

ENGRAVED DECORATION ON ENGLISH HORIZONTAL DIALS

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Horizontal sundials engraved on brass¹ have developed a very identifiable style in England.² This style is not generally heavily decorated but the elements of decoration which the dials do contain show the developments in engraving skills and style over nearly five centuries. The basic tools used were almost unchanged over this period – a burin or graver of hardened steel together with a straight-edge, a pair of compasses, and perhaps some simple templates or jigs. Nevertheless, it is usually possible to date a dial to within 50 years simply by the layout and style that the maker has adopted.

London-made sundials, produced by a small group of professional mathematical instrument makers, were key to setting the general style of sundials from the mid 16th century until the end of the 19th century. The London guild structure meant that the styles were passed from master to apprentice and changed only slowly over the centuries. The overall impression of these ‘London dials’ was of a rather restrained style appropriate for a scientific instrument with decoration only in the fine details and, perhaps, in a coat of arms. Outside London, ‘provincial dials’, perhaps made by a local clockmaker or an enthusiastic amateur, often went in for much more flamboyant decoration and hence are rather more difficult to date, the style usually being many decades behind that current in London.

The details of a brass sundial which may be considered as decorative include features such as the compass rose, the markers for half- and quarter-hours, lettering styles, cartouches for names, and borders. In addition, there may also be features (figures, flowers, astronomical diagrams

etc.) added as pure decoration to fill a blank area of brass. Indeed, on the better dials over the whole period, it was usually considered to be a sin to leave an area of brass blank!

The Earliest English Brass Horizontal Dials

The earliest extant English brass dials come from the Tudor period. Although there is written evidence of dials in the reign of Henry VII, the dial in Fig. 1 from the period of Henry VIII is the earliest dated extant example (1542). The key points to the overall style of this dial are that the origin of the delineation is in the centre of the dial plate and that it is divided only to half-hours, marked by punched stars. The original gnomon would have been much thinner than the replacement seen here, probably with a knife-edged style, so that no noon gap was necessary. The hours are numbered with inward-facing Roman numerals which have quite wide angles for the Xs and Vs. The decorative elements are the crowned Tudor rose between the HR (for *Henricus Rex*) and the floral band round the edge. The maker, Nicholas Oursian, was an immigrant, a friend of Nicholas Kratzer and responsible for the astronomical clock at Hampton Court Palace. It is likely that he bought his engraving skills with him, as did the famous maker Thomas Gemini a few decades later.

A slightly later dial (Fig. 2) from the Elizabethan era, made in 1578 by an unknown maker for Sir Philip Sidney (1554–86), is quite similar to the Oursian one in general style and whoever engraved it had a very assured hand – look at the regularity of the rope-work border. Notice too the ‘scrolls’ at the ends of the chapter ring; an early appearance of what

Fig. 1. A dial for Henry VIII dated 1542, by Nicholas Oursian. The gnomon is not original.

Courtesy of the Oxford Museum of the History of Science.



Fig. 2. An Elizabethan dial with arms featuring the motto of



Fig. 3. A very simple Tudor dial almost without decoration and made with the use of punches. Note, in passing, the decorative shape of the gnomon – an area for further study.

Fig. 4. A late-Elizabethan dial by Isaack Symmes.

Photo by the author, courtesy the Science Museum, Kensington



would become a common feature on high-quality English dials where it was a standard providing a decorative termination for any interrupted scale ring.

It seems likely that these high-class dials have been engraved by workers also skilled in other fields, such as goldsmiths, as the quality and style of the engraving is reminiscent of that found on gold- and silverware, and also on brass items such as the plaques above the stalls of the Garter knights in St George's Chapel at Windsor Castle.³ In contrast, more everyday dials of the period (Fig. 3) are much simpler and are mainly punched rather than engraved, sometimes with I, V, X and * punches and even, at times, just the I and *.⁴

At the end of the Elizabethan period, a few dials were made with a florid lettering style which reflects that seen in manuscripts of the period. Fig. 4 shows an example of this from the goldsmith Isaack Symmes. The origin of delineation has now been moved towards the southern edge of the dial-plate so that the space is better used and the division is now down to quarter-hours. Decoration is strictly limited though full use of the dial-plate is made by the set of declination lines⁵ and the lunar volvelle – an item more often found on portable dials.

The Seventeenth Century

At the beginning of the 17th century, in the Jacobean period, dials became devoted more to simple time-telling and the style was dictated by the work of Elias Allen (c.1558–1653)⁶ and his workshop, generally regarded as the father of the mathematical instrument making industry in Britain. Allen was an accomplished maker of accurate scientific instruments but his style was quite austere – for example, his half-hour markers were simple 'T' shapes. The divisions of his dials usually went to at least 5-minute, and sometimes 1-minute intervals. They also sometimes showed the old 'half-quarters' (i.e. 7½-minute) divisions which were in general use a generation earlier. This use of fractional hours in a subsidiary chapter ring carried on well into the 18th century by which time it was completely redundant and only continued for traditional reasons.

As well as the London scientific instrument makers, dials were produced by provincial makers. The dial in Fig. 5 is an idiosyncratic one-off dial from this period by an unknown maker. Besides being complex (it includes a stereographic projection although it is not a standard double horizontal dial to William Oughtred's design⁷) the dial has two charming decorative elements. One of these is a mariner looking like Mr Punch and using a cross-staff



Fig. 5. Details of a dial by an unknown maker, probably in the early 17th century.



although, like many illustrations found in contemporary books, it shows the instrument fitted with all its optional cross-pieces at the same time. The dial uses a particularly elaborate pattern – very time-consuming to engrave – in the borders and has an excellent N mark to the compass. The rather weak fleur-de-lys half-hour marks point to an inexperienced engraver working on a major project.

The middle part of the century saw dial-making continue through all types of problems including the Civil War and several outbreaks of the plague (which killed, for example, Henry Sutton (w.1649–1665) who was probably the greatest engraver of accurate scales on scientific instruments of the time⁸). Styles did not advance very much although the control and precision of the engravers did steadily increase.

After the Restoration of the monarchy in 1660, the restored aristocracy wanted to renovate their houses and gardens and often included a sundial – the bigger, the better. They thus managed to display conspicuous consumption as well as the owner’s scientific knowledge and taste. The leading maker at the end of the seventeenth century was undoubtedly Henry Wynne who could trace his ‘ancestry’ though a master-apprentice relationship through to Elias Allen. His output included a group of very large double horizontal dials⁹ where the stereographic projection in the centre of the dial-plate meant there was little room for significant decoration. One of the characteristic features of his dials is the use of an elaborate half-hour mark (Fig. 6) in an ‘H’ form and based on a group of five drilled dots: on badly worn dials, these dots become the most prominent feature.

One decorative feature of horizontal sundials of this period is their pierced gnomons (Fig. 7). This really is a subject in its own right and the styles included the use of piercing with a mixture of thin and thick scrolls, and pierced monograms and coats of arms. These latter would usually include engraving on both sides of the gnomon as well as the piercing, adding considerably to the work and hence cost. It is worth saying that the gnomons on all dials, including quite small and plain ones, would have been produced from a bespoke casting, finished with much filing. Today, most gnomons are cut from a metal plate



Fig. 7. Pierced gnomons by (left) Hilkiah Bedford, late 17th C, and (right) William Deane, early 18th C.

either by waterjet or laser-cutting for larger dials or a scrollsaw for smaller examples.

The arrival of Flamsteed’s Equation of Time tables in the 1680s and the need to convert sundial time into mean time (to allow setting of longcase clocks with ever-increasing accuracy) meant that there was a need to find space on the dial-plate for this information. Thus features such as moon dials and complete chapter rings for numerous world-wide locations, which had previously filled the space outside a central compass rose, were dropped. The ‘geographical’ data was sometimes retained by simply putting the place-name in the main chapter ring at the point where it would indicate the sundial time of local noon at the place. This scheme started with Henry Wynne and later became a staple of the standard 18th-century design.

During the last two decades of the 17th century, makers experimented with methods of presenting the EoT data.¹⁰ The dials signed by Thomas Tompion¹¹ tended to use calendar tables with a value for every day of the year (or every other day on smaller dials) which was extremely time-consuming to engrave. Henry Wynne, on the other hand, experimented with ‘strip’ scales, placing a continuous calendar scale against another of the EoT in half-minute steps. Initially, the strip was a linear one along the style edge of the gnomon (as on the Staunton Harold DH dial) but quickly moving to concentric arcs around the central compass rose. At this time, the main hour-numerals and the other engraving were still oriented towards the centre of the dial (‘inward facing’) so it was natural for the calendar scale to follow this, running clockwise.

The EoT rings were initially labelled as the ‘Æquation of Natural Days’ but this description was later taken as read and the rings were simply noted as ‘Watch [or Clock] Fast [or Slow]. They would normally be separated from the compass rose on the inside, and the chapter ring on the outside, by narrow rings of ‘oakleaf’ decoration, sometimes called ‘wheatear’. The presence of these rings, requiring hundreds of short graver strokes, is sometimes taken as a badge or ‘logo’ that the maker was a member of one of the London guilds. This does not seem to be an actual rule (although the signing of all dials certainly was) but it is generally a good indication.



Fig. 6. The characteristic 5-dot half-hour mark used by Henry Wynne.

The Eighteenth and Early Nineteenth Centuries

When Henry Wynne retired in around 1709, a new generation of mathematical instrument makers began to develop what would, by the middle of the eighteenth century, become the standard 'London pattern' dial. Wynne's own apprentices, including Thomas Wright (who took over his workshop), Richard Glynne and Thomas Tuttell all contributed small details to the style. But the biggest influence to the really top-quality dial design was John Rowley (Fig. 8). It was probably Rowley who first decided that, for large dials on relatively tall pedestals, it was easier to read the time if the main hour numerals were outward-facing. This seemingly simple change from the earlier 'clock-dial like' arrangement which was universal up to the end of the 17th century gradually spread, first to the other London makers and then, in the second half of the 18th century, to more provincial ones.

The corresponding change in orientation for the Equation of Time scales to outward-facing initially kept a clockwise direction which meant that the months were, very awkwardly, read from right to left. This was quite quickly solved by changing the scale to an anti-clockwise one.



Fig. 8. The superb quality of John Rowley's engraving.

From this point (first seen in the early 1710s), the 'standard' pattern for the London dial was set and no further major changes were made.

Mathematical instrument making had become an industry by the middle of the eighteenth century with makers such as Thomas Heath having large workshops of 'journeyman' workers each specialising in a particular aspect of the work. Engravers were just one of the specialisms (it is suspected that it was the poor apprentices that got the job of scraping the front surface of the dial-plate smooth before engraving began!). Dials were no longer 'signed' finishing with *fecit* as the name was that of the business rather than the worker. In the second half of the century, the name might just have been that of the retailer, sometimes from a different line of business such as an optician, with the maker not being mentioned at all.

Decorative features were mainly the scrolls at the terminations of the EoT and other circular rings and also the cartouches for signatures and coats of arms. The designs for these seem to have come from an as-yet unlocated patternbook. With no photographic enlarging machines available, these features were sometimes inserted into a space which was slightly too small for them, leading to a visible cropping or truncation. Extra swirls could be added if the space was larger than the patternbook element.

By the 19th century, dials had become almost commodity items to a near-standard design. The trend to simplify the decorative elements continued though the use, for example, of diamond-shaped half-hour markers though the dials remained quite complex with full Equation of Time rings being found on all the top dials.

Another simplification was the replacement of the oakleaf border with a zig-zag one which was much quicker to engrave. The use of dedicated engravers, though, did lead to a general improvement in the overall quality of the engraving with very clean and flowing lines and much fine detail. Nice touches were developed by the best engravers, such as gentle tapers on the fine strokes of the Roman numerals and 'butressed' serifs. Another variant was to the infill of the broad strokes: earlier, they had always been produced by a series of closely-spaced parallel lines along their length but some engravers developed a side-to-side infill method.



Fig. 9. A dial from John Whitehurst of Derby.

A dial from the first half of the 19th century by John Whitehurst & Son is seen in Fig. 9. Whitehurst worked from Derby rather than London but the oakleaf border is plainly seen. The scrolls at the end of the EoT scale are very similar indeed to those of nearly a century earlier. They are cropped as described above.

In the second half of the 19th century, very high quality dials by the likes of Troughton & Simms showed the variations and simplifications of the earlier form such as that in Fig. 10. Points to note are the dog-tooth or zig-zag borders and the infill on the Roman numerals.



Fig. 10. A high-quality dial by Troughton & Simms, one of the last of the mathematical instrument makers producing dials. Talc has been used to highlight the engraving.

Late Nineteenth and Early Twentieth Centuries

Towards the end of the nineteenth century, the number of active dial-makers decreased as time was distributed electrically with the telegraph and clocks and watches did not need resetting on a daily basis. A few high-quality makers did survive, most notably Francis Barker and Son. They had a large workshop and even issued a catalogue of many different decorative designs, all properly delineated. Most were hand engraved but they did start to employ other techniques, such as a form of chemical etching (the details are currently unknown) for the more repetitive decorative features. Machine (pantograph) engraving also started to make an appearance: it has an easily identifiable characteristic of flat-bottomed lines of very uniform width ending in a semicircle. The more decorative dials of this period are starting to become valuable antiques in their own right.

Styles became even more simplified and the 'Watch Faster / Slower' type of EoT ring disappeared, occasionally replaced by a much simplified table or even, after WWI, a graph. One noticeable introduction was the use of Arabic numerals for the hours. One of the earliest examples of this was a dial sold in small numbers by Liberty and designed in an *art deco* style (and manufactured by F. Barker).

Modern Times

Modern techniques mean that styles from earlier periods can be reproduced relatively easily – buyer beware! But the knowledge to produce a convincing reproduction, or even a properly delineated dial, is restricted to only a few modern makers, mostly BSS members. Modernistic styles by 'artistic' makers using techniques ranging from casting to hand-engraving do make an appearance but are impossible to categorise.

'Fakes'

The definition of 'fake' used here is a dial made, or sold, with the intention to deceive. There are a lot (many hundreds, probably thousands) of dials made in the early and mid 20th century which carry false dates from the 17th

and 18th centuries and sometimes with spurious makers' names as well. For decoration, they usually have a motto (virtually unknown before the late Victorian period) and engraved features such as Father Time figures, suns, and even masonic symbols. The most famous company to make these dials was Pearson Page Ltd or its later variants such as Peerless Brass. Their excuse, valid at the time but certainly not acceptable now, was that they were producing "what the customer wanted". With 50+ years of natural patination, these dials can at first glance look the part and they are certainly far better than a modern garden-centre dial but they can generally be recognised for what they are by the relative coarseness of the engraving – look at the spacing of the parallel-line infill on a compass point.

Conclusions

Many people like the sight of a nicely patinated brass sundial on a pedestal in a rose garden. Look closely and you might be able to construct a story of how long it has been there, the type of workman that produced it and how he had learned the skills of engraving something which is both an accurate scientific instrument and a piece of decorative art. Try to guess how many hours it took to make, especially if it has a finely-pierced gnomon. And if it features a coat of arms, perhaps half hidden below the patination, there is another field of knowledge to explore. The more you look at a sundial, the more interesting it becomes!

REFERENCES and NOTES

1. The material should really be described as copper-alloy as the dials may actually be of brass (copper-zinc) or bronze (copper-tin) or gunmetal (copper-zinc-tin) all with or without some lead.
2. Dials have also been made in other parts of the British Isles but they generally follow English (and mainly London) styles.
3. Examples of these plaques can also be seen in the British Museum.
4. See, for example, the palimpsest dial in *Bull.* 20(iii) 144-7.
5. M. Lowne & J. Davis: 'Lines of Declination and Two Seventeenth Century Dials', *BSS Bull.* 19(iii), pp.128-134, (June 2007). The delineation of the Symmes dial, which contains errors, is considered in some detail.
6. See J. Wilson: *Biographical Index of British Sundial Makers from the Seventh Century to 1920*, 2nd edition. BSS monograph No. 2. BSS, Crowthorne, (2007).
7. J. Davis & M. Lowne: *The Double Horizontal Dial – and associated instruments*, BSS Monograph No. 5. BSS, London (2009). See pp. 116–119.
8. Jill Wilson *ibid* (Ref 6); Henry Sutton.
9. J. Davis & C.M. Lowne: 'Henry Wynne's Double Horizontal Dial at Staunton Harold', *BSS Bulletin*, 15(ii) pp 46-58 (2003).
10. J. Davis: 'The Equation of Time as Represented on Sundials', *BSS Bulletin*, 15(iv), pp.135-144, (2003) and J. Davis: 'More on the Equation of Time on Sundials', *BSS Bulletin*, 17(ii), pp. 66-75, (June 2005).
11. Tompion's dials were not actually engraved by him: it is likely that John Rowley manufactured them for him and eventually made the style his own.

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