RACHAEL DURKIN

The Ingenious Mr Charles Clagget: Inventor and 'Harmonizer' of Musical Instruments

Figure 4. *Tuning set of forks and weights plus tuning hammers by Charles Clagget, The University of Edinburgh (MIMEd 6407), © The University of Edinburgh.*

RACHAEL DURKIN

The Ingenious Mr Charles Clagget: Inventor and 'Harmonizer' of Musical Instruments

Charles Clagget (1733–1796) is a name many working in organology will have come across, particularly those concerned with instruments of the eighteenth century, keyboard history, or developments in valved brass. Clagget's life was multifaceted; he worked as a musician, musical director, teacher, composer, dancing-master, and latterly as an inventor and improver of musical instruments. Despite the reach and legacy of Clagget's name, no critical scholarship concerning his life and work exists.

This article focuses on the 15 inventions of Charles Clagget, nine of which concern tuning, intonation, or temperament. Here I explore these inventions through his two patents, and his correspondence with James Watt held by Birmingham City Archives, England, which until now has been largely overlooked.[1] Clagget's social network beyond his friendship with James Watt is of note, particularly his former business relationship with William Gibson of Dublin in the 1760s, and latterly his association with Charles Burney, Joseph Haydn, and many of the best known musicians working in London towards the end of the eighteenth century. My study reveals that Clagget sought to recast himself as an innovator in order to achieve upward social mobility, elevating him to the intellectual gentlemanly status of the middling sorts. Clagget's inventions and discourses, and those of his contemporaries, foreground the innovative environment of Enlightenment Britain and its industrial revolution. As such, a study of this nature exemplifies the multidisciplinarity of the organological field. While by no means an exhaustive history of his life and work, it is hoped this article will generate further interest in Clagget and his social network during one of the most exciting periods for musical instrument innovation in early modern Britain.

CHARLES CLAGGET ESQ., GENTLEMAN

Charles Clagget was born in 1733 in Yarmouth on the coast of Norfolk, England, which was once one of the largest towns in Britain.[2] This is contrary to the *Dictionary of National Biography*'s assertion that he

[1] Access to this archive, and financial support for subscriptions to genealogical and newspaper databases was kindly facilitated by the Galpin Society Research Grant 2021. With sincere thanks to the committee for their generous support of this research. Further thanks are due to Liam Knight who photographed the Clagget materials within the archive, and John Humphries and Jenny Nex for sharing their research of, and enthusiasm for, the history of Charles Clagget.

[2] Baptised 8 March 1733 so likely born not long before. Norfolk Record Office, Parish Baptisms 1721–1754, PD 28/6. In 1700, Yarmouth was one of only seven towns with a population over 10,000 in England, with nearby Norwich being second in size to London. See Cyril Ehrlich, *The Music Profession in Britain Since the Eighteenth Century: A Social History* (Oxford: Oxford University Press, 1985), p.20.

was a 'native of Waterford' in Ireland,[3] a myth which has been perpetuated through literature.[4] Clagget did spend a significant portion of his working life in Ireland, working between Dublin and Waterford in the theatres and as a teacher, and Ireland is where he married and raised his children before relocating to London in 1788.[5] He was the eldest son of William Clagget,[6] a dancer and dancing-master who for a short time performed as part of the troupe in Sadlers' Wells theatre in London. His brother Walter was born in 1736.[7] The Clagget children were indoctrinated in the performing arts from a young age, appearing in concert as musicians with their father.[8] While Walter would go on to have a relatively stable career as a cellist, teacher, and composer, working primarily in England and Scotland,[9] Charles Clagget had an evident desire to achieve fame and fortune, which resulted in a fragmented career, punctuated by bankruptcy in 1793.

This fame, if not fortune, was achieved through Charles Clagget's work to 'improve' musical instruments later in his career; a level of celebrity he would have unlikely achieved otherwise, despite being held in high regard as a musician. His savvy approach to the eighteenth-century music industry, which propelled this later success, was evident prior to his move into musical instrument innovation. For example, in 1760 Charles advertised his arrival in Aberdeen, Scotland,[10] offering tuition in violin and 'guitar', this being the relatively new and fashionable English guittar. Within this advert he also stated that he would bring 'some of the best' guittars from makers in London and Edinburgh to 'supply Ladies with the best Instruments', and would also sell his 'lessons for one or two Guitars [...] engraved on 52 cards' which rather handily 'shut into a Case'.[11] In addition, he would supply his 'Opera Prima' for violin, which contained instructions for performance.[12] This multifaceted approach to the music business long before he turned to innovation evidences a clear understanding of the money to be made through the supply of instruments and music, and the needs of

[3] William Barclay Squire, 'Charles Clagget', in Leslie Stephen (ed), *Dictionary of National Biography* (London: Smith, Elder, & Co, 1887), vol.10, pp.368–69.

[4] With thanks to John Humphries who had also tracked down Clagget's genealogy, and who has been a valuable colleague in discussing Clagget's life and work, particularly concerning brass instruments. This myth stems from his first patent of 1776 where it opens 'I, Chares Clagget, of the City of Waterford, in the Kingdom of Ireland, but now residing in the City of London'.

[5] Clagget married Susannah Sophia Thompson, a widow, on 20 October 1762 (National Archives of Ireland, Betham's Genealogical Abstracts. Dublin Marr. Lics. C. 1735–1767). He then married Susannah Elizabeth Cross in 1767 (National Archives of Ireland, Betham's Genealogical Abstracts. Dublin Marr. Lics. C. 1767–1789).

[6] A letter from Elizabeth, Countess of Moira at Montalto House (Belfast, Ireland), to Dr Thomas Percy of Dromore encourages Percy to hire Charles Clagget as a teacher of dance and music. Within this letter the Countess writes 'His great-uncle was a Bishop of Exeter (I think, at least, an English Bishop), and his father a clergyman, who was ruined by his passion for music, and left nothing to his children except that science to gain their bread by'. See John Nichols, *Illustrations of the literary history of the eighteenth century* (London: J. B. Nichols and Sons, 1858), vol.8, pp.14–16.

[7] Baptised 28 March 1736. Norfolk Record Office, Parish Baptisms 1721–1754, PD 28/6.

[8] A benefit concert for William Clagget on 18 September 1744 would feature 'a Solo by the two Master Claggets, (who are mostly known for their Heads of Hair) the one ten Years of Age, the other Eight'. See *General Advertiser*, 17 September 1744. While this advert states that Charles was 10, he was in fact 11½. The eighteenth century saw a huge rise in the child star phenomenon as a very lucrative performance opportunity, and it is likely that the Clagget boys were billed as younger so as to appear more talented.

[9] With both Clagget children working in the performing arts, and a distant cousin, Crispus Clagget, also venturing into the leisure industry in London, the history of all three Claggets has been confused in literature due to the inconvenient eighteenth-century custom of referring to them indiscriminately as 'Mr. Clagget'. Further, the variety of misspellings of 'Clagget' (including Claggett, Claget, Clagett, Claggit, Clagit, Cleggit), and current optical character recognition technology's struggle reading a double 'g', makes contemporary research using digitised texts a lengthy process when tracking the Claggets as they move around Britain and Ireland. Much of the unseen work sitting behind this article was unravelling the stories of the three Claggets so we can focus on just the rise and fall of Charles.

[10] *Aberdeen Press and Journal*, 21 July 1760.

[11] Panagiotis Poulopoulos located these cards, entitled 'Forty Lessons and Twelve Songs for the Citra or Guittar' in the collection of the Royal Academy of Music, item 2004.723. The cards do indeed fit within the case of an English guittar. See Panagiotis Poulopoulos, 'The Guitar in the British Isles, 1750–1810', PhD thesis, The University of Edinburgh, 2011, pp.144–45.

[12] *Six duetts for violins* was co-authored with his brother, Walter. A copy is available in the National Library of Scotland, item MUS.E.I.146.

learners, particularly those geographically remote from the major cultural centres of London, Bath and Edinburgh. His appearance in Aberdeen was not welcomed warmly by his competitor, Richard Eales, who countered Clagget's advert with his own the following week, placed directly below Clagget's follow-up advert; that both Clagget and Eales were lodging at the same premises perhaps explains the evident animosity between adverts, and gives us a glimpse of a young Charles Clagget's confidence.[13] It was this time spent in Scotland which laid the foundations for Clagget's move into musical instrument manufacture and innovation, and the forging of a business friendship with the musical instrument maker, and later engineer, James Watt of Glasgow.

CHARLES CLAGGET AND JAMES WATT: THE EARLY CORRESPONDENCE

James Watt (1736–1819) has been largely overlooked as a maker and repairer of musical instruments, his career as an engineer dominating accounts of his life, but studies by Michael Wright and Nina Baker have illuminated his early business in making instruments and instrument components. Wright's article is the first appraisal of Watt's activities through exploration of his preserved workshop. His research exposed the manufacture of flutes which were possibly fraudulently stamped with the highly respected Parisian maker's name 'T Lot', and literature which indicates the employment of specialists such as Robert Allen to make and repair guitars and violins, and John Gardner to make 'plates' for guitars and flute keys.[14] Baker's chapter clarifies Watt's involvement as a maker of organs, concluding that while he was likely involved in the making of components, it is less convincing that he was the sole maker of a surviving instrument reputedly by him.[15] We do not know exactly when, or under what circumstances, Charles Clagget met James Watt, but it seems likely it was around 1760 when Clagget was working in Scotland.[16] Correspondence in the Watt Archive evidences a shared interest in musical innovation, although this depletes as Watt moved into his more lucrative engineering career. The surviving letters span the period 1765–92, ending the year before Clagget was declared bankrupt.[17]

Clagget was buying instruments from Watt by 1761, as indicated by the money received from Clagget in Watt's account books.[18] In a letter from James Watt to his father in May 1762, Watt wrote that he had sent '6 more Guittars to be forwarded to Dublin' and that he had a further two ready if the 'vessel does not saile before Wednesday'; these were likely destined for Clagget.[19] The first letter from Clagget is not until 1765, where he opens with 'I have been silent ever since the close of our dealings because I had nothing to communicate that could be of any advantage', indicating that their business relationship had ended at some point between 1762 and 1765. The end of the original Clagget-Watt relationship is then explained as Charles continues:

> I must now inform you that Mr Gibson and I have finished our dealings, our partnership ended above a year since and after that I agreed with him to be supply'd with Instruments at a fix'd profit & he promis'd the greatest punctuality, on y^{e} contrary

[13] *Aberdeen Press and Journal*, 28 July 1760. The advert for Charles is appended with 'Tho' Mr Claget does not here attempt to ascertain how long he may be able to stay in Aberdeen; yet such Ladies and Gentlemen as he engages with, may be assured he will not leave them without such Instructions and Plans for future Practice, as shall enable them to proceed and improve without further Assistance'. Both Clagget and Eales resided at Mr Macghie's in the Castlegate.

[14] Michael Wright, 'James Watt: Musical Instrument Maker', *The Galpin Society Journal* 55 (2002), pp.104–129. in light of the metalwork of the flute keys, it is possible Gardner was manufacturing the embossed metal rosette plates for English guittars rather than wooden plates for the bodies.

[15] Nina Baker, 'James Watt as Musical Organ Maker: Myth or Reality?', in Malcolm Dick and Caroline Archer-Parré, *James Watt (1736–1819): Culture, Innovation and Enlightenment* (Liverpool: Liverpool University Press, 2020), pp.209–30. The instrument in question is the 'James Watt Organ' held by the Glasgow Museums Collections, item 1918.58, labelled 'Organ built by James Watt GLASGOW 1762'.

[16] In addition to Charles' work in Aberdeen, Charles and Walter's *Six duetts* were published by Robert Bremner, who at that time had a single music shop on the High Street in Edinburgh; Bremner opened his London branch on the Strand in 1762. It seems likely that Charles spent several months traveling around Scotland seeking business.

[17] All references to a manuscript resource in this article, denoted 'MS', are from the papers of James Watt, held by Birmingham Archives. The spellings are reproduced as faithfully as possible, with any editorial matter denoted by square brackets.

[18] See Wright (2002), p.111.

[19] 10 May 1762, MS 3219/3/3/2/3/94.

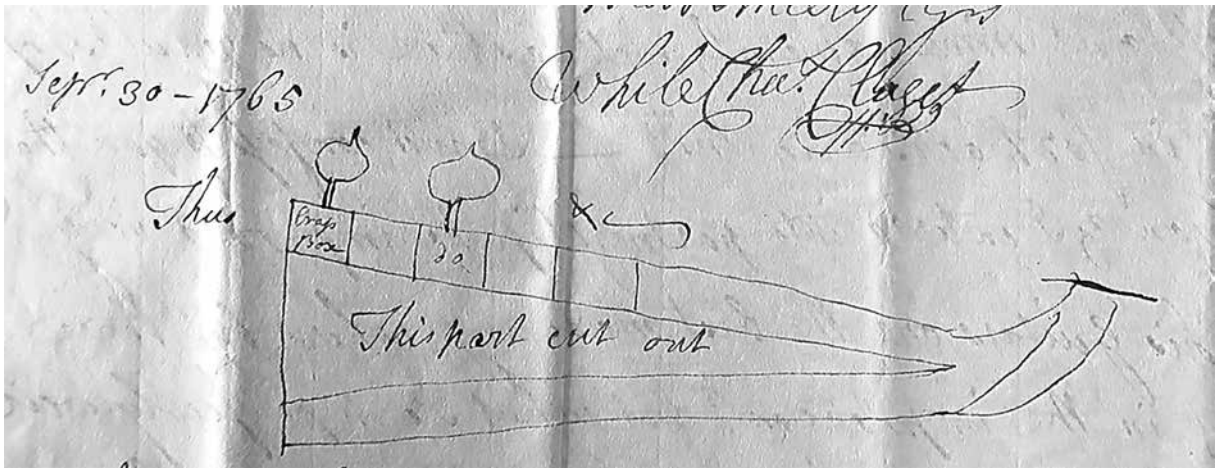


Figure 1. *Sketch of tuning mechanism on William Gibson's guittars, in letter from Charles Clagget to James Watt, 20th September 1765, MS 3219/4/1/6/1/4. Reproduced with permission from the Library of Birmingham.*

> from the beginning of our dealings to this day, I cannot say he ever kept his word with me.[20]

Mr Gibson was William Gibson, the famed English guittar maker of Dublin who worked from around 1761 until his death in 1790, and who also produced a variety of keyboard instruments in the 1770s.[21] Gibson also worked for some time as a teacher, and as a seller and publisher of music.[22] We know that Clagget's former business partner, Mr Gibson, was indeed William Gibson because Clagget continues to describe his guittars as 'the best made any where', and he details the distinctive tuning machines used, likening the screws to those Watt may 'have seen in the head of my Violin in Scotland […] a perpetual screw secreted in the head of y^{e} common form, & the screws are brass and turn a hidden perpetual screw'. He then opines 'this is certainly better y^{n} the watch key, but it is more trouble & expense'. At the foot of the page, Clagget includes a partial sketch of the mechanism (see Figure 1), and appends the description 'In each box there is a perpetual screw the pin that appears is form'd like a fiddle pin but made of Brass, very thin & hollow'd out the head in the common form the bridge of y^{e} lute kind the trible [sic] side & the lower strings go to y^{e} end as before the old fashion has been'.[23] One confirmed example of a guittar produced by this business partnership survives, signed 'Messrs Claget & Gibson', dated 1763, and held by the Stearns Collection at the University of Michigan.[24] The date of this instrument indicates that the short initial partnership between Clagget and Watt ended during or before 1763.

The reason Clagget divulges so much detail about Gibson's English guittars and their unique tuning mechanisms, is that this letter's purpose was an attempt to reinstate Watt as a supplier for Clagget. While Clagget does not explicitly request Watt to copy Gibson's design, Watt's metalwork skills and tools coupled with the knowledge and experience to apply this to guittars he was already competent in making leaves no doubt that Clagget hoped Watt would be able to replicate Gibson's successful design. Clagget even tries to convince Watt to relocate to Dublin, saying he could 'keep in the trade you are in now'—presumably the manufacture of mathematical instruments, and his early musings in engineering—and that such an arrangement would be mutually beneficial 'as there is no regular shop in Dublin for [music] Books and Ins^{ts}'.[25] Clagget also asks for recommendations of a 'man who can mend and correct ins^{ts}, out of order and make Violins', and curiously that Watt should let Clagget know the salary required so that 'Gibson may not take him from me'. This final note of concern

[20] 30 September 1765, MS 3219/4/1/6/1/4.

[21] See Panagiotis (2011), pp.578–9 for biographical information and a list of surviving instruments.

[22] Mary Pollard, *A Dictionary of Members of the Dublin Book Trade 1550–1800 (London: The Bibliographical Society, 2000), p.237.*

[23] 30 September 1765, MS 3219/4/1/6/1/4.

[24] Stearns Collection, item: 1086.

[25] 30 September 1765, MS 3219/4/1/6/1/4.

perhaps reflects an acrimonious split of the Clagget-Gibson partnership.

The result of Clagget's letter was the revival of the Clagget-Watt business relationship, with Watt supplying Clagget in Dublin with guittars. There is evidently much correspondence missing from the archive, as the lengthy letter of February 1766 is urgent and rambling, opening with

> Here is the 21st Feb'y arrived but no Guitars it is now three months this very day since I advertis'd that I had such Instˢ coming it is not possible to tell you what people sey [sic] of me & to me therefore I will not attempt it beg you will use your utmost endeavours to send me a Dozⁿ before this month is out.[26]

From this we learn that Clagget was running a small business in Dublin and was dependent on stock arriving from Watt to satisfy customer demand. There is no identifiable evidence of Clagget operating a shop front in Dublin, and so his sales were presumably to pupils and by word of mouth. Later in the letter, Clagget explains that he had two guit[t]ars 'very bad ones made in Dublin' which he exchanged for 'one old one I had of hintz', likely Frederick Hintz of London. He promised to send Watt the 'bodies of any good ones' he was able to obtain so that Watt 'may discharge the [va]rnish & work them up in your own way & it will save some trouble'. The question of how original any of Clagget's, or indeed Watt's, surviving instruments are in light of this comment should be kept in mind by anyone inspecting their work; Watt's own dabbling in the forgery of flutes is perhaps of note here. Clagget also documented a lute he had recently acquired which he called a 'chamber lute', the lengthy description of which would indicate an archlute with eight treble courses (two single and three double), and eight bass double courses tuned in octaves, and he noted that he had heard of a guitar with a keyboard mechanism.[27] This letter is the last preserved in the archive for a decade and it is likely, in light of the evident supply issues, that the relationship did not last long beyond February 1766. Watt had in any case found a new interest in steam engineering that reputedly started in 1765, and a decade later led him to partner with Matthew Boulton of Birmingham, denoting the start of Watt's success as an engineer and his definitive move away from musical instrument manufacture.[28]

The correspondence between Charles Clagget and James Watt up until 1766 is largely restricted to business with some exchange of musical curiosities. Contact between them is re-established following what appears to be Clagget hearing of Watt's success while he was in London in 1776 to obtain his first patent – it is at this time James Watt and Matthew Boulton had become British celebrities for their successful work on the steam engine.[29] It is evident that the reviving of contact was seen by Clagget as an opportunity to rekindle the support of his newly famous friend. Watt was now moving in a higher social circle, removed from his previous relatively lowly manufacturer status. At a time when the British class system was becoming entrenched in society, and the distinctions between different walks of life were more acutely felt,[30] it is of little surprise that the ambitious Charles Clagget would seek to capitalise on his newest connection to the world above his own

[26] 21 February 1766, MS 3219/4/1/6/1/3; a small portion of this letter is unfortunately missing. Clagget also commented that 'guitars that are [not] handsome will not go down here'.

[27] Of this instrument, Clagget describes its construction which is a little different: 'this lutes belly is put on in a very curious manner — and vastly better than any I ever saw[,] the edge or rim of it comes even out to the sides & as I may say is Laid on & Glewed on the top of the edge[,] then there is a silver lace like the narrow hat lace glew'd on so as to cover the Edge one half coming on to the belly the other on the rim or side […] This scheem is of great use first securer the belly doubly, 2dy if the instrument is out of order the belly can be taken of and put on as often as necessary with very little trouble & no Injury to the Lute & as this Inst is rested against the desk you play at – without such a preserver it is soon worn thro by rubing constantly against the desk'. Of the keyed guitar he writes 'I hear of a gentleman in Engd who has made a guitar & for the right hand has fix'd 7 keys like the keys of a spinet and quils in like manner strike the wires – what do you think of that scheem'. Both quotes from 21 February 1766, MS 3219/4/1/6/1/3.

[28] See timeline of Watt's activities in Caroline Archer-Parré and Malcolm Dick (eds), *James Watt (1736–1819): Culture, Innovation and Enlightenment* (Liverpool: Liverpool University Press, 2020), pp.ix–x.

[29] 15 November 1776, MS 3219/4/1/6/27/3. The letter opens 'It is so many years since I had the pleasure of seeing you or even hearing of you (until yesterday) that it is almost possible to forget each other. I heartily congratulate you on your successful and (as I find), highly applauded Improvemts [,] you cannot have more success yn I wish you'.

[30] For an excellent overview of the upper echelons of British society see Hannah Greig, *The Beau Monde: Fashionable Society in Georgian London* (Oxford: Oxford University Press, 2013), and a discussion of the merchant class see Jonathan Barry and Christopher Brooks (eds), *The Middling Sort of People: Culture, Society and Politics in England, 1550–1800* (Basingstoke: Palgrave Macmillan, 1994).

servant class of musical performance and retail. His request for a recommendation of a mechanic in his first letter did not yield a suitable answer from Watt, and Charles took this as an opportunity to flatter Watt's skills when he wrote 'I would give more to have these things [the manufacture of metal components] conducted by you than any man I ever knew'.[31]

These letters are not just a source of organological information, as they also shed light on the social history of inventing in eighteenth-century Britain, particularly between trades. In this instance, we have two inventors who had previously shared the common trade of the manufacture and sale of musical instruments, and latterly both men sought patents for their inventions at great expense. Their activity foregrounds the wider innovative environment of Enlightenment Britain, and a point in time when there was increased interest in the sciences, a focus which extended to music. One facet of music which caused some consternation was intonation and temperament, and it is this which underpins many of Clagget's inventions and led him to bestow himself with the title 'Harmonizer of Musical Instruments' (see Figure 2).[32] His interest in correcting the perceived shortcomings of contemporary intonation and temperament, coupled with his understanding of the domestic music market gained through his time teaching, placed him in a unique position to carve out a niche in the bustling music market to justify and promote his inventions. Intonation, and the science of music, was therefore of utmost interest to Clagget, providing him with answers as well as an intellectual backbone for his business.

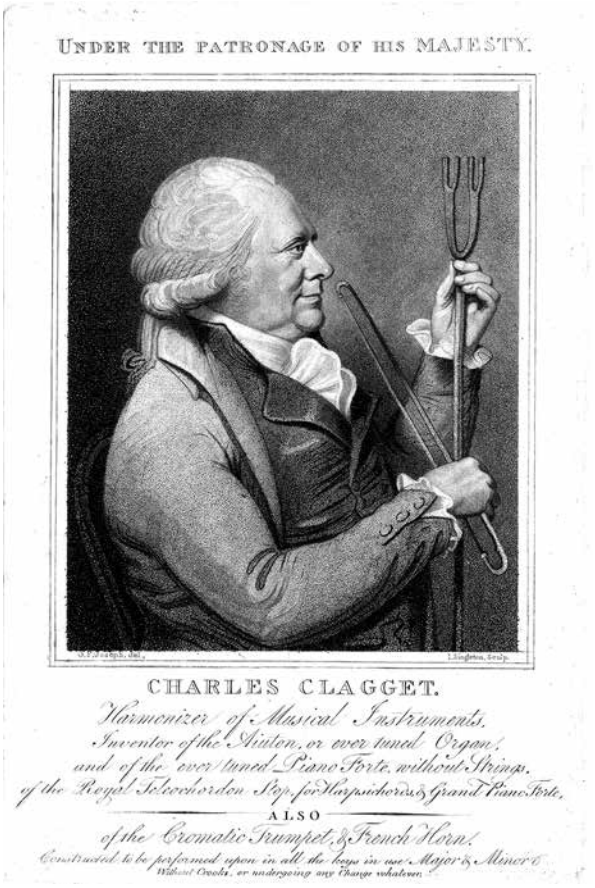


Figure 2. *Portrait of Charles Clagget, c.1790, British Museum (Heal,Portraits.216), © The Trustees of the British Museum.*

ON INTONATION

The issue of playing in tune was one which came to the fore over the course of the eighteenth century. That is not to say that it was not an issue prior, but the growth of musical entertainment, coupled with the rapid expansion of the publication industry of the time has led to many opinions being documented. Questions have been asked about listening in the eighteenth century, particularly given the very noisy and disruptive concert environment compared to today's rather staid traditions.[33] Did audiences listen enough to care about intonation? It is worth highlighting that music in the eighteenth-century public sphere was very much part of what we call the leisure industry. Audiences attended performances for a variety of reasons: some to hear the performance because they were lovers of music, others so that they could say they attended a significant social event even if they couldn't recall anything about the performance itself. This spectrum of attendees' interests, not too dissimilar to today's audiences for significant large-scale events,[34] means that perhaps

[31] 26 November 1776, MS 3219/4/1/6/27/4. This letter also communicated the change of Clagget's lodgings, from the Grecian Coffee House in Temple, to Warwick Court in Holborn. It was likely seen as an opportunity for Clagget to keep the dialogue open.

[32] Under the portrait reads: 'Harmonizer of Musical Instruments / Inventor of the Aiuton or ever tuned Organ, and of the ever tuned Piano Forte, without Strings, of the Royal Teleochordon Stop, for Harpsichords, & Grand Piano Forte, / ALSO / of the Cromatic Trumpet & French Horn. / Constructed to be performed upon in all the keys in use Major & Minor / Without Crooks, or undergoing any Change whatever.'

[33] William Weber, 'Did People Listen in the 18th Century?', *Early Music* 25/4 (November 1997), pp.679–691.

[34] I liken concert attendance in the eighteenth century to large events such as music festivals, where some attend for the music, others for the experience, and a sizeable portion in the middle attend for a bit of both.

only a small number would be actively listening to the performance, and potentially critiquing the technical skill of the performer or limitations of their instrument. Issues of intonation, then, were the concern of those closest to the performance of music, and those with a keen interest in the science of music.

One leading musical figure who observed issues of intonation was Charles Burney, whose publications document his musical encounters while on tour, often rather critically. The tuning of organs, and the intonation of singers, were issues clearly at the forefront of his mind when voicing his opinions of both sacred and secular music. For instance, on an organ in Antwerp, built in 1654, he complemented the tone but that it was 'so miserably out of tune, as to give more pain than pleasure to the hearer',[35] and noted of the opera in Brussels 'the Singing may be pronounced to have been but indifferent: there were three males and three female voices employed, no one of which was good, and out of the whole number, not one had either a shake, or the faculty of singing in tune'.[36] John Hawkins, too, found issue with intonation, remarking that the traverse flute 'still retains some degree of estimation among gentleman, whose ears are not nice enough to inform them that it is never in tune'.[37] Good intonation, for the musically accomplished Burney and Hawkins, was clearly of great importance.

The acknowledgement of the intonation problem was accompanied by discussions of temperament, being a period when musical forces were becoming more standardised as music moved from the small salon to the concert hall. The compromises of different temperaments were mostly applicable to fixed pitch instruments like harpsichords and organs, but had ramifications for any instrument or voice performing with said fixed scales. As most readers of this journal will know, it was this issue of temperament that resulted in split sharp keys on the harpsichord family as an attempt to satisfy the need for major and minor semitones, generally measured as five and four commas respectively. It also impacted the scaling of inlaid frets on guitars, and the geometry of woodwind, as both families are to an extent bound to a predetermined temperament but have some limited ability to raise or lower pitch, albeit wholly reliant on the skill of the performer. Only the violin family, the voice, and slide brass such as the trombone, were truly flexible enough to adapt to whichever temperament was employed.[38] Intonation was therefore bound with discussions of temperament during the eighteenth century, and judgement of accuracy in performance was reliant on the audience's understanding of the temperament in use.

Temperament is as much a musical as it is a scientific issue, and it is of note that interest in music as a science boomed during the eighteenth century. As with the arts in general, it became fashionable to theorise music—to quantify something subjective through a scientific lens—which led to the publication of numerous books, articles, and pamphlets. The desire to produce this body of knowledge, which was in many ways of little use to anyone, was driven by the Enlightenment quest for self-improvement.[39] This engagement with science was for many a 'fashionable pastime' rather than related to their career,[40] and this may explain the increase specifically in music publications of a scientific bent: a means of intellectual posturing on a subject, music, largely reserved to those with money. The publication of such learned texts could therefore be seen as a method of self-fashioning,

[35] Charles Burney, *The Present State of Music in Germany, the Netherlands, and United Provinces*, 2 vols (London: T. Becket and Co, Strand; J. Robson, New Bond-Street; and G. Robinson, Paternoster Row, 1773), vol.1, pp.32–33. Burney continues: 'One of the four monkish organists who attended me in a very obliging manner, pleaded poverty upon this occasion, and said, they could afford to have their instruments put in order but seldom, on account of the expense' an issue still unresolved today.

[36] Burney (1773), vol.1, p.25.

[37] John Hawkins, *General History of the Science and Practice of Music*, 3 vols (London: J. Alfred Novello, 1853), vol.2, p.739. First published in 1776.

[38] Joseph Sauveur in his *Méthode Générale pour former les systems tempérérs de musique: Histoire de l'Académie royale des science* of 1707 noted that woodwind sat in between the inflexible keyboards and versatile voice and violin. See Bruce Haynes 'Beyond temperament: non-keyboard intonation in the 17th and 18th centuries', *Early Music* 19/3 (August 1991), pp.357–82, at p.359.

[39] Maria Semi, trans. Timothy Keates, *Music as a Science of Mankind in Eighteenth-Century Britain* (Farnham: Ashgate, 2012), pp.7–8.

[40] Peter Borsoy, 'The Culture of Improvement', in Paul Langford, *The Eighteenth Century: 1688–1815* (Oxford: Oxford University Press, 2002), pp.183–212, at p.187.

speaking to the eighteenth-century ideals of politeness which were appraised through 'manners, conduct, and accomplishments'.[41] Note that this idea of Enlightenment-driven self-improvement, and indeed self-fashioning, are important points to acknowledge in a study of Charles Clagget.

These eighteenth-century publications concerning the science of music are documented at length in the tome-like work of Jamie C. Kassler.[42] The book covers a wide range of topics, from music of antiquity (developing from the previous century's trend to look back), to new inventions to assist in performance or instrument maintenance. Some of these texts attempt to rectify perceived shortcomings with contemporary temperaments, and these may have impacted performance practices of the time.[43] By far the most influential publication was Robert Smith's *Harmonics, or the Philosophy of Musical Sounds*,[44] which is of particular importance to the discussion of Charles Clagget's approach to his innovations, because it is this text that he directly cites in his marketing spiel. Smith's text was first published in 1749, and later revised and republished in 1759, a year before Clagget likely met James Watt in Scotland. Smith was an amateur musician, and mathematician of Trinity College, Cambridge, who had otherwise researched and published papers on optics.[45] *Harmonics* deals primarily with temperament, with a section on the tuning of organs, and appears very much to be a philosophical rather than practical text. John Hawkins documented that the second edition of Smith's *Harmonics* was aided by the clockmaker John Harrison, who with his monochord and method of dividing the scale using a circle had 'discovered the means of a more correct tuning than at present is known'.[46] Hawkins also comments that the book is 'so obscurely written, that few who have read it can be found who will venture to say they understand it',[47] a comment warranted as the reader needs to have some understanding of mathematics, coupled with an awareness of beat counting for tuning, to profit from reading the publication.[48]

Despite its complexity, Smith's *Harmonics* served as a seminal text over the following century for discussions of scale and tuning. It was documented by Dr John Robison (1739–1805), a contemporary of James Watt, that Watt had studied Smith's *Harmonics*, and supposedly had no ear for music.[49] Watt's engagement with Smith's text was likely linked to his forays into organ building in the early 1760s, and given Smith's focus on organ tuning from a mathematical perspective, it is plainly evident why the book would be of appeal to Watt. It is unclear if Clagget engaged with Smith's text on his own, or if he was directed by Watt, but a request for information in his letter of February 1766—'desire you will send me in your next letter (without fail) the scale for tuning as laid down by your author - I forget his name […] pray send me the scale I think it was devided & proportioned for organ pipes'—may be the point at which Watt properly introduced him to Smith's Harmonics.[50] Clagget owed much to

[41] Borsoy (2002), p.189.

[42] To serve as an example of the scale of publications, take Richard Leppert's observation of John Keeble's *The Theory of Harmonics: Or, An Illustration of the Grecian Harmonica* (London: for the Author, 1784, p.255, note 14), and how it relates to similar publications in Jamie C. Kassler's catalogue *The Science of Music in Britain, 1714–1830*, 2 vols (New York & London: Garland Publishing, Inc., 1979) which lists 'more than 50 printed texts dealing with music and mathematics, more than 200 dealing with proportions, and about 130 dealing with musical doctrines of antiquity' but acknowledges the 'considerable overlap among these categories'.

[43] For a most accessible discussion of non-keyboard temperaments see Haynes (1991).

[44] First edition published Cambridge: J. Bentham, 1749; second edition published London: T. and J. Merrill, 1759. I refer throughout this article to the 'much improved and augmented' 1759 edition.

[45] *A Compleat System of Opticks* (Cambridge: for the Author, 1738).

[46] Hawkins (1853), vol.2, pp.914¬–15. For Harrison's monochord, see Kassler (1979), vol.1, pp.453–56.

[47] Hawkins (1853), vol.2, p.915.

[48] Benjamin Cooke also objected to Smith's new temperament, arguing that the 'common scale' was most suitable. The common scale is described by Tim Eggington as a scale of 'unequal temperament' which facilitated 'modulation across the enharmonic divide'. See Tim Eggington, *The Advancement of Music in Eighteenth Century England: Benjamin Cooke and the Academy of Ancient Music* (Woodbridge: The Boydell Press, 2014), pp.136–39.

[49] James Patrick Muirhead, *The Life of James Watt: With Selections from His Correspondence* (London: John Murray, 1858), p.46. Robison would also publish on 'Temperament of the Scale of Music' and an essay on 'the Musical Trumpet' in John Robison, *A System of Mechanical Philosophy*, 4 vols (Edinburgh: John Murray, 1822), vol.4, pp.376–452, and 501–538. Robison also referred to Smith's *Harmonics* through his own discourse on music.

[50] 21 February 1766, MS 3219/4/1/6/1/3.

Smith. He cited Smith in his *Musical Phaenomena* pamphlet of 1793,[51] and in his Teleochordeon Stop, it is quite evident that Clagget's concept of a 'changeable scale' was in debt to Smith's description of harpsichord stops.[52]

CHARLES CLAGGET'S INVENTIONS

It is through this lens of Enlightenment self-improvement that I approach the innovations of Charles Clagget. While an accomplished musician, teacher and sometimes dancing-master, Clagget was regarded as a member of the lower classes, serving the newly affluent bourgeoisie above.[53] The eighteenth century was also a period of innovation in musical instrument design with new instruments appearing regularly, although many just briefly.[54] Clagget attempted to enter a higher rank of society by aligning himself with contemporary developments in music. This is most evident in his 15 inventions, but also through his discourse on correcting temperament.

These 15 inventions are captured in two patent applications of 1776 and 1788, both filed in London. The patent system in Britain and Ireland during the eighteenth century was not unified, with patents being granted in England (London), Scotland (Edinburgh) and Ireland (Dublin). Patents were enforceable in the country of application, but there was consensus between the nations that a patent could also apply to other jurisdictions albeit in a less watertight manner. The cost of obtaining a patent was high,[55] and a lengthy process was required to secure it.[56] Detailed records of English patents survive with a more limited selection from Scotland, but virtually none have been preserved in Ireland. In a letter to James Watt in November 1776 Clagget explained that he was in London seeking his first patent,[57] and his letter in January 1788 that he was in the process of securing his second and would be travelling to England soon presumably to finalise it. Why he made the effort to travel to London to file the patents is not disclosed,[58] and we have no indication if he also filed the patents in Dublin—Clagget's revelation that the second patent process had cost him £2,000, and that it had taken him 11 years to reach that point, may imply multiple applications, the engagement of patent agents, and time spent lodging in London to complete the arduous process.[59]

Patent of 1776

The first patent of 1776 documents five 'improvements' to stringed instruments, developed while Clagget was resident in Ireland.[60] Until now, relatively little was known about these early inventions beyond what was publicised via the patent or appendages to Clagget's late concert adverts trying to sell goods. Held within the Watt archive is a notebook containing the draft for a pamphlet promoting some of Clagget's 1776 patent inventions, namely the patent violin fingerboard.[61] Handwritten by Clagget, and annotated with corrections by Watt, the notebook introduces the inventions full of the marketing puff and patter of the era, the same promotional tone used by Clagget in his later *Musical*

[51] Charles Clagget, *Musical Phaenomena, founded on Unanswerable Facts* (London: for the author, 1793). This pamphlet is denoted as 'No.I', but no subsequent publication has been found. The price of the pamphlet was two shillings.

[52] Smith (1759).

[53] The position of musicians in society draws parallels with that of dancing-masters, with the majority regarded as members of the lower or servant class. See Rachael Durkin, 'The Dancing-Master's Toolkit: a Summary of the Pochette of the Seventeenth and Eighteenth Centuries and its Role in Society', The *Galpin Society Journal* 70 (2017), pp.65–79 and p.225, see particularly pp.67–70.

[54] See Rachael Durkin, 'Magnificence of Promises: Novelty Instruments in Concert in Britain, *c*1750–1800', forthcoming in *Early Music*.

[55] Richard J. Sullivan citing Gomme (1946/48) provides the cost of a patent as £62 17*s* in 1750, rising to £81 7*s* in 1850, being an increase of 29%. See Richard J. Sullivan, 'England's "Age of Invention": The Acceleration Of Patents and Patentable Invention during the Industrial Revolution', *Explorations in Economic History* 26/4 (1989), pp.424¬–52. The cost of travel and lodgings in the city where the patent was being sought further added to this cost.

[56] The full ten-stage process is discussed in Sean Bottomley, *The British Patent System during the Industrial Revolution 1700–1852: From Privilege to Property* (Cambridge: Cambridge University Press, 2014), pp.36–39.

[57] 15 November 1776, MS 3219/4/1/6/27/3. His patent was enrolled on 7 April 1777.

[58] Bottomley remarks that many patentees would obtain their patents in England first. See Bottomley (2014), p.61.

[59] 10 January 1788, MS 3219/4/1/6/51/1.

[60] Patent no.1140, 'Violins, &c.: Clagget's Specification', 1776 / 7 April 1777' (London: George Edward Eyre and William Spottiswoode, 1856). British Library Patent Collection.

[61] MS 3219/4/11/1.

Phaenomena pamphlet of 1793. No known surviving printed version of this early pamphlet survives, although it may be the same item documented in the library of William Crotch in 1873.[62] Given that the corrected notebook is still held in the Watt archives, it is possible that this notebook was never returned to Clagget. The notebook contains no date, but as it references his later inventions, it can be proposed that it dates from around 1788: this corresponds with a period in the summer of 1788 when Clagget was attempting to arrange a visit to Watt in Birmingham, and likely made the journey in late August.[63]

The 1776 patent opens with, and the draft pamphlet predominantly focuses on, a curious moveable fingerboard for the violin family. The fingerboard was made of two parts: an upper section which remained static, cut with apertures to create frets; and a lower section which could be retracted so that a player could only press on the upper section's frets, or raised to create a smooth fingerboard. This was facilitated by a spring action, the details of which have not survived, although Clagget appeared to have difficulties sourcing a maker of the springs.[64] The focus of the fingerboard was twofold. Firstly, the use of the latticed fingerboard was to make the placing of the fingers on the fingerboard easier for learners, removing the ambiguity of the normal unmarked fingerboard which would 'save them three fourths of the usual time and trouble'.[65] Secondly, the fingerboard exemplified Clagget's theory of temperament by dividing the scale into smaller intervals.

These patent fingerboards also have a tangible connection to the workshop of James Watt. In this journal in 2002, Michael Wright identified two-part fingerboards built to this exact specification held within the James Watt workshop, now preserved in its near entirety in The Science Museum, London (see Figure 3). Wright commented that the finish of the fingerboards is rough, and the scaling of the frets was likely erroneous as the 'irregularity cannot be explained by the adoption of some form of unequal temperament'.[66] However, the description in the draft pamphlet notebook, coupled with a description of the patent fingerboard for violoncello published in Clagget's brother Walter's *A New and Complete Tutor for the Violoncello*,[67] confirms that this strange scaling was intentional. The surviving fingerboards are cut with 19 frets, making 20 pitches per string when including the open string, a total which concurs with the 'General Directions' for the fingerboard drafted in the notebook.[68] Within Walter Clagget's violoncello tutor book, eight scales are presented alongside an annotated fingerboard of this design, and is then followed by a two-page description and a chart of scales with fret numbers; the same form of chart is also within the draft pamphlet, and again in Clagget's later publication about the Teliochordon stop for keyboard instruments (to be discussed below). The fingerboard therefore creates three pitches instead of two to be played by the first finger on instruments of the violin family: while the major second is maintained, the semitone below is redistributed within the scale to create a sharp and flat version, resulting in the major second rather confusingly resting at the third fret. The octave was therefore divided into 19 pitches (20 when including the octave), seven more than we use today. This directly links to Robert Smith's *Harmonics*, where he describes his meantone scales which augment the 12 chromatic pitches in general use at the time, to a scale of 20 pitches.[69] Clagget states in his draft pamphlet that his fingerboards would 'produce a perfect agreement in the Harmony, wherever a

[62] The sale listing for Crotch's library itemised three items by Clagget, described as 'Atlas folio sheets': one on the 'Royal Teliochordon Stop' from 1790; one 'Of the Harpsichord & Piano-forte'; and 'General Directions for practising on the patent fingerboard for Violins, etc. (without name of Printer or Music-Seller) very scarce, probably published by Preston (c.1790)'. From the sales catalogue by Puttick & Simpson, lot 209, held by the Library of Congress (ML138. C83), and documented by Kassler (1979), vol.1, p.195.

[63] 11 August 1788, MS 3219/4/1/6/51/8.

[64] Clagget likens the springs to watch clip springs. MS 3219/4/1/6/51/5.

[65] MS 3219/4/11/1, p.8.

[66] Wright (2002), p.125.

[67] Attributed to Walter Clagget and published by Preston & Son in London. This was likely published after 1788 given the inclusion of a tune for metallic organ, or Aiuton (as discussed below). Several copies survive, including one at the British Library, UIN BLL01004711420.

[68] 'The number counting the Cypher is 20', MS 3219/4/11/1, p.16.

[69] Smith (1759), pp.177–78.

Figure 3. *Patent fingerboards in James Watt's Garret Workshop, The Science Museum, London (1924-792/1405/2) © Science Museum Group.*

Concert is composed of Instruments finished with these Finger-boards'.[70] The surviving fingerboards are therefore most probably accurate, and the identification by Wright of small circular saws most suitable for their production may indicate that these examples were indeed made by Watt.[71]

In 1782, Clagget mentions these fingerboards to Watt in a footnote stating 'I have finish'd near one thousand of my fingerboards, as soon as the thousand are compleat I shall send them to London where they are all bespoke — I could wish my dealings if possible were all with one man if that can not be with as few as possible'.[72] This could, of course, refer to the stepped fingerboards also outlined in the 1776 patent (as below), but further correspondence later in the decade about the fingerboards indicates that Charles was likely referring to the moveable ones for violin: in May 1788, he declares that the fingerboards he had with him in Long Acre, London were of significant value to him (£4,757 0*s* 0*d*), that less than £1,000 would finish them for sale, and that 'Cramer, Barthelemon, Peltain, and some others of the greatest masters of the violin here have promised to support them, to teach on them &c, every one says, do not deliver out one until you have a quantity ready to dispose of […]'.[73] But just over a month earlier he had asked Watt for the details of someone 'in the Cabinet way or one accustomed to work in springs as the watch clip spring &c' because 'all my fingerb'd[s] require something of this kind'.[74] It therefore appears that it took over a decade from the granting of the patent for Clagget to be mass producing his fingerboards and attempting to sell them in England, and it was perhaps his relocation from Waterford to London in 1788 which unlocked this next stage of his career away from performing and teaching; a strategic move which would grant him the opportunity of upward social mobility.

The patent also details a stepped fingerboard for guitars instead of typical inlaid frets, only two

[70] MS 3219/4/11/1, p.8.

[71] Wright (2002), p.127.

[72] MS 3219/4/1/6/40/1.

[73] 26 May 1788, MS 3219/4/1/6/51/7. In a letter of 14 April 1788, Clagget remarked that his fingerboards required a 'finishing hand' and that they 'must go through three hands at the same time'. See MS 3219/4/1/6/51/5.

[74] 14 April 1788, MS 3219/4/1/6/51/5.

examples of which are known to survive: one on an English guittar labelled by Clagget; the other on a bowed psaltery by Thomas Perry of Dublin.[75] In the draft pamphlet Clagget describes the stepped fingerboard as being 'much easier to perform upon, and not subject to those inconveniences attending on fretts' which he reasons can create issues with tuning because a 'stronger or weaker finger makes a considerable difference in the sharpness of each frett'. He also remarks that the channels cut into the fingerboard to receive the metal frets 'weaken the Finger-boards considerably' so that they may 'warp, and rise at the extremities' which he reckoned the 'inclined plains' of his stepped fingerboard would prevent.[76] Note that his stepped fingerboard did not experiment with temperament, and the two surviving examples appear to follow typical scaling. Alongside the stepped fingerboard, a 'transposer' or 'modulator', essentially a capotasto, is described which could alter the third to change from major to minor, presumably most useful for the six-course English guittar tuned to two triads. Within the draft pamphlet we gain further information about how this capotasto is used, being 'worn or carried on the left thumb' which 'runs in a grove through the neck of the Instrument, which enables the Performer to change from one key to another, with the greatest of rapidity, and with equal ease from Sharp Thirds to flat thirds, and Vice Versa'.[77] Also detailed are 'barrs' or 'Modulators' for the cello to serve as a capotasto, which when no longer required would be 'discharged by a spring' to sit to the right of the instrument's neck 'out of the way of the performer's hand'.[78] The purpose of this contraption was to make playing across the three clefs of the cello easier, and that a cello using the alto modulator could 'play the Alto Viola part at that position' and 'that the four parts will be infinitely more equal than by any other method'.[79] Finally, the patent outlines a tuning device made of tuned brass or steel bars, set into a frame which stopped all but the string to be tuned with 'a little ridge of leather'. It worked through sympathetic resonance, whereby the relevant bar would vibrate in sympathy when the string was raised to the correct pitch, and would be detected by the user by placing a piece of paper on the bar which would then 'fly off' when it resonated. This final item is not included in the draft pamphlet.

The patent is most notably concluded with:

> The above improvements render it almost impossible to stop or play out of tune; that the violin, &c. will retain all former perfections. And these improvements, at the same time that they infinitely assist the very best performers, will save learners about four fifths of their trouble and time.

This final emphasis on learning highlights the fact that many of these inventions were developed to aid learners, something likely informed by Clagget's own work as a teacher. The complexities of the subdivided scale aside, the idea of an adaptable violin fingerboard to expedite accurate finger placement was one which may have been warmly received on the open market, but Clagget was aware that he had 'yet the prejudice of custom to combat', and begged that those unsure of the inventions 'wait, and with patience make trial of the Effects as well as the Consequences of his Fingerboards, Modulators, and Transposers, before they pronounce against him'.[80] This focus on learners was a particularly shrewd one, given the buoyant domestic music market for instruments and accessories, sheet music, and tuition during the late eighteenth century.

[75] Panagiotis (2011), pp.373–77. Instrument held by the Händel-Haus Museum in Halle, item: MS 129. The instrument has a paper label on the headstock which reads 'PATENT ROYAL / Charles Clagget / 16 / Greek Street Soho' which gives a date range of 1789–93 for manufacture. Bowed psaltery by Perry & Wilkinson in the private ownership of Gerald Trimble in North America, and also has a matching plain fingerboard. For a discussion of the bowed psaltery, and notes on the Perry & Wilkinson instrument, see Panagiotis Poulopoulos and Rachael Durkin, '"A very mistaken identification": the "sultana" or "cither viol" and its links to the bowed psaltery, viola d'amore and guittar', *Early Music* 40/2 (May 2016), pp.307–31.

[76] MS 3219/4/11/1, p.12.

[77] MS 3219/4/11/1, pp.12–13. Watt appended at the end of this section 'Drawings or plates will be necessary to make these descriptions intelligible'.

[78] Patent, 1776.

[79] MS 3219/4/11/1, p.11.

[80] MS 3219/4/11/1, p.4.

Domestic music-making had grown significantly over the course of the century as part of the notion of self-improvement, leading to a significant rise in learners of the most popular instruments, viz. the violin, English guittar, and harpsichord. This in turn bolstered the music market, and is why we see such an increase in music sellers, instrument makers, and publishers during this period. Clagget was therefore not only seeking to enter the learned world above through his innovation and 'self-improvement', but to also be seen as a leading figure in the domestic music market. In the case of the violin fingerboard, it was likely his attempt to do too much, coupled with the 'prejudice of custom', resulted in the fingerboard not becoming more well-known. Indeed, in creating such a fingerboard with an unfamiliar scale, Clagget was attempting to instigate a seismic change to musical performance by forcing a new temperament upon users of his fingerboard, something which he continued to campaign for in his next patent.

PATENT OF 1788

The second patent is, in many ways, even more intriguing, and it is clear from the Watt letters that the contents of Charles' second patent were formulating before he achieved any real success with the inventions from his first.[81] The second patent was granted in 1788 and this time documented ten ideas, ranging from components to full instruments. Starting with the components, two entries document changes to the keys of keyboard instruments. Firstly, the patent sought to make the keys uniform size and of the same height (removing the stepped layout of a traditional keyboard), but of the normal 'distinguishing colours', in order to only require 'one mode of fingering' which 'answers in all keys whatsoever', improve the shake, and there was apparently no 'danger of touching one key for another'. Secondly, Clagget proposed veneering the keys with 'plates of glassy enamel', similarly adhering to the accepted colours of the time, although no justification for this change is given.[82] A moveable tailpiece for the violin was proposed, which could be raised or lowered to adjust the pressure exerted on the bridge, so that the soundpost could be adjusted more easily. Clagget also outlined a membrane to be fitted over the strings of keyboard instruments to improve the tone, which could be 'opened or shut at pleasure', and which 'preserves the strings from dust and other injuries'.[83] Changes to the Celestina stop for keyboards—a device invented by Adam Walker which saw bands of silk coated in rosin rubbed against the strings[84]—sought to resolve the issues of rosin build-up by passing the strings through 'spirits of wine' to dissolve the rosin. Of note, Charles Burney, when procuring a Celestina stop for Thomas Jefferson from Jacob Kirkman, wrote that Kirkman believed that the rosin clogged the mechanism, leading it to be 'frequently out of order', and that the rosin once built up on the silks 'destroy[ed] the tone'.[85] Returning to tuning, Clagget outlines his tuning fork which could be changed in pitch through the addition of 'metallic balls or weights of different sizes' so that the exact pitch required could be sounded, but which could also be achieved through the manufacture of 'single bars or rods of metal' tuned to the required pitches. In relation to this, he also proposed a change in the design of the tuning hammer for harpsichords, making the handle longer and socket shorter to make the key 'steadier and easier to use'. These two ideas, while not listed adjacent in the patent (numbers seven and nine respectively), were evidently conceived as a kit as one surviving example is held by The University of Edinburgh, the tuning key clearly stamped with 'CHAS CLAGGET' and 'PATENT' (see Figure 4 below and in the colour

[81] Patent no.1664, 'Musical Instruments: Clagget's Specification', 15 August 1788' (London: George Edward Eyre and William Spottiswoode, 1856). British Library Patent Collection.

[82] Jenny Nex comments that the use of glass or enamel would significantly alter the 'feel' of the keys 'under the fingers', creating 'less friction between [the fingers] and the instrument'. See Jenny Nex, 'Inventions and ideas on the peripheries of British piano design between 1752 and 1832', in Luca Lévi Sala and Rohan Stewart-MacDonald (eds), *Muzio Clementi and British Musical Culture: Sources, Performance Practice and Style* (Abingdon: Routledge, 2019), pp.84–102.

[83] The membrane would be made of 'parchment, vellum, silk, linen, or paper'.

[84] For a discussion of Walker's Celestina stop, see Deirdre Loughridge, 'Celestial Mechanisms: Adam Walker's Eidouranion, Celestina, and the Advancement of Knowledge' in James Q. Davies and Ellen Lockhart (eds), *Sound Knowledge: Music and Science in London, 1789–1851* (Chicago and London: The University of Chicago Press, 2016), pp.47–76, at pp.56–60.

[85] Letter from Charles Burney to John Paradise, 19 June 1786, enclosed with a letter from Paradise to Thomas Jefferson. See *Founders Online*, National Archives, https://founders.archives.gov/documents/Jefferson/01-10-02-0014, accessed 29 May 2022.

Figure 4 (See also the colour section.). *Tuning set of forks and weights plus tuning hammers by Charles Clagget, The University of Edinburgh (MIMEd 6407), © The University of Edinburgh.*

section). Upon visual inspection alone, it could be assumed that the four tuning forks and 16 pairs of weights would produce 20 pitches, synonymous with the 20 pitches of his patent violin fingerboard, and the harpsichord outlined in Smith's *Harmonics* (see below). However, a brief investigation by Jenny Nex has instead indicated a chromatic scale of a tuning yet to be confirmed.[86]

While one example of the tuning set survives, no known examples of the three instruments detailed in the patent have been identified. Between the tuning fork and tuning hammer entries of the patent, Clagget details an instrument which came to be called his Aiuton (also Aieuton, Aiton), or ever-tuned organ. This instrument was to be fitted with the aforementioned tuning forks, or 'single prongs or rods' which were to be fixed to a box or board, and then struck by hammers or jacks, or made to sound with a Celestina stop-type mechanism. The main selling point, as outlined from the patent, was that the instrument 'will not be subject to go out of tune'. It is this final point that Clagget used to capitalise on his invention, and the quick adoption of the alternative name 'ever-tuned organ', likely in response to the ambiguity of the first name Aiuton, was employed to promote this unique selling point.

The origins of the Aiuton may lie in another instrument Clagget became aware of while he was still residing in Waterford. In a letter to James Watt in January 1782, Clagget enquired if Watt knew of an instrument called an 'Ado' which was said to be in London, and if Watt could procure the glass bars for him.[87] The Ado, according to Clagget, was a set of 34 cylindrical glass bars (although the bass ones were hollowed out) set into a flannel-covered frame, and struck with 'ebony balls fastened to whale bone handles, which is made on the same principal as the Barbery harp or Organ'.[88] This Barberi Organ was a barrel organ with pins that controlled a keyboard, which in turn let air into the organ pipes.[89] Had this final likeness not been included, Clagget's description of the Ado would have been read as a glass percussion instrument struck with beaters. However, the association with the Barbery (or Barberi) and specifically its keyboard indicates that the Ado was likely to be an early glasschord: a series of glass bars struck with hammers activated by a piano keyboard. The glasschord was invented by a German called Beyer, and was presented to L'Académie Royale des Sciences in Paris in March 1785. It was commented that it was portable, and could be placed in a vehicle so that it could be used while travelling; that its name had been bestowed by Benjamin Franklin, who had taken it to North America, literally meaning 'strings of glass'; and that in August 1785 Beyer was in the process of finishing an instrument for display.[90] The involvement of

[86] With thanks to Jenny Nex for firstly alerting me to the tuning set (a relatively new acquisition), and then sharing her findings. One theory I posit here is that the set existed in two forms: the first producing the 20 pitches of 'Clagget's scale', and the second as we find it here in item MIMEd 6407, adapted for the general market but still retaining the four forks and 16 pairs of weights.

[87] 16 January 1782, MS 3219/4/1/6/40/1.

[88] 16 January 1782, MS 3219/4/1/6/40/1.

[89] A short description of the Barbery Organ appears at the end of a sizeable section on musical instruments in Amédée Guillemin, *The Application of Physical Forces* (London: Macmillan and Co., 1877), p.197.

[90] See *Journal de Paris*, 24 August 1785, p.977. The glasschord was presented to L'Académie on 18 March 1785. The finished instrument was announced in the same publication on 18 November 1785, p.1326.

Franklin is particularly notable given his own invention of the glass harmonica in 1761, based on the principal of the popular musical glasses.[91] The benefits of glass bars, to Clagget, was their stability of tuning, not impacted by changes in humidity or temperature, although would be a notably fragile object. This concept clearly piqued Clagget's interest, and bringing his ideas of chromatic tuning forks together with the keyboard-driven struck bars of the glasschord resulted in his Aiuton.

His Aiuton was therefore a keyboard instrument equipped with tuned metal bars instead of strings or pipes, his piano 'without strings',[92] and it is these large, tuned bars we see pictured alongside Clagget in his portrait (Figure 2). The result was an instrument resilient to environmental fluctuations. The instrument was billed invariably as a replacement for church organs or to be fitted within the home, the option to be finished as a self-playing instrument with a barrel organ mechanism,[93] and suitable for use on ships or in warm climates. This last point shares commonality with the glasschord which was said to be suitable for travel, and the issue of variable climates was now of note given Britain's expanding empire. In *Musical Phaenomena*, Clagget quotes from a friend 'long resided in Bengal' to support the use of his instruments in warm climates:

> There can be no doubt but your ever-tuned instruments as of the first consequence in a warm climate, at a distance from Europe, where not only the strings, but the very essence of the instruments are exposed to, and do always yield to, the excessive heats and damps; and where it often happens, that people are not to be found to put them in tune. I should suppose such an instrument an absolute treasure in the East Indies.[94]

This friend was likely a Mr Patree who was 'lately from Bengal', as noted in Clagget's August 1792 letter to Watt.[95] This indication of an awareness of the impact of different climates on instruments, raises questions about the musical instrument trade between Britain and colonies such as the East Indies.[96] The robust build of the Aiuton with its metal bars would have undoubtedly fared better than more delicate instruments, both in their shipping and residence in a hot and humid climate. The size of the instrument, too, said to be no larger than a 'common Bookcase', may have also garnered favour.[97] Mr Patree's comment about the lack of availability of technical skills to tune or fix instruments is perhaps another worth noting, and warrants further research. In this same letter Clagget claimed to have 50 Aiutons 'bespoke', three of which were 'bespoke for churches', but that he did not have the funds to complete the orders; the letter is therefore a plea for money or referrals to help bolster Clagget's dwindling fortunes.[98] Through two descriptions from the following century we can ascertain that there were two versions of this instrument. E. Lydiatt, who had worked with Clagget to improve the Aiuton, remarked that the tuned forks were hollow, and were made to speak with a celestina stop made of seal skin and rosin on both the skin belt and the bars. It was therefore 'slow to speak', and as the rosin wore off its 'imperfections consequently became more evident'.[99] In response to this, C. I. Smyth commented that the instrument he had seen was a tuning fork piano which was unfinished as it

[91] For a brief discussion of Franklin's glass harmonica in the context of eighteenth-century timbre, see Emily I. Dolan, *The Orchestral Revolution: Haydn and the Technologies of Timbre* (Cambridge: Cambridge University Press, 2013), pp.61–65.

[92] 14 April 1788, MS 23219/4/1/6/51/5.

[93] For example, see the promotional handbill in the Watt archive, MS 3219/4/6/57/5b.

[94] Clagget (1793), p.13.

[95] 15 August 1792, MS 3219/4/1/6/57/5a.

[96] See Ian Woodfield, *Music of the Raj: A Social and Economic History of Music in Late Eighteenth-Century Anglo-Indian Society* (Oxford: Oxford University Press, 2005), particularly chapter one 'Supplying the Market' where this trade is discussed. It is perhaps notable that Woodfield's survey of inventories of deceased residents of Calcutta compiled between 1760 and 1780, highlight the flute as a very popular instrument (156 items), followed closely by the violin and French horn (91 and 53 respectively). Shipping instruments was expensive, but the flute being relatively cheap to ship, and likely more tolerant of the challenging climate than string instruments, may have boosted its popularity.

[97] Advert for a concert featuring some of Clagget's inventions from his second patent, including the Aiuton, Teliochordon Stop (to be discussed) and the different keyboard layout. See *The World*, 29 March 1790.

[98] 15 August 1792, MS 3219/4/1/6/57/5a.

[99] *The Monthy Magazine* 30, December 1810, p.412.

still required dampers, that the 'tone was *fluty*' and the 'voicing was not sufficiently equal',[100] but that he could not recall if it was at concert-pitch or an octave above as the Aiuton had been.[101]

Like the Aiuton, the Teliochordon (also spelled Telio-chordon, Teleochordon, Teleiochordon) focussed on tuning, and comparable to the patent violin fingerboard the Teliochordon sought to improve the accuracy of intonation in Britain. The Teliochordon explicitly tackled the shortcomings of equal temperament by dividing the octave into 39 pitches,[102] in order to resolve the issues of incorrect thirds and fifths, and 'what is called the wolfe is entirely done away'.[103] While the keyboard appears to have been of the standard design (or possibly equipped with his patent keyboard of equal keys), the additional pitches were achieved by two moveable bridges controlled by pedals, so that 'intonation which is to be preferred in different modulations […] be instantaneously obtained'. This division was rooted in Smith's *Harmonics*, and specifically his suggestions for an adapted harpsichord. Smith's harpsichord was to be fitted with six stops to create an octave of 20 pitches: while the jacks for A, B, D and E only struck one string, the rest of the keys were controlled by the stops to move them between two different pitches (e.g. A# and B♭).[104] Clagget's push to divide the octave into as many as 39 pitches may have been inspired by Smith's explanation of two systems of tuning: the '*Hugenian*' where the octave was divided into '31 equal parts'; and 'Equal Harmony' which divided the octave into 50.[105] This latter figure resurfaces in promotional accounts of the Teliochordon Stop where the number of available notes increased to 50.[106] In addition, a review of John Maxwell's 1781 *An Essay upon Tune* by Tobias Smollet focussed on Maxwell's tuning which called for 44 pitches in an octave.[107] Smollet also highlights the 'Tripodian, or Triple Lyre' discussed by Charles Burney, which had three sets of strings tuned to three modes (Dorian, Lydian, Phrygian), and surmised in a footnote that a 'large piano forte, with three unisons, and only one set of keys, might, by two pedals, either play them together, in the common temperament, or separately, when tuned perfectly to three different scales'.[108] Clagget was familiar with Maxwell's text as exemplified by his quoting of a 'late ingenious, but anonymous author',[109] and may have heeded Smollet's

[100] The Metallic Piano-Forte was to be used in Clagget's Hanover Square concert in May 1790 discussed below. See *The World*, 29 March 1790.

[101] *The Monthly Magazine* 30, January 1811, p.507. The column which triggered this exchange was by Capel Loft, who informs us that the name of the instrument was taken from a Greek phrase supposedly pronounced 'Aiei eutonon' meaning *'always in good tune'*. He also remarked of Clagget that he was 'a man of very interesting manners, and respectable character, who disinterestedly devoted many years of his life to the improvement both of keyed and wind instruments; whose merit in both was acknowledged by unquestionable judges; whose science, and taste, and judgement, accompanied him to the grave, with little earthly reward'. See *The Monthly Magazine*, 30 November 1810, p.305.

[102] When Clagget wrote the number of pitches for any of his instruments he included the octave in this total, whereas modern conventions are to exclude the doubling e.g. 12 semitones instead of 13. Clagget also cited 39 pitches in a letter to Watt on 14 April 1788, and also stated that the name of the instrument had been given by gentlemen of the 'Colledge of Dublin'. See MS 3219/4/1/6/51/5.

[103] Patent, 1788.

[104] Smith (1759), pp.177–78. The 20 pitches created by Smith's harpsichord were thus: C, C#, D♭, D, D#, E♭, E, E#, F, F#, G♭, F##, G, G#, A♭, A, A#, B♭, B, and C octave. In 1762 Smith published a postscript to *Harmonics*, where he expanded on the construction and tuning of his harpsichord with changeable scale. Of note, we learn that Smith's harpsichord was not just a theory, and that Kirkman had built him a harpsichord with changeable scale *c*1757. See Robert Smith, *A Postscript to Dr. Smith's Harmonics, upon The changeable harpsichord* (London: T. and J. Merrill, and B. Dod, 1762).

[105] Smith (1759), p.161.

[106] Charles Clagget, 'Some Account of the Royal Teliochordon Stop', *Monthly Register of Literature, or Magazin des Savans* (London: R. Edwards, 1792), vol.1, pp.40–43, and pp.215–17.

[107] John Maxwell, *An Essay Upon Tune* (Edinburgh: Macfarquhar and Elliot, 1781), pp.181–2 concludes his discussion of tuning an organ. Note that this publication also discusses the tuning of the violin, but this occurred after Clagget's own work with the violin's tuning.

[108] Tobias Smollet, 'An Essay upon Tune […]', in *The Critical Review: Or, Annals of Literature* 54 (London: A. Hamilton, 1782), pp.117–25.

[109] Charles Clagget, 'The various Temperaments now in Use on Keyboard Instruments in England, &c. &c.', *Monthly Register of Literature, or Magazin des Savans* (London: R. Edwards, 1792), vol.2, pp.56–58, and pp.102–106. This second article is mainly quoted endorsements, and ends stating that Clagget hoped to have his 'evertuned piano forte' completed for public viewing soon.

call to execute the idea of a keyboard instrument with different scales controlled by pedals.[110]

While the patent outlined a standalone instrument, the Teliochordon also became a stop for harpsichord or piano which could be retrofitted. This is of significance as Clagget secured the contract to furnish the British Royal family with a Teliochordonized harpsichord,[111] likely under the direction of Queen Charlotte—who was an accomplished harpsichordist—in December 1790, leading to the invention being christened with the augmented title 'Royal Teliochordon Stop'.[112] This harpsichord was said to have had 22 notes per octave,[113] and was housed in the Royal Library of Buckingham House.[114] A dedicated publication on the Teliochordon never materialised as billed,[115] and instead Clagget released some information on the Teliochordon in the *Monthly Register of Literature*, which included directions on how to play, and a chart of scales under the correct pedals to use.[116]

The final invention, and the one which has probably had the most impact on present day musical instrument design, was Clagget's cromatic [*sic*] brass instruments (see Figure 5). The patent outlines the combining of two natural French horns or trumpets pitched a semitone apart by means of a valve which would switch between the two tubes, creating an instrument supposedly capable of playing a near full chromatic scale, which included some split sharps or flats, without the need for advanced technique.[117] The patent outlined that the mouthpiece was fitted into the valve cylinder, and 'a piece of elastic, gum, or leather, or other proper material, stops the aperture of the horn or trumpet which is not in use'.[118] This was likely the first serious attempt to create chromatic brass with a valve, although it took until 1814 for Heinrich Stölzel and Friedrich Blühmel to develop what became known as the Stölzel valve.[119] Other innovators were also attempting to chromaticize brass; the end of the eighteenth century, the same period Clagget developed and promoted his instruments, saw the invention of the English slide trumpet by John Hyde.[120]

Rather surprisingly, Clagget's 'cromatic' brass is

[110] Smollet writes of Maxwell's tuning 'The idea, however, is ingenious, and we hope it will stimulate mechanics and organists, of great abilities, and perseverance, to endeavour at putting it into execution' (pp.120–21).

[111] Clagget demonstrated his inventions to the Royal family on 29th July 1790 at St James's Palace, and an order was placed for a harpsichord 'purposely to have his teliochordon stop applied to it immediately'. See *The World*, 2 August 1790.

[112] Squire (1887), pp.368–69.

[113] A newspaper advert by Clagget reporting on the delivery of the instrument to the Royal family states the instrument had 29 'regular diatonic scales', and 'one hundred and eleven intonations' equating to five octaves of 22 pitches plus the octave. See *The Diary; or, Woodfall's Register*, 31 December 1790.

[114] John Farey, 'Further Remarks on the Rev. Mr. Liston's "Essay on perfect Intonation" […]' in Alexander Tilloch, *The Philosophical Magazine: Comprehending The Various Branches of Science, the Liberal and Fine Arts, Geology, Agriculture, Manufactures and Commerce* 39 (London: Richard Taylor and Co., Jan–Jun 1812), pp.414–23, at p.418.

[115] Advert for 'A variety of periodical lessons […] for the Teleochordanized Piano-Forte, with full instructions for performing some of the late published lessons of Haydn, Pleyel, Kozeluch, &c. many of which demand at least 18 intonations in every octave' is found on a one-sheet handbill (discussed below) advertising his inventions, which states that 11 of his 13 inventions were now complete, and is dated 28 May 1790. The Teliochordon publication was due to be 'speedily published'. Item located in the Library of Congress by Kassler (1979, vol.1, p.194), and which is now digitised as part of the *Musical Phaenomena* pamphlet. See Library of Congress, item: ML1055 .C5.

[116] Op. cit.

[117] Patent, 1788. *Musical Phaenomena* (Plates 1–4, after p.22) outlines the scales available for both the cromatic horn and trumpet. The horn could supposedly differentiate between C# and D♭, D# and E♭, F# and G♭, G# and A♭, and B and C#, with A# and B♭ added further up the scale. The upper octave of the trumpet could play G# and A♭, and the topmost C# and D♭, with the lower octave 'almost as compleat'. James Brownlow comments that the instrument failed, in part, because it 'was not completely chromatic, despite the name'. He also comments that the use of the valve, while lowering the volume, also detrimentally changes the timbre. See James Brownlow, *The Last Trumpet: A History of the English Slide Trumpet* (Stuyvesant, NY: Pendragon Press, 1996), pp.24–25.

[118] Patent, 1788

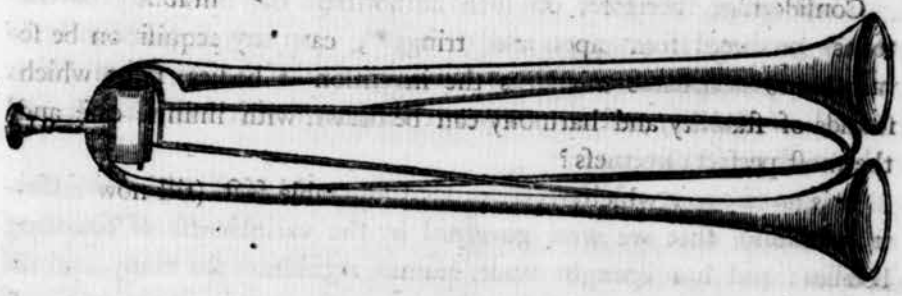
[119] Murray Campbell, Clive Greated, Arnold Myers, *Musical Instruments: History, Technology, and Performance of Instruments of Western Music* (Oxford: Oxford University Press, 2004), p.167. See also John Humphries, *The Early Horn: A Practical Guide* (Cambridge: Cambridge University Press, 2000), pp.31–33.

[120] See Edward H. Tarr, 'The Trumpet before 1800' in Trevor Herbert and John Wallace (eds), *The Cambridge Companion to Brass Instruments* (Cambridge: Cambridge University Press, 1997), pp.84–102, at pp.94-95.

(14)

Of the Cromatic Trumpet and French Horn,

A CROMATIC TRUMPET.



The Notes produced from the Patent Trumpets and Horns are always in the natural Tone of the Inſtruments, which are proved capable of regular Harmony and fine Tune, in all Keys, MINOR as well as MAJOR; and without the aſſiſtance of Crooks, or any change whatever in the Inſtrument,

By CHARLES CLAGGET,

HARMONIZER OF MUSICAL INSTRUMENTS, UNDER THE PATRONAGE OF THE KING.

THE Trumpet, or ſome inſtrument correſponding to it, appears to have been one of the firſt inſtruments invented, and employed to inſpire an idea of warlike power, regal magnificence, and imperial ſplendour; and, has (notwithſtanding its original and great imperfections)

Figure 5. *Cromatic trumpet from Musical Phaenomena pamphlet of 1793, p.14, Library of Congress (ML1055 .C5). Public Domain.*

not mentioned specifically in any surviving Clagget-Watt correspondence apart from a single hint in 1788 where Clagget asked in a postscript 'are there any French Horn makers in Birmingham?' and remarked that 'if not I must bring some with me'.[121] This intention to bring French horns with him on a visit to Watt in August 1788 may indicate Watt's involvement in the development or refinement of Clagget's valve design – given the connection between brass instrument valves and water and steam engineering, the expertise of Watt would be of great relevance. In his reply the following month, Watt informed Clagget that there were no French horn, or indeed musical instrument makers in Birmingham known to him, and warned Clagget to not use the workmen in Birmingham because 'the workmen are not to be trusted out of sight', advising Clagget to relocate to oversee any work he commissioned in the town.[122] In the draft pamphlet for Clagget's patent violin fingerboard, the invention is also alluded to but no details are provided.[123]

There is also nothing in Clagget's hand documenting where he developed the idea for chromatic brass instruments, although his work with temperament in general would be an introduction to resolving the limitations of natural brass for the less accomplished player. But in early 1776 in London, concerts were held featuring three 'cromatic French Horns'. No maker is given, and no advert follows for the instruments, but the premier at the Theatre Royal in Covent Garden, London on 28 February 1776 was allegedly 'met with universal applause'.[124] These instruments were not, to the best of present knowledge, made by Clagget and either appear to be an invention by another unknown maker or improver of musical instruments, or were regular French horns played with some form of advanced performance technique. Simon McVeigh posits a similarity in the ambiguity between the cromatic French horns advert, and a concert advert for the two brass players Johann Palsa and Carl Türrschmidt who 'could modulate through different keys without changing crooks'.[125] As a revered horn duo who exhibited mastery of the handhorn technique,[126] it is notable that Türrschmidt worked with the Parisien horn maker Lucian-Joseph Raoux in 1781 to develop the *cor solo* horn specifically designed for soloists that could play in the keys of D, E♭, E, F and G.[127] Clagget was briefly in London in 1776 to obtain his first patent, and it is perhaps while there he came across the three 'cromatic' French horns. As we know that Clagget's cromatic brass was created by the joining of two natural instruments pitched a semitone apart, it may be that the three French horns were in fact natural horns also pitched at the semitone, working together to create a near full chromatic scale in the mid and upper registers.[128] It may be that this chance encounter inspired his own forays into brass chromaticism.

Clagget's cromatic French horns received their first performances in Bath and at Hanover Square, London prior to the publication of *Musical Phaenomena* in 1793. In Bath, the horns were performed by the musician and musical instrument maker Benjamin Milgrove,[129] and John Henrard, and this public concert was said to be attended by

[121] 27 June 1788, MS 3219/4/1/6/51/8.

[122] 3 July 1788, MS 3219/4/2/2/2/417.

[123] Clagget writes: 'The Patentee has Improvements of equal utility to offer in future for the Harpsichord, German Flute, and French Horn – but from the expence, difficulties, and loss of time, attending Experiments, he is constrained to postpone his intentions, until he shall be determined by the Success of his present undertaking'. See MS 3219/4/11/1, p.5.

[124] One concert advert for the premier can be found in *Gazetteer and New Daily Advertiser* (London), 24 February 1776. An advert for a future benefit concert on 3 April 1776 featuring the cromatic horns includes the instruments' reception, see *Morning Chronicle* (London), 30 March 1776.

[125] See Simon McVeigh, *Concert Life in London from Mozart to Haydn* (Cambridge: Cambridge University Press, 1993), p.89.

[126] With sincere thanks to the reviewer of this article for drawing my attention to this important detail.

[127] These keys 'were the most practical for hand-stopping' and 'produced an ideal horn tone-quality'. See Thomas Heibert 'The Horn in the Baroque and Classical Period', in Herbert and Wallace (1997), pp.103–114, at p.112.

[128] I suggest this as if this concert was instead French horns with crooks, there would be no requirement for the more unusual number of three.

[129] Milgrove was a musician, musical instrument maker and seller, composer, and an inventor of his own chromatic horn tool called the 'Comma' in 1797. He was also an experienced horn player, stating in his advert for the Comma that he had 'more than forty years' of study on the instrument. See Matthew Spring, 'Benjamin Milgrove, the musical 'Toy man', and the 'guittar' in Bath 1757–1790, *Early Music* 41/2 (May 2013), pp.317–29. With thanks to John Humphries for highlighting this.

Charles Burney and Venanzio Rauzzini. 'Several hundred auditors' had reputedly heard the horns in performance.[130] The Hanover Square benefit concert on 18 May 1790 is captured in a retrospective handbill promoting Clagget's endeavours and success of the concert.[131] According to the bill, the cromatic French Horn was performed by Mr. Mortellari (and not Milgrove and Henrard) and that Mortellari's 'Trumpets contain the same Perfection' implying that they too were *cromatic*.[132] The concert was originally scheduled for 21 April (see Figure 6), and it is perhaps of note that by the time the concert is readvertised in the press in early May there is still no mention of the cromatic horns or trumpets,[133] although this information does appear in another handbill likely printed closer to the event once the programme was confirmed.[134] While the instruments were subsequently advertised in concert after the Hanover Square benefit, it is not until 1793 and the publication of *Musical Phaenomena* that a guide akin to that published for the Teliochordon, and drafted for the patent violin fingerboard, becomes widely available illustrating the scale and some music written for both the cromatic horn and cromatic trumpet.[135] The instruments were used in concert by Clagget after *Musical Phaenomena* and his bankruptcy, but few are found for sale beyond Clagget's adverts,[136] and no extant versions have been identified in museums or private collections to date.

The success of the horns and trumpets overcoming chromatic limitations may be gleaned from the testimonies Clagget published to support his inventions. Charles Burney, with whom Clagget was in correspondence,[137] is quoted stating that the 'imperfections' found in brass, both their scale limitations and intervals (e.g. fourths and sixths) 'are completely removed by Mr. Clagget's expedient', and in another letter that Burney had 'heartily recommended' the instruments to Lord Macartney (a British diplomat) for his musicians.[138] Burney's testimony is probably truthful based on his own criticisms of brass,[139] remarking of the trumpet's 'natural imperfections' particularly the fourths and sixths.[140] The testimony of Joseph Haydn then

[130] Clagget (1793), p.20.

[131] A handbill advertising the concert is held by the British Museum, item: J,8.302-356.

[132] Handbill dated 28 May 1790, Library of Congress, item: ML1055 .C5. It is interesting to note that a German music publication translated much of the information from the handbill as a report of the event. No further interaction between Clagget and the German music market is known. See *Musikalische Korrespondenz der Teutschen Filharmonischen Gesellschaft* (Speier, 1790), pp.94–96.

[133] The announcement advert on 29 March 1790 (*The World*) outlines the Teliochordon, patent keys, and Aiuton; the concert was originally scheduled for 21 April. On 3 May 1790 another short advert appears in *The World* for the benefit concert confirming the new date. This is curiously followed the next day by a letter publicly addressed to Clagget querying his inventions, and highlighting that 'the above object [24 intonations in an octave] was pursued by a very learned and ingenious Gentleman (Dr. Smith, of Cambridge) for upwards of thirty years, without bringing it to answer his wishes'. On 5 May, Clagget again publicly responds to the enquiry from the 'Lover of Harmony', citing his supporters (namely very well-known music professionals of the time) as evidence that his inventions worked. He concludes with 'If I have trespassed upon the attention of the community, I have only to add, that nothing could have induced me to it but your having disputed in so public a manner the merit of my inventions'. 3, 4 and 5 May 1790, *The World*.

[134] British Museum, item: J,8.302-356.

[135] Clagget (1793), Plates 1–4 after p.22.

[136] A pair of 'Cromatic French Horns' plus five single instruments were advertised for sale in Calcutta in October 1793, sold by a merchant importing items from Britain, and may have been some of Clagget's instruments. *Calcutta Gazette*, 24 October 1793.

[137] Letter from Charles Clagget to Charles Burney dated 10 August 1791, Beinecke Rare Book and Manuscript Library, MSS 3/8/614. The letter is in two parts: the first is a neatly presented cover letter stating that he had overcome his difficulties and would be giving his time over to the Aiuton, and cromatic horn and trumpet; the second inner part is a rambling and scrawly political commentary which has nothing to do with music, and appears to be a copy of a letter he had sent elsewhere. On the front of the letter is written, presumably by Burney, 'From poor Clagget not long before he died insolvent after he fancied had got over all his mechanical &c difficulties'. To the side of 'mechanical' is written 'money'.

[138] Clagget (1793), p.16.

[139] With thanks to Sabine Klaus at the American Musical Instrument Society conference of 2021 for highlighting Burney's comments on brass.

[140] This comment was based on John Sarjent's performance of 'The Trumpet Shall Sound' from Handel's *Messiah*, performed on 29 May 1784 as part of the commemoration events for Handel's death 25 years previous. See John Wallace and Alexander McGrattan, *The Trumpet* (New Haven and London: Yale University Press, 2011), p.172.

Figure 6. *Ticket for Clagget's benefit concert in Hanover Square, originally scheduled for 21 April 1790, British Museum (C,2.474-482), © The Trustees of the British Museum.*

appears in the press in 1794, perhaps an attempt by Clagget to salvage his business following bankruptcy the previous year. Haydn's testimony dated 24 December 1794 indicates a second interaction with Clagget—the first to inspect his Teliochordon keyboard instruments— and the status of Haydn's name would give weight to Clagget's marketing attempts:

> On the 13th Instant Mr. CLAGGET, who some time since produce to me a perfect Harpsichord, brought a young lad to me to perform on his Chromatic horn; he first played an Air in E♭. Minor, then scales in various keys, Minor as well as Major, after which he performed a regular Chromatic scale; then the inventor asked if there were any intonations that I wished to hear and which had not been produced, I replied, "No, Sir." I am fully convinced that you have rendered this instrument perfect, and that you have brought under command all the intervals necessary for any composition, and that without the aid of bitts or crooks, or the instrument undergoing any change whatever; that all the notes are full and correct, and always in the natural tone of the horn. I shall therefore compose for this instrument with great pleasure, and expect to produce new and fine effects. This, doubtless, is a great and valuable discovery both for the orchestra and the field, as all melodics are under perfect command; for till this was done we could not produce three regular tones diatonic or chromatic; but you have extended perfection through all the keys in use.[141]

No composition by Haydn for the instrument exists, and Clagget may have edited the letter to some degree, although like Burney's comments it is probable that Haydn did indeed warmly receive Clagget's new chromatic instruments. Ultimately, the success of Clagget's design for cromatic horns and trumpets is evident in their lack of adoption,[142]

[141] *Norfolk Chronicle*, 7 March 1795.

[142] Price may have been a major factor in the lack of uptake of many of Clagget's inventions. The retrospective handbill of 28 May 1790 (discussed above) has a pricelist on the back (guineas in brackets the author's addition): an Aiuton was a custom price; Teliochordon Stop fitted to a piano or harpsichord £20 0*s* 0*d* (19 guineas, 1*s*); patent fingerboards for violoncellos £2 2*s* (2 guineas); modulator or stops for violoncello £1 1*s* (1 guinea); patent fingerboard for violin and viola £1 11*s* 6*d* (1½ guineas); adjustable tailpieces for violin 10*s* 6*d* (½ guinea); stepped guitar fingerboards £1 11*s* 6*d* (1½ guineas); even keys for keyboard instruments £5 5*s* (5 guineas); tuning machine £3 3*d* (3 guineas); vellum covers for pianos £1 1*s* (1 guinea); patent French horn £26 5*s* (25 guineas); patent trumpet £12 12*s* (12 guineas). It is important to note that many of these prices equate to guineas, although are advertised as £-*s*-*d*. The guinea was the main gold coin of Britain in the eighteenth century, and was a denomination most associated with the middle and upper classes.

and that it took until the next century for the puzzle of chromatic brass with valves to be solved.

MUSICAL MUSEUM, BANKRUPTCY, AND CHARLES CLAGGET'S DEMISE

All of these inventions were displayed in his Musical Museum at 16 Greek Street, Soho, London. There is no precise date for the opening of the Musical Museum, but it occurred at some point between the fire at Clagget's previous residence in Long Acre in February 1789,[143] and the March 1790 advertisement for his May 1790 benefit, where tickets could be had from 'Mr. Clagget's Museum' at 16 Greek Street.[144] The opening of Clagget's museum echoed that of John Joseph Merlin, another inventor who turned his attention to musical instruments, and who opened his own 'Mechanical Museum' off Hanover Square in 1783.[145] Clagget's 1790 Hanover Square concert was therefore just round the corner from Merlin's premises in Princes Street; there is no evidence suggesting that Clagget and Merlin were acquaintances, but it seems unlikely that their paths did not cross in the bustling yet tight-knit networks of the London music business. Further, Merlin's fame, and the desirable social circles in which he moved, were no doubt an inspiration to Clagget, and may have led Clagget to embrace a degree of imitation.

According to the aforementioned May 1790 handbill,[146] entry to Clagget's Museum was charged at 2*s* 6*d* (half a crown),[147] although this dropped to 1*s* by 1793;[148] by contrast, around the same time Merlin charged 2*s* 6*d* (half a crown) admittance during the day, and increased this to 3*s* in the evening.[149] In addition, an advert in August 1790 announces the commencement of Clagget's music academy at 16 Greek Street with four rooms equipped for the instruction of keyboards, lute and guitar, and the violin family.[150] The creation of a shopfront for his wares, and the engagement of students who would likely be in need of instruments, further exhibits Clagget's understanding of marketing and the music business, creating a business model which in itself generated cross-marking opportunities.

This self-built temple to Clagget's genius serves as a helpful emblem of Clagget's thirst for acceptance by the class above. The creation of the museum was to be his magnum opus, self-fashioning Clagget as a learned middle-class gentleman and innovator, and securing his financial future as he neared 60 years of age. However, in early 1793, Clagget was declared bankrupt,[151] and for a period of months his performing activities go quiet although he still periodically advertised his museum, and requested a 'movement-maker for Piano Fortes' in the July.[152] Note that no correspondence survives in the Watt archive after 1792. Clagget's comeback is announced

[143] In *The World*, 11 March 1789, it was reported by Clagget that due to a fire on 24 February which damaged his property, 'he is deprived of many things which he had prepared' to demonstrate his improvements to musical instruments. He also promised to 'publish his Pamphlet on that subject very soon', although exactly which pamphlet or handbill is unclear.

[144] *The World*, 29 March 1790.

[145] For a detailed discussion of Merlin's life and work, see Margaret Debenham, 'Joseph Merlin in London, 1760–1803: the Man behind the Mask. New Documentary Sources', *Royal Musical Association Research Chronicle* 45 (2014), pp.130–63.

[146] Library of Congress, item: ML1055 .C5.

[147] *The World*, 12 August 1790. The entrance fee would be waived for anyone who bought an item.

[148] *Morning Herald*, 23 January 1793.

[149] *Morning and evening amusements, at Merlin's Mechanical Museum, No. 11, Princes Street, Hanover Square* ([London], date unknown), booklet advertising Merlin's museum held by the Wellcome Collection. The date of publication is unknown, but in consultation with Debenham's study of Merlin's life, it can be suggested that this booklet dates at earliest to November 1787 when Merlin took on the lease at No.11 (Debenham, 2014, p.149). With thanks to Lance Whitehead for highlighting this booklet to me.

[150] *The World*, 12 August 1790. The academy was to open the following day.

[151] *Morning Post*, 1 April 1793. The announcement, which described Clagget as a 'Musical Instrument-maker', said that Clagget was to 'surrender April 15, at six, 16, at ten, and May 11, at one, at Guildhall, London'. His attorney is listed as Thomas Holloway of Chancery Lane. He was to obtain his certificate of insolvency on 18 June 1793, see *Star and Evening Advertiser*, 30 May 1793.

[152] *The Times*, 25 July 1793. It was reported by the *London Evening Post* (31 October – 2 November 1793) that a 'Charles Clagget was indicted for stealing sundry articles of wearing apparel and trade, from William Mash, a taylor' although it is unclear if this Charles Clagget was one and the same.

by his benefit concert on 1 November 1793 at the King's Arms in Cornhill, London, where he hosted an Attic Concert featuring his inventions; it should be noted that his address, despite bankruptcy, was still his Musical Museum in Greek Street.[153] From this point his activities move out of London, and he tours with his daughter demonstrating his inventions in large towns such as Bath, Reading and Ipswich.[154] Despite Clagget's attempts to repair the damage of bankruptcy, his entire museum, his household furniture, and his patents were put up for sale in December 1794,[155] followed by a second sale in November 1795 of instruments.[156] Clagget was buried on 12 March 1796. A letter from Clagget's wife in 1803 to Watt, requesting his endorsement of her daughter as a musician about to embark on work in Birmingham, remarked of her late husband:

> Mr Claggits [sic] affairs going contrary to every ones expectation, and being swindle[d] out of a large sum, he died of a broken heart.[157]

FINAL REMARKS

The life and work of Charles Clagget is multifaceted, and here I have presented an appraisal of his inventions extracted from this complicated history. Based on these observations alone, it is clear how business oriented Clagget was in his approach to innovation, capitalising on his first-hand knowledge of the music market, and his connections built once he relocated to London. His friendship and contact with Watt, although sporadic, appears to both provide a source of expertise and encouragement to embrace innovation. My study therefore emphasises the importance of social networks in fostering organological innovation, and by extension further proves the multidisciplinarity of our field.

Clagget's inventions are wide ranging, and for the organologist raises many technical considerations particularly around temperament and intonation, and which warrant further investigation. His inventions appear to have had little long-lasting impact on instrument design, with the exception of the brass valve; it would be interesting to discover if Clagget's attempts underpin the Stölzel valve developed just over two decades later. But this study of Clagget's work also brings organology into dialogue with histories of music commerce and music education, consideration of a growing British empire and its challenging climates, and the issue of social class and the possibility of self-made upward mobility in a prosperous industrialised Britain. The limitations of a journal article preclude further investigation here, and so a further treatment of Clagget's work, and that of his contemporaries, in light of wider historiography of the period will be my next steps in this exciting body of research.

[153] *Morning Chronicle*, 26 October 1793.

[154] For example, the Claggets performed a series of three concerts in Reading in March 1794 showcasing the instruments; I discuss this concert series in relation to marketing practices in my forthcoming *Early Music* article.

[155] *Morning Chronicle*, 8 December 1794.

[156] *The Times*, 14 November 1795. Despite searching, I have not been able to locate a catalogue for this sale and would be keen to hear from colleagues who may come across this during their own research.

[157] 20 June 1803, MS 3219/4/1/5/8/14a.