head gates at the canal locks. This drill was most likely turned by hand.



## 16—Square Headed Bolts

4 feet long. These are similar to items 4 and 5.



## 17—Hand Drills

These drills are much longer than those item 10. When the workmen were drilling through granite, they would start off with a 12 inch drill. As the hole became deeper, they would need a longer drill. A 2 foot hole would take several hours to drill.

This tool could also have been used to pin/ hold rocks together to form a retaining wall in the canal.



### 18—Bull Points

These are also drills, used in a similar fashion as item 17



### 19—Funnel

The blacksmith would have poured hot metal through this funnel, possibly to fashion babbitt bearings for large machines and the shafts that provided the power to the early textile looms.

“Babbitt” is a very soft metal that melts at a low temperature. The blacksmith could cut hardened babbitt with a knife or a sharp chisel.



### 20—Poker

This tool was used to tend the coal fire in the forge and to break up the clumps of coal in the fire. The poker hung on the wall, right next to the forge (coal pit), along with other tools used frequently by the blacksmith.

### 21—Star Drill

This drill is more creative than items 10 and 17. It has more cutting edges at its base. Star drills provide a more consistent diameter and a better hole than the single edged hand drills.



### 22—Flattening Tool

This is used to shape hot iron, or to possibly to size a hole. The blacksmith would hold the hot iron in place on the anvil and his helper would hit it with the flattening tool, driving it right through the hot steel.

### 23—Hex Wrench

These wrenches were probably used on a 2 inch bolt, possibly to open gate valves on a sprinkler system or fire hydrant.



## 24—Saddle

Saddles were used to reinforce wooden beams that had developed a split. Carpenters would install the saddle to keep the split from enlarging, thus eliminating the need to replace the beam.



## 25—U-shaped Hanger

Based on the shape of this object, it appears to have supported a piece of pipe. This item is unusual in that it's made out of a single piece of metal.



## 26—Hinge Pin

This piece has been broken off at the top.



## 27—Hand Made Spikes

These were most likely made here at the Essex Company forge. There are many sizes of spikes in the Collection.



## 28—Nuts and Bolts

These were most likely used in the maintenance of the canal. The variety is endless. Standardization wasn't a common practice in the late 1800s. Every item was unique and made to order.

Blacksmiths constantly made whatever was needed, hence the wide varieties of hardware items found in the Essex Company Forge Collection.



## 29—Bolt

This is an "L" anchor. It was intentionally bent 90 degrees for a specific purpose and did not just bend with time and use.





### **30—Adjustable Metal Vise**

This tool would hold an item that was being worked on. It could be adjusted by turning the wing nut on the left side.

### **32—Assorted Nuts / 32—Assorted screws with various sized shafts and threads**

As with other hardware categories in the Collection, there many sizes.

### **33—Assorted Bolts With Various -sized Shafts and Threads**

Again, there are many sizes of bolts in the Collection.



### 34—A Variety of Drill Bits

These were probably used by the Essex Company carpenters.



### 35—Ratchet or Rack Adjustment

Those with handles were held by blacksmith's assistant while the blacksmith would do the striking, essentially "forming" the heated metal. Some are mounted on wooden handles. The wood acted as a shock absorber, reducing the vibration for the holder. Those without handles would be placed on the anvil as a tool holder. Those placed on the anvil were used most often.



### 36—Hand Forming Tools

This hand tool may have been used for spreading or compressing coil springs. Can you notice a difference between the handmade tool on the left and the machine-made tool on the right?



### 37—Handmade and Machine-made Tools

### 38—Various Specialty Washers

These washers were made to go on bolts. These are more heavy duty than normal washers and would be used for large diameter threaded bolts, components of large machinery.



### 39—Hand Drills or Pinchers

These are used to keep a hole open while working on a piece of hot metal or to create a hole with a specific diameter. There are many sizes and shapes in the Collection since various sized holes were needed.



### 40—Adjustment or Ratcheting Tool

This tool is a measuring /adjustment device used when cutting several pieces of steel that needed to be uniform. It would have been used as a gauge when working with hot metal and wouldn't melt. The openings are incremental rather than random, much like a ruler.



### 41—Handmade and Machine Made Cotter Pins

Cotter pins are a type of fastener and won't back out as can happen with threaded fasteners. The benefit of using these is that you are almost always assured that the pin wouldn't fall out. Notice the hammer marks on some of them which indicate they were handmade. These were likely produced right here in the Essex Company forge



### 42—Pipe Clamps

These are pipe clamps of various sizes. Some are handmade.



### 43—Butterfly Drill or Reamer

These may have been used to size a hole in hot metal or to smooth the inside of a hole that was already drilled.





**44—Several Handmade Items**

Left: A handmade tool, possibly used to incise wood.  
 Middle: "Door Latch" very, very old  
 Right: "Tool/Gouge" Reddish colored



**45—Hot Punches**

The blacksmith would heat steel, place this tool on the hot steel while the assistant would pound the head of the punch with a sledgehammer. The pointed end would "punch" a hole through the red hot metal. There are various diameters of punches in the Collection.



**46 and 47—Blacksmith Cross Pein Hammers**

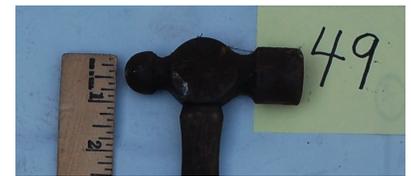
These hammers were used to flatten out hot metal into specific shapes and sizes. The hammers could also be used to cut through metal.



### 48 and 49—Ball Pein Hammers

### 50—Forming Tools

The circular one on the left is a riveting tool. It forms a round rivet head when it is beaten into hot steel. One with the cross hatch is also a forming tool. It would be used to strike two intersecting hot rods or metals to fuse them together.



These are very typical tools of the blacksmith's trade.

### 51—Axe Head

This axe head is hand forged.



### 52—Double-Headed Hammer

This would be used to drive spikes. Its shape provides a more concentrated blow than a hammer with a rounded head.



### 53—Eye Bolts

These are handmade and very strong. There are a variety of handmade hooks and chainlinks, in the Essex Company Forge Collection and they had multiple uses, such as securing boats in the canal or lifting gates in the waterways.





**54—Block and Tackle**

The Essex Company Forge Collection contains various sizes of these tools. They would have been used to lift trap doors, among many other items. The small ones could be used to hold up the very heavy old wooden windows. The larger ones could lift several hundred pounds or more.



**55—Oar Lock**

The item on the left is used to hold an oar on a row boat. Notice how it is thicker on one side That is where the largest amount of stress would occur on the metal.

**56—Metal Support**

The item on the right may have been used to support a pipe.



**57—Representative grouping of metal brackets and supports from the Essex Company Forge Collection.**





**58—Some of the Essex Company tools in the Collection.**

**59—“SX” (Essex) stamp used to mark some of the items made in the Essex Company forge.**

Some of the tools with “SX” stamp marking.





## 60—Anvil

This flat piece is the surface upon which the blacksmith would pound and shape hot metal.





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