

The leopard's head

by Jane Nead

The Goldsmiths' Company Assay Office put down its roots at Goldsmiths' Hall more than 700 years ago. The first of its kind, it has grown from testing a relatively small number of articles in the 14th century to handling more than three million articles in 2014.

The changing face of the industry means that technological developments in assaying, marking and laboratory testing are both necessary and inevitable. Whilst the Office is steeped in tradition, with staff who between them number hundreds of years of knowledge and expertise, it is also an organisation which is continually moving with the times, to meet both the demands of modern-day production and the needs of the customer.



The changing face of the leopard

The leopard's head was first used in 1300 as the King's mark of authentication. It was introduced by Edward I to protect and preserve the standards of gold and silver wares, and the mark itself was taken from the three lions passant on the Royal Arms (a 'leo part' being a lion full face).

The image of the 'leo part' was first altered in 1478 when a crown was added in order to differentiate between articles marked before and after this date. At this time, the Goldsmiths' Company appointed its first Common Assayer, Christopher Elyot, and gold- and silversmiths were required to bring their wares to Goldsmiths' Hall to receive the mark of the Hall. It is from this date that the word 'hallmarking' enters the English language – with its connotations of quality and excellence. The mark remained a crowned lion with variations in its face, which was usually shaggy, and in the crown, as new engravers were employed. However, in 1822 the crown was dropped – and the lion begins its transformation into a leopard.

Whilst the leopard's head mark has evolved over time, the most pronounced change has been in clarity and detail. It is a development one might expect, given that the early punches would have been made entirely by hand. In fact, advances in the technology used to create punches will be instrumental in taking the leopard's head into the 21st Century with crisper, clearer marks and the introduction of the first 'real' three-dimensional laser mark.

All punches and support tools used by the Assay Office are made in-house by the Engineering Services Department – a necessity these days due to a reduction in the number of UK workers possessing the required skills. The department is a hidden gem run by Pat Geary and his team of talented engineers – Simon Jones, James Richardson and Daniel Love – and it is also responsible for the maintenance of all machinery, ensuring the smooth-running of the hallmarking production process.

Punch-making is a highly-skilled craft, which is carried out using a combination of machining of a blank, engraving with a pantograph or laser and finishing by hand. It begins by manufacturing a steel blank into which four hallmark panels are cut. Before the panels can be engraved, the material surrounding them must be removed. The introduction of a CNC Milling Machine in 2014 speeded up a time-consuming process and now, once the outline of the panels is programmed into the computer, the machine quickly cuts away the surrounding material. Pat and his team are constantly testing the technology to find more efficient ways of carrying out tasks, including creating steel supports that will allow the machine to cut four punches at a time!

The next stage in the process is to engrave each individual hallmark panel. Traditionally, a pantograph was used. The pantograph has two arms: one is guided by the engineer (the stylus) and follows the master pattern, the other recreates the movements with a cutting tool (the spindle), producing a scaled-down replica of the master at a ratio ranging from 1.5:1 to 10:1. By lifting up and over sections (the z-axis), engraving in a third direction can be carried out to create 3D relief and a highly detailed mark.

In 2011, lasers were introduced for engraving. The fine beam width makes them ideal for engraving smaller marks, as a light beam is finer than the radius of a cutting tool which also wears down over time. The laser is also less labour intensive as several punches (up to 24) can be loaded into the laser to be made automatically without the need for an operator. Pantograph engraving is still used to produce punches for large marks as it is more efficient for the removal of large quantities of material.

When the engineers moved to laser punch manufacturing, all of the masters for the marks were scanned as 3D images. These images were then converted into artwork that could be read by the new laser machine. The laser rasters across the surface of the punch blank like a TV image. A smooth, 3D topography is built up as the beam cuts in thousands of ultra-thin layers. Once the panels are engraved, the punch is finished by hand, hardened, cleaned and polished and then checked under a microscope. If a punch is not perfectly made, the hallmark will never be perfect.



Pantograph in use Image: Julia Skupny

The combination of using the latest technology alongside traditional skills to make punches is an incredible achievement. Pat and his team are dedicated to improving every stage of the manufacturing process, assuring quality of tools and punches and thus, the ultimate quality of the mark. But why stop with punch manufacturing? The experience gained during the punch project gave Pat and Will Evans, the Systems Development Manager, an insight into how the new technology could make a significant difference to the quality of hallmarks applied using a laser.

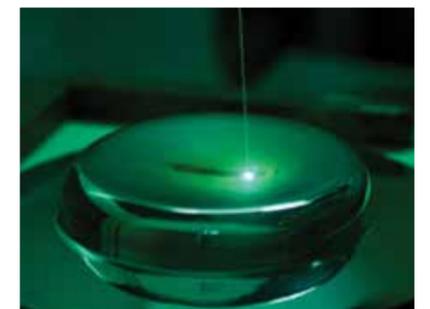


A master type set up on the pantograph machine Image: Julia Skupny

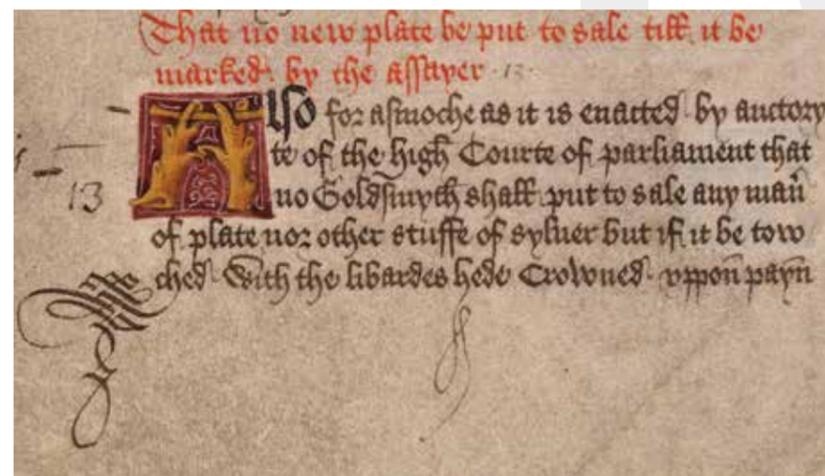
Laser hallmarking was introduced in the late 1990s; it now accounts for around 50% of all items hallmarked. The main reason for its success is that laser marking is an etching process which does not involve mechanical movement of the metal. The propensity for damage is eliminated, making it ideal for fragile, hollow, stone-set and mixed-metal pieces. The timing of its introduction could also not have been better. Around 90% of all items submitted to the Assay Office are now imported, reflecting the growth in recent years in companies manufacturing or sourcing jewellery in the Far East and Thailand. Historically, unfinished items were sent in by skilled silversmiths for hand marking and an integral part of the making process was the manual 'setting back' and polishing of the marked item. The trained silversmiths, who would have carried out these finishing operations, have been replaced by importers and middle men with no silversmithing skills. The articles arrive in a finished condition and the non-destructive nature of laser marking is thus perfect for them.

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An increasingly popular benefit of laser marking is the ability for customers to apply customised logos and personalisation and the option to mark at any size, rather than being restricted to the size of their punch.



Laser at work Image: Julia Skupny



Entry from the First Book of Ordinances, 1478, relating to the leopard's head crowned mark Image: Julia Skupny

The oldest laser machines used in hallmarking production are really only suitable for large display marks – the beam is powerful and has a high tolerance on curves, but it is too wide for small marks. The increasing requirement to mark imported jewellery, where marks needed to be smaller, led to the purchase of machines with finer beam qualities. However, both generations of machines were only capable of producing marks in two dimensions. By extending the two dimension mark into a third dimension to create a 2D+ mark, or 'deep laser mark' as it is termed, a three dimensional effect can be created. This inability to create a full three dimensional mark has led many customers to consider a laser mark as inferior to a struck mark. Fortunately, with their knowledge of the potential offered by new laser technology, Pat and Will saw an opportunity to bring laser marks up to the same standard.



Single leopard's head punches

Will and Pat worked with Acsys, the company which had supplied the Engineering Department's laser, to purchase four new machines that are specifically designed for jewellery and small items. The machines, which are significantly smaller overall, have a much finer beam and can create a more detailed image, thereby improving the quality of smaller marks and ensuring it is no longer the customer's second choice. Laser beams engrave by plotting straight lines from fixed points (nodes). The fine beam on the new lasers means that nodes can be plotted closer together, which creates finer detail and the impression of a smoother curve. More importantly, the artwork derived from a 3D scan produces node-to-node contour patterns that enable the lasers to engrave in relief, without compromising on detail. It is this capability which has led to the creation of a genuine three dimensional laser mark with the quality and clarity of a struck mark, regardless of its size



It is an enormous project; the artwork library created by Pat and his team has first of all to be inverted so that the lasers cut the design into the metal (to create the mark) rather than out of it (to create the punch). Once the scans have been successfully inverted, three dimensional artwork files have to be created and imported to create a virtual punch with four to five panels, just like the steel punches made by Pat and his team.

As it is such a lengthy process, it will be offered to customers as a special, added value service and the Deputy Warden, Robert Organ, expects it initially to appeal to a small number of contemporary designers. However, Robert envisages that the service will increase in popularity as the demand for laser marking continues to grow. Whilst there will always be a requirement for the unique, skilled craft of hand marking, it is his contention that contemporary and cutting-edge designers will favour the advantages that modern laser technology has to offer.

These exciting developments look set to have a lasting effect on the entire hallmarking process – from the common artwork that is used in the creation of punches and laser marks, to the wholesale improvement in the quality of every mark (whether struck or lasered) and the inception of a genuine three dimensional laser mark. The new technology will surely blur the lines between the two techniques, giving customers a greater choice and better overall quality. And there is no doubt that Will, Pat and his team will continue to search for new ways to improve the manufacturing and production process, bringing the leopard's head into the 21st century and ensuring that it endures for another 700 years.



Robert Organ and Alison Byne at *Make your Mark, 2015*
Image: Julia Skupny