THE 1744 CERAMIC PATENT OF HEYLYN AND FRYE: 'UNWORKABLE *UNAKER* FORMULA' OR LANDMARK DOCUMENT IN THE HISTORY OF ENGLISH CERAMICS?

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The evolution of ideas, assumptions, and peer-group constraints regarding the efficacy, or otherwise, of the 1744 ceramic patent of Edward Heylyn and Thomas Frye is discussed. Various concepts, notions, and dictates are investigated and it is observed that because of these our understanding as to the significance and importance of the 1744 patent has been undeservedly diminished over the last 150 years. Circular arguments, misleading transcripts of the patent itself, and unwarranted and unsubstantiated assertions have all combined to lessen the stature of this patent. In contrast, recent research concludes that the 1744 patent is a landmark document, which is anything but unworkable, experimental, uncertain, or hesitant. This patent on the one hand relates the 'A'-marked group of porcelains to the patent itself, and on the other hand to Cherokee clay (*uneka*) located in the southern Appalachians. In addition it offers circumstantial evidence linking these porcelains to the experimental kiln-firings of Andrew Duché in Savannah, Georgia. It is concluded that the 1744 patent is central to any future understanding of this earliest period of porcelain development in the English-speaking world.

Keywords: Edward Heylyn, Thomas Frye, Andrew Duché, 1744 ceramic patent, 'A'-marked porcelain, Bow porcelain, hard-paste porcelain, Chelsea porcelain

OF LATE there has been a number of papers investigating the birth of the English porcelain industry (Ramsay et al. 2001, 2003, 2004 a, b) and one of the significant conclusions drawn from these works is that our understanding of the period relating to the inception of the industry may have been unnecessarily impeded because of various confusions, beliefs, and unsubstantiated assertions, which over time have tended to become articles of faith. One of these beliefs relates to the perception over the last 100 years or more, that the 1744 ceramic patent of Heylyn and Frye was at best experimental and at worst, unworkable. Secondly, since the recognition of the 'A'-marked porcelains as a coherent group in the 1930s there has been a perceived reluctance in relating these porcelains to the 1744 patent and to the patentees, Edward Heylyn and Thomas Frye. The third aspect relates to the assumed pre-eminence of the Chelsea porcelain manufactory.

In the case of Chelsea there has for the last hundred years or so been the relatively unanimous view that it was most likely the first factory to produce commercial porcelains. Nightingale (1881) commences his account of English porcelains by stating that Chelsea was incontestably the most important, both artistically and otherwise, of any of the English manufactories. Adams and Redstone (1981: 19) state that Chelsea probably does bear away the 'palm' for the earliest founded English porcelain manufactory. More recently Sandon (1989) whilst noting that collectors will always argue over which was the first English porcelain factory, concludes that Chelsea is the only one which can begin to lay claim to that title.

We suggest that several factors have coalesced to develop this belief that Chelsea was not only the first manufactory but also the role-model for other concerns such that in some way it may have held a monopoly over other English-made porcelains for a short period (Sandon 1989: 17). Firstly, the Chelsea recumbent goat-and-bee jugs are generally regarded as representing the earliest English porcelain wares, with several examples bearing an incised date on their base of 1745 (Adams 2001; Godden 2004a). This in itself has tended in many instances to impose a chronostratigraphical barrier to any enquiry into porcelain developments that may have occurred prior to 1745. Secondly, the earliest extant dated Bow porcelain wares relate to 1750 (Tait 1959) thus casting uncertainty as to what, if any, Bow wares were produced prior to this date. Consequently, in the belief that there was no rival concern of comparable stature, there has been a preference to assign to Chelsea various references such as the mention in the Vincennes Privilege of 1745 to a new establishment, which had just been formed in England whose porcelain appeared finer than that of Saxony because of

its composition (Hobson 1905; Hurlbutt 1926; Legge 1984; Dragesco 1993).

With regard to the 1744 patent, whilst reference is often made to this document (Her Majesty's Stationery Office, 1856) by various writers (Burton 1902; Dillon 1904; Watney 1963, 1973; Gabszewicz 2000) there have always been doubts and questions raised as to the efficacy and verisimilitude of this patent. Possibly Begg and Taylor (2000: 18) best summarise the currently accepted view of the 1744 patent when they state,

> Porcelain which fits the first patent has not been identified, but contemporary accounts indicate that actual production had commenced by 1747, if not before.

The central thrust of our contribution in this paper is to take the 1744 patent of Heylyn and Frye and to examine the various ideas and notions that have evolved and constructs imposed on this patent over the last 150 years. It is no accident that during this period the 1744 patent has been viewed by many at best hesitantly and at worst in a somewhat dismissive manner and these aspects have contributed to this patent being diminished and its full significance to the nascent English porcelain industry not fully being appreciated or recognised. It is our contention that the 1744 patent is a landmark document in English ceramic history and that this document offers significant insights into the origins of this porcelain industry. By rehabilitating and restoring this patent to its rightful place in English ceramic history, we suggest that a better appreciation of these earliest years in Anglo-American porcelain development may be obtained and it may now be opportune to re-evaluate the role played by the Bow proprietors and their porcelain output during early English porcelain production.

THE ENGLISH PATENT SYSTEM

About 120 years before the enrollment of Heylyn and Frye's 1744 patent, Great Britain, or more correctly England, established the world's first patent system. Prior to 1624 the issuance of letters patent was a royal prerogative. The monarch issued letters patent ostensibly for the technological good of the country, but increasingly during the reign of Elizabeth 1 and James 1, for the good of the Royal exchequer. For example, during the reign of Queen Elizabeth I monopolies were granted for the manufacture and sale of commodities such as soap, salt, glass, iron and paper, to the ever-increasing displeasure of the populace. The sale of monopolies continued under James 1, however, this income generating practice ended in 1624 with Parliament passing the Statute of Monopolies.

The Statute rendered all monopolies "*utterly void and of no effect*", however, section 6 of the Statute excepted grants for 14 years or less, according to certain fundamental tenets namely, "*making of any new manufacture within the realm*" by "*the true and first inventor*". These tenets still continue to provide the basis of all patent systems worldwide. Since 1624, apart from the period of the Protectorate, this patent system has continued to operate in Great Britain. Prior to the 1624 Statute of Monopolies, the granted monopolies included few inventions when retrospectively considered against the fundamental tenets of, first and true inventor of an invention new within the realm. In the 1850s Englishman Bennet Woodcroft cataloged and numbered all (14,357) English patents issued between 1617 and 1853. It is as a direct result of Woodcroft's endeavors that copies of these early patents are available for both edification and speculation.

Various ceramic scholars have studied Heylyn and Frye's 1744 patent and have analyzed both the process disclosed and the meaning of the text. Patents are like living documents; the author (inventor) communicated a process or arrangement defining his invention. However, it is inevitable that his words are attributed new interpretations and hidden meanings. Even today the final arbiter of patent word meaning is a trial judge. Thus, to impute meanings to patent wording some 200 years later can be speculative.

Jewitt (1878) details the history of the various ceramic patents taken out in England commencing from the 17th century. On April 23rd, 1672, John Dwight took out a patent stating that,

> … he had discovered the Mistery of Transparent Earthen Ware, comonly knowne by the Names of Porcelaine or China and Persian ware, as alsoe the Misterie of the Stone Ware vulgarly called Cologne Ware.

This patent expired in 1684 and a new one specifying in greater detail the various articles and wares, was granted in June, also for a term of fourteen years. Jewitt comments that by the early 18th century the art of pot-making began to accelerate; for in the period from 1722–1749, a space of twenty seven years, no-less than nine separate patents were taken out commencing with Richard Holt and Samuel London who applied for a patent for,

> … a certain new 'composicon' or mixture (without any sort of clay) for making of white ware, which is formed and moulded in a method hitherto not known or practised, and far surpasses the finest of delf ware, or any other sort made in any part of Europe …

THE 1744 PATENT OF EDWARD HEYLYN AND THOMAS FRYE

The patent document

Watney and Charleston (1966) record that among the State Papers Domestic in the Public Records Office are various petitions for patents and in some instances the original depositions, law officers' opinions, and other relevant papers. In the case of the so-called ' Bow first patent' of Edward Heylyn and Thomas Frye a deposition was sworn at the Public Office on October 8th, 1744 with Heylyn and Frye's original signatures (Public Record Office, S.P. 36/64). On November 21st the Attorney-General reported on the petition and addressed his report to Earl Granville, one of His Majesty's Principal Secretaries of State. On December 6th the patent application was filed, affixed with the Great Seal of Great Britain, and was granted on the proviso that Heylyn and Frye,

> … describe and ascertain the nature of our said Invention, and in what manner and of what materials the same was to be performed, by an instrument in writing, under our hands and seals, or the hand and seal of one of us, …

Their specification was required to be deposited in writing and signed by one or both patentees within four months of December 6th otherwise the patent,

> … should cease and be void.

This specification was subsequently handed in to the Petty Bag Office (one of three depositories) on April 5th, 1745, (with one day to spare) stamped and awarded sealed protection. However the term of protection ran for fourteen years from the grant date of December 6th of the previous year. The Heylyn and Frye patent was reprinted and published at The Great Seal Patent Office in 1856 (Her Majesty's Stationery Office, 1856) and the specification contained in this reprint was proof read against a clerk's long hand copy (C/210/4) of Heylyn and Frye's written filing and now housed in the National Archives, Kew. Apart from punctuation differences, the 1856 reprinted version was found to be an accurate transcription. The following is a copy of the 1856 version of Heylyn and Frye's December 6th 1744 patent:-

> TO ALL TO WHOM THESE PRESENTS SHALL COME, we, Edward Heylyn, in the Parish of Bow, in the County of Middlesex, Merchant, and Thomas Frye, of the Parish of Westham, in the County of Essex, Painter, send greeting.
>
> WHEREAS His most Excellent Majesty King George the Second, by His Royal Letters Patent, under the Great Seal of Great Britain, bearing date at Westminster, the Sixth day of December, in the eighteenth year of His reign, reciting that whereas we, the said Edward Heylyn and Thomas Frye, had, by our Petition, humbly represented unto His said Majesty that we had, at a considerable expence of time and money in trying experiments, applyed ourselves to find out a method for the improvement of the English earthenware, and had at last invented and brought to perfection "A NEW METHOD OF MANUFACTURING A CERTAIN MATERIAL, WHEREBY A WARE MIGHT BE MADE OF THE SAME NATURE OR KIND, AND EQUAL TO, IF NOT EXCEEDING IN GOODNESS AND BEAUTY, CHINA OR PORCELAIN WARE IMPORTED FROM ABROAD;" which Invention we, the Petitioners, apprehended would be of vast advantage to the kingdom, as it would not only save large sums of money that were yearly paid to the Chinese and Saxons, but also imploy large numbers of men, women, and children; and that as many and as great benefits would arise therefrom to this nation, as from the woolen or iron manufactories, in proportion to the numbers of people that would be employed therein, His Majesty did therefore, of his especial grace, certain knowledge, and meer motion, give and grant unto us, the said Edward Heylyn and Thomas Frye, our extors, admors, & assigns, His especial licence, full power, sole priviledge & authority, to make, use, exercise, and vend our said Invention in that part of Great Britain called England, Dominion of Wales, and Town of Berwick-upon-Tweed, to hold to us, the said Edward Heylyn and Thomas Frye, our extors, admors, and assigns, for the term of fourteen years from the date of the said recited Letters Patent. In which said Letters Patent there is contained a provisoe, that if we, the said Edward Heylyn and Thomas Frye, should not particularly describe and ascertain the nature of our said

Invention, and in what manner and of what materials the same was to be performed, by an instrument in writing, under our hands and seals, or the hand and seal of one of us, and cause the same to be inrolled in His Majesty's High Court of Chancery, within four calendar months after the date of the said recited Letters Patent; that then the said Letters Patent, and the libertys and advantages thereby granted, should cease and be void, as in and by the same Letters Patent (relation being thereunto had) may more at large appear.

NOW KNOW YE, that we, the said Edward Heylyn and Thomas Frye, in pursuance of the said provisoe, contained in the said recited Letters Patent, do hereby describe and ascertain the nature of our said Invention, and the manner and of what material the same is to be performed, as herein-after is mentioned (that is to say)**:-**

The material is an earth, the produce of the Chirokee nation in America, called by the natives unaker, the propertys of which are as follows, videlicet, to be very fixed, strongly resisting fire and menstrua (dissolution), is extreamly white, tenacious, and glittering with mica. The manner of manufacturing the said material is as follows:- Take unaker, and by washing seperate the sand and mica from it, which is of no use; take pott ash, fern ash, pearl ash, kelp, or any other vegetable lixiviall salt, one part of sands, flints, pebbles, or any other stones of the vitryfying kind; one other part of these two principles form a glass in the usual manner of making glass, which when formed reduce to an impalpable powder. Then mix to one part of this powder two parts of the washed unaker, let them be well worked together until intimately mixed for one sort of ware; but you may vary the proportions of the unaker and the glass; videlicet, for some parts of porcelain you may use one half unaker and the other half glass, and so in different proportions, till you come to four unaker and one glass; after which knead it well together, and throw it on the wheel, cast it into moulds, or imprint it into utensills, ornaments, &c.; those vessells, ornaments, &c., that are thrown, should be afterwards turned on a lathe and burnished, it will then be in a situation to be put into the kiln and burned with wood, care being taken not to discolour the ware, otherwise the process will be much hurt. The first burning is called biscuiting, which if it comes out very white, is ready to be painted blue, with lapis lazuli, lapis armenis, or zapher, which must be highly calcined and ground very fine. It is then to be dipt into the following glaze:- Take unaker forty pounds, of the above glass ten pounds, mix and calcine them in a reverberatory; then reduce, and to each pound when reduced add two pounds of the above glass, which must be ground fine in water, and left of a proper thickness for the ware to take up a sufficient quantity. When the vessells, ornaments, &c, are dry, put them into the kiln in cases, burn them with a clean wood fire, and when the glaze runs true lett out the fire, and it is done, but must not be taken out of the kiln till it is thorough cold.

In witness whereof, we, the said Edward Heylyn and Thomas Frye, have hereunto sett our hands and seals, this Fifth day of April, in the year of our Lord One thousand seven hundred and forty-five.

Signed EDW^{D} (L.S.) HEYLYN
THO^{S} (L.S.) FRYE

Sealed and delivered (being first duly stampt), in the presence of
THO. SHERMAN.
DAN. FENDEN.
CHA^{S} HEYLYN.

AND BE IT REMEMBRED, that on the said Fifth day of April, in the year of our Lord One thousand seven hundred and forty-five above said, the aforesaid Edward Heylyn and Thomas Frye came before our said Lord the King in His Chancery, and acknowledged the above Instrument, and all and every thing therein contained and specified, in form above written. And also the Instrument aforesaid was stampt according to the tenor of the Statute made in the sixth year of the reign of the late King & Queen William and Mary of England, & so forth.

Inrolled the aforesaid Fifth day of April, in the year above said.

Although commonly referred to as the ' Bow first patent' the authors note the caution by Mr John Mallet who observes that this term may be inappropriate (Ramsay et al. 2001: 492). In the absence of dated Bow wares predating 1750, the earliest extant record which mentions Bow is the published advertisement in the 'Daily Advertiser' on 26th August, 1748 — '*BOW CHINA. GREAT variety of useful and ornamental CHINA to be sold at Mr Mitchells' Toyshop, at the Dial and King's Arms in Cornhill, near the Royal Exchange'*. In addition there is the

reference for a large manufactory lately set up in the village of Bow, in the 4th Edition of Daniel Defoe's *Tour of Great Britain*, which is regarded to have been published in June 1748 (Tait 1963) or July 1748 (Tait 1965). Lastly there is the undated letter written by John Campbell assumed to have been written to Arthur Dobbs of Carrickfergus, in which Campbell mentions his visit to the Bow ceramic concern, the presence of white clay (which could possibly be regarded as a synonym for Cherokee clay), and his less than favourable impression of the concern — thus suggesting a very early date for Campbell's on-site inspection (Daniels, pers. com. 2002). Watney (1963, 1973) dates the letter as 'about June 24th, 1749', but provides no justification and states incorrectly that the identity of the author of the letter was John Campbell L.L.D., a prolific writer and authority on industry and trade, who was made agent for Georgia in 1765. For a correct identification of John Campbell refer to Hood (1968). The letter may have been written on or around May 18th, 1749 based on an inferred companion letter to Earl Granville. Another distinct possibility is that the letter was written around May 1745 (unpublished data) and could refer to any one of a number of Campbell's visits to London, which stretch back to the 1730s. Research into which of these visits to London was the one that Campbell toured the Bow concern is nearing completion. With the foregoing, we accept the terminology 'Bow first patent,' on the basis that the 1744 patent describes the manufacture of porcelain presumably in the vicinity of Bow. In addition both patentees are recognized proprietors of the Bow manufactory during its production of phosphatic wares based on the 'Bow second patent.' In this account we regard as synonymous the terms 1744 patent, Heylyn and Frye patent, and the 'Bow first patent.'

With regard to the above patent we note the following points,

- The patent was signed by five people, the two patentees and two of the others directly related to Edward Heylyn (Charles Heylyn, his son, and Thomas Sherman an uncle). Both Edward Heylyn and Thomas Frye subsequently went on to develop and promote a highly successful ceramic concern using bone ash (Bow second patent of 1749) and because of this record we suggest that the patent is likely to be genuine and was not entered with any intent to defraud or to dissemble the truth.
- Secondly we note that Heylyn gives his address as Parish of Bow and Frye as Parish of West Ham. Thus we suggest that any concern or enterprise that was erected to carry out the manufacture of the associated porcelains would most likely have been in the vicinity of their East London addresses, probably in the general area of the village of Bow.
- Thirdly we draw attention to the clarity of the descriptions as to how these porcelain wares are made and the specifications required for this purpose.
- Lastly in regard to deductions and inferences relating to the kiln-firing of analogue 1744 patent wares, we refer to the publication by Ramsay et al. (2004a).

Other contemporary documents

A second contemporary, primary-source document, in addition to the 1744 patent, is the William Cookworthy letter to his friend, Dr Richard Hingston, dated July 27th, 1745 (Daniels, pers. com. 2002) and not May 1745 (Watney 1963, 1973). In this correspondence Cookworthy describes having met the person who had discovered 'china earth' on the back of Virginia where this person was in quest of mines. Cookworthy discusses the examples of china ware "*…of their making*", which he regards as being equal to the Asiatic and then mentions that this person had gone for a cargo of this special clay, which was essential for the success of the manufacture of this china.

A third contemporary, primary-source document is by Dossie (1758) in *The Handmaid of the Arts.* In this publication, Dossie notes that kaolin is one of the key ingredients of Oriental porcelain and this clay had been discovered in abundance on the back of the Carolinas. He also records that the proprietors of a works near London sent an agent to procure some of this China clay for them.

A further document is the Vincennes Privilege awarded to Charles Adams on July 24th, 1745 by Louis XV. This document states that in England there is one manufacturer of porcelain whose style or appearance is more beautiful than that of Saxony (Meissen) because of its composition. Whilst widely regarded as referring to Chelsea (Dragesco 1993); Tiffen (1874), Chaffers (1863), and Daniels (2003) regard the reference as referring to Bow and in the case of Daniels, as referring specifically to 'A'-marked porcelain, an observation supported through kiln-firing of analogue 1744 patent wares by Ramsay

et al. (2004a). Ramsay and Ramsay (2005b) further support Daniels and list features, compositional, technical, and decorative, as to why the Privilege refers to 'A'-marked porcelain and not to Chelsea.

From the patent and these contemporary documents we note the following, on the reasonable assumption that all four refer to the same ceramic concern and to 'A'-marked porcelain. Two of the documents specifically refer to a China clay, whilst from the patent itself, it can be inferred that the earth or clay described was a primary residual clay, such as a China clay (Binns 1898; Dillon 1904; Hurlbutt 1926). Subsequent research (Ramsay et al. 2001) has shown this clay to belong to the kaolinite group and to comprise some 90% halloysite and 10% kaolinite. Secondly from the patent it can also be inferred that the location of the manufactory was likely to be in East London, possibly in the vicinity of the village of Bow, based on the stated domicile of Heylyn and Frye. Likewise Dossie states that the concern was near London, not near Edinburgh (Charleston and Mallet 1971; Valpy 1987; Mallet 1994,), Stourbridge (Mallet 1994; Young 1999), or Newcastle-Under-Lyme (Freestone 1996). In the case of the Cookworthy letter, it refers to the porcelain carried by the discoverer of the China earth, as being "*of their making*" and from this it has been inferred that the concern was London-based, possibly Bow (Watney 1963, 1973). Three of the documents are very clear that the source of the clay was to be found in the New World on the back of Virginia (Cookworthy), on the back of the Carolinas (Dossie), and in Cherokee territory (1744 patent). This minor discrepancy in location of the clay or earth is discussed by Gilmer (1948) where she notes that at that time the border between the Carolinas and Virginia was poorly known in the '*back country*'. Finally two of the documents specify that an agent was, or had been sent to procure supplies of this clay.

Based on the patent document, Cookworthy's letter, the Vincennes Privilege, and even from the use of China clay, as specified by Dossie, it is possible to deduce that the resultant wares may have been a high-firing, hard-paste porcelain, as subsequently demonstrated by Ramsay et al. (2004a) for analogue 1744 patent porcelain.

In summary we submit that there was a ceramic concern near London producing high-firing, hard-paste porcelain by 1743, which utilised a refractory China clay imported from the New World — from the western Carolinas. William Cookworthy has provided us with an unequivocal and impartial eye witness account of this porcelain, which he described as, "*….equal to the Asiatic"* and composed of China earth derived from the back of Virginia. Likewise the Vincennes Privilege compares porcelain made in England by mid 1745 as compositionally comparable to that of Meissen. There is no known English porcelain of this period, other than 'A'-marked porcelain, which fits such descriptions. Freestone (1996) regards these wares shown Cookworthy as technically consistent with the 'A'-marked porcelain group, whilst Ramsay et al. (2001) regard such wares as in fact belonging to the 'A'-marked group. Ramsay et al. (2004a) have suggested that Cookworthy, who had devoted his life to the discovery of the method of firing hard-paste porcelains in the manner of the Chinese, represented an impartial observer and would not have been unduly impressed had such wares shown him been of a soft-paste composition after the manner of the French; what Solon (1903) refers to as that porcelain vulgarized by the French. We suggest that the inferred 'A'-marked porcelain shown him required the use of a refractory China clay (with a non-lead, high firing Si-Al-Ca glaze), was compact, hard, translucent, with a conchoidal or modified conchoidal fracture, and appeared to be of a hard-paste composition, which was resistant to thermal stress, as was found in both Chinese and Meissen wares.

Response to the 1744 patent by ceramic historians, 1837–2004

As noted in the introduction, the major aim of this contribution is to trace the various ideas and notions that have grown up around the 1744 ceramic patent of Heylyn and Frye and hence arrive at an understanding as to why this patent has received so many negative and dismissive comments during the last 100 years. This investigation commences with Simeon Shaw where he records (Shaw 1837: 436),

> The potters of Bow and Chelsea, from compounding well-washed sand from Alum Bay, Isle of Wight, ground cullet, and pipe-clay, fabricated porcelain, which was covered with a glaze, chiefly of lead, which had considerable demand in the early part of the last century.

No basis or reference for this recipe is provided and it is uncertain as to which Bow wares Shaw was referring to — first or second patent. Moreover there is a subsequent reference to this recipe by Burton (1906), which fails to afford prior acknowledgement

to Shaw. We record that neither the first nor second Bow patents specifies such a recipe, however this composition could conceivably correspond to the early Chelsea triangle period recipe, where the glass cullet employed apparently comprised both a lime-alkali glass and a flint glass — the latter to supply the lead component in the analysis (Tite and Bimson 1991: analysis No. 32699).

De La Beche and Reeks comment in their publication, *British pottery and Porcelain from the Occupation of Britain by the Romans to the Present Time,* published in 1855 that,

> The exact date of the first English porcelain manufactures at Bow and Chelsea does not appear to be correctly known……The sand used to render the clays perfectly 'dry,' is mentioned as having been obtained from Alum Bay, in the Isle of Wight, a sand which has been extensively employed in the manufacture of glass.

1863 saw the appearance of the first edition of the seminal work by William Chaffers, *Marks and Monograms on European and Oriental Pottery and Porcelain.* In this account Chaffers speculates that someone from America, as recorded by William Cookworthy, probably made terms with the Bow China factory to supply a new earth suitable for making china like the oriental. Chaffers then goes on to provide what might appear to be a transcript of the 1744 patent, but in a manner which greatly abbreviates it, such that the Chaffers' version differs considerably from the patent itself. In particular, the detailed specifications relating to the amounts of clay and glass to be used for the body and glaze are excised. This abridged version of the 1744 patent, notwithstanding Jewitt's expressed concern quoted below, has been reprinted on many occasions in numerous editions of Chaffers' *Marks and Monograms*, with the 15th edition appearing in 1965. Consequently fiction and fact may have commenced to merge resulting in what might appear to be erroneous assertions being made about the patent by various subsequent authors. The Chaffers' misleading version of the 1744 patent is reproduced yet once more below so that it can be compared with the original version of the patent given above,

> Edward Heylin (*sic*), in the parish of Bow, in the county of Middlesex, merchant, and Thomas Frye, of the parish of West Ham, in the county of Essex, painter, took out a patent on the 6th of December 1744 for "a new method of manufacturing a certain mineral (*sic*), whereby a ware might be made of the same nature or kind, and equal to, if not exceeding in goodness and beauty, china or porcelain ware imported from abroad. 'The material is an earth, the produce of the Cherokee nation in America, called by the natives UNAKER.' A glass is formed in the usual way with one part of either 'pot-ash, fern-ash, pearl-ash, kelp, or any other vegetable lixiviall salt,' and 'one part of sand, flints, pebbles, or any other stones of the vitrifying kind,' and reduced to an impalpable powder, and mixed in different proportions, according to the nature of the ware to be made, with 'unaker', from which sand and mica have been removed by washing. They are then kneaded together, thrown or moulded, and put into a 'kiln burned with wood,' called 'biscuiting,' then painted and glazed with 'unaker' and the glass above described; 'they are not to be taken out of the kiln till it is thorough cold.'

In 1878 Lewellyn Jewitt published his two volume set *The Ceramic Art of Great Britain from Pre-Historic Times Down to the Present Day.* Jewitt's main contribution with regard to the 1744 patent was to reproduce the wording of the patent (page 112) in an accurate manner using the original spelling but leaving off the names of the two patentees and the three witnesses at the conclusion. Jewitt further notes that nothing definitely is known as to the date of the first establishment of this important china manufactory located at Stratford-le-Bow, however he deduces that the concern must have been in existence some time prior to 1744, because it was in that year that the patent was taken out. He then admonishes Chaffers and states,

> This specification I have printed in full on page 112, and it will be found of the highest interest and totally different from that what is put forth by Chaffers as a copy of it.

Here arises what we regard to be the first major confusion regarding the 1744 patent, in that Chaffers' imprecise version of the patent has been reproduced endlessly, whilst Jewitt's excellent transcription has not. Reliance on the Chaffers' version has resulted in what might appear to be erroneous assertions being made about the patent by various subsequent authors, with a possible example being Bradshaw (1992).

A. H. Church, a well-regarded chemist with both an MSc and a DSc, was Professor in Chemistry at the Royal Academy of Arts, London, and a member of the Royal Society. He was most likely the first to undertake chemical analyses on wasters

of Bow porcelain, which had recently been recovered from the Messrs Black and Sons' site located on the southern side of Stratford High Street. There is some uncertainty as to the identity of the manufactory whose phosphatic wares were analysed by a Mr. Cooper and reported on by de la Beche and Reeks (1855). Church, in his Cantor Lecture of December 13th, 1880, advised that the 1744 patent's specifications require one part of potash, one of sand or flint and *unaker*. In 1885 Church published his book *English Porcelain* and this publication repeated the 1880 lecture and required the glass frit specified in the patent to comprise one part potash (potassium carbonate, K_2CO_3) and one part sand or flint (silica, SiO_2).

> The two patents taken out in connection with the Bow works disclose two essentially different porcelain-bodies. The 1744 specification of Edward Heylyn and Thomas Frye gives, as the ingredients, one part of potash, one part of sand or flint, and from one to four parts of a kind of porcelain-clay called unaker, from which the sand and mica had been removed by washing, from the Cherokee territory, North America: the glaze contained seven of potash-glass to one of unaker.

We consider this interpretation by Church of the composition of the glass frit used for both the body and glaze in the 1744 patent to be incorrect and unfortunately this incorrect composition has led to a second train of invalid assumptions and assertions, which can be traced from this date of 1885 through to Watney (1963, 1973) and beyond. The 1744 patent states as follows,

> … take pott ash, fern ash, pearl ash, kelp, or any other vegetable lixiviall salt, one part of sands, flints, pebbles, or any other stones of the vitryfying kind; one other part of these two principles form a glass in the usual manner of making glass, which when formed reduce to an impalpable powder.

Based on the 1744 recipe, we deduce the following components would or could have been included in the glass frit used by Heylyn and Frye (Table 1).

From Table 1 it can be seen that based on the patent wording alone, the glass frit, by virtue of the vegetable ashes specified, would have contained CaO, MgO, and even small amounts of P_2O_5, in addition to SiO_2 and K_2O. The practice of burning a calcium source (limestone) with fern, such as bracken, after the manner of the Chinese would have been common knowledge by then in England after Père D'Entrecolles, a Jesuit missionary to Jingdezhen (Ching-tê-Chên), wrote his letters in 1712 and 1722 on Chinese ceramic practices. These in turn were published in Paris in 1717 and 1722 and then incorporated in Jean-Baptiste Du Halde's *Description géographique … de l'empire de la Chine* of 1736, with the English edition appearing in 1738–41. As noted by Ramsay et al. (2004a) the likely source of sodium is possibly a problem although the use of kelp could produce minor levels of this element. They also note that there is some suggestion in the patent that the patentees may have had some working knowledge of soap manufacture and an understanding of methodologies by which high concentrations of sodium may be obtained because of the use of the words *lixiviall salt* ('lye' when in solution). Simeon Shaw (1837) records that sodium carbonate was obtained from lixiviating the ashes of incinerated marine vegetables or those located on the sea-shore (eg. *Salicornia Europœa)*. Likewise he notes that the sodium carbonate is derived from a plant grown in Spain and the Levant under the Spanish name *Barilla*, whilst kelp supplied from the Orkneys, in quantities greater that

	1	2	3	4	5
SiO_2		40.4	6.4	14.3	20.78
Al_2O_3		12.0	2.3	10.3	4.13
FeO		0.7	0.6	2.7	1.35[#]
MgO		11.0	1.4	6.1	2.98
CaO		20.6	49.8	37.6	34.12
Na_2O		0.2	0.1	bdl	0.32
K_2O	68.2	2.4	0.2	2.6	3.93
P_2O_5		4.4		4.7	1.94
LOI	31.8	8.3	38.1	21.5	29.93

1. Pearl ash (potassium carbonate)
2. Bracken ash fully washed (Leach 1940)
3. Bracken ash burnt with lime (McMeekin 1967)
4. Box ash fully washed (Leach 1940)
5. Wood ash from Shenhou (Yanyi 1987)

bdl. Below detection level

[#] Total iron as Fe_2O_3

Table 1. Chemical compositions (wt%) of various mineral substances and possible vegetable ashes used for glass making as suggested in the 1744 patent

3,000 tons annually, produced but some 3 wt% alkali. More recently a greater proportion of the carbonate was manufactured from common salt.

Both sodium and potassium are alkali metals, whose oxides act as fluxes on silica in broadly the same manner. Cristobalite, the high temperature form of silica, melts at 1,710°C to a glass, which can be cooled without further crystallizing. However the addition of 25% Na_2O will lower the melting point from 1,710°C to 793°C, a reduction of more than 900° (Phillips 1941). This sodium silicate is readily soluble in water and forms a viscous, alkaline solution known as water glass because the presence of modifiers such as Na_2O alter the structure by cleaving the Si-O-Si bonds to form Si-O.Na linkages. Howe-Grant (1994) records that such glasses, known as 'invert glasses' can be made with the oxides of the alkali metals Li_2O, K_2O, and Na_2O and where these alkali silicates have a silica : alkali (mol prop) ratio ranging from 0.5–3.4 they are the basis of the soluble silicate glass industry. Smaller cations having a higher charge density (e.g. Li^+) produce less soluble silicate glasses with $Li^+ < Na^+ < K^+$ (Howe-Grant 1997). Phillips notes that to overcome the water solubility of the alkali silicates, other materials can be added — one such being lime. In the case of water glass, addition of lime further reduces the melting point till the triple eutectic is reached (21.3 wt% Na_2O, 5.2 wt% CaO, 73.5 wt% SiO_2) at 725°C (Phillips 1941). It is the addition of multivalent metal ions such as Al^{3+} or Ca^{2+} that significantly reduce glass solubility and mixtures of alkali and alkaline earths give glasses higher durability and significantly reduced glass solubility than straight alkali silicates. Shaw (1837: 494) records,

> The essential components of Glass are 'sand' and 'alkali', with the addition of 'lime, nitre, borax', and 'oxides of lead, arsenic', and 'manganese,' in some of the kinds.

We believe that Church's assertion that potash was the only flux employed is in error and is not in accord with the wording in the patent itself. Both CaO and MgO would have been required additives by nature of their common presence in various fern and vegetable matter. We do however accept the collective observation made by various authors (Church 1885; Hurlbutt 1926) that the resultant glass was a lead-free glass. These points need to be borne in mind when discussing the assumptions and experiments subsequently undertaken by Burton in 1902 on the patent. We suggest that the absence from the patent specification by Heylyn and Frye of a distinct calcium source was not obfuscation; but was merely an error of omission since, at that time, it was common knowledge to those of '*ordinary skill*' in the art of glass making, that calcium {or possibly magnesium (Ramsay and Ramsay 2005a)} was required to stabilize a lead-free, alkali glass (Ramsay et al. 2004a).

Bemrose (1898: 4) in discussing the Bow factory quotes from the introductory remarks made by Professor A. H. Church in the Lady Charlotte Schreiber catalogue and hence would appear to accept Church's assertion that the recipe for the 1744 patent comprised (quartz) sand, potash, and a kind of porcelain clay.

> The porcelain made at Bow was of two kinds. The earlier body contained a kind of porcelain clay associated with sand and potash; in the later composition bone-ash and pipe clay were substituted for the porcelain clay, while a lead glaze was used.

In 1902 W. Burton published his highly influential *A History and Description of English Porcelain* At the time Burton was Director of Pilkington's Tile and Pottery Co., and prior to that he was chemist to Josiah Wedgwood and Sons, so he had a wealth of experience on which to draw yet, as with Bemrose, he appears to have accepted and closely followed Church's formula for the manufacture of the glass frit although if so, no prior acknowledgement to Church is given. This account by Burton (1902: 10) is so central to the attitude adopted towards the 1744 patent in subsequent years that we quote Burton at some length,

> It may be suggested that this origin would be found in the Heylin (*sic*) and Frye's patent of 1744 already alluded to, but that patent is not worth the paper on which it was written.* The particulars given are purposely vague, but the glass or frit is a pure alkaline glass, which when ground in water produces a soluble glass. This, when mixed with china clay, instead of producing a plastic working mass, sets almost like cement, and could never have been fashioned into shape by any ordinary pottery method, and the description of the mixtures suggests that the patentees were anxious to protect the use of substances of which they had no practical experience. Compare, for instance, the mixtures proposed by Heylin and Frye's patent of 1744–1745 with the mixtures actually used at Sèvres:-

HEYLIN AND FRYE'S PATENT.	*SÉVRES.*#
Frit.	*Frit.*
50 parts Potash *50 parts Sand* *fused together*	*Sand 60 parts* *Nitre 22 parts* *Salt 7.2 parts* *Soda 3.6 parts* *Alum 3.6 parts* *Gypsum 3.6 parts* } *fused together*
Body	
50 parts of the above glassy frit *50 parts of Unaker (china clay),* *varied to* *20 parts frit* *80 parts Unaker*	*Body* *75 parts of the above glassy frit* *17 parts of chalk* *8 parts of calcareous clay.*

Not only were the proportions of Heylin and Frye entirely wrong, but their frit was useless for its supposed purpose.

* Exhaustive experiments have convinced the author that no porcelain could have been made of the materials and in the manner specified in this patent.

Brongniart, 'Traité des Arts Céramiques ,' Vol. II., p. 460. Edition 1877.

From the above quote it appears that Burton was strongly influenced by Church in his choice of a glass frit composition comprising one part of silica sand to one part potash. It is not apparent why Burton followed this glass frit composition, which is neither in accord with the patent specifications regarding the starting materials, nor in accord with common sense glass-making techniques as again specified in the patent, "*Form a glass in the usual manner of making glass, …*". Likewise we are uncertain as to the basis for the ratio of one part silica to one part potash. We cannot accept the claim by Burton that the particulars contained in the patent are purposely vague, a claim that reverberates through subsequent writings during the 20th century. We regard the patent specifications, with the possible exception of the manner of making a glass in the usual manner, to be both reasonably clear and precise. We accept, without experimental replication, the results reported by Burton that this silica-potash glass initially dissolved when ground under water and then when mixed with kaolin clay the mixture set almost like cement. On this basis we can understand why Burton declared that the patent was not worth the paper on which it was written and we can suspect why, some sixty years later, Watney (1963, 1973) states that the recipe to be almost certainly unworkable. Yet strangely by page 59 Burton in the same volume has a minor change of heart and states,

> There is no information how these two men, one of whom is described as a merchant and the other as a painter, came to know of the existence of china clay (the 'unaker' of the patent). Neither has it occurred to anyone to enquire whether it would be possible to make a porcelain in the manner and of the materials specified. Possibly the description given is purposely vague, but there can be no doubt that porcelain was never made in any quantity under the patent.

Here we see Burton stating on the one hand that the patent was not worth the paper it was written on and emphatically stating that no porcelain could have been made of the materials and in the manner specified in this patent, yet on the other hand in the same publication, suggesting that there was a possibility that some porcelain may have been made according to the 1744 patent — although not in any quantity. This somewhat ambiguous and apparently contradictory view of the patent reappears with Tait (1963) some 60 years later.

A Brief History of Old English Porcelain and its Manufactory was published by M. L. Solon in 1903 and in this publication he mentions curious clays and stones which had been brought over by a traveller from America, who offered to sell these new discoveries to the Bow manufactory where china ovens were already at work. Interestingly Solon declares that the experimental results proved satisfactory with a result that Heylyn and Frye entered into partnership, bought a large consignment of the American clays, and took out a patent by which they secured the sole rights to this material in the manufacture of porcelain. While Solon suggests that the ceramic works must have been in full working order for a few years prior to late 1744, his final conclusion on page 33 is,

> So little promising was the use of Unaker that its mention disappeared completely in the specification of the second patent taken by T. Frye in 1748, and pipe-clay took again the place it occupied in the composition of the body before the advent of the foreign intruder.

Dillon (1904: 342) states that Heylyn and Frye professed to make porcelain by mixing a potash-

silica glass with *uneka*[1] clay, no doubt a kind of kaolin and whose use preceded by some years that of the Cornish china clay. He concedes that possibly something like porcelain was made at Bow for a short time using these incongruous materials. Here Dillon writes as accepted fact that the glass frit used was of a potash-silica composition further illustrating the influence of Church (1885) and Burton (1902).

Church (1911) on publishing through the Victoria and Albert Museum writes,

> The 1744 specification of Edward Heylyn and Thomas Frye gives, as the ingredients, one part of potash, one part of sand or flint, and from one to four parts of a kind of porcelain-clay called 'unaker,' from which the sand and mica had been removed by washing, from the Cherokee territory, North America: the glaze contained seven of potash-glass to one of 'unaker.' This specification describes, incorrectly enough as to the proportions of the materials employed for the body, how to make a glassy porcelain.

Again Church persists with the employment of a potash glass and he makes no mention of Burton's experimental results, where the mixture is described as setting like cement. Burton then subsequently published two further books, the first being *Porcelain its Nature Art and Manufacture* in 1906 and the second *A General History of Porcelain* in two volumes, published in 1921. Unfortunately these contributions, with respect to the 1744 patent and the overall Bow porcelain output, cloud the issue even further. Burton (1906: 233) notes that although some writers have given a starting date for Bow as early as 1731, most modern authorities agree that the first reliable information on the concern commences with the patent of December 6th, 1744, for the production of porcelain from an earthy mixture produced by the Cherokee nation in America and a frit formed by melting together sand and potash. He then continues,

> I have already pointed out, in my history of English porcelain, that no ware could have been made of the materials and the method specified in the patent, and though other writers have remarked that the specification was purposely vague, even to the point of being misleading, I am still of the opinion that when Helyn (sic) and Frye applied for the patent in 1744 they were really trying to protect a partially-learnt secret process; and the origin of the Bow porcelain, as of the other early English porcelains, is to be sought in the information communicated by wandering experts or experimentalists from one of the French factories.

From the above comments it can be seen that Burton accepts that the earthy mix used originated from the Americas, that no such porcelain could have been made according to the 1744 recipe, that Heylyn and Frye were being purposely vague, almost to the point of being misleading, and that the early English porcelain factories were indebted to information derived from France.

However on page 235 Burton (1906) appears to 'invent' a new porcelain body, which he confers on a small group of early Bow wares, assumed by him to pre-date the onset of the phosphatic second patent wares of Thomas Frye.

> We find among the authentic Bow pieces markedly different types of body and glaze. Certain little ink-stands, which bear the legend Made at New Canton, 1750 enable us to fix with certainty the appearance of the earliest wares. These are nearly always thick in substance, and not very skillfully fashioned……Where this early ware is thick it is quite opaque, but in thin parts it is translucent and has a beautiful, warm, creamy tone. The glaze on such pieces is sometimes gathered up in drops or patches, when it always has a distinct yellow tint, due to the high proportion of lead, and for some reason it has often become iridescent from surface decomposition. This is the ware which in all probability was introduced from France; but after a few years we find an entirely different ware being used, which is much whiter in tone, and this ware undoubtedly contained bone-ash, probably added to make the earlier porcelain mixture more stable in firing.

On page 227 Burton (1906) expands on the recipe for his 'invented' Bow composition.

> The earliest bodies, such as those of Bow and Chelsea, were of the French glassy type, the bodies being made from pipe-clay, sand from Alum Bay, and glass; while the glaze was simply a fusible English flint-glass, rich in lead. In our account of French porcelain we have pointed out that such mixtures were exceedingly difficult of fabrication, and as early as 1750 calcined bones were added to the other ingredients of the body, as it was found that this gave more manageable mixtures, besides making the ware whiter.

1 The anglicised spelling of this Cherokee word for white is *unaker.* Where not used in a quotation we have used the Cherokee spelling *uneka.*

This idea of a second type of clay (pipe-clay) harks back to his 1902 publication where on page 60 Burton states,

> Nothing is known of any factory belonging to Heylin and Frye, and it can only be surmised that they may have spent some years in trying to make porcelain after the manner set forth in this patent, and with the substitution of some other form of clay for the 'unaker.' If such were the case, they must soon have found that the potash glass described in their patent was also useless for such a purpose, and they would be plunged into a sea of experiments.

The 1906 recipe of pipe-clay, sand from Alum Bay, Isle of Wight, and glass cullet with an associated lead-based glaze, appears to have been taken from Shaw (1837). In his 1921 publication Burton complicates the situation even further on page 47 where he might appear to be suggesting that some wares were made according to the 1744 patent, but with a lead glaze.

> The first Bow factory, like so many early Continental factories, is said to have been started in a glasshouse, and the partners must have embarked on a sea of troubles in attempting to make a porcelain from potash-glass and Cherokee clay, for such a mixture would not be very tractable, especially in unskilled hands, and the examples of this earliest Bow porcelain are rather thick in substance, not very white or translucent, and are covered with a soft rich glaze of a decidedly yellow tint, which evidently resembled the contemporary earthenware glazes in containing a large percentage of lead oxide. Indisputable examples of this class of Bow porcelain are found in the round inkstands, with a branch of flowering prunus painted in bright enamel-colours, which bear round the top a painted inscription 'Made at New Canton, 1750'. Other specimens are similarly marked with the date 1751, and the sale lists prove that they were made to 1757 at least.

From this collection of somewhat confusing, and at times possibly contradictory ideas, we conclude that Burton accepted Church's assertion that the glass frit employed comprised crushed silica and potash alone. Secondly we note that Burton appears to require the pre-second patent wares to comprise a pipe-clay (together with sand from Alum Bay and glass) in some instances and Cherokee clay and potash glass in other instances. We also note Burton's continued attempt to employ the use of a lead glaze on these early wares. We speculate as to whether or not Burton may have been influenced by Chaffer's significantly abbreviated version of the 1744 patent in which most of the specifications relating to body and the glaze were either deleted or significantly abbreviated. This might explain Burton's claim in 1902 that the particulars given are purposely vague and might help to explain why he resorted to Simeon Shaw's recipe of a pipe-clay body and lead-rich glaze composition for the pre-second patent Bow wares. One clue to the possibility that he may have been reliant in part on the Chaffers' transcription of the 1744 patent is Burton's quote in his 1921 publication where he records the patent as follows,

> an earth the produce of the Cherokee nation in America, called by the natives 'unaker,'

Here Burton follows the incorrect Chaffers' version where the spelling of *Cherokee* is used and not *Chirokee* as found in the patent or in the correct transcript supplied by Jewitt. Regardless of whether Burton was influenced by the Chaffers' version of the patent or not, we have by the early 1920s a collection of conflicting ideas, some proposing compositions, both body and glaze, without any apparent basis in the patent itself, others claiming that the patent particulars were purposely vague or not worth the paper on which they were written, and that the partners must have embarked on a sea of troubles in using a mixture of Cherokee clay and potash-glass, and yet others suggesting that the use of *uneka* lacked but little promise. Collectively these views and statements have acted as a negative platform on which more recent attitudes relating to the patent can be seen to have been based. Once this thinking became established and entrenched in the literature the impression is that numerous subsequent writers and researchers may have adopted these attitudes without question. For example, by the 1940s this misunderstanding as to the composition of the glass frit used in the patent had spread across the Atlantic Ocean where Clement, writing in 1946, states that Heylyn and Frye made their porcelain by combining the kaolin with sand and potash.

Finally we note that the patent specifications have little to do with the 'French connection' as stated by Burton, if anything both the techniques and the use of a high-firing, refractory, kaolinite clay have more in common with both the Chinese and Meissen hard-paste ceramic practices (Ramsay & Ramsay in prep. a ,b, c).

An interesting exception to this developing negative mind-set regarding the 1744 patent was Hurlbutt (1926), who wrote the first comprehensive

monograph on Bow porcelain. He stood out from his contemporaries in that he appears to have consulted an original version of the patent wording and in addition, developed an independent view contrary to the prevailing fashionable ideas and dictates. Although accepting that only limited saleable porcelain was turned out between 1744 -1749, when the phosphatic second patent patent wares came into effect, Hurlbutt considers the patent as not unworkable and argues that the porcelain, comprising China clay imported from America and a glassy frit, would have initially had the character of opaque glass. This porcelain, in turn, he argues would have improved gradually as experience was gained to a glassy porcelain with high translucency and a creamy body and glaze. Of particular note, Hurlbutt recognises that the glaze associated with such wares would have been,

> … composed of the same materials as the body, but with a larger proportion of the fusible glassy frit, to ensure the glaze fluxing at a lower temperature than the body.

an observation independently arrived at and confirmed by Ramsay et al. (2004a). Hurlbutt states that the clay utilized was a China clay but he advances no reason for this deduction. Also of interest is Hurlbutt's faith in the patent specifications,

> That at present no pieces of porcelain made of the frit and china-clay body at Heylyn's glasshouse are known or identified, though, considering that the experiments went on for at least five years, there must have been a reasonable quantity of specimens made. These would be nearly all either white glazed porcelain pieces or decorated in underglaze cobalt blue.

Honey, a highly regarded ceramic historian, in his book, *English Pottery and Porcelain* (Honey 1933) comments that the 1744 patent specifies a clay brought from America and referred to as *uneka* by the native people. Honey states that nothing is known for certain of the porcelain made under this early patent and he acknowledges William Burton, whom he states was of the opinion that no sort of porcelain could have been made with the materials specified. In the third edition of Honey's *Old English Porcelain* (Honey 1977), revised by F. A. Barrett, the following is recorded,

> Under the patent a clay '… the product (*sic*) of the Chirokee nation in America, called by the natives 'unaker', was to be mixed with a frit made of ' pott ash, fern ash, pearl ash, kelp, or any other vegetable lixiviall salt', and 'sands, flints, pebbles or any other stones of the vitrifying kind'. Mr. William Burton has asserted, on technical grounds, that a paste so made would lack plasticity and that little, if any, porcelain could have been made under this patent. The 'unaker' (or china clay) was imported from America in 1743–4, doubtfully through the agency of one Andrew Duché, a potter from Savannah, in Georgia. No specimens of Bow china as early as 1744 can be identified, the earliest dated examples being of 1750, and it is doubtful whether anything was produced on a commercial scale at so early a date.

In this third edition, Franklin Barrett questions whether any wares were made according to the patent specifications, at least on a commercial basis. He also refers to the work of William Burton regarding the degree of plasticity of the paste supposedly used by the patentees. Lastly in a footnote to Andrew Duché he quotes the recent work by Graham Hood (Hood 1968) where it is concluded that Duché appears to have had no significant connection with Bow.

Fisher (1947: 23) speculates that no great amount of saleable ware was produced during the experimental period of 1744–1749, a view which appears to trace back to Hurlbutt (1926). In contrast however to Hurlbutt, Fisher (1965: 139) states that the clay added to the glass frit was a pipe-clay (ball-clay) to give the glassy artificial paste whiteness although no basis for the use of pipe-clay rather than China clay is provided. Possibly Fisher was confusing the 1744 patent with the 1749 patent of Thomas Frye, with the later patent specifically referring to pipe-clay, or he may have been influenced by Shaw (1837) and/or Burton (1906), who both suggest that Bow employed pipe-clay, sand from Alum Bay, and cullet.

Tait (1959: 8) in his significant exhibition publication on second patent Bow porcelains notes that the 1744 patent of Heylyn and Frye states,

> A new method of Manufacturing a certain material, whereby a ware might be made of the same nature or kind, and equal to, if not exceeding in goodness and beauty, China or Porcelain ware imported from abroad.

Based on the above wording Tait (1959, 1963) argues that the objective of the patent was to manufacture a material, which ultimately could be used for making porcelain wares. Tait (1965) continues this theme where he notes that the choice of wording in the 1744 patent reveals that by that date neither Heylyn nor Frye was yet able to make porcelain wares. Rather the invention patented was for the production of the material used in the construction of

porcelain wares and not for the wares themselves. Tait (1965: 43) writes,

> Very cautiously, the patent states that from this material porcelain wares 'might be made' — not that they could be made.

Yet strangely Tait (1963: 201) proposes that Heylyn and Frye, at the time of "hastily" seeking a patent, had not yet discovered how to make porcelain wares, "*at least not on a commercial scale*," thus suggesting the possibility that non-commercial wares could have been made by that date. Overall it appears that by concentrating on the wording in the patent,

> A new method of Manufacturing a certain material, whereby a ware might be made,

Tait may possibly have been quoting the patent out of context, because the patent continues in great detail specifying the proportions of the various components and detailing how such resulting wares were to be thrown on the wheel, cast into moulds, or imprinted into utensils and ornaments, with those thrown items afterwards turned on a lathe and burnished. Our interpretation on reading the patent as a whole is that the thrust of the wording is directed towards the making of wares and utensils and not merely a porcellaneous substance or material for that purpose.

Once Tait's thinking appeared in the literature it subsequently developed a life of its own and can apparently be traced into later works. Watney (1973) in a footnote to page 10 states,

> The phrase in the specification 'A New Method of Manufacturing a certain material whereby a ware might be made', suggests this urgency, as if only preliminary experiments had been made with the material for making porcelain.

Young (1999: 42) regards the patent specification as cautiously worded and Gabszewicz (2000: 15) states that the patent description for manufacturing a, "*material whereby a ware might be made*", is hesitant and uncertain and that the method of manufacturing a material does not specifically mention porcelain manufacture, but merely implies that this was the intention. Gabszewicz (2000: 15) further notes that although the patent called for the use of a China clay from North America, it is uncertain whether this clay was ever used. Subsequently Godden (2004a) states that the patent wording is tentative.

In 1963 Bernard Watney published his important book, *English Blue & White Porcelain of the 18th Century.* His comments on the 1744 patent contained in this publication have enjoyed considerable credence and influence over the last forty years and these comments are quoted,

> The specification of the first Bow patent enrolled on 5th April, 1745, claims the invention and perfection of 'a new method of manufacturing a certain material whereby a ware might be made of the same nature or kind and equal to, if not exceeding in goodness and beauty, china or porcelain ware imported from abroad'. It describes a recipe for blue and white using china clay called 'unaker' imported from North America. This kaolinic clay was intended to be used both in the glassy body and in the lead-free glaze. It is practically certain that as described this 'unaker' formula was unworkable, indeed it may have been patented merely as an attempt to monopolize the use of 'unaker' while experiments were being made to discover the secrets of Chinese hard-paste porcelain as had already been done at Meissen.

We note that based on the above quote it is difficult to deduce the grounds on which Watney was able to assert that he was practically certain that the *uneka* formula was unworkable. This assertion appears to hark-back to Burton (1902), but Watney gives no acknowledgement of these earlier observations and makes no reference to Burton's experimental work. Secondly, Watney suggests, without any apparent foundation, that the patent may have been taken out merely to monopolize the use of *uneka* while experiments were being undertaken to discover the secrets of Chinese hard-paste porcelain as had been done at Meissen. Yet again, these views appear to find parallels in comments by Burton (1906: 233),

> I have already pointed out, in my history of English porcelain, that no ware could have been made of the materials and the method specified in the patent, and though other writers have remarked that the specification was purposely vague, even to the point of being misleading, I am still of the opinion that when Helyn (*sic*) and Frye applied for the patent in 1744 they were really trying to protect a partially-learnt secret process; and the origin of the Bow porcelain, as of the other early English porcelains, is to be sought in the information communicated by wandering experts or experimentalists from one of the French factories.

In a strange manner there is possibly some truth in part of Watney's claims (though he was apparently

unaware of it at the time) because analogue wares produced according to the directions contained in the 1744 patent, using a refractory kaolinite clay (Cherokee clay) and a lime-alkali glass frit — not an alkali frit as specified by Church and attempted by Burton — are in fact hard-paste, high-firing porcelains, resistant to thermal shock, and quite dissimilar from French and English soft-paste porcelains being more akin to the hard-paste, or possibly more correctly high-firing porcelains of both Chinese and Meissen derivation (Ramsay et al. 2004a; Ramsay & Ramsay in prep. a, b, c). Such wares predate the widely acclaimed hard-paste porcelains {what Charleston and Mallet (1971) refer to as 'true' hard-paste} made by William Cookworthy by some twenty five years and in this connection it is worth recalling the suggestion by Binns (1898) that these Bow wares using such China clay would initially have been of a hard-paste nature and the prescient observations made by Arthur Lane (1958) in relation to the 'A'-marked group of porcelains,

> The body is much harder than that normal among the English soft-paste porcelains, including the soapstone porcelain of the Worcester-Liverpool group, and gives a modified conchoidal fracture. But it appears much less hard than the hard-paste porcelain made in Germany or under German influence. It is possibly a <hybrid> body, containing some kaolin, of a type made in Italy, especially in factories in the Venice area and at Doccia.

We suggest that by now an unstated circular argument may underlie much of the current interpretation of the patent; this being that because the patent was unworkable, vague, experimental, hesitant, and uncertain, this would explain why no derivative wares can be recognized and because no derivative wares can be recognized this would indicate that the patent was unworkable, vague, experimental, hesitant, and uncertain.

Adams (1973) suggests that it seems very unlikely that much porcelain was in fact made and that the patent may have been taken out merely to impede the way for would-be plagiarists, whilst Adams and Redstone (1981) record that the wording in the 1744 patent leaves one in no doubt that the idea of manufacturing china in east London was definitely under serious consideration. Subsequently Freeman (1982) records that whilst the precise materials used at Bow are not known, *uneka* clay imported from the American colonies was used in the early years.

Bradshaw (1992) in his book, *Bow Porcelain Figures circa 1748–1774*, in his treatment of the 1744 patent provides an excellent case study as to the current thinking on, and attitudes towards the patent. On page 14 Bradshaw reproduces an extract, which might appear to the casual reader be a quote from the 1744 patent itself. Bradshaw then concludes from this quote that the lack of more precise measurements in the patent suggests that the mix was experimental. Bradshaw then continues that,

> no items made from this formula have been identified and, indeed, it is unlikely any could successfully have been fired.

We note two aspects from this contribution; firstly the version of the patent supplied by Bradshaw is in fact Chaffers' less than adequate version, which has been circulating the literature since 1863, and secondly there has been a remarkable silence from the general ceramic community regarding the deductions arrived at by Bradshaw that the patent lacked more precise measurements thus suggesting that the recipe mix was experimental. It might appear that because Bradshaw's conclusions conform to the generally held view that the patent was hesitant, unworkable, imprecise, and at best experimental, little comment appears to have been made and we suspect that this may possibly be a case of the end result justifying the means.

The notion of '*experimental*' subsequently becomes '*highly experimental*' (Young 1999: 24) where he records that,

> An indication of the extremes that manufacturers would go to in order to obtain supplies in the earliest, highly experimental period is found in Bow's importation of china clay from Carolina in the American colonies in 1743/4.

Scarce (2000: 8) speculates that the 1744 patent was entered to secure the rights to use *uneka* clay and he notes that there is some evidence that American clay was actually used at Bow, although only for a very short period. Gabszewicz (2000: 15) apparently influenced by Tait's earlier writings states,

> The specification of the first patent claims the invention and perfection of 'a new method of manufacturing a certain material whereby a *ware might be made* of the same nature or kind and equal to, if not exceeding in goodness and beauty, china or porcelain ware imported from abroad.' This hesitant and uncertain way of describing the method of manufacturing a 'material' does not specifically mention porcelain manufacture, but implies that this was their intention. The recipe called for the use of a china clay called 'unaker' imported from North America, but whether this was used is not certain.

Hillis (2001) publishes part of the patent specifications, which apart from the odd variation from the patent's spelling and the elision of one or two words, is correctly based on the Eyre and Spottiswoode 1856 transcription. Although recognizing that the formula has been long held to be unworkable by modern commentators, Hillis notes that the recipe is not that dissimilar to the method used by John Dwight, which met with some degree of success, and if a China clay was used in the 1744 patent then there are grounds for accepting that 'A'-marked wares are early Bow. He also states that the lead-free glaze required by the patent and found to occur on 'A' -marked wares, supports this notion.

The most recent comment on the 1744 patent possibly lies with Godden (2004a: 71),

> It has been believed that no porcelain was ever made under this first patent* and you will note the wording is tentative and reads 'whereby a ware might be made'.
>
> * Recently (2002) *sic* — it has been suggested that the 'A' marked porcelains (see p.73) represent the earliest type of Bow porcelain, of the mid-1740s. The 'A' mark could relate to Arnold &Co.

Godden then supplies what appears to be an abridged quote taken from the patent. Part of this quote is indeed from the patent, part taken from Chaffers' incorrect version, and part might appear to be derived from some other source,

> a new method of manufacturing a certain mineral, whereby a ware might be made of the same nature or kind and equal to, if not exceeding, in goodness and beauty, china or porcelain ware imported from abroad... The material is an earth, the produce of the Cherokee nation in America, called by the natives Unaker... The articles are put into a kiln and burned with wood, called "biscuiting", if they are very white, they are ready to be painted blue...they are then dipt in glaze…

In a companion publication (Godden 2004b: 50) he accepts that American raw materials would have been used in small quantities but only during the early period.

In a comprehensive paper published detailing the 'A'-marked group of wares, the authors, Charleston and Mallet (1971) were the first to observe that based on a chemical analysis of a flange from an 'A'-marked teapot lid held in the collections of the Victoria and Albert Museum (V&A. C207A-1937), there could be some resemblance between porcelain material produced under the Bow first patent and that of the 'A'-marked group. However they continue,

> The difficulty in the way of this identification, however, is that this homogeneous small group bears no resemblance whatever, in shapes, details of potting, or enamelling, to the later Bow wares. This is difficult to credit when it is considered that the same management continued throughout the period at Bow. Nor is the 'A' mark explained, although it may be borne in mind that an 'A' mark in blue does occur on later Bow. On the whole, however, this hypothesis hardly stands up to scrutiny.

This emphasis on typological features at the expense of the composition is a feature, which has dominated English ceramic studies for many years. Subsequently Freestone (1996) likewise supports Charleston and Mallet's observation that 'A'-marked porcelain showed a good compositional correspondence with the Bow first patent, however he apparently resiled from a Bow attribution quoting the strong reservations expressed, for example, by Charleston and Mallet's on typological grounds. Whilst noting the correspondence between the Bow first patent and the 'A'-marked group, Freestone apparently opted for a Limehouse or Pomona attribution, even to the extent of speculating that the 'A'-marked wares might represent a special cargo of clay received at Limehouse. In two subsequent publications (Freestone 1999a, b) he states that the attribution of 'A'-marked wares is uncertain.

Of particular note is a footnote found in Emerson et al. (2000: 291) where Errol Manners is credited with recognizing the relationship between Heylyn and Frye and the 'A'-marked group. To our knowledge this might appear to be the first record in print where the 'trinity' is accepted, in that the 1744 patent is regarded as a viable recipe for porcelain wares, that those wares are the 'A'-marked group, and that the proprietors were Heylyn and Frye.

> A-marked porcelain as an early enterprise undertaken by Heylen and Frye, who would later establish the more commercial enterprise of Bow, is an idea first proposed to the author by Errol Manners of London, England. The use of kaolin from the Americas fits with the early Bow patent and the most recent scientific analysis of A-marked porcelain. Thomas Frye was more than capable of supplying the talent evident in the painting of the high-style wares. Certainly, porcelain decoration became a family occupation; his two daughters, their husbands, and probably his son as well were porcelain painters in the Bow factory.

In a series of papers dealing with the 1744 patent, Ramsay et al. (2001, 2003, 2004a, b) and Ramsay and Ramsay (2005a, b) adopt a somewhat different view of the 1744 patent from most other workers. They were struck with the clarity and descriptive detail contained within the patent, in particular the description of the *uneka* clay employed and its geographical location, the remarkable detail as to the proportions of clay to glass frit required for both body and glaze, the clear instructions on firing such wares, and the comments on various kiln-firing problems encountered by the patentees, Heylyn and Frye. What also struck them is the wealth of published material to be found mainly in the American literature dealing with Cherokee clay, the attempts by Josiah Wedgwood to obtain samples of this clay, and the experimental kiln-firings of Andrew Duché using inferred Cherokee clay (Watts 1913; Bayley 1925; Hommel 1934; Clement 1946, Gilmer 1947, 1948; Wells 1957; Goff 1959; Stuckey 1965; Hillier 1968; Hood 1968; Berkeley and Smith-Berkeley 1969; Mint Museum of Art 1976; Giannini 1981; Anderson 1986; Rauschenberg 1991a, b). In many instances these references are rarely quoted in English publications with the possible exception of Tait (1959, 1963, 1965) and Watney (1963, 1973).

In their publications, the Ramsays and co-workers identify the most likely source of Cherokee clay in the catchment of the Little Tennessee River, North Carolina, provide chemical and mineralogical parameters for this clay, discuss the likely discoverer of this clay, its transportation to London, and unequivocally specify the identity of those porcelains made using Cherokee clay or *uneka* according to the 1744 patent. In addition, on firing analogue porcelain wares following the patent's specifications, they question the long-held mind-set that the patent is vague, hesitant, experimental, uncertain, tentative, unworkable, not worth the paper it is written on, and nothing but a sea of troubles. Collectively these papers by Ramsay and co-workers conclude that the patent is, to the contrary, well written and remarkably clear with regard to the recipe (with the possible exception as to the specifications of the manufacture of the lime-alkali glass frit), that the patent is directed at the production of commercial porcelain wares, and that the patent is a highly significant document, which on the one hand relates to the 'A'-marked group of porcelains and on the other hand offers circumstantial evidence linking the patent to Andrew Duché and the Philadelphia ceramic tradition (Ramsay et al. 2004b).

In an address to the Royal Society of Victoria in June, 2005, Ramsay and Ramsay suggested that the 'A'-marked group of porcelains can arguably now be regarded as the most significant porcelain group to have been produced in 18th century England and that these porcelains represent the English response to both Meissen and the Asiatic hard-paste porcelains. Features listed by Ramsay and Ramsay for this proposal include;

- the presence of the 1744 patent, both dated and signed by five people, which details how these porcelains were made and without which it is doubtful that an attribution could have been achieved;
- the remarkable entrepreneurial effort involved in transporting Cherokee clay some 600 kms to the coast of the Carolinas and thence across the Atlantic Ocean to London, for a total of some 8,000kms. This transportation of the clay involved avoiding Indian objections, evading attacks by 'Crackers,' and minimising capture on the high seas by either the French or the Spanish. No other group of porcelain producers, prior to Bow, went to such extraordinary efforts in sourcing key ingredients for their wares;
- the notion that Bow first patent porcelains are the first high-firing, hard-paste, commercial porcelains to have been made in the English-speaking world using a refractory China clay;
- the use of an associated high-firing, Si-Al-Ca glaze which appears to have been fired contemporaneously with the ceramic body, in the manner of Meissen;
- the absence of lead as a significant component in either the body or the glaze, again after the manner of both the Chinese and Meissen;
- the perceived first use of slip-casting in English porcelains;
- the remarkable level of enamelling and the first to introduce Meissen- and/or Asiatic-derived decorative themes to English porcelain; and
- the distinct possibility that the 'A'-marked group of porcelains may owe a considerable, yet unrecognized, debt to the *Philadelphia ceramic tradition* out of colonial America.

DISCUSSION

In this account we have investigated various views, notions, and attitudes associated with the 1744 patent of Heylyn and Frye. Several themes or strands,

which both individually and collectively have tended to diminish, if not marginalize, the stature of this patent are identified and discussed. The first theme dates back to 1837 when Shaw stated that early Bow wares comprise a body whose recipe was pipe-clay, cullet, and Alum Bay sand which was coated with a lead-based glaze. We have to date been unable to establish the basis for this recipe in regard to Bow, though we note that such a recipe may approximate early triangle period Chelsea wares. Inexplicably, this recipe reappears some sixty-five years later when Burton proposes such a composition for early pre-second patent Bow wares. In 1863 William Chaffers' imprecise version of the 1744 patent was published. This apparent transcript has become so embedded in the literature through repeated reprints that it now at times replaces the original version, or contributes to what might be described as composite transcriptions of portions of the patent recipe. Use of the Chaffers' version of the 1744 patent has in some instances in our opinion, led to incorrect assertions that the patent was apparently deficient in precise measurements and hence was experimental.

The third aspect relates to the assumed composition of the glass frit used in the patent. Burton (1902) accepted Church's claim that the glass comprised one part silica and one part potash and in his attempted experimental replication of analogue 1744 patent wares, Burton reports that the patent recipe was unworkable and not worth the paper it was written on. We would contend that the composition of the glass frit proposed by Church and replicated by Burton is incorrect and is not in accord with either the patent wording or common sense. Church (1911), a quarter of a century after he first proposed the potash-glass recipe persists with this composition even though a decade earlier Burton had demonstrated experimentally that such a recipe composition was 'unworkable.' This notion that the 1744 patent recipe was unworkable has reappeared in numerous subsequent works, the most influential being Watney (1963, 1973) who in addition proposes, without any apparent justification, that the 1744 patent may have been a 'front' while experiments leading to the making of 'true' hard-paste porcelain were brought to fruition. We suggest that in addition, an unstated circular argument may underlie and support the assertion that the *uneka*-based formula was unworkable, namely that because the patent was unworkable this would explain the apparent absence of porcelain wares made following the patent specifications and because no such products of this patent could be recognized this was likely to reflect an unworkable patent recipe. It is tempting to speculate that it is this inferred circular reasoning which is one of the reasons, albeit unstated, why there has been such a reluctance to accept the 'A'-marked porcelain group as the legitimate products of the 1744 patent and manufactured by Heylyn and Frye in East London.

The fourth component discussed relates to Tait's claim that the patent was designed merely to make a porcellaneous substance or material and not porcelain wares themselves, at least not on a commercial scale. We suggest that this view of the patent may possibly have been taken out of context. Tait's use of the word "*cautious*" with regard to the patent has been quickly adopted and subsequent writers have used words such as cautious, tentative, hesitant, and uncertain to describe the patent wording.

Based on the wording of the 1744 patent, the work of fellow ceramic historians (Lane 1958; Charleston and Mallet 1971; Mallet 1994; Freestone 1996) and research to date by Ramsay, Ramsay, and coworkers, we suggest that far from being unworkable, experimental, or hesitant, the 1744 patent of Heylyn and Frye is one of the major documents in English ceramic history. This patent directly relates to what we would contend are the first commercial porcelains made in the English-speaking world, namely the 'A'-marked group. The clay required is a refractory China clay and as noted by Hurlbutt (1926) and Ramsay et al. (2004a), Heylyn and Frye in a brilliant stroke appear to have modified the glaze composition and its application so that it could be used as a crude but effective optical pyrometer. This firing to the porous biscuit (~950°C) followed by the glazing and then firing to top temperature (~1,280°C) (Ramsay et al. 2004a) appears to have been influenced by Meissen kiln-firing procedures (Ramsay & Ramsay in prep. a, b). We question any suggestion that the recipe was derived from the French soft-paste porcelain tradition, as suggested by such writers as Burton and Solon. Moreover these high-firing, hard-paste wares predate Cookworthy's 'true' hard-paste porcelains by some twenty five years and consequently we suggest that these Bow first patent porcelains represent the hitherto unrecognized earliest English equivalents to Meissen porcelain and the Oriental.

It has now been demonstrated (Freestone 1996; Ramsay et al. 2003, 2004a) that whoever was making the 'A'-marked group of porcelains was replicating the 1744 patent with regard to the starting materials, the composition of the body, the composition of the glaze, and the resultant mineralogy of the

subsequently fired porcelain body. The most reasonable and logical deduction based on this evidence is that it is in fact the patentees themselves, Heylyn and Frye, who were the proprietors responsible of the 'A'-marked group of porcelains and that such wares were fired in East London on a commercial basis by around 1743 (Daniels 2003; Ramsay et al. 2004a). We can find no obvious reason why these two very significant figures in the field of early English porcelain development, together with three other witnesses — two of whom were directly related to Edward Heylyn — should go to the trouble of entering a detailed ceramic patent which they had no intention of prosecuting. The specifications of this patent were 'enrolled' in April 1745 and the patent clearly refers to a preceding period of active development and experimentation. Barry Taylor (pers. com. 2005) comments that there is a distinct typological continuity between 'A'-marked wares and those of the second patent, particularly in decoration and palette, whereas the non-conformity in form and potting strongly reflects the change in the raw materials, body type, and techniques that occurred between the two patents.

From the foregoing it has been surmised that the colonial American potter, Andrew Duché played a highly significant role in recognizing the ceramic properties of Cherokee clay or *uneka*, transporting samples out of the Little Tennessee River catchment in the Southern Appalachians, conducting experimental firings of this clay by at least early 1741, if not earlier in Savannah, and introducing Edward Heylyn and possibly George Arnold to this clay, his experimental porcelains, and to at least some of the associated technology required for dealing with high-firing, refractory kaolinite clay (Savage 1970: 336; Ramsay et al. 2001; Ramsay et al. 2004b; Ramsay and Ramsay in prep. b). To date the influence of the *Philadelphia ceramic tradition* on the development of the earliest hard-paste porcelains in the English-speaking world has not been fully appreciated.

We suggest that it may now be timely to reconsider the pre-eminent role enjoyed by Chelsea to date. This role has been built on the assumption that Chelsea was the first commercial English porcelain manufactory, the quality of its soft-paste porcelain, the high standard of the potting, and the quality of the on-glaze decoration. Traditionally Chelsea has been regarded as assuming a leadership role in transmitting European ceramic decorative styles, including Meissen into the English idiom. Possibly the prevailing view as to one of the major differences between the attitudes of the proprietors of Bow second patent wares and the Chelsea proprietors is encapsulated by Stanley Fisher (1965: 139),

> When the Bow porcelain-making factory was founded about 1744 by Thomas Frye and Edward Heylyn the intention was to make a durable, sensibly decorated domestic ware, and not to try to rival the splendours of the ware made at neighbouring Chelsea, apart from an occasional colourfully painted service, and for figures which had to be made to meet an overwhelming demand.

We propose that the Bow first patent wares were directed first and foremost at the luxury or 'high-end' of the market and that this technically and decoratively brilliant porcelain group acted as the catalyst for the appearance and growth of other English manufactories (including Chelsea), which within a decade of 1744 blossomed into some ten competing concerns.

We conclude with the following points:

1. It is proposed that the 1744 patent of Heylyn and Frye is one of the major documents pertaining to the Anglo-American ceramic industry, yet the significance and stature of this patent has been apparently diminished and marginalized over the last 100 years or so, by way erroneous transcriptions of the patent itself, incorrect assertions about the chemical makeup of the patent recipe, claims that the patent recipe was almost certainly unworkable, possible circular arguments, and deductions regarding the patent, which possibly may have been taken out of context, thus leading to the belief that the patent was entered merely to manufacture a porcellaneous material and not wares themselves.
2. Some researchers, to varying degrees, have not accepted these negative views and have suggested that the patent may not have been entirely unworkable with wares of some kind being turned out for a short period. Possibly the most striking examples being Hurlbutt (1926) and Manners as quoted in Emerson et al. (2000).
3. We suggest that the acceptance of the importance and veracity of the 1744 patent is a necessary prerequisite for a better understanding of the events relating to the earliest years of the porcelain industry in the English-speaking world.
4. The 'A'-marked group of porcelains, which we regard as the product of the 1744 patent, is remarkable on account of its high-firing characteristics, its resultant hard-paste body, and the

startling standard of the on-glaze decoration. In addition the use of refractory China clay, the inferred bisque firing of the glaze and the body together, and the employment of a Si-Al-Ca body and glaze lacking the addition of lead suggest links with Meissen techniques. We agree with Tiffin (1874) and Daniels (2003) that it was Bow first patent wares, which were referred to in the Vincennes Privilege awarded to Charles Adams on July 24th, 1745.

5. We believe that the 1744 patent acts as the vital link with the 'A'-marked group of porcelains and that it can now be regarded as scientifically proven that whoever was making this remarkable group of porcelains was replicating the patent specifications with regard to starting materials, body and glaze compositions, and the resultant mineralogy of the high-fired body.
6. Numerous authorities (Burton 1906; Watney 1963, 1973; Fisher 1965; Savage 1970; Spiro 1998; Young 1999; Godden 2004a,b) unanimously credit William Cookworthy and his patent of 1768 as marking the introduction of a 'true' hard-paste porcelain to Great Britain. Whilst in no way wishing to detract from Cookworthy's significant contribution, we point out that the 1744 patent and the products of this patent predate Cookworthy's acclaimed contribution by a quarter of a century, yet because of the assumed negative aspects attached to the Heylyn and Frye patent, its significance has been overlooked or marginalised.
7. The 1744 patent offers circumstantial evidence which links the colonial American potter, Andrew Duché, to Edward Heylyn and possibly George Arnold, both as the supplier of Cherokee clay and possibly as the source for at least some of the technology required to produce high-firing porcelains using this refractory China clay. On this basis we suggest that the *Philadelphia ceramic tradition* and its influence on early hard-paste, high-firing porcelains needs to be re-assessed.
8. It might appear that the importance of the Chelsea porcelain concern *vis-à-vis* Bow needs to be re-evaluated. Contrary to popular belief, the Bow proprietors set out from the outset to produce a range of luxury porcelains (*objets de luxe*), in part inspired by decorative features derived from Meissen, thus predating the onset of Chelsea's Meissen period by some 5 to 6 years. Moreover the technical and artistic brilliance of these hard-paste porcelains surpasses that of early Chelsea soft-paste triangle period wares.
9. We propose that by around 1743 the Bow proprietors were producing high-fired, hard-paste, commercial porcelains using an imported China clay from the Carolinas with decorative elements in part derived from the London theatre, the Orient, and Meissen (Ramsay & Ramsay 2006). The decorative and compositional features of these ceramics, coupled with the proposed early date of manufacture and the remarkable entrepreneurial skill shown by the proprietors, lead us to believe that the 'A'-marked group of porcelains represents the English answer to Meissen and Oriental hard-paste porcelain and consequently is arguably the most significant group to have appeared in 18th century England. In addition the patent, which describes the manufacture of these porcelains, is a landmark document in Anglo-American ceramic history.

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