Aiglets: Medieval, Post Medieval, and Modern

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Section 1: Basics

Scope

This paper will discuss functional aiglets that would have been in use during the 16th century, specifically, the Tudor period in England. Though some decorative aiglets are referenced in this paper, it will not cover these in detail, as that discussion is more appropriate to a more general discussion of historical jewelry manufacturing techniques. The manufacturing of aiglets for use by re-enactors will also be discussed as a way to determine how aiglets may have been manufactured during the 16th century in England.

Figure 1 Modern Aiglets

Aiglets, lace tags, chapes, are all terms that describe items that are in some way used to finish the end of laces, thongs or cords. Aiglets still are in use today in the 21st century where they are utilitarian as well as decorative elements on laces for shoes, corsets and other clothing.

Many people will recognize the plastic and metal ends on the laces pictured in Figure 1 as modern aiglets. Aiglets from the late medieval period would not be much different from the metal aiglets in Figure 1. Such a common item would have been manufactured in large quantities and as such would be made with a very efficient manufacturing process.

[1]

The Late Middle Ages is often considered to begin in 1300 with some scholars putting the date as late as 1450 as the start of Late Middle Ages. The end is also debatable as it may be from 1500 to 1650. For the purposes of this paper, the dates of the Late Middle Ages will be from 1300 to 1650.

For the purposes of this paper, the following dates will be used. The Medieval era is approximately from AD 600, the fall of the Roman Empire, to 1485. The post medieval era is 1485, the establishment of the Tudor Dynasty, to 1750, the start of the industrial Revolution. The Modern era is from 1750 and later.

Definitions

Aglet (ag let) or aiglet (aig let). Metal sheath or tag at the end of a shoelace or ribbon tie, to facilitate threading. Much used in 16th and 17th century costume. Later any ornamental pendant; sometimes a small image. Also written aiguillet. From French word aiguille, meaning needle.[2]

Aiguilette (ai gwi let or F. ai-gwee-yet). Aglet or ornamental tag; also, trimming or looped cords, as on military and navel uniforms.[3]

Aiguillette (French, from aiguille, needle) A broach or earring decorated with a series of cascading gemstones of diminishing size, terminating in a thin, tapering, pointed stone. The style is also known as EN PAMPILLES.[4] Just for clarity, the word "aiguillette" is a jewelry term and can be confused with the word "aiguilette".

Aiguilletiers (French, /e.g?ij.tje/, ou aussi /?.g?ij.tje/) A person who makes aiglets.

Chape, Crampet. A metal tip that strengthens the end of a scabbard, or the termination of a belt or girdle. In Heraldry it is called a crampet. (Planche 89). From "A glossary of the construction, decoration and use of arms and armor"[5]

Point 1. Tapering tip of something pointed; as, pin point. 2. Tie or lace, as of leather or ribbon, finished with metal tab or aglet at ends. Originally, used to fasten together parts of costume; later tied in bows for trimming.

Authors notes:

Some authors separate the word "aiguilette" out as a purely ornamental item. "Aglet", "aiglet", "aiguillet" and "aiguilette" all describe the same type of object. The differences seem to be the language used, (English versus French) and the century the word was used in.

It is in later years, the 16th leading into the 17th century that aiguilette's became less functional and more decorative.

Aiglet (Chapes) Terminology

Geoff Egan and Frances Pritchard have made some very clear and easily understandable diagrams to visually show what they describe when discussing aiglets.[6] I have proposed an additional image for the 'Cut Tabs at End' as some extant aiglets have ends like this.[7]

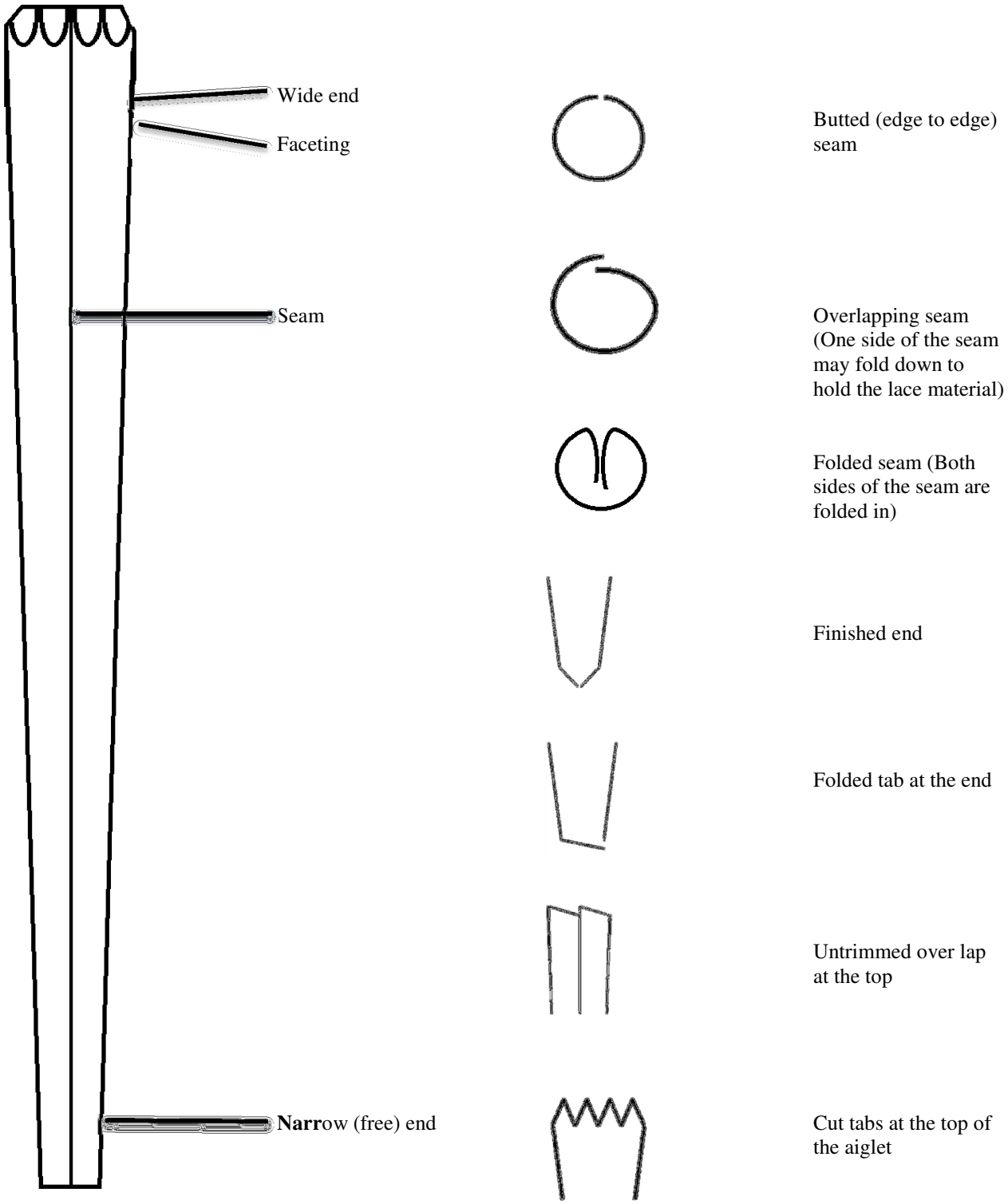


Figure 2 Aiglet terminology

Aiglet Types

The current definition of aiglet types used by scholars today is:

Type I is of slightly tapering form with the lace secured by a transverse rivet at the top, and the edges overlapping only at the base (according to Oakley, mainly 15th century, with some of 16th and 17th-century date). Type II is cylindrical in form, securing the lace along its length, with both edges folding inward to grip the lace (according to Oakley, mainly 16th and 17th centuries). Type III (not Oakley) is cylindrical with edges overlapping along its entire length and is much less common.

The above classification scheme is problematic as the descriptions are too inclusive and at the same time exclusive. For example, a tapered aiglet with a transverse rivet, securing the lace along its length, with both edges folding inward to grip the lace would count as both a type I and type II aiglet under this classification. And it is also excluded as a type I and type II aiglet under this classification.

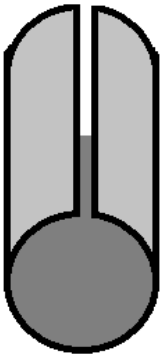
The shape of the aiglet (I.E., whether tapered or cylindrical) is not clearly addressed and both shapes could be grouped together in the above scheme. This system also utilizes attachment methods to help define the types. While there currently does not appear to be evidence to support a discussion of attachment methods as a method of determining classification and provenance, additional research into the topic is warranted.

There is no simply logical way to classify the different forms aiglets take as the current system developed over time. Aiglets made from materials other than sheet metal, decorative, and non-metallic materials need to be addressed. While copper and copper alloy aiglets were very common, there is little mention in print about aiglets made from materials such as wire, cast, or made from other metals or non-metallic materials.

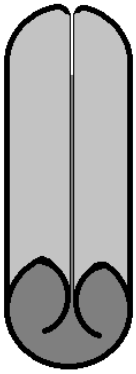
Under the above classification there is too much overlap in the classification for aiglets therefore I propose the following definitions for types of aiglets.

- Type 1 aiglets have a seam defined by the edge of the metal butting against each other along the majority of the seam. The edges may overlap for a short distance at the base and/or the top of the aiglet.
- Type 2 aiglets have both sides of the seam folding inward to grip the cord or lace along the majority (75% or more) of the seam.
- Type 3 aiglets have an overlapping seam where one side of the aiglet overlaps the other side along the majority (75% or more) of the seam. One side of the seam may, or may not, be bent in to hold the cord or lace.
- Type 4 aiglets are cast, forged, or are made from solid metallic materials other than sheet.
- Type 5 aiglets are manufactured from non-metallic materials. (bone, horn, stone, pottery, amber, etc.)
- Type 6 aiglets are purely decorative and are not functional. They may be similar to any other style of aiglet in manufacturing.

Type 1 aiglets have a seam defined by the edge of the metal butting against each other along the majority of the seam. The edges may overlap for a short distance at the base and/or the top of the aiglet.



Type 2 aiglets have both sides of the seam folding inward to grip the cord or lace along the majority (75% or more) of the seam.



Type 3 aiglets have an overlapping seam where one side of the aiglet overlaps the other side along the majority (75% or more) of the seam. One side of the seam may, or may not, be bent in to hold the cord or lace.

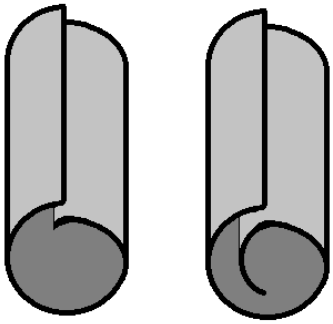
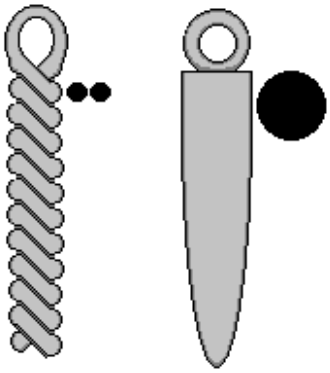


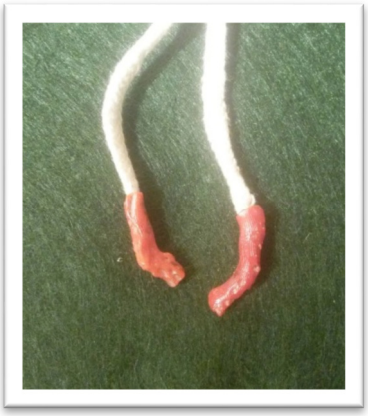
Figure 3 Visual description of aiglet types

Type 4 aiglets are cast, forged, or are made from solid metallic materials other than sheet.



Type 5 aiglets are manufactured from non-metallic materials. (bone, horn, stone, pottery, amber, etc.)

Type 6 aiglets are purely decorative and are not functional. They may be similar to any other style of aiglet in manufacturing. This set is made from red coral.



History of Aiglet Manufacturing

The history of aiglets in England extends from the 6th century as a simple utilitarian item, to the late 17th century when they became mostly a decorative item. There are many different styles and types of aiglets. Some are tapered, some are hollow tubes, and some have the metal edges folded in to hold the cord. Some are meant to be used on everyday clothing and are plain in design while some are purely decorative.

Online searches provided plenty of examples and images of extant aiglets from the 13th to the 18th centuries but yielded very little in the way of instructions on actual historical manufacturing processes

A few websites provided instruction on modern tools and materials. A video on YouTube shows a young man making an aiglet at his computer desk with basic tools.[8] For a very small amount of aiglets, his instructions using a hammer and smooth-jawed pliers will produce aiglets that are useful but the process is very slow. While he produced finished aiglets, this process is problematic because pliers leave many marks and dents that would be hard, if not impossible to remove from the thin metal after forming. Additionally since many aiglets are made from metal with a design stamped onto the metal before forming, craftsmen would have to remove a large portion of the design while trying to remove tool marks. Finally, the speed with which he made these would preclude making large numbers of aiglets every day.

A search to discover if there was any information available on the manufacturing processes for aiglets during the 14th century to modern times yielded almost no information at all. One woodcut shows men making leather points with metal aiglets but the detail is not enough to draw clear conclusions about the processes they are using.[9] Leather point makers would be able to purchase hides and cut them into thin strips to use for points. In the illustration above, the image seems to indicate that the workers are making type 2 or type three aiglets. Were these done by the same craftsmen who made type 1 aiglets?

Points made from linen, silk, or lace are more complicated to manufacture, they most likely were made by specialists and the cords sold to the point manufacturers in bulk. In addition, Type 1 aiglets were made and then normally attached to cords or lace after they are made while type 2 and 3 aiglets were often formed around flattened lace tubes or flat ribbons.

Manufacturing during the late medieval period was very much controlled by guilds and so there would be very little, if anything, published about actual processes and techniques. Documents from France in the 18th century show that there were many guilds and extensive regulation of men and women who made aiglets.[10]

Manufacturing of aiglets during the Late Middle Ages was different from modern methods in several ways mainly due to the availability of tools and the lack of mechanization. Keeping the nature of guild and trade information confidential would play a part also. We may never know for certain the true manufacturing techniques used in the late middle ages but by examination of aiglets from the 14th to18th centuries as well as an examination of extant drawings and paintings, we can infer methods that are likely very close to medieval manufacturing methods.[11] This paper will attempt to fill in that knowledge gap with a combination of research and experimental production of aiglets.

Aiglets were made from base metals such as copper and its alloys (brass and bronze), pewter, lead or precious metals. The base metal aiglets, from the number that are found during excavations in Great Britain, were common items that were made by craftsmen that did this as a full time profession in the 16th century and later. It is reasonable that they were also made by specialized craftsmen in earlier centuries as well. It is possible that they were never written about because they were such a common item. Aiglets made from precious metals would most likely be made in a goldsmiths shop and as such be described separately in documents about goldsmithing. There are several descriptions in Queen Elizabeth's day books regarding accounts of aiglets being returned to goldsmiths for repair and replacement of lost aiglets.[12]

Copper Alloys, Latten and Other Metals

Most craftsmen and metalworkers understand the basic definition of an alloy.[13] An alloy is created when a craftsmen or metalworker combine two or more metallic elements in order to have a metal with specific qualities. These can include greater strength, workability, color, or resistance to corrosion. Basic science has led to very exact terms and formulas for making alloys modern alloys where we can determine the ingredients down to billionths of a part.

Even as late as the during the 16th Century in England, the science of metallurgy was in its infancy and without being able to test the content of metals mined for secondary metals, mixing alloys was more of an educated guess.

Many times, when an extant aiglet is described as being a "copper alloy", what that means is that the person recording the object, is making an educated guess as to the metal content. Until detailed testing is done, that is usually enough to satisfy most studies.

Through many centuries, copper alloys were loosely grouped together and called by various names. Depending on the time and place, the same word could mean copper, brass, bronze or any alloy of these. Latten was a very common name applied to alloys of copper that contained zinc (bronze) but it was also used to describe many different alloys. By the time of the 16th century, there was some consensus on the names of metals. So when documents from the 16th century speak of brass, bronze or copper, it is fair to assume that the metal alloy was reasonably correct for the description. The following quote reveals one particular recipe for Latten.

"The contract for the mid-15th-century effigy of Richard Beauchamp in St. Mary's Church, Warwick, specifies 'the best latten' and analysis has shown this to be a copper-zinc-tin-lead alloy: 84.3 per cent copper, 9.4 per cent zinc, 3.3 per cent tin, 1.4 per cent lead, and the remaining c. 1.5 per cent nickel, iron, antimony, arsenic and silver."[14]

Extensive reuse of old items further makes it hard to determine what metals were used to make aiglets. Scientific metallurgical analysis of extant aiglets has been hard to find but there is some information of this kind.

Section 2: Medieval

Anglo-Saxon Aiglets

Some of the earliest references to aiglets were in Anglo-Saxon England. Page 46 of "Dress in Anglo-Saxon England" shows a ferule from a possibly cosmetic brush.[15] This looks very much like an oversized aiglet. Is it possible that someone who made brushes had a pair of very small ferules on hand and thought to use them on the end of laces, hence, a new product is created.

The earliest mention of aiglets I can locate is in this the following:

"Apparently the only survival of pagan Anglo-Saxon footwear so far recorded is a lace-tag containing 'worsted thread' found in a sixth-century grave at Chessell Down, Isle of Wright.".[16]

I have not yet been able to locate a picture or drawing of this item.

It is possible that lace tags (aiglets) were used on drawstrings for necklines also. There is no extant evidence for this but two drawings do suggest this.[17]

Section 3: Post Medieval

Images of Jewelry Workshops in the 15th and 16th Century

There are very few images showing what the inside of a workshop for the manufacturing of aiglets. There is one woodcut showing men cutting leather laces and making aiglets but there is very little detail (See Figure 9). There are several 16th century images of workshops that make jewelry, pins and needles. Many of the tools used in the manufacturing of aiglets could be found in any of them, as they are all for manufacturing small items of non-ferrous metals. The type of image that provides the best information about what tools were available during the late medieval period detail would be either drawings, engravings or painting. For additional information, the following books are recommended. 'The Archaeology of York: Volume 17: The Small Finds' as well as 'Craft, Industry and Everyday Life: Finds from Medieval York'.[18] [19]

The discussion of what tools were used to manufacture aiglets needs to start here with what images that can be found. A bench jeweler is in the unique position to look at these different paintings, engravings, illustrations, and images to determine which are accurate portrayals of tools and processes, and which are composed simply for esthetic value.[20] The books recommended above have many tools that could have been used in the making of aiglets and jewelry.

Having knowledge of modern jewelry manufacturing processes and being knowledgeable of historical manufacturing techniques, and by experimentation using only the tools and methods of manufacturing that would have been available in the 16th century will provide an accurate idea of what could have been done. Being able to examine a small item such as a piece of jewelry or an aiglet, and being able to interrupt the marks left by tools during the manufacturing process is very important. Marks and impressions left by the manufacturing process hint at the tools and techniques used.

Being able to look at the archeological record and identify the tools used in the manufacturing of an item is helpful but it does not completely inform us about the processes used in the manufacturing of that item. This is where experimental archeology becomes a useful tool. However, we must consider two important points from experimental archeology.

First, modern anachronisms diminish the legitimacy of the experimental process.

Second, fully authentic equipment and materials are hard, if not impossible to document further reducing the weight and substance of any arguments for a particular process.

By carrying out repeated experiments, we address the above points.

Each time we experiment, we can narrow down the possible processes that might have been used. Each time, with each refinement in the process, we learn what works and what does not. Each time we raise new questions while we answer others. Eventually, by repeating this experimental process we will reach a point where more questions are answered then raised. It is this experimental archeology that will lead to the statistically probable manufacturing processes we are looking to rediscover.

One important fact to remember is that the processes of manufacturing jewelry have changed very little. The main developments in the last 5 centuries is better understanding the properties of what the materials being used are as well as advances in tools. Where a 16th century engraver may use tools made from iron that needs to be sharpened every few hours, a process that can take a sizable portion of each day, the modern engraver has access to high quality tools that sharpen easily and will hold a much better edge and stay sharp for extended periods.

So with that in mind let us examine some images of shops that can help us see what tools would have been available to 16th century aiglet makers, silver and goldsmiths.

We will begin with an image is of a workshop in the mid-15th century at the very end of the medieval era. While a bit fanciful, it still functions as a reasonably accurate image and can be used as a general reference of gold smith shops during the 13th to 15th centuries.

In this 1450 engraving by the Master of Balaam, the female apprentice is appears to be using a anvil and die to to impress designs on a piece of metal. Many aiglets have patterns stamped on them before shaping them so this is a plausible reference. On the table next to her are several tools and a belt buckle. Being that they are not drawn to scale it is possible that the items next to the buckle on the front left corner of the bench could be aiglets or metal pens. It is interesting to note that women were working alongside the men in this image. While I have not found any additional information about women working in jewelry shops during the 15th century, it was common in the 18th century.[21]

Figure 4 1450 engraving by the Master of Balaam

The engravings by Etienne Delaune are probably the best references we have from that time period as to what the working conditions were. His engravings are very detailed and as he would have used all of the tools he engraved images of, it is reasonable to assume his images are accurate as to the working conditions at the time. Delaune worked as a goldsmith in Paris during the middle of the 16th century. The differences between the English and French workshops would be minor and mostly dictated by the styles of jewelry preferred by clients in the area.

Figure 5 Engraving by Etienne Delaune (1)

This engraving by Etienne Delaune is a Goldsmith's Workshop from 1576 and shows many tools still in use today by jewelers. There are several craftsmen seated at the center jeweler's bench and in the European style, they have leather aprons to catch the fines of metal generated from their work to be refined again later and reused.[22] On the walls of the workshop you can see a collection of tongs, saws, snips, drawplates, and various other tools. A young man, most likely an apprentice, can be seen drawing wire or he may even be drawing a flat sheet into a tube for later use. The Jewelers at the bench are doing various tasks while an older apprentice is doing something with a furnace.[23] With the main difference that some tools are modernized and are much smaller, all of these tools are recognizable to a well-trained jeweler.

Figure 6 Engraving by Etienne Delaune (2)

In this view of a goldsmith's workshop, the master goldsmith looks to be doing repoussé on a large serving tray. On the walls you can see many tools that are still in use today such as hammers, chisels, tongs and drills. On the shelf at the top right you can see several cones of borax waiting to be used as flux for casting and soldering.[24] One of the apprentices is working with the furnace while the youngest apprentice works the bellows. Another smith (or apprentice) sits at a stump with an iron stake, raising a hollow form. (Etienne Delaune, 1576).[25]

We know that the images show tools and processes that are recognizable to the modern jeweler. It is conceivable that a modern jeweler could walk into a shop such as the one pictured and with very little adjustment and begin manufacturing jewelry quickly. The processes will not have changed. The adjustments would mostly be familiarization with the different tools. This includes items such as chisels instead of modern jeweler saws, powdered polishing compounds instead of sand paper, a lack of rotary tools, kilns and charcoal braziers instead of modern torches.

Historical Manufacturing Process

While communicating with several artisans from the United Kingdom and the United States I have become aware of several people that use pliers and hammers for forming aiglets. Also, illustrations that shows points being made show the agletmakeres holding small hammers. Are the aiglets being formed before attachment to the leather laces, being formed around the leather laces, or are being attached to the cords, making the finished points? There is not enough detail to know for sure. Forming the aiglets would be hard to see in an illustration. Hammers would be a common tool used and easily recognized by the people viewing the illustration.

There are no extant illustrations that I am aware of that show aiglets being made or attached with pliers.

We also have to remember that many times books or any artistic work manufactured before the 17th century were made for a patron and as such would have been tailored to the wishes of the person paying for the work. Many times this included the addition of religious iconography. Hammers are easily interrupted as a common tool of craftsmen so was the artist using a hammer because it was easily recognized by the people viewing the image? Was it uses to include religious iconagaphy, or both? Hammers were used by carpenters and as such would draw a comparison between the agletmakere and Jesus. Many illustrations show tradesmen with some variation of tools that are also used in carpentry. IE: drills, rasps, files, saws, axes, adze. Many illustrations, in my opinion, tend to have some sort of religious iconography included in them, hence they may not be as accurate as historians would like them to be when representing a subject.

Some tools have been mentioned for the manufacturing of aiglets but the descriptions can be vague. On page 228 of "Queen Elizabeth's Wardrobe Unlocked" by Janet Arnold, is a reference about the tools used for attaching aiglets. This shows that:

"There is an entry in 1579 for gylberte Powlson for a bodkyn a Hammer a litell sythye and other tools to tagge points withall clenlye wrought, These were tools for hammering metal tags on the ends of ribbons or laces used for various items of clothing"

I have not been able to determine what is meant by the description of a "litell sythye". It may be a cutting tool similar in form to a leather knife or even a small pair of shears.[26] The few bits of conversation about this entry discussing the "litell sythye" all make the assumption that it is a cutting tool. With the lack of information how the tool was used or even how it looked, that is nothing more than an assumption.

I would like to put forward the idea that the tool called a "litell sythye" is only called that because the general shape of the tool looks much like a full sized version of a scythe. What if the "litell sythye" was not a cutting tool at all? Possible uses for a tool shaped like a scythe could be as a hammer, a burnishing tool. A tool to score metal, punch holes. Make holes in fabric for eyelets, to hold something in place. Experimentation is indicated before a definite use and form can be decided.

The title of the German woodcut shown in Figure 11 translates as “The strap makers”.[27] The man in the front is cutting strips of leather for points. The man to the left of the image is cutting strips of metal to be made into aiglets for attaching to the ends of the leather points. The second man in the background is clearly attaching an aiglet to a leather strip. Whether he is forming the aiglet over the leather strip or merely riveting the aiglet to the strip, is not clear. I suspect from the lack of additional tools that they are making type 2 and type 3 aiglets.

Figure 7 Detail of "The Strapmakers"

Point makers that made points with lace or strips of ribbon would get their materials from lace makers or other sources most likely. The making of lace was enough of a specialized skill that it was unlikely that aiglet makers would have done this in house.

Another valuable resource is a copy of regulations for the merchants in Paris France. While written in 1886, the book “Les métiers et corporations de la ville de Paris : XIVe-XVIIIe siècles….” has many regulations for the making of aiglets. Many of the rules and letters go back centuries. This is probably the best source of information about the industry centered on this item.[28] A translation by the author is available of several pages from chapter 28 at www.livingstonjewelers/translations.html. [29]

Some of the information in “General History of Paris Collection of Documents published under the auspices of the Parisian city Trades of Paris”. Speaks about how the “widows of doers of aiguillette” to continue that work. This shows that women were, at least in France, working alongside the men.

Aiglets and the New World

Aiglets were an important part of the discovery of America. They were used by Christopher Columbus and his crew as trade items to the natives in the New World.[30] [31] The use of jingle cones by Native American tribes may be traceable back to those first voyages of Columbus and his trading of aiglets.

A report was published in 2006 supporting the writing of Christopher Columbus. In his journals, Columbus had written that he and his men had traded brass aiglets to the indigenous people of the islands he was sailing among. Excavations in the cemetery of El Chorro de Mai´ta, Cuba has provided brass lacetags (aiglets) that with metallurgical testing show that they came from Europe.

Through analysis of metalwork found in indigenous graves near the east coast of what is now Cuba, it found that many of the long, thin beads found were made of brass. Brass was not a metal that the indigenous natives would have been able to make during that time. After analysis, it was determined that they must have been aiglets traded by ships crews during the first few voyages to that area. It was determined that the beads (aiglets) were made of brass that had probably made by brass workers in Germany. Somehow, this brass made its way to Spain. Whether as raw material or as finished goods, either way we know that it had to have been made into aiglets, most likely for the crews and passengers of the ships that first made their way to the new world, only to be used as currency that had a greater value then gold.[32]

Aiglets may have been produced by settlers in the American colony of Jamestown Virginia and used by the settlers. It is possible they were also used as trade items. The finding of aiglets hundreds of miles from the coast in what would become the State of North Dakota over a century later shows they were a popular item among the indigenous populations for trade.

Excavations in Jamestown have uncovered not only aiglets, but also beads of glass and of scrap copper alloy that have been made into tubes for use in trade with local natives.[33] Additional research is needed on the subject of the evolution of aiglets into items used by Native Americans. The trade of small metal goods such as aiglets are well documented. In June 1998, the remains of a very early 17th century native American Village, were found during a street renovation project in the City of Mandan, North Dakota. Analysis show that some of the metal may have originated in Europe.[34]

Further research on the subject of aiglets as trade goods and their eventual evolution into tinkle cones used by American Indians is another topic of study for later.

Section 4: Modern

Women as Craftspeople

While not particularly related to the subject at hand, it is worth noting that the idea that women did not do the same work as men has been shown to be inaccurate at best. We have one image from the 15th century, several French regulations from the 16th and 17th centuries as well as letters showing that women worked alongside of men in skilled crafts.

In "Technological innovation and the decorative arts" page 85, a letter dated February 7th, 1775 was written to try and recruit a James Watt, a skilled silversmith, to come to work for Matthew Boulton in Birmingham. This letter lays out the promises to Watt that if he will come to Birmingham, he will have access to several workers and any materials he wants in his shop. "Including any women as long as they were acceptable to Mrs. Watt." While this letter is about three centuries later then the image pictured, the lack of skilled workers would most likely have been have been as much a concern in 1450 as it was in 1775, or even in a goldsmiths shop today.[35] [36]

The following entry from regulations of guilds in Paris in the 15th century show that woman can and did work making aiglets.

1422, 7 février. — Arrêt du Parlement permettant aux veuves de faiseurs d'aiguillettes, remariées à un homme d'autre métier, de continuer le métier de son premier mari. (Coll. Lamoignon, t. IV, fol. 179; mention d'après le 2e livre des Métiers.

(Translation: 1422, February 7. - Judgment of the Parliament allowing for widows of doers of aiguillette, remarried to a man of another profession, to continue the business of her first husband. (Coll. Lamoignon, t. IV, fol. 179; Reference to after the 2e book of the trades.)[37]

Review of Modern Manufacturing Processes

19th Century

Many people are familiar with aiglets and do not even know they own many of them already. The modern aiglet, or lacing point, can be found on many of the shoes in your home. If your shoe has a lace, then it most likely has a thin plastic tip keeping the end from unraveling. That plastic tip is an aiglet. From what I can find, aiglets are normally made from thin plastic and are attached to the middle of a piece of long cord and then cut in half at this point. Repeating this process makes a modern shoelace.

Today it is rare to find any laces with metal aiglets with the exception of some very high priced athletic shoes. There is a small market for designer aiglets for dress and athletic shoes.

The earliest I can find a reference to modern manufacturing techniques for aiglets is a reference and two illustrations in the book "Cyclopædia of the industry of all nations" by Charles Knight, Printed in 1851.[38]

On page 58 is the following entry about aiglets.

"AIGLETS is the French name for what in England are called tags, viz., the metal sheaths at the end of laces or points. These points are now out of date; they were ties or bows, adorned at the end with aiglets, and were used instead of buttons for fastening dresses. They were, in the 16th and 17th centuries, not merely for service, as the modern tag, but were profusely employed as ornaments, glistering like spangles. In some of the silk-mills of Derby, tags for silk boot laces are made in a curious manner. A little boy sits before a kind of cutting-machine, with which he cuts a strip of sheet-brass into small pieces, each large enough for one tag; the piece is at the same time bent into a kind of semi-cylindrical form. The pieces are then taken up by another boy, and dropped one by one into a recess in another machine; and the end of a silk lace being laid in the hollow of the tag, a lever is brought down with the left hand, by which the tag is made to embrace the lace firmly, enclosing it all around. These processes are conducted with astonishing rapidity: the fingers of the two boys moving almost as fast as the eye can follow them."

The above text is accompanied by illustration #29 on the bottom of page 1044:

Figure 8 "Fixing on tags"

Figure 9 "Cutting tags"

20th century

The YouTube video “Fun with Aglets” shows a machine that forms plastic aglets onto shoelaces. This particular machine would be used most likely in a very small factory as it requires a person to operate and make every lace. It is a very good example of a modern semi-automated process.[39]

Figure 10 Screenshot of "Fun with Aglets"

This is just one version of a machine that makes modern aiglets. They range from large automatic machines to smaller machines like this that require a person to operate to small handheld crimpers.

Tinkle cones and Bola Ties

As many of the aiglets used in by reenactors are actually tips for Bola ties (sometimes called “bolo”, “bola” or “Western” ties), it is sensible to discuss how they are made.

First, the modern bola tie was invented by Vic Cedarstaff in the late 1940’s in Arizona.[40] It was quickly found to be a popular new medium for artistic expression by Native Americans in the Southwest. Instructions on making bola ties, clasps, and tips quickly found their way into instructional books for silver smithing. The bola tie was made the “official neckwear of the great state of Arizona” on April 22nd, 1971. [41]

Second, most bola tips are equal to larger aiglets in size or larger.

Third, with bola tie tips being readily available, it is easy to compare them to extant examples of aiglets manufactured during previous centuries. It is easy with a quick search online to see the wide variety of styles of bola ties tips.

Of the commercially made ones, there are many that are available but only a few styles. Most are made in a press and then plated to be either silver or gold toned. A very few are cast of a lightweight metal, then plated. If you search for handmade bola ties, you will see a wider variety of styles.

“Tips are made from tubing filed and flattened and then filled on the end with solder, or by constructing a tapered tube from 26-gauge metal and later installing a bead at the base“.[42]

“Bola tips and also necklace cones can be made by bending a V-shaped piece of 28 gauge silver sheet around the tapered end of a regular punch or nail set and then the joint soldered. A number of different bola tips can be made by soldering on different kinds of beads with a silver ball on the tip. These tips are easily held on even without glue (rubber cement) by cutting or filing notches in the top end and crimping securely around the leather cord.[43]

Replica Aiglet Manufacturing

I have been corresponding with Theodore R. Lazcano about the procedures and aiglets that he makes for historical reenactment. He has sent me two of the aiglets made by him for comparison to the ones I have made using different techniques. The ones he produces are type 1. His instructions as written, are very clear and easy to follow. His instructions include making a mandrel, a pattern for the blanks and a pair of smooth-jawed pliers for the manufacturing of the aiglets. He does not mention using dead-soft metal but he does at one place in his instructions, he suggest you hammer flat the blanks after you have cut them to size. This would harden the metal. To remove the marks left by the pliers he suggest sanding with a paper nail file.[44]

Probably the most referenced work about making aiglets would be the instruction found in "The Complete Anachronist, # 108" A publication of the Society for Creative Anachronism. The section about making aglets was contributed to by Theodore R. Lazcano, Lois Swales, and Zoe Kuhn.[45]

Peter Adams in Tournaments Illuminated, Winter 1993 Issue 109. Pens and Points: Medieval Copper Alloy Cones. Does speak about making aiglets as they are related to making pen tips.

Mr. Adams also shows a process wherein you use a hammer to form the aiglet over the mandrel. This is a very common step in making modern equivalents of late medieval aiglets.

Figure 11 Tools for making aiglets

The tools used to make type 1 aiglets are quite minimal. A mandrel for each size of aiglet, shears, bezel roller, a small piece of leather, the bronze burnishing tool I made and a flat ended punch for making holes. (Not pictured: Brass hammer, riveting hammer, and a square punch.) A specialized anvil and pliers are used to make type 2 and 3 aiglets. Type 4,5 and 6 aiglets vary so it is hard to define a specific tool set.

I have made several different sizes of type one aiglets and have found that with properly annealed metal, it is easy to form aiglets. In a manufacturing setting, it should be possible to make one plain aiglet, start to finish, in two minutes. This takes into account economies of scale in a manufacturing environment.

Making aiglets with patterned metal adds about a minute per aiglet due to the process to imprint the metal. I used a process similar to coining.

Figure 12 One inch die for imprinting aiglet blanks

Aiglets made by the author are from silver, brass and copper. Metal thickness was from 28 to 34 gauge. Experiments with milling brass bar stock (1/8th inch thickness) that is 3% lead shows it was too brittle to flatten to 30 gauge metal. The lead content caused many breaks in the metal so it was not possible to make any aiglets from this metal.[46]

While trying to manufacture a small sheet of 30 gauge sheet, enough to make 2 or three aiglets I did some experimentation with navel or milling brass (3% pb) trying to cold and hot work a bar that was 3/32'' thick and found that the lead made it very susceptible to cracking. Several aiglets found in Tipu, Belize were of metal that had only trace amounts of lead.[47]

I have been making type 1 aiglets out of commercially available sheet of 30 gauge brass. Extant aiglets measure from about 32 gauge to 28 gauge. I find the 28 gauge to be very hard to work and form easily at the size most aiglets are. I find that 30 gauge forms well, takes a nice imprint when patterning, and when sanded or filed, still has enough thickness to securely hold the lace and not deform during everyday use.

Most of the tools I used are commercially available. The shears and the bezel roller are found in any catalog selling jewelry tools. The bezel roller is steel but during the late middle ages it might be made of iron, brass, agate, jade, dense wood species or anything else that is denser and stiffer then the metal being rolled. I put a lot of force on the mandrel when forming the aglets so I suspect that the mandrel most likely would have been forged and case hardened iron. Mine were made from an ice pick, a small circular file and a scrap of iron rod. The punch was made from a worn out bead-setting tool.

The burnishing tool I made worked very well. So much so that I barely use any other tool for burnishing at all. I ground a side groove when I was roughing out the Burnishers shape and this is the one I use the most. Later I filed a

smaller groove on the other side as well. I found the grooves on the side were perfect for forming the sides of the aglet and getting the seams to lay down on the mandrel. The tapered groove on the face worked for smoothing the sides and making the curve uniform as I was burnishing the aglets. I would like to find a similar tool in a museum somewhere but the chances of that are slim at best.

When manufacturing type 2 and type 3 aiglets, the process is a bit different from making type one aiglets. After comparing several images of aiglet makers, it was obvious that type 2 and type 3 aiglets were formed on an anvil specialized for the task. After making an anvil similar, I found it was only a matter of practice to be able to make these. A set of small forged pliers is also used to make type 2 and 3 aiglets.

Figure 13 Tools for type 2 and 3 aiglets

The first step is to scribe a line on the metal and cut a large strip. Then the pattern can be scribed onto the metal.

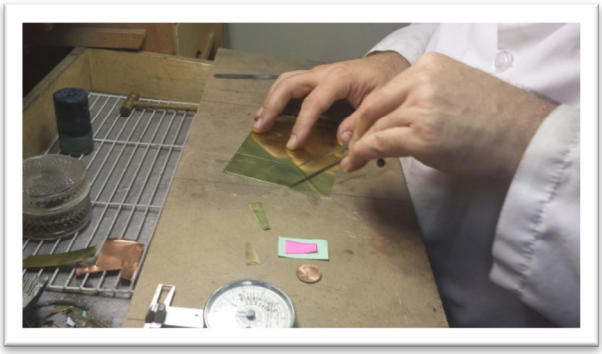


Figure 14 Scribing lines on brass sheet

If you are going to punch holes for sewing, this is the time to do it. The holes are punched with a flat faced punch. The two reasons this is done before cutting the individual aiglets from the strip is:

1. It is much easier to handle one large piece of metal rather than many small ones. If you look at the holes after punching, I used a small whetstone to flatten the spots where I had punched the holes for sewing or rivets. Burrs on the inside of the aiglets would interfere with attaching the aiglets to the cords.
2. The people who use aiglets today are mostly reenactors and costume designers. The preferred method of attachment is sewing. So making and cleaning up the holes for sewing before the aiglet blank is formed around a mandrel makes good sense.

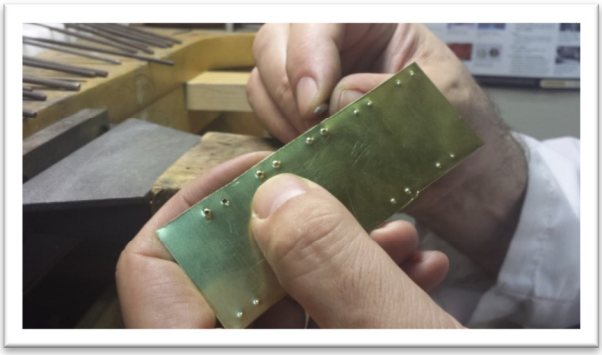


Figure 15 Back of the strip the blanks will be cut from showing the dimples left by the punch

At this point the individual aiglets blanks can be cut from the strip. The shears used are a pattern that have been used for centuries and can be seen in many drawings from before, during, and after the Tudor era in England and Europe. These shears can be seen in the images of the jeweler's shops in the section about "Images of jewelry Workshops in the 15th and 16th Century".

It is at this point you will need to decide if you will need to decide if you will be cutting tabs at the end of the aiglet, or making a tab to fold over on the end. This is when you will use a square punch to modify your aiglet blanks.

Figure 16 Samples of tabs cut on aglet blanks

Many times the ends of the aiglets were cut or filed into triangular points in order to bend these ends down to hold the fabric of the laces. This has to be considered when cutting the blanks and the position of the holes for riveting /

sewing the aiglets to the lace. When bent, the diameter of the aiglet is largest where the metal is bent. If the triangular tabs are left unbent as a stylistic decision, the eyelets in the costume would have to be larger to accommodate the larger diameter of the aiglet and they would have made it very difficult, if not impossible to remove the laces from the garment without damage to the aiglets and the garment itself.[48] It is my opinion that tabs at the top of aiglets sticking out without folding into the lace was not done on functional clothing so any you see in museums on finished clothing is not an extant item.

Some of the aiglets I made had the seam curve. This was due to the metal preferring to bend along a short axis instead of a long axis. When that happened the ends would be slightly un-even. When making the shorter aiglets it was more likely that the seams would curve a bit. Is this the reason that the longer ones were more popular? It seems to me that longer ones are more in evidence in the historical record than short ones. I rounded the corners of several aiglets before forming but found this to take too much time and did not make for a clean look at the top of the aiglet. It was much easier to file the top of each aiglet to insure the metal did not have any points sticking up.

The metal I purchased was slightly hardened from the rolling process while being manufactured. This makes it more difficult to form the aiglets. I have yet to purchase metal that is completely annealed and "dead-soft" as advertised. After the aiglets blanks are cut they are coated with flux and heated until they are annealed. After a quick soak in a pickling solution, they are cleaned, dried and are ready to form.

It is this step right here where I differ from everyone else that I have corresponded. All of the other makers of type 1 aiglets use pliers and hammers to manufacture their aiglets. I have found that by properly annealing the metal, it makes pliers and hammers not necessary when burnishing the aiglets.

Using the procedures set forth by several others, I used pliers and hammers on several aiglets. This process took about two minutes to roughly shape the aiglet but it took several additional minutes to remove the tool marks left by the pliers and hammers. After making them I was determined that, this could not be the process used during the 16th Century in Tudor England. I only made a few as I felt this was enough to show the inefficiency of this method.

The following process is descriptive but for a better understanding of the process, I suggest watching the video I placed on YouTube showing how to make aiglets. It may be found at this address. http://youtu.be/yq9wke1Ot5s.[49] As it is hard to see the process of making an aiglet that is only an inch long, I also show the manufacturing of an aiglet that is ten inches long to better illustrate the process.

To begin, use a thin piece of leather slightly larger than the blank and make the first bend over the mandrel using your fingers.

Place the aiglet into a groove on a bench pin or block and using the brass burnisher, start to burnish one side of the tip over the mandrel. Making sure you do not burnish the metal along the entire length, just the tip. I found it important to burnish the tip down first. It was this and getting the first bend around the mandrel were most important to get the seam to be straight and to not have it overlap. If not adequately annealed, a brass hammer was required to bend the brass down to have the seams meet.

Make sure the mandrel is pulled out enough to let the other side of the aiglet tip's metal bend down to touch the other side. Burnish the other side of the tip down making sure the seam closes along the first part of the tip.

Reposition the aiglet so that you can use a bit more pressure to run your burnisher along the entire side of the aiglet to bring one side down to the mandrel. One side should be done with only one or two times burnishing the metal.

Reposition the aiglet so that you can burnish the other side. Again making sure you have the mandrel pulled out so the metal of the aiglet will burnish down to the mandrel, use the aiglet tool to burnish the second side of the aiglet down. You might have to make a couple of fine adjustments to get the seam to close smoothly.

You should be holding a finished aiglet at this time. Ideally the seam will be straight and the metal edges just touching, but you may find that the metal overlaps slightly at one or both end, and possibly the entire length of the seam. Extant examples show all of these.

If you are making aiglets with a tab at the small end, this is the time to burnish this over. I found that just a bit of rubbing on a whet stone was enough to remove the sharp points of the tab and gives you a smooth metal point. A file can also be used for this.

On many of the aiglets I made I noticed that the seams tended to curve just a little. Does this indicate handiness? Being left handed I would say yes. As I made them the seam curved on many of them during a time when the metal would be pushed in the opposite direction by someone right handed. This was much more pronounced on the aiglets made from slightly hardened metal.

The process for type 2 and type 3 aiglets are similar. Again, I would direct you to watch my YouTube video about making type 2 and 3 aiglets at this address: https://www.youtube.com/watch?v=DhyBXlyK5fE.[50]

The main difference is that these aiglets are formed over the cord. Type 1 aiglets are made before they are attached to cords. The aiglets are first preformed over the same mandrels used for the type 1 aiglets and then 1 or both edges are crimped over the end of the cords that have had a bit of adhesive applied. The crimps are made with a small set of pliers. After the adhesive has been allowed to set, the aiglets are formed in the groves of a specialized anvil and rounded into the finished shape.

Type 4 aiglets are cast, forged, or are made from solid metallic materials other than sheet. So they can be made with any process common to metal workers of the time.

Type 5 aiglets are manufactured from non-metallic materials such as bone, horn, stone, pottery, amber, etc. so again, these may be made using processes common at the time for that particular material.

Type 6 aiglets are purely decorative and are not functional. They may be similar to any other style of aiglet in manufacturing.

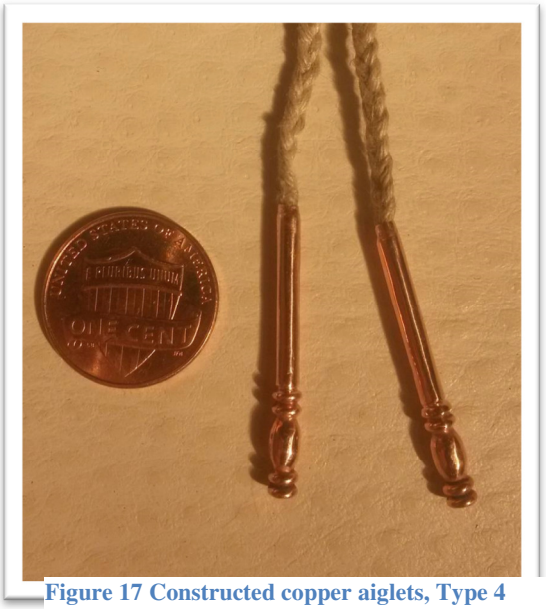


Figure 17 Constructed copper aiglets, Type 4

Attaching the aiglets to cords

Attaching the aiglets to laces and cords is done with soft iron, copper or brass rivets.

I have experimented with different gauges of wire and I have found that 22 gauge soft iron and copper is a good size to make rivets with.

I have not been able to conclusively find information about whether or not aiglets were sewn on during the 8th to 16th centuries. The only example I can find is an image with an extant aiglet that is sewn so badly, I suspect it was added or "repaired" at some point in the museum during conservation. I am not discounting that they may have been sewn on, I just have not found evidence yet.[51]

In the book "Lost from Her Majesties back" there are several entries that note aiglets were returned to a jeweler for repair or replacement of lost gems. This suggests that at least some type 6 aiglets were sewn to garments.[52]

On the aiglets that have the ends closed, such as is shown in "Dress Accessories", page 286, I have found that the instructions very close to correct. Frances Pritchard suggested rubbing the narrow end of the aiglet on a polished plate to burnish the end closed. After several attempts I found this only works if enough pressure is applied to deform the aiglet and in every instance the seam will open up and the aiglet will bend. But by rubbing the end of the aiglet on a very fine grain whetstone, the metal can be thinned enough to then burnish closed with only moderate pressure on a polished plate. The seam still wanted to open slightly but it was minimal.[53]

When burnishing the end of the finished aiglets after the cords have been attached, I made a tool based on the illustration of page 286 of "Dress Accessories" (Figures 27 and 28). Surprisingly, the tool worked very well on the first try. I could close-up the wide end of an aiglet about 30 to 35% closure. That is not enough to secure the lace to the aiglet by itself, but when combined with a rivet or organic glue available at the time, it was very secure.

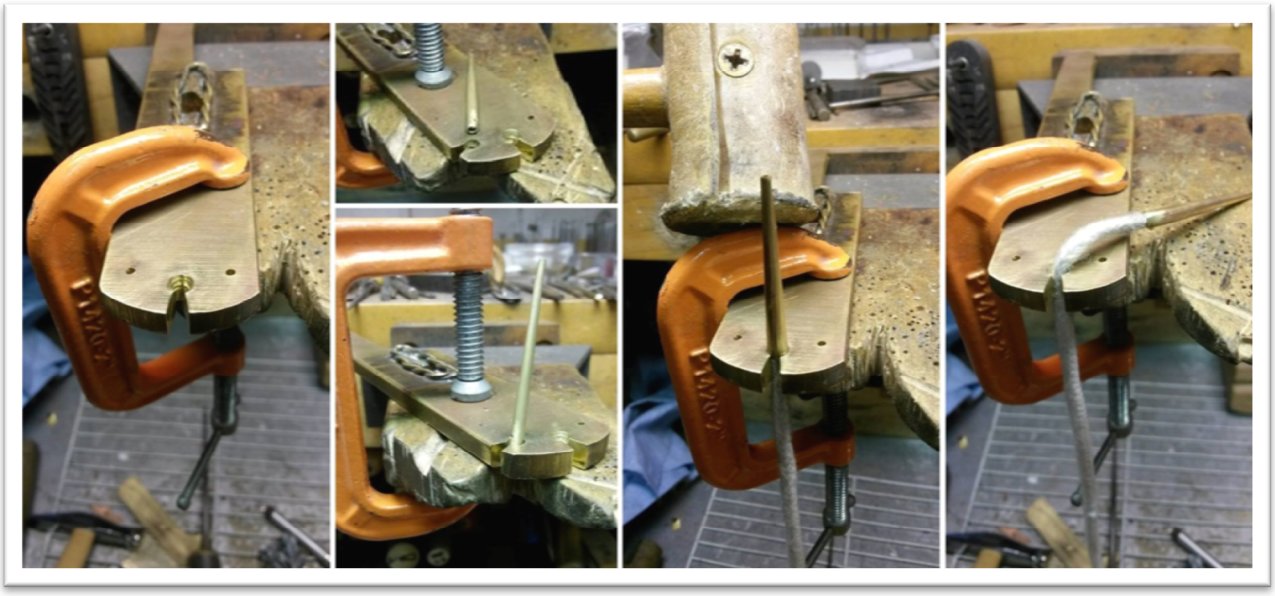


Figure 18 Dress Accessories Crimping Tool

I made an attempt at using a brass hammer to close the end of an aiglet around a cord by working on the edge of a bench block, but even with thinning the metal by faceting the top, trying to get it to close smoothly did not work. By using the tool mentioned above, I was able to close the ends around the cord quickly and easily. Also, I noticed that several extant aiglets that had the tips slightly bent also had been closed in a similar manner. I feel confident this tool is very similar to what was used in the past.

I also made several aiglets with triangular tabs cut at the end. These were cut with a square punch. The ends were folded into the ends of the cords quite easily with a bezel roller.

One of the things that is suggested by modern re-enactors is to place a bit of glue on the ends of the cords before inserting into the aiglet. In “A practical guide to Medieval adhesives”, Maya Heath provides many different recipes for adhesives.[54] After looking at them I concluded that the fish or cheese based glue would work well for clothing as it they would be water-resistant and might stand up to moisture better than some of the others. After contacting the author, she also thinks the cheese glue would work well for stiffening the ends of the cords for attaching aiglets with rivets as it stays slightly flexible.[55]

Section 5: Comparison of Extant and Modern Aiglets

Extant Aiglets

This section will discuss several extant aiglets from the Middle to Late Medieval Periods. Most of these aiglets were sent to me by Lara Maiklem AKA "London Mudlark" these were found on the Thames river foreshore in the City of London. Found from 2013 to 2014.[56]

As soon as these were received, they were separated into numbered bags, photographed and then cleaned in an ultrasonic cleaner with only hot water and photographed again.

Because provenance is not known, possible dates of manufacture will only be very broad timeframes.

First, it is clear that aiglet blanks were cut from sheet with shears. The following image clearly shows the marks left by a hand shear that has nicks on the blade.

Figure 19 Marks left by a hand shear

Also, faceting is apparent on the top of several aiglets.

Figure 20 Faceting on the top of an aiglet

Thames aiglet, type 1: This aiglet is notable for several reasons. First, it is copper. I think it is not an alloy of any kind. Unless it was metal that was reused, I suspect that we will not find more than trace impurities in it. Second, the transverse rivet that fell out when this was cleaned is not copper. It is either brass or bronze. The rivet itself is 0.64mm in width so it is very close to 22 gauge wire. Through experimenting before I obtained this extant rivet, I had experimented with different aiglet and rivet sizes and determined that I thought that 22 gauge was probably the best wire size for ease in use, malleability, and the most appropriate size for riveting aiglets. This shows that I have been able to accurately determine a very small part of the correct materials and process for the 16th century. It is also notable that this is a type 1 aiglet where the seam is defined by the edges of the metal coming together but not overlapping. The metal edges of the aiglet can be burnished down until the seam is entirely flat but this one it is apparent that the metal of the seam are touching but not completely burnished down. I have seen this many times before when I have made aiglets. If the metal blank is cut slightly too wide, the metal edges that define the seam will touch but will not will burnish down to lay flat on the mandrel. this indicates that a burnisher was used to make this extant aiglet before it was used and then lost. The small tip of the aiglet has been formed in such a way that it looks like the end could be burnished on a smooth plate to close it up. It looks like there were some tabs but the metal has corroded away a little bit.

Figure 21 Thames aiglet, type 1

Thames aiglet, type 2: I am surprised by the smooth taper of this aglet. The metal is folded in on both sides to almost fill the aiglet. This aiglet must have been formed around a fragment of lace as opposed to a leather or woven cord.

Figure 22 Thames aiglet, type 2

Thames aiglet, type 3: This is a type 3 aiglet where the entire length of the aiglet appears to have had one side of the seam folded down to hold the cord. The small end has been rounded and you can clearly see where the one side of the seam has been folded down. This shows the skill of the people employed as it is very hard to make a smooth taper such as this. There is a bit of faceting on the top.

Figure 23 Thames aiglet, type 3

None of the Thames aiglets I received were types 4 or 5 or 6.

This section will also discuss several extant aiglets that are described in "Post-medieval sites and their pottery, Moulsham Street, Chelmsford".[57] Figures 30.65 to 30.72.

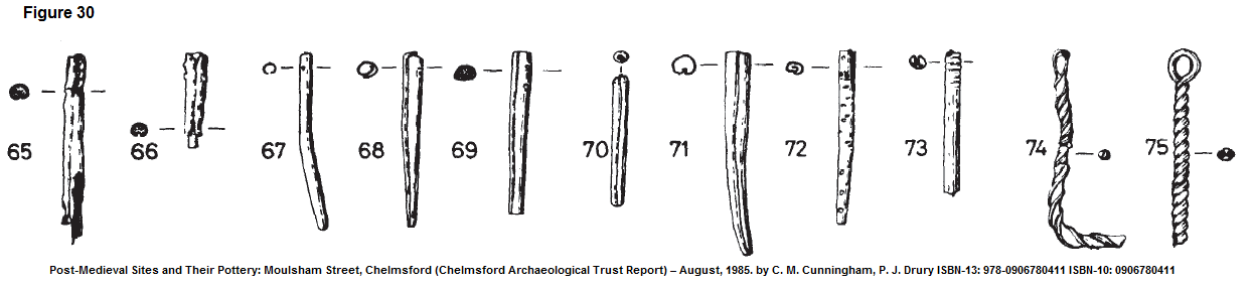


Figure 24 Figures 30.65 to 30.72

"Of the type 1 tags, 4 possessed a transverse groove decoration (AML no 876682) which Bayley (1985, 47) suggests may have been caused by the use of ridged pliers."[58]

This is notable for two reasons.

First, Four of the type one lace tags may have been decorated with the use of "ridged pliers". Decorated, not manufactured, but this is the first suggestion that pliers of any sort may have been used in the manufacturing or decoration of aiglets (lace tags). The sketch of aiglet 30.73did show the decoration but not in great detail on the otherwise an un-remarkable type 2 aiglet.

Second, this is evidence that type 2 aiglets were decorated.

One interesting part that needed an answer is the question of whether pliers were used to make aiglets.

In "Post-medieval sites and their pottery, Moulsham Street, Chelmsford" figure 30.73,[59] This aiglet was noted as possibly being decorated with something akin to ridged pliers. The curator was able to locate the aiglets in the illustration but was unable to take detailed images. He was gracious enough to send them to me for examination but unfortunately, they were too fragile and most of them did not survive the trip halfway around the globe.[60]

Of the eight aiglets sent, (Fig. 30.65, and 30.67to 30.73) only four made the trip intact. The aiglet in Figure in 60.73, was missing entirely, probably from being lost from the damage to the package in mailing.

But, like a phoenix rising from the ashes, information became available that would not have been apparent if the aiglets had arrived intact.

Figure 25 Aiglet fragment

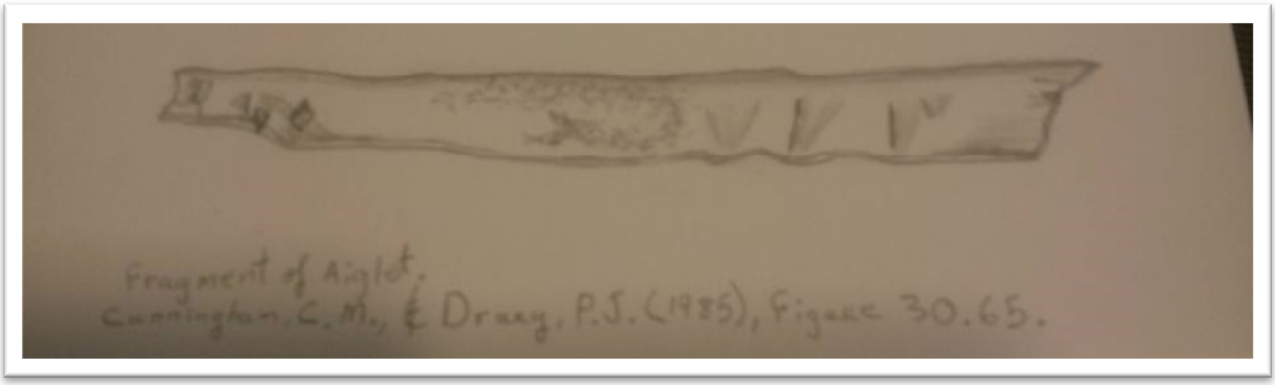


Figure 26 Drawing of aiglet fragment

The aiglet depicted in Figure 60.65 had cracked down its length and had several smaller pieces break off, and some were missing, during the journey from Chelmford, UK to Wisconsin, USA. When examined, the aiglet was determined to be a Type 2 aiglet where both sides of the metal is folded into the lace to securely hold it in place. Only one side of the seam made the trip. This inner part, having been protected from polishing, wear, and corrosion, clearly shows marks left by tools during the manufacturing process.

The edge has a pattern of bends that suggest it was folded over the lace, then crimped several times along its length by a small set of needle nose pliers to tightly grip the lace before the aiglet was bent into a round shape. It is possible it may have been done with a punch but that would take longer and involve more tools. It was quite easy to forge a set of pliers that worked for this purpose.

The aiglet from Cunningham, C. M., & Drury, P. J. (1985), figure 30.65. The top of the aiglet is on the right and the seam is at the bottom of the image. I believe the preceding image shows enough evidence to say that pliers were used during the manufacturing of type 2 aiglets. It is possible that pliers were used in the manufacturing of type 3 aiglets.

Comparison of Aiglets Made Using Modern versus Conjectured Historically Correct Methods

I have only been able to examine less than two dozen extant aiglets, and they have all been types 1, 2, and 3. The one notable property they all have in common is that none of them are identical. While they can be grouped by type, they all show the individuality of the person making them. Some have straight seams and some have seams that curve, many are straight and many taper. Some are riveted and most are not.

With the exception of aiglets made for the upper classes, aiglets made during the middle and late-middle ages show that function was more important than looks for the vast majority of them made during those centuries. It is important to remember they were a functional item.

Aiglets made during the end of the 16th century to the 20th are also purely functional. The advent of the mechanical age made them even more of a disposable item and the wide spread use of button, zippers and other closures for clothing let aiglets fall out of fashion. The only use for what were once called aiglets are as jingle cones used on American Indian clothing or as the ends of Western Bola ties.

It was only during the 20th century that aiglets again are becoming a fashion item. You can easily find fancy and varied aglets for laces on the internet. It is during this time as historical reenactors have worked towards making their costumes as accurate as possible that there has been an increased demand for historically accurate aiglets. The reenactors demand a higher quality of product as the garb they are using is only occasionally worn and they have a higher disposable income. A few hobbyists are enough to fill this niche market. Even with being made with pliers and hammers, many of the type 1 aiglets made by reenactors today would be considered a very expensive item as they are very carefully made and with very little variation, are practically identical.

Section 6: Tables, Endnotes and Additional references.

Tables

Table 1 Aiglets Length / Width Comparison

Name	Length	Top max	Top min	Bottom max	Bottom min	Weight	MM (≈ gauge)	Type	Notes
Thames 1	28.02	2.15	1.96	0.78	0.58	0.222	0.19 (33)	1	Still has rivet
Thames 2	25.84	2.62	2.21	1.91	1.60	0.258	0.28 (29)	1	Still has rivet, rivet gauge is .64mm and 0.006gms
Thames 3	21.29	4.45	---	2.35	---	0.122	0.06 (---)	---	Flattened along entire length
Thames 4	25.83	3.08	2.73	2.45	2.19	0.392	0.19 (33)	2	
Thames 5	28.74	3.07	2.61	1.82	1.71	0.3760	0.12-0.14 (35/36)	2	
Thames 6	37.02	3.49	2.03	2.22	1.66	0.342	0.18 (33)	3	
Thames 7	33.00	3.47	1.83	1.48	1.30	0.466	0.12 (36)	2	
Thames 8	27.41	2.97	2.85	1.50	1.43	0.440	0.23 (31)	3	
Thames 9	19.45	1.81	1.52	1.53	1.52	0.096	0.21 (31)	1	Small end is missing, length is approximant
Thames 10	34.07	2.61	2.39	2.03	---	0.366	0.20 (32)	2	Small end is flattened, length is approximant due to aiglet being bent
Thames 11	28.17	1.94	1.84	1.80	1.76	0.226	0.21 (31)	1	length is approximant due to aiglet being bent, has 4 holes for attachment
Thames 12	31.72	3.01	2.62	2.58	1.52	0.428	0.28 (29)	2	
Thames 13	30.83	2.78	2.37	1.73	1.43	0.426	0.18-0.21 (33/34)	2	
Thames 14	41.73	3.07	2.96	2.14	1.95	0.838	0.19 (33)	2	
Thames 15	29.96	2.55	2.00	1.42	1.30	0.256	0.12 (36)	2	
Chelmsford 30.65	--	--	--	--	--	--	0.28 (29)	2	Fragments
Chelmsford 30.67	27.87	2.75	1.26	1.95	1.43	0.286	0.25 (30)	1	Intact.
Chelmsford 30.68	30.96	3.09	2.60	1.24	1.13	0.326	0.20 (32)	3	Broken in half and missing some fragments from the broken section. Rivet still in place.
Chelmsford 30.69	25.64	2.66	1.78	2.15	1.61	0.274	0.16 (35)	1	Intact. Both rivets are still in place.
Chelmsford 30.70	20.05	2.72	1.35	2.78	1.09	0.214	0.25 (30)	1	Intact
Chelmsford 30.71	31.45	3.39	1.86	1.66	1.50	0.344	0.25 (30)	2	Broken
Chelmsford 30.72	26.99	--	--	--	--	0.266	0.23 (31)	3	Broken. Mostly intact with one small fragment.
Historic Enterprises	34.69	3.80	3.69	1.48	1.23	00480	0.23 (31)	1	Purchased from Historic Enterprises
Aiglet by T. Lazcano 1	37.32	3.30	3.01	1.46	1.31	0.460	0.32 (28)	1	Made by Theodore R. Lazcano (Master Bedwyr)

Name	Length	Top max	Top min	Bottom max	Bottom min	Weight	MM (≈ gauge)	Type	Notes
Aiglet by T. Lazcano 2	37.53	3.37	3.09	1.20	1.12	0.490	0.32 (28)	1	Made by Theodore R. Lazcano (Master Bedwyr)
plastic	15.47	2.25	--	--	--	--	--	--	Standard shoelace for athletic shoe
Aluminum (India)	12.48	1.87	1.81	--	--	.028	.07 (--)	3	Thin Aluminum aiglet from India.
Brass aiglet	37.25	2.99	2.91	1.51	1.27	0.476	0.30 (30)	1	Made by Gerald Livings
Machined bola tie tip, brass	30.71	6.02	6.02	5.97	5.97	3.956	--	4	Machined brass
Machined bola tie tip, plated	32.06	4.99	4.99	3.96	3.96	4.012	--	4	Nickle plated machined brass
Silver colored bola tip	33.11	7.51	7.05	3.62	3.29	0.928	0.33 (28)	1	Has a bead tip. This has tabs to fold into the lace.
Gold colored bola tip	53.60	7.76	7.12	4.24	4.04	1.836	0.33 (28)	4	Has a bead tip. This patterned metal aiglet has tabs to fold into lace.
Cast bola tip with hook	48.00	9.86	9.32	9.18	3.85	10.860	--	4	Cast with hook. Yellow plated metal.

Thames Aiglets 1 - 13 provided by Lara Maiklem.

Thames Aiglets 14 -15 Provided by Irene Ten-Hove.

Endnotes

[1] Dress Accessories, c. 1150- c. 1450 (Medieval Finds from Excavations in London) [Paperback] by Geoff Egan, Frances Pritchard instructions about making aiglets. Page 286.

[2] Arnold, J. (1980). "Lost from Her Majesties back": items of clothing and jewels lost or given away by Queen Elizabeth I between 1561 and 1585, entered in one of the day books kept for the records of the wardrobe of robes. [London]: Costume Society.

[3] "The Fashion Dictionary, Fabric, Sewing, and Apparel as expressed in the Language of Fashion", by Mary Brook Pickens, copyright 1957, 1973 ISBN 0-308-10052-2, Pages 2,3, 285.

[4] An illustrated dictionary of jewelry: 2,530 entries, including definitions of jewels, gemstones, materials, processes, and styles, and entries on principal designers and makers from antiquity to the present day by Harold Newman, New York, N.Y.: Thames and Hudson, 1981. Page #

[5] Stone, George Cameron. 1961. A glossary of the construction, decoration and use of arms and armor in all countries and in all times. New York: Jack Brussel. Page 173. (Planche, James Robinson. A Cyclopedia of Costume or Dictionary of Dress, New York, 1877.)

[6] Dress Accessories, c. 1150- c. 1450 (Medieval Finds from Excavations in London) [Paperback] by Geoff Egan, Frances Pritchard. Page 283.

[7] Claude Blair and John Blair, "Copper Alloy" in 'English medieval Industries', ed. J. blair and N. Ramsey (London, Hambleton) page #, figure 124

[8] YouTube http://www.youtube.com/watch?v=9CQF8BtuLXU

[9] This is from the book above in German but it is of men making aiglets. Not a lot of detail but you can see the shears and the anvil they are working on in the background. http://www.wenner.net/suche/G/Nestler_Holzrahmen_Stuck_Leder_Holzschnitt_Jost_Amman;00021229.jpg

[10] General History of Paris Collection of Documents published under the auspices of the Parisian city Trades of Paris. Page 570 to 579. www.livingstonjewelers/library/TITLE_XXVIII.pdf. The translation was done by the author and may not be completely accurate, as he does not speak French.

[11] Dress Accessories, c. 1150- c. 1450 (Medieval Finds from Excavations in London) [Paperback] by Geoff Egan, Frances Pritchard instructions about making aiglets. Page 286.

[12] Arnold, J. (1980). "Lost from Her Majesties back": items of clothing and jewels lost or given away by Queen Elizabeth I between 1561 and 1585, entered in one of the day books kept for the records of the wardrobe of robes. [London]: Costume Society. Page 82. "F 91 [381] Item delyvered to Mr Peter the vijth of October for to mend and to new trim vij per[e] of Agletes of gold emameled white. Item delyvered the xvij of October to him on[e] aglet to be mended and on[e] button of gold knotted with thre pearles in it. Reaceyved of Peter the xxiiijth of November ij Aglets which have new topes mad[e] to them."

[13] Untracht, O. (1968). Metal Techniques for Craftsmen: A Basic Manual for Craftsmen on the Methods of Forming and Decorating Metals. Garden City, N.Y: Doubleday. Pg 4. "All metals are fusible, that is, they can be brought to a liquid state by the application of heat and therefore be united to other metals. This quality, not confined to metals, allows them to be smelted or separated from their impurities and combined with other metals to create alloys. It also allows metals to be cast and to be joined by soldering, brazing, and welding. "

[14] Blair, John, and Nigel Ramsay. 1991. English medieval industries: craftsmen, techniques, products. London: Hambledon Press. Pg 82.

[15] Owen-Crocker, G. R., & Crocker, G. R. O. (1986). Dress in Anglo-Saxon England. Manchester: Manchester University Press. Image on page 46. Probable cosmetic brush.

[16] Owen-Crocker, G. R., & Crocker, G. R. O. (1986). Dress in Anglo-Saxon England. Manchester: Manchester University Press. Page 53.

[17] Owen-Crocker, G. R., & Crocker, G. R. O. (1986). Dress in Anglo-Saxon England. Manchester: Manchester University Press. Page 158, 162.

[18] Mainman, A. J., Rogers, N. S. H., York Archaeological Trust, & Council for British Archaeology. (2000). Craft, industry and everyday life: finds from Anglo-Scandinavian York. York: Published for the York Archaeological Trust by the Council for British Archaeology.

[19] Mainman, A. J., Rogers, N. S. H., York Archaeological Trust, & Council for British Archaeology. (2000). Craft, industry and everyday life: finds from Anglo-Scandinavian York. York: Published for the York Archaeological Trust by the Council for British Archaeology.

[20] http://en.wikipedia.org/wiki/Bench_jeweler. Accessed 10/16/2014. A bench jeweler is an artisan who uses a combination of jewelry-making skills to make and repair jewelry. The jewelry making arts can be subdivided into a very great many categories of specialized skills. Some of the more common skills that a bench jeweler might employ include antique restoration goldsmithing, stonesetting, engraving, fabrication, Wax Carving, lost-wax casting, electroplating, forging, and polishing. In order to understand how a bench jeweler fits into the process of jewelry making, it is important to understand the process itself.

[21] Earl, Polly Anne, and Ian M. G. Quimby. 1974. Technological innovation and the decorative arts. Charlottesville: Published for the Henry Francis du Pont Winterthur Museum [by]. Boulton and Fothergill to Watt, ca. Feb 7, 1775, Letter Book, 1774-77. (Reference # 40 on page 100.)

[22] Authors note: Leather aprons are common on jewelry benches in Europe. In America, jewelry benches tend to have a pull out drawer to catch metal filings and dust.

[23] Artist: Delaune,Etienne, armourer (1518-1583(?)) Goldsmiths Workshop., https://www.britishmuseum.org/explore/highlights/highlight_objects/pd/e/etienne_delaune,_goldsmiths_wo.aspx.Etienne Delaune, Goldsmith's Workshop, an engraving, France, AD 1576. This pair of signed and dated engravings by Delaune (1519-1583) document the practice of sixteenth-century goldsmithing.The walls of the workshop are lined with the tools of the craft: pliers, files, drills, gravers, and hammers. The boy turning the winch on the left appears to be drawing wire. The worktable is placed perpendicular to the large window, in order to provide maximum natural light to the craftsmen. On the right a youth holds a pair of tongs in a small forge, with a bellows and an anvil by his side. Each workman sits with a leather apron tucked into his belt and attached to the table to catch filings of precious metal.

[24] Cones of borax. Agricola, G., Hoover, H., & Hoover, L. H. (1950). De re metallica. New York: Dover Publications. Book 12, page 560.

[25] The second print shows the older man with spectacles serving a client through the window. He is possibly a self-portrait by Delaune. A display of chains and pendants hangs from the ceiling in full view of the street but out of reach of passers-by. Delaune is recorded working as a goldsmith in Paris in 1546 and briefly in the royal mint six years later. His first dated prints were made when he was 42 years old. As a Calvinist, he left Paris at the time of the St Bartholomew's Eve massacre in 1572, and moved first to Strasbourg and later, according to the inscription on this print, to Augsburg. The French Renaissance in Prin (Grunewald Centre for the Graphic Arts, University of California, Los Angeles, 1994) http://www.britishmuseum.org/explore/highlights/highlight_image.aspx?image=ps249953.jpg&retpage=21466.

[26] (Arnold, Janet. 1988. Queen Elizabeth's wardrobe unlock'd. Leeds: Maney.) Page 228

[27] Panoplia Omnivm Illiberalivm Mechanicarvm Avt Sedentariarum artium genera continens. (n.d.). Retrieved February 3, 2015, from http://digital.slub-dresden.de/id266129870. http://digital.slub-dresden.de/werkansicht/dlf/12703/171/0/.

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[33] Field Report 1994, Luccketti, Nicholas M.,Kelso, William M., Straube, Beverly A.. May 1994, Jamestown, Virginia. Page 27.

[34] NDDOT - Scattered Village Report. (n.d.). Retrieved February 3, 2015, from http://www.dot.nd.gov/public/education/scatteredvillage.htm

[35] Earl, Polly Anne, and Ian M. G. Quimby. 1974. Technological innovation and the decorative arts. Charlottesville: Published for the Henry Francis du Pont Winterthur Museum [by]. Page 85.

[36] Earl, Polly Anne, and Ian M. G. Quimby. 1974. Technological innovation and the decorative arts. Charlottesville: Published for the Henry Francis du Pont Winterthur Museum [by]. Boulton and Fothergill to Watt, ca. Feb 7, 1775, Letter Book, 1774-77. (Reference # 40 on page 100.)

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[38] "Cyclopædia of the industry of all nations" by Charles Knight, Printed in 1851. Page 58.

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[43] Indian Jewelry Making: Volume I by Oscar T. Branson, Treasure Chest Publications (1977), Spiral-bound, page 46

[44] Workshop notes. Theodore R. Lazcano.

[45] Compleat Anachronist, # 108. March 2000. Swales, Lois, Kuhn, Zoe copyright 2000 Society for Creative Anachronism. Additional content by Theodore R. Lazcano. (Lois Swales (Mistress Rhiannon y Bwa), Zoe Kuhn (Lady Azza Al-Shirazi), Theodore R. Lazcano (Master Bedwyr).)

[46] At least with the tools I had access to in a small jewelry shop. More research is indicated for this.

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