

# South Staffordshire Enamel – HOW... did they make that? The value of contemporary craftsmanship in revealing (absent) 18<sup>th</sup> Century metalworking skills in literary sources

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## Abstract

South Staffordshire Enamels, a niche genre of 18th century decorative accoutrements – snuff boxes, candlesticks etc. These items epitomise Midland workshop ingenuity, combining established ‘craft’ skills with emergent industrial production methods, creating objects for the fashion-conscious Georgian. Bird-shaped box, double inkwells - how were these objects made? How many times have curators asked that question? Highly complex forms, fashioned from improbably thin copper sheet (0.010inch), covered in layers of lustrous vitreous enamel, relied heavily on the interdependent tacit knowledge of box makers, enamellers and mount turners. Craftsmen in this short-lived trade (circa 1750-1830), appeared reluctant/valued their livelihood, to divulge to third parties their craftsmanship secrets. As a result, the critical process of manufacture, hidden beneath the enamel surface has been hitherto undervalued. A combination of Enlightenment writing - re-presented existing publications, and Victorian/20th-century texts - largely shaped by historical or connoisseurship approaches focused principally on enamel decoration and/or attribution. Consequently, the craftsmanship of the metal sub-structures, upon which the enamel surface relied, appears largely absent from the literature - a significant omission in our understanding of these objects. This paper presents the case for craftsmanship enquiry within a practice lead methodology, as a method to analyse and reinterpret this literature. Within this paradigm, craftsmanship understanding, acquired in the workshop - as laboratory, has established a deep knowledge of enamel process parameters and material characteristics. This empirical knowledge has then been applied to the comparative analysis of texts and enamel artefacts. Craftsmanship references in 18th century encyclopaedias, treatises, diaries etc.; and 19th/20th century scholarly catalogues, books and papers, are compared with manufacturing clues identifiable in enamel artefacts in collections - V&A, Museum of London, Harris Museum and Wolverhampton Art Gallery. Examination of the literature has resulted in the identification of three data sets. The first, concerns craftsmanship references specific to the Staffordshire Enamel trade: a lexicon of material and process descriptions; a nomenclature of 18th century terms; and the mapping of the scales, places and people engaged in the trade. The second concerns the wider ecology of allied trades: the identification of tools, process and modes of production in evidence during the period. Thirdly, the context in which the literature occurred; prosopographic analysis of authors, collectors and curators to reveal hidden occurrences, connections, relationships or bias. Within the journey of craftsmanship, materials are transformed into objects. Comparative analysis of the literature has revealed a substantial knowledge gap concerning the metal craftsmanship employed in painted enamels. Investigations reveal the manifestation of this absence, a product of the biases of past authors, collectors and historians; generated by their personal interest, occupation, or the context or circumstance, in which their ‘well meaning’ work was undertaken. However, whilst the more ‘authoritative’ 18th century literary sources, herald little of value with this regard, the investigation has revealed, the more prosaic literature - rooted to the locality of the trade’s occurrence - prove

particularly relevant. The trade directories and travel diary entries provide 'nodes' of craftsmanship reference, around which new hypothesis on the absent making will be built.

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## 1. Introduction.

This paper focuses on revealing craft making skills used in the manufacture of Midland made eighteenth century enamels: a genre of objects considered wondrous by the Georgian consumer, and the collector since. Although the production of these objects benefited from emerging forms of scaled up production of the Industrial Revolution, where hand-making processes were used extensively, very little is known about the making process employed. This paper focuses on analysing through a craftsmanship lens, the small number of eighteenth century making reference described in literature, in order to develop a richer understanding of the procedures used. The investigation is part of a larger programme of research that focuses on the analysis of enamel objects in museum collections.

## 2. The allure of Midland made enamels.

South Staffordshire Enamels, also termed English Painted Enamels and sometimes Bilston Enamels or Battersea Enamels, were an early industrial decorative art object produced circa 1750 to 1830. Manufactured from an amalgam of paper thin copper foil, 0.010" thick (Hughes and Hughes, 1951: 109), coated with multiple layers of enamel ground and subsequently decorated with painted or transfer printed enamel designs (see figure: 1).



Figure: 1. Anatomy of an eighteenth century enamel. Bilston manufactured incomplete finch snuffboxes, 1780 - 1800, EM238 and EM239. Photograph: J. Grayson (2015), image courtesy of Wolverhampton Arts and Culture.

The trade, like others of the time, relied upon craft or artisan making skills, alongside emergent forms of industrialised manufacture (Styles, 2004: 136): the development of mass production tools, the division of labour, and interconnected allied trades. Driven by the fashions, tastes and etiquettes of the day, the trade

created decorative and functional objects for the burgeoning Georgian consumer market place. Small personal items such as snuff boxes, patch boxes, scent bottles and bonbonnières' (see figure: 2); and domestic ware including tea caddies, ink wells, and candle sticks (see figure: 3), were amongst the items produced.



*Figure: 2. Bilston manufactured bird-shaped bonbonnière, 1765 -1785, B1653. Photograph: J, Grayson (2015), image courtesy of Wolverhampton Arts and Culture.*



Figure: 3. Bilston manufactured candlestick, 1770 – 1790, BI525. Photograph: J. Grayson (2016), image courtesy of Wolverhampton Arts and Culture.

Production principally centred on the South Staffordshire towns of Bilston and Wednesbury; Birmingham; to a lesser extent Liverpool; and for a short three-year period, Battersea, London. Although these objects were highly prized in the eighteenth century for their novelty, artistic accomplishment and in the case of transfer printed enamel<sup>li</sup>, for which Sadler and Green of Liverpool and York House, Battersea (Walpole, 1784: 27), London, were known - print innovation, the trade did not apply a makers mark. Furthermore, during the eighteenth and early nineteenth century, there was little written documentation of the making processes employed in the trade beyond enamel media preparation and application. These two factors have led to much misunderstanding around the manufacture of these enamel objects since the trades demise.

The lack of maker's identification on the enamels has shaped thinking and writing on the genre. Established thought until the early twentieth century, principally emanating from the connoisseur collectors of the period, believed the best pieces, which were considerable, originated from the short-lived York House, Battersea factory (1753-1755), whilst the poor quality items emanated from the extensive Midland workshops. However, in this regard, Bernard Rackham's *Catalogue of the Schreiber Collection* (Victoria and Albert et al., 1924) caused a paradigm shift in thinking in the early twentieth century. Rackham argued that it was inconceivable that the Battersea factory alone could have produced the sheer volume of extant objects, given its three-year existence. He suggested the numerous factories in South Staffordshire that operated for up to eighty years, played the most significant role, and so used the cataloguing of the Schreiber collection as a means to address the vexed question of attribution. Rackham's methodology assigned objects to specific workshops, artists

and/or geographic locations, based on stylistic analysis of decoration and the making processes entailed. He compared groups of objects with reference points of known provenance, for example: with porcelain print or painting styles; chronology of colour development; enamel decoration that incorporated dates, possible client's names or a rare artist monogram; objects in the ownership of individuals whose ancestors were once involved in the trade. The publication of this scholarly catalogue acted somewhat as a catalyst for further investigation by individuals into the genre.

The 1930s saw prolific publishing of scholarly papers on the genre, Read (1932), Rackham (1932), Toppin (1932), and Hughes (1935), presented arguments that substantiated, or revised Rackham's original classifications. This re-attribution of objects through stylistic analysis established the primacy of decoration, that then prevailed in subsequent texts on the genre: of particular note those by Hughes (1951) and Benjamin (1978). Where authors departed from this perspective, historical surveys of the participants involved in the trade were the norm, such as Benton (1970) and Cope (1980). As a consequence of the lens of enquiry used by these past authors, little is known of the craftsmanship skills and technology employed beyond the enamel surface, the manufacture of the objects fundamental metal substrate upon which the decorative painted or printed enamel surface relied.

Adamson (Adamson, 2013: XVI) reminds us that craft was not merely an antecedent to industrial production but formed an important constituent part during this period. South Staffordshire enamels are important, because like other genres of manufactured object, where hand making (craft) was central to production; ceramics, glass, metal etc., of which much has been written over the years; they have the capacity to mediate information in relation to our past material culture through their decoration, function, and material construction. Imparting information on modes of production, consumer tastes and demands, historical events etc.

This paper focuses on the identification of eighteenth century enamel craftsmanship references, both explicit and absent, within literature rooted in the time of the enamel trade. The analytical approach is framed by the researcher's personal past craft practice: expertise acquired through contemporary craft making as naturalistic enquiry. Established texts, containing descriptions of enamel processes are re-analysed through the knowledgeable eye of the crafts maker conversant with making enamel objects, thereby surfacing new insights, and identifying absent making processes from these texts missed by previous authors. This emergent knowledge is then correlated with primary data drawn from enamel objects in museum collections, to identify absent process required to undertake the full journey of craftsmanship not described. Thereby, generating understanding of broader workshop procedures entailed in this early form of industrial production.

This craftsmanship interrogation of literature is one aspect of a larger investigation being undertaken by the researcher into the craft making processes employed to make eighteenth century enamel objects. The broader research uses the object as primary data source and employs object analysis to generate hypothesis on making, which are subsequently validated through craft making.

### **3. Identifying absent making: an argument for craftsmanship understanding.**

Twentieth century authors - historians, curators, antiquarians and connoisseurs - have shaped our perspective on this genre. This research is based on the premise that their lack of craft making understanding has resulted in a bias: no acknowledgement that metal substrate manufacture is absent from eighteenth century texts. This has been compounded by reluctance by subsequent researchers to recognise this area as important, and investigate this aspect of workshop procedures employed in the trade. Consequently, this has resulted in a knowledge gap in the making processes employed.

To appreciate the critical nature of the absence of making in the twentieth century literature, a short explanation of the process of manufacture and the material parameters entailed is required. Enamelling is the fusing of ground glass to metal, and is an ancient process, the earliest known examples coming from the Mycenæan period. Multiple methods of application exist<sup>iii</sup>, of which Painted Enamel is one. Painted Enamel differs from other enamel processes because it requires the complete coverage of the metal substrate with an enamel ground coat upon which painted and/or printed enamel decoration is applied. The enamel ground can be applied to the substrate in two ways – sifted dry powder or wet enamel poured onto or dipped into. Firing in a furnace at around 800°C transforms the enamel into a lustrous coating, the substrate providing the structure and form to which the glossy, decorative surface adheres. Through this explanation it becomes apparent how the metal structure is critical to the enamel decoration, since it provides the form to the object - no metal, no decorative enamel surface! This genre of enamels is characterised by having highly complex three-dimensional forms: candle sticks shaped as Neo-classical columns, boxes sculpted into birds and other animals, mustard pots in the form of a knights in armour (see figure: 4).



Figure: 4. Bilston manufactured mustard pot, 1770 – 1790, BI681.1. Photograph: J, Grayson (2015), image courtesy of Wolverhampton Arts and Culture.

To a contemporary craft maker conversant with metal and enamel process these forms are intriguing: the smooth, decorated enamel surface belies the complexity of making hidden beneath, and raises questions over how these complex forms were made, particularly given eighteenth century tools and processes available. Age and authenticity: The materials and techniques of the 18<sup>th</sup> and 19<sup>th</sup> Century Goldsmiths (Ogden, 1999) provides some contextual insight into general tools and process available to the eighteenth century craftsman. However, knowledge of the tools available does not answer the critical questions around stamping and joining methods specific to the manufacture of this type of object. Could the forms have been pressed in one go? In

many cases this is a technical impossibility, because of undercuts in their forms. Furthermore, the thin 0.010" copper used would not have survived the deep pressing required to stamp these objects whole and would have split. Theoretically, this points to the objects being an assemblage of pressed metal components, with joints positioned strategically to allow complex forms containing undercuts to be assembled. However, this then generates further questions over the jointing methods used. Analysis of objects in museums for the broader research, of which this paper is part, provides evidence that the objects are indeed assemblages of copper components. Whilst this insight is not wholly new, Hughes making brief reference to it in *English Painted Enamels* (1951: 110), his cursory handling of the subject - a number of lines - appears to acknowledge the prevailing belief amongst authors that this process was inconsequential and not worthy of further investigation. Primary data derived through object analysis of enamels in museums for this research has revealed a rich breadth of different mechanical joining methods and their application in different circumstance. However, this aspect of the research is for another paper. Therefore, the question arises what knowledge of the making processes employed in the trade can be derived through analysis of craftsmanship references in eighteenth century literature.

#### 4. Eighteenth century craftsmanship references in literary sources.

Given the regionally specific nature of the object type, and short production time frame, it is not surprising that eighteenth century writing on the genre is particularly limited. The most extensive work on the subject is Dossie's treatise *Handmaid to the Arts* (Dossie, 1758: 228-309), written for the Society of Arts. His seventy-five page chapter 'Of the nature, preparation, and uses of the several substances employed in enamel painting' is framed by the Enlightenment writing tradition - rational re-presentation of knowledge. His primary focus was on the manufacture of enamel media, fluxes, grounds and colours, much of which has its origin in Merret's analysis and translation of Neri's *The Art of Glass* (Neri and Merret, 1662). Dossie provided minimal description of craftsmanship processes relating to metal fabrication, only a third page entry explaining the need to dish flat sheets to prevent warping in the furnace. However, he did provide extensive description of furnace building and firing, and in the context of this research provides clues to absent craftsmanship processes (see case studies 6.1). Another reference to enamelling was published in the *Encyclopaedia Britannica* edition of 1771 ('The Method of Painting in Enamel,' 2000), however this appears to be a summary of the enamel entry in *Encyclopédie* (Diderot et al., 1751: 5:533-5:542) and includes reproductions of plates from the companion volume *Recueil de Planches* (Diderot, 1762). French texts contain substantial enamelling entries, however, whilst reference is made to them in some twentieth century literature on English Painted Enamels, (Hughes and Hughes 1951: 109) and (Benjamin, 1978: 12-13), *Encyclopédie's* explanations are not representational of the English trade.

For clues to the practices of the English trade, the most valuable sources are those that appear closer to the heart of the places of production: trade directories such as that produced by Bailey (1781) provide glimpses into apprentice and trade lists and thereby afford some insight into the craft skills used; adverts placed in Birmingham's *Aris's Gazette* (Aris's Gazette, in Cope, 1980: 49) reveal materials, equipment and workshop large enough for many hands, for sale; diaries of industrial tourist's Angerstein<sup>iv</sup> (Angerstein, 2001: 47, 345) and Lady Shelburne (Lord Fitzmaurice, *Life of William, Earl of Shelburne, I*, London, 1912: 398 ff., in, Charleston, 1966: 79) provide witness accounts of craftsmanship activity being undertaken in Midland 'factory' settings; an account of processes used in South Staffordshire, purportedly from interviewing an elderly gentleman engaged in the trade before its demise (see case studies 6.2), provide observations of regional specificity in Hackwood's, *Wednesbury Workshops* (Hackwood and Stanhope, 1889: 13-19). These sources present clues to a Midland trade engaged in scaled up craft production and as a consequence were considered more useful to the research and therefore warranted analysis.

## 5. Methodology: craftsmanship framed analysis of literature.

The past craftsmanship experience of the researcher framed the enquiry. This lens provided the nuanced understanding required to surface questions of a more fundamental nature about the making processes employed in the trade than 20<sup>th</sup> century authors had. This provided the perspective to interpret 18<sup>th</sup> century descriptions of enamel manufacture. Where a written description appeared ambiguous or incomplete to the contemporary crafts-maker, the lens provided the means to identify what process and/or tool were absent. Data drawn from object analysis of enamels in museums provided theories to the researcher on how objects could have been made and the tools required for their manufacture? Comparison between the two, provided the understanding to reveal anomalies, to authenticate the literature, and to generate hypothesis of absent craftsmanship activity required to transform copper and enamel into object.

### 5.1 Enamel practice as enquiry.

In order to understand the assertion that craft practice can be used to frame enquiry in relation to this research, a short synopsis of the researcher's practice is required.

The first encounter with enamel media and this enamel object type was *Craftsense – Making Connections* (2004), an audience engagement project for Bilston Craft Gallery, part of Wolverhampton Arts and Culture. Funded by the MLA, Arts Council England and AHRC, new work was commissioned in response to the gallery's important collection of eighteenth century enamels, as a means to connect local audiences with their industrial making heritage. The project received technical assistance from Bilston and Battersea Enamels Ltd.<sup>v</sup> (see figure: 5), who provided the researcher with his first understanding of the technical parameters of working with enamel.



Figure: 5. Bilston and Battersea Enamels Ltd., factory, enamel ground application area. Photograph: J, Grayson (2004).

Over the subsequent decade, the craft workshop unwittingly became a site for research through naturalistic enquiry, 10,000 hours or more devoted to developing material understanding through the production of enamel objects for commissions and exhibitions: *Made in the Middle* (2006); *Playing with Fire* (2008); *Unravelling the Vyne* (2013); *Georgian Enamels: Piecing Together a New Narrative* (2015) (see figure: 6). These projects transformed, through the act of making, an initial acquaintance with the media into an in-depth tacit understanding of the application of wet processes enamel on copper, providing empirical knowledge to ground this research.



Figure: 6. *Tinderbox*, automaton made for *Georgian Enamels: Piecing Together a New Narrative* at Bantock House Museum (2015). Media: eighteenth century plaque from the Wolverhampton collection, contemporary enamel and brass. Size: 150mm x 105mm x 60mm. Photograph: D. Howarth-Salter.

## 5.2. Methods.

The analysis, interpretation and interrogation of this eighteenth century literature for explicit and absent craftsmanship processes, comprised three methods:

### I. Object analysis: primary data collection.

Primary data was collected through object analysis by examining enamels in the collections of Wolverhampton Museum and Art Gallery, the V&A<sup>vi</sup>, the Museum of London and the Harris Museum, Preston. Objects were selected based on:

- Complexity of form - an indication of fabrication.
- Duplication of objects across collections - evidence of mass production.

Object analysis consisted of documenting the objects: written description, drawing, measurement, photography, and microscopy. Analysis of the objects resulted in a series of preliminary hypotheses on modes

of construction based on obvious indicators, such as visible copper joints. This generated data for comparison with craftsmanship references in literature.

## II. Comparative analysis of craftsmanship descriptions in eighteenth century literature.

A data comparison matrix was created, logging and sequencing the craftsmanship references in Dossie, Angerstein and Hackwood, in the perceived order of the craftsmanship journey required to transform raw material into finished enamel artefact (see figure: 7). This revealed duplication, similarities, differences, and voids of absent making across the corpus of literature. However, this process did not fully reveal the authenticity, accuracy or relevance of the process descriptions, or what making was absent.

Copper Substrate manufacture		Diderot		Dossie		Angerstein		Hackwood	
	General Taxonomy	Craftsmanship Description	General Taxonomy	Craftsmanship Description	General Taxonomy	Craftsmanship Description	General Taxonomy	Craftsmanship Description	
Material for objects	Enamel copper	But it is sometimes determined, by economy, to be enamelled on the red copper. (Diderot P 5.537 Pa 10 line 1-2)	Copper	It being a requisite that the body painted in enamel should undergo a heat sufficient to melt soft glass, the matter of such body can only be gold, silver, copper, porcelain or China ware, hard glass, and earthen-ware. (Pg. 229 Sec. IX line 22 - 26)	Copper sheet	Here* are also workshops for enamelled boxes made of copper sheets. (Pg345 Sec. 433, line 7-8)			
Copper thickness	Thin copper sheet	Copper is taken in sheets, the thickness of a parchment. (Diderot P.5.537 Pa 10 line 7-8)					Thin copper sheet	The article to be manufactured in enamel was first "enamelled" or shaped in thin copper (pg 13 line 31-32) This metal was used because it was less liable to warp, on to blister, during the firing which subsequently it had to be subject (pg 14 line 1-2)	
Cutting of blanks from copper sheet							Cutting / pinking of copper blanks	Sheet copper, too, seemed to take the enamel well. (Pg14 line 2-3) Some of the articles were first punched out of a large sheet of copper, and after wards stamped into shape. (Pg14 line 5-6) The punching was done by hand, a mallet and a steel punch being used. (Pg14 line 7-8) In fact it will be noted that all the appliances used in the industry were of a somewhat primitive character. (Pg14 line 8-10) The pinking* of these blanks was effected by putting a lead of soft lead under the sheet-copper. (Pg14 line 11-12)	
Shape and finishing of copper blanks into a form	Shape of copper	then we are obliged to move all the pieces, whatever their shape, round, oval, or square. To ambulate them on this occasion is to make them convex on the side to be painted, and concave on the side to be counter-enamelled. (Diderot P 5.537 Pa 10 line 2-4)	Shape of copper	When plates, as in the case of pictures, dial plates, etc. are to be enamelled, they should always be made convex on the outside, and concave within; and all pieces of enamel formed of metal. (Pg 304 Sec. VII, line 3-6) *where the figure does not admit of their being thick and solid, should be of the same kind of form otherwise they will be very apt to warp in the heat; and cannot be brought straight, after they are taken from the fire, without cracking the enamel. (Pg304, Sec. VII, line 7-12)					
Shaping and finishing of copper blanks into a form	Tools / method of shaping	For this purpose it is necessary to have a punch of steel of the same shape as with a block of lead the piece is shaped on the block. The punch is pressed on, and a hammer is struck on the head of the punch. It is necessary to strike hard enough for the impression of the punch to be made at one blow. (Diderot P 5.537 Pa 10 line 4-7)				Tools / method of shaping	Tools / method of shaping	Some of the dies for "stamping had, necessarily, to be made in sections. (Pg14 line 12-13)	
Preparation of copper blank for enamelling		The piece used must be well equalled and well cleaned; the scraper is passed over the surface before and after it has received the impression. (Diderot P.5.537 Pa 10 line 8-10) What is proposed in the ambulation is to give it strength, and to prevent it from being revealed.		The body to be enamelled should be made perfectly clean. (Pg302, Sec. VI, line 2-4)				It is not certain whether every copper blank or shape, before being coated, received a wash in an acid bath. (Pg14 line 3-5)	

Figure 7. Comparative analysis matrix of copper substrate references in eighteenth century literature. Four other matrixes recorded processes relating to: application of enamel grounds; ground coat firing and furnaces; decorative enamel coats and firing; hinges and mounts.

## III. Craftsmanship analysis of making references in literature.

This comprised:

- Digital modelling of equipment described in literature, and subsequent analysis and interpretation.
- Craftsmanship analysis of eighteenth century enamel making description in literature.
- Comparison between descriptions in literature, material evidence inherent in the eighteenth-century enamel objects and material understanding acquired through practice.

## 6. Case Studies.

### 6.1 Three-dimensional digital modelling: re-constructing Dossie's furnace.

Dossie suggests two types of furnace are best for enamelling: a fixed muffle furnace for single object firing and a coffin furnace for batch firing. The furnace names were derived from the two means by which the enamel was protected from fumes and ash generated by the coal fire; the muffle, a tube in which to place a single enamel; and a coffin (6 x 7 x 10 inch) clay box to hold batches of enamel<sup>vii</sup>.

Dossie devoted ten pages to furnace construction description, his wordy explanatory texts appearing authoritative, but are complex to follow. Consequently, it is impossible to appreciate size, architecture, use, or test the clarity or reliability of his instruction from the writing alone. Therefore, digital three-dimensional drawing using Sketchup, a proprietary drawing software, was used to transform his written explanation into a three-dimensional reconstruction of his furnaces (see figure: 8 & 9). This was subsequently analysed through a craftsmanship lens.

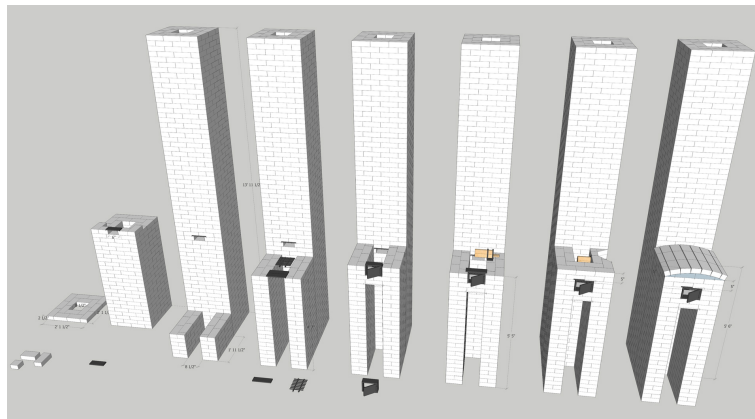


Figure: 8. Digital reconstruction of Dossie's muffle furnace. Image © J. Grayson.

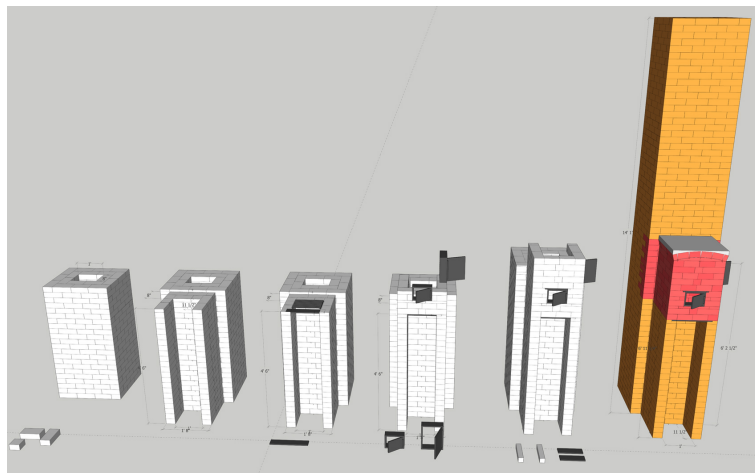


Figure: 9. Digital reconstruction of Dossie's coffin furnace. Image © J. Grayson.

## Findings.

Comparative analysis between the virtual three-dimensional model and Dossie's written references to furnace operation revealed important new insights. Dossie describes on two occasions that the advantage of the

muffle furnace and the architecture as he describes, allows for the operative to have 'convenient inspection of the work in the muffle' (Dossie, 1758: 234 & 237), presumably to witness colour change, a method enamellers use today to judge fusing temperature. However, the digital re-construction (see figure: 10) revealed the muffle to be above eye height when the furnace is built (see figure: 11), which would have hampered this ease of observation. Whilst in respect of the coffin furnace (see figure: 12), Dossie stipulates placing the coffins on the flat top of the furnace for warming before firing (Dossie, 1758: 239 - 240), to prevent thermal shock. Again, comparison with the drawing reveals a height issue, the top being seven feet from the ground, requiring the operative to lift the coffin on a baker's peel like instrument, above his head, whilst keeping it level to prevent objects shifting or toppling within the coffin. This seems unlikely and as a consequence raises questions over his build instructions. Were these anomalies a consequence of typographic errors? This seems unlikely given the over height duplication. One explanation could be that Dossie acquired the description of furnace construction from another source, perhaps a furnace builder. He in turn provided dimensions for the whole structure, but did not explain that the first courses of brick constituted a foundation, or, perhaps that a floor required building around the furnace on completion. If this were the case, then the workshop floor would be higher than it appears in the reconstruction of Dossie's furnace. As a consequence, when the furnace operative was standing on it the muffle and the furnace top would be at a comfortable working height.

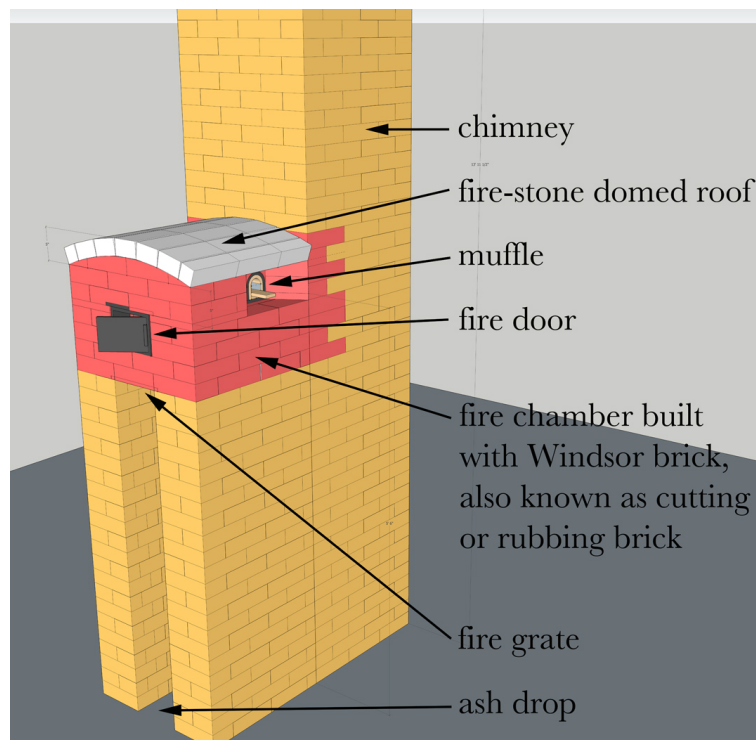


Figure: 10. Dossie's muffle furnace. Image © J. Grayson.

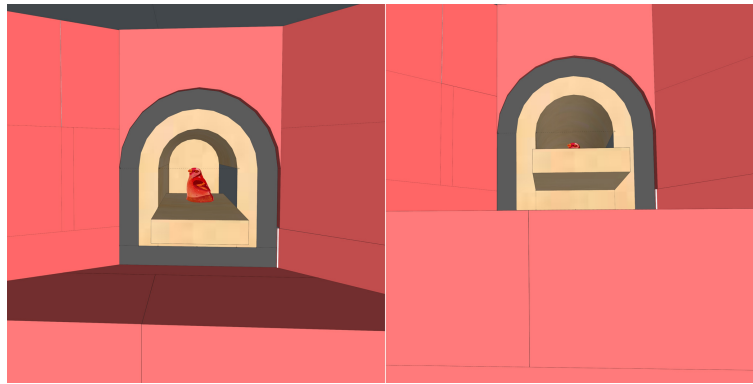


Figure: 11. (Right) Looking directly into the muffle during firing – the ideal height. (Left) The view into the muffle based on the eighteenth century average male height. Image © J. Grayson.

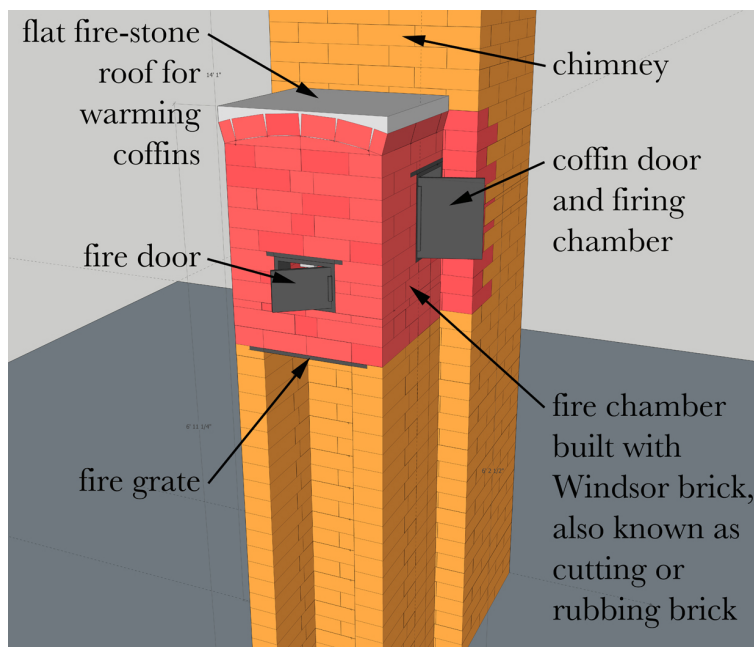


Figure: 12. Dossie's coffin furnace. Image © J. Grayson.

Furthermore, comparison between coffin furnace architecture and Dossie's description of the method of loading coffins into the furnace reveals a complex operation not alluded to in the text. Dossie explains that the coffins require placing in the furnace through the coffin door, the peel is extracted from under the coffin by using tongs, inserted through the fire door, to hold the coffin as the peel is slid out (Dossie, 1758: 305 - 306). Analysis of this operation, in relation to the position of the coffin door on the side, the fire door on the front and the distance between the two, reveals this to have been a two-person operation, information absent from his description.

## 6.2 Making in the workshop: interpreting Hackwood's craftsmanship references.

The comparison matrix revealed that Hackwood provided most information on the metal substrate stage of the process, writing:

*Some of the articles were punched out of a large sheet of copper, and afterwards stamped into shape. The punching was done by hand, a mallet and a steel punch being used. In fact, it will be noted that all the appliances used in the industry were of a somewhat primitive character. The pinking of these blanks was effected by putting a bed of soft lead under the sheet copper. Some of the dies for stamping had, necessarily, to be made in sections. (Hackwood and Stanhope, 1889: 14)*

Whilst Hackwood's process description of using lead and steel punches has resonance with those described by Diderot (Diderot et al., 1751: 5:537). Given a combination of the similarity between Hackwood's and Angerstein's assertions on other aspects of the trade, in particular the use of muffle furnaces (Angerstein, 2001: 47) (Hackwood and Stanhope, 1889: 15) and liquid enamel<sup>viii</sup> (Angerstein, 2001: 47) (Hackwood and Stanhope, 1889: 14), and the dearth of information on the fabrication of metal substrate in the literature, it was considered that this material was valuable and required analysis<sup>ix</sup>. This consisted of two methods. First, craftsmanship analysis of Hackwood's process descriptions through annotated notes and drawings around his text (see figure: 13), focusing on identifying tools and process, interpreting the explicit and suggested making references, whilst considering what absent process would be required to create the objects. Second, comparisons between the analysis of Hackwood's craft making descriptions and eighteenth-century enamel construction processes identified during primary data collection in museums.

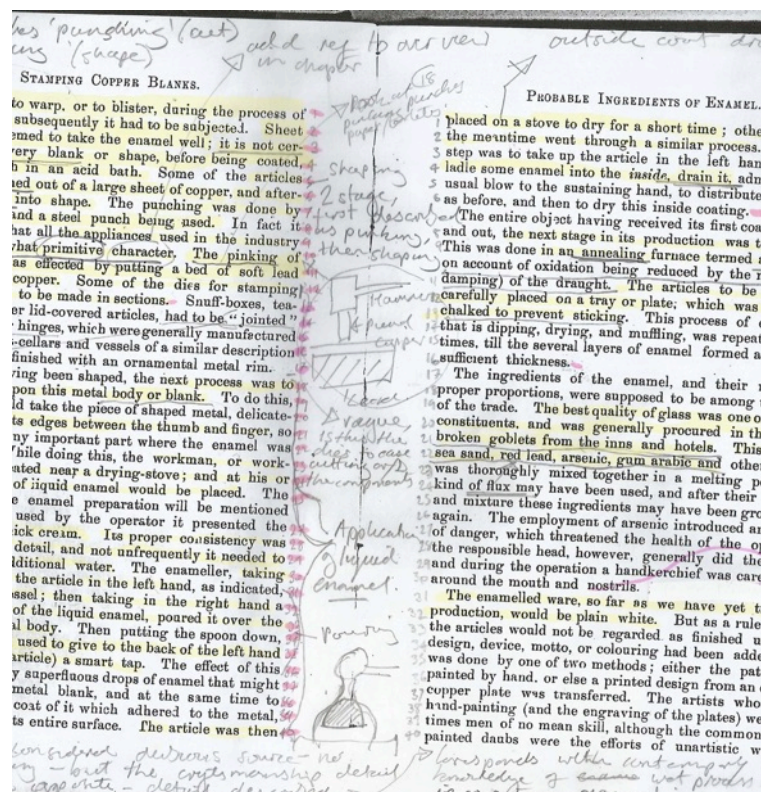


Figure: 13. Craftsmanship analysis of Hackwood's enamel entry in Wednesbury Workshops (1889).

## Findings.

My nuanced analysis of Hackwood's text focused on key details, in particular his proscribed method of first cutting out the copper shapes, followed by shaping the blanks. From a craftsmanship perspective, this runs counter to workshop practice, it being harder to judge how the metal will be drawn into the die when an exact shape is cut out. Generally, shapes are pressed from an oversize sheet and the waste edge then separated. Furthermore, after describing cutting and shaping of copper blanks, he latter describes the 'pinking' of shapes. To this researcher this apparent duplication of process description was confusing. Was he simply using a different term to describe the same action? Or, was it a nuanced reference to creating a different type of cut edge - the term pinking being used in textile making to refer to cutting an irregular edge. In this context was he making a differentiation between a straight and an irregular cut on a blank perhaps, to create tabs to effect jointing between components? Whilst it is not inconceivable that punches were manufactured to cut tabbed edges: during this period, pinking punches were made to cut decorative edges in paper and leather, and could have cut through the thin copper used. However, microscope analysis of the tabs visible on an enamel candlestick in the Wolverhampton collection (see figure: 3), revealed slight variations to the size and profile of each tab, suggesting that each was cut individually by hand. Finally, Hackwood identifies dies made in section, which may have been a reference to different press tools being made to form the various copper components of a fabricated object. Here eighteenth-century methods of construction revealed through object analysis in museums identified that multiple pressed metal components were clearly joined using tabs, corroborating this interpretation of Hackwoods description.

## 7. Conclusion.

Analysis of craft making references in literature rooted in the eighteenth century has revealed a new insight into workshop practices used in the trade, around which subsequent making hypotheses can be constructed in future research. It has identified specific information on preparation and application of enamel grounds, and painted and printed decorative techniques. Surfaced contradictions with regards to: application of enamel grounds to metal substrate - Dossie indicating sifting of enamel powder on to adhesive coated metal, whilst Angerstein and Hackwood cited liquid enamel; the types of furnaces used - Dossie suggesting muffle and coffin depending on the type of work being manufactured, whilst the regionally connected authors specify muffles. Given that fragments of coffins were found during the archaeological dig undertaken at the site of the Battersea works (Crouch, 2005: 31), an explanation could be that it is indicative of regional process difference, or, that coffins were used for batch firing of printed decoration on to identical ware (associated with the Battersea works), whilst muffles were used for firing single objects.



Figure: 14. *La Brexiteuse à Petit Talons (2016)*, digital automaton. Media: contemporary enamel, brass and electronics. Size: 235mm x 290mm x 120mm. Photograph: J. Grayson.

As part of the broader research, two contemporary craft-works, *The Discombobulated Brexiteer*, made for the Crafts Council, and *La Brexiteuse à Petit Talons* (see figure: 14), were used to test hypothesis on methods of forming, cutting and jointing to make complex objects. Through material investigation technical knowledge and material understanding was developed. This revealed to the researcher that simple generic metalworking tools (snips, saw, file) were sufficient to make complex constructions from remarkably thin copper foil. And, perhaps further corroborates this researcher's interpretation of Hackwood's writing.

Furthermore, whilst the research has confirmed a distinct absence of information on complex metal substrate manufacture, it has also raised questions over the manifestation of the absence of substrate making in eighteenth century literature. Was it a product of the apprenticeship system, tacit skills being developed and kept in the workshops and knowledge only being passed on verbally? Could it be that this aspect of the manufacturing was outsourced and so disconnected from the enamel trade, and so missed by the industrial tourist such as Angerstein? Or, was it more fundamental than happenstance, a product of a conscious decision to protect from prying eyes, valuable intellectual property, on the part of the workshop owners? If the later was the case, it puts a different perspective on this absence of substrate making description, particularly in light of the researchers own material experiments, revealing it to be considered technologically innovative at the time and possibly unique to the Midland trade. This raises questions over what value this absent knowledge may have to the twenty first century research and maker community.

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## Endnotes

<sup>i</sup> The snuff boxes held snuff (ground tobacco), snorted rather than smoked; the patch box contained black silk spots to wear on the face (initially over pox marks but later as fashion accessories), the box contained a mirror to aid application; the bonbonnière held cashew nuts flavoured with mint as an eighteenth century breath freshener.

<sup>ii</sup> Transfer printing was used extensively in the eighteenth century ceramic industry, what is less well acknowledged is the role the enamel industry played in its development, or its use in the enamel trade. Papers presented to the English Ceramic Circle provide useful insight in this regard, see:

<https://www.englishceramiccircle.org.uk/index.php/archive-link-page/>

<sup>iii</sup> Different enamel techniques comprise: Cloisonné - metal wires fixed to sheet metal to create enclosures in which individual coloured enamel is applied; Champlevé - engraved rebates in the metal surface in which enamel is laid; Plique à Jour - a metal framework where enamel is fused into each cell.

<sup>iv</sup> Angerstein's travel diary is important because of its comparatively recent translation, the information within independently verify processes description described by Victorian historian Hackwood.

<sup>v</sup> Bilston and Battersea Enamels Ltd., manufactured reproduction enamel boxes for Halcyon Days Enamels Ltd., <https://www.halcyondays.co.uk> a company originally set up by antique dealer, connoisseur and author Susan Benjamin. The company used modern techniques for stamping copper boxes, and decorated them using traditional enamel painting technique and contemporary enamel transfer print methods. The factory closed in 2010.

<sup>vi</sup> The enamels held by the V&A and Wolverhampton Art Gallery respectively, constitute the world's two foremost collections of this enamel object type. At the time of writing the V&A and Harris collections were not online. Wolverhampton collection is viewable at <http://www.wolverhamptonart.org.uk/collections/>. The Museum of London collection at <https://collections.museumoflondon.org.uk/online/search>.

<sup>vii</sup> A coffin, like a saggar in the ceramics industry, was a fire clay protective box in which ware was placed to protect it during firing in coal fuelled kilns.

<sup>viii</sup> Liquid or wet process enamel is finely ground vitreous material held in water suspension. It is particularly suitable for applying grounds to three-dimensional objects especially where inaccessible internal surface need to be coated.

<sup>ix</sup> Like many Victorian historians, Hackwood was particularly prone to not documenting his sources. Contemporary historiographers may consider Hackwood to be of limited currency, whose perspectives were framed by the Whig historical viewpoint dominant during the 19<sup>th</sup> century. His writing style, and politics were certainly in line with the Whig view of history and could explain Hackwood's vagaries concerning attributing his sources in his writing, when judged by contemporary standards.

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