

Persons of Skill and Matters of Opinion  
The Making and Rise of the Expert Witness in English Common Law  
1763 – 1800

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## Notes on Style

I wrote this thesis using modern American spelling, grammar, and punctuation while adhering to the 18th edition of *The Chicago Manual of Style*. In the interest of maintaining a consistent and readable style, all words, inclusive of proper nouns, are written with American spelling. The only exception to this rule is in-text images of original sources, inclusive of maps and invention specifications in which the spelling of the source has not been altered in any way.

Within the text of my thesis, all quoted source material has been updated to current standards while staying true to the author's or scribe's meaning. In some instances, this meant preserving grammatical errors. The Appendix of this thesis includes a selection of extended transcripts of the sources I have studied. These documents were written by individuals whose handwriting, spelling proficiency, and writing conventions differed greatly. In contrast to the modern style used throughout the body of this work, I transcribed exactly what I saw, including grammatical mistakes, inconsistent punctuation, misspellings, archaic words and the use of capitalization and underlining for emphasis.

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My research has taken me to archives in London, Birmingham, and Norfolk. Across these archives, I had nothing but the most positive experience, as archivists and librarians not only showed interest in my work but also universally took action: searching for extra information, locating misplaced sources, and helping me decode provenance and handwriting alike. I would especially like to thank Carol Morgan, the archivist at the Institution of Civil Engineers (ICE), for her assistance with all things Smeaton and for offering me the opportunity to contribute to the ICE's celebration of John Smeaton's 300th anniversary. Thank you to Victoria Iglkowski-Broad of the National Archives, Vaughan Griggs of the Norfolk Record Offices, and Helen Glenn of the Wolfson Center for their collective assistance during my visits. I would like to extend an additional thank you to Dr. Daniel Gosling of the National Archives for his insight and guidance on the complexities of early modern English law. Here at my academic home of Oxford, I would like to thank the librarians of the Bodleian Law Library and Weston Library for their continued assistance in countless ways over the years. Thank you to Oliver House for your assistance with newspaper records and to the Bodleian Law Library staff for your Herculean efforts in decoding and showing me the path towards making sense of eighteenth-century legal acronyms.

Along the way, I have been fortunate to have the support and assistance of both friends and colleagues whose comments and insights I will always be grateful for. I would like to thank Angus Docherty for his Latin translations and Wolf Wilson, whose weekly calls helped keep me sane.

As any historian of war might say, it is the tireless work and support of the home front that makes the holding of any front line possible, and here this is no less true. Belief, support, and assistance from my family have always been extraordinary. Thank you to my parents, who have never once questioned my chosen path and only ever supported and pushed me to succeed. To my mother, Nancy, who has always been my number one reader. Your attention to polish and form has made my work better. Additionally, your advice during my hours of transcribing archival sources must be mentioned with my deepest thanks. To my brother Evan, your penchant for distraction is certainly made up for by your unmatched command of the English language. I will always be grateful for your pointers on all questions of syntax and grammar. Thank you to my dad, Ilan, for your wisdom. Your logical and even-handed approach to life is something that I always strive for.

If this section has been in any order, it has proceeded from the brain to the heart. And there is no one closer than my partner Josephine Blagrove. You are my true anchor, a confidant of unmatched brilliance and humor. A scientist whose approach to the world has only ever made me smarter and kinder. Oxford will always be the city where we met and for this, I will always so fondly remember it. To my family, without you all, I would be lost. So, in closing, one last deep and heartfelt thank you.

## Abstract

This thesis challenges the accepted historiographical narrative regarding the origins of the partisan non-medical expert witness. While the expert witness is generally accepted to have been formalized by the courts in 1782, I instead reveal, by novelly turning to patent law beginning in 1763, a rich yet unformalized culture of participation by persons of skill. Patent law uniquely encouraged the participation of experts, as all parties involved in the dispute were, as inventors, experts in their own right. Moreover, the explanation of their inventions at trial begged deference to alleged subject-matter experts.

I show that once jurisprudential weight was placed on the instructiveness of the patent specification, the technical description filed with a new invention, the determinative impact of the testimony of expert witnesses only increased. By 1777, the effect was a tacit acceptance of the hired expert witness who explained the details of the specification to the jury and attempted to sway the jury on their client's behalf.

Plaintiffs, particularly the first generation of industrialists, quickly discovered the persuasive power of the expert witness. With industrial empires that depended on the enforcement of their patents, they zealously worked to secure increasingly prominent natural philosophers to defend the validity of their property rights at trial. Similarly, plaintiffs and defendants, due to the adversarial and zero-sum nature of law, were incentivized to hire expert witnesses in what quickly became an arms race. From the perspective of the expert witness, I show that presentational ability was of ever-increasing importance, as the art of swaying a jury was as much one of relevant technical knowledge as it was a rhetorical art. That is to say, the emergence of the expert witness was simultaneously the emergence of the *expert* expert witness.

## Table of Major Patents and Trials Examined Throughout

1753

- June 23 – The Privy Council effectively credits the adjudication of patent disputes to the common law courts.<sup>1</sup>

1758

- April 19 – John Dollond is granted a patent for a refracting telescope.<sup>2</sup>

1763

- July 12 – *Dollond v. Watkins and Smith*; Heard before the King’s Bench; Dollond prevails.<sup>3</sup>

1766

- February 20 – *Dollond v. Champneys*; Heard before Common Pleas; Dollond prevails.<sup>4</sup>

1769

- April 25 – Watt enrolled the specification for his improvements to steam engine efficiency.<sup>5</sup>

1769

- July 16 – Richard Arkwright enrolls his patent specification for his mechanized spinning frame.<sup>6</sup>

1773

- April 3 – John Liardet is granted a patent for an oil-based “cement” or stucco.<sup>7</sup>

1775

- December 16 – Richard Arkwright is granted a generalized cotton, and other fiber, carding machine.<sup>8</sup>

1776

- February 10 – John Johnson is granted a patent for a water-resistant “cement” or stucco.<sup>9</sup>
- May 13 – John Liardet is granted an act of parliament extending his patent by 18 years.<sup>10</sup>

1778

- February 21 – *Liardet v. Johnson*; Kings Bench; Liardet prevails.<sup>11</sup>

1779

- January 8 – Bryan Higgins is granted a patent for a “water cement or stucco.”<sup>12</sup>

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<sup>1</sup> See endnotes in *Appendix II. b.*

1781

- July 17 – *Arkwright v. Mordaunt* (1781) King’s Bench; Mordaunt prevails.<sup>13</sup>
- August 10 – *Folkes, Bart., v. Chadd and Others*; Norfolk court of assize; Folkes prevails.<sup>14</sup>

1782

- July 25 – *Folkes, Bart., v. Chadd and Others*; Norfolk court of assize; Chadd prevails.<sup>15</sup>
- November 21 – *Folkes, Bart., v. Chadd and Others*; Kings Bench; Folkes prevails.<sup>16</sup>

1783

- August n.d. – *Folkes, Bart., v. Chadd and Others*; Norfolk court of assize; Chadd prevails.<sup>17</sup>
- November 27 – *Folkes, Bart., v. Chadd and Others*; King’s Bench; Chadd prevails.<sup>18</sup>

1785

- February 17 – *Arkwright v. Nightingale*; Common Pleas; Arkwright prevails.<sup>19</sup>
- June 25 – *Rex v. Arkwright*; King’s Bench; King’s Counsel prevails.<sup>20</sup>

1793

- June 22-23 – *Boulton and Watt v. Bull* at Common Pleas; Jury finds for Boulton and Watt; Court requests further review.<sup>21</sup>

1795

- May 16 – *Boulton and Watt v. Bull* in error at Common Pleas; The court issues no ruling.<sup>22</sup>

1796

- December 16 – *Boulton & Watt v. Hornblower and Maberley* Common Pleas; Boulton and Watt prevail.<sup>23</sup>

1799

- January 25 – *Hornblower and Maberley in error*; Kings Bench; Boulton and Watt prevail.<sup>24</sup>

## Introduction

Set in the English courtroom during the second half of the eighteenth century, this thesis seeks to refocus our current understanding of the origins and immediate aftermath of the formal introduction into the courtroom of the partisan expert witness, commonly attributed to Lord Mansfield's 1782 precedent-setting ruling in *Folkes v. Chadd*.<sup>2</sup> The expert witness, a novel entity, was legally empowered by virtue of his apparent knowledge, status, or vocational expertise to speculate on record, thereby informing the judge and jury of his opinion relating to the agreed facts of the cause. This was highly unusual as trial testimony given by a witness was theoretically, and usually, limited to statements of fact, that is, direct sense observations relevant to happenings of the case.<sup>3</sup> Yet, in 1782 Lord Mansfield overturned a lower court ruling, asserting that the opinions of the eminent civil engineer, John Smeaton FRS, had to be considered by the court as admissible evidence.<sup>4</sup> According to Mansfield, in "matters of science" it was precisely the opinions of "men of science" that the court, in the interest of fact finding, ought to hear.<sup>5</sup> Here it was the ability of Smeaton, a post-

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<sup>2</sup> James B. Thayer, *Select Cases on Evidence at Common Law* (Charles W. Sever, 1892); John Henry Wigmore, *A Treatise on the Anglo-American System of Evidence in Trials at Common Law*, 3rd ed. Brown, Little, 1940); Anthony Kenny, "The Expert in Court" in *The Ivory Tower* (Blackwell, 1985); Stephan Landsman, "Of witches, madmen, and products liability" *Behavioral Sciences & the Law* 13, (1995), 131-57; Christopher M. Milroy, "A Brief History of the Expert Witness," *Academic Forensic Pathology* 7, no. 4 (2007), 516-26; Norman S. Poser, *Lord Mansfield*, (McGill-Queen's University Press, 2013), 331-3; Jennifer L. Mnookin, "Idealizing Science and Demonizing Experts," *Villanova Law Review* 52, (2007), 763 notes the case's enduring legacy; Lord Mansfield served as chief justice from 1756 until 1788. Mansfield's political leanings were generally royalist. I refer to him as a reformist in that he is known for constantly reforming and expanding the jurisdiction and scope of common law, from formalizing the use of expert witnesses to developing commercial law whole cloth; James Oldham, "Murray, William," *ODNB* (2008); Norman S. Poser, *Lord Mansfield Justice in the Age of Reason* (McGill-Queen's University Press), 57-8; J. J. Spigelman, "Lord Mansfield and the Culture of Improvement," *Quadrant*, vol. 52, no. 10 (2008), 53-5; S. Todd Lowry, "Lord Mansfield and the Law Merchant," *Journal of Economic Issues*, vol. 7, no. 4 (1973), 605-22.

<sup>3</sup> Golan, *Laws of Men and Laws of Nature* (Harvard University Press, 2004), 5-7; Joel Peter Eigen, *Witnessing Insanity* (Yale University Press, 1995), 54; More specifically on sense perception and philosophies of knowledge in the eighteenth century English court see: Rose-Mary Sargent, 'Scientific Experiment and Legal Expertise' *Studies in History and Philosophy of Science* 20, no. 1 (1989), 19-45; Barbara J. Shapiro, "'Beyond Reasonable Doubt'" *Law and Humanities* 8, no.1 (2015), 19-52; James Fieser and James Oswald, eds., *Scottish Common Sense Philosophy* (London, 2000); William Twining, *Theories of Evidence* (London 1985).

<sup>4</sup> *Folkes v. Chadd* (1782) in Henry Roscoe, *Reports of cases argued in the Court of King's Bench...* vol. III. (S. Sweet and Stevens and Sons, 1831), 157-61.

<sup>5</sup> Roscoe, *Reports* vol. III, 159.

Newtonian natural philosopher, to extrapolate conclusions about the natural world beyond what the senses could detect that clearly challenged the conventional wisdom and principles regarding the laws of evidence. As Mansfield's ruling makes clear not all experts were natural philosophers; for example, Mansfield discussed receiving expert advice from sealmakers in disputes over forgery.<sup>6</sup> However, it was specifically the speculative nature of Smeaton's claims that transcended mere technical knowledge and therefore to the lower court seemed to be mere opinion.<sup>7</sup> Indeed, Mansfield's newfound deference to the opinions of natural philosophers is specifically what made *Folkes v. Chadd* such an apparent rupture with past court practices.

### ***Folkes v. Chadd* The Beginning of the Expert Witness?**

The work of the legal historians James Thayer and John Henry Wigmore helped cement the long-standing historiographic understanding that *Folkes v. Chadd* was the origin point of the expert witness.<sup>8</sup> This consensus was recently tempered by Tal Golan's 2004 monograph, *Laws of Men and Laws of Nature*, which represents the most extensive modern historical account of the Anglo-American expert witness to date.<sup>9</sup> Golan argued that *Folkes v. Chadd* is better conceived of as a formalizing yet non-revolutionary case, as it codified and clarified what was existing court practice.<sup>10</sup> Additionally, he stressed that Mansfield's favorable view of the testimony of Smeaton was closely tied to his elite status as a "gentleman of science" honor bound to give the unbiased truth regardless of his hiring.<sup>11</sup> It is for this reason that Golan ultimately argued that Mansfield never intended to usher in an era

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<sup>6</sup> *Folkes v. Chadd* (1782) in Roscoe, *Reports* vol. III, 159.

<sup>7</sup> *Ibid.*

<sup>8</sup> *op. cit.* 2.

<sup>9</sup> Golan, *Laws*.

<sup>10</sup> "Winnowing the Wheat from the Chaff..." in *Ibid.*, 41-9.

<sup>11</sup> *Ibid.*, 50-1.

of highly partisan witnesses, as he did not conceive of Smeaton in such partisan terms.<sup>12</sup>

While Golan made an important first step toward historical revision, his analysis raises an important question that he leaves unanswered, namely: if the expert witness did not truly begin with the court's formal recognition of the validity of Smeaton's testimony in 1782, when in fact did the expert witness emerge? Golan's work, akin to the classic legal history of the expert witness he is building upon, ultimately treats the partisan expert witness as fundamentally a figure of the nineteenth century, and after an initial chapter on *Folkes v. Chadd* his monograph moves into the following centuries. This circumvention of the question of the partisan expert witness's origins is a substantive oversight that this thesis addresses.

Moving beyond Golan's initial findings, my project begins in the 1760s, almost two decades before *Folkes v. Chadd*.<sup>13</sup> I proceed chronologically, exploring the development of the partisan expert witness until the turn of the century. As such, my treatment of *Folkes v. Chadd* serves as the midpoint of my project, as I recontextualize this point of origin within a longer and underexplored story. Here I further challenge Golan's account as *Folkes v. Chadd* reemerges as an essential act of sanctioning existing partisan practice by Lord Mansfield himself. By the last quarter of the eighteenth century, the English common law courts were already deeply adversarial and by extension partisan forums of adjudication.<sup>14</sup> As such, I will show how *Folkes v. Chadd* was a ruling produced by a common law court that fundamentally considered law through a partisan frame. Indeed, during his ruling on *Folkes v. Chadd*

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<sup>12</sup> Golan, *Laws*, 49-51.

<sup>13</sup> *Ibid*, 41-6; On the expert witness as a nineteenth-century phenomenon: Tal Golan "Who Shall Decide Where Experts Disagree? The Nineteenth-Century Debates" in Golan, *Laws*, 107-43; Christopher Hamlin, "Scientific Method and Expert Witnessing," *Social Studies of Science* 16, no. 3 (1986), 485-513; Graeme Gooday, "Liars, Experts and Authorities," *History of Science* 46, no. 4 (2008) 431-56.

<sup>14</sup> On the rise of adversarial law: John H. Langbein, *The Origins of Adversary Criminal Trial* (Oxford University Press, 2003); Stephan Landsman, "A Brief Survey of the Development of the Adversary System" *Ohio State Law Journal*, vol. 44 (1983), 714-739; Stephan Landsman, "Rise of the Contentious Spirit: Adversary Procedure in Eighteenth Century England," *Cornell Law Review*, No. 75, No.3 (1990), 496-609.

Mansfield is recorded as having raised the possibility of perjury as a check against dishonest “persons of skill.”<sup>15</sup>

Moving beyond an understanding of the history of the expert witness as rooted in *Folkes v. Chadd* I show that the formal rise of the partisan, non-medical expert witness was specifically a product of the niche arena of patent law adjudication.<sup>16</sup> In particular, I argue that the partisan expert witness co-emerged with the common law adjudication of the patent specification in a gradual process that was clearly realized by 1777.<sup>17</sup> Resultantly, in this thesis I present the first extensive historical study into the connection between English patent law and the expert witness of the eighteenth century.

### **The English Patent System and the Expert Witness**

The English patent system of this period has been well studied, with particular attention paid towards its contested role in stimulating and protecting initiative activity during the onset of the Industrial Revolution. More broadly, patent regulation was understood to provide a material form of English economic competitive advantage when compared to the European continent.<sup>18</sup> From a different perspective, the more legally focused work of Sean Bottomley and Helen Mary Gubby has revealed how—despite no legislative reform to the

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<sup>15</sup> Roscoe, *Reports* vol. III. 159; See Chapter 3, 187-9

<sup>16</sup> “There is a vibrant history of the medieval beginnings of the medical expert: Wendy J. Turner and Sara M. Butler, eds., *Medicine and the Law in the Middle Ages* (Brill, 2014); Sara M. Butler, *Forensic Medicine and Death Investigation in Medieval England* (Routledge, 2014); Catherine Crawford and Michael Clark, eds., *Legal Medicine in History* (Cambridge University Press, 1994); Sydney Smith, “History and development of forensic medicine” *British Medical Journal* 1, no. 4707 (1951): 599-607; I address discreteness of the longer tradition of the medical expert history see: 12-3.

<sup>17</sup> *Liardet v. Johnson* in James Oldham, *The Mansfield Manuscripts* (The University of North Carolina Press, 1992), vol. I, 749-54 [Hereinafter *MM*].

<sup>18</sup> Harold Irvin Dutton, *The patent system and inventive activity during the industrial revolution 1750-1852*, (Manchester University Press, 1984) [Hereinafter *PIA*]; Christine MacLeod, *Inventing the Industrial Revolution The English patent system, 1660-1800* (Cambridge University Press, 1988) [Hereinafter *IIR*]; Petra Moser, ‘How Do Patent Laws Influence Innovation? Evidence from Nineteenth-Century World Fairs’ *American Economic Review*, 95.4 (2005), 1214-36; Sean Bottomley, “Did James Watt’s Patent(s) Really Delay the Industrial Revolution?” in Naomi R. Lamoreaux and Stephen H. Haber, eds., *The Battle over Patents* (Oxford University Press), 112-35; Christine MacLeod, “The 1690s Patents Boom: Invention or Stock-Jobbing?,” *The Economic History Review*, 39.4 (1986), 549-71; Alessandro Nuvolari and Christine MacLeod, “Patents and Industrialization,” *A Report to the Strategic Advisory Board for Intellectual Property Policy* (2012), 1-45.

system during the eighteenth century—the courts were able to gradually shape what was largely an instrument of royal patronage into a rights-based system, meaningfully adjudicated under common law.<sup>19</sup> Their work provides a rich backdrop that I build upon and further enrich as I introduce the expert witness as a meaningful historical agent who had a determinative impact on the very case law that transferred the English patent system during the second half of the eighteenth century.

The role of the expert witness is almost wholly absent from the existing patent system historiography. Indeed the authoritative work of Dutton, MacLeod, Gubby, and Bottomley barely mentions the participation of the expert witness in patent law cases.<sup>20</sup> Although Golan acknowledges the presence of the expert witness in eighteenth-century patent cases as an illustrative example, his treatment of the subject is limited to a single sentence and footnote.<sup>21</sup> In the parallel universe of contemporary criminal law, Joel Peter Eigen has shown how similarly in the 1760s a novel form of partisan medical experts emerged.<sup>22</sup> Here, a uniquely speculative form of medical testimony was accepted, as so-called “mad-doctors” offered insanity defenses in an increasing variety of cases.<sup>23</sup> However, the non-medical expert remains to be treated almost exclusively as a figure of the nineteenth century.<sup>24</sup>

In summary, in the following chapters I demonstrate how the patent specification, an unassuming official bureaucratic document for a small still-developing area of law, played such a dominant role in enabling the rapid and clandestine emergence of the partisan expert witness. The debut of the expert was rapid, as a 450-year-old tradition of non-partisan expert

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<sup>19</sup> Sean Bottomley, *The British Patent System during the Industrial Revolution*, (Cambridge University Press, 2014) [Hereinafter *BPS*]; Helen Mary Gubby, *Developing a Legal Paradigm for Patents*, PhD thesis, (Erasmus University Rotterdam, 2011) [Hereinafter *DLPP*].

<sup>20</sup> Dutton, *PLA*; MacLeod, *IIR*; *Ibid*.

<sup>21</sup> Golan, *Laws*, 42, 274.

<sup>22</sup> Eigen, *Witnessing Insanity*, 1-12.

<sup>23</sup> *Ibid*.

<sup>24</sup> *Ibid*; Also see: Stephan Landsman, “One Hundred Years of Rectitude,” *Law and History Review* 16, no. 3 (1998): 445-94.

testimony gave way to normalized partisan expert witnesses in a process taking less than twenty years.<sup>25</sup> Additionally, the growth was clandestine insofar as the expert witness's widespread adoption during patent law cases of the early 1780s and beyond was informal. Judges, plaintiffs, prosecutors, and defendants alike took an increasingly permissive view towards the formal standards and norms of evidentiary procedure, effectively treating the partisan expert witness as any other witness. As I will demonstrate, through the careful reconstruction of seven discrete patent law cases, patent law litigation was in practice a meticulous debate over the technical details and execution of an invention.<sup>26</sup> In this context the presence of experts—even partisan experts—to explain and argue the particulars of an invention to judge and jury emerged out of a tacit concession to the inevitable realities of adjudicating inventions.

### **The Early English Patent System 1600-1750**

A patent was formally a royal grant for a limited monopoly on the production and selling of one's own invention.<sup>27</sup> The legal fiction backing a patent was that of a royal privilege conveyed through the administration of the Privy Seal. Therefore, litigation of patents primarily fell to the Privy Council and in limited instances the High Court of Chancery.<sup>28</sup> Both discreet administrative bodies were led by the Lord Chancellor who was also the keeper of the Great Seal, which conveyed the monarch's sanctioning of this particular form of letters patent.<sup>29</sup> The letter patent generally was a broad administrative tool

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<sup>25</sup> I arrived at the number of 450 years using a 1299 case as the starting point. Golan, *Laws*, 20; Joel Peter Eigen, *Mad-Doctors in the Dock*, (Johns Hopkins University Press, 2016), 15, 183.

<sup>26</sup> *Dollond v. Watkins and Smith* (1763), *Dollond v. Champneys* (1766), *Liardet v. Johnson* (1778), *Arkwright v. Mordaunt* (1781), *Arkwright v. Nightingale* (1785), *Rex v. Arkwright* (1785), *Boulton & Watt v. Hornblower and Maberley* (1796); For the full sweep of Boulton and Watt's legal saga, see "Boulton and Watt's Patent Law Disputes," Appendix II. b.

<sup>27</sup> Bottomley, *BPS*, 1-2, 75; MacLeod, *IIR*, 10.

<sup>28</sup> Bottomley, *BPS*, 75.

<sup>29</sup> Daniel D. Birk, "Interrogating the Historical Basis for a Unitary Executive," *Stanford Law Review* 73, (2021), note 184; Brian Gee with Anita McConnell and A. D. Morrison-Low, eds., *Francis Watkins and Dollond*

for the conveying of privileges from Crown to subject and included, for example, the granting of lands, peerage, and office.<sup>30</sup>

The key piece of legislation that outlined the extent of one's patent rights was the 1624 Statute of Monopolies.<sup>31</sup> This short statute clarified that a patent was granted "to the true and first inventor and inventors" and that a patentee's exclusive right was limited to fourteen years.<sup>32</sup> The Statute of Monopolies additionally purported to render the adjudication of patent disputes to the common law courts.<sup>33</sup> This legislation emerged during an extended wave of hostility towards Crown monopolies and was the product of a parliament who generally viewed the Elizabethan patent system as widely corrupt: a system in which favored courtiers were granted exclusive rights to existing industries.<sup>34</sup>

Despite purporting to stem disputes resulting from the monarchical abuse of a royal privilege, in practice, as the historiography recognizes, the 1624 act did not lead to a material transfer of the patent system to common law.<sup>35</sup> From the passage of the act until the early 1750s, the adjudication of a patent remained with the Privy Council—a body of royally appointed men accountable to the court.<sup>36</sup> The Privy Council could, in theory, recommend that the attorney general prosecute patent infringers or refer disputing parties to the civil

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*Telescope Patent Controversy* (Ashgate, 2014) [Hereinafter *WDTC*], 128; James F. Baldwin, "The King's Council and the Chancery, I," *The American Historical Review* 15, no. 3 (1910), 497; Bottomley, *BPS*, 38,45.

<sup>30</sup> Gubby, *DLPP*, 2; MacLeod, *IIR*, 2.

<sup>31</sup> Oren Bracha, *Owning Ideas* (Cambridge University Press, 2016), 2; "Statute of Monopolies 1623," *Acts of the English Parliament*, legislation.gov.uk.

<sup>32</sup> *Ibid.*

<sup>33</sup> *Ibid.*; Gubby, *DLPP*, 4.

<sup>34</sup> MacLeod, *IIR*, 14-7; Elizabeth Reed Foster, "The Procedure of the House of Commons against Patents and Monopolies" in Richard Cust and Ann Hughes, eds., *Conflict in Early Stuart England* (Longman, 1989), 59-85; G. A. Harrison, "Innovation and Precedent" *The English Historical Review* 102, no. 402 (1987), 31-62; Ramon A. Klitzke, "Historical Background of the English Patent Law," *Journal of the Patent Office Society* 41, no. 9 (September 1959): 615-50.

<sup>35</sup> Gubby, *DLPP*, 4, 15-6; MacLeod, *IIR*, 40-2.

<sup>36</sup> *Ibid.*, 15-6.

jurisdiction of Common Pleas.<sup>37</sup> However, in practice both actions were exceptionally rare.<sup>38</sup> Disputes were heard at the Privy Council's discretion following a direct petition, a system which favored those with connections. Petitions were then generally resolved through a juryless arbitration process before members of the Council. From the Tudors through to the early Stuart period, few members of the Privy Council were trained in the law.<sup>39</sup> Therefore, when the need arose, they would request advice from the sitting common law judges or the Crown's own law officers. Even as the Privy Council became increasingly staffed by members of the bar, from the Restoration until the 1750s, the process for resolving patent disputes remained firmly rooted in the discretionary power of the Lord Chancellor extended on behalf of and in the interest of the monarch.<sup>40</sup>

The patent specification is a technical document, of varying detail, that aims to explain the workings and methods of a patented invention. Gradually introduced as a soft requirement in the early 1700s, such descriptions were mandatory by 1742.<sup>41</sup> Specifications in England could be enrolled in one of the three Chancery Offices, which comprised the final step of filing for a patent.<sup>42</sup> In theory, the introduction of the patent specification should have helped to ensure the legitimacy of an invention. Yet, with no preemptive enforcement mechanism, inventors who had no interest in divulging their prized invention to would-be competitors, simply approached the specification as simply another bureaucratic hurdle to clear.<sup>43</sup> As a result, the early English patent system is best described as a non-investigative

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<sup>37</sup> MacLeod, *IIR*, 59.

<sup>38</sup> *Ibid.*

<sup>39</sup> Gubby, *DLPP*, 15.

<sup>40</sup> *Ibid.*

<sup>41</sup> It is common for the date of the specification requirement to be listed as 1731. However, a specification could be waived until 1742 if the title of the invention was seen as sufficiently revelatory; see Bottomley, *BPS*, 38; Eric Robinson uses this date, quoting D. Seaborne-Davies's "Early History of the Patent Specification," *Law Quarterly Review* 50, no. 86 (1934), 90; see Eric Robinson, "James Watt and the Law of Patents," *Technology and Culture* 13, no. 2 (1872), 119 [Hereinafter "JWLP"].

<sup>42</sup> Bottomley, *BPS*, 26, 36-9.

<sup>43</sup> Bottomley, *Ibid.*, 42-50; MacLeod, *IIR*, 2-3, 49-50.

system, as the process for filing a patent from 1535 until 1852 was a complex and expensive exercise in bureaucratic rubber-stamping and not one of vetting or substantive review.<sup>44</sup> This was exacerbated by the long legacy of the Clerk of the Signet and Privy Seal Act of 1535, which created a system designed to distribute fees to royal bureaucrats, as sixteenth century officials were unsalaried and only paid for services rendered.<sup>45</sup> By the 1720s, the patent filling process was a laborious and byzantine process that still depended as much upon finances as it did upon having a favorable reputation with the Crown.<sup>46</sup>

This contrasts with the French system designed by Jean-Baptiste Colbert following the creation of the *Académie des sciences*.<sup>47</sup> To be sure, royal connections and patronage were, if anything, more important, as the state took a direct role in fostering the inventions of the select few holders of a royal *privilège* as an extension of state economic policy.<sup>48</sup> However, in France prospective patentees presented their inventions to a board of *Académie* members, who, following a review for its viability and originality, would grant the inventor a formal seal of approval known as a *privilège*, a necessary step towards the possible receipt of an exclusive right to manufacture their invention, yet usually limited to a singular town or region.<sup>49</sup> The British and French patent system further diverged during the eighteenth century. The French system required extensive examination, review, and negotiation yet offered state investment in the invention, while the English system remained individualistic

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<sup>44</sup> In 1713, Queen Anne ordered that the Royal Society scrutinize all new patent applications, yet this order was not implemented; Gee *WDTC*, 128; MacLeod, *IIR*, 47.

<sup>45</sup> Bottomley, *BPS*, 35-6.

<sup>46</sup> *Ibid*, 36-7, 42.

<sup>47</sup> MacLeod, 41; David S. Lux, "Colbert's plan for the Grande Académie," *Seventeenth-Century French Studies* 12, no. 1 (1990): 177-88.

<sup>48</sup> Bottomley, *BPS*, 18-9.

<sup>49</sup> *Ibid*; On the post-1790 transformation of the French system from one of royal *privilèges* to *intellectual property rights*: Jérôme Baudry, "Examining inventions, shaping property," *History of Science* 2019, vol. 57 (1) 62-80; Jérôme Baudry, "A politics of intellectual property" *Technology and culture* 61, no. 4 (2020): 1017-44; Liliane Hilaire-Pérez, "Invention and the State in 18th-Century France," *Technology and Culture* 32, no. 4 (1991), 911-31.

and market-driven.<sup>50</sup> Still, both systems theoretically provided individual inventors a legal pathway to protect and profit from their invention. In summation, the English patent system of the early modern period above all else placed the onus—from filing to enforcing—on the inventor. Indeed, for all intents and purposes, until a specific letter patent or infringer was specifically challenged by petition to the Privy Council, a letter patent was merely a formality.<sup>51</sup>

### **The British Patent System and the Outset of the Industrial Revolution**

Despite the lack of legislative reform from 1624 through the nineteenth century, the patent system not only endured but also played a central role in the explosion of innovation, production, and technological change brought about by the “classic” Industrial Revolution from the 1760s to the 1830s.<sup>52</sup> The lack of reform was likely due to the general dormancy of the English patent system as indicated by the fact that between 1700 and 1767, a total of only 522 patents were awarded.<sup>53</sup> However, this sum total masks the dramatic increase in the rate of change in patent filing that began in the 1750s. Within a ten year period, from approximately 1760 to 1770, the number of patents issued increased to 200 and the figure continued to rise exponentially into the nineteenth century.<sup>54</sup> Economic historians have long debated the merits of using patent statistics as a proxy for inventive activity.<sup>55</sup> As MacLeod astutely illuminates, the patent system was but one element of many that stimulated the Industrial Revolution.<sup>56</sup> Yet, there is no doubt that the patent system played a central role in

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<sup>50</sup> MacLeod, *IIR*, 41.

<sup>51</sup> *Ibid*, 2.

<sup>52</sup> Bottomley, *BPS*, 11.

<sup>53</sup> *Ibid*, 42.

<sup>54</sup> *Ibid*, 18; MacLeod, *IIR*, 5.

<sup>55</sup> *Ibid*, 4-5; Bottomley, *BPS*, 11-20; Dutton, *PLA*, 1-9; Joel Mokyr, *The Enlightened Economy*, (Yale University Press, 2009), 403-5.

<sup>56</sup> MacLeod, *IIR*, 5; On the causes of the Industrial Revolution: Paul Mantoux, *The Industrial Revolution in the Eighteenth Century* (Harcourt, Brace & Co. 1928); Maxine Berg and Pat Hudson, *Slavery, Capitalism and the Industrial Revolution* (United Kingdom: Polity Press, 2023).

shaping the birth of England's mechanized industry. As both Dutton and Bottomley demonstrate, the patent system was generally stimulating, as its imperfections paradoxically achieved a kind of Goldilocks Effect: it offered both enough protection while not being so punitive or airtight as to wholly prevent technological diffusion.<sup>57</sup>

An additional reason parliament may have not elected for legislative reform of the patent system through the eighteenth century was that this was not their only lever with which to affect English economic policy. It possessed the right to grant extensions for existing inventions, and their prerogative when it came to outlining the letters of such acts of extension was only constrained by party and partisan interests. Indeed, the terms of extension and coverage of the granted monopoly varied from case to case.<sup>58</sup> Additionally, parliament from the early eighteenth century onwards took an active role in regulating the movement of skilled laborers and technology to and from Britain. Domestic interventions included the gradual renegotiation of guild bylaws throughout the eighteenth century.<sup>59</sup> Other legislative activity was more internationally minded, such as the early 1719 passage of an act restricting immigration. This act was a direct response to fears over Russian spies and an organized French effort to encourage the emigration of skilled workers.<sup>60</sup> By the late eighteenth century, as France became Britain's chief economic and military rival, the pace and scope of such protections against industrial espionage only increased.<sup>61</sup> Lastly, parliament could explicitly encourage inventive activity that aligned with state interests, as exemplified by the Longitude Act of 1714.<sup>62</sup>

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<sup>57</sup> Dutton, *PLA*, 108-15, 202-5; Bottomley, *BPS*, 284-94.

<sup>58</sup> Gubby, *DLPP*, 32-5.

<sup>59</sup> John R. Kellett, "The breakdown of guild and corporation control..." *The Economic History Review* 10, no. 3 (1958), 381-94.

<sup>60</sup> J. R. Harris, *Industrial Espionage and Technology Transfer Britain and France in the Eighteenth Century* (Ashgate Publishing Company, 1998), 1-27.

<sup>61</sup> *Ibid*, 453-78.

<sup>62</sup> The act most directly stemmed from the controversy over the 1707 Scilly naval disaster: William E. Carter and Merri Sue Carter. "Macroscopic: The British Longitude Act Reconsidered," *American Scientist* 100, no. 2

Ultimately, especially in the wake of the Restoration, the ability for parliament to act as a body independent of the system of royal privileges, of which letter patents were a subset, may have helped to delay the patent system reform as other avenues of economic policy were pursued. Yet the eighteenth century remained a period of rapid economic growth and technological transformation, as exemplified by the increasing numbers of inventors who turned to the patent system. The dramatic increase in activity that occurred from the middle of the century served as a stress test for the system as a whole and revealed the numerous legal ambiguities in the system whose resolution, in the face of legislative silence, fell to the courts.<sup>63</sup>

### **The Rise of Patent Litigation at Common Law**

The long eighteenth century was similarly a time of great change for English law. The century saw the English courts, which did not operate within the common law, cede jurisdiction to the common law courts of which the King's Bench, the superior common law court, was the greatest beneficiary.<sup>64</sup> The rise of common law trials in conjunction with the growth of the jury trial saw the increasing role and professionalization of the lawyer, especially the barrister, and further cemented the adversarial system.<sup>65</sup> In this thesis I show that it was this adversarial system that provided the necessary framework and context for partisan expert witnesses to legally assert themselves. The shift in jurisdiction from the Privy Council to common law jury trials was often the result of protracted battles of authority and

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(2012), 102–5; Tessa Mobbs and Robert Unwin. “The Longitude Act of 1714 and the Last Parliament of Queen Anne,” *Parliamentary History* 35, no. 2 (2016): 152-70.

<sup>63</sup> Bottomley, *BPS*, Chapter 3-5; MacLeod, *IIR*, Chapter 4; Harold Irvin Dutton, *PIA*, Chapters 4 and 5.

<sup>64</sup> MacLeod, *IIR*, 73-4; John Baker, “The Resurgence of the King’s Bench” in *Introduction to English Legal History*, 5th ed. (online ed., *Oxford Academic*, 2019); Henry Horwitz and Patrick Polden “Continuity or Change in the Court of Chancery in the Seventeenth and Eighteenth Centuries?” *Journal of British Studies* 35, no. 1 (1996), 24-57; Julia Rudolph, *Common Law and Enlightenment in England, 1689-1750*, (Boydell Press, 2013), 130-6, 159-63; Poser, *Lord Mansfield*, 48-9.

<sup>65</sup> Lemmings; *Professors of the Law*, 1-24.

political power between the law courts and the Crown.<sup>66</sup> By the mid-eighteenth century this fight, as primed since 1624, came to patent law.

The inciting dispute was Walter Baker's 1752 challenge to Dr. Robert James's patent rights for a popular mercury-based medicine on grounds of originality.<sup>67</sup> On January 14, 1752, Baker, a chemist by trade, followed standard procedures and petitioned the Lord Chancellor to void James's patent on the grounds that James was not in fact the true original inventor. By February the following year, the Privy Council, after consulting with the Chief Justice of Common Pleas, had declined Baker's request as they considered the evidence presented in his petition to be insufficient proof of a previous identical invention.<sup>68</sup> Normally, this would have been the end of a patent challenge, yet Baker responded with what Hulme describes as an "unprecedented request"—i.e. he brought a perjury charge against James for lying to the Privy Council in his original patent petition when he asserted that he was the inventor.<sup>69</sup> Baker petitioned the Council asking if one of their clerks could testify at common law on the record on his behalf. The Council demurred and after further consultation with legal advisors decided that the weighing and investigating of the facts relating to claims of being the original inventor was, constitutionally, the appropriate function of the common law courts and a jury trial.

As first argued by Hulme, this decision marks the formal relinquishing of patent adjudication authority by the Privy Council to the common law courts.<sup>70</sup> As noted, the Privy Council had long turned to the law courts in an advisory fashion, and so in the context of the

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<sup>66</sup> *op. cit.* 55; Daniel Klerman, "Jurisdictional competition and the evolution of the Common Law," in Anthony Musson, ed., *Boundaries of the Law* (Routledge, 2017), 149-68.

<sup>67</sup> E. Wyndham Hulme, "Privy council law and practice of letters patent for invention from the Restoration to 1794 II," *Law Quarterly Rev* 33, (1917), 189-91, 193-4; MacLeod, *IIR*, 59-60; John Coryton, *A Treatise on the law of letters patent* (T & J. W. Johnson, 1855), 319-20.

<sup>68</sup> Hulme, "Privy council law," 189-90.

<sup>69</sup> MacLeod, *IIR*, 59.

<sup>70</sup> Hulme, "Privy council law," 189-94; Also see: Gubby, *DLPP*, 15-7; MacLeod, *IIR*, 59; Bottomley, *BPS*, 75.

general rise of Common law jurisdiction during the eighteenth century, that transfer in authority is not altogether unsurprising. Indeed, Oldham, although skeptical of the certainty of Hulme’s claim, nevertheless agrees: by the early 1750s this transfer in oversight occurred because a common law trial was better equipped to adjudicate the factual disputes of patent law—when heard *nisi prius*—through a jury trial.<sup>71</sup> While common law trials, both in the form of trials *nisi prius* and the juryless “trial at bar” before a panel of judges at the superior Westminster courts, became the most frequent forum for patent litigation, the Lord Chancellor retained certain select powers regarding the enforcement of patents.<sup>72</sup> Most importantly, the High Court of Chancery retained the right as a court of equity to issue certain forms of relief prior to the settling of a patent’s validity at common law. Most notable in this case was their exclusive right to grant preemptive injunctions against alleged infringers through direct petitions to the Lord Chancellor.<sup>73</sup> James Watt capitalized on his favorable relationship with the Lord Chancellor and made extensive use of the process.<sup>74</sup> In rare instances direct petitions for arbitration would still be made to the Privy Council yet these were referred back to the common law courts.<sup>75</sup> Finally, the court of equity theoretically retained responsibility for awarding damages until 1852.<sup>76</sup>

### **Lord Mansfield and the Development of Intellectual Property Rights**

Set against the backdrop of increasing inventive activity and patent filing, the Privy Council’s willingness to yield jurisdiction to the more accessible and predictive common law

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<sup>71</sup> Oldham, EM, 48, 199; Gubby, *DLPP*, 16-7.

<sup>72</sup> Gubby, *DLPP* 22.

<sup>73</sup> *Ibid*, 19; By the 1830s it became increasingly difficult to receive injunctive relief at Chancery; Bottomley, *BPS*, 142.

<sup>74</sup> Robinson, “JWLP,” 137; A. N. Davenport, *James Watt and the Patent System* (British Library, 1989); For a detailed account see “Boulton and Watt’s Patent Law Disputes” in Appendix II. b.

<sup>75</sup> Such a strategy was attempted by the Spectacle-makers’ Company in response to Peter Dollon’s aggressive enforcement of his telescope pattern; Gubby, *DLPP*, 16-7; As covered in Gee, *WDTC*, 165-70.

<sup>76</sup> MacLeod, *IIR*, 59; The Common Law courts did, in some instances, award nominal damages: Bottomley, *BPS*, 137.

courts neatly coincided with the rise to power and dominance of the singular legal force of the eighteenth century: William Murray, Lord Mansfield.<sup>77</sup> During thirty years of actively sitting on the bench, Mansfield is credited with overseeing a large quantity of legal reforms as diverse as beginning the process of merging equity and common law, forwarding religious toleration and the abolitionist cause alongside a restrictive view of a free press and the reluctant acceptance of the jury trial.<sup>78</sup> Although Mansfield was an institutionalist and monarchist, he was also a deeply committed proponent of free trade, controversially encouraging trade with France during times of war.<sup>79</sup> Deeply enmeshed in the cultural and philosophical movements of his time, he held key Enlightenment ideals and brought an enduring trust in the status and knowledge of the natural philosopher into his jurisprudence. Taken holistically it is unsurprising Mansfield was so willing to call experts before the court and ultimately trust their opinions when called by the parties of the court. Regarding patent law, the commercially astute Chief Justice—described by his colleague Francis Buller as “the founder of the commercial law of this country”—was more than willing to fill the legislative void.<sup>80</sup>

In a series of cases beginning with *Dollond v. Watkins and Smith* (1763), Mansfield clarified two important standards in patent law. Firstly, that a patent was only valid to the first inventor who publicized their invention, so a challenge could not bring forth old secret workings and claim priority.<sup>81</sup> Secondly, in 1778 with his ruling in *Liardet v. Johnson*

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<sup>77</sup> Poser, *Lord Mansfield*, 3-7; James Oldham, *English Common Law in the Age of Mansfield* (University of North Carolina Press, 2004), 6-16. [Hereinafter *EM*]

<sup>78</sup> Mansfield’s views on jury trials were complex; while he indicated that they should not have been introduced in the first place, he made extensive use of the jury trial, was willing to take input from jurors, and greatly expanded the purview of the special jury; Oldham, “Murray, William,” *ODNB* (2008).

<sup>79</sup> Su Jin Kim and James Oldham, “Insuring Maritime Trade with the Enemy in the Napoleonic Era,” *Texas International Law Journal* 47, (2011), 1-33.

<sup>80</sup> Quoted in: Oldham, “Murray, William”.

<sup>81</sup> This was the strategy employed by Baker against James; *Dollond v. Watkins and Smith* (1763); Gee, *WDTC*, 187.

Mansfield's jury instructions established the first legal standard for the patent specification: it must genuinely teach the public how to replicate the patented invention.<sup>82</sup> Ever concerned with commercial policy, Mansfield deliberately sought to balance the two interests on either side of a patent. Regarding the private interest of the inventor, Mansfield worked to preserve the patent as a just economic reward for a successful invention. Yet, he also wished for the public to be able to profit from the invention once the patent lapsed. Mansfield feared that the inventor, by filing a vague patent specification, could benefit from what was tantamount to a perpetual monopoly as the workings of their invention could remain a personal secret long after the patent expired. As noted above, an English patent was devoid of substantive vetting or review and so inventors, especially during the patronage heavy periods under Stuart rule, might provide only the most scant of details regarding their purported invention.<sup>83</sup> Indeed, Mansfield in part attributed his concern to the scruples of inventors such as James, whom he incorrectly accused of failing to provide proportions for his elixir.<sup>84</sup> In summary, by the 1780s Mansfield's jurisprudence had clarified that the bargain at the heart of the patent was a protected monopoly of a commercially viable and original invention traded in turn for genuine public disclosure.

This shift in the patent from a privilege rooted in royal prerogative to an individually owned item of property protected by increasingly robust common law jurisprudence was not merely a political and legal shift but an intellectual one. In eighteenth-century England, land was the "paradigmatic form of property" tied to both political representation and social status; a robust legal framework coexisted alongside a culture in which property was a

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<sup>82</sup> *Liardet v. Johnson* (1778); Oldham, *MM* vol. I, 749-54.

<sup>83</sup> MacLeod, *HIR*, 2-3, 39.

<sup>84</sup> Hulme, "Privy council law," 194.

protected right.<sup>85</sup> Over the course of the eighteenth century, jurists, political philosophers and in particular authors and inventors, drawing from the work of contract theorists such as Hugo Grotius, Samuel Pufendorf and John Locke began to argue that the fruits of their intellectual labor were akin to physical property and thereby owed the same rights and protections.<sup>86</sup> The central concept, as articulated by Locke, was rooted in a notion that “an individual’s ‘person’ was his own property.” From this formulation Locke outlined that “the *labor* of his body, and the work of his hands, we may say, are properly his....he hath mixed his *labor* with, and joyined to it something that is his own, and thereby makes it his *property* [sic].”<sup>87</sup> In short, over the course of the 1750s this labor-based theory of ownership and property was extended to the “incorporeal” work of authors and inventors.<sup>88</sup>

The major fault line and forum for debates regarding intellectual property as a right occurred during the “copyright wars” of the mid-eighteenth century.<sup>89</sup> Lord Mansfield himself was a lifelong advocate of the existence of intellectual property rights and, in the realm of author ownership, the manifestation of this right through the granting of perpetual copyright to the author.<sup>90</sup> In 1741, as a young advocate, then Murray, he represented his

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<sup>85</sup> Bottomley, *BPS*, 96; John Brewer and Susan Staves, “Introduction” in John Brewer and Susan Staves, eds., *Early Modern Conceptions of Property* (Routledge, 1995), 1-2; H. T. Dickinson, *Liberty and Property* (Methuen, 1979), 50-2.

<sup>86</sup> Adam Mossoff, “Rethinking the Development of Patents,” *Hastings Law Journal* 52, no. 6 (2001) 1,258; Mokyr, *Enlightened Economy*, 252-3.

<sup>87</sup> Mark Rose, *Authors and Owners* (Harvard University Press, 1993) 5; Peter Laslett, ed., *Two Treatises of Government* (Cambridge University Press, 2018), 287-8.

<sup>88</sup> Poser, *Lord Mansfield*, 324; Mansfield’s description of literary property in *Millar v. Taylor* (1769): James Burrow, *Reports of Cases Argued and Adjudged in the Court of King’s Bench... (1756-1772)* vol. IV, (A. Strahan and W. Woodfall, 1790), 2340.

<sup>89</sup> Peter Baldwin, *The Copyright Wars* (Princeton University Press, 2014), 34-5, 67; Bottomley, *BPS*, 96; For the key copyright cases of the eighteenth century see: *Millar v. Taylor* (1769) and *Donaldson v. Beckett* (1774); Burrow, *Reports of Cases Argued...*, vol. IV, 2303-418; James Boswell, *The Decision of the Court of Session, Upon the Question of Literary Property: in the cause of John Hinton of London.... Pursuer; against Alexander Donaldson and John Wood... and James Meurose...* (Printed by James Donaldson, for Alexander Donaldson..., 1774).

<sup>90</sup> Poser, *Lord Mansfield*, 234-7.

friend Alexander Pope in filing an injunction against the “pirate” publisher Edmund Curll.<sup>91</sup> As Mansfield rose to the rank of chief justice he would continue to intervene on behalf of his Westminster literary friends such as Thomas Newton.<sup>92</sup> While there are no patent law cases that discuss the nature of the property invested in the patentee with the same explicitness as the contemporary realm of copyright, there was implicit crossover.<sup>93</sup>

While the statutes that grounded the rights of inventors and authors were distinct, the judges that oversaw both patent and copyright cases were not. As judges such as Lord Mansfield, Francis Buller, and Lloyd Kenyon moved between realms, they maintained their belief in the creative power of the originator whose transformative and singular intellectual labors were within the rights they were duly owed.<sup>94</sup> While the case law makes clear that questions of originality, method, and disclosure dominated judicial thinking on patent law, the overriding interest in balancing public and private interest was nevertheless rooted in the fundamentally Lockean presupposition that the private individual had a strong right to ownership. Yet, as evidenced by the fact that Mansfield never so forcefully advocated for the patent rights of inventors as he did in the case of authors, the jurisdictional move from author to inventor did not necessarily imply a shared intellectual framework of ownership. The judge had immense power and say over the conduct of their courtroom, a fact only exacerbated by Mansfield’s willingness to bring the discretionary approach of equity into common law.<sup>95</sup> In

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<sup>91</sup> Poser, *Lord Mansfield*, 323; Rose, *Authors and Owners*, 57-66; Malcolm Baker, “Busts and friendship,” *Sculpture Journal* 22, no. 2 (2013), 65-76.

<sup>92</sup> Poser, *Lord Mansfield*, 323.

<sup>93</sup> Bottomley, *BPS*, 98-103; Made most explicit during Watt’s discussion of system reform: Robinson, “JWLP,” 130-9.

<sup>94</sup> Rose, *Authors and Owners*, 6, 120-1; Mossoff, “Rethinking the Development of Patents,” 1302-13.

<sup>95</sup> Derek Whayman “Equity in the Common Law Courts” *SSRN* 5209421 (2025), 9-16; Darren Lee, “The dynamics of equity and common law,” *Plymouth Law Review* 17, no. 1 (2024), 98-9, 102; On the personal power of the Judge: James Oldham, “Informal Law-Making in England by the Twelve Judges in the Late 18th and Early 19th Centuries” (2011); Charles E. Clark, and David M. Trubek, “The creative role of the judge,” *The Yale Law Journal* 71, no. 2 (1961), 255-76; In jurisprudential thought; Howard L. Lubert, “Sovereignty and Liberty in William Blackstone’s ‘Commentaries on the Laws of England,’” *The Review of Politics* 72, no. 2 (2010), 271-97; Alexander M. Forbes, “Johnson, Blackstone, and the Tradition of Natural Law,” *Mosaic* 27, no.

the case of Mansfield this manifested as a strong belief in the “just merits” that ought to be awarded to “men of ability” who applied their talents to the benefit of all.<sup>96</sup> Taken all together Mansfield felt strongly that the “ingenuity and labour” of a genius conveyed moral rights deserving of property rights.<sup>97</sup> Therefore, it is of little surprise that intellectual property law, broadly defined, greatly developed under Mansfield’s long stewardship of England’s superior common law court.

As patent jurisprudence developed, greater scrutiny was placed on the inventors to demonstrate how a novel principle or theory could be meaningfully implemented via a discrete technology.<sup>98</sup> In practice this meant that during patent trials the task of arguing the workability of an invention as disclosed through the patent specification was increasingly taken up by the expert witness.<sup>99</sup> Such expert testimony was commonplace across the few common law patent trials that preceded *Folkes v. Chadd*. It expanded during that the exhaustive patent litigation by the titans of the Industrial Revolution, such as Richard Arkwright and James Watt, during which the natural philosophers and expert mechanics hired by these industrialists would argue that “to any man deserving the name of a mechanic” replication based solely on their specification was trivial.<sup>100</sup> These claims would in turn be countered by additional esteemed professionals prepared to assure the jury that the opposite was in fact true: reconstructing the invention on the specification alone was simply

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4 (1994), 81-98; This point is heavily reinforced in the hagiography: Allan C. Hutchinson, *Laughing at the Gods: Great Judges and How They Made the Common Law* (Cambridge University Press, 2012), 21-50.

<sup>96</sup> Quoted from Mansfield’s ruling in *Sayer and others v. Moore* (1785); Edward Hyde East and G. M. Wharton, ed., *Reports of the Cases Argued and Determined in the Court of King’s Bench...1800-1802*, Second American Edition, (Lea and Blanchard, 1845), 182. This ruling was first published as an extended reference in *Cary v. Longman and Reese* (1801); East, *Reports*, 180-2; Poser, *Lord Mansfield*, 325; James L. Oakes, “Copyrights and Copyremedies,” *Hofstra Law Review* 18, no. 4 (1990), 987-8.

<sup>97</sup> *Millar v. Taylor* in Poser, *Lord Mansfield*, 326.

<sup>98</sup> Brad Sherman and Lionel Bently, *The Making of Modern Intellectual Property Law* (Cambridge University Press, 1999), 46.

<sup>99</sup> *Ibid.*

<sup>100</sup> *Rex v. Arkwright: The Trial of a Cause Instituted by Richard Pepper Arden...by Writ of Scire Facias, to Repeal a Patent Granted... to Mr. Richard Arkwright...* (Printed for Hughes and Walsh, 1775), 62-7, 136. [Hereafter referred to as *Rex v. Arkwright*], 136.

“impossible to execute.”<sup>101</sup> Mansfield’s idealized aims of a kind of equity inspired rights-based calculus collided with the practical and not wholly unwarranted concerns of the inventors who, rightfully afraid of pirates, worked to reveal as little as possible in their patent specification.

In reality, the patent process from the initial filing to the eventual enforcing was slow and expensive.<sup>102</sup> Those who could most effectively wield the rights nominally granted by a patent were the inventors with access to extraordinary capital. The first step to the enforcement of a patent required the filing of an injunction with Chancery that ordered the halting of all alleged piracy. This could be complied with or disputed resulting in a costly common law trial. As Arkwright and Watt discovered, threats of trial and the serving of injunctions were normally sufficient to encourage the prompt payment of licensing fees.<sup>103</sup> Additionally, a well-financed inventor was best suited to prevail at trial; as they, surrounded by a litany of authoritative men of science and factory floor aficionados could always attempt to convince the jury that any failure to interpret a specification was simply an issue of skill. This was precisely the legal strategy Arkwright adopted in the mid-1780s and was refined by Watt in the following decade. Both men came to court prepared with not just a range of expert witnesses but with modeled machines and other exhibits with which they might attempt to dazzle the jury.<sup>104</sup>

### **The Co-Emergence of the Expert Witness and the Patent Specification**

Ultimately, my work reveals that even during this early period in the history of expert testimony, legal teams came to understand that a hired expert’s technical skill was not by

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<sup>101</sup> Oldham, *MM* vol. I 765.

<sup>102</sup> Dutton, *PIA*, 45, 59; MacLeod, *IIR*, 73, 77; Christine MacLeod, “The Paradoxes of Patenting,” *Technology and Culture* 32, no. 4, (1991), 885-910.

<sup>103</sup> Arkwright’s successful use of threats: Fitton, *Arkwrights*, 93; On enforcement tactics used by Watt: Bottomley, *BPS*, 252-65.

<sup>104</sup> Models were used in: *Arkwright v. Nightingale*; *Rex v. Arkwright*; *Watt v. Hornblower and Maberley*

itself necessarily sufficient to persuade a jury. The common law courtroom trial was a public, adversarial, and deeply rhetorical performative space that required a notable degree of showmanship on the part of the expert witness.<sup>105</sup> The performance of the expert witness, as perceived by members of the court, was mediated through the lens of class, gentlemanly status, and the often lively interjections launched not just by rival barristers but also by the judge and jury. Taken all together I will argue that it was late eighteenth-century patent law cases that demanded the appearance on the stage of the *expert* expert witness: a man of opinion who was noted not just for his technical skill but also for his ability to successfully perform for the court.

The cases that I examine in this thesis are not usually categorized, especially by legal scholars, as key cases in the history of the role of the non-medical expert witness.<sup>106</sup> As a result, patent law represents a parallel and subterranean history of the expert witness. Despite such historiographical neglect, by the mid-1780s patent disputes saw the intense activity of expert witnessing.<sup>107</sup> Even as the very legitimacy of their testimony remained in a legal grey zone the expert witness played a fundamental role in patent law adjudication. As exemplified by the well compensated testimony of Erasmus Darwin, James Watt, Samuel Moore and James Lind, both plaintiffs and defendants evidently considered partisan expert testimony as a fundamental aspect of pursuing a patent law trial.<sup>108</sup> As such, it is my contention to

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<sup>105</sup> On conceptualizing the courtroom as a theater: Julie Stone Peters, *Law as Performance* (Oxford Academic, 2022); Kate Leader, “The trial’s the thing”; *Theoretical Criminology* 24, no. 2, (2020), 241-57; P. J. Klemp, “I have been bred upon the Theater of death, and have learned that part,” *Century* 26, no. 2, (2011), 323-45.

<sup>106</sup> See traditional histories of the expert witness: Golan, *Laws*; Oldham, *EM*; Wigmore, *Treatise on the Anglo-American System of Evidence in Trials at Common Law*; Learned Hand, “Historical and Practical Considerations Regarding Expert Testimony”, *Harvard Law Review* 15, no. 1 (1901), 40-58.

<sup>107</sup> Case law explicitly about the rules of expert testimony include: *Folkes v. Chadd* (1782) in Henry Roscoe, *Reports*, vol. III, (S. Sweet and Stevens and Sons...1831), 160, *Brown v. Newham* (1785) unreported cases recorded in Mansfield’s notes quoted in: Oldham, *EM*, 65-6 and *Goodtitle on the demise of Revett against Braham* (1792) in Charles Durnford and Edward Hyde East, *Reports*, vol. IV (A. Strahan, 1799), 497-9.

<sup>108</sup> Samuel Moore, Erasmus Darwin and James Watt were called twice by Arkwright; *Arkwright v. Nightingale* (1785) and *Rex v. Arkwright* (1785); Dr. James Lind was called by James Watt; Robinson, “JWLP,” 127; H. W. Dickinson and Rhys Jenkins, *James Watt and the Steam Engine* (Clarendon Press, 1927), 325.

substantively introduce patent law as a meaningful category in which to study and better understand the development of the early expert witness.

It is only by approaching the history of the expert witness as a far broader and more nuanced historical story—rather than just one of limited case law—that the early partisan expert can emerge in its totality. Since this project sits at the bustling intersection of the histories of law, science and the early Industrial Revolution, some pre-existing information is required to help ensure a coherent and readable project. Moreover, it is essential to clarify and engage with the key historiographical traditions that this project will be addressing and (where relevant) challenging. To this end, the remainder of this introduction addresses three general topics. Firstly, I will provide a general history on the status of the expert witness at common law during the first half of the eighteenth century. This overview of the explicit case law pertinent to the history of the expert witness provides general context and demonstrates the disruptive conduct of an unregulated expert as a partisan witness during patent law trials. Secondly, I will further clarify this thesis’s main methodological and historiographical inspirations as a work of broadly contextualized legal history. Thirdly, I will conclude with an outline of the chapters to follow, highlighting their place in the larger story of the beginnings and ascension of the partisan expert witness at patent law.

### **The Court’s Approach to Expert Evidence Prior to the Eighteenth Century: Medical Beginnings**

By the early eighteenth century, English common law had developed two distinct approaches with which to allow the input of experts: the empaneling of a special jury or the summoning of a subject matter expert to directly advise the judge. These procedures could be instigated through an ever-increasing variety of writs, plaintiffs and defendants that increasingly forced the need for expert intervention.<sup>109</sup> In both instances, drawing from

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<sup>109</sup> Golan, *Laws*, 18-21.

Roman precedents, there was thought to be a degree of impartiality as experts were summoned by, and answerable to the court, not the parties bringing the dispute.<sup>110</sup>

Akin to these Roman precedents early common law most often engaged with expertise in an explicitly medical context.<sup>111</sup> To this point the earliest explicit record of the consultation of any form of expertise dates to 1299, in a case where medical practitioners were summoned to advise the court on the possible medicinal value of wolf meat.<sup>112</sup> Moreover, the legal frameworks of the coroner jury and jury of matrons were medical contexts in which common law courts from the Middle Ages onward engaged with a discrete form of court-managed expertise.<sup>113</sup> The evolution of the medical expert witness has been well-studied, and to a large extent this history represents a very different path from the one I study in this thesis.<sup>114</sup> However, in the late eighteenth century there were several similarities between the experience of medical expert witnesses and “men of skill” testifying in patent

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<sup>110</sup> Darrel W. Amundsen and Gary B. Ferngren, “The Forensic Role of Physicians in Roman Law”, *Bulletin of the History of Medicine* 53, no. 1 (1979), 39-56; Ido Israelowich, “Physicians as Figures of Authority in the Roman Courts and the Attitude Towards Mental Diseases in the Roman Courts During the High Empire”, *Historia: Zeitschrift Für Alte Geschichte* 63, no. 4, (2014), 445-62; Jacob Arthur Gorsky, “The history of forensic medicine,” *Charing Cross Hospital Gazette* 58, (1960), 34; Claire Bubb and Michael Peachin, eds., *Medicine and the Law Under the Roman Empire* (Oxford University Press, 2023).

<sup>111</sup> Sydney Smith, “The history and development of forensic medicine” *British Medical Journal*, (March 24, 1951), 600; Quoted in Amundsen and Ferngren, “The Forensic Role of Physicians in Roman Law”, 40.

<sup>112</sup> *op. cit.* 7.

<sup>113</sup> The coroner office itself was likely formalized by Article 20 of the Articles of Eyre in September 1194; R. F. Hunnisett, “The Origins of the Office of Coroner”, *Transactions of the Royal Historical Society* 8, (1958), 85-104; The summoning of a woman to give their opinion on a matter of pregnancy or sexual assault dates to the early twelfth century: Thomas R. Forbes, “A Jury of Matrons”, *Medical History* 32 (1988), 23-33.

<sup>114</sup> There is debate regarding the medical knowledge of the coroner jury: D. J. Murray, “Crown and Community” (master’s diss., University of Calgary), R. F. Hunnisett, “The importance of eighteenth-century coroners’ bills” in E. W. Ives and A. H. Manchester, eds., *Laws, Litigants, and the Legal Profession* (Royal Historical Society, 1983), 126-39; Carol Loar, “Medical knowledge and the early modern English coroner’s inquest”, *Social history of medicine* 33, no. 3, 475-91; For a critical view on coroner juries: J. D. J. Havard, *The Detection of Secret Homicide*, (Macmillan, 1960), 2; T. R. Forbes, *Surgeons at the Bailey* (Yale University Press, 1985), 11; On the authority and reputation of the jury of matrons: James C. Oldham, “On Pleading the Belly,” *Criminal Justice History* 6, (1985), 1-64; Sara M. Butler, “More than Mothers,” *Law and History Review* 37, no. 2 (2019), 353-96; On the discrete literature of medical expertise more generally: *op. cit.* 6.

trials, caused in part by the strong shift towards adversarial law in the eighteenth century that dramatically affected the conduct of all trial witnesses.<sup>115</sup>

The historiography of the medical expert shows that because of the medical practitioners' pre-common law roots, they represented a form of scientific and professional authority with which the court was most familiar.<sup>116</sup> Specifically, surgeons provided testimony regarding the cause of death with examples dating to coroner inquiries in 1597.<sup>117</sup> Simultaneously, forms of medical testimony were marshaled in during witchcraft trials throughout the early seventeenth century as exemplified by the medicalized defense of Elizabeth Jackson by Edward Jorden in 1602.<sup>118</sup> Despite a notable gap in the historical record, the Old Bailey's first published trial records in 1676 demonstrate the steady participation of physicians, surgeons and members of the Company of Barber-Surgeons in criminal trials through the end of the seventeenth century.<sup>119</sup> This feature of medically-related trials further highlights the uniqueness of the non-medical expert witness when compared to the medical practitioner who, with established credentials, made direct observations of a body or wound in question.<sup>120</sup> By contrast, whether a factory technician or natural philosopher, the non-medical expert witness represented a comparatively novel and loosely organized form of

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<sup>115</sup> Eigen, *Witnessing Insanity*, 113, 160-1; Silvia De. Renzi, "Medical expertise, bodies, and the law in early modern courts," *Isis* 98, no. 2 (2007): 316. Katherine Watson, *Medicine and justice* (Routledge, 2020).

<sup>116</sup> Clark and Crawford, "Introduction" in *Legal Medicine in History*, 9; Quoted in Landsman, "One Hundred Years of Rectitude", 448.

<sup>117</sup> Iain Richards, "Medicine, religion and the judiciary" master's thesis., (University of Huddersfield, 2013), 43.

<sup>118</sup> J. F. Payne and Michael Bevan, "Jorden, Edward" *ODNB* (2004); Michael MacDonald, eds, *Witchcraft and Hysteria in Elizabethan London* (Psychology Press, 1991), xiv-xix.

<sup>119</sup> *Ibid*, 28-45; Vanessa McMahon, "Reading the body" *Social History of Medicine* 19, 1 (2006), 19-35; Clive Emsley, Tim Hitchcock and Robert Shoemaker, "The Proceedings-Publishing History of the Proceedings," *Old Bailey Proceedings Online*; On similar medical testimony in the eighteenth century: Landsman, "One Hundred Years of Rectitude", 445-94.

<sup>120</sup> On the authority and reputation of medical practitioners: Celeste Chamberland, "Honor, Brotherhood, and the Corporate Ethos of London's Barber-Surgeons' Company, 1570-1640," *Journal of the History of Medicine and Allied Sciences* 64, no. 3, (2009) 300-32; Malpractice trials date back to 1355: Michael T. Walton, "The Advisory Jury and Malpractice in 15th Century London," *Journal of the history of medicine and allied sciences* 40, no. 4 (1985), 478-82.

epistemic authority which challenged the eighteenth-century court's *modus operandi* of clear claims of causality and direct sense perception.

### **The Use of Special Juries**

The foundation for the eighteenth-century explosion in special juries occurred across several areas of law, expanding the reach of the long-standing frameworks for dealing with cause of death and debates of paternity.<sup>121</sup> A special jury was effectively the court's previously accepted method with which to interact with expertise. However, the expert employed in this context was explicitly not a partisan witness. Additionally, the judiciary generally perceived special juries to be better equipped to wisely and fairly rule on complicated cases. Perceived more as genteel peers, usually steeped in a particular commercial trade than as lay persons, judges, such as Mansfield, were willing to differ to and even take advice from members of special juries.<sup>122</sup>

The growth in the use of the special juries was enabled by a series of procedural and statutory developments. For example, in *Rex v. Burridge* (1724) the King's Bench ruled that a special jury could be summoned by the court without the consent of either party.<sup>123</sup> By 1730 as a matter of law, either party, not just the defendant, could request a trial by special jury.<sup>124</sup> Lord Mansfield heavily favored the use of a special jury particularly when hearing cases related to commerce.<sup>125</sup> By the time he heard patent law cases in the 1760s, all patent trials going forward were tried before a commercial jury, a subset of the special jury.<sup>126</sup> The elevation of a special jury over individual advisory experts was a matter of personal

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<sup>121</sup> James Oldham, "The Origins of the Special Jury." *The University of Chicago Law Review* 50, no. 1 (1983): 137-221.

<sup>122</sup> See *Morris v. Braunson* (1776) in Oldham, *EM*, 200-1.

<sup>123</sup> Milroy, "A Brief History of the Expert Witness", 517.

<sup>124</sup> *Ibid.*

<sup>125</sup> *Ibid.*; Oldham, *EM*, 104-5; Oldham, "Murray, William"; Oldham, "The Origins of the Special Jury", 138.

<sup>126</sup> Gubby, *DLPP*, 25-30.

preference as near contemporaries of Mansfield such as Chief Justice Lee and Lord Hardwicke in 1773 and 1775 respectively chose to consult with merchants rather than call a special jury when ruling on trade disputes.<sup>127</sup> In contrast to advisors and special juries, there was no official mechanism with which one or both parties could call their own experts to testify before the court.<sup>128</sup> Yet beginning in the Tudor period on the civil side during Crown criminal prosecutions, justices of the peace, coroners, or bailiffs might nevertheless present their opinions to a jury on behalf of the prosecution.<sup>129</sup>

### **The Testimony of Persons of Skill During the Eighteenth Century**

By the time of the Stuarts, it was not unheard of for an increasing number of subject matter experts to be presented as witnesses.<sup>130</sup> For example, during his ruling in *Folkes v. Chadd*, Lord Mansfield discussed an unnamed forgery case in which seal makers testified about the quality of a wax impression.<sup>131</sup> Although their testimony was more often than not rooted in the observable facts of the case, it was not treated or recognized by the court as distinct from that of a lay witness. The fact that the testimony of the partisan expert witness did not yet constitute a discrete category was the immediate context that preceded Lord Mansfield's ruling in *Folkes v. Chadd*. Soon after this, a series of cases emerged that were in part explicitly concerned with categorizing and delineating the expert witness.<sup>132</sup>

In *Folkes v. Chadd*, Mansfield explicitly noted that the objection by the plaintiff to the testimony of John Smeaton was grounded in the claim that Smeaton planned to “speak, not as to facts, but as to opinion.”<sup>133</sup> Mansfield's ultimate finding was that Smeaton—by

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<sup>127</sup> Golan, *Laws*, 21.

<sup>128</sup> *Ibid.*

<sup>129</sup> *Ibid.*, 22.

<sup>130</sup> *Ibid.*, 22-3.

<sup>131</sup> Oldham, *EM*, 65; Roscoe, *Reports*, vol. III, 159.

<sup>132</sup> Oldham, *EM*, 65; Milroy, “A Brief History of the Expert Witness,” 518-20.

<sup>133</sup> Roscoe, *Reports*, vol. III, 160.

virtue of his qualifications, reputation, and specific skill—should not just be permitted to testify but that it was essential he did so. To use the language that Henry Roscoe would later attribute to Mansfield “in matters of science no other witness can be called.”<sup>134</sup> When justifying his rationale, Mansfield harked back to the calling of special advisory experts, notably the masters of Trinity House, as a precedent for the court’s deference to persons of skill. Here, Mansfield was in fact citing himself, as he popularized the very practice of consulting the masters of Trinity House at common law jury trials.<sup>135</sup> Additionally, Smeaton was particularly well positioned to receive such a warm reception from the court, having served as an arbitrator on previous cases.<sup>136</sup>

However, it is important to note that it was not just the would-be expert that was heavily restricted from testifying. During this early period of common law formation, the concept of a trial witness was generally narrow. For example, as Christopher M. Milroy has shown, defendants exclusively in treason trials could not be represented by counsel until 1696.<sup>137</sup> Additionally, it was not until 1702 that the defense could call sworn witnesses, and plaintiffs were not permitted to personally give evidence until 1851.<sup>138</sup> Rather than allowing witness testimony at trial, early modern courts relied heavily on written documents such as interrogatories and affidavits, which were collected and submitted to the court prior to the formal beginning of a trial.<sup>139</sup> Furthermore, the context and effect of witness testimony taken prior to the active participation of a defense counsel, a practice which was cemented by the

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<sup>134</sup> Roscoe, *Reports*, vol. III, 160, 159.

<sup>135</sup> Oldham, *EM*, 64-5.

<sup>136</sup> Smeaton worked with Mansfield on *Cook v. Bisson* (1777); *Ibid.*

<sup>137</sup> Milroy, “A Brief History of the Expert Witness”, 518; Also see: John H. Langbein, “The Criminal Trial before the Lawyers” *The University of Chicago Law Review* 45, no. 2 (1978), 263-316.

<sup>138</sup> *Ibid.*

<sup>139</sup> There is a colorful history in the late medieval recording of interrogatories by state officials, which are usually transcribed in a commandeered pub over a long day. Modern archivists are deeply familiar with the consistent degradation of script work as the transcript stretches on. [From a discussion with archivists at the National Archives during the PAST Records Workshop - Early Modern Legal Records, June 15, 2022].

1730s, would necessarily have been markedly different from any cross-examination or interrogation of the facts led by the judge and a vocal jury.<sup>140</sup>

Most importantly, by the mid-eighteenth century witness testimony was generally understood to concern matters of fact as dictated by the standard of sense perception, that is, what the said witness had taken in through one of their five senses.<sup>141</sup> This standard was made clear in the notable ruling of Justice John Vaughan in the common plea review of Edward Bushell's *habeas corpus* request, in which Vaughan is reported as having clarified that "a witness swears to what he has seen and heard...to what hath fallen under his senses. But a jury swears to what he can infer and conclude from the testimony by the act and force of the understanding."<sup>142</sup>

Mansfield's ruling in 1782 broke the dam on the court's long held silence regarding the permissibility of testimony by persons of skill. In the ensuing decades, the King's Bench—both under Mansfield and his successor Lord Kenyon—issued a number of rulings that generally upheld and expanded the scope of the partisan expert witness. In the 1790 trial *Thornton v. Royal Exchange Assurance Company*, Kenyon allowed a shipbuilder to testify on the seaworthiness of the vessel in question despite not having personally been involved with its construction.<sup>143</sup> His ruling further legitimized the idea of a general subject matter expert,

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<sup>140</sup> Golan, *Laws*, 33; Langbein, *The Origins of Adversary Criminal Trial*, 106-8.

<sup>141</sup> Over the course of the long eighteenth century, the deeply Baconian observation framework that defined legal standards of truth developed to incorporate the probabilistic emphasis of the Scottish Common Sense school of thought and the legal writings of Jeremy Bentham; Golan, *Law*, 39; Silvia Manzo, "Certainty, laws and facts in Francis Bacon's jurisprudence," *Intellectual History Review* 24, no. 4 (2014), 457-78; John H. Langbein, *Torture and The Law of Proof Europe and England in the Ancient Régime* (University of Chicago Press, 1976); Barbara J. Shapiro, *A Culture of Fact* (Cornell University Press, 2000), 47-51, 109; Gerald J. Postema "Facts, Fictions, and Law" in *Utility, Publicity, and Law* (Oxford University Press, 2019), 202-20; David Kaye, "The Laws of Probability and the Law of the Land," *University of Chicago Law Review* 47, no. 1 (1979), 34-56; S. A. Grave, *The Scottish Philosophy of Common Sense* (Clarendon Press, 1960).

<sup>142</sup> *Bushell's Case* in Edward Vaughan, *The Reports and Arguments of that Learned Judge, Sir John Vaughan...* (1665-1674) (Richard and Edward Atkins, 1706), 135-58; Often referred to as simply *The Bushell (Bushel) Case*, this ruling is most remembered for affirming the right of a jury to nullify a judge's findings as a matter of "consensus." Kevin Crosby, "Bushell's Case and the Juror's Soul." *Journal of Legal History*, vol. 33, No. 3 (2012), 257-9; John H. Langbein, 'The Criminal Trial Before the Lawyers', 263, 297-8.

<sup>143</sup> Oldham, *EM*, 65; Thomas Peake, *Cases Determined at Nisi Prius...* (Charles Hunter, 1820) 37-8.

that is an individual who by virtue of their training and expertise does not need any direct observational information with which to inform their speculative opinion. Two years later, in 1792, Kenyon permitted the testimony of two clerks from the post office to assess the veracity of handwritten documents.<sup>144</sup> When grounding the rationale for such a ruling over the objections by the defense counsel, Kenyon's colleague and Mansfield's protégé, Justice Francis Buller demonstrated personal knowledge of *Folkes v. Chadd* as he cited the case as an example of a circumstance in which "persons of skill were allowed to give evidence of opinion."<sup>145</sup> The fact is that, more often than not, late eighteenth-century common law courts and judges had a fluid approach to the rules of evidence.<sup>146</sup> In some instances strict interpretation of rules and procedure tended to give way to the practical demands of, as was the norm, resolving a trial in a single sitting.<sup>147</sup>

Indeed, the case law regarding expert testimony did not consistently flow in the direction of relaxing the rules of evidence. In the 1785 case of *Brown v. Newham* an insurance dispute involved a ship, the *Independent*, that was lost en route to Philadelphia.<sup>148</sup> The defense produced several notable shipwrights to attest to the vessel's lack of seaworthiness. However, Mansfield prevented the shipwrights from testifying. The *Daily Universal Register* supported this ruling and reported that such evidence was deeply improper as the "shipwrights would not be competent to decide the question, not having examined the ship themselves, she being lost in America....That whether a question of navigation arose it was very different, for there the opinion of skillful persons might be admitted in evidence."<sup>149</sup>

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<sup>144</sup> *Goodtitle on the demise of Revett against Braham* (1792) in Durnford and East, *Reports* vol. IV, 497-9.

<sup>145</sup> *Ibid*, 498.

<sup>146</sup> Oldham, *EM*, 67; Thomas P Gallanis, "The Rise of Modern Evidence Law," *Iowa Law Review* 84, no. 3 (1998), 499-560.

<sup>147</sup> Although cases might be retried over an extended period of time, an individual trial was often constrained to a single day, even as this became increasingly infeasible; for example, in *Rex v Arkwright* (1785) the court sat in session from 9 a.m. until 1 a.m. the following day.

<sup>148</sup> An unreported case from Mansfield's notes quoted in Oldham, *EM*, 65; Oldham, *MM* vol. II.

<sup>149</sup> *Daily Universal Register*, 28 May 1785 quoted in Oldham, *EM*, 65.

Unlike *Folkes v. Chadd*, in *Brown v. Newham* Mansfield found the question of the missing ship to be unfalsifiable in a manner that rendered the opinions of persons of skill to be opinions. Additionally, it was not clear to Mansfield, considering the nature of the insurance contract, why said experts should be permitted to stretch beyond direct observation and provide their hypothetical opinion. As Oldham argues, although Mansfield had begun the process of permitting opinionated testimony, partisan expert testimony remained atypical and had limited case law covering its permissibility, leaving the eighteenth-century courtroom unprepared.<sup>150</sup>

As my examination of patent law in the late eighteenth century makes clear, it was less that the courts were unfamiliar with the presence of opinionated testimony than the fact that they were unfamiliar and unprepared for barristers to so directly and formally challenge the presence of these informal experts. What in part makes the context of patent law so unique, and worth studying, is precisely how the experts who testified for and against the likes of the Dollonds, Arkwrights, Boultons and Watts, existed in a kind of novel liminal space. They were neither members of a special jury nor direct advisors to the court; instead, as a vital element of patent adjudication, expert witnesses organically emerged from the day-to-day requirements of litigation as individuals knowledgeable enough to effectively contend with and answer the technical questions put forth by the patent specification. As their presence proved increasingly essential to victory, their involvement only increased as plaintiffs, prosecutors and defendants alike saw it in their collective interest to allow their experts to testify. In reality, as the informal acceptance of the expert witness during patent law trials demonstrates, late-eighteenth century common law had a discretionary approach to the rules of evidence. This flexibility allowed the court to accept the practical reality of patent

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<sup>150</sup> Oldham, *EM*, 65-6.

law adjudication from the spontaneous introduction of explanatory models to the explanations offered by the accompanying expert witness.<sup>151</sup>

### **Methodology and Historiography Contextualism as Legal History**

In the following section I elaborate on the central principles that steer my approach in the chapters that follow. In short, I will present my thesis as an archival rigorous work of legal history that turns to the specific practice of the natural philosophers and skilled craft workers who assumed the mantle of the expert witness. To this end I first defend the catch-all terminology of the term “expert witness.” Next, I provide a case study, using *Folkes v. Chadd* as a most pertinent example of the historical challenges when relying on law reports as a source. Finally, it is my contention that for a work of legal history to be rigorous and maximally insightful it must be deeply contextual.

This means taking into account a wide range of contexts and approaches that stretch beyond said problematic law reports. Specifically, for my investigation into the co-emergence of the patent specification and expert testimony this means drawing from the history of science and technology as well as the history of the Industrial Revolution, particularly the making of the knowledge economy, technological transfer, and innovation.<sup>152</sup> Additionally, insights drawn from the histories of broader military and geopolitical context helps bridge my micro findings with the macro conditions that often served as an explicit backdrop to the trials examined. For example, threats of French property theft, couched in theatrical asides,

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<sup>151</sup> Presentations of experimental evidence or models were involved in the following, non-exhaustive list of trials: *Liardet v. Johnson* (1778), *Arkwright v. Mordaunt* (1781), *Arkwright v. Nightingale* (1785), *Rex v. Arkwright* (1785), *Boulton & Watt v. Bull* (1793), *Boulton & Watt v. Hornblower and Maberley* (1796), *Boulton & Watt v. Hornblower and Maberley* (1799).

<sup>152</sup> On the knowledge economy: Margaret C. Jacob, *The First Knowledge Economy: Human Capital and the European Economy, 1750-1850* (Cambridge University Press, 2014); Moker, *The Enlightened Economy*; Joel Mokyr, *The Gifts of Athena: Historical Origins of the Knowledge Economy* (Princeton University Press, 2005); On technological transfer and innovation: Harris, *Industrial Espionage and Technology Transfer*; Catherine L. Fisk, *Working Knowledge: Employee innovation and the Rise of Corporate Intellectual Property, 1800-1930* (University of North Carolina Press, 2009).

made during the later patent trials of Arkwright in the mid-1780s exemplify the plurality of contexts which can so enrich historical understanding of the happenings within the courtroom.<sup>153</sup> Such an approach has long been advocated by Barbara Shapiro, is exemplified in the work of Amy Dru Stanley and has more recently been described by Catherine L. Fisk and Robert W. Gordon.<sup>154</sup>

Although my work does engage with the findings of historians of patent law and the Industrial Revolution alike, the particular historiographical debates that dominate the existing literature are tangential to the specific scope of my project.<sup>155</sup> The literature on patent law is well known for being economically-slanted, and academic debate has been primarily concerned with the economic effectiveness of the patent system, whether it accelerated or retarded the Industrial Revolution, and the lessons to draw for contemporary legal practice.<sup>156</sup> Despite discussing many of the very same patent law cases as the recent canonical works on the history of the English patent system, their treatment does not include a sustained discussion of the expert witness.<sup>157</sup> It is precisely for this reason that my project may be considered as a relevant addition to the otherwise well-established picture of patent law as found in the work of historians such as Dutton, MacLeod, Bottomley, and Nuvolari.<sup>158</sup>

### **Historicity and Terminology**

Many of the key words and phrases I use in this thesis—such as expert witnesses, scientists, scientific knowledge and objectivity—were absent from the eighteenth-century

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<sup>153</sup> For example see: “Rex v. Arkwright” and Arkwright and Co., “The case of Mr. Richard Arkwright”; As discussed in Chapter 2, 105-6, 134-35.

<sup>154</sup> Barbara Shapiro, “Law and Science in Seventeenth-Century England”, *Stanford Law Review* 21, no.4 (1969), 728; Amy Dru Stanley, *From Bondage to Contract* (Cambridge: Cambridge University Press, 1998); Catherine L. Fisk and Robert W. Gordon, “Foreword: ‘Law As...,’” *UC Irvine Law Review*, (2011), 519.

<sup>155</sup> An excellent overview of the literature can be found in: Bottomley, *BPS*, 2-26.

<sup>156</sup> Niels Pepels, “Review of Bottomley’s *BPS*”, *The Journal of Legal History*, vol. 38, no. 3 (2017), 338, 340; *op. cit.* 10.

<sup>157</sup> Neither Dutton, *PIA* nor MacLeod, *IIR*, include a single reference to the expert witness; Bottomley, *BPS*, includes two references yet neither is during eighteenth century common law; see 103, 135.

<sup>158</sup> Dutton, *PIA*; MacLeod, *IIR*; Bottomley, *BPS*; *op. cit.* (ref 143).

vernacular. A key issue is raised by the use of the term “expert.” Firstly, proto-expert witnesses were in contemporary parlance commonly referred to as “persons of skill” and discussion focused as to whether it was permissible for said individuals, often referred to by profession or title, to give “their opinion” on “matters of fact.”<sup>159</sup> From the fourteenth century, the word “expert” usually referred to the action of “having experience” in a particular activity.<sup>160</sup> The term would not be commonly used in the sense of “one whose special knowledge or skill causes him to be regarded as an authority” until the early nineteenth century.<sup>161</sup> Nor, throughout the eighteenth century, was “expert” used as a noun, a shift that suggests the word’s convenience of a recognized category of person.

As the participation at trial of the expert witness continued to grow throughout the nineteenth century the public’s general perception of these individuals would further shape the meaning of the term.<sup>162</sup> By the latter half of the nineteenth century to be called an expert witness was pejorative.<sup>163</sup> This disapproving attitude toward an expert witness resulted from decades of scandal-laden trials that pitted well-compensated scientists against one another; in doing so, this undercut any attempts for these scientists to portray themselves as unbiased seekers of truth.<sup>164</sup> My investigation into the early expert witness occurred a century before *The Times*, in a reflection of public sentiment, published the joke “that liars might be divided into three classes—liars, great liars, and scientific witnesses.”<sup>165</sup> Public imagination in the

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<sup>159</sup> Samuel March Phillipps, *Law of Evidence* (1815), 209-10; Roscoe, *Reports*, vol. III, 160; Durnford and East, *Reports* vol. IV, 497-9.

<sup>160</sup> See Frank R. Freeman, “The Origin of the Medical Expert Witness”, *Journal of Legal Medicine* 22, no. 3 (2001), 349-40; *OED*, “expert (adj.1),” (2025).

<sup>161</sup> *OED*, “expert (n.),” (2024).

<sup>162</sup> Gooday, “Liars, Experts and Authorities”, 431-56.

<sup>163</sup> *Ibid*, 432.

<sup>164</sup> Gooday, “Liars, Experts and Authorities”, 432; Also see: Golan, *Laws*; Christopher Hamlin, “Scientific method and expert witnessing: Victorian perspectives on a modern problem”, *Social studies of science* 16, no. 3 (1986), 485-513.

<sup>165</sup> *The Times*, 4 April 1882, 9, col. C quoted in Gooday, “Liars, Experts and Authorities”, 433, 437-41, 450; For the America version; Golan, *Laws*, 255.

late eighteenth century had yet to so clearly coalesce around a preconception of the expert witness. In short, the partisan “person of skill” who is my focus, entered the courtroom with a remarkably cleaner slate than their nineteenth-century successors.

With this linguistic background acknowledged, for the sake of clarity and brevity during my analysis I will generally employ the otherwise ahistorical term of expert over the technically accurate term of “persons of skill.” When greater specificity is required, I use the terms favored by relevant historical actors signified by appropriate attribution and the use of quotation marks. Moreover, it is my contention that the term expert is doing real descriptive work as I show how the specific practices of these “persons of skill” lent these men a particular kind of authority and legitimacy in which the judge and jury were incentivized to accept their opinions as fact. It is the combination of the legitimacy and knowledge-based authority that constitutes these men as experts.

### **The Necessity of Archival Minded Legal History As Explored Through Court Reporting on *Folkes v. Chadd***

As described by Golan, Smeaton’s testimony in *Folkes v. Chadd* has dominated as “the origin story for the series of partisan expert testimony” in common law on both sides of the Atlantic.<sup>166</sup> When summarizing this case, be it in the work of traditional internal legal historians such as the writings of James Thayer and John Henry Wigmore or more modern accounts such as those by Norman S. Poser and Christopher M. Milroy—the singular source used is the law report on these cases.<sup>167</sup> Even Golan’s more richly sourced work makes widespread use of the very same law report.<sup>168</sup> Resultantly, the historiographical dominance of *Folkes v. Chadd* has traditionally been rooted in analysis that was drawn from a singular

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<sup>166</sup> Golan, *Laws*, 41.

<sup>167</sup> James Bradley Thayer, *Select Cases on Evidence at the Common Law* (Charles W. Sever, 1892), 688-70, 705; Wigmore, *Treatise on the Anglo-American System of Evidence in Trials at Common Law*, vol. 4, 105; Poser, *Lord Mansfield*, 331; Milroy, “A Brief History of the Expert Witness,” 518.

<sup>168</sup> Golan quotes nearly the entire law report during his account of *Folkes v. Chadd*: Golan, *Laws*, 40-3.

and chronologically removed source.<sup>169</sup> It is likely this setting of the origin story of the expert witness in 1782 that has led to the neglect in the study of the expert witness during patent disputes since the late 1760s.

Law reporting through the publication of the *English Reports* began as early as 1220 and lasted in this approximate format until 1865.<sup>170</sup> Generally, the *English Reports* are divided into two categories: the yearbooks and the named (or private) reports. The former, beginning with thirteenth-century manuscripts and lasting until the early Tudor period, noted for their anonymous authors, are deeply inconsistent in the comprehensiveness of their coverage and are not viewed by the early modern legal practitioners as particularly accurate or verifiable in their reporting. Unlike their predecessors, the named reports were “written with a view to publication” and on average were far more thorough in their courtroom reporting than their earlier counterparts.<sup>171</sup> Nevertheless, the reputation of reporters varied infamously. Lord Lyndhurst noted that the King’s Bench reporter Thomas Barnardiston (1726-1735) “was accustomed to slumber over his notebook and the wags in the rear took the opportunity of scribbling nonsense in it.”<sup>172</sup> In apparent agreement, Mansfield forbade the citation of Barnardiston’s accounts in his court “on the ground that such citation would be misleading to students who might read the report.”<sup>173</sup> However, it is generally agreed that the quality of the *English Reports* greatly increased by the mid-eighteenth century, a fact of great relevance to the case of *Folkes v. Chadd*. Baker singled out Mansfield’s court as notable for “attracting King’s Bench reporters of high caliber,” such as Sylvester Douglas, who, like the reporters who followed, wrote with publication in mind. The early twentieth-century

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<sup>169</sup> Golan’s work marked an important challenge to this tradition; Golan, *Laws*, 1-52.

<sup>170</sup> Baker, *Introduction to English Legal History*, 189; K. Sriram, “Law Reporting: Past, Practice and Developments,” *Student Bar Review* (2002), 78-80.

<sup>171</sup> Baker, *An Introduction to English Legal History*, 195.

<sup>172</sup> Quoted in N. G Jones, ‘Barnardiston, Thomas (1706–1752), law reporter’ *ODNB* (2008).

<sup>173</sup> Jones, “Barnardiston, Thomas”.

American Judge Van Vechten Veeder agreed, noting that the “reports, of the utmost value in themselves as a record” should include those produced during the courts of Mansfield.

The authorship of the law report of *Folkes v. Chadd* is often attributed to Douglas, and by extension his account of the trial is treated as a direct, if not verbatim, account of the conduct of the first formal expert witness.<sup>174</sup> Nevertheless, this is not an accurate statement, and Douglas’s accounts were subtly and for my purposes, significantly revised in the following decades. It is true that he sat in Mansfield’s court, taking rough notes in his capacity as court reporter and by 1782/1783 he had published his first private report covering cases spanning the years 1779 through 1781.<sup>175</sup> Douglas’s work proved popular and received several reprintings in England, Scotland and soon the Americas. By 1789 his work was retitled to include “Part I” suggesting its place in a larger and forthcoming project covering the remaining years of Douglas’s time at Mansfield’s court.<sup>176</sup> This prospective Part II and onward was presumably going to include his account of *Folkes v. Chadd* which—since the trial took place on November 21, 1782—fell beyond the scope of the reports he had published to date.<sup>177</sup> However, the later editions were slow to arrive, although further editions of Part I were published in 1790, 1807 and finally 1813.<sup>178</sup>

By 1813 Douglas, now Lord Glenbervie and consumed with the scandals of public office, resumed publishing with the help of an editor, Serjeant-at-Law William Frere.<sup>179</sup> Having fully delegated the task of court reporting to Frere, the publication of his law reports

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<sup>174</sup> The following citation most often used for the case is 3. Doug. 157, 159, 99 Eng. Rep. 589, 590 (1782). Written in a standard form for modern references to the *English Reports*, this citation refers first to the volume and name of the original reporter followed by the corresponding volumes in the edition of the *English Reports* used.

<sup>175</sup> Sylvester Douglas, *Reports*, (1783).

<sup>176</sup> Sylvester Douglas, *Reports*, 2nd ed., Part I (1789), *Title Page*.

<sup>177</sup> Douglas, *Reports*, 2nd ed., Part I (1789), *Title Page*.

<sup>178</sup> Sylvester Douglas, *Reports*, 3rd ed., vol. I (1790); Sylvester Douglas, *Reports*, 1st American ed., vol. I (1807); Sylvester Douglas, *Reports*, ed. by and with additions William Frere, 4th ed., vol. I (1813).

<sup>179</sup> Roland Thorne, “Douglas, Sylvester” *ODNB* (2013).

could now continue beyond the year of 1781. However, the third volume of *The Douglas Reports*, the first edition to include a full report of *Folkes v. Chadd*, would not be published until 1831, eight years after Douglas's death, and almost half a century after the events being reported on.<sup>180</sup> Moreover, authorship of the accounts was now no longer attributed to Douglas but to Henry Roscoe who constructed this work "from the manuscripts of The Right Hon. Sylvester Douglas", supplemented by additional notes from a variety of lawyers and judges - as the lengthy full title of his work indicated.<sup>181</sup>

To do historically rigorous internal legal history requires paying close attention to the origins and nature of those sources that typify the "box of legal things." A range of historians over the last century have depicted Mansfield as describing Smeaton as a "man of science."<sup>182</sup> Although likely representative of the literal language of Mansfield's ruling, it is highly unlikely that in 1782 Mansfield used the word science in such a capacity. In any case, eighteenth-century court reporting even at its best was not rooted in trial transcripts and summaries of the language used at the bench, despite the use of quotations to attribute verbatim language to certain individuals. In the methodological preface to the 1783 edition of Douglas's *Reports*, in a section on "the best method of reporting", he noted: "I could have wished to give in the words in which they were delivered... I often found to be impracticable, as I neither write in shorthand, nor very quickly. Memory, however, while the case was recent, supplied at home, many of the chasms which I had left in court."<sup>183</sup> Whether it was Roscoe half a century later or Douglas in the weeks following a trial, *English Law Reports*

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<sup>180</sup> Sylvester Douglas, *Reports*, ed. by and with additions William Frere, 4th ed., vol. II (1813); Roscoe, *Reports*, vol. III (1831); William Frere and Henry Roscoe, *Reports*, vol. IV. (1831).

<sup>181</sup> "and also from the manuscripts of Mr. Justice Lawrence, Mr. Justice Le Blanc, Mr. George Wilson ..."; Roscoe, *Reports* (1831), *Title Page*.

<sup>182</sup> *op. cit.* (ref 160).

<sup>183</sup> Douglas, *Reports*, (1783), v-vi.

were akin to Thucydides rendering the speeches of Pericles: a dramatic recreation that captured the spirit of the event rather than meticulously recording the facts as they unfolded.

For a project that seeks to reconstruct the interior drama of the courtroom with a particular emphasis on the specific actions and words of the expert witness, the limitations of the *English Reports* presents a serious challenge. Resultantly, when researching this thesis I consistently checked the veracity of the *English Reports* through careful cross-referencing with other contemporaneous sources. This methodological insight is a key point of divergence between my work and that of traditional case law legal history, as I recognize the fundamental epistemic limits of the *English Reports* and take as holistic and archivally rooted approach to legal history as possible. The key sources which underpin this approach include personal correspondence between the individuals before the court, reports conducted by the experts themselves, newspaper summaries, formal legal documents such as bills of complaint and answers, and most importantly, surviving privately commissioned verbatim transcripts of select trials. Keeping true to this emphasis on archival rigor, in the body and footnotes of this thesis I acknowledge and explain the unresolved gaps, contradictions, trustworthiness, and often complex journeys quotations have taken in the intervening 260 years. Finally, further distinguishing my work from that of standard works of legal history, I do not use abbreviated notations when referring to cases named in the *English Reports*. As demonstrated, abbreviated notations can be misleading because notations use the date of the case instead of the date of the report's publication. Instead, I will provide a full reference to the specific edition of the *English Reports*, aiming to use first editions when available. It is through this approach to my sources that I am able to do historically rigorous internal legal history, an

approach that seeks to overcome the constraints of the discipline as traditionally understood.<sup>184</sup>

### **Natural Philosophers and Skilled Technicians as Foils of the “Great” Industrialists**

A key category of the expert witnesses examined in this thesis—the “persons of skill” called to the stand to present their opinions to the benefit of their client—were men, such as civil engineer John Smeaton, the chemist physician Bryan Higgins, the apothecary Samuel Moore, the physician and naturalist Erasmus Darwin, and the chemist and engineer John Robison, who embodied the broad categorization represented by the label of natural philosopher. These men, polymaths and generalists, frequenters and founders of varying philosophical, scientific societies and dinner clubs (such as the Lunar Society, Society of Arts, Society of Civil Engineers and Royal Society) are effectively archetypes of what Steven Shapin refers to as “men of science.”<sup>185</sup> Men of science were indeed exclusively male and scientific discoveries, especially until the emergence of salon and café culture during the late eighteenth century, occurred in exclusively male spaces.<sup>186</sup> Secondly, their eclectic backgrounds and training reflected the general instabilities, epistemic, professional, and religious beliefs of non-professionalized knowledge construction. To a substantial degree their authority descended from their social status, and they styled themselves not just as “men of science” but also as gentlemen of science.<sup>187</sup>

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<sup>184</sup> On internal legal history: Robert W. Gordon, “Introduction,” *Law & Society Review* 10, no. 1 (1975), 9-55; Gordon, *Taming the Past* (Cambridge University Press, 2017), 18-9; Its critics; Barbara Shapiro, “Law and Science in Seventeenth-Century England,” 728; John Phillip Reid, “Law and History,” *The Loyola of Los Angeles Law Review* 27, no. 1 (1993), 193-224; Saul Cornell, “Heller, New Originalism, and Law Office History,” *UCLA Law Review* 56, (2008), 1095-125; Matthew J. Festa, “Applying a Usable Past,” *Seton Hall Law Review* 38, (2008), 479-533. The inspiration for my approach is drawn from more recent attempts at a synthesis between internal and external legal histories; Fisk and Gordon, “Foreword: ‘Law As...,’” 519; Kunal M. Parker, “Writing Legal History Then and Now,” *American Journal of Legal History*, (2016), 169.

<sup>185</sup> Steven Shapin, “The Man of Science” in *The Cambridge History of Science: Volume 3*, 170-1.

<sup>186</sup> John J. Conley, *The Suspicion of Virtue: Women Philosophers in Neoclassical France* (Cornell University Press, 2002); Anne R. Larsen, “Salons, Patronage Networks, and the Self-Representation of Three Seventeenth-Century French Women of Science,” *Early Modern Women: An Interdisciplinary Journal* 17, no. 2 (2023), 274-98.

<sup>187</sup> Shapin, “The Man of Science,” 188-91.

The categories associated with gentility were more stylistic, performative and cultural than literal. The presentation and decorum of gentlemanly status not only justified their new intellectual practices and pursuits but also offered a shield from the criticism of the scholars' proclivity towards disputation and pedantry.<sup>188</sup> Moreover, once natural philosophers began to participate in trials as witnesses, this persona offered the indispensable aura of credibility and authority: attributes that compose the very definition of the expert witness. Indeed, as historians such as Anne Goldgar and Alice N. Walters have described, the politics of politeness played an essential role in the construction of networks of knowledge and professional connections.<sup>189</sup> To this point, major figures such as Matthew Boulton, Erasmus Darwin, and later Richard Arkwright and James Watt frequently met in the polite setting of the Birmingham Lunar Society to discuss their trials and patent disputes. Arkwright even hired Darwin and Watt over the course of two trials in the mid-1780s.<sup>190</sup> Here the line between industrialist, expert witness, and interested natural philosopher blurred as James Watt served as all three. Indeed, the flexibility of identity and impulse for reinvention is a noted aspect of the natural philosopher.<sup>191</sup> The courtroom, enhanced by the zero-sum nature of trial, provided yet another context that encouraged the temporary refashioning of identity to the end of pleasing the client, judge, and jury, while maintaining broader social and disciplinary credibility.

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<sup>188</sup> Shapin, "The Man of Science," 1, 188; Steven Shapin, "'A Scholar and a Gentleman': The Problematic Identity of the Scientific Practitioner in Early Modern England," *History of Science*, vol. 29 (1991), 279-327.

<sup>189</sup> Anne Goldgar, *Impolite Learning: Conduct and Community in the Republic of Letters, 1680-1750* (Yale University Press, 1995); Alice N. Walters, "Conversation Pieces: Science and Politeness in Eighteenth-Century England", *History of Science*, vol. 35, no. 2, 121-54; Rose-Mary Sargent, "Virtues and the Scientific Revolution" in Noretta Koertge, ed., *Scientific Values and Civic Virtues*, (Oxford University Press, 2005), 71-80.

<sup>190</sup> *Arkwright v. Nightingale; Rex v. Arkwright*.

<sup>191</sup> Rob Iliffe, "'In the Warehouse': Privacy, Property and Priority in the Early Royal Society," *History of Science* (1992) vol. 30, no. 1, 55; Steven Shapin, "Who was Robert Hooke?" in Michael Hunter and Simon Schaffer, eds., *Robert Hooke: New Studies* (The Boydell Press, 1989) 253-85; Frank Whigham, *Ambition and Privilege: The Social Tropes of Elizabethan Courtesy Theory* (University of California Press, 1984); Newton's shifting identities is a theme present in Rob Iliffe's, *Priest of Nature: The Religious Worlds of Isaac Newton* (Oxford University Press, 2017), 357.

Men of means such as Arkwright and Watt possessed the advantage with their capacity to summon generally renowned natural philosophers before the judge and jury. Indeed, following Arkwright's loss to Mordaunt in 1781, Arkwright heavily preferred to compose a witness list that maximized reputational renown, a tactic further developed by Watt in the 1790s. Yet under the economic and procedural pressures of trial, legal professionals often found even greater utility and success with the testimony of what Shapin and Rob Iliffe have referred to as the “invisible” technician.<sup>192</sup> Often existing in the “continuum between servitude and apprenticeship” these men, be they engine erectors, contracted clockmakers, personal assistants or cloistered inventors in their own right, possessed the precise specialist knowledge particular to the trial in a way the comparative renowned gentleman and natural philosophers did not.<sup>193</sup> This tension between generalized knowledge about natural work and a practical grasp of mechanics emerged as a key tension throughout the trials of Arkwright.

Taken together the very practice and conduct of the expert witness, be them scientific instrument makers or generalist natural philosophers, acts as a destabilizing narrative with respect to traditional accounts of the “great men” of the Industrial Revolution. The patent law, intellectual property and property disputes that Arkwright and Watt litigated in the common law courts placed these individuals of unprecedented wealth into systems and forums not fully within their control. There is no doubt that their wealth brought astronomical advantages to the fee-heavy and patronage-rich early modern legal system. However, the general mood, disposition and views of the judge and jury were far beyond their powers of

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<sup>192</sup> Steven Shapin, “The invisible technician,” *American Scientist*, vol. 7, (1989), 554–63; Rob Iliffe, “Technicians,” *Notes and Records of the Royal Society*, vol. 62, no. 1(2008), 3-16; For a modern discussion: Jenny Bangham, Xan Chacko, and Judith Kaplan, eds., *Invisible Labour in Modern Science* (Rowman & Littlefield, 2022).

<sup>193</sup> Iliffe, “Technicians”, 3.

influence. As such, this thesis strikes a balance between problematizing the myth of the so-called great men without denying meaningful actions of impactful historical agents.<sup>194</sup>

In theory, the common law courts functioned as the legitimate, disinterested, and equitable forum that, with the backing of the coercive power of the state, could authoritatively settle what would otherwise remain private disputes. As patent cases—brimming with technical details and ambiguous questions about vocational knowledge and skill—were increasingly brought before the court, the partisan expert witness emerged as an essential player that, perhaps unwittingly, worked to reinforce the necessary fiction of an impartial and dispassionate finding of the facts. As I show across five chapters, the expert witness was in the unique and unenviable position of rapidly swaying or outraging judge and jury alike, and on their actions the wealth of their employer rested. The denouement cannot be underplayed: on December 23, 1796, at Watt’s continued behest and following significant compensation, the ailing and almost certainly self-dosed with opium, professor John Robison took the stand, as the ever-anxious and fastidious micromanager James Watt, prone to ulcers, held his breath.<sup>195</sup>

### **The Structure of This Thesis**

My work will proceed in as chronologically a fashion as possible across five chapters. Beginning in the early 1760s, two decades prior to *Folkes v. Chadd*, I show in Chapter 1 how the unofficial adoption of partisan expert testimony emerged as a result of changes in patent law jurisprudence. For patents to be a public utility they now had to explicitly inform learned professionals how to replicate the said invention. I trace the increased focus on

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<sup>194</sup> On this balancing act see: Kristian Camilleri, “The Shaping of Inquiry: Histories of the Exact Sciences after the Practical Turn” *Advances in Historical Studies* 4, no. 2 (2015), 68-84.

<sup>195</sup> Eric Robinson and Douglas McKie, eds., *Partners in Science: Letters of James Watt and Joseph Black*, (Harvard University Press, 1970), “Letter 166”, 239; “Letter 168”, 243; On Watt’s constitution and nerves: Elizabeth Green Musselman, *Nervous Conditions: Science and the Body Politic in Early Industrial Britain* (University of New York Press, 2006), 4; James Patrick Muirhead, *The Life of James Watt* (John Murray, 1858), 23, 50.

adjudicating the patent specification as generally instructive to the public through three key cases, *Dollond v. Watkins and Smith* (1763), *Dollond v. Champneys* (1766), and *Liardet v. Johnson* (1778) emphasizing when, why, and how persons of skill were called to testify in court. I argue that when opticians began to challenge in court the pedagogical deficiencies of John Dollond's "new method of making the object glasses of refracting telescopes" in the 1760s, the court was, in all but official designation, already grappling with expert testimony.<sup>196</sup> By the late 1770s, this practice of persons of skill playing a vital role in patent law rapidly accelerated to encompass experimental work submitted to the court, without contention, on behalf of their clients. Taken collectively, these cases demonstrate that patent law was a vibrant and early proving ground for the incremental growth of the embryonic expert, whose testimony evolved in accordance with changes in the wording and interpretation of the law.

Proceeding into the 1780s Chapter 2 will continue my examination of the now commonplace practice of the securing of expert testimony during Richard Arkwright's attempts between 1781 and 1785 to enforce and hold on to his cotton carding patent. Taken together these chapters introduce Arkwright as an illuminating case study of the intertwined development of the expert witness and patent law. To this end, in Chapter 2 through a close study of Arkwright's first two major disputes, *Arkwright v. Mordaunt* (1781) and *Arkwright v. Nightingale* (1785), I will draw out two interrelated conclusions. Firstly, the success or failure of a patent dispute hinged heavily on the normalized although not yet formalized presence of the expert witness. Secondly, this chapter will show how the indisputably persuasive power of the expert witness was deeply shaped by the receptiveness of the presiding judge and jury who remained the final adjudicators of law and the facts in a

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<sup>196</sup> "Dollond's Patent," Appendix I. a.

courtroom. As a result, this chapter will draw out the principles and jurisprudence that shaped contrasting judicial responses to the rapid appearance of a new species of expert.

Having examined the development of the persistent expert witness at patent law from approximately 1760 though until 1785 Chapter 3 will turn to the chronologically near contemporary cases of *Folkes v. Chadd*. As described, appeals and judicial ruling during the many cases of *Folkes v. Chadd* directly problematized the testimony of the expert witness in a way patent law trials did not. This chapter will show how the adjacent formal recognition of the expert witness by the common law courts only came after courts, judges, and lawyers were already familiar with the power and promise of the testimony of the expert witness. In a break from Golan's pioneering coverage of the full trial, my examination is more narrowly focused on the specific conduct of the expert engineers, as I draw out the disruptive nature of their testimony, the epistemic challenges it raised and the relational risks inherent in representing a client during an adversarial trial. Ultimately, I argue that *Folkes v. Chadd* is better understood as a moment of inflection that marked the formal and deliberate sanctioning of the pre-existing but rapidly evolving role of the fundamentally partisan expert witness.

My detailed account of particular episodes in the approximately four-year long legal affair known as *Folkes v. Chadd*, treads novel ground by turning away from the language and rulings of judges to emphasize the practice and conduct of the numerous engineering experts present during this dispute's multiple trials. Such analysis is only possible through the use of letter books, trial notes and summaries, personal correspondence, and the original reports as accessed from both the Norfolk County Archives and the Institute of Civil Engineers. By the extensive use of previously unpublished correspondence and local trial commentary I am able to show the negotiations and preparations that went into the practice of expert witnessing. Additionally, these sources revealed the wide range of actions such speculative testimony elicited. Finally, by providing a close reading of the commissioned reports, I deliberately turn

to the practice, that is, the methods and underlying epistemology of knowledge construction that made Smeaton's testimony so polemical to the eighteenth-century courtroom.<sup>197</sup> This is precisely the scope of sourcing required in order to engage in contextualized legal history.

I return to patent law and the Arkwright's legal saga, in Chapter 4, by examining Arkwright's final trial *Rex v. Arkwright* (1785). This in-depth focus is supported by the unique survival of a complete transcript of the trial. This rich and colorful source allows my analysis to comprehensively examine the conduct and practice of the expert witness. I argue that within three years of Mansfield's ruling in *Folkes v. Chadd*, expert witnesses were so common, particularly in patent law disputes, that the legal profession had established a set of strategies and tactics to enable and challenge expert testimony.<sup>198</sup> Examining the performance of key experts on the stand, I show how the expert witness had to be much more than a professional man of skill but needed also to be an accomplished and persuasive expert witness. In other words, the expert witness had to possess presentational and rhetorical skills to weather increasingly effective cross-examination and exasperated members of the jury. I compare and contrast evidence relating to Watt's courtroom presence with his private account of the trial. The extreme gap between Watt's ambitious hopes and the reality of the trial revealed not just the limits of pretrial preparation but further reinforced the courtroom as a dramatic, live, and ever-shifting environment full of unpredictable variables.

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<sup>197</sup> On the turn to practice in this history of science: Soler, Zwart, Lynch, and Israel-Jost, eds., Léna Soler, Sjoerd Zwart, Michael Lynch, and Vincent Israel-Jost, eds., *Science after the Practice Turn in the Philosophy, History, and Social Studies of Science* (Routledge, 2014), 6-28; Max Dresow, "History and philosophy of science after the practice-turn: From inherent tension to local integration," *Studies in History and Philosophy of Science Part A* 82, (2020), 57-65.

<sup>198</sup> And would continue to evolve rapidly in the following decades as seen in the trials of Arkwright, Watt and numerous examples from the nineteenth century such as: *Severn, King and Company v. The Imperial Insurance Company* (1820), *Regina v. Spence* (1857), *Young & others v. Fernie & others* (1864); June Z. Fullmer, "Technology, Chemistry, and the Law in Early 19th Century England," *Technology and Culture* 21, (1980), 1-28; Golan, *Laws*, 76-9, 93.

While Arkwright's cases are highly significant in their own right, they also prove exemplary of the development of the role of the expert witness stretching across Mansfield's ruling in *Folkes v Chadd*. Indeed, the intensity and scale of the involvement of expert witnesses in these series of cases continued without pause or adjustment in response to contemporaneous rulings on the laws of evidence by the very same jurists hearing cases on patent law. As such, with attention fully focused on litigating the legibility of the specification, patent law emerged as a kind of silo in which the partisan expert witness developed. Functioning as both a proving ground and laboratory to perfect and maximize the impact of expert testimony, it is in the technical minutiae of these exceptionally high-stake cases that the professionalization and profitability of the expert witness was assured. For, following the ultimate voiding of Arkwright's patents in 1785, the lesson to industrialists and patent holders was clear: experts, and well-prepared expert witnesses, were of vital importance in the courtroom.

My fifth and final chapter continues from 1785 into the 1790s. Pivoting from Arkwright to Watt I focus on the extensive preparation leading into Boulton and Watt's 1796 trial against Jabez Hornblower and Stephen Maberley.<sup>199</sup> Here, the demands on the now ever-present expert witness's courtroom purview increased as questions of specification legibility sat alongside questions concerning what pre-existing natural and theoretical knowledge the inventor ought to have. As this chapter will show, Watt's comprehensive familiarity with patent law both in theory and through his experience of the cut-and-thrust of the trial itself led to a strategy of immense caution. Key to his decision to pursue a trial was the prerequisite of securing expert testimony, a task to which he dedicated very considerable effort and resources. At the center of Watt's focus was his hiring of the aged professor of natural

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<sup>199</sup> Davenport, *James Watt and the Patent System*, 33; Also spelled Maberly in Richard L. Hills "Hornblower, Jabez Carter" *ODNB* (2004).

philosophy at the University of Edinburgh, John Robison, who had worked closely together on Watt's steam engine experiments nearly thirty years prior; this would have a determinative effect on the trial.<sup>200</sup>

As will be seen in the case of Robison, working with expert witnesses could be a challenge all unto itself, as disagreements concerning the best approach to testifying further complicated pre-trial preparation. Additionally, this chapter will show how the courtroom remained a deeply unpredictable forum in which the *ad hoc* decisions of the many players could throw the best laid plans into chaos. For after such extensive efforts to secure the testimony of Robison it appeared that he would not testify at all until suddenly at the whim of barrister and judge, Robison found himself back on the stand. Finally, this chapter aims to gently shift the traditional evaluation of Watt's role as an individual of great historical agency and import as the testimony of Robison proved essential to Watt's fate before the common law courts. It is through the testimony of experts, such as Robison, that the relevance of the expert witness—as a key causal link in the English Industrial Revolution—may take, for the first time, center stage.

Across five chapters this thesis embarks on a close internal examination of the ascension of the partisan non-medical expert witness at common law from 1760-1800. Placing patent law at the center of the narrative, this project traces developments in patent law jurisprudence, as exemplified by the specification, and its effects on the rules of evidence, the practice of adversarial law and long-standing conceptions regarding the limits of opinionated testimony in common law courts. I argue that it is the crucible of patent law that encouraged and permitted the expert witness, not just to rise, but rise in such an informal and unregulated manner.

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<sup>200</sup> John Playfair, "Biographical Account of the Late John Robison..." in *Transactions of the Royal Society of Edinburgh*, vol. 7 (Edinburgh, 1815), 513; Paul Wood, "Robison, John" *ODNB* (2013).

Time proved that Mansfield's pivot towards the explanatory power of "persons of skill" was vindicated and misplaced in equal measure. The insights offered by the natural philosopher were genuine should the court aim to pursue truth; yet the methods and knowledge claims of said philosophers were poorly adapted to dynamics of the courtroom as amplified by market pressures. Expertise was matched by expertise and disputes were *settled* in less than a day in a categorical direction irrespective of the truth claims underpinning the expert's testimony. This presented a paradox: the very natural philosophers who Mansfield formally ushered into the courtroom (because of their perceived explanatory and predictive power) in fact led to further derision and obscurity. For while Mansfield's inclination to look towards expertise was grounded in the ancient history of legal practice, by permitting the expertise to be partisan in nature, the clarity Mansfield hoped to facilitate was short-lived. It is this legacy that modern courts still grapple with, as science in the courtroom seems as indispensable, rife for abuse, and in the context of law, ultimately limited as ever.

## Chapter 1

### Encountering The Expert Witness in Pre-1782 Patent Law Disputes

#### Introduction

Orthodox historical studies of the English patent system, in terms of methodology and thesis, bend toward economic history.<sup>1</sup> Indeed, the very titles of these works, especially H. I. Dutton's 1984 *The patent system and inventive activity during the industrial revolution 1750-1852* and Christine MacLeod's 1988 *Inventing the Industrial Revolution: the English patent system, 1660-1880* signaled their fundamental economic leanings and interest in understanding whether the patent system played a causal role in kickstarting and propelling the British Industrial Revolution. Even Sean Bottomley's broader and more legally minted reexamination of this history contains the phrase "Industrial Revolution" in its title.<sup>2</sup> This meant that the central questions addressed by the foundational monographs on eighteenth and nineteenth-century patent law are presupposed by questions of economic growth in the context of the Industrial Revolution.

The economic emphasis of these texts does not mean that they are decoupled from questions of law or that their authors are not careful, diligent legal historians. In his monograph, Sean Bottomley was particularly careful in qualifying how his work oscillates between economic and legal history, while his stated aim addressed the legal deficiencies in the work that came before.<sup>3</sup> As a result, his study of early English patent law pushed back against both MacLeod's and Dutton's conclusions regarding its allegedly abject failure to have any stimulating effects, be it technical diffusion and or inventive activity. Still,

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<sup>1</sup> Bottomley, *BPS*; Robinson, "JWLP," 115; Niels Pepels, "Review of Bottomley's *BPS*", *The Journal of Legal History* 38, no. 3 (2017): 338, 340; Alessandro Nuvolari, "Review of Bottomley's *BPS*" *Journal of British Studies* 54, no. 4 (2015): 1004; Alessandro Nuvolari and Christine MacLeod, "Patents and Industrialization", *A Report to the Strategic Advisory Board for Intellectual Property Policy* (2012): 1-3.

<sup>2</sup> Dutton, *PIA*; Christine MacLeod, *IIR*; Bottomley, *BPS*.

<sup>3</sup> *Ibid*, 26-9, 173, 284-294.

Bottomley, like the works he is chiefly in conversation with, is substantially focused on understanding the patent's causal impact on the contours of the first Industrial Revolution. For example, Bottomley's treatment of James Watt's patents concludes with an assessment that Watt's monopoly on the separate condenser did not nominally slow down steam engine adoption.<sup>4</sup>

The economic slant of the dominant historical literature on patent law means that the effects of patent law on historical phenomena beyond the Industrial Revolution have been comparatively neglected.<sup>5</sup> This gap in study is especially evident in the early history of the partisan expert witness. As this chapter will demonstrate across the trials of *Dollond v. Watkins and Smith* (1763), *Dollond v. Champneys* (1766), and *Liardet v. Johnson* (1778) patent law, from its first hearings before English common law courts, emerged as a key forum in which the English court was forced to accommodate the expert *witness*.<sup>6</sup>

I will argue the specific and unique nature of patent law created an environment so particularly primed for the casual participation of skilled professionals, whose opinions were treated like the fact-based testimony of a lay witness. Despite the court's hesitant engagement with legal strategies that sought to raise the specific challenges and secret arts of manufacturing, plaintiffs and defendants consistently asked judge and jury to consider these very issues. The facts and grievances alleged by both plaintiff and defendant were

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<sup>4</sup> The impact of Watt's patents on the pace of the Industrial Revolution is a much-studied topic: Christine MacLeod, "James Watt, heroic invention and the idea of the industrial revolution," in Maxine Berg and Kristine Bruland, ed., *Technological revolutions in Europe* (Edward Elgar Publishing, 1998), 96-116; Bottomley, *BPS*, 235-65; Michele Boldrin and D. K. Levine, "The Case against Intellectual Monopoly," *International Economic Review* 45, (2004), 327-50; Michele Boldrin, D. K. Levine, and Alessandro Nuvolari, "Do Patents Encourage or Hinder Innovation? The Case of the Steam Engine," *The Freeman: Ideas on Liberty* vol. 57, no. 10 (2008), 14-7; "Chapter 1: Introduction" in Michele Boldrin and David K. Levine, *Against Intellectual Monopoly* (Cambridge University Press, 2008), 1-14; George Selgin and John Turner, "James Watt as Intellectual Monopolist," *International Economic Review* 47, no. 4 (2006), 1341-8; Charles McMains, "A Rhetorical Response to Boldrin & Levine," *Review of Law & Economics* 5, no. 3 (2009), 1081-100.

<sup>5</sup> As a proxy for the reach of these three major works, Google Scholar lists that *PIA* has been cited by 449 authors, *IIR* has 824 and *BPS* has 77 recorded citations respectively. [numbers collected on September 18, 2022]; Anne-Wil Harzing, "A preliminary test of Google Scholar as a source for citation data: a longitudinal study of Nobel prize winners" *Scientometrics*, vol. 94 (2013), 1057-75.

<sup>6</sup> James Champneys's surname is occasionally spelled Champness.

substantially of a technical nature and beyond the purview of both judge and jury making the gradual emergence of the testimony of persons of skill appear as a kind of necessity. These experts were opticians or chemists who appeared before the court to shed substantial light on the facts in dispute. As Lord Mansfield constructed the jurisprudential standards of English patent law—public disclosure and an intelligible patent specification—in response to the questions raised by these very trials he did so in an environment dominated by technical expertise. During these early patent disputes the expert witness was never formally designated, yet their function was clear and distinct from that of the lay witness. Without formal recognition, guiding procedures or even legal challenges under existing understandings of the rules of evidence, the expert witness in all but name emerged as a player of unmatched rhetorical power and saw during the common law courts the first substantial engagement with patent law.

This chapter's examination of the nascent presence of this early partisan expert witness is of additional historical note as the formal beginning of the expert witness in English law is conventionally traced back to Lord Mansfield's technical 1782 ruling in the trespass case of *Folkes v. Chadd*.<sup>7</sup> As noted, the fundamentally whiggish project of attempting to categorically locate the historical origins of a phenomenon in a singular time and place is a substantial fallacy that I am wary of. To this point, it is precisely this chapter's emphasis on the gradual and tentative emergence of the expert witness in the decades preceding *Folkes v. Chadd* that challenges such a neat, linear and progressive historical narrative. In short, the non-medical expert witness neither emerged fully formed nor burst onto the scene uncontested; rather, the expert witness gradually emerged out of the unique demands of patent law. It was during early patent disputes between 1763 and 1778 that

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<sup>7</sup> Henry Roscoe, *Reports of Cases Argued and Determined in the Court of King's Bench....[1778-1785]*, vol. III, (Steven and Sons... 1831), 157-60.

plaintiffs and defendants incrementally pushed beyond the traditional bounds of speaking strictly of observable facts when on the stand.

I will proceed in two board sections with each part dedicated to a particular trial in chronological order. A chronological rather than a thematic approach is particularly appropriate to the study of legal history due to the incremental and self-reflective nature of common law itself. Part 1 is focused on the full sweep of John and Peter Dollond's improvements and patent for a refracting telescope culminating in their two trials: *Dollond v. Watkins and Smith* (1763) and *Dollond v. Champneys* (1766). The trial against Watkins and Smith hinged on John Dollond's claim to originality in which Chester Hall, a lay inventor who held a competing claim for intellectual priority, was prepared for trial, present in the courtroom yet never called to the stand due to the court's strict focus on the narrow legal question of public disclosure.

Dollond's second trial against James Champneys was effectively a test case in which Peter Dollond hoped to fully vindicate the validity of his father's patent and consolidate his monopoly in the face of the ever-mounting pressure by the spectacle-makers guild. Here the presence of the expert witness escalated one step further with extensive expert testimony included and referred to during the lengthy pretrial process of complaint and answer filing. Although in neither trial did a person of skill actually make it to the witness stand, both show, in an escalating fashion, how the very context of patent law so readily encouraged the court to consider expert opinion.

The second section focuses on the 1778 patent trial of *Liardet v. Johnson*, which concerned a disputed patent and claim of infringement around a patent for an allegedly novel form of oil-based stucco. Here, Bryan Higgins, an established chemist and well-known natural philosopher, testified before the court to dramatic effect.<sup>8</sup> Based on experiments

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<sup>8</sup> Oldham, *MM* vol. 1, 748-57; David Knight, "Higgins, Bryan", *ODNB* (2004).

conducted on behalf of the plaintiffs, Higgins demonstrated the evident deception in the patent specification held by the defendant and thereby clearly swung the trial in Liardet's favor. Higgins's testimony was not challenged by any similarly credentialed witness presented by the defense nor was it objected to on evidentiary grounds. Without self-reflection, problematization by the court or surrounding historical actors, by the time of *Liardet v. Johnson* the expert witness was undoubtedly a fully and deeply impactful player in the disputes of patent law.

In summary, this chapter reveals the nuances of the court's push and pull when pressed to engage with the technical challenges raised by patent law cases. Patent disputes were in and of themselves disputes between experts and so the court was pushed to substantially engage with expert opinions. Initially, Mansfield focused the court on clarifying narrow questions of law, a move which circumvented the need for the testimony of persons of skill. This proved temporary because with the common law courts firmly established as the appropriate forum for intellectual property disputes it only took the action of subsequent plaintiffs before the court was adjudicating the relative merits of a patent specification and standards of knowledge amongst trade professionals. In other words, the court was dealing with matters of art and science.

### **The Patent Empire of John and Peter Dollond A Refracting Telescope is Patented**

On April 12, 1758, John Dollond's formal petition to King George II for a letter patent was all but officially granted.<sup>9</sup> Dollond's patent had successfully wound its way in and out of the court offices, through the necessary officeholders that comprised the King's Privy Council and culminated with the authoritative press of the Great Seal of the Realm kept by the Lord Chancellor.<sup>10</sup> Dollond's patent was signed off by Charles Pratt yet there was one last

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<sup>9</sup> Full patent see: "Dollond's Patent," Appendix I. a.

<sup>10</sup> Bottomley, *BPS*, 25-65.

hurdle for him to clear: to formally file or *enroll* his patent specification in the official catalog of all valid patents in the land after said specification was sealed.<sup>11</sup> This final step was in fact largely a procedural and complex formality since the details, if any were given, for Dollond’s “new method of making the object glasses of refracting telescopes” had been broadly described in his patent and was preapproved. Dollond, or perhaps his lay patent agent Francis Watkins, wasted little time. The final engrossed and sealed legally valid patent listed April 19, 1758 as the date of commencement.<sup>12</sup>

The arduous and costly process of applying for a patent was conducted by the established, well-connected and financially successful optician Watkins, Dollond’s soon-to-be business partner.<sup>13</sup> Dollond, who lacked starting capital, accepted Watkins’s financial assistance in obtaining a letter patent in return for the shared property rights of Dollond’s highly promising refracting telescope.<sup>14</sup> With his success in acquiring the patent, the sale of his novel telescope accelerated and by May 28, 1761 Dollond was elected Fellow of the Royal Society. Unfortunately, without warning, on November 29, 1761, Dollond suffered a severe stroke and died.<sup>15</sup>

Dollond died intestate, however, his eldest of five surviving children, Peter (then 29) was well equipped to take over his father’s business.<sup>16</sup> Peter had worked as an optician alongside his father and later improvements to their telescope design showed that he was a skilled experimental lens maker in his own right. He possessed considerable and much

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<sup>11</sup> “Dollond’s Patent” in Appendix I. a.

<sup>12</sup> Ibid.

<sup>13</sup> John Farey estimated the average cost of filing a patent was £120; *Report from the Select Committee on the Law Relative to Patents for Inventions*, (The House of Commons, 1829), 17; Bottomley and MacLeod agree that the cost—although highly volatile—was consistently prohibitively expensive; MacLeod, *IIR*, 76-8, Bottomley, *BPS*, 59-65; For reference, the most a skilled London-based artisan could earn was £40 per year; Richard Sorrenson, “Dollond & Son’s Pursuit of Achromaticity,” *History of Science*, vol. 39, no. 1 (2001), 52.

<sup>14</sup> “The Several Answers of Francis Watkins one of the Defendants to the Bill of Complaint of Peter Dollond, Complaint,” November 30, 1765; Quoted in Gee, *WDTC*, 127-8.

<sup>15</sup> John Kelly, *The Life of John Dollond* (W. M. Thiselton, 1808), 13-4; Kelly incorrectly lists the day of Dollond’s death as November 30, 1761; Gloria Clifton, “Dollond Family”, *ODNB* (2013).

<sup>16</sup> Gloria Clifton, “Dollond Family”.

commented upon Knack as a cutthroat businessman, who consistently reaped greater profits and successfully leveraged the protective power of his father's patent.<sup>17</sup> By the end of the 1760s Peter had successfully consolidated the developing refracting telescope industry through his aggressive, and ultimately successful, legal actions which hinged on competing claims between rival scientific instrument makers.

### Patenting the Impossible

Just a decade prior to Peter Dollond's inheritance of his father's business, most optical specialists working in London would have considered it nothing short of impossible to make in practice.<sup>18</sup> A refracting telescope, that is, a telescope that focuses light through a lens (the object) had a history of being an imperfect device. Images tended to be out of focus due to spherical aberration, which resulted in an image that was blurred at the edges.<sup>19</sup> Experienced opticians, such as the Dollonds or the exceptionally gifted lens maker George Bass, likely knew that the theoretical solution to spherical aberration was to carve an aspherical lens in the contour of a proposed parabolic or hyperbolic curve.<sup>20</sup> However, manufacturing such a lens was a monumental technical problem that would not be accomplished until the second half of the twentieth century.<sup>21</sup> The practical solution was to live with a minor mitigation of this effect by finding a good optician who, through practiced polishing, could compensate, making the curve of the lens as even as possible. Unfortunately, some of the strategies used to combat spherical aberration presented tradeoffs. For example, the process of gradually

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<sup>17</sup> On Peter's improvement to his father's telescope: Gee, *WDTC*, 55-8; Gee refers to Peter as "ruthless" as does Rolf Willach, "New light on the invention of the achromatic telescope objective", *The Royal Society Journal of the History of Science*, vol. 50, no. 2 (1996), 195-210.

<sup>18</sup> This view was hardly universal; Caleb Smith and later Benjamin Martin clearly believed that making such a device was more of a technical challenge rather than being impossible in principle Gee, *WDTC*, 86.

<sup>19</sup> "aberration" in "The Editors of Encyclopaedia Britannica", *Encyclopaedia Britannica*, 24 Oct. 2016; Neil English, *A Guide to Collecting, Restoring, and Using Telescopes of Yesteryear* (Glasgow: Springer, 2013), 233.

<sup>20</sup> A "perfect lens" focused all light into the same point and was mathematically proven by René Descartes in 1637; it is possible that Bass was the first to grind an achromatic doublet in the early 1730s; Mark B. Villarino, "Descartes' Perfect Lens" *arXiv: General Mathematics* (2007), 1-12; Gee, *WDTC*, 75, 148.

<sup>21</sup> J. C. Deiman, *Microscope Optics 1750-1850 and J.J. Lister's Influence on the Development of the Achromatic Objective*, PhD thesis, (University of London, 2020), 16.

narrowing (sloping down) the aperture of the object lens led to a sharper image, but it also reduced the amount of light let through, rendering a much darker and hard-to-read image.<sup>22</sup>

The challenge of spherical aberration was not the least of the prospective refracting telescopes users' problems, as an image focused through even the most well-cut convex spherical lens would find their image tinged with a rainbow outline, the result of a phenomenon called chromatic aberration. Chromatic aberration only occurs with lenses, not mirrors, as the glass fails to bend all wavelengths of light onto the same plane.<sup>23</sup> Isaac Newton, when he attempted to grind his first telescope lenses in the mid-1660s, encountered this very challenge.<sup>24</sup> Newton, with the publication of *Opticks* in 1704, cemented the notion that correction for chromatic aberration was, as a matter of theory, impossible.<sup>25</sup> Key to this fact was his *demonstration* that refraction was in no way affected by the material composition of the prism or lens.<sup>26</sup> It was for this reason that Newton, in an effort to sidestep the problem of chromatin aberration, abandoned the production of a telescope through the stacking of lenses and instead turned to the use of reflective mirrors.<sup>27</sup>

John Dollond, a silk spinner by trade, began by seriously reconsidering the impossible impasse present by chromatic aberration when attempting to defend Newton's theory from

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<sup>22</sup> Gee, *WDTC*, 74-5.

<sup>23</sup> "chromatic aberration" in "The Editors of Encyclopaedia", *Encyclopedia Britannica*, 24 Oct. 2016; Terrance E. Boulton and George Wolberg, "Correcting chromatic aberrations using image warping" *CVPR* (1992), 684.

<sup>24</sup> Rob Iliffe, *Newton: A Very Short Introduction* (Oxford University Press, 2007) 27, 42, 47; Edmund Whittaker, "An introduction" in Isaac Newton, *Optics or A treatise of the Reflections, Refractions, Inflections & Colours of Light* (Dover Publications, 1952), lxvi.

<sup>25</sup> See experiment 8 in Book I, Part II of: Newton, *Opticks*, 20-1.

<sup>26</sup> Ibid.; There has been much contemporary literature on how to read Newton's *Opticks* and his related experiments: Richard S. Westfall, "Newton's Optics", *Isis* vol. 57, no. 1 (1966), 102-7; *The British Journal for the History of Science*, vol. 8, no. 2 (Jul., 1975), 101-26; Alan E. Shapiro, "Skating on the Edge: Newton's Investigation of Chromatic Dispersion and Achromatic Prisms and Lenses" in Jed Z. Buchwald and Allan Franklin, eds., *Wrong for the Right Reasons* (Springer, 2005), 99-126; Steffen Ducheyne, "*The Main Business of Natural Philosophy*": Isaac Newton's Natural-Philosophical Methodology (Springer, 2012), 179-205. On Newton's "Experiment 8": H. C. King, "The invention and early development of the achromatic telescope", *Popular Astronomy*, vol. 56 (1948), 76; Gee, *WDTC*, 84. The writings and lectures of James Hodgson, John Desaguliers, Benjamin Martin, Francesco Algarotti, and Voltaire all helped to popularize Newton's work.

<sup>27</sup> Newton, *Opticks: Or, A Treatise Of The Reflexions*, 75.

the skeptical writings of continental natural philosophers and mathematicians.<sup>28</sup> James Short (FRS), a famous optical instrument-maker who had invited Dollond to respond to Leonhard Euler's 1753 paper did not publish Dollond's response as it proved too combative and ungentlemanly by the standards of the day.<sup>29</sup> Instead he initiated a productive series of exchanges which pushed Dollond to revisit his commitment to Newton's claims.<sup>30</sup> Following additional input from the mathematician Samuel Klingenstierna, on February 21, 1753, Dollond began to conduct his own experiments on the refractive properties of light.<sup>31</sup>

After these exchanges Dollond's rapid progress toward an achromatic object glass increased. Looking at Dollond's paper given to the Royal Society, only after he had succeeded, provides some insight into his process of improving such lenses: "I discovered a difference, far beyond my hopes, in the refractive qualities of different kinds of glass, with respect to their divergence of colors."<sup>32</sup> Dollond soon discovered that crown, "and the flint or crystal" were the best yet there was still a splitting of the color spectrum. Yet, Dollond's paper provided scant technical details as to the precise methods regarding the construction of his telescope.<sup>33</sup> This is deeply relevant because when Peter eventually took his father's former partners to trial they stressed that the cryptic nature of Dollond's writings on his method for producing lenses ought to be grounds for the voiding of his patent.<sup>34</sup> The legal protection offered by a letter patent under the Statue of Monopolies was thought to be a reward and

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<sup>28</sup> Clifton, "Dollond"; Notably the work of Leonhard Euler, "Sur la perfection des verres objectifs des lunettes", *Euler Archive - All Works*.118. For the evolution of Euler's ever-evolving theory of light: Kurt Møller Pedersen; "Leonhard Euler's Wave Theory of Light", *Perspectives on Science* 2008; 16 (4), 392-416.

<sup>29</sup> Letter from Dollond to Short (March 11, 1752) quoted from Gee, *WDTC*, 113-4.

<sup>30</sup> James Short and John Dolland, "XLIII. Letter relating to a theorem of Mr. Euler..." *Philosophical Transactions*, vol. 48 (December 31, 1753), 287-96; Short made sure Euler's responses in French were included.

<sup>31</sup> "Klingenstierna, Samuel." *Complete Dictionary of Scientific Biography*, (Charles Scribner's Sons, 2008), vol. 7, 403-4; Klingenstierna's insights were communicated to Dollond in person through a student of his, Fredrik Mallet, in early 1755. "Appendix 5" in Gee, *WDTC*, 335-8.

<sup>32</sup> *Ibid*, 319.

<sup>33</sup> Dollond and Short, "An account of some experiments concerning the different refrangibility of light", 740-1.

<sup>34</sup> Sorrenson, "Pursuit of Achromaticity", 35.

incentive for public disclosure.<sup>35</sup> Dollond, in his paper written for the Royal Society, wrote only that he had ground the crown glass to “different angles.”<sup>36</sup> Although he did specify the ratio between the different glasses, the way in which he specifically overcame additional problems, such as spherical aberration was mysterious to his contemporaries. Dollond’s patent specification is even more sparse, making no mention of what the “compounding mediums of different refractive qualities” are, nor does he specify how the errors have been “perfectly corrected”, simply that they have been.<sup>37</sup> Dollond’s specification does, however, emphasize the great public utility his invention would provide both commercially and militarily to king and country.<sup>38</sup>

Dollond’s experimentation with lens construction was by no means pursued in a vacuum; for example, around 1756, a meeting with George Bass inspired Dollond to turn to flint glass for elements of his telescope constructions.<sup>39</sup> Yet despite the complex and often private meetings and exchanges of knowledge across London, opticians were omitted from all accounts.<sup>40</sup> Although Dollond’s patent made it through the laborious vetting process at Chancery, this vetting process focused not on the technical details of the invention nor its veracity but on whether issuing a patent would run afoul of the “good of the realm” requirements of the Monopolies Act.<sup>41</sup> Dollond’s patent was at least slightly less revealing than other contemporary patents tended to be, a fact that was seized upon by rival opticians in response to Petter Dollond’s attempts to enforce his father’s patent.<sup>42</sup> Additionally, John

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<sup>35</sup> Macleod, IIR, 183.

<sup>36</sup> “Dollond’s Patent”, Appendix I. a.

<sup>37</sup> Ibid.

<sup>38</sup> Ibid.

<sup>39</sup> Gee, *WDTC*, 121.

<sup>40</sup> Ibid.

<sup>41</sup> As the end of Proviso VI of the Statute of Monopolies reads: “not contrary to the Lawe nor mischievous to the State, by raisinge prices of Commodities at home, or hurt of Trade, or generallie inconvenient [sic]”; “Statute of Monopolies 1623”, *Acts of the English Parliament*, legislation.gov.uk.

<sup>42</sup> On the abnormal lack of disclosure present in Dollond’s patent: Appendix I. a.

Dollond's lack of disclosure regarding the process and progress of his invention would also invite legal challenges on the substantive ground of his, now posthumous, claims of originality. Both lines of attack on the validity of Dollond's patent depended on the testimony of persons of skill; all that remained to be seen was how the common law courts would respond to a trial law strategy.

### **The Expert Witness That Almost Was (1763)**

Frances Watkins's relationship with Peter Dollond rapidly deteriorated following Peter's inheritance of his father's contract with Watkins. An early point of friction was Dollond's wish to raise their profit margin from 60% to 200%, a move of excessive profiteering in which Watkins refused to participate.<sup>43</sup> Both Watkins and Dollond wished to walk away from their contract without blame or clear wrongdoing, and after a standoff Watkins exited the agreement, largely on Peter's terms. As revealed in a surviving answer to a later suit issued by Peter, it was after this falling out that Watkins began to publicly suggest that the Dollond family, in spite of the patent, were not the legitimate inventors of the achromatic refracting telescope. As he wrote in November 1765, the rights to the invention properly belonged to Chester Moor Hall, who had many years prior to Dollond successfully constructed a similar refracting telescope that allegedly minimized spherical aberration and chromatic aberration.<sup>44</sup>

This public challenge to Dollond's claim of originality explained why Watkins exited such a promising contract. Perhaps, seeking to test this theory, Watkins and his new patterner Addison Smith began to sell refracting telescopes made with achromatic lenses that,

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<sup>43</sup> Gee, *WDTC*, 154-7; Sorrenson, "Pursuit of Achromaticity", 37-8.

<sup>44</sup> "The Several Answers of Francis Watkins one of the Defendants to the Bill of Complaint of Peter Dollond, Complaint, November 30, 1765"; quoted from Gee, *WDTC*, 155.

according to Peter, had been made and delivered to Watkins before his father's death.<sup>45</sup> With his patent's legitimacy under threat due to the Hall rumor and financially under threat because of Watkins and Smith's unlicensed selling of the Dollond's telescope, Peter Dollond acted swiftly and issued separate "pleas of trespass" against both Watkins and Smith.<sup>46</sup> A plea of trespass or a complaint of wrongdoing had long lost the requirement that said trespass be conducted "with force and arms" or "against the king's peace."<sup>47</sup> Rather, by the mid-eighteenth century it was a well-established mechanism by which to address a grievance that did not amount to treason or felony.<sup>48</sup> In this instance the wrongdoing was against a property right as conveyed by Dollond's patent. Although the King's Bench and Court of Common Pleas had overlapping jurisdiction regarding trespass cases, because this dispute was over a patent which was a royal grant, the case was to be filed at the King's Bench. Therefore, Peter's attorney, John Walton, filed two complaints emphasizing that Watkins "well knowing that promises but devising and maliciously intending to injure the said Peter and further to deprive him of the benefit profit and advantage of the said invention and the said letters patent after the death of John Dollond.... [made] 500 object glasses."<sup>49</sup> In his claim Dollond emphasized the impressive novelty of his father's invention explaining to the court that their object glass "perfectly corrected that the improvement which had been in vain sought after by several others above a century than past."<sup>50</sup>

Watkins and Smith, working with the same attorney, John Ramsden, developed a multi-step plan to fight Dollond's plea. Knowing full well that they were in breach of the patent, they had little choice but to challenge its validity; should Dollond not be the legitimate

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<sup>45</sup> "Plea of Trespass. *Dollond v. Smith; Dollond v. Watkins*, Michaelmas Term 1763"; quoted from Gee, *WDTC*, 159.

<sup>46</sup> Dollond's Plea of Trespass (1763), quoted from Gee, *WDTC*, 159-60.

<sup>47</sup> Baker, "The Jury and Pleading" in *Introduction to English Legal History*.

<sup>48</sup> *Ibid.*

<sup>49</sup> Dollond's Plea of Trespass (1763), quoted from Gee, *WDTC*, 159.

<sup>50</sup> *Ibid.*

holder of the King's patent there would be no property right for Watkins and Smith to run afoul of. The alleged inventor of the achromatic lens, Chester Moor Hall, born in 1703 and a successful lawyer, was key to the strategy of the defendants. Hall's name had been circulating around the optician scene largely due to George Bass and Hall's unusual lens orders made in 1733.<sup>51</sup> Whether Hall was in fact the original inventor of the achromatic lens is a matter of intense historiographical debate; unlike Dollond, there are no surviving records by Hall claiming he made such a discovery, nor are there any surviving lenses.<sup>52</sup> However, Watkins and Smith certainly believed or at least testified under oath and constructed a legal strategy singularity around Hall's claim. To this end Watkins and Smith, accompanied by the great instrument-maker John Bird, who knew Hall as a former customer, visited Hall in Rochford (Essex) prior to the start of the trial. According to Brian Gee, the leading expert on this dispute, based on surviving personal correspondence, London opticians were given a tour by Hall, examined his object glasses and were permitted to take them home to be used as an "exhibit at the trial."<sup>53</sup> Moreover, Hall, responding to a subpoena, appeared in court (for both cases) as a witness ready to testify on behalf of Watkins and Smith yet was never called to the stand.

On July 12, 1763, Smith's trial was held before Mansfield, who deliberately impaneled a jury of "ordinary merchants" for this case.<sup>54</sup> The events played out entirely in Dollond's favor as Mansfield effectively drew a distinction between the private act of inventing and the commercial act of vending. Mansfield explained to the jury and court that the question in play was not actually who had technical priority for the invention but who had

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<sup>51</sup> Gee, *WDTC*, 148.

<sup>52</sup> On Hall's claim: Sorrenson, "Pursuit of Achromaticity," 31-55; For a nuanced account of the likely exchanges of knowledge between Hall and Dollond through third parties: Gee, *WDTC*, 86-95, 147-75; King, "The invention and early development of the achromatic telescope". 75-88; For a defense of Hall: Willach, "New light on the invention of the achromatic telescope objective," 195-210.

<sup>53</sup> Gee, *WDTC*, 160-1.

<sup>54</sup> *Ibid.*

successfully developed and brought the said invention into the marketplace. Hall was never called to the stand and the defense, whose entire argument rested on Hall's testimony, crumbled. The jury's path was quite clear. According to some reports Mansfield is said to have summarized as follows: "It was not the person who locked up his invention in his scutoire that ought to profit by a patent for such invention, but he who brought it forth for the benefit of the public."<sup>55</sup> Although no contemporary documents detailing Mansfield's views survive, his merely symbolic ruling on damages which amounted to a single shilling suggest that he was well aware that he was setting a novel precedent.<sup>56</sup> This ruling is unexpected insofar as the relevant statute made no mention as to a specific demand for comprehensive public disclosure. Mansfield's new requirement, almost certainly invented as a response to a gap in the letter of the law, represented his general philosophical view on the power and proper role of common law courts which ought to wield discretionary evaluations in a manner that typically resided within the courts of equity.<sup>57</sup> Yet, by limiting testimony to the matters now directly before the court Mansfield, for the time being, maintained a narrow and highly formal approach to the procedures of the King's Bench.

In summary, the very first patent law trial before common law occurred twenty years prior to the formal recognition of the partisan expert witness; moreover, the case was pursued

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<sup>55</sup> The attribution of this quote has a sorted history; more contemporary sources claim it was delivered by Lord Camden in 1766; Gee, *WDTC*, 187; English, *A Guide to Collecting, Restoring, and Using Telescopes of Yesteryear*, 10; John Strong, *Concepts of Classical Optics* (Dover Publications, 1958), 321. The only author to provide a citation to a primary source for this quotation is Gee referring to *Gentleman's Magazine*, 36 (February 18, 1766), 102. However, Camden's statement does not appear in this short article. [accessed through ProQuest] Rather it appears first, significantly after the fact, in an October 1790 issue of *Gentleman's Magazine*; September 30, 1790 in *The Gentleman's Magazine and Historical Chronicle for the year of MDCCXC* (John Nichols, 1790), 890; Also see: Alexander Tilloch, *The Philosophical Magazine...* (London, 1789), 176-77; Here it is attributed to Mansfield yet the fact that the letter was sent by Ramsden makes the specifics suspect. Webster recorded Justice Buller as issuing a similar quote in *Boulton & Watt v. Bull*; Thomas Webster, *Reports and Notes of Cases on Letters Patent for Inventions* (Thomas Blenkarn, Law Bookseller, 1844), 43-4; Referenced again in S. H. Hodges, "Reducing an Invention to Practice." *The American Law Register*, vol. 20, no. 10 (1872), 614. Regardless, something to this effect was said at both Dollond's 1763 and 1766 trials.

<sup>56</sup> The total costs were greater as the court's and Dollond's legal costs had to be covered by Watkins and Smith; Gee, *WDTC*, 161.

<sup>57</sup> Derek Whayman "Equity in the Common Law Courts" *SSRN* 5209421 (2025), 9-16; Darren Lee, "The dynamics of equity and common law", *Plymouth Law Review* 17, no. 1 (2024): 98-9, 102.

with a legal strategy prepared solely around the testimony and probable demonstration of Hall's achromatic object glass. Watkins, Smith and more importantly their lawyer Ramsden thought that a person of skill could present permissible evidence on the stand that would in turn be interpreted by a jury. In some ways this early near encounter with an expert was accepted by the court. Hall was summoned and allowed into the court and pretrial pleadings made clear the intended attack on the patent's originality. Yet, Hall was never called to give his informed opinion on John Dollond's claim to originality nor critique the vague methods of lens production as described in his specification. Instead, legal proceedings steered away from the question of originality to the novel question of vending.

Importantly, Hall's testimony and the history of invention with which Ramsden was prepared to dazzle the jury were not rejected by the court for running afoul of any rules regarding the purview of sense-perception testimony or otherwise being too speculative. Rather, they were simply never considered. As Gee notes, explaining the court's lack of engagement with the technical details in question, "Lord Mansfield avoided all scientific and technical matters" and so the legibility of Dollond's patent never arose in court.<sup>58</sup> Mansfield's pivot away from all matters scientific did not last and by 1778 he provided the jury with instructions for the debating of patent specifications.<sup>59</sup> For now the precedent stood and Peter Dollond, at least in theory, enjoyed full legal protection offered by his patent. However, he was far from done pressing his advantage in court: after a series of procedural legal disputes with the Spectaclemakers' Company found in his favor, Dollond looked to fully test his newfound privilege in the lower courts. In doing so the defending opticians and instrument makers once again questioned the validity of Dollond's patent, this time doubling down on

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<sup>58</sup> Gee, *WDTC*, 180.

<sup>59</sup> Jury instructions of *Liardet v. Johnson*, Oldham, *MM* vol. I, 754.

technical details as they sought to challenge Dollond's specification on the grounds of unsatisfactorily divulging his methods.

### **The Test Case Against Champneys August 1765 – February 1766**

By the end of Friday, September 20, 1765, Peter Dollond had enjoyed a particularly productive day at the Court of Chancery offices.<sup>60</sup> In one fell swoop he had issued two bills of complaint which named a total of five opticians for, allegedly, violating his father's patent. Sorted into groups based on professional connections, Dollond collectively targeted the "City Three" James Champneys, Christopher Stedman and William Eastland, and in a separate bill the "Westminster Pair" Francis Watkins and Addison Smith. Although Dollond's original bills of complaint are seemingly lost and with them the specific language of the charges he levied at the five, it is known from repeated language in the surviving answers that these were effectively suits for the selling of compound achromatic object glasses without license from the patent owner of said invention, Peter Dollond.<sup>61</sup>

Bills of Complaint such as the one Dollond filed were the first steps in pretrial litigation. Bills of Complaint accepted by the court would lead to a "Writ of Subpoena to summon" of the defendant in which said defendants—in this case the five opticians—were required to deliver a written response at the Court of Chancery public office. Because Bills of Complaint compelled sworn responses they were often accompanied by a list of questions, known as "interrogatories" which were intended to determine the facts of the offense and were often used to fish for wrongdoing when the plaintiff was uncertain as to the exact nature

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<sup>60</sup> The date and individuals named in Dollond's Bill as recorded in the *Chancery entry books of Decrees and Orders*; Gee, *WDTC*, 176-7.

<sup>61</sup> "The Several Answers of James Champneys, William Eastland and Christopher Stedman, Defendants to the Bill of Complaint of Peter Dollond, Complainant, 29th October 1765" Quoted in Gee, *WDTC*; For example, Champneys claimed Eastland had sold several glasses to "a Captain Richard Prideaux."; Note on sourcing: unable to access this Bill of Complaint I relied on the extensive quotations as provided by Gee.

of the wrongdoing.<sup>62</sup> Although Dollond brought five complaints, in time he would drop all but one. In any case, he was fishing for an ideal candidate to take to court as a way to formally test Mansfield's earlier ruling in favor of his patent. This was a bold and preemptive strategy that risked financial burden due to the possibility of a lengthy trial as well as opened up his patent to further formal challenges in the court. Yet, the reward was total market consolidation over the refracting telescope.<sup>63</sup>

On October 29, 1765, the answers of Champneys, Stedman and Eastland were signed off by the Court of Chancery clerk J. Lamey and their lawyer John Madocks, in which they clearly declared that they sought to fight Dollond on the merits of his patent.<sup>64</sup> The language of their answer emphasized how, in the words of the opticians, Dollond's "pretend" specification simply did not explain "the manner how it [the manufacturing of achromatic lenses] is performed."<sup>65</sup> Dollond's specification should have been sufficiently revealing to other members of the trade so that once his patent expired and his method for making object glasses of refracting telescopes was legally copyable, other trade persons could, for the financial benefit of the realm, replicate Dollond's successes.<sup>66</sup> Yet, his patent included no precise reference to either materials used, any discussion method for manufacturing nor the final dimensions of his chromatic aberration correcting doublet.<sup>67</sup> This was of paramount importance as it was specifically the method of production not the abstract principle for which Dollond had been granted a patent. The resulting theory of the case as offered by Champneys, Stedman and Eastland was that Dollond's patent ought to be voided as the specification included no material discussion of method, just a cursory overview of the

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<sup>62</sup> The step-by-step pretrial process as described to the author by Daniel F. Gosling; National Archives, seminar (2022).

<sup>63</sup> At least until the patent expired in 1772.

<sup>64</sup> "Answers of James Champneys," as quoted in Gee, *WDTC*, 177-8.

<sup>65</sup> *Ibid.*

<sup>66</sup> Gee, *WDTC*, 176-80; MacLeod, *IIR*, 183; Dutton, *PIA*, 20-2.

<sup>67</sup> "Dollond's Patent," Appendix I. a.

principles and the pre-existing object of the telescope neither of which were legally patentable.<sup>68</sup> To this end, in their complaint, all three lens makers challenged Dollond by specifically drawing on their technical and scientific knowledge on the process of lens making. In no uncertain terms the very legal strategy employed by their complaint was only possible because they were experts.

Eastland, from the perspective of a working optician, throughout his affidavit stressed the true insufficiency of the specification as it did not reveal a remotely intelligible recipe for reproduction.<sup>69</sup> Recalling the extent of the explanatory language of Dollond's patent is instructive as it places the challenge of the opticians in their appropriate context:

compounding mediums of different refractive qualities whereby the errors arising from the different refrangibility of light as well as those which are produced by the spherical surfaces of the glasses are perfectly corrected<sup>70</sup>

Indeed, after direct quotation to this allegedly explanatory language, Eastland rhetorically questioned, "what spherical surfaces the glasses are to be formed in order to teach opticians the manner in which they are to obtain the due degree of refrangibility which is proper for each glass."<sup>71</sup> Here Eastland was clear that the issue concerned the inadequacy of Dollond's patent as a teaching tool, since the specific glass used and grinding specifications were crucial. To play this argument out, the court would have to contend with Eastland's assessment; since this was not a strictly observable fact but merely a professional opinion,

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<sup>68</sup> For an overview of judicial interpretations of "method": Gubby, *DLPP*, 111-26

<sup>69</sup> "Answers of William Eastland," quoted in Gee, *WDTC*, 178.

<sup>70</sup> "Dollond's Patent," Appendix I. a.

<sup>71</sup> "Answers of Eastland," quoted in Gee, *WDTC*, 178.

Dollond cited his own expert knowledge to challenge this, arguing that any respectable instrument maker should be able to intuit what type of glass was necessary.

Champneys took a very similar approach in his answer, also noting in regards to Dollond's patent specification "there is no substance by which to teach opticians the manner in which they are to obtain the due degree of refrangibility."<sup>72</sup> Here, Champneys made a broader argument noting not only the lack of a discussion on materials but the very methodology by which one would grind and polish their glass. The attack on method was crucial because it was the novel *method* opposed to the *object* that was generally patentable. Indeed, Dollond's patent claimed he "at last invented and brought to perfection a new method of making the object glass of refracting telescopes"; Champneys pressed the attack as informed by his craft experience:

such a new invention consisted not in making the object glass of two or more glasses put close together wherefore one is concave and the other coven (that having been practiced long before the said letter patent was granted) but such new invention must consist (if such there was) in the particular formation of the convex and concave glasses and the mediums and substances of which they are made in which particular the said patent specification is totally silent and therefore it hath not set forth how the pretended invention is to be performed.<sup>73</sup>

Champneys's attack was similar to Eastland's in that it was both remarkable in its damaging detail and in what it asked the court to consider. Taking on the role of a lawyer, Champneys positively asserted to the court what a patent ought to look like and in the process what patent

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<sup>72</sup> "Answers of Champneys," quoted in Gee, *WDTC*, 178-9.

<sup>73</sup> *Ibid.*

law ought to consider. In this case Dollond's invention was tantamount to fraud, a pretend invention, since its claims to be a patent on method was "totally silent" on the actual method itself. In effect, Champneys, along with his lawyer and two other fellow opticians, instructed the court that Dollond's patent was insufficiently specific in regard to the method of construction, and they asked the court to consider what knowledge was necessary for a skilled workman to perform the task.

Indeed, the recent historical work of Rolf Willach and Richard Sorrenson helps to illustrate not just how obscure the specification of the Dollond patent already was by the standards of the time but also why fellow instrument makers so clearly wanted to know about the specifics of the telescopes sold by Peter Dollond.<sup>74</sup> More importantly for my specific aims of examining the early presence of expertise in the courtroom, their analysis demonstrated just how technical, intricate, and discipline specific the arguments of Champneys, Stedman and Eastland were. Willach compared the descriptions of John Dollond's existing lens with a diagram that was published in an optical textbook in 1759 and deduced that the Dollonds' refracting telescope c. 1758 employed a Flint Forward Spherical (FFS) doublet. As illustrated in Figure 1 the concave flint lens receives light first which is then focused by the spherical crown glass. He showed that this was very similar to an early version of the renowned John Dollond telescope, a device that "astronomers traveled to London to buy...kings and princes collected,...practical opticians tried to copy them, and theoreticians set about mathematizing the surprising result."<sup>75</sup>

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<sup>74</sup> Willach, "New light on the invention of the achromatic telescope objective", 195-210; Rolf Willach "personal communication" with Sorrenson, "Dollond & Son's Pursuit of Achromaticity", 37-40; footnote 21, 24.

<sup>75</sup> *Ibid*, 35.

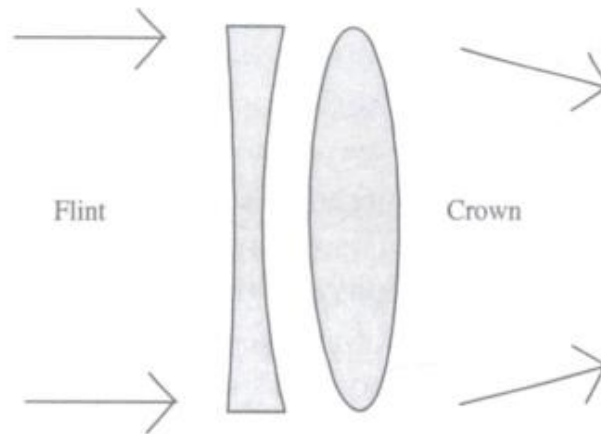


Figure 1: The FFS Doublet<sup>76</sup>

However, by 1766 and with a design that may have been finalized as early as 1760—two years after the patent was successfully filled by Watkins—Dollond was no longer selling his FFS telescope. Instead, Peter, perhaps in concert with his father, had engineered a “most brilliant and simple” improvement that—despite attempts at imitation—remained exclusive to telescopes manufactured by the Dollonds.<sup>77</sup> The crown and flint glass were swapped so that the crown glass received the incoming light first. Not only did this improve the longevity of the telescope as the crown glass weathered better but by changing the ground radius of the flint concave glass from spherical to aspherical a significantly sharper image was produced with this Crown Forward Aspherical (CFA) design.

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<sup>76</sup> Diagram from Sorrenson, “Pursuit of Achromaticity”, 38.

<sup>77</sup> Willach, “New light on the invention of the achromatic telescope objective”, 205.

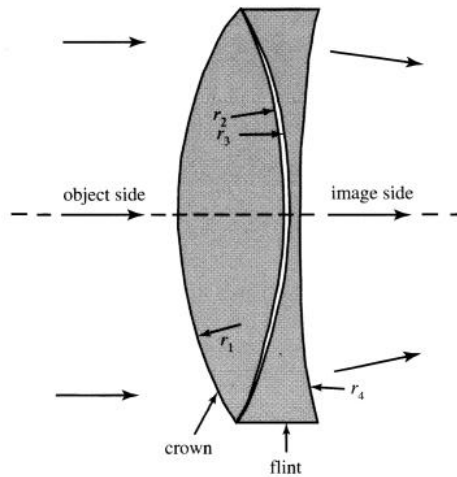


Figure 2: The CFA Doublet<sup>78</sup>

Based on analysis of surviving Dollond telescopes in the CFA configuration, at some point Peter figured out that by adding a light and very brief polish around the outermost edges of the now internal flint glass “the spherical aberration of the entire lens was removed” without compromising achromaticity.<sup>79</sup> These design improvements were inclusive of new methods, specifically the extra brief polish, made Dollond’s CFA “the classic ‘English’ design for achromatic doublets into the 1820s.”<sup>80</sup> This successful new design was clearly not what John had patented in 1758, since all these iterations postdate the patent. This new design must have originated in the trials conducted by Peter which therefore made his 1765 round of suits even more audacious, since he was by now selling a telescope that was not covered by the original patent.<sup>81</sup>

Sorrenson has argued that such a technical question was beyond the law courts of the 1760s. However, two qualifications are instructive to draw a fuller picture: Firstly, the

<sup>78</sup> Diagram from Willach, “New light on the invention of the achromatic telescope objective”, 206.

<sup>79</sup> Sorrenson, “Pursuit of Achromaticity”, 38; Willach, “New light on the invention of the achromatic telescope objective”, 208.

<sup>80</sup> Sorrenson, “Pursuit of Achromaticity”, 38; *Ibid*, 206; For the optical parameters of Dollond’s FFS and CFA doublet see: Igor Nesterenko, “Remarks to the Article: ‘New Light on the Invention of the Achromatic Telescope Objective’”, *arXiv: History and Philosophy of Physics*, 1-2, 7-6.

<sup>81</sup> Sorrenson described Peter’s suits as “of dubious morality and practicality”; “Dollond & Son’s”, 39.

vagueness of Dollond's patent as accepted by the Lord Chancellor on behalf of the king was evidently an asset, and it was possible that the new method suggested in the Dollond patent had always been this extra polish. Secondly, the defendants did implore the court to consider the technical details or lack thereof in Dollond's specification. It is true that no optician named in the suits specifically drew attention to more recent developments in Dollond's telescopes, but they did very explicitly draw attention to how clueless they were in regard to both the method of construction and the physical composition of Dollond's doublet. Indeed, based on Champneys' deposition it seemed that his own knowledge about achromatic lens construction was based on "the Quere", a crude recipe for an achromatic flint-crown glass combination.<sup>82</sup> In all probability the lenses that Champneys was selling, and which put him in violation of Dollond's patent, were nowhere near the same quality as Dollond's.<sup>83</sup>

By November 28, 1765, once Champneys, Stedman, Eastland, Watkins and Smith had submitted their "answers", the pretrial proceedings could enter the pleading stage in which the plaintiff and defendant could continue to submit interrogatories and rejoinders until the case was either settled pretrial or continued to a trial.<sup>84</sup> Dollond clearly never had any intention of taking all five spectacle makers to court, and only one trial was necessary to test Mansfield's ruling, assert his patent and solidify his monopoly. It has been noted that Dollond's test case was a risky endeavor—and considering the flexible nature of patent law it certainly was—but more than anything it was an exceedingly well-calculated risk. As part of these calculations Dollond singled out Champneys as the man to actually bring to trial. Champneys was a newer member of the trade who the personal wealth, and as a member of the Stationers Company he lacked the likely backing of Dollond's frequent rival: the

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<sup>82</sup> Gee, *WDTC*, 176, 179.

<sup>83</sup> *Ibid*, 184-7; Champneys went as far as running advertisements in the *Gazetteer and New Daily Advertiser* such as: "REFRACTING TELESCOPES With a compound OBJECT GLASS" after being issued his suit. *Burney Newspapers Collection*; Gale Primary Sources Z2000350777, *Gazetteer and New Daily Advertiser*, August 13, 1765, Issue 11 363 (London), 1.

<sup>84</sup> Gee, *WDTC*, 184-7; Champneys, Stedman and Eastland answered about a month before Watkins and Smith.

Spectaclemakers' Company.<sup>85</sup> Watkins and Smith were of little use in reaffirming a precedent since a case had already been decided against them, while Eastland was well established and as Gee points out "might well have reacted more assertively than Champneys."<sup>86</sup> Finally, it would seem that Stedman was not in violation of the patent since he was producing achromatic object glasses through a license. Contemporary coverage of the case by both *The Gentleman's Magazine: And Historical Chronicle* and *Gazetteer and New Daily Advertiser* indicates that the case was tried in the lower Court of Common Pleas. This seriously minimized the risk of an unfavorable outcome for Dollond, since it was highly controversial as well as unusual for a recently issued King's Bench ruling to be struck down by a lower court.<sup>87</sup>

Dollond's calculations played out on Tuesday, February 18, 1766, at common pleas before Lord Camden. Although the detailed records of the case have been lost since 1886, as the *Gazetteer and New Daily Advertiser* reported, much like Dollond's 1763 trial, this case was also heard before a "special jury."<sup>88</sup> Without direct records of the trial, what transpired during the proceedings must be inferred by using the surviving pretrial pleas in conjunction with the reported outcome. What remains is a snapshot into what Champneys's legal counsel was prepared to argue going into trial. Nevertheless, the limited surviving pleading records provided direct insight into the agreed-upon effort the defense made when it came to presenting fellow lens makers to challenge the vitality of Dollond's specification. Assuming the prepared argument was executed as planned, Champneys's counsel tried to get the judge to adjudicate specifically the matter of Dollond's patent specification. Fellow instrument makers, John Bird and Robert Rew, were called by the defense, most likely to bolster

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<sup>85</sup> Gee, *WDTC*, 183-4.

<sup>86</sup> *Ibid.*

<sup>87</sup> *Gentleman's Magazine*, 36 (February 18, 1766), 102; *Burney Newspapers Collection*; Gale Primary Sources Z2000354022, *Gazetteer and New Daily Advertiser*, February 20, 1766, Issue 11 527 (London), 1.

<sup>88</sup> *Gazetteer and New Daily Advertiser*, February 20, 1766, 1.

Champneys's own attack on the lack of constructive instructions present in Dollond's patent.<sup>89</sup> Bird, Rew and Champneys' probable testimony was based on the arguments previewed during their pleadings, the feasibility of replicating Dollond's patent, and rooted in their professional experience and authority as opticians; it was—in all but official designation—the testimony of expert witnesses. This is because they likely instructed a jury as to what knowledge an optician in fact needed in order to duplicate a patent. Yet, to their frustration, Lord Camden had little choice but to reinforce Mansfield's recent clarification on the matter of Dollond's patent.<sup>90</sup>

The matter was practically settled since Dollond's priority in actually filing for a patent, disregarding the quality of the patent, was not in dispute. As a result, as *The Gentleman's Magazine* reported the matter, "after a long trial, it appearing to the satisfaction of the court and jury, that the plaintiff had been greatly injured, and put to great expense by unlawful combinations to defeat him of the benefit of his patent, a verdict was given in favor of the plaintiff, with £150 damages."<sup>91</sup> The financial penalties forced Champneys into bankruptcy, and by 1772 he had little choice but to close his workshop and liquidate his possessions.<sup>92</sup> Dollond had once again capitalized on Mansfield's solo emphasis on original commercial viability as a means to evade any issue about the technical faults of his father's patent.

MacLeod's summation that eighteenth-century "patentees dreaded the law courts" most certainly did not apply to Peter Dollond.<sup>93</sup> No less than twelve times Dollond effectively leveraged and reinforced the foothold Mansfield had awarded him in 1763 when elevating

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<sup>89</sup> Gee, *WDTC*, 187.

<sup>90</sup> What was actually said is in dispute see footnote 134; The contemporary published newspaper accounts did not record Camden's exact language.

<sup>91</sup> *Gazetteer and New Daily Advertiser*, February 20, 1766, 1; *The Gentleman's Magazine* reported the damages at £250.

<sup>92</sup> Gee, *WDTC*, 188-189.

<sup>93</sup> MacLeod, *IIR*, 73.

clear public disclosure as the true threshold for a new invention.<sup>94</sup> Moreover, his legal success was rooted in encouraging the court to turn away from the sometimes literally present expert witness. Of course, Dollond only had so much to do with Mansfield's economically minded initial ruling. However, after a favorable ruling was handed down, Peter Dollond made the absolute most of his vindicated patent rights by aggressively pursuing pirates and expanding his specialist business. This success continued despite the consistent attempts by rival opticians to present further specific and technical knowledge as to why Dollond's patent specification ought to be void. Although the emphasis on the specification was not tactically successful, there clearly was an appetite and existing history of asking the court to decide on the technical matter of specifications. Per usual, Lord Mansfield was not satisfied in allowing an active area of law to remain underdeveloped or inadequately prepared to grapple with the clear questions before it. Enter *Liardet v. Johnson* a case tried twice, first on February 21, 1778 and then on July 18, 1778, in which Mansfield not only stipulated justiciable standards for the patent specification but also permitted, in all but codification, extensive expert testimony.<sup>95</sup> As Mansfield's and his peer the Right Honorable Sir Francis Buller's surviving trial notes and jury instructions made clear, there is no doubt that chemists, plasterers, and architects gave their opinions on the stand which a special jury considered in their deliberations. It is this unequivocal early performance of the expert witness that shall be examined in the next section.

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<sup>94</sup> In total Peter brought twelve bills of complaint against rival opticians; Gee, *WDTC*.

<sup>95</sup> Date of first trial: "Table of Cases: Intellectual Property" in Oldham, *MM*, 738; Corroborated by newspaper accounts see footnotes 177 and 17. Date of second trial taken from: John N. Adams & Gwen Averley, "The patent specification the role of *Liardet v. Johnson*", *The Journal of Legal History* 7, no. 2 (1986), 164; Corroborated by: *Burney Newspapers Collection*; Gale Primary Sources Z2000938706, *Morning Post*, July 20, 1778, Issue 1759 (London), 2.

***Liardet v. Johnson***  
**The Patent Specification Receives Formal Legal Standards**  
**(1777–1778)**

Mansfield’s landmark ruling in *Liardet v. Johnson* has long been recognized and discussed as making an essential contribution to patent law jurisprudence.<sup>96</sup> However, this decision has not always been viewed in a positive light. The early twentieth-century legal historian Edward Wyndham Hulme regarded this landmark trial as an unfortunate example of legislating from the bench.<sup>97</sup> Hulme’s charge was, in part, that extra scrutiny placed on the patent specification after *Liardet v. Johnson* loaded further burdens on the already arduous and risky process of inventing, thereby undermining the intended stimulative effect of the Statute of Monopolies.<sup>98</sup> William Searle Holdsworth, a contemporary of Hulme reached much the same conclusion on the landmark yet detrimental nature of *Liardet* in establishing the necessity of “written disclosure.”<sup>99</sup> Over a century later, Bottomley in his treatment of *Liardet v. Johnson* also emphasized how consumed the trial became with the details of Liardet’s specification writing, noting that “either both sides managed to anticipate the importance Mansfield would attach to the specification (a remote possibility if this was indeed unprecedented), or it was commonly known that the validity of the patent would rely on the accuracy of the specification.”<sup>100</sup>

Yet, as shown by my analysis of Dollond’s trials, Mansfield had not previously focused on the specification, although many opticians, such as Champneys, Stedman, and Eastland, had attempted to invoke the specification requirement in argument.<sup>101</sup> To some

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<sup>96</sup> Oldham, *MM*, 723.

<sup>97</sup> Hulme, E. Wyndham, “On the Consideration of the Patent Grant Past and Present,” *Law Quarterly Review* 13, no. 3 (1897): 317.

<sup>98</sup> Hulme, “On the Consideration of the Patent Grant, Past and Present”, 317.

<sup>99</sup> For an overview of the early twentieth century literature: Adams & Averley, “*Liardet v. Johnson*”, 156-62.

<sup>100</sup> Bottomley, *BPS*, 91.

<sup>101</sup> Gee, *WDTC*, 184-7; Earlier cases, outside of common law, had seen inventors invoke vague specifications as grounds for voiding: *Bell v. Heath* (1736) and *Wilkinson v. Sunderland* (1752); Bottomley, *BPS*, 90.

extent, John N. Adams and Gwen Averley's treatment of *Liardet v. Johnson* affirms this position, as they note, by late eighteenth century standards the case was remarkably technical, lengthy, and expensive due to the trials' singular focus on interpreting patent specifications.<sup>102</sup> However, Adams and Averley argue that despite this uniqueness, the importance of the trial in regards to the adjudication of the patent specification has subsequently been greatly exaggerated. Their reasoning is that patent specifications had been a mandatory part of the patent filing process for some time.<sup>103</sup> As we have seen, this is certainly true, and by the time of Dollond, the clarity and detail of specifications was rapidly rising. Additionally, Adams and Averley fail to take into account that while individual Lord Chancellors had considered patent specifications in select cases, the common law courts had not.<sup>104</sup> Indeed, common law had only held clear jurisdiction for some twenty-five years, not the full sixty-six years over which a patent might have been submitted with a specification.<sup>105</sup>

As a result, the common law courts were by no means guaranteed to issue relief pre-*Liardet v. Johnson* due to a faulty specification. This is precisely what Lord Camden had done when he ignored the litany of expert testimony as to why Dollond's specification did not satisfactorily describe his achromatic doublet. Just over a decade later, the *Morning Post* in its February 23, 1778 issue noted that: "some of the most eminent and experienced architects, plasterers and builders gave the most ample testimony of the novelty and utility of the plaintiff's invention, and that till it came into use they knew no stucco that would, in this climate stand on the outside work exposed to the weather."<sup>106</sup> Evidently, the opinions of trade

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<sup>102</sup> Adams & Averley, "*Liardet v. Johnson*", 171.

<sup>103</sup> *Ibid*, 160-2.

<sup>104</sup> The records are sparse, yet some examples included a 1731 petition against Robert Hamblin and a 1736 Chancery trial: *Bell v. Heath*; Bottomley, *BPS*, 89-90.

<sup>105</sup> Adams & Averley provide the date of 1711 as the first patent specification; Adams & Averley, "*Liardet v. Johnson*", 158; As previously noted it would not become a full requirement until 1742; Bottomley, *BPS*, 38, 46.

<sup>106</sup> *Burney Newspapers Collection*; Gale Primary Sources Z2000937245, *Morning Post*, February 23, 1778, Issue 1667 (London), 2

professionals at trial would not now be sidestepped, and the expert witness had fully entered into the courtroom as a partisan expert witness.

*Liardet v. Johnson* was covered extensively in the press, with its proceedings also reported in *The Public Advertisers*, *The St. James's Chronicle*, and *The London Chronicle*.<sup>107</sup> Filling in the gaps, both parties made ample use of publicly published pamphlets to lambast the opposition, often citing favorable excerpts from the who's who of experts present at trial.<sup>108</sup> Perhaps contributing to the public interest was the drama surrounding the participants, specifically Robert Adam. Along with his three brothers John, James, and William, Robert had on May 20, 1774 entered into partnership with Liardet and for the sum of £500, paid in two installments, had received the right to work with Liardet's stucco.<sup>109</sup> Equipped with Liardet's special oil-based stucco, Robert, a renowned Scottish architect and decorator, made major alterations to the country estate of fellow Scot Lord Mansfield. Inclusive of the remodeling, the south front was resurfaced with stucco "prepared according to Liardet's specification."<sup>110</sup> As such, when Liardet took Johnson to trial for infringing on his patent the Adam brothers joined the title on the side of the plaintiff only to appear before their former employer Lord Mansfield. As Adams and Avery point out, this gave rise to allegations of bias, which at least partially explains why Mansfield was ready to grant a new trial, despite

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<sup>107</sup> *Burney Newspapers Collection*; Gale Primary Sources Z2001163698, *Public Advertiser*, February 23, 1778, Issue 13533 (London), 3; *Burney Newspapers Collection*; Gale Primary Sources Z2001282838, *The St. James's Chronicle or The British Evening Post*, February 21-24, 1778, Issue 2634 (London), 1; *Burney Newspapers Collection*; Gale Primary Sources Z2000567414, *London Chronicle*, February 21-24, 1778, Issue 3311 (London), 6.

<sup>108</sup> From the defense: *The Making of the Modern World*; Gale Primary Sources U0101790408, *An Appeal to the public on the right of using oil-cement, or composition for stucco, &c....* (J. Hand, 1778); Observations on two trials at law, respecting Messieurs Adams's new invented patent stucco, etc. (Printed for Fielding and Walker in Pater Noster Row, 1778); From the plaintiff: "A Reply to Observations on Two Trials at Law..." (Printed for J. Bew in Pater-Noster-Row, 1778).

<sup>109</sup> Adams & Averley, "*Liardet v. Johnson*", 162.

<sup>110</sup> Oldham, *MM* vol. I, 750; Norman S. Poser, *Lord Mansfield* (London, 2013), 329.

the almost identical evidence being presented.<sup>111</sup> Curiously enough, he still presided over the second trial and the jury still handed in a ruling in favor of Liardet.<sup>112</sup>

This trial, shrouded in controversy and replete with colorful out-of-court exchanges, offers a rich body of primary sources to draw upon. It is these sources, most notably Mansfield's and Buller's own case notes, on which I will base my analysis.<sup>113</sup> Firstly, a short overview of the dispute that resulted in the first trial will be presented. The next and final section will place Mansfield's trial notes front and center as they illuminate the specific emphasis he personally placed on the technical nature of the testimony before him. This study of Mansfield's clear deference to informally permitted expert testimony demonstrates unequivocally the formalizing rather than revolutionizing role of *Folkes v. Chadd* four years later.

### **Patenting an Oil-Based Stucco**

John Liardet, a Swiss-born protestant clergyman, studied natural philosophy and conducted experiments in chemistry during his spare time.<sup>114</sup> Such explorations were evidently successful and on April 3, 1773 he was granted a patent for “a composition or cement for all the branches concerning buildings to which the same is applicable.”<sup>115</sup> On August 3, 1773, Liardet successfully enrolled his patent specification at the Court of Chancery.<sup>116</sup> To modern readers his invention, most commonly called ‘cement’ during the trial, is recognizable as stucco: an ornamental surfacing material applied to the façade of buildings to resemble the texture of stone. Originating in the Italian city states and made

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<sup>111</sup> Adams & Averley, “*Liardet v. Johnson*”, 164.

<sup>112</sup> *Ibid.*

<sup>113</sup> As printed in Oldham, *MM* vol. I.

<sup>114</sup> Quoted in Adams & Averley, “*Liardet v. Johnson*”, 162. This language is generally attributed to collaboration with Frank Kelssa. Such language does not appear in his published paper on the subject: Frank Kelsall, “Liardet versus Adam”, *Architectural History* 27, (1984), 118-26.

<sup>115</sup> “Liardet's Patent” in Appendix I. d.

<sup>116</sup> *Ibid.*

famous with the villas and country homes designed and constructed by Andrea Palladio, the Palladian architecture movement did not gain momentum in England until the mid-eighteenth century.<sup>117</sup> The English architect John Gwynn strongly favored the incorporation of stucco but as his 1766 treatise explained with regret, stucco did not favor England: “It is to be lamented that encouragement is not given to some ingenious person to find out a stucco or composition resembling stone, more durable than the common sort.”<sup>118</sup>

Stucco was normally made with lime, sand, and water, and did not hold up well in England’s wet and cold climate. To compensate for this, Liardet incorporated lead (white, red or “calx lead”) and oil.<sup>119</sup> The lead acted as a drying agent and the oil turned the stucco to a more putty-like consistency.<sup>120</sup> Resultantly, the stucco could withstand water content better. The Duke of Northumberland was pleased with Liardet’s improvements and put him in contact with the successful Adam brothers, so that Liardet’s stucco could see wider use.<sup>121</sup> Clearly, these efforts were met with success as on May 13, 1776 Parliament passed an act reasserting Liardet’s patent, setting prices and as only a parliamentary act could do, it extended the monopoly for an additional eighteen years from the date of the bill’s passage.<sup>122</sup> The bill noted the dual values implicit in the patent: Liardet’s justly owed compensation for such an invention and the public’s ability to use such an invention without the price consistently escalating due to demand. The bill argued that without the extended protection offered by this act of parliament:

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<sup>117</sup> Andrea Palladio in “The Editors of Encyclopaedia Britannica”, *Encyclopedia Britannica*, July 28, 2022; S. R. Wassell, “Andrea Palladio (1508-1580)”, *Nexus Network Journal* 10, no.2 (2008), 213-26; Poser, *Lord Mansfield Justice in the Age of Reason*, 329; John Harris, *The Palladian Revival* (Yale University Press, 1994).

<sup>118</sup> John Gwynn, *London and Westminster improved, illustrated by plans....* (Printed for the author 1766), 83; Quoted in Kelsall, “Liardet versus Adam”, 118.

<sup>119</sup> Ingredients as described during the trial: Oldham, *MM* vol. I, 749.

<sup>120</sup> Adams & Averley, “*Liardet v. Johnson*”, 164, 172.

<sup>121</sup> *Ibid*, 162; Poser, *Lord Mansfield Justice in the Age of Reason*, 329.

<sup>122</sup> Appendix I. g.

it will neither be possible for the said John Liardet to receive an adequate recompense for his labor, expense and time, nor for the public at large to reap the various advantages in point of utility and economy, as well as ornament in building, which would arise from this invention were its uses universally diffused, and its price lowered.<sup>123</sup>

Proviso 6 of the bill required Liardet to reenroll an updated patent specification within four months. Although Liardet did not re-file until September 4—three months past the deadline—his tardiness was not a problem.<sup>124</sup> Business resumed and continued without any legal disruptions at a now set price of sixpence per foot square on plain building surfaces “and twopence per foot as aforesaid for arises.”<sup>125</sup>

By 1766 John Johnson had begun in earnest his career as a “speculative builder.”<sup>126</sup> Based in London he made a name for himself with his country homes mostly located in Essex, Northamptonshire, Devon, Suffolk, and Glamorgan. On March 29, 1777 Johnson visited the Chancery Offices in Westminster and successfully filed a letter patent for “A Cheap and Durable Composition for the Covering the Fronts and Tops and Ornamenting of Houses and Buildings, and for other Purposes in the Building Trade, and which will adhere to Surfaces that are Wet as well as those that are Dry, at any Season of the Year.”<sup>127</sup>

Johnson’s initial filing included his ingredient list and the corresponding ratios as follows: “take any quantity of the serum of blood, to which add an equal quantity of linseed oil; mix this liquid with a quantity of dry large-grained river sand or other sand cleared from

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<sup>123</sup> “An Act for vesting in John Liardet, his, &c., the sole use and property of a certain composition or cement of his invention throughout his Majesty’s kingdom of Great Britain for a limited time”, Quoted in Appendix I. g.

<sup>124</sup> Adams & Averley, “*Liardet v. Johnson*”, 162.

<sup>125</sup> Webster, *Reports*, 53; aris: “The sharp edge formed by the meeting of two flat or curved surfaces”, *OED Online* (Oxford University Press), September 2022.

<sup>126</sup> Nancy Briggs, “Johnson, John (1732–1814), architect” *ODNB*.

<sup>127</sup> “Johnson’s Specification”, *The British Library: Business & IP Centre*, GB177701150A, 1; See Appendix I. h.

its loomy particles, and slaked lime or whiting sufficient to make the composition or cement of the consistence of stiff mortar”.<sup>128</sup> The fact that someone had filed a patent for an oil-based stucco must have been brought to Liardet’s attention because in early May 1777, barely a month after Johnson’s filing, Liardet, joined by the Adam brothers, filed an injunction against Johnson. This was shortly followed up with a formal Bill of Complaint clarifying Johnson’s infringement.<sup>129</sup> During the ensuing pretrial pleading Johnson returned to Westminster and successfully enrolled his patent on July 25, 1777 just thirteen days after being served an injunction which prevented him and his servants Edward Downes and Edward Bellman (also named in the original complaint) from making, using, or selling Johnson’s particularly recent invention.<sup>130</sup> Johnson in his answer offered a dual line of attack: first he pointed to a series of publications—two additions of *A New and Universal Dictionary of Arts and Sciences* published in 1751 and 1764—as well as Charles Rawlinson’s roofing patent, as publicly disseminated examples of an oil-based surfacing material. Therefore, Liardet’s patent was not sufficiently novel. Secondly, he argued that he had a genuinely new form of stucco due to his incorporation of “serum of blood” which was probably oxen blood.<sup>131</sup> Liardet, the Adams brothers and the council responded by formally bringing an action against Johnson at the King’s Bench on four counts which equated to the “using and counterfeiting a certain invention of the plaintiff’s without his license.”<sup>132</sup> As the King’s Bench under Mansfield had been transformed into the most popular of the three central courts, the once overburdened

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<sup>128</sup> “Johnson’s Specification”, Appendix I. h.

<sup>129</sup> Adams & Averley, “*Liardet v. Johnson*”, 163.

<sup>130</sup> Date of commencement listed as part of “Johnson’s Specification”, 317.

<sup>131</sup> “The Several Answers of John Johnson, Edward Downes and Edward Bellman, Defendants to the Bill of Complaint of John Liardet, John Adam, Robert Adam, James Adam, William Adam Complainant, May 1777” Quoted in Adams & Averley, “*Liardet v. Johnson*”, 163.

<sup>132</sup> Oldham, *MM* vol. I, 748.

Court of Common Pleas was now reduced to a “sleep[y] hollow” and would not hear the case until the start of the next year.<sup>133</sup>

### **A Chemist Testifies Adjudicating the Patent Specification**

This time the trial centered almost entirely on the specificities of Liardet’s patent. This shift in tone and substance from the manner in which *Dollond v. Watkins* and *Dollond v. Champneys* were adjudicated, is made clear from the very start of Mansfield’s surviving trial notes which began by listing, likely for continued reference, the exact make up of “plaintiff’s specification: sand, &ca., white or red lead, or calx lead, calcareous earth, oil.”<sup>134</sup> Calx lead refers to either burnt or roasted lead, a process designed to “drive off all volatile parts” while calcareous earth is a synonym for limestone.<sup>135</sup> More recent historians, specifically, Frank Kelsall, John Adams and Gwen Averley, who have examined *Liardet v. Johnson* all concur with some sarcasm that “the trial, which should have been on the law of patents, rapidly turned into a trial of the relative merits of the cements.”<sup>136</sup> In fact, within their mild exasperation lies the heart of this chapter’s thesis: the adjudication of patent disputes at common law eventually required the integration of inventions in a legal context. This interrogation was necessarily a dispute between skill professionals, the patent holders and their peers, and as such opinion laden expert testimony was smuggled into the courtroom by way of adjudication of the patent specification.

As the intense technical details of the Dollond object glass disputes also illustrated, by the eighteenth century inventions and by extension patents had become not only more iterative, that is refining inventions in existing disciplines, but also the inventions themselves

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<sup>133</sup> J. B. Atlay quoted in Baker, “Uniformity and Abolition” in *Introduction to English Legal History*.

<sup>134</sup> Oldham, *MM* vol. I, 749.

<sup>135</sup> See *Ibid*, 751; Definitions taken from *OED*.

<sup>136</sup> Adams & Averley, “*Liardet v. Johnson*”, 164; Frank Kelsall, “*Liardet versus Adam*”, 118-26.

took on ever escalating complexity.<sup>137</sup> This increase in complexity was mirrored by the letter patent itself which between the sixteenth and mid-eighteenth century transformed from a generalized exclusive right to a natural resource or broadly defined industry into a technical description of novel improvements for further perfecting of an existing invention.<sup>138</sup> If the patent system was to be enforceable, preserve invention, and consider what in fact was a new invention the courts had to get involved with increasingly technical disputes. In short, in order to issue a ruling on the patent forgery dispute at the heart of *Liardet v. Johnson* the King's Bench and jury had to be able to recognize if there were genuine differences in Liardet's and Johnson's stucco.

The early testimony of the trial focused on clarifying the makeup of the plaintiff's and defendant's stucco and untangling what component parts of stucco were general trade knowledge that predated both patents and as such could legally be used by both. James Hollis, whose specific profession is not labeled by Mansfield, clarified to the court that he was employed by the Adam brothers. As conveyed by Mansfield's shorthand Hollis always mixed the stucco according to Liardet's specification and he "never used serum of blood."<sup>139</sup> Furthermore, he emphasized that as far as he knew, the stucco "if properly executed" had never failed due to water damage.<sup>140</sup> Robert Taylor, who Mansfield noted is an architect, seconds that he "never known it [to] fail. I have a very good opinion of it... I never knew an oily composition answer before. I prefer this to any."<sup>141</sup> This is the first but not last time that Mansfield would underline a specific element of given testimony. Taylor's testimony stands out as he asserted on the witness stand that, in his opinion as a working architect, this is the

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<sup>137</sup> Hulme, "On the Consideration of the Patent Grant, Past and Present", 317 quoted in William Searle Holdsworth, *History of English Law* 11, (Sweet and Maxwell, 1938), 427.

<sup>138</sup> *Ibid.*

<sup>139</sup> Oldham, *MM* vol. I, 749.

<sup>140</sup> *Ibid.*

<sup>141</sup> *Ibid.*

first stucco to employ oil, just as Liardet alleged, and the stucco is superior specifically because of this addition. There is no indication that Mansfield viewed such testimony as unusual or otherwise an unfit example of speculation in his courtroom. If anything, the reverse is true, since Taylor had informed the court and jury on the facts that as the plaintiff alleged their invention is truly new, noteworthy and consequently patentable. Of course, experts such as Taylor were very likely to be favorable as they had been called by the plaintiff. In turn, the defense was permitted a similar slate of experts.

Mirroring the start of the trial the first named witness was James Downe, one of the men who mixed Johnson's stucco and who clarified the use of "serum blood" as a key ingredient to be added to the oil.<sup>142</sup> Recalling that Johnson had alleged that Charles Rawlinson's patent for roof slates made Liardet's specification insufficiently novel, Johnson had Rawlinson called as a friendly witness. His testimony was not particularly helpful as he eventually conceded that his earlier "discovery [of cement] might vary in some respects."<sup>143</sup> Rawlinson must have been pressed on this fact, as Mansfield recorded the ingredient list underlining distinctions and changes over time. The court recognized that Rawlinson never used limestone and although he claimed that he began to use sand during the first few months of 1773 this addition was never included in his published account. Downe further testified that "serum blood" and "oil" were used in Johnson's stucco; this effectively affirmed that Johnson's stucco was made as his patent claimed.<sup>144</sup> However, the testimony of Bryan Higgins, described as a chemist by Mansfield, successfully challenged that Johnson produced stucco as he claimed.<sup>145</sup> Although still in the early years of his career, by 1778 Higgins was

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<sup>142</sup> Oldham, *MM* vol. I, 749.

<sup>143</sup> *Ibid*, 750.

<sup>144</sup> *Ibid*, 749-51.

<sup>145</sup> Mansfield's notes do not identify Higgins by first name. At the time Higgins was working on his own improved cement which he patented in 1779: Adams & Averley, "*Liardet v. Johnson*", 174; F. W. Gibbs, "Bryan Higgins and his Circle" in A. E. Musson, ed., *Science, Technology and Economic Growth in the Eighteenth Century* (Routledge, 2009), 195-207; Knight, "Higgins".

not an anonymous chemist. As of 1770 he had opened a “school of practical chemistry” in Soho and successfully sold the first compilation of his lectures in 1775.<sup>146</sup> The following year he pushed the results of his experiments on the freezing of sea water.<sup>147</sup> A known experimental chemist and seasoned lecturer Higgins was the ideal expert to clearly and authoritatively articulate his findings conducted on behalf of Liardet and his legal team.

Higgins was commissioned to test the stuccos used by both parties but because he was hired by Liardet the sample used as a control for Johnson’s work was simply taken from a house Johnson had previously plastered.<sup>148</sup> In contrast it appeared that Liardet or the Adams brothers provided Higgins with samples with which to test their mixture.<sup>149</sup> Higgins’s first finding, based on six experiments with various stucco mixtures, was that “serum blood [makes] no difference.”<sup>150</sup> This finding was damning enough as it suggested that Johnson’s apparent new method was purely superficial, yet his account of his most damaging finding was recorded last by Mansfield: “I made experiments, No. 1,2, 3, 4, 5.....No. 1, 2, 5 [and used] the same ingredients as [the] plaintiff’s [there was] a difference between 3 & 4 A substantial difference [in test] No. 3. [which contained] No lead. White. Sand, lead, or calx of lead, calcareous earth [which are the] only matter [in the] Plaintiff’s ingredients.”<sup>151</sup>

To clarify, Higgins had initially confirmed that serum of blood affected the stucco and that the biggest factor by far in the quality of the stucco was the presence of lead as found by experiment number 3. However, Johnson’s wall-derived sample was not substantially different from the stucco of Liardet. This was essential because according to the letter of Johnson’s patent his stucco should not have lead in it and if Johnson’s stucco was without

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<sup>146</sup> David Knight, “Higgins, Bryan”, *ODNB* (2004).

<sup>147</sup> *Ibid*; Brian Higgins, *Observations of the Floating Ice....* (C. Heydinger, 1776).

<sup>148</sup> Adams & Averley, “*Liardet v. Johnson*”, 164-5.

<sup>149</sup> *Ibid*.

<sup>150</sup> Oldham, *MM* vol. I, 749.

<sup>151</sup> *Ibid*.

lead, as Johnson claimed, it should more resemble stucco 3 than Liardet's sample. In no uncertain terms Johnson was lying because he had not finished houses with the stucco he had patented; his stucco just like Liardet's contained lead! When the trial began the emphasis was on Johnson's novel inclusion of serum of blood and whether Liardet's use of oil (which Johnson clearly was using) was a novel invention of Liardet. However, experiments had unintentionally revealed that the presence, or lack thereof, of lead significantly changed the behavior of stucco therefore Johnson must have been confronted about what exactly was in his stucco.<sup>152</sup> What this exchange between lawyers, plaintiffs and defendants in the ever-crowded halls of Westminster looked like is not known—all that is preserved are Mansfield's reserved note: "[It was] admitted [that the] defendant used that composition".<sup>153</sup> With the exception of blood serum which appeared to make no difference the resulting two stuccos were just about identical. Johnson's camp, likely in an attempt to draw attention away from Johnson's evident deception, aggressively parodied the experimental work done by Higgins as they questioned the credulity of his work that revealed the serum of blood:

On which occasion Lord Mansfield observed, 'the doctor seemed to be very impartial between the parties, acting like a philosopher rather than any thing else;' thus ironically insinuating, as it is said, that his evidence was of little or no consequence to either. But let the doctor's own words speak both for his motives and actions....Let the world judge if an adept capable of decomposing aliment, so levigated by the animal organs or secretia and excretia as mush have been the calipash, palipee, marrow pudding etc. abovementiond—Let the impartial world

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<sup>152</sup> The reason lead had such a significant effect on the properties of stucco is because lead acts as a drying agent. Adams and Averley note that Johnson's stucco specification did not produce a viable product as it lacked any driers; Adams & Averley, "*Liardet v. Johnson*," 171-2.

<sup>153</sup> Oldham, *MM* vol. I, 749.

judge, we say, if such an adept in chemistry can be incapable of discriminating in like manner the same quantum of sand, calcareous earth, linseed oils and calx of lead, made up in the form of stucco *Magna est veritas et praevalebit* [sic].<sup>154</sup>

Before the expert witness had yet to even be recognized, categorized and regulated it had already attracted controversy. Outside the courtroom Mansfield made an easy target due to his personal connection with the plaintiff. Indeed, during the trial, when Thomas Rose, a well-known plasterer, was called as a witness for Liardet, he testified to the quality of the stucco, claiming “[It has] infinite merit beyond anything yet discovered. I never knew anything before that would stand. This does.”<sup>155</sup> Yet his example of the durability of Liardet’s stucco was none other than Lord Mansfield’s own home where the stucco had survived for four years. As for Higgins’s role within the trial, his experience and impact are remarkably similar to that of Smeaton’s apparently landmark conduct a few years later.<sup>156</sup> Both were learned men who conducted research on behalf of their employer, a plaintiff before Mansfield’s bench. Both men went on to produce incontrovertible experimentally based evidence that was favorable to their employer. Finally, their employer ultimately won the case largely as a result of the unique evidence.

Higgins himself did not keep private the information he gleaned from his experimentation with stucco mixtures, nor did he seem to have ceased in his experimentations once the trial was concluded. On January 8, 1779 Higgins was guaranteed his own patent for a “water cement or stucco” which as detailed in his specification could be adjusted along a

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<sup>154</sup> “Observations on two Trials at law”, 12-3; “*Magna est veritas et praevalebit*” translates to “truth is mighty and will prevail”: L. Brent Vaughan, *Hill's Vest-pocket Latin-English and English-Latin Dictionary* (George M. Hill Co., 1900), xxxix

<sup>155</sup> Oldham, *MM* vol. I, 749, n.3; Mansfield identified this witness as “Joseph Rose” however Adams and Averley have clarified that this witness is in fact Thomas Rose; Adams & Averley, “*Liardet v. Johnson*”, 156, n.52.

<sup>156</sup> Chapter 3, 180-4, 160-6; Indeed, this similarity extends to all six engineers involved in the cases of *Folkes v. Chadd*; Golan, *Laws*, 30-40.

plethora of parameters depending on the requirements of the task.<sup>157</sup> Yet, further disclosure was provided by Higgins in a book published the following year which detailed across twenty-four subsections the constructions and finds of his many experiments on stucco mixtures conducted over two years.<sup>158</sup>

In the next half century expert testimony showed no sign of slowing down as technical knowledge occupied a place somewhere between (1) a necessity to engage with the alleged complaint and (2) a powerful argumentative asset which could persuade a jury. In the case of *Liardet v. Johnson* we saw the pressure that the patent specification placed on the court from the perspective of admitting experimental science—in the form of Higgins’s experiments—into the courtroom to try and resolve the factual disputes inherent in the cases. This trend of engaging with experimentation would only escalate during the turn of the century as will be explored in the following chapters. Dollond’s trials offer an interesting point of contrast in showing how desperately inventors tried to leverage technical knowledge in the face of a seemingly uninterested court. However, this was due to the interpretation of Mansfield’s narrow 1763 ruling and not necessarily because the court thought the testimony of opticians was secondary. To this very point, as some later law reports on *Dollond v. Champneys* suggest, Lord Camden was able to simultaneously uphold Dollond’s patent and assert Chester Hall as the original inventor.<sup>159</sup> What specifically caused Mansfield to expand his patent law jurisprudence between 1763 and 1778 cannot be said for certain. There appears to be no surviving notes on the Dollond case and Mansfield’s jury instructions, which stressed specific clarity standards for a patent specification, are not robustly drawn from existing case law. Mansfield’s biographer Norman Poser describes Mansfield’s ruling as

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<sup>157</sup> “Higgins Specification”, Appendix I. i.

<sup>158</sup> Of the book’s twenty-five sections in total one is his specification; Brian Higgins, *Experiments and Observations Made with the View of Improving the Art of Composing and Applying Calcareous Cements and of Preparing Quick-lime* (T. Cadell, 1780).

<sup>159</sup> See Webster, *Reports*, 42-3; Carpmael, *Law Reports*, 29-30; Blackstone, *Reports of Cases*, 469.

primarily “based on common sense” while Adams and Averley less favorably characterize Mansfield’s ruling as relying “on no authorities.”<sup>160</sup> Regardless of the language used to characterize Mansfield’s ruling he was unambiguously inventing new law.

Mansfield’s new multi-factor patent adjudication regime was based on three questions. First, Mansfield asked the jury to decide if Johnson had used Liardet’s patented invention. Next, they were to decide if the patent enrolled was in fact a new invention. Here, Mansfield turned to existing law, albeit without citation, as he drew upon his commercial standard first forwarded in *Dollond v. Watkins*. Finally, Mansfield asked the jury to consider if the specification was instructive in teaching other inventors how to make the patented invention. Mansfield’s language as recorded by his peer the Right Honorable Justice Buller states:

The meaning of the specification is that others may be taught to do a thing for which the patent is granted, & if the specification [is] false, the patent is void, for the meaning of the specification is that after the term [of the letter patent] the public shall have the benefit of the discovery....The specification here is that you may take the particular weight of one of the ingredients, and either will do. The weight [is] very material, as a man complains he can’t make it.<sup>161</sup>

This final step always required input from members of the field or craft being disputed at trial for the court had to ask skilled craftsmen or inventors what knowledge was needed for replication. As Mansfield stressed to the jury, even something that they might regard as insignificant such as the weight of a component part of stucco should be considered when

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<sup>160</sup> Poser, *Lord Mansfield Justice in the Age of Reason*, 330.

<sup>161</sup> Oldham, *MM* vol. I, 754.

upholding or striking down a patent especially when trade persons testify that such information is critical. The details were essential because an invention must be replicable based on the specifications for the patent to fulfill its role as a public good. It was the unclear use of materials upon which Champneys built out his attack on Dollond's specification. As has been extensively discussed, the Court of Common Pleas, largely due to the narrowness of Mansfield's earlier ruling, refused to engage with objections to Dollond's patent specification. However, in fairness to Mansfield, *Dollond v. Champneys* was not held before his bench. Additionally, when Watkins and Smith presented their case the emphasis was almost wholly on novelty rather than the exactitude of Dollond's specification. Chester Hall was summoned into court to claim he had made an achromatic doublet first, not to comment upon whether Dollond's specification was sufficiently instructive. As can be seen by Mansfield's second jury instructions in *Liardet v. Johnson* he reiterated the same novelty standard that he forwarded in *Dollond v. Watkins*. Perhaps Mansfield's expanded jury instructions of 1778 are more indicative of a judge—renowned for his creative responses to “the needs of a burgeoning commercial community”—who directed his full attention toward refining and expanding patent law as informed by the imperfect practice of said law in the intervening years.<sup>162</sup> Maybe, had Watkins or Smith focused their attack on the opaque nature of Dollond's patent, Mansfield's patent specification instructions would have been delivered fourteen years sooner. In such an imagined trial, in which Dollond's patent specification was litigated, the expert witness at trial would also have experienced an earlier birth.

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<sup>162</sup> Baker, “Uniformity and Abolition” in *Introduction to English Legal History*.

### The Contested Legacy of *Liardet v. Johnson*

The novel legal standards regarding the requirements of the patent specification were evidently internalized by the expert witness himself. Higgins's specification, which included variations on his base formula, depended on the requirements of the construction project. Some of the variants received discreet names such as "water cement fine grained" a mixture intended for a finished project with finer texture and intended to be used as a finished coat.<sup>163</sup> Other variations included a much cheaper yet coarser mixture intended to be mass-producible.<sup>164</sup> This variation is less expensive and its intended purpose as initial surfacing material meant that extra finesse in the finish was not necessary.<sup>165</sup> Notably, and in striking contrast to Dollond, Liardet, and Johnson, Higgins included the precise measurements needed to replicate not just his basic invention but all of his discoveries therein. For example, "water cement fine grained" used fifteen instead of fourteen pounds of limestone.<sup>166</sup>

Higgins provided even further details regarding his specification in his annotated and public reporting which comprised a section in his book, *Experiments and Observations Made with the View of Improving... Cement and Stucco*.<sup>167</sup> The description of Higgins's experiments comprised the majority of his book while footnotes provided further elaboration and corrections to the text of his specification as well as cite the relevant experiment that explained the rationale for his described formula.<sup>168</sup> For example, Higgins explains how the amount of wood ash in the mixture has a dramatic impact on the "plasticity" and "pongy" degree of the stucco, as it works to accurately determine the drying time of the mixture.<sup>169</sup>

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<sup>163</sup> "Higgins specification", Appendix I. i.

<sup>164</sup> Ibid.

<sup>165</sup> Ibid.

<sup>166</sup> Higgins, *Experiments... Made with the View of Improving...Cements*, 184-205.

<sup>167</sup> Ibid.

<sup>168</sup> See footnotes in "Higgins specification", Appendix I. i.

<sup>169</sup> "Higgins specification", Appendix I. i; Higgins, *Experiments...Made with the View of Improving...Cements*, 162.

Experiments in section XXI conducted over two years explored the varying threshold and principles for experimenting with the amount of bone ash in the final product.<sup>170</sup> In no case should the ratio of wood ash and lime exceed 1 to 1 or the structural integrity of the final mixture will be radically compromised without providing any beneficial tradeoff.<sup>171</sup>

This unprecedented amount of detail is no accident as Higgins showed a remarkable amount of legal due diligence throughout his work. Although the experiments regarding oil and oxen-blood commissioned by Liardet are mentioned in detail, there is no direct reference to the inventions of Liardet or Johnson. Rather, in an aside to the reader Higgins wrote:

I have studiously avoided strict comparisons of my cement or the best Roman cements, with the oil cements; because the best of these is private property; not doubting that my liberal readers will give this since a construction equally favorable to the proprietors and to me.<sup>172</sup>

Undoubtedly a reference to Liardet's monopoly, it is clear that Higgins's experience at trial had made him deeply wary of both being brought to trial for infringing any outstanding patents and concerned about his own patent's clarity being challenged. Moreover, the thoroughness of Higgins's specification further supports my claim that Mansfield's ruling in Liardet was generally understood by knowledgeable patentees and so the filing of a vague specification was pursued at one's own legal risk. However, historians of patent law are in general skeptical that the providential ruling was widely disseminated let alone understood by inventors generally.<sup>173</sup> Gubby emphasized how *Liardet v. Johnson* was not comprehensively

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<sup>170</sup> Higgins, *Experiments...Made with the View of Improving...Cements*, 160-70.

<sup>171</sup> *Ibid*, 164.

<sup>172</sup> *Ibid*, 277.

<sup>173</sup> MacLeod and Gubby are particularly skeptical: *DLPP*, 41-3; MacLeod, *IIR*, 60.

covered by contemporary *Law Reports* with its coverage limited to pamphlets and newspaper articles.<sup>174</sup> Additionally, when the works of Carpmael and Webster on *Liardet v. Johnson* were included in nineteenth century *Law Reports*, there were errors in reporting such as describing Johnson as the victor.<sup>175</sup> Considering my argument that *Liardet v. Johnson* is jurisprudential relevant it is essential to note the evidence of contemporary reach of this decision.<sup>176</sup>

To this point, the *Morning Post*'s coverage included specific references to Mansfield's speech about the necessary instructive properties of the specification.<sup>177</sup> Additional evidence towards contemporary communication around the shifting meaning of the patent specification is evident in Frances Buller's 1790 treatise, *An Introduction to the Law Relative to Trials at Nisi Prius* in which he defined the patent specification in terms consistent with the familiar *Liardet* through Arkwright jurisprudence:

The meaning of the specification is, that others may be taught to do the thing for which the patent is granted; and if the specification is false, the patent is void; for the meaning of the specification is, that after the term the public shall have the benefit of the discovery.<sup>178</sup>

As noted, the trial was sensationalized because of Mansfield's conflict of interest with the plaintiffs and thus the first trial was relatively well reported by the London press.<sup>179</sup>

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<sup>174</sup> Gubby, *DLPP*, 41-3; Robinson agrees: Robinson, "JWLP," 119-22.

<sup>175</sup> Carpmael and Webster incorrectly listed Johnson as victorious in the suit: William Carpmael, *Law Reports of Patent Cases* (A. MacIntosh, 1843) vol. I, 35-7.

<sup>176</sup> Similar views are suggested by; Poser, *Lord Mansfield*, 330-1; MacLeod, *IIR*, 49; Dutton, *IIR*, 75.

<sup>177</sup> *Burney Newspapers Collection*; Gale Primary Sources Z2000937245, *Morning Post*, February 23, 1778, Issue 1667 (London), 2.

<sup>178</sup> Francis Buller, *An introduction to the law relative to trials at nisi prius*, 5th ed. (A. Strahan and W. Woodfall, 1790), 76.

<sup>179</sup> *op. cit.* 99.

Additionally, as the patent agent took on an increasing role in the filing for a patent it is more likely that this niche professional class of clerks deeply familiar with patent law were privy to developments at patent law.<sup>180</sup> *Liardet v. Johnson* was not the first time a patent had been voided due to issues with the specification, such as the earlier cases of *Bell v. Heath* (1736) and *Wilkinson v. Sunderland* (1752).<sup>181</sup> Yet these earlier cases were decided by the Lord Chancellor prior to the common law court's assumption of jurisdiction over patent law and therefore do not necessarily speak to how the common law courts would rule, let alone establish replicable principles, on the matter. As observed by Bottomley, the legal counsel on both sides in *Liardet v. Johnson* came nominally prepared to dispute the details of Johnson's specification suggesting some expectation that the disclosure of a specification was material to a patent.<sup>182</sup> This follows as the specification had been a required part of the process for the thirty-five years that preceded Liardet's trial. It follows that in this time a loose set of norms had come to govern the shape of a specification. As was seen by Dollond, individual inventors could and would push those norms erring on the side of secrecy over disclosure for the market advantage this enabled. As *Dollond v. Champneys* further clarifies, it was not until the wake of Liardet that it was clear a common law court would specifically engage with a patent specification. Ultimately, it would seem that the disclosure provided by the invitee largely depended on their personal constitution and assessment of the comparative threats. As will be seen in the following chapters, Richard Arkwright, enraged by property theft, shifted from an expansive 1769 patent to a far more obtuse patent in 1775 which he ultimately lost at trial.<sup>183</sup> James Watt, concerned with the legal viability of his 1769 patent, proactively expanded the extent and specificity of his disclosures in his subsequent engine patents.<sup>184</sup>

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<sup>180</sup> On the rise of patent clerks: Bottomley, *BPS*, 65-72.

<sup>181</sup> *op. cit.* 94.

<sup>182</sup> Bottomley, *BPS*, 91.

<sup>183</sup> In *Rex v. Arkwright* see Chapter 2, 103-5; Chapter 4, 199-204.

<sup>184</sup> See Chapter 5, 243-5.

These patents enrolled in 1781, 1782, 1784, and 1785 tended to describe specific mechanical minutiae related to engine construction.<sup>185</sup>

### **Conclusion**

The above cases demonstrate that the mid-eighteenth century saw significant clarification in the realm of patent law. Such clarification was expansive, ranging from the protections it offered to the specific barriers that needed to be cleared by would-be patentees. Chiefly, the specification first mandated in 1731 only grew in importance over the course of the century, a process that made the courtroom debut of the expert witness all but guaranteed. This is because the specification was first and foremost intended as an internal tool of communication. Sure, Mansfield spoke broadly that “the public shall have the benefit of the discovery.”<sup>186</sup> However, in reality, if a specification was sufficiently revelatory, it would not be the general public that would make use of the legally disclosed knowledge but rather the other skilled laborers capable of replicating the invention in the first place. This was assuming that the invention was not promptly reverse-engineered, irrespective of the language of the specification. It was the person of skill who possessed the know-how, equipment and material required to infringe, legally replicate, or further improve an existing patent relevant to their craft. It followed that only individuals from similar fields possessing similar knowledge could and would bring suits against one another, and at trial, the dividing lines between plaintiff, defendant and proto-expert witness were blurred.

The orthodox literature on the early development of patent law does not view the law component to patent law in a particularly favorable light. In concurrence with Dutton, MacLeod argues that “until the 1830s judges and juries appear to have shared a prejudice that patentees were parasitic monopolies to be unsuited at every opportunity”; however, this is

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<sup>185</sup> Patent Numbers: 1306, 1323, 1432, 1485; Woodcroft, *Alphabetical Index*, 11.

<sup>186</sup> Oldham, *MM* vol. I, 754.

clearly in need of substantial qualification.<sup>187</sup> Throughout the second half of the eighteenth century, there was and continued to be a steady adjudication of letters patent in favor of the plaintiff. Dollond and Liardet, both patentees, found repeated relief in the English courts and represented a continuity in legal thought on the nature of the patent. While the fairness of the rulings in these cases can be endlessly disputed, MacLeod is correct to point out the existence of “highly uncertain” and at times “random” outcomes simply because decisions and their foundations in the ever-growing body of precedent law were not quickly or accurately disseminated amongst the legal community, especially prior to *Boulton & Watt v. Bull* (1795).<sup>188</sup> Neither Dollond’s nor Liardet’s cases saw contemporary law reporting despite being tried before Lord Mansfield’s amply commented upon court. Furthermore, by the mid-nineteenth century, the courts intervened in substantially more patent law disputes. Yet, in spite of the obvious deficiencies and challenges with eighteenth-century patent law, to not take its jurisprudential growth seriously is to miss the quiet revolution in witness testimony that early patent law made possible. As exemplified by the experiments presented to the court by Higgins, it was the expert witness who was tasked with revealing the true nature of the patent specification in question.

Higgins’s conduct during the trial corroborates Carol Jones’s view of the expert witness as simultaneously engaged in two related kinds of expert activity.<sup>189</sup> Firstly, Higgins’s performance constituted a public demonstration of his authority in the courtroom, while his reputation continued to be founded on the hidden, highly technical and esoteric work on which such public authority rested.<sup>190</sup> There is no doubt that his experiments enabled

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<sup>187</sup> MacLeod, “Strategies for innovation”, 288; Dutton, *PIA*, 76-7.

<sup>188</sup> MacLeod, *IIR*, 73.

<sup>189</sup> Carol A. G. Jones, *Expert witnesses* (Clarendon Press, 1994); Roger Smith and Brian Wynne, *Expert evidence* (London, 1989); Graeme Gooday, “Liars, Experts and Authorities”, *History of Science* vol. 46, no. 4 (2008) 433.

<sup>190</sup> *Ibid.*

his effective public showcasing of expertise during the trial of *Liardet v. Johnson*. However, his conduct consistently blurred the line between the more and less visible sources of his authority. For it was Higgins's precise public accounting of his private experiments that made his testimony seem so persuasive. To this point, the patent specification following Mansfield's ruling was really a requirement to bring the most minute technical works of an invention into public light. This is a lesson Higgins enthusiastically accepted as his published account of his own cement patent described to the public in full, not just his methods but the experimentations upon which they rested.

From the perspective of the court, the rapid rise in significance of the expert witness was bound up with the need for a detailed and accurate patent specification and the focus of the said specification in court: both functioned to make visible the otherwise hidden work of the inventor. Mansfield likely envisioned the in court explanatory work of the expert witness as a process of genuine and unbiased advice.<sup>191</sup> Yet, from the outset, the expert witness hired by the plaintiff and defendant was always a partisan figure. The partisan nature of the adversarial expert witness escalated as the economic stake of intellectual property increased exponentially during the final decades of the eighteenth century.<sup>192</sup>

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<sup>191</sup> Golan, *Laws*, 49-51.

<sup>192</sup> On the wealth of patent holders, notably James Watt and Richard Arkwright see: Bottomley, *BPS*, 250-1, 255, 261; R. S. Fitton, *The Arkwrights* (Manchester University Press, 1989), 245-6, 294-6.

## Chapter 2

### The Rapid Development and Persuasive Power of the Expert Witness in the Early Patent Trials of Richard Arkwright (1781-1785)

#### Introduction

Between 1781 and 1785 Richard Arkwright, a Lancaster-born cotton spinning industrialist and holder of two essential textile manufacturing patents, was involved in three major patent law trials.<sup>1</sup> The trials were *Arkwright v. Mordaunt* (1781), *Arkwright v. Nightingale* (1785) and *Rex v. Arkwright* (1785).<sup>2</sup> Arkwright would lose to Mordaunt, prevail against Nightingale and lose again, with his 1775 patent fully overturned, as a result of *Rex v. Arkwright*, a trial brought in the name of the king. Although Arkwright's legal saga spanned less than five years, the intense action before the common law courts was nevertheless one of deep tumult and whiplash with oscillating legal rulings quickly turning triumphant celebration into outrage.<sup>3</sup> Moreover, Arkwright's well-documented trials saw the extensive testimony of persons of skill despite beginning a year before Mansfield's formal recognition of the expert witness in 1782.

From the perspective of uncovering the early history of the expert witness, Arkwright's understudied trials warrant extensive coverage that will be divided between Chapter 2 and Chapter 4. This chapter, Chapter 2, will provide some context on the nature of Arkwright's invention and attempts at patent consolidation. Then I will examine Arkwright's

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<sup>1</sup> J. Mason, "Arkwright, Sir Richard" *ODNB* (2004); R. S. Fitton, *The Arkwrights* (Manchester University Press, 1989), 1-9; Arkwright's two patents are found in *Appendix I. c* and *I. f*.

<sup>2</sup> Oldham, *MM*, 763-7; John Davies, *A Collection of the Most Important Cases Respecting Patents of Invention and the Rights of Patentees....* (W. Reed, Law Booksellers, 1816), 37-60 [Hereinafter *ICRP*]; *The Trial of a Cause Instituted by Richard Peeper Arden...to Repeal a Patent Granted...to Mr. Richard Arkwright* (Hughes and Walsh, 1775), [Hereinafter *Rex v. Arkwright*], 11-187.

<sup>3</sup> Such celebration and outrage can be found in numerous issues of the *Manchester Mercury: Burney Newspapers Collection*; Gale Primary Sources: JL3241470011, CL3241470620, and CL3241470734 *Manchester Mercury*, March 20, 1781 Issue 1560; March 1, 1785 Issue 1769; June 28, 1785 Issue 1786; *Leigh Broadsheet*: "Just Arrived, by Express, from London, an account of the Law Suit betwix A-----ht and the Gentleman of the cotton Factories," Monday 27, June 1785, reproduced in full in Fitton, *Arkwrights*, 139.

trials against Mordaunt and Nightingale in order to show just how rapid and comprehensive the explosion of the expert witness was at patent law. Arkwright's loss to Mordaunt in 1781 and victory against Nightingale in 1785 coincides with the parallel legal developments regarding the formal status of the partisan expert witness in 1782.<sup>4</sup> Yet, any formalizing effect of *Folkes v. Chadd* on the permissibility of the expert witness had little to do with his embrace of expert testimony following his loss to Mordaunt. As a result of this defeat, Arkwright and his legal team learned firsthand that from the perspective of prevailing at patent law, the testimony of an expert witness, even in its nascent form, was already all but required.

Arkwright's first trial was held before the King's Bench in July of 1781 with Lord Mansfield presiding.<sup>5</sup> The defendant, Charles Lewis Mordaunt, was a comparatively small mill operator.<sup>6</sup> By singling him out Arkwright sought to halt the operations of numerous patent infringers using his patent protected methods across the northwest of Britain.<sup>7</sup> This was an offensive action on the part of Arkwright. He hoped this aggressive strategy of litigation would show to the broader manufacturing communities of Lancaster and Manchester the repercussions of bluntly infringing on his 1775 expansive patent for a range of mechanical devices and machines essential in the preparation of cotton for spinning.<sup>8</sup> Arkwright, in a matter of great personal shock and rage, lost this first trial as the jury, swayed by a number of experts brought to the court by Mordaunt, ruled that his patent nominally

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<sup>4</sup> Specifically, Mansfield's ruling in *Folkes v. Chadd*; See Chapter 3, 141-6.

<sup>5</sup> Oldham, *MM*, 763.

<sup>6</sup> Fitton, *Arkwrights*, 96-7.

<sup>7</sup> *Ibid.*; Arkwright filed additional bills of complaint against other mill owners that did not result in a trial; *Rex v. Arkwright*, 22. For more detail see 10-3.

<sup>8</sup> In what would become a matter of legal importance the patent claimed to cover the preparation of a broad range of materials for spinning, including hemp, wool and silk. Patent No. 1111; *Rex v. Arkwright*, 34-7; Fitton, "The great patent trials: Arkwright on the offensive" in *Arkwrights*, 91-117.

issued to cover a cotton carding machine was insufficiently described by the enrolled patent specification.<sup>9</sup>

Arkwright regrouped and crucially expanded his legal defense, securing the testimony of noted experts such as James Watt and Erasmus Darwin in order to retry and defend his patent at common law.<sup>10</sup> Targeting Arkwright's closest neighbor, an action was brought against Peter Nightingale for using unlicensed machines protected by Arkwright's 1775 patent.<sup>11</sup> This second trial was heard before Common Pleas on February 17, 1785 with Justice Loughborough presiding.<sup>12</sup> This time Arkwright was equipped with the testimony of five skilled workmen who claimed that they had constructed his machines working from the specification alone; this proved essential in shaping the carefully instructed jury's ruling in Arkwright's favor.<sup>13</sup>

Taken together, these cases show how incorporating an expert witness in a patent law dispute was, as early as 1781, strategically non-negotiable. The persuasive and explanatory power of the expert witness in the necessary task of parsing the technical details of a patent specification was unmatched and strongly correlated with a successful trial. This was made particularly clear in Arkwright's trial against Mordaunt in which the testimony of the well-respected president of the Society of Arts, Samuel Moore, was left unchallenged.<sup>14</sup> The issue was not that Arkwright came to court without expert witnesses, as a number of workshop assistants were called to the stand, but that the gentlemanly status and air of respectability surrounding Moore was not matched by any of Arkwright's experts. This misstep would not

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<sup>9</sup> MacLeod, *IIR*, 78, 103; Dutton, *PIA*, 27, 37, 188-9, *Matthew Boulton to James Watt*, August 7, 1781, Boulton & Watt collection: Quoted in Fitton, *Arkwrights*, 98.

<sup>10</sup> "Erasmus Darwin to Matthew Boulton January 26, 1785," *Revolutionary Players and History West Midlands* (2024) [Accessed December 20, 2023]; Fitton, *Arkwrights*, 180.

<sup>11</sup> *Ibid*, 105; R.S. Fitton and A.P. Wadsworth, *Strutts and the Arkwrights, 1758-1830* (Manchester University Press, 1958), 86, 106.

<sup>12</sup> Davies, *ICRP*, 52.

<sup>13</sup> *Ibid*, 58.

<sup>14</sup> D. G. C. Allan, "More, Samuel," *ODNB* (2016); Fitton, *Arkwrights*, 108.

be repeated; prior to his trial against Nightingale, Arkwright embarked on careful and expensive interpersonal dealings in order to secure gentlemen of skill fit to impress the judge and jury.<sup>15</sup>

Finally, in this chapter I argue that despite the ascendancy of the expert witness and adversarial advocacy, the judge remained lord of their courtroom with the apparent leanings of the judge highly predictive of the jury's ultimate ruling. The judge had immense power to shape the impact and contours of expert testimony. As was the case with Justice Loughborough during Arkwright's second trial, this took a more subtle form such as constraining the permitted hostility and force of a cross-examination.<sup>16</sup> More explicitly, the judge, by restricting evidence, summarizing testimony and carefully directing the jury had the penultimate say on the proper interpretation of an expert's performance on the stand. Indeed, across both cases, the jury closely adhered to the characterization of the evidence as given by the judge in their consistently swift rulings.<sup>17</sup>

Taken all together, the insights of this chapter extend the findings of Chapter 1 which detailed the incremental and informal inclusion of the expert witness in patent law. The trials, which began just four years after *Liardet v. Johnson*, show not merely the presence of the expert witness at common law but also how rapidly and wholeheartedly the necessary players accepted and requested their presence. As the testimony of expert witnesses became even more normalized, it was, from the perspective of legal practitioners and their clients, increasingly imperative to develop strategies that maximized the odds of expert testimony to succeed, constrained as ever by the temperament of the presiding judge.

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<sup>15</sup> Fitton, *Arkwrights*, 98-107; Also see, 109-19.

<sup>16</sup> *Richard Arkwright, Esquire; Versus Peter Nightingale, Esquire. Proceedings on the Trial of this Cause* (1785) [Hereinafter *Arkwright v. Nightingale*] quoted in Fitton, *Arkwrights*, 112.

<sup>17</sup> Oldham, *MM*, 763-7; *Manchester Mercury*, March 1, 1785.

## The Patent Consideration of Richard Arkwright Leveraging Nascent Intellectual Property Law

Lancashire's textiles industry emerged slowly over the course of the seventeenth century in response to a commercial demand for fustian, a broad category of cotton and linen mixed fabrics.<sup>18</sup> This heavy hand-woven cloth was one of the "new draperies" introduced to the eastern British market by immigrants from Belgium and Netherlands.<sup>19</sup> Prior to the rise of Arkwright's patent-protected cotton spinning frame, the textile industry had largely developed through the use of manual labor.<sup>20</sup> A key challenge in the comprehensive mechanization of cotton textile manufacturing was the spinning problem.<sup>21</sup> This refers to the fact that the process of spinning cotton or the conversion of carded cotton (cleaned and intermixed cotton fiber) into workable yarn or thread requires two discrete mechanical actions. The first is the drawing (also referred to as the drafting) stage in which the carded cotton is stretched to the required thickness of the yarn or thread. Secondly, the stretched fibers are twisted or spun together creating a solid workable thread. Combining both these actions into a single machine had proven to be a substantial hurdle.

Ultimately, Arkwright's cotton spinning machine solved the above-mentioned spinning problem through a variety of innovations.<sup>22</sup> Firstly, Arkwright and his many assistants, employees and collaborators refined the gap between the pair of rollers which first

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<sup>18</sup> Fitton, *Arkwrights*, 10; Roger Holden, "Fustian and Velvet Cutting—A Subdivision of the Lancashire Cotton Industry," *Industrial Archaeology Review* vol. 38 no. 2 (2016), 133-138; Linda Baumgarten Berlekamp "The Textile Trade in Boston: 1650-1750" (master's thesis., University of Delaware, 1976), 69; Perry Walton, *The Story of Textiles* (Walton Advertising and Printing Co, 1925), 64.

<sup>19</sup> Fitton, *Arkwrights*, 10.

<sup>20</sup> *Ibid.*; Julia De Lacy Mann and Alfred P. Wadsworth, *The Cotton Trade and Industrial Lancashire, 1600-1780* (Manchester University Press, 1931), 15-23.

<sup>21</sup> For more on the spinning problem see: Richard L. Hills, "Sir Richard Arkwright and His Patent Granted in 1769," *Notes and Records of the Royal Society of London* vol. 24, no. 2 (1970), 257; Richard L. Hills, "Hargreaves, Arkwright and Crompton. Why Three Inventors?," *Textile History* vol. 10 no. 1 (1979), 114-5.

<sup>22</sup> For an account of the spinning problem, and on earlier roller uses in the Paul-Wyatt machine see: Fitton, *Arkwrights*, 17; Richard L. Hills, *Richard Arkwright and Cotton Spinning* (Priory Press, 1973), 30; Stanley D. Chapman, *The Early Factory Masters* (David & Charles, 1967), 44.

pressed and then drew the cotton fiber through the hole in the machine.<sup>23</sup> The challenge, presumably solved through trial and error, was to not shred, snap or produce unusable yarn that was uneven with a lumpy thickness. Shredding and snapping occurred when the rollers were placed too close together as the contracting speeds between the feeding rollers and the pressing rollers caused the fiber to shear. In contrast, should not enough pressure be applied to the fiber, the fiber would drift between the rollers, snapping or forming unevenly pressed clumpy yarn. This multifaceted problem of applying enough pressure and applying it evenly was solved by a system of counterweights installed onto the top rollers, a detail described in Arkwright's jointly-owned 1769 patent and sealed in a July specification as follows: "iron levers with small lead weights, hanging to the rollers by pulleys, which keep the rollers close to each other."<sup>24</sup>

The terms of Arkwright's contracts ensured that ownership and by extension all revenue, including licensing fees, from the 1769 patent-protected cotton spinning machines would be split with his co-owners.<sup>25</sup> Yet, as a letter dated February 1775 seeking legal advice from Lloyd Kenyon (then a widely successful solicitor with an expertise in the Court of Chancery) made clear, Arkwright was further troubled by the fact that his contract stipulated that all future improvements he and his employees made to the cotton spinning machine would also be split amongst the partners.<sup>26</sup> Arkwright, evidently interested in being the most dominant player in the booming mechanized cotton industry, adopted a two-prong approach.

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<sup>23</sup> Filton, *Arkwrights*, 257.

<sup>24</sup> Appendix I. c.; The petition for the patent was submitted over a year earlier in June of 1768; Mason, "Arkwright"; Fitton, *Arkwrights*, 26; Fitton and Wadsworth, *The Strutts and the Arkwrights*, 62-3.

<sup>25</sup> For a full account of the details of the partnership see Filton, *Arkwrights*, 23, 26-9; "Articles of Agreement between Richard Arkwright, John Smalley and David Thorley, 19 June 1769" held at the *University of Manchester Institute of Science and Technology*, quoted in *Ibid* and Richard L. Hills, "Sir Richard Arkwright and His Patent Granted in 1769." *Notes and Records of the Royal Society of London*, vol. 24, no. 2 (1970), 254-60.

<sup>26</sup> Douglas Hay, "Kenyon, Lloyd, first Baron Kenyon (1732–1802), judge," *ODNB* (2009); Kenyon by this time was earning over £4,000 per year and by the time of his death he had an estimated wealth of £300,000; Fitton, *Arkwrights*, 29; *The Gentleman's Magazine and Historical Chronicle*. vol.72, Part I (Nicholas and Son, 1802), 379.

Firstly he worked to dissolve the contracts that spread the wealth of the 1769 patent and secondly he filed for a new patent of which he would be the sole owner.<sup>27</sup> Kenyon warned Arkwright that he could not individually refile his jointly-owned original invention; moreover, a new patent required new inventions, specifically methods, that did not fall under the extensive intellectual property ownership clauses of the contracts.<sup>28</sup> Arkwright's new patent, which broadly targeted the carding process "for certain machines for preparing silk cotton, flax and wool for spinning" was sealed by December 16, 1775.<sup>29</sup> The gap of approximately ten months between Arkwright's consultations with Kenyon and the filing of his next patent strongly suggests that Arkwright always intended to file.<sup>30</sup> Indeed, prior to contacting Kenyon, he had begun clandestinely installing newly-devised and more efficient parts at his mill in Cromford.<sup>31</sup> As such, his correspondence with Kenyon appears to resemble after-the-fact legal reconnaissance rather than the genuine pursuit of preemptive advice. This incident hints at Arkwright's willingness to use his now considerable capital to enforce and legitimate his new patent through common law litigation.

By 1780 Arkwright's consolidation of the cotton industry was complete. To give a sense of the scale of his successes, in the same year he charged the astronomical figure of £7,000 for every 1,000 spindles licensed.<sup>32</sup> Edward Bearcroft, the Sergeant-at-Law who consistently led the cases against Arkwright through the 1780s, estimated that Arkwright's 1769 patent alone had brought in "a great fortune" in the excess of £100,000 during its

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<sup>27</sup> Arkwright's plans are implied by the questions asked of Kenyon, quoted in Fitton, *Arkwrights*, 40-2.

<sup>28</sup> Fitton replicates and combines Arkwright's questions and Kenyon's answers as well as an intermediary letter by Thomas Wilson, who forwards Kenyon's response to Arkwright in full: *Ibid.*

<sup>29</sup> Appendix I. c.

<sup>30</sup> Fitton, *Arkwrights*, 42.

<sup>31</sup> *Ibid.*, 39.

<sup>32</sup> *An Impartial Representation of the Case of the Poor Cotton Spinners in Lancashire ....* (G Bigg, 1780), 2; Mason, "Arkwright"; For more details on Arkwright's fees see Fitton, *Arkwrights*, 92, 114, footnote 7. Richard L. Hills, "Sir Richard Arkwright and His Patent Granted in 1769," *Notes and Records of the Royal Society of London* 24, no. 2 (1970), 257.

fourteen-year lifetime.<sup>33</sup> Simultaneously to Arkwright's evidently successful consolidation of the industry, prices for in-demand textile products remained high and as such the incentive to try and outmaneuver the ascendent capitalist remained.<sup>34</sup>

Methods for evading Arkwright's control included relocation to Scotland or Ireland, where his carding machine was not patented and where the filing of one's own distinct cotton spinning patent or unlicensed manufacturing based on Arkwright's designs could be easily carried out.<sup>35</sup> The carrying of information regarding Arkwright's nascent system or working to construct cotton machinery across the channel to France would truly pick up steam after 1785.<sup>36</sup> While fleeing for France to work in the cotton industry was an option taken by some—such as the Kay family—it was, strictly speaking, an illegal one.<sup>37</sup> Britain was remarkably early in developing law against industrial espionage beginning in 1719 with a broadly written piece of legislation that primarily targeted the movement of English iron and clockmakers to France and Russia.<sup>38</sup> By the end of the century, as this body of legislation matured, with additional acts passed in 1750, 1774 and through the 1780s, taking one's skill abroad shifted from a violation of mores to one of law.<sup>39</sup> By the time of Arkwright's initial

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<sup>33</sup> Hills, "Sir Richard Arkwright and His Patent Granted in 1769," 257.

<sup>34</sup> Fitton's definitive biography on Arkwright notes that it is not known how Arkwright overcame the legal ambiguities regarding the validity of selling his 1775 patent: Fitton, *Arkwrights*, 92.

<sup>35</sup> *Burney Newspapers Collection*; Gale Primary Source: CL3241470620, *Manchester Mercury*, March 1, 1785 Issue 1769; Fitton, *Arkwrights*, 117.

<sup>36</sup> J. R. Harris, "2. French Industrial Espionage in Britain in the Late Eighteenth Century" *RSA Journal* 137, vol. 137, no. 5398 (1989), 629-30; Paola Bertucci, "Enlightened Secrets" *Technology and Culture* 54, no. 4 (2013), 820-3.

<sup>37</sup> John Key along with three of his children, Robert, James and John were deeply and tumultuously involved in the process of developing the French cotton spinning technology under the sponsorship and sanction of the French Government. J. R. Harris notes how Key's status as an English inventor and self-proclaimed gentleman helped him to avoid the 1719 Act. J. R. Harris, *Industrial Espionage and Technology Transfer* (Aldershot: Ashgate, 1998), 93; D. A. Farnie, "Kay, John," *ODNB* (2004); On Key in France, see: Harris, *Industrial Espionage*, 82-94.

<sup>38</sup> Harris argues that even early legislation clamped down on technological transfer; Harris, *Industrial Espionage*, 455 The "Act to prevent the Inconvenience arising from seducing Artificers in the Manufacturer of Great Britain into Foreign Parts" received royal assent and formally became law on April 18, 1719; 'House of Lords Journal Volume 21: April 1719, 1-10,' in *Journal of the House of Lord* (London, 1767-1830), 115-25.

<sup>39</sup> Harris, *Industrial Espionage*, 458-67; *Journal of the House of Lords* (London, 1767-1830) vols. 27, 34, 36-37.

patent disputes, war with the American colonies had spilled out into a war with Spain and France, increasing anti-French sentiment.<sup>40</sup> Although the 1783 Peace of Paris marked a brief respite to ongoing overt hostilities, legislative work to tamp down industrial espionage increased culminating in the Tool Act of 1785 and 1786.<sup>41</sup> Arkwright for his part was keen to use the show of surging foreign competition—going as far as threatening to personally pack up for Europe—during his confrontations with the Manchester and Lancaster Committee of Trade.<sup>42</sup> Indeed, the ever-present dangers of French spies was later used by Arkwright to justify any potential gaps of clarity in his patent.<sup>43</sup>

Arkwright, ever determined to maintain his hold on the cotton industry and assert the necessity of his invention, tapped into his rapidly accumulating wealth and turned to the common law courts and made effective use of the threat of litigation. In February of 1781 he issued suits against mill owners Henry Marsland, Daniel Lees and John Middleton for unlicensed use of his machine as described in his cotton carding patent. The three relented prior to any court proceedings and Arkwright, seeking to press his advantage and consolidate his reputation, had their unconditional and total surrenders made public, running a confession of guilt in the “Advertisement and Notices” in either *The Manchester Mercury, & Harrop’s General Advertiser* and *Derby Mercury* newspapers. Middleton’s personal surrender as issued in the February 11, 1781 edition of the *Manchester Mercury* was signed and witnessed

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<sup>40</sup> Steven C. A. Pincus, “From butterboxes to wooden shoes,” *The Historical Journal*, vol. 38, no. 2, 333-61; Anne E. Brownlow, “Eighteenth century English patriotism and the French revolution,” *History of European Ideas* 13, (1992), 289-96; Gerald Newman, “Anti-French Propaganda and British Liberal Nationalism in the Early Nineteenth Century,” *Victorian Studies* 18, no. 4, (1975), 385-418.

<sup>41</sup> The Editors of Encyclopaedia Britannica, “Peace of Paris,” *Encyclopedia Britannica*; Andrew Stockley, *Britain and France at the Birth of America* (University of Exeter Press, 2001), 9; Fitton, *Arkwrights*, 52; Harris, *Industrial Espionage* 462-3.

<sup>42</sup> Boulton recalled that during a meeting with Arkwright following his loss to Mordaunt in 1781, Arkwright “swears he will take y<sup>e</sup> cotton spinning abroad,” quoted in Fitton, *Arkwrights*, 98; During his petition for an act of Parliament Arkwright extensively appealed to the wisdom of being wary of the “evil” of foreign espionage as a sound justification for any alleged deficiencies in his 1775 patent; Arkwright., “The case of Mr. Richard Arkwright and Co. In relation to Mr. Arkwright’s invention of an engine for spinning cotton...” (London, 1782) *Gale Primary Sources*: CW0105341230, 2.

<sup>43</sup> *Ibid.*

in the style of a formal plea in which he swore: “now I do hereby declare and acknowledge myself to have worked and infringed upon the said patent, and that I have this day paid all expenses attending that said action.”<sup>44</sup> The defeat was crushing and the threat to infringers made clear, as Arkwright demanded the machines that violated his patent were surrendered to him upon request.

In response to Arkwright’s growing assertiveness by way of legal bullying, the Manchester Committee of Trade met on March 5, 1781 to decide what to do about the Arkwright problem.<sup>45</sup> Ultimately, they resolved to support the next person Arkwright chose to leverage his patent against, and issued an open call to “consider the most effectual means of obtaining the free and general use of all engines and inventions for the manufacturing of cotton.”<sup>46</sup> Indeed, as Dutton has pointed out, the opposition of the Manchester Committee of Trade was not focused on the practice of patenting in general, as they sought to secure novel patents for similar spinning machines, but to the specific “tyranny” Arkwright was personally exerting upon the cotton trade through the competitive leveraging of his broad and legally unclarified patent.<sup>47</sup> Nevertheless, Arkwright had full confidence in the validity of his patent and—disregarding Kenyon’s legal advice—did not back down to the Manchester Committee. By contrast, working with the retained legal counsel James Wallace and John Dunning, Arkwright responded by bringing proceedings against nine manufacturers for the unlicensed use or construction of his 1775 cotton carding machine.<sup>48</sup>

As we saw in Chapter 1, Peter Dolland had targeted the non-guild member James Champneys, who lacking financial backing proved to be a weak link, a fact vindicated, at

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<sup>44</sup> *Burney Newspapers Collection*; Gale Primary Sources: JL3241469989, “Advertisement and Notices,” *Manchester Mercury*, Feb. 13, 1781 Issue 1524, 2; Henry Marsland’s near identical confession appeared in the next issue of the *Manchester Mercury*; *Burney Newspapers Collection*; Gale Primary Sources: JL3241469994 “Advertisement and Notices,” *Manchester Mercury*, Feb. 20, 1781 Issue 1525.

<sup>45</sup> Fitton, *Arkwrights*, 92.

<sup>46</sup> *Manchester Mercury*, March. 20, 1781 Issue 1560, 1.

<sup>47</sup> Dutton, *PIA*, 27.

<sup>48</sup> Webster, *Reports*, 60; Fitton, *Arkwrights*, 93-4.

least in part, by the highly favorable ruling for Dolland.<sup>49</sup> Mirroring this approach, Arkwright and his legal team sued Charles Lewis Mordaunt, who was later described by his own lawyer Edward Bearcroft, as “a gentleman of family, but not of much fortune.”<sup>50</sup> Mordaunt’s medium-sized mill contained 600 spindles and employed approximately 160 women and children.<sup>51</sup> Mordaunt’s legal team, which included Bearcroft and Thomas Erskine, faced Arkwright in court on two more occasions and it is the surviving transcript from Bearcroft’s later 1785 courtroom prosecution of Arkwright, that provides some insight into why Arkwright singled out Mordaunt. Bearcroft’s in-trial recollections of *Arkwright v. Mordaunt* had every reason to frame Arkwright in as negative a light as possible. For example, Bearcroft narrated how “Mr. Arkwright, is a sharp man himself, and well advised by a great many very able counsel” had nine cases, yet chose Mordaunt as “the fittest to be put forth,” due both to his light purse and apparent temper.<sup>52</sup> Bearcroft’s emphasis on attempts to take advantage of Mordaunt’s apparently-known mercurial nature can be understood as a bit of courtroom theater designed to make Arkwright seem especially conniving. Additionally, Bearcroft’s consistently emphasized the modest size of Mordaunt’s mill, and in particular his precarious financial position. As such, Bearcroft’s later insights are instructive in further highlighting the well-known and openly used strategies of the Dollonds, particularly the careful engineering of the perfect test case. Crucially, unlike the Dollonds, Arkwright had yet to have the courts formally uphold his 1775 patent, yet he boldly threatened litigation appearing to operate under an assumption that he would prevail. This was an assumption that

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<sup>49</sup> Chapter 1, 64-74.

<sup>50</sup> *Rex v. Arkwright*, 22; Mordaunt was a part of the Earl of Peterborough family line. Fitton describes Charles Lewis Mordaunt as the cousin of Charles Mordaunt, the extensively titled 3rd Earl of Peterborough and 1st Earl of Monmouth, but it seems that the Earl was Mordaunt’s uncle. Fitton, *Arkwrights*, 96; John B. Hattendorf, “Mordaunt, Charles,” *ODNB* (2008); “Mordaunt Paternal Family Tree” in twentytrees [https://www.twentytrees.co.uk/History/England/Paternal/Mordaunt.html].

<sup>51</sup> Fitton and Wadsworth, *The Strutts and the Arkwrights*, 83; “Charles Mordaunt to Duke of Rutland June 1782” in *The Manuscripts of His Grace the Duke of Rutland: Letters and papers, 1440-1797* (HM Stationery Office, 1894), vol. III, 85.

<sup>52</sup> *Rex v. Arkwright*, 22.

during his initial foray into the common law courts, and despite his careful selection of an ideal test case, would prove very wrong.

***Arkwright v. Mordaunt***  
**A Narrow Defense and a Strategy Backfires**  
**(1781)**

The case against Mordaunt was heard at the King’s Bench before Lord Mansfield on July 17, 1781 with the now familiar special jury of “men of means” called to give due deference to the property rights under dispute.<sup>53</sup> Mordaunt and his counsel deliberately avoided a legal strategy that sought to challenge Arkwright’s cotton spinning machine on grounds of originality. As examined in Chapter 1, patent law disputes post *Dollond v. Watkins* began to shift away from a standard of originality as the law prioritized public disclosure over cloistered first invention. *Liardet v. Johnson* (1778) serves as an excellent demonstration of the often uneven and gradual transition of both legal strategy and jurisprudence as a kind of catch-all strategy, challenging both originality and specification readability in court. However, this probing of originality was comparatively brief and its lack of centrality to the trial is reflected in the volume of testimony converging on the material makeup of stucco and the actionable nature of each specification. Furthermore, testimony on originality was only given the most cursory of summaries within Mansfield’s own notes.<sup>54</sup> This lack of attention to challenges of priority was further reinforced in Mansfield’s jury instructions, which reinforced public disclosure as the bar of originality as he steered the jury’s attention towards carefully considering the adequacy of Liardet’s specification.<sup>55</sup>

Mordaunt’s defense could very well have focused on challenging Arkwright’s originality and there is even evidence to suggest that this strategy was considered. Thomas Highs, the inventor for whom John Kay had allegedly first reproduced the spinning rollers

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<sup>53</sup> Oldham, *MM*, 763.

<sup>54</sup> *Ibid*, 749.

<sup>55</sup> *Ibid*, 754.

from, was summoned from Balbriggan, Ireland where he was working as a superintendent at a new cotton spinning mill.<sup>56</sup> Highs was clearly eager to give testimony in any one of the nine suits, as is evident in his swift departure from Ireland.<sup>57</sup> However, he does not appear to have been called as a witness as he was not included in Mansfield's trial notes.<sup>58</sup> Highs would get the opportunity to have his claim of originality entered into the record when called as a witness by the King's Counsel against Arkwright four years later.<sup>59</sup> Even so, this later testimony, in conjunction with Arkwright's assertions, illuminates that all parties agreed that sequestered originality was not sufficient. For example, Highs alleged that during a 1771 meeting in Manchester, Arkwright asserted that "if any man has found out a thing, and begun a thing, and does not go forwards, he lays it aside, ... another man has a right to take it up, and get a patent for it."<sup>60</sup> When confronted with the fact that his own logic implied that he had lost his claim for priority by not publicly disclosing his method of roller spinning, Highs, in stark contrast to his previously confident assertions on the nature of patent law, informed the court that he, in fact, "never was much concerned in law [sic]."<sup>61</sup> Here, Highs revealed that, as an inventor, he had a clear awareness of the demands of public disclosure yet carefully distanced himself from overstepping his expertise and making any authoritative and thereby potentially damaging statements on the nature of patent law.

Returning to 1781, Mordaunt's counsel did not get bogged down in almost certain dead-end debates about private parties or even seek to deny he had infringed upon

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<sup>56</sup> Jennifer Tann, "Richard Arkwright and Technology," *History* 58, no. 192 (1973), 29-44; D. C. Wellington, "Sir Richard Arkwright," *International Journal of Social Economics* 20, no. 12, (1993) 37-49; Frank Nasmith, "Richard Arkwright," *Transactions of the Newcomen Society* 13, (1932), 51-3; Not to be confused with his contemporary John Kay of Lancashire, the tall tale shrouded the inventor of the wheel-shuttle and a key player in French technological transfer; Harris, *Industrial Espionage*, 82-94.

<sup>57</sup> Fitton, *Arkwrights*, 96.

<sup>58</sup> Oldham, *MM*, 763-7.

<sup>59</sup> *Rex v. Arkwright*, 57-62.

<sup>60</sup> *Ibid*, 59.

<sup>61</sup> *Ibid*.

Arkwright's, yet to be upheld, 1775 patent.<sup>62</sup> The strategy the defense orchestrated was one of efficiency, clarity and by extension effectiveness. While Mordaunt conceded that he had in fact violated Arkwright's patent, his counsel and witnesses argued in court that this infringement was immaterial and ultimately impossible. Mordaunt's counsel articulated before Mansfield and a jury that the specification attached to Arkwright's patent was completely invalid due to its blatant incompleteness and deliberate obscurity.<sup>63</sup> By the jurisprudence of the Mansfield court an invalid specification was grounds for the voiding of a patent and, in the argument's coup de grâce, an invalid patent could not be infringed upon for there was nothing to infringe. However, this argument, no matter how logically neat, fully hinged upon the successful testimony of "persons of skill," whose task was to definitively prove that Arkwright's specification was, in the eyes of the relevant technicians, unreadable.

Representing the plaintiff, Arkwright's legal team was the first to call witnesses and called six in total.<sup>64</sup> The first witness to give substantial testimony on Arkwright's behalf and face rigorous cross-examination from the opposition was Thomas Bell.<sup>65</sup> Bell identified himself as an employee of Arkwright's for thirteen years who had worked closely with Arkwright alongside Kay and John Hackett in the perfection of Arkwright's carding and spinning machine. Bell's comments, as well as the inferences from Mansfield's shorthand notes of the trial, emphasize the iterative, failure-prone and chaotic process of developing the cotton carding and spinning machine. This process required some "100 dozen experiments" to be conducted over the course of five years as many instruments were "made, tried & destroyed."<sup>66</sup> Bell described himself as an intermediary who worked with numerous workmen

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<sup>62</sup> The 1785 trial was brought by a writ of *Scire Facias* which enabled the Crown to challenge all aspects of Arkwright's patent.

<sup>63</sup> Oldham, *MM*, 763-7.

<sup>64</sup> *Ibid.*

<sup>65</sup> *Ibid.*

<sup>66</sup> *Ibid.*

employed by Arkwright who were not allowed to fully interact and know how their component parts worked together. Importantly, for Arkwright's case Bell testified that the specification was "sufficient" to direct workers how to fabricate the many component parts of the spinning machine.<sup>67</sup>

Bell's testimony was followed to a similar effect by that of J. Barnes, an employee of Arkwright for three-and-a-half years who also affirmed that the specification was sufficient to enable him to successfully construct the machine despite not having a strong familiarity in working with either wood or iron.<sup>68</sup> Here, Barnes presented himself as functionally a quasi-expert diminishing his exact knowledge and familiarity with Arkwright's machines. This strategy emphasized that the patent was so clear and effective even a non-expert such as Barnes could successfully use it as a guiding tool thereby undermining any claim of insufficiency. Barnes continued, stating how he had seen Mordaunt's facsimiles of Arkwright's machine and could attest that although they accomplished their task they were "more awkward" than Arkwright's.<sup>69</sup> Barnes, apparently comfortable on the stand, offered some speculative advice for the opposition claiming that for Mordaunt's machine to truly function he required the addition of lead weights presumably to hold down the rollers present in his machine. Likely pressed to divulge further technical details, he noted that it was not always better for the rollers to be fluted, but it was "sometimes better."<sup>70</sup> Barnes had in fact brought up two key details that, unlike Arkwright's 1769 patent specification, were largely omitted in the 1775 patent currently on trial. Not wasting any time, Mordaunt's legal team recalled Bell to the stand to drive home just how problematic such omissions were.

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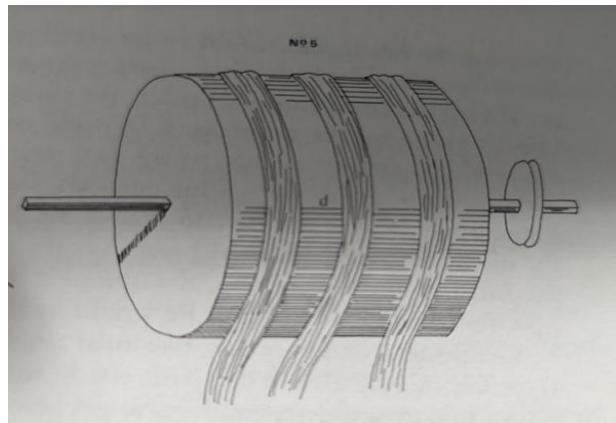
<sup>67</sup> Oldham, *MM*, 763.

<sup>68</sup> *Ibid*, 763-5.

<sup>69</sup> *Ibid*.

<sup>70</sup> Mansfield's trial notes only contain shorthand summaries and phrases from Bell's responses, not the direct questions he was asked.

Once again on the stand, although this time being questioned by opposing counsel, Bell began by affirming that the fluted cylinders of the machine could in fact be made from the 1775 illustration which accompanied the patent specification. This would seem plausible as the written description associated with Figure 5 of the patent specification mentions fluted cylinders:



*“No. 5 is the last-mentioned cylinder, which hast fillet cards; behind this cylinder,” Appendix I.f.*

Note how the visual depiction of the cylinder in Arkwright’s specification does not self-evidently appear to be fluted. Mansfield’s relevant personal view of just how damaging such an ambiguity was, is suggested by his emphatic underlining of Bell’s final clarification that he and Arkwright were inconsistent in their use of fluted cylinders.<sup>71</sup> All in all the workmen called by Arkwright to attest to the solidity of his patent revealed how in practice the letter of his specification was inconsistently followed. Recalling how Mansfield defined “the meaning of the specification is that others may be taught to do a thing for which the patent is granted...” meant that the ad hoc yet essential changes made to the machine by Arkwright presented a serious challenge for the prosecution.<sup>72</sup> In an ironic twist of fate, the very fact that Mordaunt’s attempted replication of Arkwright’s spinning machine was so deficient is evidence of the inherent faultiness of Arkwright’s patent as a tool of instruction.

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<sup>71</sup> Oldham, *MM*, 763-4; Oldham, *MM*, 763; Mansfield, in what is likely an error, records Bell as referring to “lower pillars.” This is the only mention of pillars as opposed to cylinders in Mansfield’s trial notes.

<sup>72</sup> As articulated during Mansfield’s jury instructions issued during *Liardet v. Johnson*; *Ibid*, 754.

This is made clearer by Barnes's suggestion to include weights. As Bell revealed under oath and cross-examination "from the specification [there is] no mention of leads, but leads [were in] use when I was there."<sup>73</sup> Bell continues, by clarifying for the judge and jury the "great benefit" of pressing down the upper cylinder with lead weight fixed to leads.<sup>74</sup> Later the defense called their own witness a "Mr. Comyns" who asserted that without the use of lead weights the rollers would simply not work.<sup>75</sup>

It is important to note when considering the consolidation of technical testimony around the lead weights, that the omission of the said weights was a key distinguishing characteristic between Arkwright's 1769 and 1775 patents.<sup>76</sup> A further distinction is that the machine described in the 1775 patent was only rendered in its select component parts rather than shown as assembled, as was the case in the 1769 patent.<sup>77</sup> This distinction was emphasized as one of great significance by the defense's final witness W. D. Crofts. Professionally a law clerk, Crofts began his testimony by affirming his specific and privileged expertise as the individual hired by Arkwright to write the words to Arkwright's specification, under Arkwright's apparently close direction, based on the provided illustrations. In his testimony Crofts strenuously described the differences between the patent specifications claiming that when contracted by Arkwright he had warned Arkwright that the 1775 patent was "not drawn by scale of proportion as his former patent."<sup>78</sup> Moreover, in Arkwright's following trials, Crofts maintained that the specific reason for drawing the invention in detached parts was because Arkwright "wished it to be as obscure as the nature [of] the case would admit."<sup>79</sup> Of course, Arkwright's counsel ought to have emphasized to the

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<sup>73</sup> Oldham, *MM*, 765.

<sup>74</sup> *Ibid.*

<sup>75</sup> *Ibid.*

<sup>76</sup> Compare specifications in Appendix I. c. and I. f.

<sup>77</sup> This would prove to be a substantial issue in *Rex v. Arkwright*. See Chapter 4 for discussion, 208-10.

<sup>78</sup> Oldham, *MM*, 765.

<sup>79</sup> *Ibid.*

jury that skirting up to the line of the law was fully within his legal right and Crofts's testimony could be used to argue that Arkwright was on the right side of said line. Yet Mansfield's case notes do not indicate that Crofts or any of the defense witnesses were cross-examined.

Unfortunately, the exact details of what fully transpired in court on July 17, 1781 cannot be fully known, as the full transcript of the *Arkwright v. Mordaunt* trial recorded by Joseph Gurney "shorthand writer to the courts of law and in Parliament" and paid for by Arkwright has not survived.<sup>80</sup> However, the broadest strokes and categorical outcome were reported in the July 24, 1781 edition of *The Manchester Mercury* and corroborated by the July 18 edition of the *Derby Mercury*. As *The Manchester Mercury's* coverage made abundantly clear, the jury was left utterly convinced: "the inefficiency of the plaintiff's specification of his second patent, dated December 1775, was so clearly proved, that the jury brought in a verdict for the defendant, without going out of court."<sup>81</sup>

Arkwright's first attempt to enforce his patent and the successful challenge were replete with technical testimony and speculation given on the stand centering around the necessity of lead weights. None of the expertise-informed yet nevertheless speculative testimony was thrown out or challenged on procedural grounds. As this case was tried a year prior to Mansfield's ruling in *Folkes v. Chadd* this is an important data point, further reinforcing the by now acceptability to the court of accepting the opinions of men of skill within patent law disputes. Furthermore, it serves as an insightful case study into how essential it was for the defense to bring the right experts, that is men of skill or preferably gentlemen of skill who could give the jury their word that they have constructed the machine in question on the specification alone.

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<sup>80</sup> Fitton, *Arkwrights*, 96.

<sup>81</sup> *Burney Newspapers Collection*; Gale Primary Sources: CL3241470121, *Manchester Mercury*, July 24, 1781 Issue 1578, 1.

As such, to simply call any expert was not enough and capable counsel such as Bearcroft and Erskine worked to outmaneuver the expert taking full advantage of their willingness to voluntarily offer extra information on the stand. To clarify, Bell, an expert witness for Arkwright volunteered, without much prodding, improvements that Mordaunt could have made to his machine. These *helpful* suggestions were skillfully weaponized by Bearcroft and Erskine as they drew attention to their auspicious absence from Arkwright's 1775 patent. Indeed, Bearcroft's own summary of his preparation for this case suggests carefully managing and working with his selected expert witness in a legal reality in which scrutiny of the patent specification reigned supreme. Bearcroft publicly admitted that the strategic and legal effectiveness of focusing solely on the viability of Arkwright's specification had been made apparent to him after consultation with an anonymized expert witness.<sup>82</sup> As Bearcroft's precise, probing questions and clear familiarity with the disputed technical issues demonstrated, to an extent, Bearcroft in his own right had become an expert on cotton manufacturing.<sup>83</sup> This reveals the shifts that the introduction of the expert into the courtroom demanded as an attorney's expertise in the law and experience arguing the details of law would increasingly be insufficient to argue a case. Overall, and as reaffirmed by Bearcroft's own telling, his legal strategy had little to do with chance but rather relied on his pretrial preparation drawing on the combined expertise of Erskine and a learned witness.<sup>84</sup>

Arkwright, by way of his legal counsel, also demonstrated an awareness of the testimonial climate they were entering as they secured the assistance of Richard March, an

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<sup>82</sup> Bearcroft's summary of his previous trials against Arkwright occurred during his opening statement for *Rex v. Arkwright*. Perhaps Bearcroft kept the identity of this essential confidant secret because it was Samuel Moore, his key witness against Arkwright in 1781 who had subsequently been hired by Arkwright; Indeed, it is almost certain that Moore was in the courtroom and heard Bearcroft's recounting of this bold exchange; *Rex v. Arkwright*, 22-6.

<sup>83</sup> Oldham, *MM*, 763-5.

<sup>84</sup> *Rex v. Arkwright*, 23; Erskine's involvement in the pretrial proceedings of many of the eight lawsuits brought by Arkwright, appears to have developed a considerable self-taught understanding of cotton spinning machines.

inventor who held a number of patents related to the manufacturing of hosiery.<sup>85</sup> March is recorded as having sworn on the stand that he had in fact produced Arkwright's machine based on the drawing alone, with Mansfield's trial notes indicating that said machine was produced in court as a demonstration of the instructive merits of the machine.<sup>86</sup> March's ultimately unpersuasive testimony may have largely been undone by the first witness called by the defense, the well-connected and respected apothecary by training, Samuel Moore.<sup>87</sup> Moore, spelled Moor in Mansfield's notes and only referred to by his last name, is identifiable by his title as "Secretary to Society [of] the Arts," a yearly elected position he held for twenty-nine years until his death in 1799.<sup>88</sup> Moore had spent time serving on all the committees represented at the Society of Arts and he had chaired the Committee of Chemistry from 1762 to 1767. There are numerous testimonies to his technical qualifications and he had a large network of friends and confidants, from members of the Lunar Society to industrialists and inventors including Matthew Boulton and James Watt. For example, the chemist and FRS Joseph Priestley later described Moore as "a kind of necessary man for all philosophers."<sup>89</sup> In short, Moore was exactly the kind of witness the judge and jury were likely to find credible.

Moore swore to the jury that having personally inspected both the drawing and the written specification, Figure No. 5 was "impossible to execute" based on the information provided in the letter patent.<sup>90</sup> In his capacity as a learned gentleman on the stand he continued to explain the particulars of why it would be so hard for even a skilled inventor to replicate Arkwright's rollers. For without the inclusion of any wheels in the drawing it was

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<sup>85</sup> Also spelled Marsh or Marshe; A. M. Clerke and Michael Hoskin, "Michell, John" *ODNB* (2008).

<sup>86</sup> Oldham, *MM*, 765.

<sup>87</sup> Also spelled More; Allan, "More".

<sup>88</sup> *Ibid.*; Fitton, *Arkwrights*, 108.

<sup>89</sup> Henry Carrington Bolton, ed., *Scientific Correspondence of Joseph Priestley* (Collins Printing House, 1892), 82.

<sup>90</sup> Oldham, *MM*, 765.

not evident what mechanisms allowed the rollers to move freely and efficiently. Additionally, the rollers depicted in Figure 2 did not provide any information as to their relative proportions which is needed to determine the rollers' ultimate velocities. Recalling the cotton spinning problem, this information was essential as should the rollers rotate too quickly the cotton fibers would tear apart.

Overall, Arkwright's 1781 trial demonstrated not just the mere presence of expertise in the courtroom but the rapidly growing strategies by which such expertise was leveraged and the ease with which it could be countered. Experts had to be able to withstand cross-examination and be attuned to the fact that information casually revealed during descriptive lectures to a jury could be used against their employer by the opposing counsel and experts alike. Furthermore, the exact words of an expert or gentleman of skill could be directly contradicted by yet another gentleman of skill such as was the case with Marsh and Moore. Guided by jury instructions, the jury was left to decide whom to trust, and perceptions of prestige and respectability could help sway their ultimate decision. Indeed, this strategy of producing known gentlemen of knowledge would be adopted, refined and used to great success in Arkwright's subsequent attempt to reaffirm his 1775 patent. Outraged and surprised by this loss and the existential threat it presented, he would recruit and secure the testimony of the most eminent and respected inventors and machine makers he could find, including Erasmus Darwin, James Watt, and in a surprising reversal, even Samuel Moore.<sup>91</sup>

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<sup>91</sup> Webster, *Reports*, 62-4; Davies, *Cases Respecting Patents*, 37-60.

*Arkwright v. Nightingale*  
**Not Just an Expert but Also a Gentleman**  
**(1785)**

Matthew Boulton visited Arkwright soon after his disastrous trial versus Mordaunt expecting to discuss “engine improvements.”<sup>92</sup> However, as a letter to Watt revealed, neither improvements nor inventions were on Arkwright’s mind at their meeting, as Arkwright threatened to find a more welcoming foreign market and swore he would “ruin those Manchester rascals.”<sup>93</sup> Spurred on by a successful legal vindication of his shared 1769 patent in 1783, Arkwright began the process of carefully preparing for the legal vindication of his solely owned 1775 patent.<sup>94</sup> To this end Arkwright organized a meeting with his attorney George Goodwin, seeking to identify the best possible target of a new case. They settled on “Mad” Peter Nightingale. Nightingale, formally the High Sheriff of Derbyshire had a reputation as a dare-devil horseman prone to “gambling, hard drinking and low company.”<sup>95</sup> Arkwright and Goodwin seemed convinced that beyond making a superbly unfavorable defendant, Nightingale had in fact used unlicensed machinery that was covered by Arkwright’s 1775 patent.<sup>96</sup> However, what is most noticeable about the preparation for this case is the extent to which Arkwright and counsel consulted and secured as much expert input as possible. Surviving correspondence indicates that as early as April of 1784, Goodwin was dispatched to London to discuss the case with none other than Samuel Moore as well as a “Mr. Lawson,” an individual R. S. Fitton identifies as likely the attorney William Lawson.<sup>97</sup>

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<sup>92</sup> *Matthew Boulton to James Watt*, August 7, 1781, Quoted in Fitton, *Arkwrights*, 98.

<sup>93</sup> *Ibid*, 98.

<sup>94</sup> Although Arkwright did his best to micromanage the prosecution, such as rapidly summoning and dispatching Strutt, their legal team, and a host of “ingenious mechanics,” the case was formally brought by Strutt. See *Ibid*, 101-5.

<sup>95</sup> *Ibid*, 105; “Family History” *The Life and Times of Florence Nightingale* [Accessed 3/01/2023]; Gillian Gill, *Nightingales* (Ballantine Books, 2009), 6.

<sup>96</sup> Fitton, *Arkwrights*, 108.

<sup>97</sup> *Ibid*, 105, 115.

Moore, having changed sides, would testify on Arkwright's behalf not only against Nightingale but also against a latter cause brought in the name of the king.<sup>98</sup>

Arkwright's preparations for his suit against Nightingale, specifically through his efforts to consult expert testimony, are made clear through his exchanges with his solicitor Thomas Ince. Shortly after leaving Arkwright's residence in Cromford, Ince was tasked with drawing up an effective rough draft of the case's ultimate brief. However, he was interrupted from his delegated task with strict instructions to "wait on Dr. Darwin of the business."<sup>99</sup> Arkwright was referring to the physician Erasmus Darwin, a natural philosopher with a deep interest in mechanical inventions, chemistry and evolution.<sup>100</sup> Becoming a Fellow of the Royal Society in 1761 Darwin would, over the course of his life, publish six papers on subjects spanning topics such as physiology and electricity in *Philosophical Transactions*.<sup>101</sup> However, it was likely Darwin's status as a founding member of the Lunar Society of Birmingham that made him a readily desirable expert for the Arkwright legal team since the society, which was at the height of its popularity and activity during the 1780s, brought together a collection of England's foremost men of science, industry and natural philosophy all with an interest in facilitating and ensuring the mechanization of the English economy from manufacturing to transportation.<sup>102</sup> Ultimately, it would seem that the expert input of the

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<sup>98</sup> Fitton, *Arkwrights*, 108-9; *Rex v. Arkwright*, 133-44; For details on Moore's testimony and defense of his flipped position, see section 4.2.

<sup>99</sup> Fitton, *Arkwrights*, 106.

<sup>100</sup> James Harrison, "Erasmus Darwin's View of Evolution" *Journal of the History of Ideas*, vol. 32, no. 2 (1971), 247-64.

<sup>101</sup> Erasmus Darwin "IV. A new case in squinting" in *Philosophical Transactions of the Royal Society of London*, vol. 68, Issue 68 1778, 86-96; Erasmus Darwin and William Watson, "XXX. Remarks on the opinion of Henry Eeles, Esq; concerning the Ascent of Vapour..." in *Philosophical Transactions of the Royal Society of London*, 50 1757, 240-54.

<sup>102</sup> On the status of Natural Philosophy in the eighteenth c. see: Roy Porter, ed., *The Cambridge History of Science: Eighteenth-Century Science*, vol. 4 (Cambridge University Press, 2008); G. N. Cantor, "Essay Review: 'The Eighteenth Century Problem,'" *History of Science* 20, 20, no. 1 (1982), 44-63; Danilo Capecchi, *Epistemology and Natural Philosophy in the 18th Century* (Springer, 2021); Rachel Laudan, "Tensions in the Concept of Geology," *Earth Sciences History*, vol. 1, no. 1 (1982), 7-13.

well-regarded Darwin was considered to be of such importance that Arkwright went so far as to halt the necessary clerical working leading up to filing.

Arkwright, who was in London around the time the meeting with Darwin was set to take place, dispatched Ince and his son Richard Arkwright junior to present their case to Darwin, whom they met on January 25, 1785.<sup>103</sup> Darwin confided in fellow Lunar Society founder and close friend Boulton about the details and his assessment of this meeting.<sup>104</sup> The meeting, Darwin revealed, was arranged to provide possible answers to “objections made to the specification,” indicating that the encounter contributed substantially to Arkwright’s trial strategy.<sup>105</sup> Darwin, displaying his self-assuredness as an expert, acknowledged that Arkwright had made numerous improvements to his cotton machine since the filing of the patent “all which I [Darwin] and master of, & could make more improvements myself.”<sup>106</sup> Darwin consulted the specification personally and concluded that Arkwright had “unduly” lost in 1781.<sup>107</sup> Darwin, deeply concerned about the ramifications of Arkwright’s loss, wrote to Boulton questioning if Boulton and Watt’s patent and act of parliament were on as “firm [a] foundation” as they had previously considered.<sup>108</sup>

As a member of the Lunar Society, inventor and manufacturer owner himself, Darwin’s enthusiastic support of Arkwright’s case is not surprising when considering his vested interest in the predictable legal protection of the patent.<sup>109</sup> On this point, beyond testifying on Arkwright’s behalf, Darwin worked closely during pretrial preparations with the entire Arkwright legal team, especially Ince, Goodwin and their lead barrister, Serjeant-at-

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<sup>103</sup> Fitton, *Arkwrights*, 105-6.

<sup>104</sup> D. G. King-Hele, “Erasmus Darwin, man of ideas and inventor of words,” *Notes and Records of the Royal Society of London* 42, no. 2 (1988), 151; Charles Darwin and Desmond King-Hele, eds., *The Life of Erasmus Darwin* (Cambridge University Press, 2004), 13, 45-7, 118; Eric Robinson, “The Lunar Society,” *Transactions of the Newcomen Society* 35, no. 1, (1962), 153-77.

<sup>105</sup> Fitton, *Arkwrights*, 105-6.

<sup>106</sup> Erasmus Darwin to Matthew Boulton January 26, 1785, *Boulton & Watt* collection quoted in *Ibid*, 106.

<sup>107</sup> *Ibid*.

<sup>108</sup> *Ibid*.

<sup>109</sup> Maureen McNeil, “Erasmus Darwin” *ODNB* (2004).

Law James Adair.<sup>110</sup> Darwin's status as a partisan expert witness is unambiguous: he was consulted specifically because he was a gentleman natural philosopher and he could provide a favorable speculative opinion on the intelligibility of the patent specification. Beyond his personal interest in vindicating Arkwright, Darwin's partisan nature is made outwardly apparent by the £137 10s he received in compensation.<sup>111</sup>

This compensation more than doubled the amount paid to all other expert witnesses, including James Watt, as employed by Arkwright during his trials.<sup>112</sup> In a letter written to Goodwin about two months after the trial, Watt acknowledged the payment of approximately "forty guineas" for his "time and expenses" as a witness in the trial against Nightingale.<sup>113</sup> Most interestingly, Watt strongly suggests that the generous payment is a "far greater one than is due to me as a simple evidence" writing how it was his pleasure to take on the just cause of assisting "a man of ingenuity" who was "ill used by the infringers of this patent."<sup>114</sup> Here, Watt's overlapping interests as inventor, expert witness, patent holder, commentator on patent law, and fellow Lunar Society luminary are simultaneously evident.<sup>115</sup> Arkwright's trial presented Watt with the invaluable opportunity to try and help steer, from the stand, a patent law jurisprudence that favors the prerogative of the inventor when it comes to patent specification disclosure. Ultimately, despite the fact that Watt's compensation paled in comparison to Darwin's, considering the alignment of interests and shared values there can be no doubting the partisan nature of Watt's expert testimony. The recruitment of Darwin and Watt speaks to the understood importance of pretrial preparation and strongly suggests that the general contours, if not specific exchanges, of the expert witness's inevitable testimony

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<sup>110</sup> Fitton, *Arkwrights*, 106; Michael T. Davis, "Adair, James" *ODNB* (2008).

<sup>111</sup> *Ibid.*, 109.

<sup>112</sup> "James Watt to Mr. G. Goodwin" April 11, 1785; See Appendix IV. e.

<sup>113</sup> "Watt to Goodwin" April 11, 1785.

<sup>114</sup> *Ibid.*

<sup>115</sup> On Watt's one developed expertise on patent law see Robinson, "JWLP," 115-39. Also see; Chapter 4, 233-9 and Chapter 5, 246.

was rehearsed before the trial. This makes sense considering the detailed involvement of models and specification figures the expert and barrister worked through together in an attempt to sway the jury in the upcoming cases.

Returning to the essential recruitment of expert witnesses, the Arkwrights, further inspired by the rousing success with Darwin, promptly sought consultation from another FRS and compatriot of the Lunar Society, the former Woodwardian Professor of Geology at Cambridge, the Reverend John Michell. Like Darwin and reflecting the natural philosopher's interest in uncovering nature's many secrets, Michell pursued a variety of subjects including magnetism, astronomy, instrument making and geology.<sup>116</sup> Once again Arkwright junior was given the task of convincing an eminent natural philosopher to give testimony at trial on Arkwright's behalf.

Records of both the trial against Nightingale and the subsequent trial against the king made it clear that Arkwright was not successful in recruiting Michell although this attempt speaks to the value Arkwright now placed on the natural philosopher as an expert witness.<sup>117</sup> In addition to Moore and Darwin, Arkwright's camp came prepared with fresh testimony from James Watt and Richard March.<sup>118</sup> The plaintiffs further sought to bolster their case by securing the hopefully favorable testimony of Charles Wilkinson, a professional draftsman and illustration instructor, who illustrated the patent in question.<sup>119</sup> Finally, Arkwright's *coup de grâce* would lie in the testimony of five persons of skill who would swear before the court that they had personally constructed Arkwright's machine exclusively from the 1775 patent specification. These men were Thomas Wood a weaver (and Arkwright's brother-in-law), Samuel Wise an inventor and musician, John Stead an industrial mechanic and engineer,

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<sup>116</sup> Clerke and Hoskin, "Michell, John".

<sup>117</sup> He does not appear as a listed witness in *Arkwright v. Nightingale* or *Rex v. Arkwright*.

<sup>118</sup> Fitton, *Arkwrights*, 110.

<sup>119</sup> *Ibid.*

William Allen a lathe worker and model manufacturer, and William Whitmore a clockmaker.<sup>120</sup>

With his skilled professionals and natural philosophers lined up, Arkwright was ready for trial, his confidence reflected in the case's fast track to trial. The defendant, Nightingale, was represented by the previously successful duo of Edward Bearcoft and Thomas Erskine. The defense had similarly shored up their litany of experts and considering their past success had good reason to be hopeful. Without seeking any procedural delays the trial was brought to the Court of Common Pleas before the Scottish-trained Chief Justice Alexander Wedderburn (often referred to by his baronage Lord Loughborough) on February 17, 1785 less than twenty-three days after Darwin's presence in court had been confirmed.<sup>121</sup>

Serjeant Adair's first task as the prosecuting attorney was to convince the jury that this second trial was not solely based on merit but was fundamentally demanded by the unjust errors of the first trial which had so harmed his client. Adair's approach to this challenge focused on the general inaccessibility of technical expert knowledge. Adair began by asserting that when the case was tried previously, it "was not understood either by the court, the jury, the counsel or the witnesses."<sup>122</sup> The reason for this was that "Mr. Arkwright, relying upon his own skill, had supposed, that every lawyer must necessarily be an ingenious mechanic, but in this he was mistaken; as many are not informed of the principles, they are ignorant of the practice."<sup>123</sup> Adair's explanation for his client's previously lost trial was that Arkwright, an expert in his own right, had understandably failed to consider just how ignorant the court would be regarding his machines. More specifically, Lord Mansfield and the defendant had fixated on superficial differences between varying iterations of his

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<sup>120</sup> Fitton, *Arkwrights*, 111-4; Webster, *Reports*, 62-3; Davies, *ICRP*, 56-69.

<sup>121</sup> Davies, *ICRP*, 34; Alexander Murdoch, "Wedderburn, Alexander, first earl of Rosslyn" *ODNB* (2004).

<sup>122</sup> *Ibid*, 37.

<sup>123</sup> *Ibid*.

invention rather than the more important underlying principles behind it. Adair continued, emphatically claiming that the said principles had always been fairly disclosed in the 1775 patent. This appeal to Arkwright's own expertise is instructive in further highlighting the unique and specific realities of patent law disputes that so rapidly enabled and demanded the presence of expert testimony. The plaintiffs and defendants in these cases, as we have seen in Chapter 1, were themselves inventors and technical experts, a fact that could be brought into court to great effect.

Throughout the trial Adair constantly reminded the court that his client was after all "the most indisputable inventor" and that he had "never yet heard that point brought into question."<sup>124</sup> This was not mere flattery, as Arkwright was made into a kind of expert witness by proxy who had, obscured by his own genesis and natural understanding of his invention, failed to adequately explain it to the court. Adair attempted to make this argument without disparaging the "ingenious and able mechanics" who had testified on Arkwright's behalf, explaining that they simply were unfamiliar with Arkwright's machines in particular, a fact that had since been remedied.<sup>125</sup> Adair aptly demonstrated the razor's edge upon which epistemic authority sat as he tried to simultaneously affirm the underlying expertise of his client, who would surely know what an intelligible patent would look like, and the missteps of the esteemed experts in the previous trial. In summary, Adair was attempting to take advantage of the unique authoritative status of his client as he sought to remind the court just how challenging it was to correctly understand Arkwright's patent.

The key confusion Adair was hoping to relieve was how, in the 1781 trial, there were inconsistencies in the cotton carding and spinning machine models presented to the court. Some models were based on Arkwright's 1769 patent, others on his 1775 patent, in addition

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<sup>124</sup> *Arkwright v. Nightingale* quoted in Fitton, *Arkwrights*, 107.

<sup>125</sup> Davies, *ICRP*, 37-8.

to deviations in the machines actually used on both Arkwright and Mordaunt's factory floor.<sup>126</sup> This led to contradiction and confusion, for example, the lead weights that were present in Arkwright's working machine were not described in this 1775 patent. Hoping to clear this all up, Adair presented the court with three models.<sup>127</sup> The first showed a pre-1775 cotton carding machine, the second was a machine constructed to the specifications of the 1775 patent and the final model was the further improved machine currently in use.<sup>128</sup> Adair emphasized to the court that all three machines completed the same patent-protected task, and that the changes were relatively superficial—only leading to a more finished product. Nightingale's counsel challenged Adair's claim that all three machines were similarly effective, arguing that the differences between models were so substantial that the cotton carding and spinning machine Arkwright currently used should not be considered by the same 1775 patent. In a move of bullish bluster Bearcroft asked for a dismissal of the trial on the grounds that Arkwright ought to apply for a new patent.<sup>129</sup> Lord Loughborough instantly dismissed such a suggestion, claiming that the iterative improvement of machines was commonplace and did not void an existing patent.<sup>130</sup>

With the scene set and the necessity of the trial successfully affirmed by the prosecution, the case, according to Fitton, “turned entirely on the sufficiency of the patent.”<sup>131</sup> To a point this is clearly true as such was the context into which the litany of experts carefully secured by Arkwright at his expense. Darwin, as expected, affirmed that being “so used to machinery” he would “not have the least difficulty” instructing an able mechanic to construct a working cotton carding machine from the specification alone.<sup>132</sup>

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<sup>126</sup> Fitton, *Arkwrights*, 107-8.

<sup>127</sup> *Ibid.*

<sup>128</sup> Davies, *ICRP*, 41; Fitton, *Arkwrights*, 107-8.

<sup>129</sup> *Ibid.*, 49.

<sup>130</sup> *Ibid.*; Webster, *Reports*, 60.

<sup>131</sup> Fitton, *Arkwrights*, 107.

<sup>132</sup> *Arkwright v. Nightingale* quoted in *Ibid.*, 108-9.

Darwin's testimony also responded to some of the objections made to the patent in the 1781 trial, as he assured the jury that the issue of scale or the drawing being only of component parts in isolation was of no concern to the astute and informed reader of the patent. Finally, Darwin made it clear that his visit to Cromford and pretrial discussions with the Arkwrights were not at all necessary for him to be able to interpret the patent.<sup>133</sup>

William Baldwin, a barrister for Arkwright, next introduced James Watt to the court. His introduction demonstrated just how important it was for the counsel to style their expert as especially well positioned to comment on the matter; for "though the gentlemen of the jury may not know" who Watt is, Baldwin declared: "I do," for he was "the gentleman that made some improvements upon the fire-engines."<sup>134</sup> Indeed, 1785 Watt's name was likely familiar to many in manufacturing, mine operation or canal transport.<sup>135</sup> Indeed the fact that this trial was held before a special jury which in addition to the standard requirements of being a land-owning male each juror had to meet a certain bar for social standing.<sup>136</sup> This bar would not be formally codified in statute until 1825, beginning with merchants, bankers, and esquires.<sup>137</sup> Arkwright's own later trial saw eight out of twelve jurors to be esquires with the remaining four split between a gentleman, a broker, a bell manufacturer and Willaim Storer referred to as a "Chinaman"<sup>138</sup> It is safe to assume that Baldwin's extravagant introduction of Watt was to a certain degree courtroom theater, a net and effective way to puff up the status of the friendly witnesses on the stand. It is not known if members of the jury did in fact know of James Watt, although to be sure, their higher status as wealthy men who usually frequented the city of London increased this likelihood. Watt's widespread reputation and casting as the

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<sup>133</sup> *Arkwright v. Nightingale* quoted in Fitton, *Arkwrights*, 108-9.

<sup>134</sup> *Ibid*, 108.

<sup>135</sup> Jennifer Tann, "Watt, James," *ODNB* (2014).

<sup>136</sup> Gubby, *DLPP*, 25-6.

<sup>137</sup> *Ibid*, 26.

<sup>138</sup> *Rex v. Arkwright*, 11.

hero of the Industrial Revolution would be enhanced throughout the 1820s following his death.<sup>139</sup>

Despite his build up, Watt's responses, although generally favorable to Arkwright, were much more speculative and therefore rife with qualifying and clarifying clauses.<sup>140</sup> When finally asked if he could construct Arkwright's machine from the specification alone Watt first clarified that he would in fact need additional information such as Arkwright's general methods when it came to spinning. However, as these were public knowledge, Watt continued, it would not be a problem to locate this. He clarified his position by noting "I think I might have made it out; but I deliver this as a matter of opinion, and desire it might be understood so."<sup>141</sup> Watt's consistent emphasis that the court regard his comments as simply his informed opinion is remarkable, demonstrating how in less than three years after *Folkes v. Chadd* the courtroom so readily tolerated Watt's speculative opinions. Indeed, he was self-professedly not presenting testimony constrained to fact-based sense perception; he was, instead, delving fully into the realm of editorializing before the jury. Moreover, the fact that Nightingale's consistently quick-footed and proficient counsel did not press this particular issue testifies to its normalcy. Watt seemed to be well aware that so long as he did not present his opinion as tantamount to fact, he was safe to speculate on the stand. Here, his otherwise incidental words grant some insight into the dual reality of expert testimony, during the mid-1780s, as commonplace in patent law disputes yet only recently formally protected.

Nightingale's defense would not, however, allow Arkwright's experts to speak unchallenged, no matter their status or prestige. Under cross-examination, Watt went off script as under some pressure, he admitted that he personally thought he could have described

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<sup>139</sup> Tann, "Watt, James"; David Philip Miller, "'Puffing Jamie': a 'Philosopher'..." *History of Science* 38, no. 1 (2000), 1-24.

<sup>140</sup> *Arkwright v. Nightingale* quoted in Fitton, *Arkwrights*, 108.

<sup>141</sup> *Ibid.*

the machine better than it was described in the patent specification.<sup>142</sup> When pressed as to whether it was easy to include a better specification, as Arkwright should have done, Watt pushed back: explaining how in his opinion the specification only needed to include the novel inventions and not restate older developments known to the trade. Here Watt suggested that details such as the use of lead weights as they were revealed in the older and now expired 1769 patent need not be rehashed since a true expert, the person for whom the patent specification was legally required to be written, would know of such past developments. Making his view clear to the jury Watt argued that “people are supposed to know the things that are old, or else they are not masters of their business.”<sup>143</sup> Of course, Bearcroft and Erskine challenged this point directly with their own litany of experts. This time their witnesses included FRS William Harrison, an instrument maker perhaps best known as the son of the acclaimed inventor and watchmaker John Harrison.<sup>144</sup> William provided the defense with clear testimony that contradicted the statements of Arkwright’s friendly witnesses. Harrison concluded on the stand that “it does not appear to me that the secret was intended to be disclosed.”<sup>145</sup> Some experts present for the defense at the 1781 trial would reappear, such as W.D. Crofts and the watchmaker Alexander Cummings, a Fellow of the Royal Society.<sup>146</sup>

### **Loughborough and a Jury Confront Conflicting Expert Testimony**

Compared to the nine expert witnesses called to the stand in *Arkwright v. Mordaunt*, the trial of *Arkwright v. Nightingale* saw a total of twenty-one experts who testified under oath.<sup>147</sup> The jury understood the gentleman of knowledge on both sides to be of good

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<sup>142</sup> *Arkwright v. Nightingale* quoted in Fitton, *Arkwrights*, 108.

<sup>143</sup> *Ibid.*

<sup>144</sup> *Ibid.*

<sup>145</sup> *Ibid.*, 110.

<sup>146</sup> *Ibid.*, 109.

<sup>147</sup> Oldham, *MM*, 763-7; Fitton, *Arkwrights*, 107.

character and skill thus the court was presented with the seemingly difficult task of deciding between experts. Lord Loughborough's lengthy jury instructions explicitly picked up on the fact that expert testimony may have ultimately obscured rather than revealed whether the jury could understand Arkwright's patent specification to be intelligible "to persons in the profession having skill in the subject, not men of ignorance."<sup>148</sup> He agreed that many of the witnesses called by Bearcroft for the defendant were "of undoubtable character and skill" but the fact that they could not construct the machine from the specification was "nothing more than a corollary from their own opinion, because it is not intelligible to them."<sup>149</sup>

Here, Loughborough's interpretation of patent law jurisprudence meant that the jury should not widely extrapolate the general veracity of the patent specification based on the ability of any single expert to construct Arkwright's machine from said specification. Indeed, despite Loughborough affirming the "undoubtable character and skill" of the experts called on behalf of Nightingale, their inability to comprehend the specification may simply reflect personal ability, or lack thereof, rather than speak to the underlying readability of the patent.<sup>150</sup> This order to the jury was exceptionally favorable to Arkwright as the fact that experts for the defense, men such as Harrison or Alexander Cummings, could not work from the patent was reframed as merely a particular example and insufficient to support the claim that the patent be voided.<sup>151</sup> Evidently Justice Loughborough was, at least in part, buying into the argument made by Arkwright's attorneys.

In his closing remarks to the court Sergeant Adair emphatically explained that should one man of skill be able to construct Arkwright's machine from the specification alone "it will overbear the evidence of five hundred witnesses, who say they think it could not be

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<sup>148</sup> Webster, 61.

<sup>149</sup> John Davies, *ICRP*, 58-9.

<sup>150</sup> *Ibid*, 59.

<sup>151</sup> Fitton, *Arkwrights*, 109.

done.”<sup>152</sup> Adair’s reasoning behind presenting such an argument is clear, as this low bar of proof would have made the task for Arkwright’s rivals immense. This is because theoretically, there was no feasible manner in which counter expert testimony could undermine Arkwright’s expert witnesses under this standard, for all an inventor’s legal team needed to do was present the court with a singular person of skill who allegedly worked solely off the specification in question. This inventive standard offered Loughborough and the court an easy-out towards resolving mutually exclusive expert testimony. Effectively, the technical details or specific objections of rival experts no longer needed to be engaged with. Instead, this shift of emphasis meant that the court did not need to consider any of the testimony of the persons of skill beyond their affirmative answer regarding replication. Here, the court and jury are in the familiar territory of adjudicating the truthfulness of witnesses.

Adair’s bold suggestion to judge and jury remained just that, until Loughborough delivered his jury instructions during which he did, in a move almost certainly unforeseen by Nightingale’s defense, offered what was tantamount to a repackaging of Adair’s suggestion. Loughborough asked the jury not specifically to focus on the dissenting expert opinions regarding the readability of Arkwright’s specification, but to exclusively judge the trustworthiness of just five of Arkwright’s expert witnesses.<sup>153</sup>

Loughborough was referring to the five machine makers, invoked by Arkwright, who had allegedly succeeded in making a working machine from the 1775 specification alone. To briefly summarize their case-deciding testimony, Samuel Wise confirmed that “he did actually make a machine from the specification, without any previous knowledge of the old machine, except a cursory view.”<sup>154</sup> Thomas Wood claimed on the stand that without guidance whatsoever, he had been successful in his construction of Arkwright’s machine

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<sup>152</sup> Davies, *ICRP*, 54.

<sup>153</sup> *Ibid*, 59-60; Webster, *Reports*, 64.

<sup>154</sup> *Ibid*, 62.

solely from the specification. Wood claimed he had even figured out how to use fluted rollers as they “were not new” but had been known to him for many years; as such he intuitively and easily knew how to address this apparent deficiency in the specification.<sup>155</sup> William Whitmore testified that he had been similarly successful after only consulting the specification for about an hour.<sup>156</sup> William Allen succeeded in replacing a model of the machine despite never having examined a carding machine in person.<sup>157</sup> Finally, John Stead had, back in 1782, successfully constructed component parts of the machine based solely on the provided diagrams.<sup>158</sup> Stead, Allen and Whitmore had all contacted each other about constructing models for this trial and swore under oath that they had not assisted each other or received any additional help from Arkwright or his legal team.

Nightingale’s legal team was indignant about this kind of unverified and unverifiable testimony and challenged each of the five men under cross-examination as much as Lord Loughborough would allow. As Whitmore struggled to express himself on the stand, it prompted an aggressive cross-examination from Erskine. In a dramatic public display of doubt, Erskine presented to the court that the credibility of the witness ought to be in question if he could not successfully describe the principles of the machine he had illegally constructed.<sup>159</sup> Unimpressed with this hostile approach against Whitmore, Loughborough emphasized to the jury that they must not consider Whitmore’s rhetorical abilities as indicative of his mechanical abilities. Loughborough explained that in his personal experience many mechanics, including James Brindley, whom Loughborough described as “the ablest mechanic that I believe the country ever produced,” were notoriously incapable of

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<sup>155</sup> Webster, *Reports*, 62.

<sup>156</sup> *Ibid.*

<sup>157</sup> *Ibid.*

<sup>158</sup> *Arkwright v. Nightingale* quoted in Fitton, *Arkwrights*, 111.

<sup>159</sup> *Ibid.*, 112-3; Davies, *ICRP*, 57.

verbally describing their mechanical genius.<sup>160</sup> Here, Loughborough seemed to be suggesting that there was a specific and discrete type of ability innate to the engineer that was fundamentally separate from the rhetoric laden landscape of the adversarial courtroom. To conflate the two would be both a grave mistake and an injustice to the skill of the witness. Taken altogether, to justice Loughborough, Whitmore's word that he had constructed the machine without assistance from the specification was sufficient for his testimony to stand. This shift in the trial from opinions on the integrity of the patent specification to the alleged success of experts in working from the specification alone was made stark in Loughborough's final remarks to the jury:

Having stated the whole of the evidence, I cannot conclude without saying, that this case turns upon a very short point; that is no matter of argument in it: it is simply whether you believe five witnesses who have sworn to a positive fact...it can only be on supposition that they are every one of them perjured...Therefore the only question for your consideration is, whether these five men have made the machine?<sup>161</sup>

Once again, the jury would issue their opinion without leaving the courtroom to deliberate.<sup>162</sup> This time, after ten hours of testimony, the jury found in Arkwright's favor, clearly believing the gentlemen experts who each swore that they had spoken the truth. This case proves illuminating both as an undeniable demonstration of the relative normativity of non-medical partisan expert testimony as well as an indication of how a judge could respond when expert testimony was deadlocked. That is by refocusing the examination from the opinions of experts to the truthfulness of their highest-level claim: constructing a machine based on

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<sup>160</sup> *Arkwright v. Nightingale* quoted in Fitton, *Arkwrights*, 112.

<sup>161</sup> *Ibid.*

<sup>162</sup> Davies, *ICRP*, 60.

specification alone. As has been seen, this approach was normally proposed by Adair and for good reason. Fortunately for Adair, Loughborough demonstrated a strong commitment to the fact that the patent need not be generally comprehensible.<sup>163</sup> Although Loughborough's commitment to this principle seems stronger than Mansfield's, it was well supported by the case law of the King's Bench following *Liardet v. Johnson*.<sup>164</sup> It was Loughborough's pivot to focus on credibility that is novel to the patent law cases examined in this and the preceding chapter. Yet the said shift should not be too surprising in the general context of the behavior of superior court judges for, as Gubby notes, it was well within Loughborough's prerogative to direct the jury in this matter.<sup>165</sup> Again, social standing and an acknowledged reputation as a natural philosopher or physician—facts made very familiar to the court—could be used as a proxy for parsing scientific information.

Throughout the trial Loughborough consistently exerted his power from the bench in a way that appeared to have privileged Arkwright. This behavior extended beyond the reining in of the hostile cross-examinations of his experts to what evidence could be submitted to the court. Nightingale's counsel aggressively questioned witnesses about the authors and origins of "The Case of Mr. Richard Arkwright and Co" a 1782 widely circulated petition to Parliament through which Arkwright hoped to get an act of Parliament passed to extend and enshrine his patent rights.<sup>166</sup> Written following the unfavorable ruling in *Arkwright v. Mordaunt*, the reason Bancroft and Erskine wanted to have this piece of evidence included is clear. In this public pamphlet Arkwright not only admits that his specification was unclear but that such obfuscation was in fact largely deliberate and necessary to protect an invention Arkwright justly considered to be "of great national importance."<sup>167</sup> As such, Arkwright's

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<sup>163</sup> Davies, *ICRP*, 56, 58-9.

<sup>164</sup> *Liardet v. Johnson* jury instructions in Oldham, *MM*, 752-3.

<sup>165</sup> Gubby, *DLPP*, 189.

<sup>166</sup> Arkwright and Co., "The case of Mr. Richard Arkwright"; Mason, "Arkwright"; Fitton, *Arkwrights*, 98-100

<sup>167</sup> *Ibid*, 2.

care in protecting his invention “cannot” be interpreted to mean that he intended to defraud his countrymen; the reverse was made clear, Arkwright argued, as he allowed full replications of his machines to be shown in open court.<sup>168</sup> Although this document was intended as a kind of *apologia* the admissions made are substantially damning as the justifications provided are not of legal merit. Loughborough was explicit in this fact, noting in his summary of evidence that “a good deal was said” regarding how Arkwright “overshot himself” in attempting to keep the invention from the French. However, he went on, the jury “cannot apply that idea to his [Arkwright’s] mind.”<sup>169</sup> Loughborough’s rationale was that by applying for a patent in the first place, Arkwright had demonstrated his good faith towards the patent process and as a result had a strong claim to his intellectual property rights that cannot be distracted from with circumspect assumptions about intent. Moreover, Arkwright had no reason to doubt the quality of a specification approved by the chancery office.<sup>170</sup>

The need to pay attention to Loughborough’s language regarding patent rights and property is essential in order to understand the logic underlying his continued favoring of Arkwright’s position. This sympathy culminated with his ultimate direction to the jury regarding conflicting expert testimony where he noted that “the law has established the right of patents for new inventions; that law is extremely wise and just.”<sup>171</sup> This speaks to a late-eighteenth century shift in the understanding of letters patent as not merely as a privilege to manage a monopoly but a full body right to protect one’s own property.<sup>172</sup> For Loughborough the property right conveyed by the fruits of Arkwright’s labor, akin to a land dispute, ought to come with serious legal and social protections, a fact he clarified when he noted that “nothing

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<sup>168</sup> Arkwright and Co., “The case of Mr. Richard Arkwright,” 3.

<sup>169</sup> Davies, *ICRP*, 59.

<sup>170</sup> *Ibid*, 59-60.

<sup>171</sup> *Ibid*, 55.

<sup>172</sup> Gubby, *DLPP*, 229-30; Dirk Van Zyl Smit, *Social creation of a legal reality*, PhD thesis, (University of Edinburgh, 1980); Bottomley, *BPS*, 46-7, 75-9, 88-90.

could be more essentially mischievous” than to settle a conflicting property claim by bowing to “considerations of public convenience or expediency.”<sup>173</sup> Here Loughborough revealed his preference for settling this patent dispute like a dispute between conflicting property claims, meaning that public perceptions and discussion were made moot in the face of a veiled contract which Arkwright received once his patent was sealed. For Loughborough, it seems, patent law had to consider the private person first and the public second. While he could not dismiss Mansfield’s prescriptions regarding the standards of a specification, he could shape how his court treated this hurdle.

As a result, the jury was asked to refocus on the character of five deeply partisan expert witnesses. Indeed, the partisan nature of these experts extended beyond their adversarial presence in the courtroom; it was reflected in their payment, sometimes in multiple installments, for the work done on behalf of their client inside and outside of the courtroom. All five of Arkwright’s machine replicators were paid and Allen, Whitmore and Wise received payment both for the making of their models and for their expenses when staying in London during the trial.<sup>174</sup> Nevertheless, these men of good reputation and noted skill were vindicated by Justice Loughborough as he effectively forced Nightingale’s counsels, much to their objection, to prove a negative. In summary, experts faced off in the courtroom and yet through a set of jury instructions, a crisis of fact and authority was neatly resolved through the discretionary choice of nonengagement. For while the early modern court welcomed the expert with perhaps surprising swiftness and procedural dexterity there was no mistaking or challenging the broad power of the sitting judge to handle such opinions

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<sup>173</sup> Davies, *ICRP*, 55-6. Eighteenth-century English law vigorously protected land rights, a tradition informed in part by the writings of John Locke. Lawrence C. Becker, “The Labor Theory of Property Acquisition” in *Property Rights* (Taylor & Francis, 1977), 32-56; Rob Iliffe, “‘In the Warehouse’: Privacy, Property and Priority in the Early Royal Society,” *History of Science* 30, no.1 (1992), 53; Adam Mossoff, “Rethinking the Development of Patents: An Intellectual History, 1550-1800,” *Hastings Law Journal* 52, 1255-322.

<sup>174</sup> The witnesses received the following: Stead £52 10s, Wood £21, William Allen £36 15s, Whitmore £42, and Wise £36 2s 6d; Payment breakdown obtained from Fitton, *Arkwrights*, 116.

of persons of skill on the stand as they saw fit, usually, as informed by the witness's perceived social status and credibility. Loughborough's strong commitment to resolving a patent dispute as a narrow and private property rights dispute further limited the purview of the jury's deliberations. Ultimately the jury did not consider whether or not Arkwright's specification was generally thought to be intelligible, but acknowledged that for certain skilled artificers, as their testimony affirmed, the specification was more than enough.

### Conclusion

Despite his resources and planning, Richard Arkwright's attempt to consolidate the cotton spinning industry through the enforcement of his generalized 1775 patent collided with the implications of recent developments in both patent law and jury trials. In practice, this meant relying on extensive testimony given by persons of skill and ensuring that their testimony had a positive effect on the jury. Arkwright's cases against Mordaunt in 1781 and Nightingale in 1785, as covered in this chapter, bookend the rehearing of *Folkes v. Chadd* in November of 1782.<sup>175</sup> As such, the fact that a wide range of technical experts from the workshop assistant Thomas Bell to Erasmus Darwin were present in these cases substantiates and enriches Tal Golan's depiction of *Folkes v. Chadd* as norm clarifying rather than norm remaking.<sup>176</sup> Clearly, as *Arkwright v. Mordaunt* demonstrated neither judge nor legal counsel remotely problematized the presence of persons of skill describing in their opinion whether the specification was or was not sufficient.<sup>177</sup> This strongly suggests that in the context of a rapidly developing patent law jurisprudence this kind of testimony, even prior to Mansfield's ruling in *Folkes v. Chadd*, was too commonplace to challenge on evidentiary grounds.

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<sup>175</sup> Roscoe, *Reports*, 157.

<sup>176</sup> Golan, *Laws*, 5-51; Tal Golan, "Scientific expert testimony in Anglo-American courts, 1782-1923," *CSTMS Research Unit* (1997); Tal Golan, "The History of Scientific Expert Testimony in the English Courtroom," 7-32.

<sup>177</sup> Oldham, *MM*, 763-7.

My account reaffirms the argument in the previous chapter, which showed how Mansfield refocused patent law towards the detailed examination of the patent specification, a jurisprudential clarification, which both required and permitted the presence of expertise in the courtroom. More specifically, by setting the legibility standard around the expected knowledge of the relevant technical professionals, such as in *Liardet v. Johnson*, this standard informally preceded *Folkes v. Chadd* in constructing a formal category for the court to contend with persons of skill. The fact that Arkwright's great misstep in his first trial against Mordaunt was failing to sufficiently match or exceed the caliber of expert witnesses brought by the defense, serves as additional reinforcement towards understanding patent law in the early 1780s as a vibrant and foundational era of adversarial expert testimony.

On this point, it is worth pointing out that across the two trials examined the number of witnesses per trial continued to balloon. In 1781 Arkwright's team called six witnesses to the stand and by 1785 the number increased to eleven.<sup>178</sup> As has been noted, failing to secure the testimony of John Michell, Arkwright worked hard to increase this number even more. Additionally, long-term employees of Arkwright such as Bell and J. Barnes, who testified in 1781 were accompanied by Erasmus Darwin, Samuel Moore and James Watt whose presence before the court was secured at substantially more expense.<sup>179</sup> The increased presence of expert witnesses, simply in sheer volume, speaks to the invaluable role expert testimony played in presenting a case. It also showed how quickly this strategy was picked up by the legal teams involved in patent disputes, as expert claims were nigh insurmountable if not countered, by countervailing testimony. In *Arkwright v. Mordaunt*, Samuel Moore's

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<sup>178</sup> Oldham, *MM*, 763-7; *Rex v. Arkwright*, 127-61.

<sup>179</sup> Indeed, Watt only accepted reimbursement for travel and living expenses during the trial but overall, Arkwright's legal battle costs quickly added up. Goodwin's bill for both *Arkwright v. Nightingale* and *Rex v. Arkwright* was an outrageous sum of approximately £1,808. Expert testimony in his action against Nightingale exceeded £370 a cost that likely reoccurred during *Rex v. Arkwright*. Figures (excluding Watt's) from Fitton, *Arkwrights*, 116, 138. Watt's requested reimbursement slightly increased the second time around: "James Watt to Mr G. Goodwyn," February 4, 1786, Library of Birmingham, Letter Book 1, MS 3219/4/123, 160.

definitive statements about the defects of Arkwright's patent went essentially unanswered, a strategic misstep that would not be repeated in the subsequent two trials.<sup>180</sup> Indeed, this escalating number of expert witnesses is a trend that continued to increase in the decade and into the next, initially in Arkwright's final trial and subsequently in the many patent trials of James Watt.<sup>181</sup>

However, as *Arkwright v. Nightingale* demonstrated, the expert witness was neither the master of the courtroom nor had the final say. To a certain extent, this fell to the propertied male and respectable commercial jury, although their conduct was heavily dependent on the instructions and guidance given by the judge, who ultimately shaped the determinative impact of expert testimony. It was Mansfield's legal precedent, this refocusing on the patent specification, that truly opened up and blessed the presence of persons of skill in patent law disputes.<sup>182</sup> Yet jurisprudence is open to interpretation and it was the prerogative of justices to steer Mansfield's decree in one direction or another, at least until Mansfield had the final say.<sup>183</sup> Lord Loughborough's interpretation of legibility as meaning *legible to any skilled inventor* meant that when faced with contradictory expert evidence, he redirected the court to assess not the witness's skill but their supposed honesty.<sup>184</sup>

This highly traditional solution to a more novel courtroom challenge is reflective of a key backdrop in the story of the ascendancy of the partisan non-medical expert witness in the late eighteenth century. So long as the expert witness remained a largely organically developing phenomenon, devoid of formal regulation, the specifics of the expert's determinative power during a trial would remain highly variable, fluctuating from patent trial

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<sup>180</sup> Oldham, *MM*, 765; See Moore's testimony in *Rex v. Arkwright*; Chapter 4, 210-8.

<sup>181</sup> Covered respectively in Chapters 4, 196–240 and 5, 270-283.

<sup>182</sup> See *Liardet v. Johnson* in Oldham, *MM*, 754.

<sup>183</sup> The King's Bench did have the power to review lower court discussions yet the House of Lords, of which all judges were members, had the collective and true final say. Gubby, *DLPP*, 13, 17-9; E. Wyndham Hulme, "Privy Council Law and Practice of Letters Patent for Invention From the Restoration to 1794 II," *Law Quarterly Review*, vol. 33 no. 2 (1917), 180-95.

<sup>184</sup> *Arkwright v. Nightingale* quoted in Fitton, *Arkwrights*, 111.

to patent trial. Nevertheless, as Arkwright quickly learned, it was best that one showed up well prepared, and so the days of the unilateral and singularly disruptive expert, represented by the testimony of the likes of Moore and Higgins, were gone almost as soon as it began.

## Chapter 3

### The Emergence of the Civil Engineer as Partisan Expert Witness (1780-1784)

#### Introduction

On November 21, 1782 the King's Bench took up an appeal from a trespass case decided by the Norfolk court of assize on July 25, 1782.<sup>1</sup> The plaintiffs, Sir Martin Browne Folkes and Roberts Hales, had lost and upon appeal alleged that the testimony of their witness John Smeaton, the most widely known civilian engineer in all the realm, had been improperly silenced by the lower court when the judge instructed the jury to disregard the contents of Smeaton's report.<sup>2</sup>

The dispute as summarized in the first published report hinged on the true cause of the decline of Well's Harbor.<sup>3</sup> Wells Harbor in Norfolk had long served as a safe haven for ships making the dangerous trek across the North Sea carrying goods from the north of England to London.<sup>4</sup> The respite provided by Wells Harbor only increased in importance as the county became the agrarian workhorse of England.<sup>5</sup> This process accelerated and with it Wells Harbor's importance, as during the early eighteenth century, the safety of the harbor was matched by the area's incredibly fertile salt marshes.<sup>6</sup> The problem was that the harbor of Wells was not served by a back-channel, that is, a fresh water source that would regularly

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<sup>1</sup> Henry Roscoe, *Reports of Cases Argued and Determined in the Court of King's Bench....[1778-1785]* vol. III, (Steven and Sons and R. Milliken and Son, 1831) 157-161; "Anonymous Shorthand Notes of Proceedings," MS 486, *NRO*, 47-9, 68.

<sup>2</sup> On Smeaton's reputation: A. W. Skempton, "Smeaton, John" *ODNB* (2004); June Garth Watson, *The Smeatonians* (Telford, 1989), 1-3; M. D. Morris, "A man for all reasons: John Smeaton" in Bernard G. Dennis Jr., Robert J. Kapsch, et al., eds., *American Civil Engineering History: The Pioneering Years* (2023), 1-24; Roscoe, *Reports*, 157-61.

<sup>3</sup> *Ibid.*

<sup>4</sup> Tal Golan, *Laws of Men and Laws of Nature*, (Harvard University Press, 2004), 7-8; John Barney, *The Trials of Wells Harbor* (Mintaka Books, 2000) 7-8

<sup>5</sup> *Ibid.*; The Editors of Encyclopaedia Britannica, "Norfolk four-course system" (1998); R. A. C. Parker, *Coke of Norfolk* (Clarendon Press, 1975); Naomi Riches, *The Agricultural Revolution in Norfolk* 2nd ed. (Frank Cass and Co. lim., 1967), 15-7, 95, 150-2.

<sup>6</sup> Golan, *Laws*, 9; Evidence of Wells Harbor's importance is suggested by a protective act of parliament passed on June 2, 1663: *Journals of the House of Commons* VIII, 496.

scour the harbor of sediment buildup.<sup>7</sup> Instead, the maintenance of the Wells Harbor initially relied solely on the natural wash of the tide, a process that appeared to grow less and less effectively as former marshland was increasingly reclaimed and embanked to serve instead as farmland.<sup>8</sup> The correlation between the embankment of land and the decay of the harbor was first observed in 1725 just five years after the first major embankments were built.<sup>9</sup> This increasingly put local landowners such as Lord John Turner, the father-in-law of Folkes and Hales, at odds with the shippers, merchants, and harbor masters who alongside the area's noted landlords sat on a Harbor Commission, empowered by Parliament to maintain the harbor.<sup>10</sup>

The *English Reports* describe the commissioners of the harbor believing the embankment owned by recently deceased Lord Turner was the true cause of the harbor's demise and therefore threatened to destroy it leading to a trespass dispute.<sup>11</sup> Lord Turner, now represented by Folkes and Hales, his heirs by way of marriage, commissioned the work of Smeaton. Upon close study of the site he concluded that the harbor's decay was natural and the removal of any embankment would have a negligible effect on restoring the harbor to its former state.<sup>12</sup> Justice Henry Gould presiding over the Norfolk assize found Smeaton's testimony to be inadmissible evidence as his testimony on the hidden true cause of the harbor's decay was mere opinion and not rooted in the sense evidence that common law

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<sup>7</sup> Golan, *Laws*, 8; Barney, *The Trials of Wells Harbor*, 1-5; John H. Farrant, "The rise and decline of a south coast seafaring town" *The Mariner's Mirror* 7, no. 1 (1985): 73.

<sup>8</sup> Golan, *Laws*, 9-11.

<sup>9</sup> Thomas Badeslade, *The History and Present State of the Port of King's Lynn...* (J. Roberts, 1725), 35; John Smeaton, "The Report of John Smeaton, Engineer, upon the State and Condition of Wells Harbor, in the County of Norfolk" (1782), MS 486, *NRO*, 1-4.

<sup>10</sup> The harbor commissioners were further empowered by a 1768 act of parliament; Language of bill quoted in Golan, *Laws*, 10; The bill received the royal assent on December 20, 1768; *Journals of the House of Commons* Vol. XXXII, 114; "A particular of the Estate Late of Sir John Turner..." NRS 8730, 21D3, *NRO*.

<sup>11</sup> Roscoe, *Reports*, vol. III, 157.

<sup>12</sup> Golan, *Laws*, 13-4; "A particular of the Estate Late of Sir John Turner..." *NRO*; "Smeaton's Report," MS 486.

required.<sup>13</sup> However, on appeal Lord Mansfield of the King’s Bench strongly objected and declared, as written in a 1835 trial report, that “in matters of science, the reasonings of men of science can only be answered by men of science.”<sup>14</sup> To Lord Mansfield and the King’s Bench, the truth hinged on the cause of a harbor’s decay; the court would be negligent if it did not permit the testimony of the men such as Smeaton who “understands the construction of harbors, the cause of their destruction, and how remedied.”<sup>15</sup> In short, Smeaton’s technical knowledge and expertise rendered his conclusions, which were rooted on observable facts of the harbor, to be more akin to a statement of fact fit for a jury to weigh than mere speculations.

This 1782 King’s Bench ruling on *Folkes v. Chadd* has from the periphery cast a substantial shadow over the work of this thesis just as it does over the general historiography surrounding the early expert witness. First outlined in the Introduction and serving as background context in Chapters 1 and 2, this case has traditionally been recognized as the beginning of the partisan expert witness at common law and is deeply material to a project dedicated to uncovering the early development and conduct of the expert witness. The examples of short references to *Folkes v. Chadd* often in the service of a legal opinion or as part of a larger modern-looking account of the appropriate role of science in the courtroom are numerous and ever-multiplying.<sup>16</sup> Suffice it to say that the legacy of *Folkes v. Chadd* as

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<sup>13</sup> Roscoe, *Reports*, vol. III, 158.

<sup>14</sup> *Ibid*, 159.

<sup>15</sup> *Ibid*.

<sup>16</sup> Golan argues such mythmaking began with Henry Roscoe, *Reports*, vol. III, 157; Golan, *Laws*, 45, 5; This has since continued: Thayer, *Select cases on evidence at the common law*, 688-70,705; Wigmore, *Treatise on the Anglo-American System of Evidence...*, vol. 4, 105; Siobhan Keegan, “Evaluating the Expert Witness in the Modern Legal Landscape,” *Scottish Council of Law Reporting*, delivered on 18 April 2024; “Lady Chief Justice The Right Honourable Dame Siobhan Keegan,” NIJAC; Milroy, “A Brief History of the Expert Witness”; Craig Howell and Richard Honey, “Expert Evidence and how to be a Good Witness,” *FTB Chambers* (2010); For Citations by contemporary US courts: *Lincoln v. Saratoga & S.R. Co.* (1840) 23 Wend. 425; *Federal Power Commission v. Florida Power & Light Co* (1972) 92 S.Ct. 637; *Brenda Minner, Hillard Muttart, Linda Brennan et al. v. American Mortgage & Guaranty et. al* (2000) 791 A.2d 826.

the case which invented the expert witness is thoroughly incorporated into historical legal memory.

Yet, as has already been seen, particularly at the trials of Dollond (1763 and 1766), Liardet (1778) and Arkwright (1782), the presence of a person of skill was implicitly accommodated during patent law trials; therefore, it is now both chronologically and thematically appropriate to address these cases on the testimony of the expert witness *qua* expertise.

Focus on the well-trodden ground of Mansfield's 1782 ruling obscures the scale and complexity of the expert witness who came along before November of 1782. The first trial between landowners and harbor commissioners had occurred over a year prior on August 10, 1781 and carried by the sole testimony of Scottish engineer Robert Mylne, Folkes and Hales prevailed.<sup>17</sup> The defense appealed to Mansfield on a writ of error claiming that they were not expecting nor prepared for the testimony of an engineer therefore they requested a second trial in which they could also present this kind of expert evidence.<sup>18</sup> In the months preceding the trial, there was a true race to secure a favorable report highlighting the true cause of the harbor's decay and as both plaintiff and defendant hoped, a favorable jury verdict.<sup>19</sup> The second assize trial was held on July 25, 1782 and this time the commissioners of the harbor were handed a victory by the local special jury. Folkes and Hales appealed to Mansfield, resulting in Mansfield's famed ruling and a third trial scheduled to be held in August of 1783.<sup>20</sup> This final trial which resulted in a victory for the commissioners of the harbor proved

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<sup>17</sup> "Arguments of Counsel," 50-1, 56-7; *Reports*, vol. III, 159.

<sup>18</sup> *Ibid*, 47-9, 68.

<sup>19</sup> A memo between counsel for the commissioners of the harbor stressing the imperative of sourcing expert evidence: "Copy of Directions of Mr Dunning," MS 486, *NRO*, 69.

<sup>20</sup> "Arguments of Counsel," MS 486, *NRO*, 51; None of the anonymous reporters on the trial provide a precise date for the final trial; MS 486, *NRO*.

to be the last as upon hearing Folkes's appeal on November 27, 1783 Lord Mansfield, believing the matter settled, refused to grant a fourth trial.<sup>21</sup>

A final point of often overlooked complexity that helped shape the trials of Wells Harbor is the alleged trespass for which the trial was granted, which was entirely a legal fiction.<sup>22</sup> In an effort to save the Wells Harbor the commissioners had constructed a number of artificial measures in an attempt to better scour the sediment from the bay.<sup>23</sup> The center piece of this construction project, referred to as Freestone sluice and likely brought into operation in 1748 was an artificial and narrow single point of drainage cut into a watery reserve referred to as Wharham Slade.<sup>24</sup> This opening was designed to funnel flood water down the length of the harbor's depth with the intent of scouring sediment buildup.<sup>25</sup> However, as of 1758 Lord Turner had constructed 172 acres of farmland that butted up against this slade, an action that seemed to have a demonstrable effect on the flooding of Slade and thereby the functioning of Freestone sluice.<sup>26</sup> It was for this reason that the commissioners of the harbor specifically targeted the removal of this embankment at trial.<sup>27</sup>

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<sup>21</sup> Roscoe, *Reports*, vol. III, 340-3.

<sup>22</sup> *Ibid.*; "Anonymous Shorthand Notes of Proceedings," MS 486, *NRO*, 120; Golan, *Laws*, 11-5; On the constraints of writs and why such machinations were necessary: John Baker, "The Forms of Action" in *Introduction to English Legal History* (Oxford University Press, 2019), 60-77; Amanda L. Tyler, *Habeas Corpus: A Very Short Introduction* (Oxford University Press, 2020); James Oldham, "Reinterpretations of 18th-Century English Contract Theory," *The Georgetown Law Journal*. 76, no. 6 (1987): 1949-92; Gubby, *DLPP*, 19.

<sup>23</sup> *Ibid.*; "Anonymous accounts of the Wells Harbor Trial," *NRO*.

<sup>24</sup> There is some discrepancy regarding when Freestone, alternatively referred to as Fristan's Sluice, began operation. Mylne's report lists the date as 1748. This is the date used by Tal Golan in his detailed account of the trial; however, Smeaton's report lists the date of the sluice as 1738. It is possible this is the date in which the elements of construction began. Finally, the Norfolk Records Office possesses multiple copies of Smeaton's reports. Across all copies an unknown hand has crossed out the date provided by Smeaton and replaced it with the date 1749. Written in ink in what appears to be multiple scripts the providence and veracity of this alteration remains a mystery. "Engineers Reports," MS 486, *NRO*; "Reports by Mylne and Smeaton," MS 17640 38F3, *NRO*; Golan, *Laws*, 10.

<sup>25</sup> *Ibid.*

<sup>26</sup> Robert Mylne, "Report on Wells Harbor" (1781) and Smeaton, "The Report of John Smeaton" in MS 486, *NRO*.

<sup>27</sup> The actual removal of the embankment could only be ordered by an injunction from Chancery following a favorable ruling from the common law courts; Golan, *Laws*, 11-5; "Reports of Mylne and Smeaton" in MS 486, *NRO*.

Irrespective of the overstated precedential nature of the second King's Bench hearing, the collective trials remained unique due to the consistent attention the defense placed on the very epistemological and jurisprudential grounding of the evidence provided by persons of skill. The court's dramatic response led to extensive retrials as the cause bounced between Westminster and Norfolk. This dynamic contrasted with the relative procedural calm in which patent law incorporated the opinions of experts and was ultimately contingent on the continued silent acceptance of the parties involved.

It is with an aim towards drawing out both the knowledge-making claims of the hired civil engineers (in their professional capacity and as an expert witness) and the broad response ranging from lawyers to judges and the local community that motivates this chapter. Indeed, for the potential and promise of the persuasive reports of the engineers the final verdict always lay with the special jury as carefully selected by both plaintiff and defendant.<sup>28</sup> Through a holistic engagement that spans across five trials and numerous procedural motions, this chapter will spotlight moments that showcase the often fraught and dramatic points of collision between the natural philosopher and legal practitioner. This will be accomplished in four parts.

In the first section through the surviving correspondence of civil engineer John Smeaton, I will piece together the process through which the landowners and plaintiffs Sir. Martin Browne Folkes and Robert Hales secured the in-demand services of England's most acclaimed engineer.<sup>29</sup> Particular attention will be paid to Smeaton's enduring attempts to steer the trial towards arbitration as well as the manner in which he sought to maintain and exert his independence and impartiality despite being effectively hired to produce a singular result favorable to this client.

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<sup>28</sup> All cases held at the Norfolk Assize courts were held before a special jury: "The Special Jury on the Trial in August 1793," MS 486, *NRO*; "Arguments of Council," also in MS 486, *NRO*.

<sup>29</sup> *op. cit.* 3.

Secondly, I examine in detail the four reports that were ultimately produced during the legal disputes. Robert Mylne and John Smeaton wrote two separate reports for the prosecution.<sup>30</sup> The remaining two reports authored by Joseph Hodkinson and Joseph Nickalls were commissioned by the defense.<sup>31</sup> Two other engineers hired by the commissioners of the harbor, John Grundy and Thomas Hogard, did not issue reports of their own but in a signed letter fully endorsed the findings of Joseph Hodkinson.<sup>32</sup> Particular attention is paid overall towards the methods and sources of authority the authors drew from. All authors ultimately rooted their findings, no matter how speculative, in the initial observations and measurements they made of the harbor at the time of their visit. Additionally, despite normally endorsing the preferred outcomes of their client, they carefully couched and qualified their claims to ensure that their assessment did not drift substantially from the recognized facts of this complex geological puzzle.

Thirdly, this chapter will examine the specific trial strategy of the commissioners of the harbor as orchestrated by their lead solicitor George Hardinge. Here, Hardinge was able for a time to successfully problematize the very opinions of persons of skill as mere opinions not fit for a jury to examine. This gambit was enabled by the participation of Judge Gould who, from the bench, enforced a strict standard of sense perception as the only foundation of the kind of verifiable truth claims that a common law court could examine.<sup>33</sup>

Fourthly and finally, I will turn to examine an emergent dispute over the constituent parts of gentlemanly status, namely the reputation and professional decorum between Robert

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<sup>30</sup> Robert Mylne, *Report on Wells Harbor* (1781) and Smeaton, "The Report of John Smeaton" in MS 486, *NRO*.

<sup>31</sup> Joseph Hodkinson, "The Report of Joseph Hodkinson, Engineer, reflecting the State of Wells Harbor, In the Country of Norfolk" and Joseph Nickalls, "The Report of Joseph, Engineer, on the State of Wells Harbor in Norfolk" (1782) in MS 486, *NRO*.

<sup>32</sup> John Grundy and Thomas Hogard to The Commissioners for the Preservation of the Harbor of Wells, July 6, 1782, in MS 486, *NRO*.

<sup>33</sup> "Anonymous accounts of the Wells Harbor Trial of July 25, 1782," in MS 486, *NRO*.

Mylne and George Hardinge.<sup>34</sup> In the wake of the final trial, Mylne went to great lengths to receive a public and formal apology from Hardinge for his mistreatment during cross-examination. The ensuing dispute included mediation from Hardinge's friend Thomas Pitt, better known as Lord Camelford. This dispute ultimately yielded an apology, which Mylne rushed to print resulting in at least one broadsheet.<sup>35</sup> This saga not only prefaces how potentially fraught the relationship between the adversarial advocates of the legal profession and the hired gentleman of science could be but also revealed the contemporary self-conceptions of both men.

### **The Hiring of John Smeaton Civil Engineer, FRS**

On December 12, 1781, self-described civil engineer John Smeaton, responded to John Forster concerning the possibility of offering his services.<sup>36</sup> Writing from Austhorpe, the location of his office and private workshop since 1760, Smeaton had over the course of nearly thirty years not just cemented a reputation as England's foremost civil engineer but also played a key role in defining the very discipline.<sup>37</sup> In 1771, Smeaton founded the Society of Civil Engineers with the novel descriptor of "civil" intended to distinguish the discipline from the established and in demand siege, ballistic and, fortification work of the military engineer.<sup>38</sup> By 1781 Smeaton had overseen projects ranging from mills (both wind and water) to canals, bridges and drainage projects<sup>39</sup> Additionally, as a respected *gentleman of science*

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<sup>34</sup> The exchange is preserved as a set of letters the majority of which are printed; "Letters concerning accusations made against Robert Mylne by George Hardinge during the trial of the Wells Harbor...", WLP 18/25, 4, *NRO*.

<sup>35</sup> "Printed Broadsheet Concerning Correspondence between Robert Mylne George Hardinge," September 20, 1784, WLP 18/25, 4, *NRO*.

<sup>36</sup> John Smeaton to John Forster, December 12, 1781, *Smeaton Letterbooks*, vol. 1, 4, *ICE*.

<sup>37</sup> A. W. Skempton, "Smeaton, John" (2004).

<sup>38</sup> Mike Chrimes, "Society of Civil Engineers (act. 1771–2001)" *ODNB* (2005); Richard Parker, "Smeaton Lecture 2024: John Smeaton, mechanical engineer-rotating machinery, history and legacy" *ICE*; On the rapid rise of military engineers during the tumultuous late-eighteenth century: H el ene V er in and Irina Gouz evitch, "The Rise of the Engineering Profession in Eighteenth Century Europe." *Engineering Studies* 3, no. 3 (2011), 153–69; Douglas William Marshall, "The British Military Engineers, 1741-1783," PhD thesis., (The University of Michigan, 1976).

<sup>39</sup> Skempton, "Smeaton, John"; Golan, *Laws*, 24-5.

Smeaton had contributed numerous experiments and letters to *Philosophical Transactions* inclusive of extensive experiments with steam engine efficiency having conceptualized horsepower as measure of energy 18 years prior to James Watt standardized and popularized the metric.<sup>40</sup> However, in December of 1781 Smeaton's expertise and status were requested by Forster in regards to a specific matter: the readily apparent decay of Wells Harbor in Norfolk.

Smeaton's requested intervention, by the newly minted landowners of Folkes and Hales, into the disputed cause of the harbor's decay had not been immediate. In fact, the dispute had already been heard in August 1781 at the Norfolk assize court with the jury finding on behalf of Sir Folkes and Mr. Hales.<sup>41</sup> Yet, the commissioners of the harbor successfully appealed for a retrial citing that they were unprepared to greet the expert evidence of the plaintiffs presented by the Scottish engineer Robert Mylne. The King's Bench chose to grant the appeal and ordered a new trial to be undertaken at the local venue.<sup>42</sup> Despite the victory, Folkes and Hales were not entirely happy with Mylne's performance, finding him combative, too discursive and arrogant on the stand.<sup>43</sup> Although they retained Mylne's services, possibly to save face or to not anger Mylne who took affronts to his reputation quite seriously, they augmented Mylne's testimony by turning to none other than the esteemed FRS John Smeaton who had substantial experience surveying and producing comprehensive, systematic and theoretically minded reports on the formation and prognosis of harbors.

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<sup>40</sup> Some examples of Smeaton's eighteen publications in *Philosophical Transactions* include: John Smeaton, "An experimental enquiry concerning the natural powers of water and wind to turn mills, and other machines, depending on a circular motion" *Philosophical Transactions*, vol. 51 (1759), 100–74; John Smeaton, "Description of a new method of observing the heavenly bodies out of the meridian," *Philosophical Transactions*, vol. 58 (1768).

<sup>41</sup> Roscoe, *Reports*, vol. III, 157.

<sup>42</sup> *Ibid.*

<sup>43</sup> See "Offending a gentleman Legal Practice v. Gentlemen of Knowledge," 189-95.

The demand for Smeaton's talents is evident in the fact that he was nearly simultaneously contacted by both the commissioners of the harbor and the representatives of Folkes and Hales. In his December 12, 1781 letter Smeaton informed Forster of this fact noting that he had "received a letter from Daniel Jones... desiring [Smeaton] to view the harbor and ground on behalf of the commissioners to give my opinion to them and support my opinion at a future trial."<sup>44</sup> Smeaton expressed an interest in both parties using himself as a mediator and wrote to Forster, that it was only as an impartial mediator he would have full "confidence" in the "weight" of his "opinion" on the true cause of the harbor's decline.<sup>45</sup> Despite his clear wish to serve as a mediator, Smeaton assured Forster that, since Forster requested his services first, Smeaton would represent Folkes in the event of a trial.<sup>46</sup> Here Smeaton embodied the same professional and gentlemanly qualities of a renowned lawyer or surgeon; the very terms he would later state as his model for the appropriate and necessary personal touch of a good civil engineer<sup>47</sup> Indeed, Smeaton independently and promptly informed the harbor commissioners that his services were requested first by the plaintiffs.<sup>48</sup> This professional courtesy notwithstanding, Smeaton strongly reiterated to all parties that it would be to "the advantage of both parties to proceed upon the business jointly".<sup>49</sup>

The surviving correspondence held between the Institute of Civil Engineers and the Norfolk Records Office is too fragmented to fully piece together the intermediary developments. A surviving letter from Smeaton once again to Forster dated December 26, 1781, reaffirmed Smeaton's interest in settling the matter through arbitration as he reiterated his suggestion to view the harbor on behalf of both parties.<sup>50</sup> In an effort to facilitate this

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<sup>44</sup> John Smeaton to John Forster, December 12, 1781, *Smeaton Letterbooks*, vol. 1, 4, *ICE*.

<sup>45</sup> *Ibid.*

<sup>46</sup> *Ibid.*

<sup>47</sup> John Smeaton to Galton, January 15, 1783, quoted in Skempton, "Smeaton".

<sup>48</sup> John Smeaton to John Forster, December 12, 1781.

<sup>49</sup> *Ibid.*

<sup>50</sup> John Smeaton to John Forster, December 26, 1781, *Smeaton Letterbooks*, vol. 1, 8, *ICE*.

Smeaton requested permission to circulate a contract between the commissioners of Wells Harbor and Folkes and Hales.<sup>51</sup>

Smeaton's persistent legal advice regarding arbitration was neither uninformed nor ad hoc, and he had considerable legal experience despite his distinguished career as an engineer. His legal familiarity extended beyond his time spent advising on trials, serving as a called-upon expert or even functioning as an arbitrator. His father William was a practicing attorney and Smeaton initially intended to follow in his father's footsteps.<sup>52</sup> In 1740 at the age of sixteen, after graduating grammar school Smeaton worked the next two years at his father's legal office in Leeds before moving to London to attend Gray's Inn and continue his legal education.<sup>53</sup> He spent two more years studying to be called to the Bar, yet in practice his time was largely consumed not with case law or pleading procedures but in his well-appointed home workshop experimenting with instrument making.<sup>54</sup> It was during this transition period that he began a lifelong friendship with Henry Hindley, who would go on to become a highly accomplished instrument and clockmaker.<sup>55</sup> Clearly drawn to the philosophical sciences, in 1744 Smeaton wrote a lengthy *Apologia* to his father in which he outlined his understanding of law and why the discipline did not suit "the bent of his genius."<sup>56</sup> His father accepted his plea and Smeaton, free to fully abandon his pursuit of a legal career, returned home to Austhorpe and spent the next four years training as a maker of philosophical instruments, a practice that would enable his future in what Smeaton would later label as civil engineering.<sup>57</sup>

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<sup>51</sup> John Smeaton to John Forster, December 26, 1781.

<sup>52</sup> Skempton, "Smeaton".

<sup>53</sup> Mary Dixon, ed., *Reports of the Late John Smeaton* vol. 1 (1812), xvi-xvii; "Education" in John Smeaton Civil Engineer, 1724-1792, *ICE* webpage [2025].

<sup>54</sup> Dixon, *Reports of the Late John Smeaton*, xvi-xvii.

<sup>55</sup> Skempton, "Smeaton"; John Brooks, "Hindley, Henry," *ODNB* (2004).

<sup>56</sup> Dixon, ed., *Reports John Smeaton*, xvi.

<sup>57</sup> Skempton, "Smeaton".

Smeaton's grounding in law helps to explain and further contextualize both his general comfort in the court, the high opinion judges, particularly Mansfield, clearly held of him, and finally the legal advice and commentary he provided his clients alongside his opinions about the decay of harbors. Additionally, Smeaton's sensitivity towards impartiality and clear awareness of the demands and difficulties of appearing as a witness further suggested the presence of a legal background. Nevertheless, despite his best attempts, Smeaton's suggestion to arbitrate fell on deaf ears. It seemed that it was the commissioners who declined Smeaton's offer, feeling confident, despite their recent loss, in the sympathy of a local jury over the lofty promises of a natural philosopher.<sup>58</sup>

Moreover, the commissioners reasonably believed that with a lost trial behind them the only possibility of securing a removal of the embankment lay with a new favorable ruling at the local court of assize. By January 27, 1782 it is clear from Smeaton's correspondence that he would be viewing the harbor in early February strictly on behalf of Folkes and Hales.<sup>59</sup>

Smeaton's report, produced relatively late in his career, reflected the precision and method that had built his reputation, contributed to the respect of the profession of civil engineer and allowed him to gradually increase his fee. For the majority of the 1760s Smeaton charged the modest and standard rate of 1 guinea per day plus expenses; by 1767 he had doubled his base rate to 2 guineas per day, and by 1768 he was charging 2 ½ guineas per day for office work and 5 guineas per day for field work.<sup>60</sup> His letters to the representatives of Folkes and Hales show that he did not require payment up front nor was the full price for his services seem to have been negotiated prior to the completion of his report. Letters sent on December 26, 1781, May 18, 1782, June 1, 1782, November 12, 1782, and June 15, 1783 all

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<sup>58</sup> Smeaton's Collective Correspondence, *ICE*; Golan, *Laws*, 24-9.

<sup>59</sup> John Smeaton to John Forster, January 27, 1782, *Smeaton Letterbooks*, vol. 1, 21, *ICE*.

<sup>60</sup> Skempton, "Smeaton".

involve the chasing down of outstanding fees as Lord Turner's trust never seemed prompt to provide payment.<sup>61</sup> In letters dated May 18, 1782 shortly after Smeaton had submitted his report he referred to an outstanding balance of £10 and June 1, 1782, he drafted a bill of £30 possibly to cover costs for his forthcoming travels to testimony provide at the Norfolk court of assize for the trial scheduled in July.<sup>62</sup> Although consistent in his follow-up for duly owned compensation Smeaton was exceptionally gentle in the framing of his requests, writing in May of 1782 that he would make an exception and proceed prior to receiving payment.<sup>63</sup>

Similar deference towards the preferences of his employers is found in a letter sent on November 12, 1782 in which he noted "I am ready to accept whatever they [Folkes and Hales] think proper."<sup>64</sup> Finally, showing a sense of humor and the greatest amount of assertiveness he seemed able to muster, he reminded his employers that ultimately "the more readily my charge is paid, the more ready you will find me to engage in their business the next time!"<sup>65</sup>

Despite such comments in jest regarding services rendered, Smeaton was adamant that he should view the harbor, embankment and sluices before becoming further familiarized with the opinion of Mylne or any other interested parties.<sup>66</sup> Smeaton's apparent desire for impartiality sits at odds with the fact that he was evidently well aware of the interests of his clients. In the end he was expected to secure them a favorable verdict. Indeed, in his final report Smeaton affirmed the findings of Mylne's earlier work.<sup>67</sup>

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<sup>61</sup> *Smeaton Letterbooks*, vol. 1, 8, 45, 54-56, 86 *ICE*.

<sup>62</sup> John Smeaton to John Forster, May 18, 1782, *Smeaton Letterbooks*, vol. 1, 45; John Smeaton to John Holmes, June 1, 1782, *Smeaton Letterbooks*, vol. 1, 54-6.

<sup>63</sup> Smeaton to Forster, May 18, 1782.

<sup>64</sup> John Smeaton to Rooke, November 12, 1782, *Smeaton Letterbooks*, vol. 1, 122, *ICE*.

<sup>65</sup> *Ibid.*; The underline and exclamation point are Smeaton's.

<sup>66</sup> Smeaton to Forster, January 27, 1782.

<sup>67</sup> Smeaton, "Report," 15.

Smeaton's balancing act between impartiality and partisanship reflected the potential burdens that working as an expert witness placed on one's reputation. His extensive overtures at impartiality to the very clients who hired him elucidated the potential burdens being an expert witness placed on one's reputation. As England's foremost consulting engineer, Smeaton relied on both his track record of successful constructions and the confidence his employers had in the veracity of the numerous reports he had completed over the years. Smeaton's initial surveys often led to expensive and largely successful construction projects.<sup>68</sup> This of course was contingent on his work truly reflecting, describing, and predicting the natural world around him, a requirement which could, potentially, be at odds with the interests of his clients. In short, Smeaton's work had to both reflect the demands of his client yet not be pure hackery or otherwise divergent from the truth, insofar as this was possible. Whether Smeaton's impartiality was motivated by self-interest or pride and belief in the work he did is a matter of psychological speculation. Nevertheless, Smeaton's long career alongside his reasonable fees—which he was willing to negotiate—coupled with his continued probing into the workings of the natural world suggest that he was highly successful in maintaining the impartiality of his work.<sup>69</sup> Finally, it is clear that Smeaton saw himself as a gentleman, professional and representative of this “new era all the arts and sciences, learned and polite” and wished to hold himself to a high standard.<sup>70</sup>

Ultimately, Folkes and Hales prevailed insofar as they secured for themselves the favorable opinion of England's most famous engineer. At the heart of the many legal disputes relating to the contested cause of Wells Harbor's decay lay the perceived explanatory and exculpatory power of the reports of the engineers hired by both plaintiff and defendant. It is the completion of these reports that distinguished Mylne, Smeaton, Hodskinson, Nickalls and

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<sup>68</sup> Skempton, “Smeaton”.

<sup>69</sup> Ibid.

<sup>70</sup> “Preface” in *Reports John Smeaton* vol. 1, 2.

the rest of the engineers hired to testify from lay witnesses. More specifically it is the precise methods and nature of their reports that so distinguishes their claims as speculative and opened them up to attacks of merely providing “speculative opinions and unfounded conjecture.”<sup>71</sup> It is these reports, the veritable stock and trade of the to be formalized expert witness, that I will now turn to.

### **The Reports of the Expert Witnesses**

Just like the patent law trials that have been previously examined, the first trial involved the asymmetric testimony of only one person of skill.<sup>72</sup> The individual persuaded to prepare a report on behalf of his client was Robert Mylne.<sup>73</sup> Between Folkes and Hales it was Folkes, due to his lay interest in natural philosophy, that took the lead in securing the testimony of an expert witness.<sup>74</sup>

Mylne, born in 1733 into a notable family of Scottish master masons, received architectural training in both France and Rome.<sup>75</sup> Upon his return to England in 1759 he won a design competition for the construction of a new bridge across the Thames.<sup>76</sup> Among the contestants was none other than Smeaton, but ultimately Mylne’s design was accepted and when successfully completed in 1769 it would remain his magnum opus throughout his career. He would join Smeaton as one of the founding figures of the Society of Civil Engineers and although he specialized in bridges his experience included waterworks as he served as a surveyor and architect for the supplier of London’s fresh water, New River

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<sup>71</sup> “Summarized state of the trial in 1783,” MS 486.

<sup>72</sup> I am referring to the near testimony of Chester Moor Hall *Dollond v. Watkins and Smith*; Bryan Higgins in *Liardet v. Johnson*; and Samuel Moore in *Arkwright v. Mordaunt*.

<sup>73</sup> Mylne, “Report,” 1.

<sup>74</sup> Robin Healey and Margaret Escott, “Browne Folkes, Sir Martin” in D. R. Fisher, ed., *The History of Parliament: the House of Commons 1820-1832* (Cambridge University Press, 2009), *History of Parliament Online*; D. Haycock, “Folkes, Martin” *ODNB*, (2022); Leslie Stephen, “Browne, Sir William,” *ODNB* (2007); Golan, Laws, 15-6; “Folkes; Sir; Martin Browne,” Catalogues of past Fellows, *The Royal Society.org*.

<sup>75</sup> Woodley, “Mylne”.

<sup>76</sup> *Ibid.*; Ted Ruddock, *Arch Bridges and Their Builders* (Cambridge University Press, 1979), 63-79; Roger Woodley, “Robert Mylne’s Struggle to Get Paid for Blackfriars Bridge” *Architectural History* 43 (2000): 172-86.

Company, from 1771 until 1810.<sup>77</sup> Additionally, Mylne had experience with legal disputes having served as a court appointed witness at Westminster.<sup>78</sup>

With Mylne's services secured by Folkes, he traveled to Wells in October of 1780 and began his extensive viewing and surveying of the town, haven, Wells' active channel, the sandbar at the mouth of said channel, the marshes and finally the embankments themselves. His report printed on April 28, 1781 for use at trial spans approximately seven pages and begins with an extended description of the maps Mylne commissioned, maps rooted in his and a Mr. Biederman's surveying data.<sup>79</sup> His map (Appendix V. o. a.) is notable for recording the ebb and flow of the tide, which, in and of itself, was an effective rendering of the extent and effectiveness of the land reclaiming efforts of the last sixty years. This introductory description of the topography of Wells Harbor grounded all of his subsequent findings and observations.

### **Mylne's Report**

Following his presentation of the "present situation of things" Mylne specifically outlined the primary reason for his report clarifying that he sought to address two questions:

1. Do the 10 embankments "containing about 64 acres of land, and about three acres of water, affect the harbor of Wells" generally?<sup>80</sup>
2. Is the embanking of Wharham Slade notable for causing disproportionate damage to the harbor?

Mylne's ensuing analysis began with a discussion of the weather conditions, orientation of the landmass and relative height of the marshland compared to sea level describing how these factors taken together in a time scale "imperceptible... to human observation" are responsible

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<sup>77</sup> Woodley, "Mylne".

<sup>78</sup> Golan, *Laws*, 17; Albert Edward Richardson, *Robert Mylne, Architect and Engineer* (Batsford, 1955), 94.

<sup>79</sup> Mylne, "Report," 1.

<sup>80</sup> *Ibid*, 2.

for the formation of Norfolk's coast and its extensive network of marshes, sandbars, and channels.<sup>81</sup> Drawing comparisons to Holland and the lagoons of Venice, he noted that the entire coast of Norfolk was consistently receiving deposits of sand and mud from the western estuaries of England, which had a negative cumulative effect on the navigability of Well's Harbor.<sup>82</sup> This was made worse, Mylne stressed, as Norfolk does not have "a drop of backwater" to scour away the sediment making degradation further inevitable.<sup>83</sup> In short, Mylne described this process as the marshland naturally embanking themselves writing: "The sea is embanking, of itself, the whole coast; and the time will probably come, when this harbor will diminish to a creek."<sup>84</sup>

Throughout his analysis there is a tension in the way Mylne treated the role of observation. Observations, particularly of the land's comparative elevation, are essential and as Mylne reiterated self-evident to the point of being beyond dispute. Yet, the causal changes that Wells Harbor had and continued to undergo were not observable on a human timescale. As such, Mylne as a natural philosopher was able to use direct observations of the land around him to reach conclusions that penetrated beyond the reach of what was readily apparent to a lay observer. His opinions were clear and Mylne contended that they would withstand the scrutiny of "impartial men" should they look close enough and understand the true sources of causality.<sup>85</sup> Mylne emphasized this point during his discussion of the particular 1758 embankment of Wharham Slade Wharham Slade emphasizing how while the general public was correct in its observation of the decay of the harbor, the specific linking of the decay to the slade missed the grander and ever present trends of the harbor. As he wrote in the conclusion of his report: "Human nature is too apt to form systems and draw

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<sup>81</sup> Mylne, "Report," 4.

<sup>82</sup> Ibid.

<sup>83</sup> Ibid.

<sup>84</sup> Ibid.

<sup>85</sup> Ibid, 7.

conclusion, without sufficient observation and scrutiny. Too often the search is made for an evil in our neighbor's property, when, perhaps, it is to be found at home".<sup>86</sup> Beyond his analysis of the natural and progressive buildup of sediment and emphasis on observation, Mylne attempted to strengthen his findings through two more primary methods: an analysis of the sluices themselves and further consideration of the hypothetical distribution of the embankment held by his employers at Wharham Slade.

Regarding the two sluices built by the commissioners of the harbor, Mylne issued a damning assessment stating that: "vain are the expectations of those who think of driving any substantial benefit therefrom."<sup>87</sup> The reason for this was twofold: firstly, the sluices only served the deep back channel of the harbor and therefore only serviced the deepest sections of the harbor.<sup>88</sup> Secondly, the design of the sluices themselves was faulty since they contained no stop gate.<sup>89</sup> Without any valve to temporarily prevent the flow of water, the sluice automatically drained water when it reaches a certain level; this substantially diminished the potent force that could be unleashed by the sluices should they have a proper reservoir system. The less force of the water the weaker the sluice's ability is to flush out the buildup sediment.

Finally, Mylne in his report asked the jury to consider just how impactful Wharham Slade really is as a part of the natural reservoir that might help wash away the harbor's sediment. To make this point Mylne engaged in a quantitative comparison: he estimated that Wharham Slade is about 64 acres of reclaimed land, yet to the east remains some 1,000 acres of underbanked marshland with an additional 600 acres to the west.<sup>90</sup> To this calculation Mylne approximated 150 acres of "creaks, fleets, and inlets" providing addition sources of

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<sup>86</sup> Mylne, "Report," 7.

<sup>87</sup> *Ibid.*, 4.

<sup>88</sup> *Ibid.*

<sup>89</sup> *Ibid.*

<sup>90</sup> *Ibid.*, 6.

backwater to the harbor. Mylne's aim was to have the jury consider what a difference 64 acres of addition marshland could possibly contribute when the harbor continues to decay with over 1,600 acres of available floodplains.<sup>91</sup> To illustrate his answer—that it was functionally meaningless—Mylne wrote, “it is like a drop of water to the sea.”<sup>92</sup> Having noted the poor likelihood of meaningful change with Wharham Slade de-embanked, Mylne engaged in some patriotic political economy on behalf of his clients emphasizing that the trade-offs matter: “it cannot be deemed wrong for any proprietor to improve his own estate (thereby adding to the general national stock) if it does not annoy or disturb the possession of others.”<sup>93</sup>

Mylne's report was closely rooted in his own observational work and he painted a comprehensive picture that was favorable to his clients. Constructing a number of discrete arguments which included a challenge of the relative size of Wharham Slade and the construction of the existing sluices, Mylne's work ultimately fell back upon his broad understanding of the incontrovertible problem facing Wells Harbor, namely that the shoreline received a large volume of sediment without the countervailing force of a natural and consistent supplier of fresh water to scour the harbor's floor. Yet, there were notable ways in which Mylne's report was not a work of unrestrained partisanship. He gave serious consideration to ways in which the harbor might be saved, emphasizing specific and particular problems with the sluices currently constructed. Additionally, he clearly stressed that certain conclusions are his “opinion” and resorted to figurative speech when making specific predictions. The point was not that the restoration of Wharham Slade would have no effect, a position that is as a matter of intuition is deeply improbable, but it was that it would have a negligible effect. Mylne's simile is evocative yet safe, due to its imprecise nature. To

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<sup>91</sup> Mylne, “Report,” 5-6.

<sup>92</sup> *Ibid.*, 5.

<sup>93</sup> *Ibid.*

be sure, Mylne's report is a partisan work. This is exemplified in particular by his discussions of the evident good done by Folkes's ownership of the land, a good this expert implies, through subtext, that the jury ought not interfere with. However, it is in through their linguistic gaps and instances of hedging that Mylne was able to assert professional competence and impartiality regardless of the trial's outcome.

### **Smeaton's Report**

Smeaton's report also commissioned by Folkes and Hales approximately eight months later, retained broad thematic similarities with that of Mylne's yet was substantially more thorough and systematic.<sup>94</sup> Smeaton progressively built his case beginning with general principles, continuing on to his findings as supported by field work before concluding with his suggested solutions, should the commissioners of the harbor wish to try and save Wells Harbor. Smeaton's work was the result of three days spent riding up the length of the coast near Wells taking tidal depth measurements, through the harbor channel at low tide and inspections of the network of sluices. Smeaton also completed a map of the region based on his measurements; the initial draft, as was always the case for Smeaton, was compiled by his own hand.<sup>95</sup>

While the ultimate use of his report is clearly signaled within the header as Smeaton names the parties involved, he does not state that he is conducting his report on behalf of the plaintiffs. Presenting an air of impartiality, he opened with the following statement:

Having carefully inspected the present condition of the Harbor of Wells... and having also carefully inspected the several plans and papers containing the evidence... the

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<sup>94</sup> Smeaton, "Report," 15.

<sup>95</sup> Skempton, "Smeaton"; See Map in Appendix V. o. b.

following facts... [are] drawn from my own view of the premise, and... appear to me to be well ascertained and agreed upon.<sup>96</sup>

Smeaton then proceeded to list twenty-one bullet points—enumerated in Roman numerals—that clearly and efficiently summarized all major developments and changes to the harbor since the year 1719.<sup>97</sup> His account was dispassionate and presented as though what he claimed were irrefutable facts pertinent to the case. He detailed the construction of embankments, sluices, acreage measurements and the fact that “no fresh water river makes its way to the sea though the channel.”<sup>98</sup>

Yet, among these statements of the agreed facts of the harbor Smeaton included essential details that gradually helped to build his clients’ case. Most notable was his systematic description and critique of the sluices built by the commissioners of the harbor. In point IX Smeaton explained how the mouth of Freestone Sluice is only buttressed with “fascines, stakes” and “poles” and the mouth of this wooden earthworks has itself been eroded by the flow of water.<sup>99</sup> This challenged the commissioners’ narrative that the embankment of Wharham Slade was the true cause of the harbor’s decline, for as Smeaton explained, the mouth of Freestone Sluice exiting Wharham Slade was too wide to generate enough force for the water to effectively scour the harbor. Additionally, in point XII Smeaton noted how the commissioners of the harbor had ignored an engineer’s reports on the damaged sluice.<sup>100</sup> Rather than reconstruct the sluice out of stone as was advised, wood was replaced with wood; therefore, the rot begotten by boring sea worms had, by Smeaton’s own estimation, rapidly returned.<sup>101</sup> Wrapping up his assessment of the state of the facts on the

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<sup>96</sup> Smeaton, “Report,” 1.

<sup>97</sup> *Ibid.*, 1-3.

<sup>98</sup> Point VIII; Smeaton, “Report,” 2.

<sup>99</sup> *Ibid.*

<sup>100</sup> *Ibid.*

<sup>101</sup> The Editors of *Encyclopaedia Britannica*, “shipworm,” *Encyclopaedia Britannica* (2018); F. A. Potts, “The Structure and Function of the Liver of *Teredo*, The Shipworm,” *Biological Reviews* 1 (1923): 1-17.

ground with a detailed account of Wells topography, Smeaton moved on to clearly posit and address in turn the primary questions facing his report with the clarity he was known for<sup>102</sup>:

- I. Is there any natural cause of the decay of the harbor of Wells?
- II. Whether the embankment in question, made in the year one thousand seven hundred and fifty eight, has contributed thereto?
- III. Whether the removal of the embankment will contribute to the amendment thereof?”<sup>103</sup>

In matching sections Smeaton returned to each of the questions presenting counterfactuals and comparisons between the relative amounts of flood lands and embanked land.<sup>104</sup> Yet Smeaton, also like Mylne, contends that in order to answer his first question, “it will be necessary to show the natural cause by which the Port of Wells has been formed.”<sup>105</sup> For Smeaton the story began with the exceptional amount of rain and snowfall Wells received in conjunction with the natural flow of the English rivers that ran to the sea and resulted in a plethora of “clayey, earthy and sandy matter.”<sup>106</sup> This matter in turn was tossed by the tide, pushed inland, and observed to be deposited back into the landmass of Wells.

Smeaton was aware that not all of his conclusions were traceable to direct observation and explained that particular gaps in his observation of the facts are not material, arguing, “it is however of no consequence to our argument to point out from whence they [the sediment] came; it is sufficient that they have come.”<sup>107</sup> This was precisely the selective and theoretical evidence he was commissioned to produce and what made his contribution so abnormal to the

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<sup>102</sup> Golan, *Laws*, 27.

<sup>103</sup> Smeaton, “Report,” 3-4.

<sup>104</sup> Although Section II received a heading in the printed text, the report did not include a matching number. This is likely a mistake as Sections I and III included matching numbers; Smeaton, *Ibid*, 7.

<sup>105</sup> *Ibid*, 4.

<sup>106</sup> *Ibid*.

<sup>107</sup> *Ibid*.

standard methods the eighteenth century courtroom used to ascertain matters of fact.<sup>108</sup> The court's preference was for the visual, and evidence not directly observed was to be rejected.<sup>109</sup> The veracity of the direct ocular experiences of the witness were to be assessed by a jury and key to this assessment was the character of the witness.<sup>110</sup> Yet, Smeaton contended that his skill and knowledge could, with his further careful study of the limited observable facts of the harbor, empower him to convincingly present testimony that might be outright rejected as mere musings. Indeed, the skill and knowledge of the individual was generally understood as an essential factor in assessing the trustworthiness and by extension the certainty of their claims.<sup>111</sup>

In short, by virtue of his skill Smeaton did not need to see nor confirm the source of the sediment in order to confidently state its observable effects. While the precise mechanism that generated and governed the path of the sediment could be inferred, what mattered was the observable effects on the harbor. This kind of appeal, to look beyond what appeared to be invisible, to be able to understand an evasive yet predictable grand system from targeted observation, represents the key claims and controversial promise of the natural philosopher. From the divergent epistemological views espoused in Newton's *Principia* to the Boyle-Hobbes vacuum controversy of just over one hundred years earlier, what remained familiar was the ability of the natural philosopher to springboard beyond the hard limits of sense perception.<sup>112</sup> It was this kind of extension into the hypothetical that typified the reports of engineers such as Smeaton and Mylne. A particularly strong example of this was Sematon's

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<sup>108</sup> Barbara J Shapiro, "Beyond Reasonable Doubt" *Law and Humanities* 8, no. 1 (2014): 19-52; Golan, *Laws*, 18-22.

<sup>109</sup> Shapiro, *A Culture of Fact* (Cornell University Press, 2000), 119.

<sup>110</sup> *Ibid.*, 17-8, 119-21.

<sup>111</sup> As popularized by Isaac Watt's immensely popular *Logick: or the Right Use of Reason in the Enquiry After Truth* 12 ed., (J. Buckland, 1763); Shapiro, "Beyond Reasonable Doubt," 35-8.

<sup>112</sup> Shapiro, *A Culture of Fact*, 154-60, 172-73; Isaac Newton, *The Mathematical Principles of Natural Philosophy*, trans. C. R. Leedham-Green (Cambridge University Press, 2021); Andrew Janiak, *Newton as Philosopher* (Cambridge University Press, 2008); Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump* (Princeton University Press, 2011).

extended invitation for his readers to imagine the state of the harbor since time immemorial.<sup>113</sup> He then examined the eons long natural process of geological development that led the harbor to its present predicament.<sup>114</sup>

Based on this empirically informed yet speculative reasoning, Smeaton could confidently posit on the ultimate fate of the Harbor writing, “there appears no power of nature, by which they [the sediment] can be returned to the high grounds or coast.”<sup>115</sup> Thus, the ever-increasing buildup of sediment would never naturally cease. The only remedy was the special application of “the ingenuity and labor of man.”<sup>116</sup>

The remainder of Smeaton’s report largely consisted of a detailed critique of the construction and installation of the sluices at Wells, covering location, design, material makeup, anchoring mechanism, and, in agreement with Mylne, the lack of an effective reserve mechanism.<sup>117</sup> Smeaton emphasized that it was unrealistic for the commissioners of the harbor to expect such “marvelous effects” in such “a short space of time” considering the compound issues with their half-measured attempts to save the harbor.<sup>118</sup> Smeaton acknowledged that this was entirely possible as “the greatest part of the seaports in Flanders and Holland are kept open, and under circumstances more unfavorable than the port of Wells.”<sup>119</sup> Yet, such efforts required “something more powerful, and better adapted, than any of the sluices already constructed” but the commissioners of Wells Harbor.<sup>120</sup>

Despite payment and the unspoken agreement to provide a favorable report for his clients, Smeaton understood himself to still be bound by the facts on the ground and was

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<sup>113</sup> Smeaton, “Report,” 5.

<sup>114</sup> *Ibid.*, 5-6

<sup>115</sup> *Ibid.*, 4.

<sup>116</sup> *Ibid.*, 7.

<sup>117</sup> *Ibid.*, 7-15.

<sup>118</sup> *Ibid.*, 14.

<sup>119</sup> *Ibid.*

<sup>120</sup> *Ibid.*

unwilling to outright mislead or fabricate. In truth, Smeaton admitted that the influx of a single bucket of water into the system would remove some amount of sediment, as “every engineer and skillful person” would know, but the subjective question really is should the amount of sediment dislodged by a bucket of water be understood to be substantial?<sup>121</sup> The removal of Folkes’s embankment adjacent to Wharham Slade had a cost and Smeaton was asking the court to carefully consider if the benefit to the harbor was substantial enough to justify this cost.

Smeaton demonstrated the minimal benefit of removing Folkes’s embankment in quantitative terms as he used fractions to help express the comparative small scale of the embankment compared to all the other embankments the commissioners of the harbor were not attempting to remove.<sup>122</sup> Smeaton ended his text by stating that he “must therefore conclude in the sentiment of Mr. Mylne” that the very same deterministic “operation of nature” which had allowed the harbor of Wells to form would also see the harbor “grow more and more into a state of decay.”<sup>123</sup> The comparatively measly 64 acres of land in question were too little to substantially affect the harbor and that the commissioners, rather than turn their attention to the landowners ought to turn their attention to their sluices which as “proved by the facts already stated” were “totally *ineffectual*.”<sup>124</sup>

The inclusion of italics for emphasis was no accident and reflects Smeaton’s eye towards making a rhetorically effective argument. When submitting an edited version of his report to be printed prior to trial, Smeaton provided precise instructions as to what kind of liberties the printer could and should not take.<sup>125</sup> Spelling and the use of capital letters were delegated to the judgment of the printer yet for the inclusion of italics, noted in the

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<sup>121</sup> Smeaton, “Report,” 7.

<sup>122</sup> *Ibid*, 9.

<sup>123</sup> *Ibid*, 15.

<sup>124</sup> *Ibid*.

<sup>125</sup> Smeaton to Forster, July 6, 1782, *Smeaton Letterbooks* vol. 1, 86, *ICE*.

manuscript with underlining, were to be diligently retained.<sup>126</sup> Failing to incorporate such stylistic flourishes Smeaton warned “may destroy the strength of the argument.”<sup>127</sup> This background work suggested that Smeaton, despite careful qualifications and even concessions in places throughout his report, evidently wanted his work to align with his client’s interests and be as persuasive as possible.

While the precise terminology of “expert witness” had yet to be coined let alone formally recognized by the court, Smeaton—just as Bryan Higgins and Samuel Moore before him—understood the true purpose of his hiring.<sup>128</sup> Prior to his testimony at the Norfolk court of assize Smeaton was involved in a case at Maidstone in Kent. In a letter dated July 6, 1782 Smeaton warned Forster that he would not be able to arrive early at Wells for any pretrial preparation.<sup>129</sup> Nevertheless, Smeaton was confident such preparations were unnecessary as he confidently informed his employer that “I think myself perfectly clear and master of the subject.”<sup>130</sup>

### **The Reports for the Defense**

The commissioners of the harbor hired a total of four engineers who collectively produced two individually authored, yet similar, reports and one affidavit supporting the findings of one of the reports.<sup>131</sup> Both reports are dated July 5, 1782 having been finalized just weeks before the scheduled date of the trial. What I will hereby refer to as Report 1 and Report 2, the former was signed and written by Joseph Hodskinson with the latter produced by Joseph (alternatively Josh) Nickalls. The comparatively later date of the reports is unsurprising, as Hodskinson, accompanied by John Grundy and Thomas Hogard, spent ten

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<sup>126</sup> Smeaton to Forster, July 6, 1782, *Smeaton Letterbooks* vol. 1, 86, *ICE*.

<sup>127</sup> *Ibid.*

<sup>128</sup> Golan, *Laws*, 22; Shapiro, *Culture of Fact*, 17-8.

<sup>129</sup> Smeaton to Forster, July 6, 1782.

<sup>130</sup> *Ibid.*

<sup>131</sup> “Reports,” MS 486, *NRO*.

days in Wells during the first weeks of April 1782.<sup>132</sup> This meant they not only dodged the snowy weather which had plagued Smeaton's visit but also visited during some of the highest spring tides. Nickalls visited the site independently on June 12, 1782; this formed the foundation of his report which he cross-referenced with the data provided by Hodskinson.<sup>133</sup>

Joseph Hodskinson (1735-1801), although not elected as a member of the Society of Civil Engineers until 1792, was an experienced surveyor and engraver who had produced a number of highly regarded county maps of Bedfordshire (1765), Yorkshire (1771) and Cumberland (1774).<sup>134</sup> Joseph Nickalls (1725-1793) and John Grundy (1719-1783) were among the founding members of the Society of Civil Engineers and both had extensive engineering experience.<sup>135</sup> Nickalls, a millwright by training, had worked under Smeaton at the complex Calder and Hebble waterway project. He was held in high opinion by Smeaton and had experience defending the projects of the Thames Commissioners before parliament.<sup>136</sup> Smeaton also had great respect for John Grundy who had specific expertise as a navigation engineer having overseen both marshland drainage as well as harbor construction. Although based in Spalding, he was well known throughout the greater region including Norfolk.<sup>137</sup>

Finally, Thomas Hogard (also spelled Hogarth) was similarly a Spalding based navigation engineer with the deeply prescient experience of helping to engineer the drainage of the Fens.<sup>138</sup> Hogard joined the Society of Civil Engineers in 1772 during its second year of

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<sup>132</sup> Golan, *Laws*, 32, 27.

<sup>133</sup> Nickalls, "Report," 1.

<sup>134</sup> Watson, *The Smeatonians*, 8, 20, 161; Andrew MacNair, "Joseph Hodskinson's map of Suffolk," [hodskinsonsmapofsuffolk.org](http://hodskinsonsmapofsuffolk.org); Golan, *Laws*, 26.

<sup>135</sup> Watson, *The Smeatonians*, 3, 8, 160; "History of the Society," The Smeatonian Society of Civil Engineers, [smeatonians.org](http://smeatonians.org).

<sup>136</sup> History of the Society,"; Watson, *The Smeatonians*, 6.

<sup>137</sup> *Ibid.*; Golan, *Laws*, 26.

<sup>138</sup> *Ibid.*; Watson, *The Smeatonians*, 12; "certain low-lying districts in Cambridgeshire, Lincolnshire, and some adjoining counties," "a marsh"; *OED*, "the fen' in fen (n.1), sense 1.b." (2025).

existence.<sup>139</sup> Later, in 1783, prior to the third trial Smeaton received word that a favorite pupil and effective successor, William Jessop, would be representing the commissioners of the harbor. Although Jessop never produced a report, the sheer phalanx of engineers mustered by the commissioners was impressive to the point of worrying Smeaton who “wish[ed] not to stand single and unsupported against a legion.”<sup>140</sup>

The reports submitted by Hodskinson and Nickalls did not contain the theoretical and selective considerations as to how the harbor of Wells was formed. Both reports were grounded in direct observations of the state of the harbor in living memory. Hodskinson meticulously turned to the observations of knowable locals while Nickalls primarily cites his own observations. This appeal to direct observation was further augmented with appeals to authority: Hodskinson included an appendix in which excerpts from relevant reports of other similar harbors are listed.<sup>141</sup> Finally, by using volumetric calculations of effective loss of floodwater rather than comparing the average of the embanked land, both Hodskinson and Nickalls attempted to assert that the embankment of Wharham Slade was uniquely damaging to the harbor.

### **Hodskinson’s Report**

Hodskinson’s apparent inclination to work more like a practical engineer rooted in direct observations and measurements rather than speculative investigations into underlying principles that typified the philosophical approach of Smeaton is evident from his report’s opening lines. Written in the first person, Hodskinson states how he found “this navigation of this harbor much obstructed” based on his personal “views, surveys, and observations.”<sup>142</sup> Next, Hodskinson provided evidence as to the “state of the low-water channel” by explaining

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<sup>139</sup> Watson, *The Smeatonians*, 8.

<sup>140</sup> Smeaton to Forster, July 1, 1783, *Smeaton Letterbooks* vol. 1, *ICE*.

<sup>141</sup> “Appendix” in Hodskinson, “Report,” 13-4.

<sup>142</sup> *Ibid*, 1.

how he “inquired of several pilots and harbormasters... into the ancient and present state...” of Wells Harbor. Hodskinson included in his report a footnote listing the identity, age, and names of his eyewitnesses who ranged in age from thirty to seventy-six.<sup>143</sup>

Based on this testimony Hodskinson argued that the state of the low-water channel “was the same then as it had immemorially been.”<sup>144</sup> In other words, Hodskinson’s claim, in contrast to Mylne and Smeaton’s, was that the land was not increasing in height due to sediment deposits. Hodskinson explored this further with a specific thesis looking to the notable shift in the mouth of the harbor eastward.<sup>145</sup>

This shift of the entrance to the port was deeply material to all who use the harbor as it had made navigation “very dangerous, by reason of the strong tide setting to the E.S.E [east southeast] which forces the ships to sail in against the tide.”<sup>146</sup> Pointing to maps produced by the commissioners for this very purpose, Hodskinson explained how entire sections of the harbor were no longer accessible and during certain times of the day it was simply impossible to enter the harbor due to the fact that pilots have to fight the current.<sup>147</sup>

Naturally, Hodskinson linked the shifting mouth of the harbor and associated danger and difficulty directly to the 1758 embankment of Wharham Slade. Referring to his eyewitnesses, Hodskinson described how the mouth of the harbor began to change, and did so rapidly, following the embankment of the Slade.<sup>148</sup> Additionally, Hodskinson challenged Mylne and Smeaton’s assertion that the deterioration of harbor was due to silt deposits from nearby estuaries. Again, direct observation and appeals to authority are central to Hodskinson’s work. He first described how he asked “the said navigators whether they had

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<sup>143</sup> “Appendix” in Hodskinson, “Report,” 1.

<sup>144</sup> *Ibid.*

<sup>145</sup> See “Detail from Hodskinson’s map Wells Harbor” in Appendix V. o. d.

<sup>146</sup> Hodskinson, “Report,” 2

<sup>147</sup> *Ibid.*

<sup>148</sup> *Ibid.*, 2-3.

observed that the sea had retreated from the coast within their memoires; they answered it had not, but that on the contrary it had gained in many parts thereof.”<sup>149</sup>

While Smeaton’s report asserted that the increase in depth was due to specific scouring and did not disprove the overall rising of land, Hodskinson, in turn, argued that the direction of the tide made it impossible for silt from the western facing estuaries to be carried into the harbor.

To confirm the veracity of the statements he has heard from the local navigators, Hodskinson described setting himself adrift during a full moon and measuring his progress through the harbor as the wind and tide carried him with minimal interference by his hand. Hodskinson meticulously recorded the time it took to get between key locations and while along his route he measured the depth of the floodwater.<sup>150</sup> Hodskinson described how during his particular journey the high water level was two feet eight inches above the ground level of Wharham Slade. Implying that should “the slade been open” it would have filled with over two feet of water and help feed Freestone Sluice.<sup>151</sup>

Aware that two feet is not necessarily significant, he recounted the heights of recent floods which included a high tide of three feet and a flood of over five feet.<sup>152</sup> With his direct observations complete, Hodskinson asserted that “from these inquiries and observations, I am fully satisfied that the information given to me as aforesaid is founded on truth.”<sup>153</sup> Moreover, Hodskinson suggested that because the floodwater carried him so far into the harbor it meant that any speculative consideration of the possible effects of the ocean on the harbor are moot,

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<sup>149</sup> Hodskinson, “Report,” 3.

<sup>150</sup> *Ibid.*, 3-4.

<sup>151</sup> *Ibid.*, 4.

<sup>152</sup> *Ibid.*

<sup>153</sup> *Ibid.*

writing, “I concluded, that the causes of... [the harbor’s] obstructions were not to be fought in the main ocean; and therefore I turned my inquiries internally.”<sup>154</sup>

The remainder of Hodskinson’s report was divided into two parts. In part one, he assessed the effect of the three sites of embankment construction focusing most of his attention of the disputed land of Wharham Slade.<sup>155</sup> In the second part he offered his calculations of the maximum tons of floodwater that the embankments theoretically removed from the Wells Harbor system.<sup>156</sup> Regarding the embankments, Hodskinson appealed, much like Smeaton before him, to the brute facts, recognizing that “the mischievous effects of these embankments are not all alike, but proportionate to their situation and to their distance from the harbor.”<sup>157</sup> In an inverse to Smeaton’s hypothetical bucket of water, the picture painted by Hodskinson framed the embankments as implicitly harmful. Indeed, Mylne and Smeaton had admitted that any embankment was theoretically detrimental to the harbor, yet the low acreage of Folkes’s embankment made any of its possible damage immaterial. Representing the position of the harbor commissioners, Hodskinson’s point was that *any amount of embanking is harmful*. Although he was forced to acknowledge the small area of Wharham Slade, Hodskinson argued that its substantial elevation in the harbor and the lengths of the section of land allow it to funnel water in a uniquely effective fashion. On the contrary, for Smeaton the elevation of Wharham Slade meant it would not flood regularly and be an effective reservoir. Hodskinson assured the readers of the report that it was precisely the elevation of the slade which made it such an effective supplier to the sluice.<sup>158</sup>

In comparison to both Mylne and Smeaton, Hodskinson spent just a single compound sentence on the sluices, stating “no place to make them [sluices] in can be so eligible as

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<sup>154</sup> Hodskinson, “Report,” 4.

<sup>155</sup> Ibid, 4-7.

<sup>156</sup> Ibid, 7-10.

<sup>157</sup> Ibid, 6.

<sup>158</sup> Ibid, 7

Wharham Slade, that being at the upper extremity of the harbor.”<sup>159</sup> With a final flourish, it all came back to the ruinous effects of Folkes and Hales’ embankment of the slade.

Ultimately, Hodskinson concluded that restoring Wharham Slade to its natural state will have better odds of restoring the harbor to its intended and beneficial purpose compared to “any artificial means whatsoever.”<sup>160</sup> Hodskinson’s conclusions functioned as partisan expert testimony insofar as they are a commissioned report that sought to systematically vindicate the position of his client. Yet, from an evidentiary perspective, Hodskinson’s reliance on witness testimony both his own and those of others of strong credibility led to a presentation of evidence that relied very little on the kind of speculation that often defined the testimony of the expert witness.

### **Nickalls’s Report**

Nickalls’s report is markedly similar to that of Hodskinson’s and began in much the same fashion. The shortest of all the reports commissioned for the trial, Nickalls set the scene and clarified the extent of the harbor’s demise, declaring that “in its present state perilous and uncertain for ships coming in or going out UNDER ANY WIND WHATSOEVER; and that the navigation under many winds is wholly impracticable.”<sup>161</sup>

With the harbor’s deteriorating state made clear, Nickalls presented a similar tour of the embankments and major channels of the harbor. He too concluded that the shift in the harbor’s mouth “is not to be imputed to any external cause” and so Nickalls subsequently turned his attention to the embankment.<sup>162</sup> However, unlike Hodskinson, Nickalls did not discuss interviewing locals nor give an extended review of their recollection of how the harbor changed over time or like Smeaton who provided a detailed, yet selective account of

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<sup>159</sup> Hodskinson, “Report,” 12.

<sup>160</sup> Ibid.

<sup>161</sup> Nickalls, “Report,” 1; The writing convention of all uppercase letters is as styled in the report.

<sup>162</sup> Ibid, 2.

the harbor's emergence across eons from a solid bank of sand into a narrow stretch.<sup>163</sup> Hodskinson, for his part kept his time scale to living memory and focused his efforts on recreating the harbor as it was twenty-three years prior.<sup>164</sup> Nickalls took an even more streamlined approach skipping such background investigations to focus entirely on the observable and quantitative effects of the embankment of Wharham Slade.

With his primary focus on showing “the great utility of the waters from Wharham Slade” Nickalls measured the current of the water near the embanked slade.<sup>165</sup> Finding the figure to be sixty-one and a half feet per minute, Nickalls stressed how this measurement was in fact a low bound, for should the slade be opened the water would flow from a greater height across the length of the slade exiting the reservoir at an even greater speed.<sup>166</sup> This speed, Nickalls asserted, “exceeded that of most rivers” and would have exceptional scouring ability.<sup>167</sup> To drive home this single point of the essential nature using the existing floodplains Nickalls listed the harbors of Langstone, Chichester, and Selsey which operated successfully without the supply of any fresh water.<sup>168</sup>

Finally, Nickalls discussed the decay of the Harbor of Rye “once famous” was “at last” ruined by the construction of embankments.<sup>169</sup> Nickalls strategically noted that a 1763 report by one “Mr. Smeaton” devised a system to collect “nearly or about 733,415 tons of

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<sup>163</sup> Nickalls, “Report,” 2.

<sup>164</sup> Although the trial of Wells predated James Hutton’s esoteric yet systematic investigations into the history of the earth by a handful of years, estimations of the earth’s age were generally increasing since Newton’s experimental calculations of the cooling rate of iron spheres; Golan, *Laws*, Jean Jones, 30; “Hutton, James,” *ODNB* (2013); Dennis Dean, *James Hutton and the History of Geology* (Cornell University Press, 2019.); Stephen Baxter, *Revolutions in the Earth* (Phoenix, 2004); Roy Porter, ed., *The Cambridge History of Science* vol. 4 (Cambridge University Press, 2008), 434-35; Arthur Stinner, “Calculating the age of the Earth and the Sun.” *Physics Education* 37, no. 4 (2002): 296-7.

<sup>165</sup> Nickalls, “Report,” 3.

<sup>166</sup> *Ibid.*

<sup>167</sup> *Ibid.*

<sup>168</sup> *Ibid.*, 4.

<sup>169</sup> *Ibid.*, 5.

water” for the process of scouring the harbor for the extraordinary cost of £26,751. Nickalls concluded his report by emphasizing that:

If Wharham Slade is opened, and the tidal waters primped to flow... nature will then supply the Harbor of Wells with much more water... than, according to Mr. Smeaton’s estimate could be obtained for the Harbor of Rye for £26,751.<sup>170</sup>

In short, the most cost effective and just solution to a region of such importance was for the embankment of Wharham Slade to be swiftly removed. Mylne, Smeaton, Hodskinson, and Nickalls all sought to present the court a persuasive account that revealed the true cause of the decay of Wells Harbor. The intent was explicitly and inexorably to assign blame that could then be leveraged into an appropriate and legally binding remedy. All parties agreed to the fact that the harbor had decayed; this was readily evident to anyone who visited and attempted to navigate the harbor. However, the question each set of experts was hired to illuminate went beyond what could immediately be observed as it was fundamentally an inquiry into chance, which over time pitted natural forces against and in concert with the “labor of man.”<sup>171</sup> As has been examined, the specific path taken by each report was distinct yet all reports in spite of their divergent claims and levels of abstraction all ultimately rested upon the initial direct observations of the author of the report. Direct observation was not only central to the epistemological groundings of the court but also to the workings of the natural philosophers of the Restoration period and onward into the eighteenth century.<sup>172</sup> Moreover, the importance of observation meant that both law and science engaged in detailed

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<sup>170</sup> Nickalls, “Report,” 5; It should be noted that by the defense’s own estimate of Wharham Slade contained only 214,122 tons of water; Hodskinson, “Report,” 9.

<sup>171</sup> Smeaton, “Report,” 7.

<sup>172</sup> Shapiro, “Beyond Reasonable Doubt,” 25-33.

considerations of the credibility of the eyewitness when assessing possible truth claims. So while the reports sought to present the court with a novel kind of speculative and theoretical testimony, the court had yet to develop a robust set of rules and procedures regarding such evidence. Therefore, the epistemic ground the reports themselves generally fell back upon was familiar to the court.

### **Putting the Reports into Epistemic and Jurisprudential Context**

In the last quarter of the seventeenth century the noted jurist Sir Matthew Hale identified three categories of knowledge of decreasing certainty.<sup>173</sup> Logical theories and mathematical proofs were classified as “science” (knowledge) and beyond any doubt. The second class referred to as “faith” or “belief” concerned all “the facts of nature, historical knowledge” and acquired truths. Matters of “belief” were accessible through direct observation or through the collected observations of others and so Hale devised standards in which the credibility of observers should be compared against.<sup>174</sup> Importantly, knowledge both about the natural world and the settling of matters before the court was intrinsically a matter of degrees of uncertainty. By the mid-eighteenth century Hale’s skeptical empiricism amalgamated with a Lockean probabilistic approach to knowledge to form a jurisprudence deeply consumed with assessing the credibility of the eyewitness.<sup>175</sup> First explicitly articulated in a legal context by Sir Geoffrey Gilbert in his posthumously published *The Law of Evidence* (1756), Gilbert described that one’s probable degree of certainty lies with either primary or secondary experience and observation.<sup>176</sup> During a trial this meant in practice that

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<sup>173</sup> Matthew Hale, *The Primitive Origination of Mankind, Considered and Examined According to the Light of Nature* (William Godbid, 1677), 128-32; Murray Raff, “Matthew Hale’s Other Contribution,” *Australian Journal of Law and Society* 13, no. 1997 (1997): 73-117.

<sup>174</sup> Shapiro, “Beyond Reasonable Doubt,” 30.

<sup>175</sup> *Ibid.*, 34, 45-6; Barbara J. Shapiro, *Probability and Certainty in Seventeenth Century England* (Princeton University Press, 1983).

<sup>176</sup> Shapiro, “Beyond Reasonable Doubt,” 45-6; Geoffrey Gilbert, *The Law of Evidence*, 5th ed. (Joseph Crukshank, 1788).

the jury's degree of certainty relied on the careful assessment of eyewitness testimony.<sup>177</sup> This assessing of evidence on a "scale of probability" was later developed and popularized by Jeremy Bentham with cross-pollination from common sense philosophers such as George Campbell and Thomas Reid.<sup>178</sup> Gilbert endorsed eight criteria for assessing the credibility of a witness which included the "integrity and skill of the witness."<sup>179</sup> The probable certainty of a witness's claim then fell back upon the careful adjudication of these criteria. It was precisely the attributes of skill and trustworthiness which both plaintiff and defendant hoped to leverage.

With this intellectual context in mind, it is no surprise that all reports began with the author's personal journey to the harbor and subsequent observations. Yet, it is upon this initial shared observational grounding that the reports of the plaintiff and defense diverged so completely. The defense painted a deeply intuitive and for the eighteenth century epistemically normative account of the harbor's decay linking the observed buildup in sediment to the similarly timed construction of the 1758 embankment. The number of eyewitnesses as well as their relevant professions as mariners and harbormasters add credibility and by extension probable certainty to their accounts. In contrast, both Mylne and Smeaton stressed implicitly and explicitly their personal skill and credibility in challenging what they allege was the deceptively self-evident false link between the construction of the embankment and the harbor's decay. Their specific skill allowed them to observe the harbor in greater detail and see, understand and then extrapolate the true and inevitable natural fate

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<sup>177</sup> Shapiro, "Beyond Reasonable Doubt," 45-6.

<sup>178</sup> Ibid.; Stephan Landsman, "From Gilbert to Bentham: The reconceptualization of evidence theory," *Wayne Law Review* 36 (1989): 1149-86; James Fieser & James Oswald eds., *Scottish Common Sense Philosophy* (Thoemmes Press, 2000); S. A. Grave, *The Scottish Philosophy of Common Sense* (Clarendon Press, 1960).

<sup>179</sup> Shapiro, "Beyond Reasonable Doubt," 45; Gilbert, *An Abstract of Mr Locke's Essay on Human Understanding* (1752) 48-9; Geoffrey Gilbert's later *The Law of Evidence*, 5ed. (Joseph Crukshank, 1788), 119-44, 155 expands the criteria to 10 factors.

of the harbor. The suggestion was that the jurors should trust in the skill of Mylne and Smeaton, which would in turn give their cause a greater degree of probability.

Moreover, all reports made use of some form of quantitative data expressed in the form of measurement, be it of water depth, speed or volume. Measurements were often expressed comparatively with the clear rhetorical intent of drawing a kind of irrefutable numerical attention to the absurdity of the opposition's position. For the plaintiffs how could the enhancement of Wharham Slade be uniquely and determinative damaging to the harbor if it only comprised 1/34 of the overall series of embankments? As for the defense's view, surely Wharham Slade must matter if it was responsible for delivering some 214,112 tons of water to Freestone Sluice. However, beyond any initially persuasive power, recalling Hale's framework, mathematics and mathematical expression is uniquely beyond refute: it is the only category of knowledge that exists outside of doubt. Rearticulating and successfully describing the world through the certain language of mathematics was an essential task for the knowledge building project of eighteenth-century natural philosophy. Mathematical redescription elevated, supplemented, or superseded mere observations into "theories" which, in this post-Newton world, allowed for the construction of "facts of nature"; descriptions of such probabilistic certainty that to redescribed them as mere hypothesis or conjecture was tantamount to insult.<sup>180</sup> It seems clear that it is precisely this tradition which further encouraged and supported the precise uses of mathematics by the early partisan expert witness.

In some ways the engineers who descended to Wells Harbor to conduct their own observations and experiments presented themselves as travelers. However, their travelogues

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<sup>180</sup> Newton was particularly sensitive to the interchangeable use of theory, hypothesis and conjecture and sought to present something of far greater correctitude. Shapiro, *Culture of Fact*, 154-5; While practical natural philosophers like Smeaton, Mylne et al. showed no particular allegiance to the specifics of Newton's epistemology they, over a generation removed, lived with the mathematical legacies of Newton and his interlocutors.

were replaced with imperial measures and their observations given probable and moral serenity through a variety of appeals. In the case of the reports conducted by Hodkinson and Nickles such authority came, in part, from relaying the eyewitness accounts of individuals they encountered. In contrast to Mylne and Smeaton, their underlined understanding of the principles that governed their observations allowed them to see deeper yet also present truths. Dorinda Outram's work has described how throughout the enlightenment travelogues played an essential role in further uncovering the hidden workings of the natural world as personal observation through travel made truth.<sup>181</sup> Yet in increasingly epistemically unstable times, as wrought by the skepticism of Hume and Voltaire, it was essential for the lone traveler to impute their works with moral authority and appeals towards objective.<sup>182</sup> Key to this impartiality was the traveler's lack of a predetermined destination or intention beyond ambiguously defined exploration. By these standards the engineers called to examine Wells did not embody the idealized moral construction of the traveler for they all entered with a most well-defined destination, one as dedicated by the clients who had paid for their travel and their reports. Perhaps it was this undercurrent of improbability that encouraged the couching of claims that is present throughout all the reports.

Ultimately, all experts clearly and carefully stressed that their report reflected their opinion—not uncontested knowledge—of what they hoped to present as probable fact: reasoned opinions drawn from collected observations mediated by reasons and skill. Or in essence, sentiments for the “consideration” by a fair-minded jury of “impartial men.”<sup>183</sup>

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<sup>181</sup> Dorinda Outram, “On being Perseus” in Dorinda Outram, *Science, Enlightenment and Revolution* (Routledge, 2021), 281-94.

<sup>182</sup> Outram, “On being Perseus,” 177-8; David Hume, “SECTION X Of Miracles.” in *An Enquiry Concerning Human Understanding* (Oxford: Oxford University Press, 2020); Steven Shapin, “Robert Boyle and Mathematics” *Science in Context* 2 (1988), 25-58.

<sup>183</sup> Mylne, “Report,” 7.

## Hardinge's Gambit - The Limits of Sense Perception

With the reports complete and the window for the Summer Assize sitting rapidly closing, the relevant pretrial preparations continued with notable speed. Folkes and Hales spent the first week of July 1782 coordinating and confirming their desired selections for the empaneling of a special jury with the sheriff of Norwich, Henry See Warner.<sup>184</sup> As of July 5 prospective juror James Smyth responded in the affirmative to the sheriff noting that he had “taken a view at Wells thinks it a duty to attend as a juror the trial the cause of the assizes.”<sup>185</sup>

The involvement of the interested parties in selecting jury members is unsurprising. Following the passage of An Act for the better Regulation of Juries in 1730, it was codified that both parties were to select what was referred to as a “struck jury” with each side selecting twelve individuals from a list of forty-eight provided by the relevant sheriff.<sup>186</sup> The term struck jury was used interchangeably with special jury although a special jury might include specific types of juries such as the twelve person jury of merchants often empaneled during patent law cases.<sup>187</sup> Regardless of the species of special jury, the specific requirements to be a member of a special jury were not codified until 1825, yet there was a general understanding that a jury member ought to be of above average wealth, a gentleman in good standing with the community, and possibly a member of a relevant profession. Ultimately, the applying party had to pay for the selection of a struck jury. This was money well spent; the determinative effect selecting jury members had on a trial made the struck-jury immensely popular, particularly with plaintiffs.<sup>188</sup> Judges too, especially Mansfield, enjoyed the perceived competence and fairness of the gentlemen often selected to be members of a

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<sup>184</sup> “June 25, 1782 Letter or Summons,” MS 486, *NRO*.

<sup>185</sup> “James Smyth to Sir Martin Folkes, July 6, 1782,” MS 486, *NRO*.

<sup>186</sup> James Oldham, “The Origins of the Special Jury,” *University of Chicago Law Review* 50, no. 1 (1983): 137-221.

<sup>187</sup> Oldham, *EM*, 22-23; Bottomley, *British Patent System*, 136-7.

<sup>188</sup> In civil cases both sides could request a special jury; Oldham, “The Origins of the Special Jury”; Gubby, *DLPP*, 25.

special jury and so by the 1780s a substantial portion of common law cases were tried before some form of special jury.<sup>189</sup>

Sheriff Warner sent out his evidentiary summons on June 25, 1782 with the “house of Philip Batchelor known by the sign of the standard at Wells in Norfolk” set as a meeting point.<sup>190</sup> With jury members selected, the reports of both the plaintiffs and the defendants were circulated to the jury members for upwards of a week preceding the trial.<sup>191</sup> With the civil caseload of the Norfolk assize given to Henry Gould, the trial began about a month after the initial summons.

Following the loss at the first trial in 1781, the commissioners of the harbor hired a new barrister, George Hardinge, to lead their defense.<sup>192</sup> Not three months before appearing at the Norfolk court of assize on behalf of the commissioners of the harbor, Hardinge had been named solicitor-general to Queen Charlotte.<sup>193</sup> Noted throughout his life of his interest in literature, theater, and acting Hardinge had similarly developed a reputation for his frequent and bombastic speeches on the floor of the house of lords.<sup>194</sup> A practiced and confident public speaker, Hardinge, much like his contemporary Thomas Erskine, represented the late eighteenth century model of the adversarial lawyer, a professional of rhetorical skill and argumentative capabilities whose approach to law was keenly focused on the audiences of judge and jury.<sup>195</sup>

At trial Hardinge took a hard-nosed approach to the rules of evidence, carefully laying the groundwork for objections to any testimony that was not rooted in direct personal

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<sup>189</sup> Moreover, it has been argued that by the end of the eighteenth century the difference between a special and common jury was merely one of procedure; Oldham, *EM*, 25.

<sup>190</sup> “June 25 1782 Letter or Summons,” Appendix V. b.

<sup>191</sup> “Arguments of Counsel,” MS 486, 58.

<sup>192</sup> For Hardinge’s biographical background, see: Michael T. Davis “George Davis Hardinge,” *ODNB* (2009).

<sup>193</sup> “Lot Essay” Christie’s, Live Auction 7092, British Pictures 1500-1850, Nathaniel Dance Portrait of George Hardinge.

<sup>194</sup> John Nichols, *Illustrations of the literary history of the eighteenth century*, vol. III (Nichols and Bentley, 2015), 9 quoted in Davis “Davis Hardinge, George”.

<sup>195</sup> Golan, *Laws*, 36-7.

observations of the harbor. To this end, the defense did not summon any of their four experts nor, based on the fragmentary shorthand notes of the trial, introduce their reports as evidence.<sup>196</sup> Instead, Hardinge presented the court with the sworn statement of twenty persons who testified to the evident decay of the harbor, which had so clearly accelerated in 1758 once the embankment had been constructed.<sup>197</sup> The surviving accounts do not name the specific individuals called to the stand but characterize their testimony as the result of personal eye witness experience of the harbor's decay.<sup>198</sup> Additionally, some mariners and pilots testified that navigating vessels throughout the length of the harbor had grown more difficult with each passing year.<sup>199</sup> Having worked the harbor for the last twenty years, these witnesses personally stated that prior to 1758, "navigation was good, and no ships or lives had been lost."<sup>200</sup> When the plaintiff called Smeaton to the stand to respond to the defense's lengthy list of eyewitnesses, Hardinge objected. This objection, presented to Judge Gould, Hardinge justified on two grounds, both of which were linked to the nature and practice of the work conducted by Smeaton.

Firstly, Hardinge contended that Smeaton report's referenced locations that were not relevant to Wells, such as the harbors of Venice and Lynn. He argued that the court "could not possibly be prepared to enter into any proof concerning the state, or the cause of the decay of any other harbor than that of Wells."<sup>201</sup> These other harbors had not necessarily been directly examined and their possible link to that of Wells was a matter of mere speculation, and thus not fit to be considered by the court. Of course, such comparative analysis had been

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<sup>196</sup> Based on the compiled manuscript documents in MS 486, *NRO* inclusive of "A. B. C. to the Printers of the Norfolk Chronicle," 55-60; "A.B to the Printers of the Norfolk Chronicle" 50-5; "Anonymous Shorthand Notes of Proceedings," 47-9, 50-6.

<sup>197</sup> Hodskinson, "Report," 1.

<sup>198</sup> "Arguments of Counsel," 50-60.

<sup>199</sup> *Ibid.*; Golan, *Laws*, 37.

<sup>200</sup> *Ibid.*, 57.

<sup>201</sup> *Ibid.*

undertaken by reports on both sides, yet Hardinge had strategically not introduced the reports of his own clients in the first place. Secondly, he made the more substantive point that in speaking to the jury in any capacity, Smeaton would unduly prejudice the jury by exposing them to his personal opinion. This was fundamentally improper, as a jury should only hear facts pertaining to the case: facts, which by definition were dependent on direct eyewitness testimony. In summary, Hardinge directly challenged the kind of theoretical work that the reports by Mylne and Smeaton aimed to undertake. As we have seen, the reports were rooted in initial observations drawn from personal examinations of the harbor. Hardinge argued these facts, as mediated by the testimony of a witness, were rendered into personal opinion, an allegation only reinforced by the nature of the theoretical asides Smeaton so readily engaged in.<sup>202</sup>

Hardinge's motion was summarized in the handwritten response of an anonymous observer who signed their report with the initials A. B. C. The letter sought to present the readers of the *Norwich Mercury* with a view of the trial firmly from a perspective hostile to Folkes and Hales, sardonically describing "the skillful, the celebrated, the omniscient Mr. Smeaton" whose evidence was tantamount to the assigning of "his opinion & conjectures [to] other causes of the decay for the harbor."<sup>203</sup> This they argued was an issue, for "unless Smeaton's opinion was founded upon facts—within his own knowledge, he ought not to be permitted to speak to matters of opinion alone."<sup>204</sup>

As this observer of substantially slanted objectivity recounted, Hardinge's attempt to prevent Smeaton's report from being presented in court was simply an endeavor to do the court, jury and public a favor and to save time. As A. B. C. contended, this motion was of great merit, for Hardinge was simply ensuring that Smeaton did not further taint the jury with

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<sup>202</sup> Hardinge's testimony as summarized in "Arguments of Counsel," 50-60.

<sup>203</sup> *Ibid.*, 58.

<sup>204</sup> *Ibid.*

unsubstantiated opinions which were unfit for a courtroom. However, A. B. C. was keen to emphasize that Smeaton was welcome to testify should his account actually be rooted in his “knowledge.”<sup>205</sup> Here, “knowledge” presumably referred to what Smeaton directly knew of the facts related to the case through sense experience and not to what he might infer due to his training, skill or experience. This highly partisan observer was keenly attuned to the legal reality that it was the opinion-based nature of Smeaton’s testimony that Hardinge had grounds to challenge.

Ultimately, it fell to the discretionary power of Judge Gould to determine whether Smeaton should be barred from testifying and his reports struck from the record. Gould represented a different generation of lawyers compared to that of Hardinge. Having been called to the bar in 1734, nine years before Hardinge was born, Gould’s career reflected a rise to prominence that was an inverted reflection of Hardinge’s rise.<sup>206</sup> Gould’s professional life, first as a king’s counselor had “been distinguished more by the soundness of his law than by the power of his oratory.”<sup>207</sup> By the time of the trial at Wells Harbor, the 72-year old Gould was still traveling from his home in Lincoln’s Inn Fields, London to serve as part of the assize court’s rotation, often traveling to the northern circuit courts. He was also a judge of stern conviction and self-assured belief, who refused personal protection following the riots of 1780, that saw the burning of Mansfield’s country home. A patriot in the mold of Socrates, he allegedly claimed that “he would rather die than live under any other than the laws of England.”<sup>208</sup> Jurisprudentially astute and possessing strong empiricist convictions, Gould’s logic of law “disdained abstract explanations, suspected elegantly constructed theories, and stressed the necessity of direct observational data in processes of proof.”<sup>209</sup> In short, Gould

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<sup>205</sup> “Arguments of Counsel,” 58.

<sup>206</sup> Stuart Handley, “Gould, Sir Henry” *ODNB* (2008).

<sup>207</sup> Edward Foss, *Biographia Juridica* (John Murray, 1870) 308.

<sup>208</sup> Foss, *Biographia Juridica*, 308.

<sup>209</sup> Golan, *Laws*, 39.

was an ideal judge for the defense to have drawn and in practice this proved to be true. He swiftly granted Hardinge's motion, finding that, as reported by Roscoe, "the evidence of Mr. Smeaton was [a] matter of opinion, which could be no foundation for the verdict of the jury, which was to be built entirely on facts, and not on opinions."<sup>210</sup> Without the testimony of their star expert witness, the case for the plaintiffs quickly fell apart and the jury shortly handed in a verdict for the defense.

In retrospect, Gould's apparent hostility towards selective opinionated evidence seemed to not have been lost on the plaintiffs or Smeaton, who later, when he learned that Lord Loughborough not Gould would oversee the following trial of 1783, optimistically noted "and [I] hope that arts and sciences will receive that protection from a Loughborough that could not be expected from a Gould."<sup>211</sup> By 1783, Mansfield and the King's Bench had intervened in the Wells Harbor dispute thrice, each time their ruling permitted what Mansfield argued was not opinion-based testimony but rather the authoritative findings of "men such as Smeaton."<sup>212</sup> For it was their deductions that were most relevant when the court was asked to contend with the hidden cause of nature.

It was Mansfield's ruling on November 21, 1782, which struck down Hardinge's challenge, that is remembered and emphasized in the substantial literature on this case. As Golan repeatedly notes, Mansfield's ruling in "the great case of *Folkes v. Chadd*" has traditionally functioned as the starting line for the dramatic rise of the partisan expert witness in the common law tradition.<sup>213</sup>

However, as the preceding chapters have shown in substantial detail, civil trials, particularly patent trials, made an informal yet nevertheless widespread use of what was

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<sup>210</sup> Roscoe, *Reports*, vol. III, 158.

<sup>211</sup> "Smeaton to Forster, July 1, 1783," Appendix III. k.

<sup>212</sup> Roscoe, *Reports*, vol. III, 157-60, 340-3.

<sup>213</sup> *op. cit.* n.16.

tantamount to a partisan expert witness. As such, any claim about the revolutionary nature of *Folkes v. Chadd* ought to be tempered against the gradualism and ad hoc nature with which experts entered the courtroom. This is even more apparent should one examine the much longer history of the medical expert witness during criminal trials. Golan, in his important revisionist account of *Folkes v. Chadd*, emphasized the post hoc nature of often legally minded historical accounts of the trial of Wells Harbor.<sup>214</sup> Such reflexivity and introspection is, as Golan noted, central to the function of common law. As much as Golan is correct that the historiographical legacy of *Folkes v. Chadd* has been overstated, the Wells Harbor affair did not go fully unremarked upon in the half century after its occurrence. Practicing law in the early 1820s, Henry Roscoe understood the importance of the Wells Harbor cases.<sup>215</sup> So much so, he made the editorial decision to include them in his selective account of the most important cases before Mansfield.<sup>216</sup> Moreover, there is a breadcrumb-like scattering of allusions and references to the cases through legal sources long before Roscoe's full report was published. Charles Durnford and Edward Hyde East's *English Reports* covered the King's Bench from 1790 to 1792. First published in 1799, their reports included a case referred to as "Goodtitle on the demise of Revett against Braham."<sup>217</sup> This case revolved around the reliability of handwriting; Chief Justice Lloyd Kenyon allowed the plaintiff to call two clerks from the post office to offer their opinion on the case despite the defense's objection. Kenyon's colleague and Mansfield's protégé, Justice Francis Buller agreed with his chief justice and is recorded to have said, "it was like the case of Wells Harbor, where persons of skill were allowed to give evidence of opinion."<sup>218</sup>

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<sup>214</sup> "Winnowing the Wheat from the Chaff in *Folkes v. Chadd*" in Golan, *Laws*, 41-5.

<sup>215</sup> Jonathan Harris and C. W. Sutton, "Roscoe, Henry," *ODNB* (2004).

<sup>216</sup> Roscoe, *Reports*, vol. III, v-vi.

<sup>217</sup> Charles Durnford and Edward Hyde East, *Reports* (1799), 497-99.

<sup>218</sup> *Ibid*, 498.

Although the legal profession of the late eighteenth century was growing, particularly at Westminster, it was not an infinitely deep pool of talent. The judges served tenures as long as health allowed and familiar barristers and solicitors, such as Hardinge, Le Blanc and Erskine, often took up cases before them. Indeed, Le Blanc had been involved in some of the procedural hearings during the Wells Harbor cases.<sup>219</sup>

The gentleman of this growing profession corresponded and shared professional updates, and as with Justice Buller during *Revett v. Braham*, they were allowed to recall or reference cases they had heard through word of mouth or personal correspondence even if a formal report was yet to be printed. Such a fact is similarly testified to in Samuel March Phillipps' *Treatise of the Law of Evidence* which by 1815 similarly cited the Wells Harbor case as one of the rare exceptions in which the opinions of a witness were considered acceptable evidence.<sup>220</sup> Nevertheless, attempting to ascertain the true spread of knowledge about Mansfield's ruling through passing references across the diffuse correspondence of the legal profession is a task beyond the scope of this thesis. What is pertinent and directly answerable is what the trials say about the state of the partisan expert witness in the late eighteenth-century English courtroom. It is perhaps more surprising and noteworthy that it took until 1782 and the confluence of a specific legal strategy for the emerging presence of the witness of skill to be so directly challenged. Hardinge's tactics were just as valid as the legal counsels defending against the Dollonds, Liardet or Arkwright and yet that path was not taken in those cases. Hardinge's appeal is so notable because it laid bare just how informal and ad hoc the day-to-day operations of the courtroom could be. That is to say, it reveals how often norms gradually shifted due to the practical demands of litigating increasingly technical matters, prevailed over strict traditional black ink interpretation of legal standards of truth and

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<sup>219</sup> "The argument of Counsel," 78-118.

<sup>220</sup> Samuel March Phillipps, *Law of Evidence* (1815), 209-10.

meaning. It is precisely for this reason that the context of Hardinge's appeal rather than the substantially more famous subsequent trial before Mansfield has been the focus of this section. It was before Judge Gould that the evidence of experts was to be presented, and it was Gould who, when pressed, saw it jurisprudentially just to question the normative and informal functioning of the expert witness.

However, Gould's intervention proved short-lived as Mansfield's personal epistemology made the excising of natural philosophers from the courtroom nothing short of an irrational failure to utilize a legitimate producer of knowledge:

I cannot believe that where the question is, whether a defect arises from a natural or an artificial cause, the opinions of men of science are not to be received. Handwriting is proved every day by opinion; and for false evidence on such questions a man may be indicted for perjury.<sup>221</sup>

As Roscoe's reporting of Mansfield's words depicts, the court already possessed the mechanism, in the form of perjury, to regulate all witnesses. Accusations and investigations into potential perjury punished individuals found to be dishonest just as the threat of such an ordeal incentivized the continued honest statements of all witnesses speaking to the court. Mansfield's reference to perjury and the linking of Smeaton's conduct with the court's routine engagement with the difficulties of assessing the veracity of handwriting is of both historical and historiographical note. Historiographically, it suggests that Mansfield was considering the implications of explicitly permitting Smeaton's testimony through a partisan lens. In this context, Mansfield's ruling portrays the potential challenges inherent to the credibility of expert testimony as unremarkable—fundamentally familiar ground for the jury.

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<sup>221</sup> Roscoe, *Reports*, vol. III, 159.

This was a challenge which faced not just the expert witness but all witnesses on the stand. This background challenges Golan's assertion that Mansfield's "decision finds little awareness, let alone angst, about the issues of Smeaton's appearance as a partisan witness" as Mansfield was effectively placing Smeaton's testimony into an adversarial context.<sup>222</sup> As a matter of historical fact this reaffirms that Mansfield was intending to sanction partisan expert testimony. Moreover, as we have extensively seen from the context of the Dolland, Liardet and Arkwright trials all heard before Mansfield, in the preceding years, Mansfield had evidently become comfortable with the court's ability to effectively assess the opinions of persons of skill, as it might with any other witness.

Mansfield's permissive attitude towards such testimony was strongly signaled from the earliest stages of the Wells Harbor dispute. For example, following the first assize trial of August 10, 1781, the commissioners of the harbor appealed with a writ of error in which they alleged that they had not been prepared to match Robert Mylne's specialist testimony.<sup>223</sup> Here, Mansfield, in reviewing this measure, agreed and granted a retrial on the grounds that all parties ought to be able to present the best possible evidence or otherwise be permitted to marshal similarly skillful witnesses. As Roscoe reports, during this initial procedural ruling Mansfield asserted that "in matters of science, the reasonings of men of science can only be answered by men of science."<sup>224</sup> Such a view explicitly conveys, on Mansfield's part, a partisan understanding of the expert witness: the retrial he permitted effectively requested that both plaintiff and defendant enter the courtroom with their own experts. As a necessary ramification of the adversarial process, the experts would then present two alternative accounts pertaining to the true cause of the harbor's decline.<sup>225</sup> Ultimately, Mansfield's

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<sup>222</sup> Golan, *Laws*, 49.

<sup>223</sup> "Arguments of Counsel," 47-9, 68; Roscoe, *Reports*, vol. III, 159.

<sup>224</sup> Roscoe, *Reports*, vol. III, 159.

<sup>225</sup> Golan is aware of this procedural development: Golan, *Laws*, 23-4.

multiple interventions into the Wells Harbor saga reaffirmed a jurisprudence that both understood the adversarial ramifications of his ruling, yet saw this a secondary, if not a necessary public debate, which would ultimately equip both judge and jury with the full range of insights as offered by the powerful and promising explanatory tools of the natural philosopher.

However, in practice these men were being asked to provide their opinions, which, by definition, could not be categorically proved to be false. Here, Golan is correct to emphasize that when on the stand the nascent expert witness was not merely providing evidence for their employer but embodying the performance of a proper gentleman of science.<sup>226</sup> For men such as Mylne and Smeaton, when in the courtroom much was at stake, as representatives of a novel discipline, they were staking both their professional reputations as individuals alongside the nascent discipline they were trying to define. What followed was inevitable: in the course of legal argumentation, their trustworthiness was challenged, so too was their credibility as honest and reputable gentlemen of science.

### **Offending a Gentleman Legal Practice v. Gentlemen of Knowledge**

It is safe to say that the Wells Harbor saga did not prove to be a pleasant experience for Robert Mylne. During the first trial in 1781 when Mylne was the only expert witness to present a theoretical account of the harbor's decay he was pressed under cross-examination about the origin of the sediment that he alleged had caused the harbor to decay.<sup>227</sup> Under oath Mylne speculated that sediment was able to converge at the mouth of the harbor due to the meeting of the western and northern tides. During the trial this was accepted as fact and Mylne and his report carried the day for his employers Folkes and Hales. However, in the intervening year during which the commissioners of the harbor contracted their own reports

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<sup>226</sup> Golan, *Laws*, 49-51.

<sup>227</sup> Roscoe, *Reports*, vol. III, 159.

they came to believe that Mylne's statement was inaccurate.<sup>228</sup> As recounted during the above discussion of Hodskinson's report, the experts for the harbor argued that the currents flowed in their respective directions and never met thereby making it impossible to carry sediment towards the harbor. Mylne's alleged error was publicly known by December 14, 1782 at the latest.<sup>229</sup> Foreseeing this development, Folkes's legal counsel feared that this would undermine Mylne's overall credibility and so he was requested to not participate in the second trial.<sup>230</sup> Moreover, they generally found Mylne a difficult man to work with.<sup>231</sup> On the other hand, Smeaton, a longtime colleague of Mylne, stood by him and noted his agreement with and belief in Mylne's findings in the final page of his own circulated report.<sup>232</sup>

Following his forceful defense of Mylne, Smeaton got his wish and they both participated in the final trial together facing a relentless and colorful cross-examination from Hardinge.<sup>233</sup> Perceiving Mylne as the weak link, Hardinge did just as the commissioners had planned; he accused Mylne of lying about the true cause of the harbor's decay and threatened to bring the justified charges of perjury against the engineer.<sup>234</sup> Unfortunately, no surviving shorthand notes that capture the exact nature of Hardinge's attack on Mylne exist.<sup>235</sup> However, there is a lengthy paper trail illustrating the fallout of this deeply personal and cutting cross-examination and after nearly a year of contemplation or perhaps stewing Mylne sent Hardinge a scathing letter demanding a full and public apology.

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<sup>228</sup> Hodskinson, "Hodskinson"; Nickalls, "Report".

<sup>229</sup> *Norfolk Chronicle*, Saturday, December 14, 1782, 3.

<sup>230</sup> Golan, *Laws*, 25.

<sup>231</sup> *Ibid*; This interpretation is based on Golan's review of pretrial preparation notes between Folkes's lawyers and Mylne on May 14, 1781. These records are held at the Sutro Library in San Francisco, California, USA.

<sup>232</sup> Smeaton, "Report," 15; "Smeaton to Forster, July 1, 1783".

<sup>233</sup> Smeaton to Forster, July 1, 1783; Mylne to Hardinge, July 24, 1784, WLP 18/25, *NRO*; "Summarized State of the trial in 1783"; Golan, *Laws*, 46-7.

<sup>234</sup> Mylne to Hardinge, July 24, 1784.

<sup>235</sup> In his initial July 24th letter to Hardinge, Mylne referred to the presence of a shorthand recorder in a suggestion that they might check the record for proof of perjury; Mylne to Hardinge, July 24, 1784.

In a letter sent on July 24, 1784, Mylne began by insisting that Hardinge's "injurious and illiberal treatment...requires some reparation."<sup>236</sup> Characterizing Hardinge's cross-examination as noisy and frothy, Mylne spoke in terms of gentlemanly rather than professional conduct emphasizing that is his reputation "as an honest man" and not "as an artist" which Hardinge had so indecently attempted to affix such "foul aspirations" to.<sup>237</sup> Finally, continuingly in his mode of emphasizing the relevant social mores, Mylne argued that if Hardinge was the gentleman he claimed to be, he ought to feel like he owed an apology.<sup>238</sup>

Hardinge immediately took Mylne's aggressive letter along with a copy of his drafted reply to Thomas Pitt.<sup>239</sup> Recently elevated to Lord Camelford, Pitt was a longtime active politician, member of the landed gentry, noted dilettante and most relevantly a close confidant of Hardinge.<sup>240</sup> It seemed Hardinge hoped Camelford would serve as an intermediary and whose status could de-escalate the situation, presumably, in Hardinge's favor. Camelford issued a prompt reply and immediately suggested that they should have a one-to-one discussion hosted at whichever of his residences proved most conveniently located.<sup>241</sup>

Unfortunately, Hardinge's response to Mylne was lost in the mail.<sup>242</sup> Receiving no response from Hardinge and viewing this as a further slight, Mylne responded to Camelford's request for mediation hostilely, for Mylne believed Camelford was merely a representative on Hardinge's behalf and not truly a neutral intermediary.<sup>243</sup> Mylne stressed that the Lord,

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<sup>236</sup> Mylne to Hardinge, July 24, 1784.

<sup>237</sup> Ibid.

<sup>238</sup> Ibid.

<sup>239</sup> Lord Camelford to Robert Mylne, July 29, 1784, WLP 18/25, *NRO*.

<sup>240</sup> Roland Thorne, "Pitt, Thomas" *ODNB* (2008); Davis, "Hardinge".

<sup>241</sup> Camelford to Mylne, July 29, 1784.

<sup>242</sup> George Hardinge to Robert Mylne, July 31, 1784, WLP 18/25, *NRO*.

<sup>243</sup> Robert Mylne to Lord Camelford, July 29, 1784, WLP 18/25, *NRO*.

should he excuse Mylne's candor, "must be ignorant of the principle part of this business" and informed Hardinge's friend of the true unvarnished nature of the unjust and ill-mannered assault of honor that has occurred.<sup>244</sup> Concluding his letter to Camelford, Mylne reiterated his interest in conduct and norms of reputation stating that only a full apology "will satisfy the injury" and prove Hardinge "a man of pure honor."<sup>245</sup>

In response, Hardinge re-sent his earlier letter with a few additions before he received Mylne's forceful follow-up.<sup>246</sup> In the letter Hardinge defended his conduct and further challenged the behavior of Mylne. Firstly, Hardinge appealed to his profession noting that in the abstract the "zeal of an advocate" was in equal parts the source of a lawyer's "praise" and "censure."<sup>247</sup> Hardinge informed Mylne that strong defense is simply the profession and stated that he is "not more faulty" than his fellow legal practitioners.<sup>248</sup> Secondly, Hardinge contended that if at the time this alleged offense had occurred Mylne had approached him with the discretion and respect appropriate of a gentleman he surely would have apologized. Yet, thirdly and finally, Hardinge sought to turn the tables on Mylne, arguing the tone of Mylne's letters was the true outrage.<sup>249</sup> In short, Mylne's bombast was met in kind with Hardinge assuring that Mylne's letter of outrage—written a year after the fact—was the true breach of gentlemanly behavior.

Camelford, having too been attacked by Mylne, saw the possibility of further legal escalation. Not content to sit the matter out, on July 30, 1784 he responded with a wide ranging letter that simultaneously defended his own actions, attested to the professional standards of the legal profession, and issued a direct warning to Mylne.<sup>250</sup> Rhetorically

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<sup>244</sup> Mylne to Lord Camelford, July 29, 1784.

<sup>245</sup> *Ibid.*

<sup>246</sup> George Hardinge to Robert Mylne, July 28, 1784, WLP 18/25, *NRO*.

<sup>247</sup> *Ibid.*

<sup>248</sup> *Ibid.*

<sup>249</sup> Hardinge to Mylne, July 28, 1784.

<sup>250</sup> Lord Camelford to Robert Mylne, July 30, 1784, WLP 18/25, *NRO*.

playing off Mylne's assessment of biases, Camelford's letter casually informed Mylne that he is "not easily discouraged... especially when a friend of mine is concerned" and although he was not a firsthand witness to the alleged slights he will offer Mylne sound advice for his "dispassionate" consideration.<sup>251</sup>

The heart of Camelford's letter and defense of Hardinge amounts to an extended statement on the duties, obligations, and nature of arguing a case before an open court:

Not given by Mr. Hardinge in his private capacity but in his discharge of his professional duty towards his client in an open court.... Few gentlemen of the profession I believe account themselves answerable for their pleading out of court. If they were, it would be difficult for them indeed to do justice to their clients without offending their antagonists.<sup>252</sup>

In short, Lord Camelford was arguing that Mylne failed to understand the professional realities of representing a client and in effect ought to accept the lively nature of the adversarial courtroom with some grace. Mylne would do no such thing. Responding on August 2, 1784 he argued that the very fact the attack on his character was made in front of a jury and thereby publicly made his request for an apology even more just.<sup>253</sup> Moreover, such a public attack demands a public apology.

Mylne's response was to offer his own contrasting analysis of the legal profession: it is precisely their premeditated and public attacks on character that earn the legal profession such universal derision as Mylne wrote "it is true, many at the bar practice and are expert at

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<sup>251</sup> Lord Camelford to Mylne, July 30, 1784.

<sup>252</sup> *Ibid.*

<sup>253</sup> Robert Mylne to Lord Camelford, August 2, 1784, WLP 18/25, *NRO*.

that weapon, to the great disgrace of our courts of justice, complained of by all the world.”<sup>254</sup> Throughout the continued exchanges, Mylne continuously played offense with the debate focused on what is the proper conduct of the practitioner of law without any security placed on the appropriate conduct of a witness of skill. As the conflict dragged on, challenges with the postal system and the late delivery of Hardinge’s letters, blame swiftly passed to his footman and the General Postman. This led Hardinge to recruit his friend August Greenland to act as a personal intermediary.<sup>255</sup> After some confusion and subsequent conflicts, Greenland met with Mylne and then hand-ferried letters between Mylne and Hardinge.<sup>256</sup> Resultantly, Greenland proved more successful than Camelford in effecting some kind of resolution.

Ultimately, Hardinge largely conceded and produced a letter of apology, which Greenland delivered to Mylne on August 3, 1784.<sup>257</sup> However the text, which was later summarized in a public accounting of the dispute, did not meet Mylne’s standards as he found it to be “insufficiently explicit and satisfactory to him.”<sup>258</sup> Hardinge promptly redrafted it and in the final version dated August 4 he publicly admitted that in his ‘zeal’ he had unjustly threatened Mylne with prosecution for perjury charges, and Mylne had “claim to every degree of reparation; that a man of honor can make.”<sup>259</sup> Mylne was evidently delighted with this final result and promptly had the letter widely circulated to his peers and published in a London paper with an open header declaring said verbal duel was directed to all “judges, jury, counsel, engineers, and other evidenced, who attended the several trials at Norwich, on

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<sup>254</sup> Mylne to Lord Camelford, August 2, 1784.

<sup>255</sup> George Hardinge to Robert Mylne, July 31, 1784.

<sup>256</sup> August Greenland to Robert Mylne, July 31, 1784, Robert Mylne to George Hardinge, August 2, 1784, and August Greenland to Robert Mylne, August 2, 1784, WLP 18/25, *NRO*.

<sup>257</sup> “Printed Broadsheet Concerning Correspondence between Robert Mylne and George Hardinge, September 20, 1784,” WLP 18/25, 4, *NRO*.

<sup>258</sup> Printed Broadsheet, 4.

<sup>259</sup> George Hardinge to Robert Mylne, August 4, 1784, WLP 18/25, *NRO*; For a full transcript of Hardinge’s apology letter see Appendix entry IV. h.

the Wells harbor cause... to such persons who are, or may have been, any what interested or conversant in the principal business thereof.” Subsequently, Mylne issued his own apology letter to Hardinge in which he stated that he was “sorry for the disagreeable manner and unhandsome expressions, I made use of to you, in my letter of 28th July.”

The affair, as dramatic and ultimately public as it had been, it was not an unprecedented manner in which gentlemen of the late-eighteenth century might settle a dispute. By the 1770s, dueling, although still practiced by some members of the gentry and officer class, was of ever escalating social disfavor.<sup>260</sup> This form of settling a dispute occurred more frequently in private due to both its illegality and growing taboo; to further erode the alleged purpose of the duel, by the end of close of the eighteenth century it was not uncommon for bystanders and police offices to break up duels before they could even occur.<sup>261</sup> The interlocking realms of civil lawsuits and mass newspapers proved to be a successful replacement with newspapers in particular due to their far wider of an audience than a sequestered duel ever could.<sup>262</sup> Moreover, the intellectual movements of the late eighteenth century both religious and philosophical “condemned manhood’s culture of honor” and the violence it encouraged.<sup>263</sup> As masculinity reinvented itself, intellectual aplomb, honesty, stoicism and rhetorical skill were among the prized traits of a gentleman.<sup>264</sup> Indeed, for a natural philosophers and a member of the bar it only follows that they selected the pen and the newspaper as their weapons of choice.

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<sup>260</sup> Stephen Banks, *A Polite Exchange of Bullets* (Boydell Press, 2010), 1-2; Lord Camelford outlived his son who, in 1804, died as the result of a duel. Camelford II final requests included instructions to his father not to prosecute his killer; Ibid, 138; Wade Ellett, “The death of dueling,” *Smithsonian* 123, (1997): 60-2; Robert B. Shoemaker, “The Taming of the Duel,” *The Historical Journal* 45, no. 3 (2002), 539.

<sup>261</sup> Ellett, “The death of dueling,” 65-6.

<sup>262</sup> Ibid, 60.

<sup>263</sup> Ibid, 65.

<sup>264</sup> Michèle Cohen, “‘Manners’ Make the Man,” *Journal of British Studies* 44, no. 2 (2005): 312-5, 26; Robert Shoemaker, “Male honour and the decline of public violence in eighteenth-century London” *Social History* 26, no. 2 (2001): 207-8.

## Conclusion

This dispute between the newly formalized expert witness and the barrister shows just how clearly adversarial the practice of law had become. The public fallout between Mylne and Hardinge highlighted the established standards and appropriate conduct of the legal practitioner. In contrast, the obligations of the role of expert witness taken on by Mylne were left unscrutinized, showing the novelty and still indefinite scope and conception of the place of a person of skill at trial. From Mylne's perspective, in 1781 he had been the lone natural philosopher who boldly and confidently revealed the true cause of the harbor's decay without push-back from counsel let alone rival experts. Less than three years later, in 1783, he was pitted against a well-prepared Hardinge who had the additional backing of his own hired experts. The context in which the expert witness was operating was changing faster than the formalized legal procedures around it and key among them was the shaping flame of the adversarial furnace. By the mid-1780s, as the next chapter will demonstrate through the trials of Arkwright, to be a person of skill was not enough. One had to have the confidence, constitution and of course reputational renown to withstand the increasing rigors of a hostile and fully prepared cross-examination. Yet, overconfidence and excessive swagger were risks onto themselves. As outsiders explaining the true and inevitable cause of the harbor's collapse, Smeaton and Mylne's testimony proved deeply unpopular with the locals of Wells. Ultimately, striking of the appropriate balance between authoritative and alienating proved to be an art above all else.

In historical memory and to a lesser extent in jurisprudential history, *Folkes v Chadd* is credited for ushering in and formalizing the expert witness. Henry Roscoe's recreation of Mansfield's judgment exemplified and channeled the clear enlightenment ethos that is implicit in Mansfield's lofty call that "in matters of science no other witness can be

called.”<sup>265</sup> Indeed, Mansfield’s ruling did not grapple with Smeaton’s partisan nature nor seek to consider the possible limits or challenges the science Smeaton might face in the courtroom. Best described as an idealistic and optimistic ruling, Mansfield’s novel statement affirmed that expert opinions were far from mere opinions; rooted in mathematical understanding and professional skill they ought to be treated with moral certainty. The bulk of Mansfield’s ruling was consumed with an extensive list of the times the court deferred to persons of skill, from the consultation of shipwrights to clerks to experts in Latin. Mansfield’s insight was that, as both a practical matter and in the interest of the court’s desire to find truth, insofar as it is possible, the court procedures and rules of evidence must yield to the knowledge and insight that exist outside the personal knowledge of judges, lawyers, and members of the jury. Precisely to this point, as I have and will continue to explore, the technical nature of patent law saw the court, as a matter of practicality, passively welcome the testimony of partisan experts.

Mansfield’s aspirations for the non-partisan experts he summoned to court sit in stark contrast to the turbulent reality of the adversarial expert witnesses. As this chapter has spotlighted, for the landmark case which marked such a procedural step for the admissibility of the testimony of persons of skill, the actual practice and performance of persons of skill at the Norfolk court of assize was anything but smooth. The first trial in 1781 saw Robert Mylne vindicate his clients unopposed, yet his statements on the stand led to threats of perjury. The strategizing by George Hardinge during the second trial in 1782 saw not a single engineer testify despite the completion of four reports at the expense of both plaintiff and defendant. The collision between experts and barristers in the third and final trial in 1783 proved so reputationally offensive that Mylne embarked on a lengthy quest to secure a public apology from Hardinge. Moreover, the plaintiffs, equipped with Smeaton, the engineering

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<sup>265</sup> Roscoe, *Reports*, vol. III, 159.

heavyweight and his vindicated theoretical account of the cause of the harbor's decay, ultimately lost before a local jury. All the while, the *Norfolk Chronicle* published anonymous reports and accounts of the trial, which further attacked the credibility and merit of the expert engineers.

Following the final trial, a local newspaper concluded their coverage of the three-year saga with a final sweeping critique of the expert witness, writing:

but that melancholy scene [the continued decay of the harbor as the trials proceeded], it is hoped will now be closed to the confusion of those engineers, whose speculative opinions and unfounded conjecture have served no other purpose but to mislead their employers, protract the suit, and occasion expense to both parties.<sup>266</sup>

The dramatic contrast in language between Lord Mansfield and the newspaper's author speaks to the many tensions of the partisan expert witness from its inception. Mansfield's perspective was that the expert witness represented a necessary kind of explanatory power that the court was foolish to ignore.<sup>267</sup> Yet, the practical reality, reflected in the frustrated remarks of the newspaper author, was that as the expert shifted to fulfill a partisan role in the increasingly adversarial court, the personal interests of the expert witness became subject to a multitude of conflicts. What remains clear is that from the moment of the partisan expert witness's formal recognition, said experts were a figure of marked controversy.

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<sup>266</sup> "Summarized State of the trial in 1783"; This newspaper is clipped and pasted into a letter book (MS 486, *NRO*) in such a manner that the printer is unknown; the account does not appear to match anything published in the months following the trial in the *Norfolk Chronicle*.

<sup>267</sup> The extent to which Smeaton was correct is up for debate. Writing in 2004, Golan noted that although much of Smeaton's theory was accepted today as true, his expert opinion was tentative. Even 200 years later accurately predicting the fate of a harbor requires incredibly precise measurements and modeling of factors. At best the answers would be probabilistic and not categorical; *Laws*, 48-9.

## Chapter 4

### Examining the Practice, Conduct, and Theatrics of Established Courtroom Experts Through the Final Patent Trial of Richard Arkwright (1785)

#### Introduction

On February 17, 1785 Richard Arkwright prevailed against Peter Nightingale and in the moment it seemed, at least to Arkwright, that his patent had, at last, been successfully vindicated by the trial law courts.<sup>1</sup> Yet, days before this, a writ of *Scire Facias* was successfully filed by a collection of Arkwright's Manchester rivals, laying the groundwork for a parallel legal challenge to Arkwright's now singular cotton carding patent.<sup>2</sup> With the Nightingale trial favorably wrapped up Arkwright pivoted to addressing this looming reexamination of his patent, meeting with Goodwin and Ince on April 24 and 25 respectively to review the situation.<sup>3</sup> Less than two months later, *Rex v. Arkwright* was held on June 25 before the King's Bench with Mansfield's longtime associate, Judge Francis Buller presiding.<sup>4</sup> Despite several similarities with the previous two trials of *Arkwright v. Mordaunt* and *Arkwright v. Nightingale*—including the same counselors and returning witnesses—the successful writ of *Scire Facias* ensured that in many ways, this trial was fundamentally different from his encounter with Nightingale. Firstly, Arkwright was no longer a plaintiff filing a suit against his infringers; instead, he was a defendant tasked with swaying the jury that the state had not erred in issuing Arkwright the 1775 patent in the first place.<sup>5</sup> For the

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<sup>1</sup> John Davies, *A Collection of the Most Important Cases Respecting Patents of Invention and the Rights of Patentees* (W. Reed Law Bookseller, 1816), 37-60; R. S. Fitton, *The Arkwrights* (Manchester University Press, 1989), 113, 177.

<sup>2</sup> *The Trial of a Cause Instituted by Richard Peeper Arden ...to Repeal a Patent Granted ...to Mr. Richard Arkwright* (Hughes and Walsh, 1775), 10 [Hereafter *Rex v. Arkwright*.]

<sup>3</sup> Fitton, *Arkwrights*, 117-8.

<sup>4</sup> James Oldham, "Buller, Sir Francis, first baronet," *ODNB* (2004).

<sup>5</sup> For the core complaint of the writ see: *Rex v. Arkwright*, 4-7; "Scire Facias to Repeal Letters Patent" in Thomas Campbell Foster, *A Treatise on the Writ of Scire Facias* (V & R. Stevens and G. S. Norton, 1851), 236-78; For an account of how the writ was likely acquired see: Hewish, "New Light on the Arkwright Patent Trials," 82, 85-6.

first time, a prosecution was empowered to reexamine Arkwright's patent on all grounds including original public disclosure of a novel invention, proper disclosure of novel uses of existing inventions, and a patent specification that teaches others within a trade "to do a thing for which a patent is granted."<sup>6</sup>

For this reason, this trial was the most exhaustive of all Arkwright's patent cases with a total of forty-four witnesses appearing before the court, some taking the stand multiple times. Justice Buller took his seat sharply at nine o'clock and the jury, after the trial concluded at one o'clock in the next morning, perhaps unsurprisingly, "without a minute's hesitation," reached their verdict against Arkwright.<sup>7</sup> It was Bearcroft and Erskine, now in the role of prosecutors, who substantially rounded out their list of witnesses, enabled to do so by the fact that the question of originality was open for reexamination. The prosecution called thirty-three individuals including the apparent original perfecter of the rollers Thomas Hayes, who testified to Arkwright's theft of his invention, a claim supported by a host of former workers and their spouses such as John and Sarah Kay.

In a rare yet historically fortuitous deviation from the norm of selective and imprecise law reports, the entirety of the trial was recorded in the form of a verbatim transcript. This transcript, paid for by Arkwright, was likely taken by the accomplished short-hand recorder Joseph Gurney.<sup>8</sup> Within the close circle of wealthy Lunar Society manufacturers who frequented the common law courts, equally benefiting attorneys and future litigation, the practice of privately commissioning transcripts seems to have caught on as evidenced by James Watt's repeated hiring of Gurney during his litigation through the 1790s.<sup>9</sup> Arkwright

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<sup>6</sup> *Rex v. Arkwright*, 4-7; Oldham, *MM*, 754.

<sup>7</sup> *Rex v. Arkwright*, 187; "Leigh Broadsheet, Monday 27 June 1785" quoted in Fitton, *Arkwrights*, 139.

<sup>8</sup> Thompson Cooper and Joanna Hawke, "Gurney, Joseph," *ODNB* (2018); Arkwright began commissioning transcriptions of his trials during his original case against Mordaunt in 1781: Fitton, *Arkwrights*, 96; On the unusualness of this practice: John Hewish, "Rex vs Arkwright, 1785: A judgment for patents as information," *World Patent Information* 8, no. 1 (1986), 34.

<sup>9</sup> Unlike Arkwright's transcripts, Gurney's trial recordings appear not to have survived in full. However, some notes remain in his shorthand and were never published, for example: "Copy of the Short Hand Writer's Notes

had personally begun this comprehensive record-keeping practice during the trial against Mordaunt in 1781.<sup>10</sup> Most importantly, the *Rex v. Arkwright* transcript does not seem to possess any overt evidence of pro-Arkwright bias. This logically follows as the transcript lost its preparatory utility, what Arkwright was in fact purchasing, as it may not accurately represent what transpired in the courtroom. Fitton's careful archival work has revealed that previously, when Goodwin and the rest of Arkwright's representatives and witnesses rented two private houses from which to prepare for the upcoming trial against Nightingale, Ince and Goodwin had come prepared with a copy of Gurney's notes on the first trial to use as preparatory material.<sup>11</sup> So the fact that Arkwright actively used the transcripts to inform legal arguments is not a matter of inference or speculation. As will be seen, the transcript's credible impartiality is evidence that Arkwright's witnesses, legal team, and the ultimate ruling of Justice Buller and the jury was, from Arkwright's perspective, far from favorable or flattering. Finally, the printed transcript's exceptional detail included interruptions by counsel, judge, and jury and short references to physical demonstrations of machines and even textual flavor, such as Buller's punctuality and the jury's quick deliberation.<sup>12</sup> Altogether, this provides an unprecedentedly rich source, providing direct insight into the expert witnesses' courtroom conduct and behavior as they responded to both friendly and hostile questions.

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of what passed in the Common Pleas on the motion for a New Trial being refused," *Boulton & Watt and Successor Firms Legal Records, Library of Birmingham*, MS 3 147/2/45; The favorable ruling and reasoning of the King's Bench for Watt were, in contrast, deliberately published: *The Special Case in the cause Boulton & Watt ...with the Arguments of the Judges thereon; and an Appendix of Matters referred to* (London, 1795); *The Arguments of the Judges in Two Causes relating to the Letters Patent granted to James Watt...Taken in short hand by Mr Gurney...*(London, 1799).

<sup>10</sup> Fitton, *Arkwrights*, 96.

<sup>11</sup> *Ibid*, 106; The transcript from *Arkwright v. Mordaunt* has not survived.

<sup>12</sup> Due to the sparse title page, it is unclear who commissioned the print of the transcript. All that is listed in this regard is "Printed for Hughes and Walsh, Inner Temple-Lane." Although the title page does not include an author, it is common in library databases for Arkwright to be listed as the author.

In this chapter, through an extended and detailed look at the testimony of witnesses during *Rex v. Arkwright* I am able to reveal the simultaneously contested, normalized, fraught, and powerful nature of expert witness testimony. Ultimately, this chapter will enrich and clarify the specific conduct and growing presence of the expert witness within the confines of patent law disputes that have been defined in the last two chapters. Divided into five parts, I will first survey the testimony of machine and clockmaker John Immison, uniquely experienced in the making of machines from drawings; indeed, his testimony created a significant challenge for the defense.<sup>13</sup> Immison prevailed in court, as he demonstrated the conduct of an effective expert witness, offering narrow and careful answers enabled without hindrance the aims of friendly counsel.

Secondly, I will examine the contrasting testimony of Samuel Moore, drawing attention to his honest yet, from the perspective of the defense, decidedly unhelpful testimony. As Moore flipped sides after the first trial versus Mordaunt, his in-court justification for legitimately swapping sides provides a rich case study of the tensions present between serving one's client and accurately speaking to the facts as a genuine person of skill.

Thirdly, the testimony of Sarah Key and Elizabeth Hargreaves will be examined as their likely official status as wives limited to fact-based testimony quickly vanished once on the stand.<sup>14</sup> Once again, the fundamentally technical nature of patent law pushed witnesses towards opinionated testimony, something both Key and Hargreaves were well prepared to give. This instance in which gender and expertise interact stresses the ways in which courts in practice could be governed, above all else, by the continued engagement of all players.

Fourthly, attention will be turned to the significantly more intense, thorough, and damning cross-examinations of all who had so recently claimed to have replicated

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<sup>13</sup> Also spelled Imison; Sutton and Ramwell, "Imison, John".

<sup>14</sup> Also spelled Hargrave in trial transcript; *Rex v. Arkwright*, 41.

Arkwright's machine. The success of this cross-examination and the eroding of Arkwright's experts was further pressed by Justice Buller's final summary of the evidence. Here, attention will be focused on how Buller stressed what he saw as the varied degrees of eminence and credibility in the experts before the court, effectively reminding the jury of their prerogative to assess the expertise of the apparent experts.

Finally, I will examine Watt's own analysis of the trial provided in a series of letters and extensive notes sent to Arkwright by October 1785.<sup>15</sup> Watt affirmed the justness of Arkwright's overall cause as he admitted the general weakness in Arkwright's specification. This analysis provides unique insight into how an expert witness and inventor interpreted and was dissatisfied with patent law. Additionally, these personal letters reveal a self-understanding of the role of the expert as paramount in securing the rights of the inventor in court.

Ultimately, Justice Buller, in contrast to Justice Loughborough, handed the jury a broad multi-factor test giving them more to consider when deliberating the verdict. However, both judges agreed that the testimony of expert witnesses was crucial and highly relevant to the outcome of jury deliberation. By the time of this trial, the experts on both sides—presenting in a highly partisan and thereby critical atmosphere—were subject to probing cross-examinations with their testimony given little to no deference based on their esteemed reputation alone by judge, jury, or rival barrister. Resultantly, both Arkwright's counsel and the Crown's prosecutors clearly understood the expert witness to be a full, active, and essential player in the adversarial framework of common law.

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<sup>15</sup> Correspondence between James Watt and Richard Arkwright; October 12, April 4, April 11, October 11, October 26, October 27, *WC*, MS 3219/4/128, Appendix IV.

**John Immison**  
**A Clockmaker is Brought Forth by the Crown**

The Crown concluded their comprehensive opening statement by handing out the illustrations and reading the associated specifications of both Arkwright's 1769 and 1775 patent in full to the jury.<sup>16</sup> The strategy here was threefold: first, the prosecution wished to demonstrate that all ten parts of the 1775 specification had been disclosed in Arkwright's now expired 1769 patent and should count as unprotected public knowledge.<sup>17</sup> Secondly, even if the defense could demonstrate there was a significant divergence between some component parts in the two patents, any such differences were used in other inventions prior to Arkwright's 1775 patent filing. Thirdly, should the defense manage to demonstrate that a part of Arkwright's 1775 patent was not a replication of his 1769 patent or otherwise public knowledge—something that the prosecution repeatedly and forcefully emphasized they had exceptional evidence to counter—such demonstrations were ultimately moot as these deviations were invented solely to obscure the true construction of the machine thereby making the specification void.<sup>18</sup> Here the prosecutorial team replicated their broad multifactor approach, challenging the defense to clear multiple bars on their way to proving the patent's validity while the prosecution continued to object to the defense's primary answers. As this strategy effectively played out during the ultimate ruling, the jury was asked to give a favorable answer to Arkwright on all of these points while for the Crown only one of the many listed deficiencies had to be agreed upon.<sup>19</sup>

As will be seen in the following analysis, from the Crown's perspective, Immison proved to be a highly effective expert witness. Called twice to the stand, he succeeded not

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<sup>16</sup> *Rex v. Arkwright*, 26.

<sup>17</sup> "Arkwright's Specification," Appendix I. f.

<sup>18</sup> It is worth emphasizing that despite the invention's mechanical similarities, the prosecution's strong rebuttal stated that the two patents were filed for separate inventions. The 1769 patent covered spinning while the 1775 patent covered the carding process. Patent No. 962: Hayward, *Hayward's Patent Cases*, 178; Patent No. 1111, *Ibid*, 179.

<sup>19</sup> *Ibid*, 187.

only in maintaining his credibility under cross-examination but was also narrowly questioned on facts that were exceptionally hard for Arkwright's counsel to challenge.<sup>20</sup> Resultantly, the multi-skilled clock and watchmaker, printer, engraver and optician from Manchester serves to demonstrate how as early as 1785, legal teams such as Bearcroft and Erskine understood that the less rope given to the right expert the better.<sup>21</sup> Ultimately Immison demonstrated how an expert witness could successfully navigate the adversarial context of the court to the end of bolstering those who hired him, while maintaining their own reputation.

Immison was first called directly following the reading of both patents to the jury and set up by the Crown's prosecutors with a clear task: help introduce and explain the relevance of new evidence. Erskine began his questioning by handing Immison the book *Principles of Mechanics* by William Emerson, whereupon Immison confirmed that this book had been in print for "some years."<sup>22</sup> Next, Immison, with Justice Buller's agreement, confirmed that a beating hammer as described in *Principles of Mechanics* was identical to the one described in Arkwright's patent.

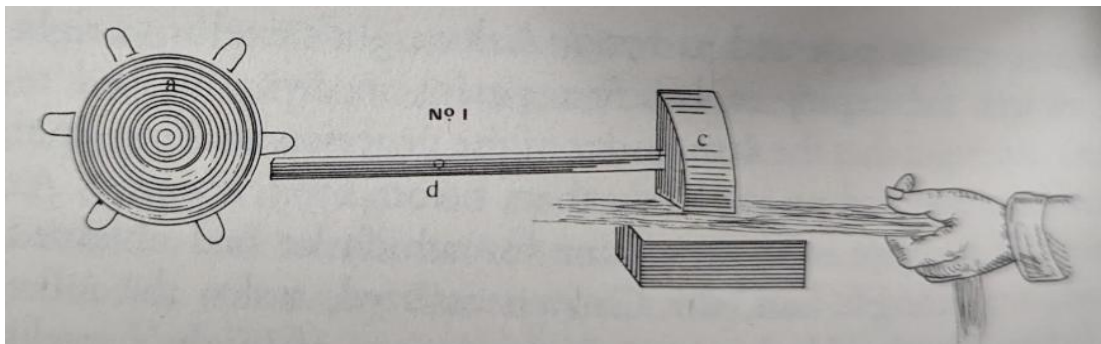


Figure 1. The beating hammer as it appears in Arkwright's 1775 patent specification.<sup>23</sup>

<sup>20</sup> *Rex v. Arkwright*, 33-4, 77-81.

<sup>21</sup> Sutton and Ramwell, "Imison, John".

<sup>22</sup> *Rex v. Arkwright*, 33.

<sup>23</sup> Patent specification from Fitton, *Arkwrights*, 120-1.

The expert witness and barrister carefully restated that the disclosure of the said hammer predated Arkwright's 1775 patent. However, such revelation, damning in its own right, was not the crux of Immison's testimony. Asked what use such a hammer had when manufacturing cotton, as Arkwright's machine was intended to do, Immison responded "A very great disuse, if applied to it," for the hammer, if applied to cotton "would break the seeds so much among the cotton, it would be of great disuse when it came to be roved and spun."<sup>24</sup> Through short and clear responses, Immison effectively led the courtroom in two mutually undermining directions: the hammer discussed in Arkwright's patent was both unoriginal and a barrier to the actual intended use of the machine. Moreover, throughout this testimony and eventual cross-examinations, Immison consistently demonstrated further specialist's knowledge in the unique demands of cotton manufacturing, as he, with the aid of a friendly barrister, redirected the technical discussion to the precise details of cotton manufacturing.<sup>25</sup> This was a deeply effective move that spoke to the evident preparation and rehearsal of the prosecution, and it highlighted how Arkwright's 1775 carding patent was doubly deficient. As noted, Arkwright's 1775 patent was broad and covered carding with a range of materials from hemp and wool to, of course, cotton.<sup>26</sup> Immison's testimony challenged the patent in the invention's most well-known use, cotton mills, arguing that this application was little more than a fantasy should the machine be constructed as described.

In response to this challenging and well-orchestrated testimony Mr. Wilson, counsel for the defense, only asked Immison to clarify a single question: whether the hammer as described in *Principles of Mechanics* was intended to be used on hemp. To which Immison simply replied in the affirmative, as this question asked under cross-examination did nothing to justify the hammer's legitimate inclusion in Arkwright's specification for a cotton carding

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<sup>24</sup> *Rex v. Arkwright*, 34.

<sup>25</sup> Immison affirms on the stand that he has "general knowledge of cotton works" *Rex v. Arkwright*, 78, 81-2.

<sup>26</sup> Patent No.1111; Webster, *Reports*, 56.

machine.<sup>27</sup> Indeed, the prosecution continued to build upon the confusion of the hammer with additional expert testimony.<sup>28</sup> Adair, unable to deny the widely agreed use of the hammer, did his best to remind the jury that the 1775 patent was for a general carding and spinning machine that could be used on materials other than cotton including hemp.

Immison's second appearance before the court proved far more controversial as it was met by a lengthy and contentious cross-examination that caused Justice Buller to intervene. Immison's task was less narrow than before, yet he kept to giving short answers, only expanding when prodded by his allied barrister. Erskine began the examination by confirming Immison's qualifications before the court, noting how Immison was especially "accustomed to making machines from drawings" alone, a detail which spoke to his general competence.<sup>29</sup> Therefore, the prosecution contended, if Immison found the specification obfuscating it would be the same for any reasonable machine maker. Immison testified to the confusing nature of the 1775 specification noting how there "are very few parts of the carding machine here, that are in the carding engine, and they are very imperfectly described that are here."<sup>30</sup> Immison's testimony would ultimately focus on the visual depiction of one of the cotton rollers, image No. 5 in the specification.<sup>31</sup> This point, successfully argued in 1781, was argued again now by Immison, who said, based on the drawing alone, there was simply no way to know that the roller ought to be fluted, and that it was unclear what precise mechanism was enabling the roller to spin appropriately.<sup>32</sup>

The repetition of the successful 1781 strategy by Erskine and Bearcroft is likely no coincidence. In his opening statement to the court Bearcroft provided a detailed summary of

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<sup>27</sup> *Rex v. Arkwright*, 34

<sup>28</sup> Benjamin Pearson and Joshua Wrigley also spoke to the curious inclusion of the beating hammer; *Ibid*, 34-7.

<sup>29</sup> *Ibid*, 77.

<sup>30</sup> *Ibid*, 77.

<sup>31</sup> *Ibid*; See page 112 for Figure No. 5.

<sup>32</sup> *Ibid*, 77.

his history of litigation against Arkwright including apparent direct quotations from the happenings before Mansfield four years prior.<sup>33</sup> Bearcroft's organic interjection that "I believe I have got the works in my own brief" as captured by Arkwright's courtroom scribe strongly suggests that the prosecution was working off of notes to assist in their presentation of evidence, cross-examinations, and occasionally carefully working in a friendly expert witness.<sup>34</sup> Indeed, this careful note-based trial preparation is unsurprising considering that such practice was, as has been seen, extensively used by Arkwright's legal team.<sup>35</sup> By the end of the eighteenth century such use of courtroom notes during trial was commonplace.<sup>36</sup>

Returning to Immison's testimony, guided by Erskine's pin-point questioning, Immison worked this way through each figure in Arkwright's specification, repeatedly describing the various ways in which the description was technically deficient.<sup>37</sup> In fact, when asked to confirm Erskine's description of how all the component parts illustrated separately were intended to fit together, he responded, "it seems to me to be rather an intention to conceal, than to discover. Those are the back rollers the communication is fixed in; which is wrong in fact too."<sup>38</sup> A key challenge in reading Arkwright's specification, as pressed by Immison during his testimony, was the lack of scale between each illustration, a confusion further exacerbated by the fact that each image was being viewed from a different angle as illustrated in the figure below:

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<sup>33</sup> *Rex v. Arkwright*, 22-6.

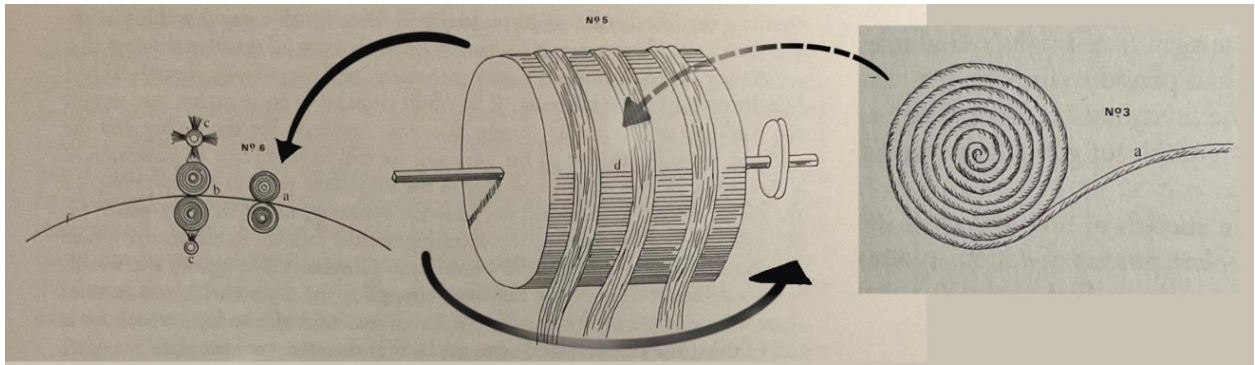
<sup>34</sup> *Ibid.*, 23.

<sup>35</sup> *Ibid.*; See 25-8, 44.

<sup>36</sup> Lemmings, *Professors of the Law*, 141

<sup>37</sup> *Rex v. Arkwright*, 77-9.

<sup>38</sup> *Ibid.*, 78.



*The language of the specification does go some of the way towards demonstrating how, in theory, the component parts of the machine ought to fit together: “No. 5 is the last-mentioned cylinder, which hath fillet cards; behind this cylinder No. 3 delivered its contents upon another cylinder. No. 6 consists of rollers fixed to a wooden frame, the contents of No. 5 being brought to it at a, and going through at b, produceth it [the thread] a proper size f, c, c, are brushes for clearing the machine.”<sup>39</sup>*

Immison’s testimony demonstrated how the angles selected were of little use to the would-be constructor of the machine as the turning mechanisms hinted at in image No. 5 were no longer visible in image No. 6 because the machine was being viewed from behind.<sup>40</sup> This Immison argued was intended to confuse; in what may have been a rehearsed exchange, considering how well prepared the duo evidently were, Erskine did not miss a beat and posed the leading question “It appears to you an intention rather to conceal, than discover,” which Immison tersely confirmed to be unambiguously the case.<sup>41</sup> The jury followed the cross-examination with a copy of the illustrations and Erskine asked Immison a final pointed question:

Q: Though you are a person well acquainted with the nature of cotton machines in general, you could not possibly make up a cotton machine for spinning, by that specification?

<sup>39</sup> Patent specification original images from Fitton, *Arkwrights*, 120-1; Digital manipulation and diagramming by Alexander M. Aizenman in *Procreate*.

<sup>40</sup> *Rex v. Arkwright*, 77-9.

<sup>41</sup> *Ibid*, 78.

A: I really could not.<sup>42</sup>

This encounter shows well why the expert had so rapidly found himself summoned to court during patent law disputes. Specifications were dense, deeply technical and without guidance naturally unintelligible to the wider court until counsel, in an exchange with an affirmative and articulate expert, transformed a specification into an effective lucid demonstration of their client's correctness. Indeed, this act of making the complex seem straightforward and intelligible further demonstrated the witness's expertise to the presiding judge and jury. In this case, a barrister and expert worked in tandem not simply to illuminate the technical details of the patent but also to highlight points of confusion. However, arguing in favor of unintelligibility introduced a kind of contradiction as the barrister and friendly expert were tasked with making the patent clear while still preserving their underlying argument that, even for the skilled artificer, the patent specification was unworkable. Erskine and Immison seemed to navigate this tension well with Erskine, as seen above, in effect playing the role of neophyte.<sup>43</sup> He is confused by the representation of the rollers and their function and Immison, who although he clearly understood this, gives credence to the reasonableness of Erskine's confusion. Ultimately, this tag-team emphasis on Erskine's productive confusion worked toward demonstrating just how impenetrable Arkwright's specification was.

However, common law was an adversarial system and so any discrimination and by extension experts would need to be able to withstand the scrutiny of cross-examination. For Arkwright, Sergeant-at-Law Adair responded to Immison's damning indictment of the specification by attacking his expertise in the first place; he challenged just how familiar Immison was with Arkwright's patent and his machines in practice. After trying to establish

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<sup>42</sup> *Rex v. Arkwright*, 79.

<sup>43</sup> As we know from Immison's own description of his rigorous trial preparation with Erskine, leading up to their representation of Mordaunt, Immison was well versed in the details of the case. Furthermore, this was his third time litigating these same issues before a jury. *Ibid*, 23.

that Immison did not have perfect working knowledge of Arkwright's machine, Adair asked Immison if he could now construct Arkwright's machine after being present in the court when Adair, working from models, examined the workings of Arkwright's carding machine. To this Immison said he could not, asking Adair why the details of the machine were not more clearly illuminated. Adair took the challenge hostilely, responding "I am asking *you* a question, answer yes or no according to your judgment" as to whether you could make the 1775 machine if equipped with both patents and a copy of the 1769 machine. Immison repeated that he could not, due to the specification's litany of issues.<sup>44</sup>

After a further exchange in which Adair attempted to hone in on Immison's specific issue with the specification, specifically the omission of an axis and roller in Figure No. 3, Adair pressed Immison's technical abilities saying "I hope the jury will judge your skill, look upon the drawing?"<sup>45</sup> Immison, replied noting how he expected the drawing to better depict the nature and use of the rollers.<sup>46</sup> Accordingly, Adair continued to further push Immison to precisely clarify what element of the roller illustration was *too challenging* for him. To this end Adair asked Immison whether, if he was hypothetically directed to make the machine, he "would hesitate a moment to put a roller there?"<sup>47</sup> Here Adair attempted to get Immison to state how for a competent mechanic, the specifics of the rollers should be intuitible.<sup>48</sup> In other words, Adair was pushing Immison to admit that the details surrounding the rollers should be considered general knowledge for a skilled artificer—such as Immison himself—and therefore need not be covered by the patent. Immison in his least succinct and categorical answer admitted that now that it had been revealed to him how Arkwright fashioned his rollers, he would have done the same in the process taking Adair's bait and defending his

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<sup>44</sup> *Rex v. Arkwright*, 79.

<sup>45</sup> This exchange focused on if cotton would get caught in the invention as described; *Ibid*, 79-80.

<sup>46</sup> *Ibid*, 80.

<sup>47</sup> *Ibid*.

<sup>48</sup> *Ibid*.

own skill.<sup>49</sup> However, resisting Adair's pressure and challenge to his abilities Immison maintained that prior to the information revealed during trial Arkwright's roller solution was truly obscured in the letter of the patent.

Now Buller intervened on Immison's behalf, allowing Adair's line of questioning to continue but cautioning that what mattered was not Immison's ability to imagine how the rollers might in fact work or be improved on but "whether [Arkwright's] specification leads him to it or not."<sup>50</sup> Adair, as Arkwright's lead counsel, whose current strategic aim was to degrade the prosecution's witness, reminded the jury that under the law what really mattered was not Immison's technical ability but the information he clearly had extracted from Arkwright's specification. After a further back and forth it remained clear that Immison, as he had maintained, did not regard the patent specification to be remotely instructive; rather the machine described was, in his opinion, not even functional.<sup>51</sup> Immison went on to clarify that if the patent specification was used as the basis for a real object, the resulting machine would surely clog with cotton if it did not destroy itself first.<sup>52</sup> To this Adair assured Immison and the jury that if he stayed in court for "an hour longer" the true effectiveness of Arkwright's machine as described would be clear to all.<sup>53</sup>

As was his prerogative, Justice Buller had the last word on Immison's testimony. During his summation of the evidence, Buller guided the jury as to how they should consider Immison's opinions. Buller's words were heavily favorable, reflecting the effectiveness with which Immison was employed by the Crown as he restated Immison's relevant skills, particularly his familiarity in working from drawings when constructing machines. Buller continued by outlining Immison's complaints centering on the workings of the rollers before

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<sup>49</sup> *Rex v. Arkwright*, 80.

<sup>50</sup> *Ibid.*

<sup>51</sup> *Ibid.*, 80-1.

<sup>52</sup> *Ibid.*

<sup>53</sup> For Adair's cross-examination of Immison, see *Ibid.*, 79-81.

wrapping up with a summary of Immison’s ultimate statement that he would now have likely included a roller as used by Arkwright as he stated under cross-examination.<sup>54</sup> Here, Buller emphatically stated that this was not a grand revelation for the defense, instructing the jury that “Gentleman, that don’t prove the specification to be sufficient.”<sup>55</sup> The key point that Immison’s testimony proved, as Buller himself saw it, was that familiarity with how to replicate Arkwright’s machines as gleaned over the course of three trials simply reflected the skill of the expert witness and was not relevant to the language of the patent specification itself: as Buller put it, “if he [Immison] makes it [the cotton carding and spinning machine] complete it is his ingenuity, and not the specification of the inventor.”<sup>56</sup> Whether or not Immison did in fact testify to his genuine beliefs on the stand is unknown. What is clear is that he was an effective expert witness whose encounter in the courtroom went a long way towards demonstrating just how normative and familiar such testimony was in as little as three years post *Folkes v. Chadd*. This familiarity is reflected by the deftness with which Immison and Erskine performed their dismantling of Arkwright’s patent and in Adair’s clear familiarity and experience in cross-examining a particularly resolute witness on the grounds of their informed opinions. Indeed, the capacity of Immison’s testimony to withstand scrutiny reflected both his general credibility and the skill with which he articulated his position, from the curious inclusion of a hemp beating hammer to the carefully selected profile of the rollers.

### **Samuel Moore The Expert that Erred**

The test of the better known and well-regarded Samuel Moore brought forward by Arkwright’s defense serves as an excellent and stark point of contrast to the experience of Immison, revealing how challenging it could be to tease out favorable testimony from a

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<sup>54</sup> *Rex v. Arkwright*, 174.

<sup>55</sup> *Ibid.*

<sup>56</sup> *Ibid.*

supposed friendly witness. Additionally, since Moore had previously testified against Arkwright, as required, he navigated the many hurdles and contradictions facing a flipped expert. Now Moore had to affirm his epistemic authority, while admitting that he previously erred in his judgment on the very same set of facts. In short, the task for Arkwright's counsel was to assure the jury that this change in perspective was well warranted. Ultimately this task proved far easier than getting favorable answers from their perhaps *too* honest expert.

Like the testimony of Immison before him and that of the majority of all experts called to the stand, friendly counsel began by drawing attention to the authority and genuine expertise of Moore. With Moore having taken his oath, Alan Chambré for the defense began by stating "I believe I need not ask you, whether you have a good deal of experience in mechanics."<sup>57</sup> This bit of courtroom theater was a reminder that the expert witness was simultaneously brought into the courtroom to illuminate or clarify a technical obscurity as well as make a mutually exclusive case for their employer, a partisan in the case before the court. Moore's friendly examination was particularly replete with theater as his changing position on the matter at hand, and the good reasons for it, were slowly and with as much care as possible explained to the court by both himself and Chambré.

Firstly, Moore's involvement in the previous two cases was brought up as an example as to just how familiar with and thereby qualified he was to comment on the validity of the patent specification.<sup>58</sup> However, there was a delicacy towards presenting Moore as too knowledgeable too early in the proceedings, for a core part of his formal reason for legitimately switching sides lay with his confession that in the previous case he had lacked crucial expertise. Specifically, Moore argued that he only developed a working knowledge of cotton carding machines a few days before *Arkwright v. Mordaunt* went to trial and he had at

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<sup>57</sup> *Rex v. Arkwright*, 133.

<sup>58</sup> *Ibid*, 134.

that time an erroneous understanding that the machines in use must be a verbatim copy of the patent.<sup>59</sup> As in the *Nightingale* case, Moore was an expert witness under pressure, albeit now as a witness for the defense against the king. His formal justification for switching sides lay in his previous lack of a comprehensive understanding and expertise in cotton carding machines despite appearing before the court to speak to the ease of their construction. Now, Arkwright's defense asked the jury to ignore Moore's past error and regard his current testimony as fully credible. In Moore's own words to the court, he navigated this challenge as follows:

when I first gave evidence in this case, I have already said I was unacquainted with these sorts of machines; I had one brought for me to look at, and I gave the best account I could; I then concluded myself bound simply to the form of the machine that stood by me in court; I was to consider myself totally unacquainted with any machines before used; I looked upon it in that light since that, I have found it is allowance for a witness to consider himself as having been acquainted with the old machine in use previous so the additions supposed to be in the specifications, for my, lord these are rather additions to the machine, than the old and complete machine itself.<sup>60</sup>

Having explained that he now had a comprehensive understanding of a carding machine and was no longer tripped up by the fact that the various iterations of the machine did not match the patent, Moore was prepared to speak to the methods of Arkwright's machine rather than simply replicating their precise form. Chambré proceeded to ask Moore the fundamental

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<sup>59</sup> *Rex v. Arkwright*, 134.

<sup>60</sup> *Ibid.*

question, namely whether he could direct the construction of Arkwright's present machines, improvements included, based on the specification alone.<sup>61</sup> Moore's answer, although changed, was highly qualified, a fact Justice Buller would later reinforce with the jury. Moore explained that he believed "with due attention to the old machine, and the due consideration of all the parts that are here...I could give such direction to an accurate and ingenious workman."<sup>62</sup> After all that preamble and careful working towards his answer, the best the defense got from him was a qualified statement that with enough information and an able assistant he could *likely* construct Arkwright's machine. Unperturbed and with his eminent expert still on the stand, Chambré pressed onward hoping to get Moore to make a dent in the many hours of preceding testimony, including Immison's, that the illustrations were deficient.<sup>63</sup> Chambré began with a related challenge to the machine rollers, pointing out that the furled material as illustrated in image No. 3 did not depict the "cylinder roller, or axis upon which it turns."<sup>64</sup> To this, Moore, evidently unwilling blatantly perjure himself before Justice Buller, quickly responded stating clearly that "certainly it is not described in the drawing."<sup>65</sup>

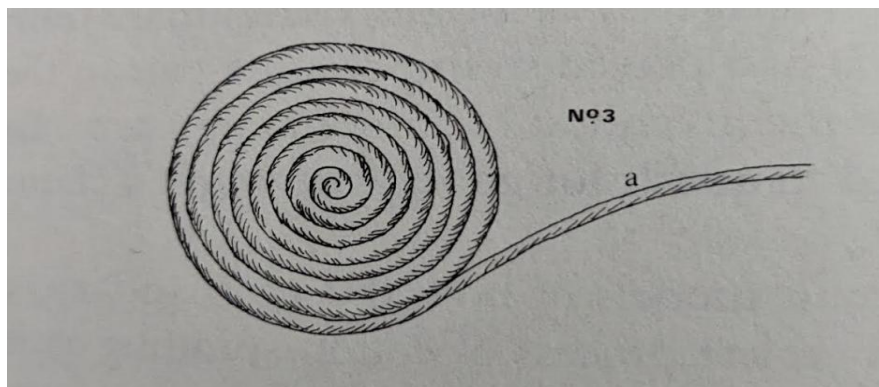


Figure 2. "No. 3 is a piece of cloth, with wool, flax, hemp, or any other such materials spread thereon as at a.," Arkwright's 1775 Specification, Appendix I. f.

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<sup>61</sup> *Rex v. Arkwright*, 134.

<sup>62</sup> *Ibid.*

<sup>63</sup> *Ibid.*

<sup>64</sup> *Ibid.*

<sup>65</sup> *Ibid.*

While Moore's presence was paid for by Arkwright and his overall position had changed, his quick and unfavorable answer demonstrated that some facts, such as the omission of rollers for Figure 2, were indisputable and thereby beyond the reach of any reasonable division of opinion between experts. It was during moments such as this, when the partisan expert broke from the overall position they were selected to uphold, that Mansfield's romantic image of the necessity of the expert witness was realized. Yet in the reality of the courtroom Moore's allied lawyer found himself facing the uphill battle of favorably spinning what, oddly, seems to have been an unexpected response. Chambré pressed Moore on just how necessary it was for a roller to be present to spool and feed the material. Moore in his response was repeatedly clear that he is speaking in regards to his own opinion yet nevertheless told Chambré that "my lord and the Jury have seen" that the machine simply does not work without a roller present in the center.<sup>66</sup> Again, given a less than favorable answer by Moore, Chambré seemed to scramble asking Moore to speculate as to if "any mechanic of tolerable knowledge" could, based on their expertise and the specification, devise some solution to the lack of information as provided in figure No. 3.<sup>67</sup>

To this question Justice Buller immediately interjected, reminding the court and counsel that "it is not sufficient, to ask what an ingenious man would think of to supply the defect" as it is not relevant to adjudicating the viability of Arkwright's specification.<sup>68</sup> Buller continued, pointing out that the defense was effectively asking their ingenious witness to solve a problem with their own specification that the very witness had discovered. Despite this he permitted Moore to answer the question, to which Moore finally responded that the inclusion of a cylinder ought to "have occurred to any man deserving the name of a

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<sup>66</sup> *Rex v. Arkwright*, 135.

<sup>67</sup> *Ibid.*

<sup>68</sup> *Ibid.*

mechanic.”<sup>69</sup> Nevertheless, this did not change the fact that the illustration lacked key information, and so Moore’s comments did not satisfy the jury in the least.

Later during Moore’s testimony, when asked about preventing the cotton from clogging the smooth rollers as described by Immison, Moore once again offered a speculative solution, noting how “the idea of an horizontal motion of this part of the machine, at the same time as it is making this rotary motion” only to be cut off by an exasperated member of the jury who proclaimed, with Justice Buller’s blessing, “There is not a word of that in the specification.”<sup>70</sup> To which Justice Buller agreed stating, “No, not a word in it, all this is the conclusion of a very ingenious, sensible man.”<sup>71</sup> All in all Moore’s carefully couched and complicated testimony full of requests for permission to amend his statements given during *Arkwright v. Mordaunt* seemed to have little persuasive effect on either the judge or jury. The challenge for the defense was not that Moore had joined their side but rather that he could not provide favorable testimony. Moore’s qualifications and expertise, despite his partisan reversal, were beyond reproach by all in the courtroom; his credibility remained very much intact, perhaps aided by his honest—but unhelpful—answers.

Indeed, the highly effective cross-examination by Erskine took a measured approach, largely integrating Moore’s flipped position on merit and thus forcing him to further admit to deficiencies in the wording of the patent. From the onset Erskine showered Moore in calculated praise, explaining to the jury that:

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<sup>69</sup> *Rex v. Arkwright*, 135.

<sup>70</sup> *Ibid*, 136; Jurors in eighteenth-century courtrooms were permitted to interject and ask questions of witnesses on the stand; Gubby, *DLPP*, 9; In *Morris v. Bramson* (1776) Mansfield received a letter from a juror offering an interpretation on a matter of law. Mansfield mentioned the letter in his summary of the evidence agreeing with the analysis of a most “sensible” letter; *Ibid*, 29; Oldham, *EM*, 200-1; This practice now called jury questions is still permitted yet disapproved by most judges; The Rt Hon Sir Ernest Ryder, email to author, February 14, 2024; Sally Lloyd-Bostock, “The Jury in the United Kingdom” in Graham Davies, ed., et al. *Psychology, Law, and Criminal Justice* (De Gruyter, 1995), 349-62.

<sup>71</sup> *Rex v. Arkwright*, 136.

I am at present examining you as a witness for the side, I have before had the honor of examining you; you have given a very candid, and at the same time very necessary explanation of the difference of your evidence upon the two occasions.<sup>72</sup>

This was very much a fair characterization of Moore's previous testimony for the defense. For example, his clarification around the lack of necessity of Figure No. 2 and the obscurity of Figure No. 3 was candid and did nothing to aid Arkwright. Now being called by the prosecution, Erskine's first aim was to have Moore clarify his understanding of the distinction between the facts of Arkwright's machine and the principles behind it. Here Erskine's aim was to press Moore on why the problematic descriptive facts of Arkwright's specification, facts Moore himself had said were inadequate, were no longer paramount when it came to deciding this case. Moore, despite his many admissions around the ambiguities of the 1775 specification, never yielded his changed position that should a mechanic truly understand how Arkwright's machine functioned in principle the challenges around the specification were surmountable for anyone deserving the name of a mechanic. Indeed, Moore had attempted to offer specific solutions when confronted with the apparent mechanical problems with Arkwright's machine, a move that as we have seen did not satisfy the judge or jury.

Erskine, at his most pointed, commented "I take it for granted you were deserving the name of a mechanic, when I was examining you before in this cause."<sup>73</sup> During the previous trials, it is plausible that Moore tried to downplay his expertise, inviting this snipe from Erskine in an attempt to appear to the jury more representative as to what an ordinary mechanic would understand from the specification. However, as the cross-examination

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<sup>72</sup> *Rex v. Arkwright*, 138.

<sup>73</sup> *Ibid.*

unfolded Moore's primary objective was to maintain his credibility despite having switched sides. In this instance, with his previous evidence being used against him, Moore did not take the bait and simply responded "You do me credit."<sup>74</sup> To which Erskine agreed, followed by a neatly crafted segue asking Moore about the lack of a visible roller in Figure No. 3.

Following a lengthy cross-examination, Moore made several further concessions regarding the readability of the patent admitting that the specification did not reveal how the cotton is to be laid out across the machine's rollers, the speed of each roller and inclusion of superfluous parts, especially an iron frame with teeth. Erskine seemed taken aback by Moore's easy and forthright admission that he knew no reason for the patent's inclusion of an iron frame, and he responded with the complementary statement: "You give your evidence very fairly."<sup>75</sup>

As Moore's testimony continued he admitted to a final qualifying element that further complicated his testimony, specifically that he was not a "practical mechanic."<sup>76</sup> He was forced to emphasize his theoretical background in response to unprompted questions from the jury, piled on by Justice Buller, as they together inquired as to what factors precisely determined the velocity of the rollers and the effects on the cotton fiber of the rollers moving at varying speeds. Moore deferred to the practical experts in the room to comment specifically as to what roller diameters were required to make a specific type of thread and whether fluting the smaller cylinder would be beneficial. Interestingly, it did not seem that Moore's lack of precise knowledge eroded his esteem or credibility; rather it merely served to reinforce the kind of expert he was, a generalist natural philosopher, who was not representative of the kind of technical mechanic to whom the patent was supposed to be intelligible.

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<sup>74</sup> *Rex v. Arkwright*, 138.

<sup>75</sup> *Ibid*, 142.

<sup>76</sup> *Ibid*, 140.

Moreover, in his summary of Moore's evidence, Justice Buller reinforced the point that when Moore's extensive expertise was taken into account, his ultimate assertion that he *might* be able to oversee the construction of Arkwright's machine was rather unimpressive. Indeed, Buller called the jury to consider "this is all that a very ingenious sensible man can say of this specification," that with the greatest care and as informed by his ever-increasing familiarity with the machines over the course of four trials he could *possibly* oversee the machines' construction only if aided by the most skillful of mechanics.<sup>77</sup> Nevertheless, his overall treatment of Moore during his final statement was deferential, if pointed, for Moore's testimony proved deeply illuminating to the court. Yet, from the perspective of Arkwright and counsel, Moore's testimony was disastrous. In summary, Moore's great efforts to justly distinguish the impartiality of his shifted position allowed him to speak quite broadly on the patent specification and in the process honestly reveal a wide range of questionable decisions in regards to Arkwright's claimed transparency.

**"What is the name...of your husband"<sup>78</sup>**  
**The Substantive Expertise of Elizabeth Hargreaves**

According to the strict letter of the law, the testimony of women was heavily constrained by "the limiting rule," a principle which imposed the restrictions of limiting accusation to actions and events directly observed.<sup>79</sup> Under this principle women in the eighteenth century were, in theory, even more confined to the narrow role of fact-based witness as judges and juries were likely to take a more skeptical attitude towards the *mere*

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<sup>77</sup> *Rex v. Arkwright*, 178.

<sup>78</sup> Mr. Lee for the Crown to Elizabeth Hargreaves quoted in *Ibid*, 41.

<sup>79</sup> Susanne Jenks, "occidit ... inter brachia sua: Change in a Woman's Appeal of Murder of her Husband," *Legal History* 21, no. 2 (2000), 119-22; On inequality between the men and women before the law see: Janelle Greenberg, "The Legal Status of the English Woman in Early Eighteenth-Century Common Law and Equity," *Studies in Eighteenth-Century Culture* 4, (1975), 171-81; Judy M. Cornett, "Hoodwink'd by custom," *William & Mary Journal of Race, Gender, and Social Justice* 4, no. 1 (1997), 1-89; Alexandra Shepard, "Worthless Witnesses?" *Journal of British Studies* 58, no. 4 (2019): 717-34.

opinions of women.<sup>80</sup> However, as has extensively been demonstrated, in practice the court could be a place more governed by norms when pushed by the divergent interests of the players before the court. It was this particular reason within Mansfield's courtroom which first permitted the testimony of Brian Higgins in 1778.<sup>81</sup> By 1785, common law courts were far more familiar with the process of adjudicating patent law cases just as counsel, exemplified by Bearcroft and Erskine, were experienced in representing their clients during an adversarial jury trial.<sup>82</sup>

Empowered by the sweeping writ of *Scire Facias*, Bearcroft and Erskine sought to challenge the validity of Arkwright's specification as they had done through the testimony of John Immison and his claim of originality. In practice this meant calling to the witness stand contemporary inventors with competing priority claims such as John Kay to assert their claim of originality.<sup>83</sup> John Kay's testimony was followed by that of Sarah Kay, who, subsequent to her clear identification as John's wife, provided fact-based support for the timeline presented by her husband.<sup>84</sup> Yet, Sarah's testimony did not stay rooted in a confirmation of dates for long, as Erskine asked her to confirm details about the nature of John's model spinning machine.<sup>85</sup> Sarah affirmed that the model drew up a content thread expressly for the purpose of spinning.<sup>86</sup> Here, Sarah, without pause or confrontation offered her personal opinion on the

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<sup>80</sup> Cornett, "The exclusion of women" 81-9; The type of dispute did have an impact on the participation and perceived reliability of female witnesses; Shepard, "Worthless Witnesses?," 729-34; J. C. Oldham, "On Pleading the Belly: A History of the Jury of Matrons," *Criminal Justice History* 6, (1985), 1-64; Craig Muldrew, "'A Mutual Assent of Her Mind?' Women, Debt Litigation and Contract in Early Modern England," *History Workshop Journal* 55, no. 1 (2003), 47-71.

<sup>81</sup> Oldham, *MM*; Vol. 1, 748-57.

<sup>82</sup> Literature on the rise of the adversarial system skews towards criminal law yet many of the thematic insights are appropriate as this is a large-scale case brought in the name of the Crown; Stephan Landsman, "Rise of the Contentious Spirit," *Cornell Law Review* 75 (1989), 497-609; John H. Langbein, *The Origins of Adversary Criminal Trial*, 252-344.

<sup>83</sup> *Rex v. Arkwright*, 62-7.

<sup>84</sup> *Ibid.*, 67-8.

<sup>85</sup> *Ibid.* 67.

<sup>86</sup> *Ibid.*

nature and effectiveness of John's invention; in no uncertain terms Sarah Kay provided elements of expert testimony.<sup>87</sup>

Unlike the men of skill who dominated the testimony of patent law trials, the women present at trial were identified and framed not by their profession or skill but by their relational status.<sup>88</sup> Yet, once upon the stand these women provided emphatic and effective testimony about the substantive nature of the invention the court was considering. This pushing beyond the fact-based testimony was even more true for Elizabeth Hargreaves, who along with her husband James Hargreaves, had moved to Nottingham prior to Arkwright in order to find a more expansive market for James' spinning jenny.<sup>89</sup> Between Kay's fly shuttle and Hargreaves's spinning jenny—both developed at least a decade prior to Arkwright's 1775 patent—the strategy of the Crown prosecutors was to argue that Arkwright had stolen and compiled existing inventions.<sup>90</sup> John and Sarah Kay both made this argument in turn with the brunt of the technical details falling upon the testimony of John; however, in the case of James Hargreaves this was simply not possible as James had died in 1778.<sup>91</sup> In practice this appeared to be no deterrent nor hindrance to the Crown's case when calling Elizabeth to the stand, who over the course of her testimony, moved even more from a fact witness to a genuine expert witness in her own right.

Much like Sarah, the start of Elizabeth's testimony focused squarely on her status as Hargreaves' widow.<sup>92</sup> Indeed, the Crown's prosecutor, John Lee, conducting the friendly examination, was quick to emphasize James' death implying that the lack of his presence was

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<sup>87</sup> *Rex v. Arkwright*, 67.

<sup>88</sup> *Ibid.*, 41, 67.

<sup>89</sup> Christopher Aspin, "Hargreaves, James," *ODNB* (2004); R. L. Hills, "Hargreaves, Arkwright and Crompton. Why Three Inventors?" *Textile History* 10, no. 2, (1979), 114-26.

<sup>90</sup> Aspin, "Hargreaves, James"; *Rex v. Arkwright*, 41.

<sup>91</sup> *Ibid.*; Aspin, "Hargreaves, James".

<sup>92</sup> *Rex v. Arkwright*, 41.

the rationale for this extended interrogation.<sup>93</sup> Elizabeth, answers at this time are recorded as being concise and to the point as she layouts the timeline of their relocation to Nottingham and her late husband's business associates<sup>94</sup>. Elizabeth's presumed status as a lay witness receded into the background as the examination progressed. The point of inflection was Lee's query whether Mrs. Hargreaves knew what "is meant by the word crank."<sup>95</sup> Affirming that she did and had seen James's work on numerous versions of a crank mechanism beginning "about thirteen or fourteen years" ago.<sup>96</sup> Hargreaves continued explaining how the crank was designed to card wool and Lee wrapped up his testimony by asking her to examine a working model of Arkwright's carding machine as described in his 1775 patent.<sup>97</sup> The trial transcript shows that the machine was "set in motion" and that Hargreaves spent some time examining the machine.<sup>98</sup> Following her visual inspection, Hargreaves consistently and emphatically affirmed that Arkwright's usage and her husband's design were one in the same:

Q: Such a crank as that, was it?

A: Yes

Q: It took it off in that way

A: Yes, it took it off in that way

Q: Exactly in that fashion

A: Yes, exactly in that fashion I am certain.<sup>99</sup>

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<sup>93</sup> Confirmed Lee's identity via; Fitton, *Arkwrights*, 118.

<sup>94</sup> *Rex v. Arkwright*, 41.

<sup>95</sup> *Ibid.*

<sup>96</sup> *Ibid.*

<sup>97</sup> *Ibid.*

<sup>98</sup> *Ibid.*, 42.

<sup>99</sup> *Ibid.*, 42, 118.

This, in all but official designation, was expert testimony, since Elizabeth Hargreaves had provided the jury with her opinion as to whether Arkwright’s carding crank was identical in construction and function to that of James’ early invention. A substantive leap from the theoretical limits on the limiting rule, Elizabeth was speaking not just about observations from the distinct past but rendering her own judgment on the matter of mechanics. Justice Buller did not challenge the legitimacy of this testimony and the cross-examination launched by Thomas Cowper was focused on the facts Hargreaves claimed, not on her authority to answer them.<sup>100</sup> Common law’s long history of matron juries meant that judges were familiar



James Gillray, published by William Humphrey, “Sir Francis Buller, 1st Bt (‘Judge Thumb’)” (1782), *National Portrait Gallery*; Transcription of text: Buller: “Who wants a cure for a rusty wife? Here’s your nice family amusement for winter evenings! Who buys here?” Wife: “Help! Murder, for God sake, murder!” Husband: “Murder, hey? It’s law, you bitch: it’s not bigger than my thumb!”

<sup>100</sup> *Rex v. Arkwright*, 42-4.

with deferring to the experience of women; yet considering Buller's ignominious reputation regarding the rights of women, under coverture law, his silence is more noteworthy.<sup>101</sup>

To some contemporaries Justice Buller was thought to be "arrogant and impetuous." Additionally, his judicial and personal reputation was substantially damaged by his apparent decree during a marriage case that a husband may physically beat his wife so long as "the rod or stick he used was no thicker than his thumb."<sup>102</sup> Earning the nickname "Justice Thumb" this anecdote was popularized in a crude caricature by James Gillray published on November 27, 1782 just three years before *Rex v. Arkwright*.<sup>103</sup> There is some historiographic dispute as to whether Justice Buller ever made such a ruling, yet to his contemporaries the ill reputation of Justice Thumb, regardless of its variability, was widespread.<sup>104</sup>

With Buller finding the evidence provided by Sarah and Elizabeth to be revealing it was not until after the trial that Adair, during his attempted appeal of the verdict, tried to more explicitly challenge their testimony.<sup>105</sup> The approach he took was to present to the court that he had additional witnesses who could contradict their testimony.<sup>106</sup> In reviewing this appeal Mansfield was far from impressed, comparing Adair's request to that of a child who showed up unprepared.<sup>107</sup> He maintained that there was "no color" to Adair's motion, as a clear verdict had been given by a jury which had proven fully satisfactory to Justice Buller.

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<sup>101</sup> Sara M. Butler, "More than Mothers," *Law and History Review* 37, no. 2 (2019), 353-96; While there is recent literature finding agency under coverture overall it "was more debilitating than merely presuming women's inferiority to men"; Lisa Forman Cody, "Marriage is No Protection for Crime," *Journal of British Studies* 61 (2022), 810; Joanne Bailey, "Favoured or oppressed?" *Continuity and Change* 17, no. 3 (2002), 351-72

<sup>102</sup> James Oldham, "Buller, Sir Francis, first baronet (1746–1800), judge." *ODNB* (2004).

<sup>103</sup> Oldham lists the date of the caricature as November 27, 1783. This seems to be an error as indicated by a copy held in the national gallery; James Gillray, published by William Humphrey, "Sir Francis Buller, 1st Bt ('Judge Thumb')" (1782), *National Portrait Gallery*; Further confirmed by: Jack C. Straton, "Rule of thumb versus rule of law," *Men and Masculinities* 5, no. 1 (2002), 104; Henry Ansgar Kelly, "Rule of thumb and the folklaw of the husband's stick," *Journal of Legal Education* 44, no. 3 (1994), 341-65.

<sup>104</sup> Oldham is skeptical based on work by Edward Foss, *The Judges of England* vol. VIII (John Murry, 1864), 251-3.

<sup>105</sup> "Motion for a New Trial November 10, 1785" in *Rex v. Arkwright*, 187-91.

<sup>106</sup> *Ibid.*

<sup>107</sup> *Ibid.*, 191.

To request a retrial simply because he now had conducted more research and claimed to have more evidence was not a sufficient objection on a matter of law.<sup>108</sup> So the testimony and claims of both Sarah and Elizabeth in all their persuasive power stood. It would be an overstatement to claim that their testimony was read by the exclusively male courtroom as comparable to that of men such as Immison or Moore. Their assigned role and status as “wives” were likely never far from the minds of the all-male jury.<sup>109</sup> Yet in practice they would not testify merely in their capacity as fact-based affirmers of the existing record; rather, and without pause they rendered their opinion on the precise nature and similarities between inventions. Regrettably, I have not been able to find any records indicating if they were or were not paid for their testimony, an act that would only further equate their conduct to that of an expert witness. At the very least it is highly probable that their trip to London along with lodgings was covered by the backers of the writ.<sup>110</sup> The mystery of payment aside there is no doubt that in form, function and effect their testimony was that akin to a person of skill.

### **Justice Buller Speaks: Reframing the Expert and a Multifactor Test**

Justice Buller’s concluding description of the evidence presented at trial not only placed the expert witness at the center of the trial but also drew a striking comparison between the quality and relevance of the contrasting evidence presented when he wrote:

You see, upon the part of the prosecution, they have called to you very ingenious men, that seem to be much beyond what are called common mechanics in life, they have all told you it is impossible for them to make the machine according to the specification.

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<sup>108</sup> *Rex v. Arkwright*, 191.

<sup>109</sup> *Ibid*, 41, 67.

<sup>110</sup> The records pertaining to those who brought the complaint are so sparse that their precise identities remain a matter of speculation; Fitton, *Arkwrights*, 117-8; Hewish, “New Light on the Arkwright Patent Trials,” 82.

Upon the other hand, several respectable people are called upon the part of the defendant, who say they could do it, but there is this difference in their description, most, if not every one of them, have looked at and seen how the machines were worked by the defendant, and have gotten their knowledge by other means, and not from the specification and plan alone.<sup>111</sup>

Buller's contention was that the partisan experts called by the Crown, such as John Immison, were more adept and skilled than the average mechanic and still they could not successfully work from the specification alone. Buller thus cut off the defense's counterargument that the present experts were simply not qualified enough, before the jury was even asked to consider this fact. The impenetrability of Arkwright's patent specification was made even more apparent as the "respectable" men called by Arkwright's counsel, such as Moore, Darwin and Watt had not, in fact, constructed Arkwright's engine themselves. As Justice Buller's language made clear during his summary to the jury, the experts' claimed ability to construct Arkwright's machine working off of his specification alone should be understood as conditional and by no means certain.<sup>112</sup> Buller's just summary was not particularly favorable to the experts and left the ultimate task of interpreting how strongly to consider their assertions on the feasibility of unaided construction up to the jury. It is this final point of aid and assistance that truly separates this case against the king from the recent case against Nightingale. The narrow reframing around the credibility of five witnesses so ordered by Lord Loughborough never came to pass with quite the same degree of specificity during *Rex v. Arkwright*. This was because all the experts who claimed to have replicated Arkwright's machine based on specification alone received a substantially more rigorous cross-

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<sup>111</sup> *Rex v. Arkwright*, 181.

<sup>112</sup> *Ibid*, 180-1.

examination which complicated their earlier accounts given under oath on Arkwright's behalf.

Samuel Wise, who claimed in *Arkwright v. Nightingale* to have constructed a model of Arkwright's machine with only a cursory "glance" at a working version, was not present during the trial.<sup>113</sup> Therefore, there were four remaining witnesses for the prosecution to contend with. John Stead, despite his own confidence in being able to easily navigate the patent, much like Moore, admitted that certain technical details in regard to the rollers were not disclosed although he was certain their velocities must vary for the machine to function.<sup>114</sup> Buller's takeaway was that even if Stead had personally figured out how to replicate Arkwright's machine, his testimony makes it clear that these details are "not stated as to enable the person that reads that specification, to know" how to construct Arkwright's machine.<sup>115</sup> Next, it was revealed that William Allen and William Whitmore collaborated, in some capacity, in the construction of their separate models.<sup>116</sup> Bearcroft, assisted by another prosecutor, identified as Serjeant Bolton, together led the cross-examination of Allen, repeatedly reminding him that he was under oath and had previously testified about his construction of this model. The transcript clearly illustrates the pressure this tag team placed upon Allen:

[Bolton] Q: Have you not made any one [model of Arkwright's machine], without conferring with any other person?

A: What I say not, I said before, we had liberty to talk about it.

Q: Did you say in your former examination, you had talked with Whitmore about it?

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<sup>113</sup> The case for the Crown: *Rex v. Arkwright*, 12-103.

<sup>114</sup> *Ibid*, 150, 180.

<sup>115</sup> *Ibid*, 180.

<sup>116</sup> *Ibid*, 155-8.

A: Yes, I did.

Mr Bearcroft Q: Did you do it yourself, or did any-body else assist you? Was the question put to you, and the answer is, a servant of mine assisted in making another model.

A: Give me a leave to explain, that I had no servant at the same time; I meant a friend, I said a friend I had consulted that was Mr. Whitmore.<sup>117</sup>

This fascinating admission by Allen offers a substantial point of clarification, since the *mere* servant who had apparently assisted in the construction of the machine was in fact a qualified colleague and friend of the machine maker Whitmore. It was now indisputable that Allen had worked from more than just the specification and with Whitmore called to the stand, more revelations about the apparent unassisted construction of Arkwright's machine would emerge. Among Whitmore's sources of assistance was a two-to-three-hour conversation with Arkwright that did touch upon the construction of his machine.<sup>118</sup> Additionally, John Stead "the honest Quaker" had informed Whitmore of the construction of the back cylinder obscured in Figure No. 3.<sup>119</sup> Finally, Thomas Wood's own apparent replication of Arkwright's machine was undermined by the fact that he only required consulting Figures 4 through 7 to construct Arkwright's cotton carding machine.<sup>120</sup> Justice Buller pressed upon the jury that assuming this information was true it "will blow up the patent at once" for the six figures of unnecessary information should be understood as obfuscation rendering the patent void.<sup>121</sup> All in all, the Crown's prosecutors, deeply familiar with many of the experts

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<sup>117</sup> *Rex v. Arkwright*, 155.

<sup>118</sup> *Ibid*, 157.

<sup>119</sup> *Ibid*, 158.

<sup>120</sup> Wood was not the last of the above witnesses to testify. He was sworn in after Stead and before Allen. *Ibid*, 150-3, 151.

<sup>121</sup> *Ibid*, 180.

testifying as well as the minutiae of the case from representing Mordaunt and Nightingale, successfully eroded the court's confidence in the original claims of these four expert machine makers thereby paving the way for the question of readability to be judged on the language of the specification and utility of the drawing alone.

Buller was central in chipping away at the testimony of the apparently unassisted construction of the machine. He repeatedly required experts to re-answer hostile questions when evasive answers were given and, as his characterization of Wood's testimony demonstrates, he was particularly strict on what constituted a readable specification: excessive information was just as misleading as withholding information. In this regard Buller acted as a kind of shadow prosecutor, keen to provide additional support to cross-examinees when, it seemed, he doubted the credibility of the witness before him. Buller's active style of ruling the courtroom based on the available evidence for the select patent trials I have examined is a step beyond that of his mentor Mansfield and substantially more inquisitorial than Loughborough's approach. Overall, Buller seemed to have been a thorough and diligent jurist, as indicated by his surviving trial notes, which were highly detailed and often included extended statements in verbatim prose.<sup>122</sup> This contrasts with Mansfield's more fragmented and succinct style of notetaking. Additionally, as evident with this sixteen-hour trial, Buller's in court behavior encouraged a trial that tended towards grueling. This is an additional point of contrast with Mansfield who favored shorter hearings and was known to produce newspapers or even begin writing personal letters during spells in which he perceived the lawyer before him to be wasting the courts time.<sup>123</sup> In the case of *Rex v. Arkwright*, Buller's active and comprehensive style on the bench, unlike that of Loughborough a few months prior, served to draw out opinionated testimony as he

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<sup>122</sup> As exemplified by his notes on *Liardet v. Johnson*: Oldham, *MM* vol. I, 754.

<sup>123</sup> Poser, *Lord Mansfield*, 207.

questioned mechanics before him. Finally, in what was his most dramatic break from Lord Loughborough, Buller asked the jury to consider three separate but related questions in their deliberation of the case:<sup>124</sup>

1. Was the “certain machines for preparing silk, cotton, flax, and wool for spinning” reference to a new invention?<sup>125</sup>
2. Was Arkwright the sole inventor of the machine described in said patent?
3. Did the filed patent specification sufficiently describe how to construct said machine?

While the narrowness of Lord Loughborough’s response to clarity around a patent specification reflects the norms of Common Pleas, the breadth of Buller’s multifactor test makes sense when considering the prerogative of the King’s Bench and unique circumstances which allowed this case to be tried in the first place.<sup>126</sup> That is the writ of *Scire Facias* which specifically instructed the court to reconsider a patent on all legal grounds. This broad reexamination of Arkwright’s 1775 patent is precisely what Buller ordered the jury to do, a task well enabled by the Crown’s strategically broad attack on Arkwright’s patent.

Importantly, as Buller instructed the jury, for Arkwright to prevail he had to meet all of the questions enumerated above; anything short would result in a verdict for the Crown.<sup>127</sup> Additionally, Buller’s jury instructions were especially explicit in keeping with the post *Liardet v. Johnson* precedent emphasizing that the readability of the specification was of paramount importance for “it is clearly settled at law, that a man, to intitle himself to the benefit of a patent for a monopoly, must disclose his secret, and specify his invention in such

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<sup>124</sup> Based on Buller’s final comments to the jury *Rex v. Arkwright*, 187; Fitton, *Arkwrights*, 135.

<sup>125</sup> Patent No.1111; Webster, *Reports*, 56.

<sup>126</sup> See the similarly narrow interpretation of the King’s Bench precedent by Lord Camden in *Dollond v. Champneys* (1766) as detailed in Chapter 1, 72-3.

<sup>127</sup> *Rex v. Arkwright*, 187.

a way, that others may be taught by it.”<sup>128</sup> Justice Buller concluded the case by placing the fate of Arkwright’s specification squarely in the hands of the jury, stating “it will be for you to say, upon this part of the case, whether you are satisfied [with] this specification.”<sup>129</sup> And so, the jury was required to focus on the patent specification, which in essence meant they were required to judge conflicting expert testimony. As Gurney’s transcript narrates, this was done swiftly and “without a minute’s hesitation” the jury handed down a decision for the Crown.<sup>130</sup>

### **James Watt’s Assessment on *Rex v. Arkwright***

Following Arkwright’s loss at the trial, he and Watt continued to correspond, meeting through September 1785 to discuss Watt’s proposed changes to the English patent system.<sup>131</sup> It is likely that during these discussions Watt assured Arkwright that he would provide his peer with his comprehensive and honest assessment of Arkwright’s patent specification and the soundness of Justice Buller’s unfavorable ruling.<sup>132</sup> However, it took another month for Watt to receive the trial notes he planned to use as reference for his commentary. By October 26, 1785, Watt received some unspecified material related to the trial yet still lacked a copy of Gurney’s full trial transcript.<sup>133</sup> Nevertheless, upon his return home from a late night spent with friends in London, he informed Arkwright that although it was too late for him to write his full opinion on the matter of the specification, he explained how during his day in London conversation touched upon *Rex v. Arkwright*.<sup>134</sup>

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<sup>128</sup> *Rex v. Arkwright*, 172.

<sup>129</sup> *Ibid*, 182.

<sup>130</sup> *Ibid*, 187; Swift jury decisions were commonplace in late-eighteenth-century common law courts. Although not often exercised, the jury had the right to reach a verdict before all witnesses had testified; Gubby, *DLPP*, 29; Oldham, *EM*, 59.

<sup>131</sup> Fitton, *Arkwrights*, 140-2.

<sup>132</sup> *Ibid*.

<sup>133</sup> “James Watt to Richard Arkwright,” October 26-27, 1785, *WC, Letterbook* 1 150, Appendix IV. g.

<sup>134</sup> *Ibid*.

In the late hours of October 26 Watt wrote to Arkwright that all were in agreement that the “great lawyers,” including the Lord Chancellor himself and even Mansfield, were “all against you on that footing of your not being the inventor and of you intentionally withholding a clear description of your invention.”<sup>135</sup> Watt went on to note how the public, implying any prospective jury pool, was similarly hostile to Arkwright simply because of the amount of wealth he had accumulated from his labor. This, Watt wrote, was for “many of the lauded gentlemen” an “unpardonable crime in a tradesman or artist.”<sup>136</sup> Arkwright was not born a gentleman. He made his fortune through the arts, rather than pursuing such knowledge as an end in and of itself. Watt’s point was that Arkwright’s business acumen was seen as ungentlemanly. Indeed, it was true that Arkwright had developed a reputation as a bullish blowhard with a temper.<sup>137</sup> In a letter to Boulton in 1781, Watt expressed his concern and sympathy in the wake of Arkwright’s loss to Mordaunt yet proceeded this admission by describing how “though I do not love Arkwright” he disliked the ruling more.<sup>138</sup> In the intervening four years, Watt and Arkwright had worked together on two patent cases and drafted a proposed bill of patent law reform; if Watt still disliked Arkwright’s public behavior he seemed to have come to respect Arkwright’s similarly relentless and restless work ethic.<sup>139</sup>

Addressed to his “sincere friend,” in broad strokes Watt explained how, in his opinion, whether Arkwright chose to pursue a new trial rested completely on his ability to undermine the witnesses who had so powerfully challenged both the intelligibility of his specification and his claims of originality:

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<sup>135</sup> “Watt to Arkwright,” October 26-27, 1785.

<sup>136</sup> *Ibid.*

<sup>137</sup> “Society sneered at his extravagance and ridiculed his gauche behavior” - J. J. Mason in “Arkwright, Sir Richard,” *ODNB* (2004). For a more complimentary assessment of his temperament see Fitton, *Arkwrights*, 206-11.

<sup>138</sup> “James Watt to Matthew Boulton July 30, 1781” quoted in Samuel Smiles, *Lives of Boulton and Watt* (John Murray 1865) 302-3, 140; Watt previously described Arkwright similarly in letters sent to Matthew Boulton, February 18, 1783, and to James McGrigor October 30, 1884, both cited in Fitton, *Arkwrights*, 140, 144-5.

<sup>139</sup> *Ibid.*, 210.

If therefore you cannot prove these witnesses perjured to the satisfaction of all impartial people, I would...advise you not to attempt a new trial, as it could only serve to give a fresh cause of triumph to your adversaries.<sup>140</sup>

Watt's advice elevated above all else the determinative impact of witness testimony during Arkwright's trial. In summary, Watt understood that for Arkwright to prevail before a common law court he must be able to counter the testimony of men such as Immison. This is an interesting admission because it was precisely the testimony of men such as Watt that was intended to lead Arkwright to victory. In other words, Watt was asserting the usefulness of the very task he was hired to do.

In his notes on Arkwright's final trial, Watt firmly articulated his view that Buller's judgment was "very erroneous."<sup>141</sup> Working wholly off of the Statute of Monopolies, Watt argued that there ought to be no legal grounds on which to rest the validity of a patent on the quality of its specification.<sup>142</sup> He cited his own research and argued that it was not until 1717 that he could find an invention which was filed with a descriptive specification.<sup>143</sup> He continued to argue that the original rationale for a specification was not to disclose the workings of an invention but merely to ensure that a patent was not granted for the same invention multiple times. Watt further expressed his belief in the impracticability of placing such explanatory weight on a specification when he noted how in his opinion "no man can draw a specification of any complicated machine that may not be overthrown for want of clearness."<sup>144</sup> Yet such commentary on how the case ought to be judged was little more than

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<sup>140</sup> "James Watt to Richard Arkwright: Watt's opinion on Arkwright's specification," October 27, 1785, *WC*; loose leaf between letters 150 and 150 in Letterbook 1; Appendix IV. g.

<sup>141</sup> "Watt's opinion on Arkwright's Specification," Appendix IV. g.

<sup>142</sup> *Ibid.*

<sup>143</sup> *Ibid.*

<sup>144</sup> *Ibid.*

commiseration with a fellow inventor and did not amount to actionable advice that Arkwright might employ, should he be able to secure a retrial. To a limited extent, Watt recognized this as he eventually conceded to the reality of patent law jurisprudence and acknowledged that the specification had in fact taken on such weight.<sup>145</sup> Despite knowing about this development Watt did not know how or why it had come about as he wrote to Arkwright that “I cannot tell at what time the present doctrines began to prevail.”<sup>146</sup> The difficulty Watt had in sourcing knowledge about the workings of the patent system lend credence to Dutton and MacLeod’s description of the patent system as largely impenetrable and Gubby’s assessment of the lack of widespread dissemination of case law and law reports.<sup>147</sup> Later in life Watt made inquiries directly to judges, yet in this instance Watt appears to not have written to Mansfield or Buller who would likely have informed him of *Liardet v. Johnson* or at least expounded on their rationale regarding the patent specification.<sup>148</sup>

Following his concession that the validation of a patent was rooted in its specification, Watt spent the remainder of his letter providing a personal assessment as to the readability of each element in Arkwright’s specification. Undoubtedly most of Watt’s functional suggestions would have been substantially more instructive to Arkwright had they been provided before not after the trial. Taken all together, Watt seems to believe that Arkwright’s specification was consistently not as clear as it should have been. In particular, Watt notes what he viewed as reasonable confusion stemming from the isolated nature of the illustrations that make up Arkwright’s 1785 patent.<sup>149</sup>

Watt’s tentative solution to this underlying issue was to propose, in retrospect, how he might approach a defense of a particular element for Arkwright’s specification. For example,

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<sup>145</sup> “Watt’s opinion on Arkwright’s Specification,” Appendix IV. g.

<sup>146</sup> *Ibid.*

<sup>147</sup> Dutton, *PLA*, 70-1; MacLeod, *IIR*, 182-15; Gubby, *DLPP*, 35-42.

<sup>148</sup> Robinson, “JWLP,” 138.

<sup>149</sup> “Watt’s opinion on Arkwright’s Specification,” Appendix IV. g.

Watt argued that a mechanic should as a matter of general trade proficiency know without additional instruction the implementation of certain aspects of Arkwright's rollers. Watt explained how the use of rollers was widespread through the textile industry and additionally "rollers have long used for stretching metals"<sup>150</sup> In Watts' view, Arkwright had a strong priority claim for the use of rollers "in stretching cotton in spinning." Yet, the principle in abstract should be widely understood and thereby within the capacity of an engineer working from Arkwright's specification.<sup>151</sup> This commentary spoke precisely to the task of the partisan expert witness: to argue that the technical knowledge required to make sense of a specification was in fact general trade knowledge or otherwise simply within reach of a sufficiently competent mechanic. Such was the general tact of Watt's review of Arkwright's specification and the trial as a whole. As an additional example, Watt argued that the alleged surplus inclusion of a beating hammer in what was nominally a cotton carding machine (evidence concerning which Immison had so effectively testified) was not superfluous at all. Here, Watt asserted that in his experience, in Scotland, unlike England, it was standard practice to use a beating hammer in both the wool and cotton carding process.<sup>152</sup>

Taken all together, Watt's favorable advice to Arkwright largely amounted to a specific strategic decision regarding witness testimony should a new trial be granted. At the time of Watt's writing Arkwright had yet to be denied his petition and so for Arkwright and Watt the faint hope of a retrial remained.<sup>153</sup> This was a long shot strategy due the the finality implicit in a write of *Scire Facias* and as Mansfield would state just a few weeks later, having better prepared witnesses was by no means sufficient grounds for a retrial.<sup>154</sup> Watt's most intrusive remark towards the cause of being granted a retrial is a brief aside that "the truth of

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<sup>150</sup> "Watt's opinion on Arkwright's Specification," Appendix IV. g.

<sup>151</sup> Ibid.

<sup>152</sup> Ibid.

<sup>153</sup> This hearing occurred on November 10, 1785; *Rex v Arkwright*, 187-91

<sup>154</sup> Ibid, 191.

[William Harrison's] depositions should be enquired into."<sup>155</sup> The precise impetus for Watt's insinuation remains shrouded. Research by R. S. Fitton unearthed that William Harrison, the son of John Harrison, famed inventor of the marine chronometer, had sailed with Erskine on the HMS Tartar as Harrison was testing his invention.<sup>156</sup> During the trial Harrison testified that no inventor, even a skilled one, would be able to replicate Arkwright's machine based on the specification even with that aid of an older machine.<sup>157</sup> Watt's likely insinuation is that this testimony was less than Harrison's true opinion and was provided as a favor to Erskine.<sup>158</sup> During the trial Harrison affirmed that he was in the process of erecting a mill but proved evasive as to what patent his content spinning machines were based on.<sup>159</sup> When asked outright if he was an interested witness Harrison responded, with evident charm, that "I hope I am not a rouge, Sir."<sup>160</sup> To this Bearcroft interjected that his interest matched that of all others who brought this case and as such were not unusual. Harrison admitted in court to knowing Erskine by way of his father and short of any new revelation, Watt's point had in a real sense been heard by the court and accepted without controversy.<sup>161</sup> Moreover, considering the eighteenth-century court's highly flexible attitude towards personal connections that might raise questions of impropriety, such an accusation is more likely to have initiated a public feud, akin to Robert Mylne and George Hardinge, than lead to any legal action.<sup>162</sup>

Watt's detailed post-mortem on Arkwright's final trial is a unique source. Blending autodidactic legal commentary with the pertinent technical knowledge of an inventor and

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<sup>155</sup> "Watt's opinion on Arkwright's Specification," Appendix IV. g.

<sup>156</sup> Fitton, *Arkwrights*, 109-10; Andrew, King "Harrison, John," *ODNB* (2008).

<sup>157</sup> *Rex v. Arkwright*, 91-5.

<sup>158</sup> I have been unable to find any records indicating that Arkwright followed up on this.

<sup>159</sup> *Rex v. Arkwright*, 91.

<sup>160</sup> *Ibid*, 91.

<sup>161</sup> *Ibid*, 91-2.

<sup>162</sup> Mylne to Hardinge, July 24, 1784, WLP 18/25, *NRO*.

practical engineer, his advice was singular to the mixed interests and background of Watt. In many respects Watt's "advice" tended to tilt at windmills as he extensively imagined and applied his own preferred standards of patent law adjudication. As such, Watt frames his own missteps as mere misunderstandings that, if corrected, might lead to future successes. In addition, Watt replays how, given another trial, Arkwright might better prepare his expert witnesses to more successfully defend the instructiveness of his patent specification. More than anything it reveals that contemporary patentees understood the importance of having one's expert witness make a pervasive case to the judge and jury. Truth be told, should a patentee fail in this regard, in hindsight there was little that could be done.

### **Conclusion**

Across all three of Arkwright's patent trials, a central theme consistently emerged. The true task of the expert witness lay not in the mastery of mechanical knowledge itself, but in their ability to persuade judge and jury. It was this ability that had come to significantly determine the outcome of a patent dispute. Yet, *Rex v. Arkwright*, which served as the final and significantly most expansive interrogation of Arkwright's 1775 patent specification, offers an unprecedentedly robust source with which to analyze and understand the conduct of the early expert witness. Through the survival of a complete trial transcript, I am able to show a wide range of truths and contradictions about the practice of the person of skill.

John Immison's well-observed testimony combined with visual aids was clear and concise.<sup>163</sup> Samuel Moore was effectively challenged as being too skillful, as his ability to work with Arkwright's specification was successfully argued to be a result of his unique brilliance; on those grounds he could not speak to the accessibility of the patent to the general would-be assembler of one of Arkwright's machines.<sup>164</sup> Both Sarah Kay and Elizabeth

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<sup>163</sup> *Rex v. Arkwright*, 33-4.

<sup>164</sup> *Ibid*, 178.

Hargreaves were called to the stand clearly intending to serve as fact-based witnesses; yet once their testimony was underway, they, Hargreaves in particular, increasingly offered their expert opinion, which was readily accepted by the court. Finally, Justice Buller's comprehensive jury instructions and his exhaustive summary of the evidence left the contradictions between rival experts stand; meanwhile, the adjudication of the merits of their relative claims fell to the jury, who remained vocal and inquisitive throughout the sixteen-hour trial. It is precisely the immense variation and interplay across these numerous figures that this singular trial warranted a separate chapter.

More so than any previous trial, Arkwright's legal adversaries came fully prepared with a well-financed legal team representing the king and the extraordinary support of thirty-three witnesses.<sup>165</sup> However, the ever-increasing quantity of expert testimony was not simply an escalation in terms of scale but it also represented a growth of technical sophistication and detail. Nowhere is this made more apparent than in the trial transcript, as the varied legal strategies used to make the most of a friendly expert and undermine a hostile counterpart were on full display. As has been seen, the prosecution, notably led by Bearcroft and Erskine, developed their own essential familiarity with the highly technical mechanical details of the case.<sup>166</sup> Indeed, the active involvement of partisan experts in pretrial preparations and on the stand required barristers themselves to be adept enough to sustain exchanges with the formal experts. In the case of Samuel Moore, Erskine continued to press on the specific omissions regarding the construction and function of the carding machine's rollers and in the process demonstrated his own awareness of what might be required for a skilled worker to replicate Arkwright's roller system.<sup>167</sup> Cross-examining a hostile expert, especially one as esteemed as Moore, was a delicate and highly theatrical art in which

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<sup>165</sup> Hewish, "From Cromford to Chancery," 85-6.

<sup>166</sup> *Rex v. Arkwright*, 22-3.

<sup>167</sup> *Ibid*, 140-2.

Arkwright's adversaries made excellent use of strategic deference and clarifying questions, allowing the confident expert to drift off script.<sup>168</sup> For as much as legal professionals had to adapt to the increased and sustained testimony of experts, now the experts—one opinion among many—had to demonstrate their competence as an effective witness in addition to being accomplished experts in their relevant discipline.

Ultimately, three factors proved key in facilitating such a swift and categorical decision by the jury. Firstly, the sheer number of collaborating, likely well-coached, witnesses brought by the Crown who stayed on topic and spotlighted narrow fact-based issues with Arkwright's patent primed the courtroom with skepticism. Unlike previous trials, the *Scire Facias* made Arkwright intrinsically easier to attack, as a wide range of previously dismissed evidence that spoke to Arkwright deliberately filing an obscure patent specification was permitted to stand. This included Arkwright's highly damaging petition to Parliament which Justice Loughborough during *Arkwright v. Nightingale* did not find relevant to the question of specification legibility.<sup>169</sup> In contrast, Justice Buller, ever the consistent acolyte of Mansfield, asked the jury to consider every aspect of Arkwright's patent including its originality and therefore saw no issue with allowing it to be read in full to the jury.<sup>170</sup> Buller's permissive attitude toward evidence included allowing extensive cross-examinations of the many experts brought before the court and left genuine contradictions in opinion for the jury to resolve.<sup>171</sup>

Secondly, as the successes and failures of the many experts called before the court demonstrates, simply being an expert witness was far from sufficient. One had to play to their many audiences and there was no singular or assured path towards success. Immison's

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<sup>168</sup> *Rex v. Arkwright*, 138-42.

<sup>169</sup> Davies, *A Collection of the Most Important Cases*, 59-60.

<sup>170</sup> Norman S. Poser, *Lord Mansfield* (McGil-Queen's University Press, 2015) 386; *Rex v. Arkwright*, 25-6.

<sup>171</sup> *Ibid*, 186-7.

terseness proved to be a boon that begot clarity while Watt's careful couching of his claims was interpreted by judge and jury to represent a lack of faith in the claims made by the defense. In contrast, Moore, for all his theoretical proficiency was, with little prodding, forced off script and ultimately divulged damaging facts that were detrimental to his client. To be either a master of the technical facts of engine construction or of the theoretical principles that underlay the mechanism of Arkwright's machine was not enough. One had to be an expert at being an expert witness. Immison's success at being an *expert* expert witness was clearly enabled by his pretrial preparation and ability to effectively support his claims with physical evidence. Yet, it was not predetermined that his lack of extended exposition would be well received. The *expert* expert witness, would in theory, need to go into more detail when it mattered yet refrain from oversharing when not necessary. This was clearly the tactic taken by Elizabeth Hargreaves as the judge and jury asked pertinent questions, she promptly responded with answers favorable to her client. The ever-escalating standards as to what was required of the expert witness in order to successively sway the jury was an inevitable evolution as their presence in the courtroom multiplied. With so many well-qualified people providing details relevant to a trial, a witness had to demonstrate their expertise and address why they, above those experts of the opposition, ought to be differed to. Indeed, the increased presence of the expert witness at patent law trials raised the floor on what successful witness conduct looked for all courtroom practitioners.

Therefore, thirdly and finally, the trial of *Rex v. Arkwright* reveals how adept legal practitioners had become at presenting and channeling expert testimony. This extends to the extraordinary amount of precise knowledge about cotton spinning that Erskine, Bearcroft, and the other attorneys and barristers had to accumulate when preparing for a trial. For it was only with this knowledge in conjunction with pre-existing experience as a prosecutor that enabled them to take rival expertise head-on. The prosecution further showed the value in

choosing the right experts who were in turn set up to succeed on the stand. In retrospect, in Buller's courtroom, the law had never been in Arkwright's favor and yet the trial of *Rex v. Arkwright* was unequivocally dictated, defined, and extended by the permitted speculations of the expert witness and the many players who enabled and challenged them.

## Chapter 5

### The Chaos of the Expert Witness at the Trial of Matthew Boulton and James Watt

#### Introduction

Matthew Boulton and James Watt had the most impactful business partnership of the early Industrial Revolution.<sup>1</sup> This was certainly the view of Watt's near contemporaries, such as the nineteenth-century engineer John Farey who described Watt's engine as the most important invention "in the history of the arts."<sup>2</sup> Within a century of Watt's death his legacy as solitary inventor, singular genius and a local secular hero, known throughout Glasgow to Birmingham, was cemented in tributes ranging from paintings, medallions, sculptures and statues.<sup>3</sup> In 1825, just six years after Watt's death, a marble statue was placed in Westminster Abbey to honor the genius philosopher of industry.<sup>4</sup> Costing the extraordinary sum of £6,000, the statesman and future Lord Chancellor Henry Brougham wrote the inscription which lauded Watt in purple prose as the man who directed the "force of an original genius" towards the improvement of the steam engine to become "among the most illustrious followers of science and the real benefactors of the world."<sup>5</sup>

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<sup>1</sup> For example, Eric Robinson consistently refers to Watt's achievements as of such importance he ought to be regarded as "Britain's greatest mechanical engineer..." Eric Robinson and Douglas McKie, eds., *Partners in Science: Letters of James Watt and Joseph Black*, (Harvard University Press, 1970), 3; Eric Robinson, "JWLP," 118; Eric Robinson, "Matthew Boulton and the Art of Parliamentary Lobbying," *The Historical Journal* 7, no. 2 (1964), 209.

<sup>2</sup> John Farey, *A Treatise on the Steam Engine: Historical, Practical, and Descriptive* (Longman, Rees, Orme, Brown, and Green, Paternoster-Row, 1827), 473; Also see: "Significance" in Jennifer Tann, "Watt, James," *ODNB* (2014).

<sup>3</sup> Ben Marsden, *Watt's Perfect Engine* (Icon Books, 2002), 183-4; More generally: Christine MacLeod and Jennifer Tann, "From engineer to scientist..." *BJHS* 40 (2007), 389-411; Michael Shortland and Richard Yeo, eds., *Telling Lives in Science* (Cambridge University Press, 1996); Christine MacLeod, "James Watt, heroic invention, and the idea of the industrial revolution" in Maxine Berg and Kristine Bruland, eds., *Technological revolutions in Europe* (Edward Elgar, 1998), 96-116; Christine MacLeod, *Heroes of Invention* (Cambridge University Press, 2007).

<sup>4</sup> David Philip Miller, "'Puffing Jamie': a 'Philosopher'..." *History of Science* 38, no. 1 (2000), 1-2.

<sup>5</sup> "James Watt," *Westminster Abbey* [<https://www.westminster-abbey.org/abbey-commemorations/commemorations/james-watt>; Accessed: August 27, 2023].

This “puffery” of James Watt began with the assistance of friends and colleagues prior to his death.<sup>6</sup> For example, Farey’s early history on the steam engine was not written in a vacuum as he was a former employee and friend of Watt’s.<sup>7</sup> Furthermore, Watt’s legacy was deeply useful to a variety of interests, from economic liberals who adopted him as a champion of British economic might to the Mechanics’ Institute who saw him as a symbol of the benefits of education.<sup>8</sup> Exaggerated and simplified narratives of Watt’s genius have more recently been superseded by deep academic division regarding his impact on the Industrial Revolution. Within economic history, substantial historiographic disagreement centers on the nature of Watt’s wide-ranging steam engine patent (1769-1800) which, according to critics, effectively hampered technological diffusion, thereby slowing the steam engine’s trajectory towards greater efficiency.<sup>9</sup> Jennifer Tann’s and Eric Robinson’s work stands out as an effective middle ground position, persuasively recognizing that on the whole Watt’s patents did likely retard some innovative activity.<sup>10</sup>

This meta-historical question has dominated the historiographical literature on Watt, particularly amongst economic historians, leading to a comparative underdevelopment in the historical analysis of Watt’s carefully constructed and zealously protected patent empire.<sup>11</sup> Watt’s control of key patents began in 1769 and lasted until the turn of the century as he

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<sup>6</sup> Miller, “‘Puffing Jamie’,” 17-8; Marsden, *Watt’s Perfect Engine*, 183-7.

<sup>7</sup> Farey’s account quickly became regarded as a definitive history of the recent era. Marsden, *Watt’s Perfect Engine*, 186.

<sup>8</sup> Christine MacLeod, “James Watt, heroic invention and the idea of the industrial revolution” in Maxine Berg and Kristine Bruland, eds., *Technological revolutions in Europe: Historical Perspectives* (Cheltenham, 1998), 96-115.

<sup>9</sup> Michele Boldrin and D. K. Levine have published widely on their belief that Watt’s weaponization of the patent system “delayed” the Industrial Revolution. *op. cit.*, Chapter 1 note 4; Boldrin and Levine greatly exaggerated the reach of Watt’s engine as Boulton and Watt’s market share never exceeded 25% of engines erected in the UK: John Kanefsky and John Robey, “Steam Engines in 18th-Century Britain,” *Technology and Culture* 21, no. 2 (1980), 161-86; George Selgin and John Turner, “Watt, Again?,” *Review of Law & Economics* 5, no. 3, 2009, 1101-13.

<sup>10</sup> Tann, “Watt, James”; Jennifer Tann and M. J. Breckin, “The International Diffusion of the Watt Engine, 1775-1825,” *The Economic History Review* 31, no. 4 (1978), 541-64; Robinson, “JWLP,” 11.

<sup>11</sup> *op. cit.* 9, 10; Attention to the patents of Watt is commonly found in the discrete silo of patent law historiography: Bottomley, *BPS*, 231-65; MacLeod, *IIR*, 68, 71, 78.

simultaneously developed plans to streamline the existing patent system with many of his suggested improvements aimed at illuminating the legal burden Mansfield had placed on the specification.<sup>12</sup> Indeed, his concern with defending his own inventions made him the foremost late eighteenth-century expert on the intertwined philosophical, legal and political issues regarding patents.<sup>13</sup> Watt's lifelong attempts to assert the legitimacy of his monopoly amounted to a Promethean example in the long history of inventors working to cast their rivals as intellectual pirates, a label which was as much a serious attack on character as much as it was an implicit legal threat.<sup>14</sup>

Watt's 1769 patent for "Lessening the Consumption of Steam and Fuel" is clear in setting out his aims: he believed he had extensively improved the efficiency, reliability and power of the Newcomen engine through a number of discrete improvements.<sup>15</sup> These improvements were enumerated across seven principles which comprised the bulk of Watt's filed specification. Some specific details pertinent to engine construction were given, such as principle seven, which described the use of oil to lubricate the piston.<sup>16</sup> Other details such as the use of a jacket to keep the cylinder hot and the use of a separate condenser were referred to in the most general of terms.<sup>17</sup> Yet the specification included no visual depictions of the engine nor any practical instruction regarding the engineering or manufacturing process

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<sup>12</sup> Robinson, "JWLP," 125-6.

<sup>13</sup> Bottomley, *BPS*, 249-50.

<sup>14</sup> Cultural historians who study the *patent management* operations of inventors are acutely aware of the use of the term "pirate" as a term of abuse or conveyor of scientific information and credibility rather than a fixed legal category: Carolyn C. Cooper, "Social Construction of Invention through Patent Management: Thomas Blanchard's Woodworking Machinery," *Technology and Culture* 32, no. 4 (1991), 960-98; Stathis Arapostathis and Graeme Gooday *Patently Contestable: Electrical Technologies and Inventor Identities on Trial in Britain*, (London: MIT Press, 2013), 11-8; Charles Bazerman, *The Languages of Edison's Light* (Cambridge, MIT Press, 1999); Regarding the challenges of treating piracy as strictly a legal term: Adrian Johns, *The Nature of the Book: Print and Knowledge in the Making* (London: University of Chicago Press, 1998), xx-xxi, 30-5; On piracy as moral and political label first and foremost: Adrian Johns, *Piracy: The Intellectual Property Wars from Gutenberg to Gates* (London: University of Chicago Press, 2009), 5-8, 500-11.

<sup>15</sup> "Watt's Patent Specification," The British Library: Business & IP Centre, GB176900913A; For the full patent see Appendix I. b.

<sup>16</sup> *Ibid.*

<sup>17</sup> *Ibid.*

required to make the described component parts of Watt's engine improvements function.<sup>18</sup> Indeed, at the time of filing Watt had yet to build a full-size engine, let alone refine its functioning which meant that even the patentee did not truly know how to build his own engine from the specification alone.<sup>19</sup> Even the passage of an extending parliamentary act in 1775 preceded the successful implantation of Watt's engine design in a real working environment by nearly two years.<sup>20</sup> Through the wielding of existing capital and political connections, Boulton and Watt had secured approximately eight years of state science protection in which any attempts to introduce a successful steam condenser to the market, ahead of Boulton and Watt, were transformed into acts of piracy. Strongly evoking Adrian John's description of piracy as first and foremost a moral and political category, the de facto power wielded by Boulton and Watt by virtue of their monopoly rights was certainly evident to their rival engine producers, who were strongly encouraged to proceed with caution.<sup>21</sup>

Nevertheless, the successful and de jure enforcement of Watt's 1769 patent would ultimately hinge on the now familiar testimony of the partisan expert witness at common law patent trials. As Watt feared losing at trial, he was reluctant to proceed, preferring to resort to Chancery injunctions and the threat of lawsuit.<sup>22</sup> Eventually, a trial proved impossible to avoid and the promise of vindication by the courts enthused some members of Boulton and Watt's organization: Watt Jr. in particular. Earnest legal action began thirty years following the granting of Watt's patent and approximately sixteen years following the successful licensing of Watt's improved engine. By the time legal action before common law was considered in late June of 1793, Boulton and Watt were astronomically wealthy having

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<sup>18</sup> "Watt's Patent Specification," Appendix I. b.

<sup>19</sup> A. N. Davenport, *James Watt and the Patent System* (British Library, 1989), 15-6; Watt was not satisfied with the design until at least 1778; Marsden, *Watt's Perfect Engine*, 107.

<sup>20</sup> Bottomley, *BPS*, 249-50; "An Act for vesting in James Watt, Engineer...the sole Use and Property of certain Steam Engines...of his Invention... throughout his Majesty's Dominions for a limited time" (1775), *Parliamentary Archives*, HL/PO/PU/1/1775/15G3n83.

<sup>21</sup> Generally see: Johns, *The nature of the book*, esp. 128-9. Johns, *Piracy*, 35-9.

<sup>22</sup> Bottomley, *BPS*, 261-5.

accumulated profits in excess of £100,000.<sup>23</sup> Ultimately their causes were not settled until late January of 1799, just short of a year from the sunset date of Boulton and Watt's Act of extension and Watt's retirement.<sup>24</sup> Taken all together the trials spanned nearly a dozen hearings held between Common Pleas and the King's Bench.<sup>25</sup> Substantial delays were caused through pretrial motions, the rescheduling of court dates and repeated writs of error which effectively required retrials before the King's Bench. Yet the largest impediment towards settling the validity of Watt's patent in either direction proved to be the fact that the judges both at Common Pleas and the King's Bench were unable repeatedly to reach a verdict, thereby leaving the matter of Watt's patent still unresolved and necessitating further trials.<sup>26</sup>

Within this complexity Boulton and Watt pursued two patent trials before the English courts; the first was an action against Edward Bull and Richard Trevithick Jr. (1793) who constructed and operated an inverted engine at Balcoath mine in Cornwall; the second was against the engineer Jabez Hornblower and his partner Stephen Maberley (1796).<sup>27</sup> This second cause took three years and was substantially broader in scope as the inciting injunction alleged that any engine that included a separate condenser violated Watt's intellectual property rights.<sup>28</sup> In both cases Boulton and Watt received initial vindication during their first hearings with favorable jury verdicts in *Boulton and Watt v. Bull* (1793) and

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<sup>23</sup> I derived this low end-estimate by summing Kingsford's calculation of royalties dated to 1790 with Bottomley's figures for manufacturing profits dated to 1785. This estimate is in line with David Miller's estimate which places Watt's total profit as £150,000 by 1800. Peter W. Kingsford, "James Watt," *Encyclopædia Britannica* (2025); David Phillip Miller, *The Life and Legend of James Watt* (University of Pittsburgh Press, 2019); Bottomley, *BPS*, 255.

<sup>24</sup> For a complete timeline detailing the full scope of Watt's patent law disputes, including the extensive use of injunctions, see Appendix II; Tann, *James Watt*.

<sup>25</sup> *Ibid.*

<sup>26</sup> Split rulings occurred in: See *Ibid.*

<sup>27</sup> *Boulton and Watt v. Bull* (1793); *Boulton & Watt v. Hornblower and Maberley* (1796); Davenport, *James Watt and the Patent System*.

<sup>28</sup> "Letter from Watt Jr. to Wilson January 16, 1796," Boulton & Watt Letter Books at Kresen Kernow, AD1583/9/3. Watt's 1769 patent had, in theory expired, by 1783 yet it remained legally valid until 1800 due to the extension granted by the Fire Engine Act of 1775.

*Boulton & Watt v. Hornblower and Maberley* (1796).<sup>29</sup> However, the case against Bull was never fully resolved as following a split verdict in May 16, 1795 the disputed fact of the validation of Watt's patent was adjudicated through the subsequent trials concerning Hornblower and Maberley. Finally, on January 25, 1799, the King's Bench found unanimously in Watt's favor with all four justices each issuing a separate opinion.<sup>30</sup>

The involvement of expert testimony, rooted in the technical details of engine construction, was given prior to even the first hearing in the summer of 1793. As early as November 13, 1792 Watt wrote to Thomas Wilson, his Cornwall-based representative and, in practice, fixer with instructions to commission a replica model of Bull's engine to be used at trial by both witnesses and barrister to visually demonstrate the alleged infringement by Bull's design.<sup>31</sup> This strategy of replica construction and its augmentation by the testimony of esteemed natural philosophers such as Jean-André Deluc and William Herschel was likely inspired by the trials of Arkwright.<sup>32</sup>

However, and as we have seen, unlike any plaintiff previously examined, Watt had personally served as an expert witness in his own right.<sup>33</sup> Watt's experience was further informed by his extensive autodidact study of patent law rendering him as a "double expert" proficient in both the technical details of his own invention and the contours of patent law. This unique position, as both inventor and expert witness, well-versed and interested in law

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<sup>29</sup> Davenport, *James Watt and the Patent System*, 25-37.

<sup>30</sup> James P. Muirhead, *The Origin and Progress of the Mechanical Inventions of James Watt*, vol. III (John Murray, 1854), 252-72.

<sup>31</sup> "J. Watt to T. Willson November 13, 1792," Boulton & Watt Letter Books at Kresen Kernow, AD1583/5/59; "M. Boulton to T. Willson November 21, 1792," Boulton & Watt Letter Books at Kresen Kernow, AD1583/5/64.

<sup>32</sup> In *Boulton & Watt v. Hornblower and Maberley* (1796) Jean-André Deluc provided extensive background on the basic principles of steam formation arguing that a proper understanding was necessary to appreciate the originality and inventiveness of Watt's invention; William Herschel was similarly called in *Boulton & Watt v. Hornblower and Maberley* speaking towards the general intuitive nature of Watt's specification; "Boulton and another v. Hornblower and Another Trial Transcript," WC, MS 3219/4/272/11.

<sup>33</sup> *Arkwright v. Nightingale* (1785); *Rex v. Arkwright* (1785).

was first explored by Eric Robinson and later expanded upon by A. N. Davenport.<sup>34</sup> Together their work served as a starting point for the frame of this chapter. Resultantly, this chapter presents an extensive examination of both pretrial preparation and midtrial happenings due to rich primary source material from the Boulton and Watt Collection held at the Library of Birmingham's Willison Center.<sup>35</sup> My detailed focus on the preparation and securing of experts, leading to *Boulton & Watt v. Hornblower and Maberley* in December of 1796 separates this chapter from Eric Robinson's more general overview of Watt's attempts to reform the patent system and the successful wooing of judges,<sup>36</sup> Here I build on Robinson's novel yet broad approach to understanding Watt as a legal figure and his shift from one typified by breadth to one of depth. This narrow focus allows me to examine the conduct of the expert witness before, during and after the trial. I show how it became clear that Watt, and those around him, understood the real legal weakness of their 1769 patent yet nevertheless believed, with good cause, that the favorable testimony of expert witnesses could in the unpredictable and adversarial context of the courtroom lead to vindication before a jury.

Across three sections, the majority of which are set outside the courtroom, this chapter will highlight the numerous decisions that eventually led Boulton and Watt to take Hornblower and Maberley to trial. Key to their planning was the meticulous persuasion of a Scottish professor of natural philosophy and former partner of Watt's, John Robison, to serve as an expert witness. In the first section I examine the reasons behind Boulton and Watt's caution at pursuing action before the common law courts. Watt's assessment of the likelihood of his own legal success provides further insight into his unique status as an engineer and expert in patent law in his own right. Additionally, I work towards deconstructing the mythic

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<sup>34</sup> Robinson, "JWLP," 115-39; A. N. Davenport, *James Watt and the Patent System*, British Library, 1989).

<sup>35</sup> Generally: MS; In addition to correspondence and legal invoices this collection includes full copies of Boulton and Watt's bill of complaint, answers as well as a complete trial transcript.

<sup>36</sup> Robinson, "JWLP," 115-39; For a sociology of technology approach to Watt's patent trials see: David Philip Miller, "Watt in Court: Specifying Steam Engines and Classifying Engineers in the Patent Trials of the 1790s," in Ian Inkster, ed., *History of Technology* 27, (London: Bloomsbury Academic, 2007), 43-76.

figure of Watt as the lone genius by stressing the essential advice given by his extensive network of family members, friends, and colleagues. In particular, Watt's son James Watt Jr.'s well-reasoned faith in the common law courts helped to sway his elders into action.

In the second section I analyze the dance between Watt and his old friend Robison as Watt pulled out all the stops in an effort to recruit Robison as an in-person expert witness.<sup>37</sup> Here the essential role of personal networks intersects with that of early expert witness, as Watt's wooing of Robison supports three related points. Firstly, the expert witness was understood to be an absolute necessity. The value of an expert witness was even further enhanced due to the generalized nature of Watt's patent, as the only defense against criticisms of inadequate disclosure was for relevantly skilled experts to swear that a specification was in fact sufficient for a machine to be made according to its specifications. Secondly, Watt and Robison's exchange further draws out the tension between the expert witness's personal views and those of the lawyer. It shows that the expert's very nature as a figure of specialized authority could push up against the lawyer's own legally-informed assessment of the most favorable course of action. Finally, the preparation of Robison for trial reinforces the conclusion in the previous chapter, namely that by the 1790s lawyers were well seasoned in careful and deliberate pretrial rehearsal.

The third and final section details the content and performance of Robison's testimony at trial as well as his own assessment of the trial's favorable outcome. Despite such meticulous pretrial planning Robison's testimony did not play out as expected. Within the courtroom Robison went from expected star witness, to not expecting to be called at all, to being summoned to the stand by the barristers representing Hornblower and Maberley. Additionally, Robison's testimony midtrial was greatly enhanced by the unplanned presentation of relevant evidence that came from Robison's pocket. Taken all together,

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<sup>37</sup> "Letters 162-171" in Robinson and McKie, eds., *Partners in Science*, 229-53.

Robison's actions at trial demonstrated not merely the persuasive power and authority of the expert witness but rather their proven tendency to disrupt and otherwise complicate jury trials. Here, the late eighteenth-century courtroom is, once again, revealed to be governed less by the strict interruption of existing procedural law but by norms and the highly contingent behavior of all involved actors.

### **To Go, or Not to Go to Trial**

From the initial steps of a viable engine in 1775 until profits soared in the 1790s, Boulton and Watt prioritized enforcing and upholding their highly favorable licensing agreements over challenging possible patent infringers. Even after opening a major engine foundry in Soho in 1796 the overwhelming majority of the partnership's income came from the licensing of their engine as enshrined in the 1775 Act.<sup>38</sup> For example, from 1778 through 1785 Boulton and Watt received a staggering total of £36,346 in royalties.<sup>39</sup> Over nearly the same period, 1778 to 1784, the profit of material goods produced, including engine parts, totaled £33,992.<sup>40</sup> Even in the post Soho foundry days, when Boulton and Watt were at their greatest in-house manufacturing capacity, the profit of manufacturing from 1795 to 1800 totaled £5,716 compared to the £42,273 made in licensing fees.<sup>41</sup> Clearly, the licensing fees propped up their empire as the total amount generated surpassed that of manufacturing throughout the entire lifespan of the partnership. Mine owners looking to purchase a Watt engine not only had to contend with its expensive upfront cost but also with non-fixed licensing agreement that scaled based off of engine usage.<sup>42</sup> Boulton and Watt's original licensing fee was calculated as 33% of the value of the coal saved by running Watt's more efficient engine in place of the cheaper and more available Newcomen engine.

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<sup>38</sup> Dickinson & Jenkins, *Watt*, 270-273; Bottomley, *BPS*, 250-65.

<sup>39</sup> *Ibid.*, 250-1.

<sup>40</sup> *Ibid.*

<sup>41</sup> *Ibid.*

<sup>42</sup> Tann, *The Selected Papers of Boulton & Watt*, 107.

Beyond substantial profits the aim of this licensing system was to effectively generate a continued record of their engine's superiority. When agreeing to a contract the participating mine was effectively co-signing to the value proposition of the Watt engine.<sup>43</sup> Sometimes, as with the Cambridgeshire mine owner Robert Wild, negotiation was not a challenge as Wild found Boulton and Watt's terms "most equitable."<sup>44</sup> However, this was atypical, especially among the Cornwall mine operators. Challenges with the efficiency calculations were abound especially when Watt's engine was not replacing a Newcomen engine, which would have given the mine owners a comparative baseline. Furthermore, the efficiency of the engine was, in practice, far from static and ranged drastically dependent on upkeep, the quality of the initial parts used, the skill with which the engine was built, and the non-ideal condition during which the engine was run. However, the fact that Boulton and Watt's profits were tied to the efficiency of their engines served as an incentive to supply the best possible product.<sup>45</sup> This meant they worked with the most able and reliable engine builders such as John Rennie and provided the best possible parts.<sup>46</sup>

During this roughly fifteen years of business, Boulton, Watt and their friends, employees and children kept careful tabs on pirate activity. Watt's longtime employees and invaluable contributions John Southern and William Murdock described peering over walls and sneaking onto factory floors in an effort to check for piracy.<sup>47</sup> In a December 5, 1790 letter to Joseph Black Watt described how John Wilkinson and William Reynolds, two iron masters essential in their production of engines, were among the infringers who beset his

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<sup>43</sup> When preparing for trial Boulton and Watt collected hundreds of pages of positive testimonials from clients; *WC*, MS 3219/4.

<sup>44</sup> "Document 136" in Tann, *The Selected Papers of Boulton & Watt*, 295.

<sup>45</sup> Bottomley, *BPS*, 253-4.

<sup>46</sup> Andrew Saint, "Rennie, John" *ODNB* (2022); Dickinson & Jenkins, *Watt*, 261.

<sup>47</sup> Marsden, *Watt's Perfect Engine*, 175-7; "Boulton to T. Willson November 21, 1792", *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/5/64.

business from all sides.<sup>48</sup> Interestingly, Watt assigned different motivations to the two men describing Wilkinson as one who “acts avowedly for his own interest [while Reynolds acts]... from a purer motive, the good *of the public*, and the preventing our being paid for our merits more than we deserve.”<sup>49</sup> Here Watt suggests some awareness about both the extent of his monopoly as well as the challenges of working off of his patent without having been explicitly trained or otherwise involved in previous engine construction. Despite awareness of their infringement Watt did not inform his partnership’s lawyer Ambrose Weston specifically of Wilkinson’s infringement until nearly five years later.<sup>50</sup> In his September 10, 1795 letter to Weston, Watt provided an exhaustive list divided into date of the engine construction, the diameter of the engine cylinder, who the engine was constructed for and for what purpose.<sup>51</sup> According to Watt’s own reporting Wilkinson’s earliest unlicensed engine project was in February of 1787 and continued until July 9, 1795. Just a month before Watt formally brought in his lawyer, Wilkinson had constructed some thirty-five engines.<sup>52</sup>

As Watt was reporting on the infringement within his own operation externally, Jabez Carter Hornblower and Stephen Maberley were working on building engines under a 1791 patent taken out by Isaac Manwaring, a saw maker, for a “new[ly] invented pendulum steam engine.”<sup>53</sup> The engine proved unworkable without drawing heavily from the construction of Watt’s engine information, allegedly obtained from a “drunken scoundrel” formally employed by Boulton and Watt at their foundry in Soho.<sup>54</sup> Upon confirmation of this accusation and with a lawsuit looming, Maberley quickly acquiesced and offered terms under

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<sup>48</sup> “Letter 131” in Robinson and McKie, eds., *Partners in Science*, 183-4. Italics included by editors.

<sup>49</sup> *Ibid.*; Bottomley, *BPS*, 253-4.

<sup>50</sup> *Ibid.*

<sup>51</sup> “Document 52” in Jennifer Tann, ed., *The Select Papers of Boulton & Watt*, 130-1.

<sup>52</sup> *Ibid.*, 131-6.

<sup>53</sup> “Patent No. 1792” in Woodcroft, *Alphabetical Index*, 362 It is unclear as to whether Maberley purchased the patent from Manwaring or if Manwaring was a pseudonym used by Maberley when he secured the patent. Contrasting descriptions in: Bottomley, *BPS*, 256 and Davenport, *James Watt and the Patent System*, 33-4.

<sup>54</sup> Marsden, *Watt’s Perfect Engine*, 145.

which he would not be charged for engines already constructed and in return would pay any necessary fees when constructing engines in the future.<sup>55</sup> Boulton, for one, was willing to accept Maberley's terms, fearing the possible outcome and general uncertainty that surrounded the trial. On October 16 Boulton penned a letter to their lawyer Weston, suggesting caution and emphasizing that cutting their losses with Maberley may be worth it considering: "I am staggered when I think of what may be the extent of the mischief, by the loss of our trial...suppose we sacrifice a little to Maberley and the suit is dropped, our other enemies are not likely to suddenly review it."<sup>56</sup> Boulton's letter strongly suggested that as far as he was concerned, the trial, with the untold risks it raised, had always been a bluff. Boulton had good reason to be nervous; their previous trial against engineer and former employee Edward Bull was not a categorical success and this second attempt could conceivably lead to a successful challenge to Watt's vague 1769 specification.<sup>57</sup>

Watt displayed a similar level of anxiety not just in regards to the Maberley issue but towards the prospect of trial generally.<sup>58</sup> In an April 2, 1795 letter to Black, Watt attributed his current poor health to the distress and fatigue wrought by the "disagreeable business of our lawsuit."<sup>59</sup> The collective misery with which Boulton and Watt looked upon trials at common law helps to explain the lack of legal action taken through the 1780s. Additionally, there were further factors that may have encouraged Boulton and Watt to prefer premium negotiations over policing pirates.

Firstly, a trial was exceptionally expensive. Looking into the future, the trial with Maberley would cost the partnership nearly £6,000, an amount that far exceeded any sum

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<sup>55</sup> Davenport, *James Watt and the Patent System*, 34.

<sup>56</sup> "Boulton to Weston, October 16, 1796" quoted in Bottomley, *BPS*, 258.

<sup>57</sup> Davenport, *James Watt and the Patent System; Boulton and Watt against Bull* [1795] *English Reports*, 4114, [<http://www.commonlii.org/uk/cases/EngR>], 651-70.

<sup>58</sup> "Letters 153 and 162" in Robinson and McKie, eds., *Partners in Science*, 212-3, 231.

<sup>59</sup> "Letter 153," in *Ibid*, 212-3.

they could hope to recover.<sup>60</sup> By the time all legal proceedings were concluded in 1800 the firm had spent approximately £10,000 in litigation over seven years.<sup>61</sup> This amounted to about 20% of earnings for patent licensing during this same period.<sup>62</sup> A non-trivial amount, it must be noted that Boulton and Watt were proactively bringing suits against infringers rather than defending their patent against challenges of viability. Boulton and Watt never possessed more than 22% of the steam engine market in the United Kingdom and with the cost of their license so closely tied to their genuinely superior performance it is likely that the firm would have continued to prosper without legal action.<sup>63</sup> Moreover, as Sean Bottomley notes, Boulton and Watt were most successful when they used the law as a threat as it was far more time efficient and cost effective.<sup>64</sup> Watt's own head legal counsel, Weston, would later boldly estimate that mere intimidation inherent in the threat of suit had yielded the firm £40,000.<sup>65</sup> Of course, the threat of suit was only effective should it be perceived to be actionable and this required follow through. As a result, it is exceedingly difficult to judge the cost benefit analysis of Boulton and Watt's decision to enforce their patent at common law. What is clear is that they conducted themselves as an extraordinarily profitable firm even though they did not truly succeed in enforcing their patent against some select infringers until 1799, the final year for which their patent was valid.<sup>66</sup> Nevertheless, when operating without the benefit of hindsight, in the early 1790s the patent system offered them implicit state protection, which

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<sup>60</sup> Marsden, *Watt's Perfect Engine*, 145-6; Eventually the legal proceedings and unfavorable outcome did not just bankrupt Hornblower but sent him for a time to debtor's prison; Richard L. Hills, "Hornblower, Jabez Carter" *ODNB* (2022). The total legal fees paid by Boulton and Watt over their parallel disputes and many retrials amounted to approximately £10,000. Robinson, "JWLP," 138.

<sup>61</sup> Robinson, "James Watt," 138.

<sup>62</sup> Bottomley, *BPS*, 255

<sup>63</sup> John Kanefsky and John Robey, "Steam engines in 18th-century Britain," *Technology and Culture* 21, no. 2 (1980), 174.

<sup>64</sup> Bottomley, *BPS*, 261.

<sup>65</sup> *Ibid.*

<sup>66</sup> *Ibid.*, 262.

had launched their business in the first palace. Yet, the question as to the hidden costs of making good on their threats remained.

For example, Watt and Boulton worried that the trial would have a possible chilling effect on their current outstanding negotiations, further hampering business. Additionally, victory at common law, as Arkwright's saga had made painfully clear to the world of Lunar Society men, was anything but guaranteed. This was the worst-case scenario as a loss would substantively weaken their negotiating leverage and expose them to the full force of the open market. Here the broad language of Watt's 1769 patent was a further pain point that likely pushed Watt away from the law courts.<sup>67</sup>

James Watt Jr. did not share the same anxiety of his employer and father. On October 5, 1796 he sent a document to Weston's office titled "Considerations upon the measure most proper to be adopted in the present state of affairs with Maberley."<sup>68</sup> Watt Jr.'s document laid out a pro and con list under the subheadings "Reasons for Agreeing" and "Reasons Against" that worked through a series of possible responses. Watt Jr.'s calculus regarding Maberley's proposed terms pitted six pros against six cons. Tellingly, his first reason for agreeing was none other than "B & W will avoid a trial for the present with all its attendant anxiety and expenses."<sup>69</sup> However, Watt Jr. was also concerned that they would be setting a precedent that suggested infringement would be met with soft compromises, writing "flatter them [future infringers] with the hope of impunity."<sup>70</sup> Of course, as we have seen, Boulton and Watt's ongoing policy was effectively just that. Nevertheless, Watt Jr. pointed out that such piracy could very well escalate. Furthermore, Watt Jr. raised the point that enabling pirates

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<sup>67</sup> Quoted in Dickinson and Jenkins, *James Watt and the Steam Engine*, 327.

<sup>68</sup> "Document 53" in Jennifer Tann, ed., *The Select Papers of Boulton & Watt*, 136.

<sup>69</sup> *Ibid*, 136-7.

<sup>70</sup> *Ibid*, 137.

might also offend their clients who would in effect be paying for a product that was easily obtainable through less honest means.

Ultimately Watt Jr. worked his way towards making an exceptionally forceful argument for a trial before common law. To this point, going to trial is the only subheading within his “considerations” that exclusively listed arguments in favor. Watt’s Jr.’s contrasting confidence at trial spans a range from the political to the technical. For example, Watt noted Chief Justice Eyer’s previous favorability to their patent and so Watt expected the Chief Justice to remain just as friendly. However, at the heart of Watt Jr.’s account was the favorable potential of the expert witness. Watt Jr. approached the expert witness from both sides as he emphasized first the “Respectability of the witness we have to adduce, the clearness of their testimony and their intelligence of the subject.”<sup>71</sup> This he contrasted with a second reason to strongly favor pursuing trial: the flipped “ignorance” and “malicious[ness]” of the experts to be called by Maberley. Watt’s confidence in the experts his father and Boulton had secured extended to a strong belief that their experts could systematically dismantle any *expertise* Maberley attempted to introduce into the court: “We can prove one or other upon all of them. They will get no man of character to assist them.”<sup>72</sup>

The connection between Watt Jr.’s confidence at trial and the emphasis he placed on the expert witness is deeply revealing. Firstly, it further highlights the unquestioned growth of the expert witness; secondly, it affirmed the essential nature of the expert witness; and thirdly, it emphasized that preparing to go to trial required taking stock of one’s ability to secure relevant experts. By the 1790s the expert witness’s ability to make or break a case was so evident it was a dominant factor in whether trial was seen as a valid option and as Watt Jr. believed, the key reasons why victory could reasonably be assumed. Watt Jr.’s advice proved

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<sup>71</sup> “Document 53” in Jennifer Tann, ed., *The Select Papers of Boulton & Watt*, 140.

<sup>72</sup> By “one or other” Watt is referring to the following traits he expects Maberley’s experts to have, namely their ignorance, bias and maliciousness.

highly persuasive: Weston replied to Boulton's inquiry regarding backing down with one of puzzlement, advising that they should and would proceed with trial.<sup>73</sup> Indeed, by the time Boulton had voiced his reservations preparations were already underway as Watt Sr., with renewed confidence, wasted no time in his efforts to bring together the "respectable" and "intelligent" experts so necessary for their case.<sup>74</sup>

**"I must needs go"<sup>75</sup>**  
**Courting a Witness: The Persuasion of Professor Robison**

James Watt junior's "considerations on the affairs with Maberley" made it abundantly clear that his preferred course of action was to pursue trial at common law. As we have seen, key to Watt's bullishness in pursuing a cause was rooted in his confidence in being able to secure knowledgeable and respectable gentlemen to serve as witnesses. The Watts, unified in their conviction that the court would uphold their problematic 1769 patent, did not hesitate in reaching out to esteemed friends who might serve as ideal expert witnesses in the coming cause. On October 11, 1796, just six days after Watt Jr's recommendation, Watt Sr. contacted John Robison, an old friend and longtime confidant, mathematician, navigator, and as of September 1774 the chaired Professor of Natural Philosophy at the University of Edinburgh.<sup>76</sup> Robison had first introduced himself to Watt around 1757 at a time when Watt was temporarily employed by the University of Glasgow to repair some astronomical instruments.<sup>77</sup> Fondly recalling their introduction, Watt noted how "happy [I was] to find in home a person who was so much better informed on mathematical and philosophical subjects

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<sup>73</sup> "Weston to Boulton October 17, 1796" quoted in Bottomley, *BPS*, 258.

<sup>74</sup> To clarify the timeline: Watt Jr. gave his suggestions on pursuing a trial on October 5, Watt Sr. reached out to Robison on October 11, and Boulton signaled his reservations on October 16. "Document 53" in Jennifer Tann ed., *The Select Papers of Boulton & Watt*, 136; Robinson and McKie, eds., *Partners in Science*, 229; Bottomley, *BPS*, 258.

<sup>75</sup> "Robison to Black November 1796" in Robinson and McKie, eds., *Partners in Science*, 239.

<sup>76</sup> John Playfair, "Biographical Account of the Late John Robison..." in *Transactions of the Royal Society of Edinburgh*, vol. 7 (Edinburgh, 1815), 513.

<sup>77</sup> Even when recounting their friendship after Robison's death in 1805, Watt is unsure of the exact year of their first meeting suggesting it was in either 1757 or 1758. "Letter 257" in Robinson and McKie, eds., *Partners in Science*, 411.

than I.”<sup>78</sup> Watt further remarked warmly on Robison’s communication ability, a clarity that was matched by a well-known boisterousness.

Indeed, such an adept and esteemed public speaker, should they prove controllable, would make an ideal expert witness of credible character. However, over the years Watt and Robison’s correspondence was, at times, inconsistent due in part to Robison’s frequent trips abroad. Robison had made a name for himself teaching the mathematics of navigation and artillery at a naval college in Russia and years prior was a member of the board who tested John Harrison’s marine chronometer in practice aboard the H.M.S. *Deptford* both en route to and in Jamaica.<sup>79</sup> Although it appears to have been years since their last communication, on October 24, 1796 Watt received a relatively prompt response and so ensued a lengthy back and forth that included the difficult task of persuading Robison to personally appear at trial.<sup>80</sup> Their correspondence also covered disagreements between Robison and Watt’s legal counsel on the exact narrative to present to the judge and jury at trial. The currying favor and molding of an acquaintance into a suitable and key expert witness is an episode worth extended scrutiny as the detailed letter trail provides unique insight into the kind of close preparatory work done with experts prior to trial as well as the challenging balancing act between flattering, deferring to and overruling the personal opinions of your essential expert witness. A balancing act which seeks not to alienate yet to ultimately control the precise language of a boisterous and dangerously “garrulous and sometimes ill tempered” ailing professor.<sup>81</sup> Watt very well may have feared Robison’s potential to wander off-topic and hinder his case akin to Samuel Moore’s role in Arkwright’s trial over ten years earlier.<sup>82</sup> However, Watt’s eagerness

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<sup>78</sup> “Letter 257” in Robinson and McKie, eds., *Partners in Science*, 411.

<sup>79</sup> Playfair, “John Robison,” 511; Eric Gray Forbes, “The Original and Development of the Marine Chronometer,” *Annals of Science* 22, no. 1 (1966), 5-6; Robison was only involved with the first and ultimately disputed tests, a result which as Forbes noted can be read as a challenge of Robison’s integrity.

<sup>80</sup> “Letter 163” in Robinson and McKie, eds., *Partners in Science*, 232-5.

<sup>81</sup> *Ibid.*, 3.

<sup>82</sup> Watt was present during this trial; *Rex v. Arkwright*, 144-50.

to recruit the professor speaks highly of the substantial baseline benefits of generally favorable testimony from a respected and well-credentialed source.

Having not conversed with Robison in some time Watt began his letter with a preamble that with deference and determination laid out the necessary, justified and essential nature of his letter, writing “I flatter myself, that when you are informed of the motives, which urge me at present you will excuse me.”<sup>83</sup> Watt continued with a brief and exceptionally favorable summary of the legal events to date emphasizing the unceasing infringement he and Boulton received and the resulting legal action against Bull in 1773. Watt discussed the subsequent split rulings despite “an unqualified verdict from the Jury... the case therefore remains undecided” and informed Robison of the successful injunctions still upheld by Chancery.<sup>84</sup> He keenly stressed how expensive and exhaustive the ongoing legal process was, despite their best efforts, and added that the ruling of the jury only “served more to keep the enemy at bay than to produce profits to us.”<sup>85</sup> It was in such a climate that Watt turned his attention to what he described as Maberley and Hornblower’s unrelenting holdout, a stance taken despite the fact that “most of them [pirates] have submitted to our demands.”<sup>86</sup> Watt’s description, as we have seen, does not fully capture Maberley and Hornblower’s willingness to reach a particular compromise; however, it does accurately represent their clear infringement. Watt’s primary aim was, of course, the recruitment of Robison and to this end he succeeded in presenting a strongly justified cause for pursuing trial. Further impressing the importance of his request, Watt clarified the time-sensitive nature of this case noting that by December “we must collect all our forces” and be prepared for trial in the following court term.<sup>87</sup>

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<sup>83</sup> “Letter 162” in Robinson and McKie, eds., *Partners in Science*, 229.

<sup>84</sup> *Ibid.*, 230.

<sup>85</sup> *Ibid.*

<sup>86</sup> *Ibid.*

<sup>87</sup> *Ibid.*

The extensive summary, time pressure and humble deference to Robison was all in service of securing Robison's in-person testimony rather than simply his written opinions, which Watt also requested. A written deposition from Robison in which he swore to Watt's status as original inventor as well as lauding the clarity of Watt's 1769 patent was relatively straightforward and, for an old friend, a task Robison clearly felt was reasonable. However, the personal journey to London to give testimony was a significantly greater ask. Watt approached this bigger request with great care, largely because of Robison's ill health. Indeed, Watt's initial outreach was exceptionally general, writing that: "Knowing the state of your health and your avocations I am afraid to ask you to appear as a witness upon the trial if your opinions should be favorable."<sup>88</sup> Through his initial inquiry to Robison, Watt repeatedly tied himself into knots affirming both the value Robison's oral testimony would have while clarifying that undoubtedly "If your health or other circumstances render this request improper I cannot urge it."<sup>89</sup> However, once Robison responded with a highly favorable set of opinions regarding Watt's specification and his singular role as the first inventor of the separate condenser, Watt rapidly upped the pressure in persuading Robison to make the journey to London. Furthermore, and perhaps most importantly, Robison showed a real eagerness to work with Watt to refine his testimony and construct a truly persuasive "narrative" that the professor assured would certainly help Watt's cause.<sup>90</sup>

In a follow up letter sent on the same day he received Robison positive response (October 24), Watt made clear that his new priority was, above all else, to get the professor to London despite any reservations Robison might have regarding travelling over such a long distance. Clarifying the stakes, Watt assured him that this was no casual request:

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<sup>88</sup> "Letter 162" in Robinson and McKie, eds., *Partners in Science*, 231.

<sup>89</sup> Ibid.

<sup>90</sup> "Letter 168" in Ibid, 243.

I have been obliged to trouble many of my friends with these abominable law affairs but have hitherto, have only called those who lived near London, but now these scoundrels, the Hornblowers and others have leagued against us we must call all who are willing to help us.<sup>91</sup>

Here, Watt's near desperation in bringing Robison into London further emphasized the extent to which he truly understood the power, weight and essential nature of friendly expert testimony. Just as his son had noted, their success at trial was largely due to the esteem of the gentleman with which they presented to the court, and with Hornblower and Maberley bringing forth their own experts, every name counted. Furthermore, this telling passage revealed the fact that the sweeping list of renowned fellows Watt presented to the court, such as William Herschel, Jean-André Deluc and James Lind, were partisan experts through and through.<sup>92</sup> The structure of Watt's trial strategy was straightforward, robust and built on the support of the expert witness at every turn. Counsel would introduce the importance and novelty of Watt's invention of which he was the sole inventor. Next, they would describe what novel philosophical insights and experiments Watt had uncovered regarding his ideas for engine improvement. Finally, all experts would swear that they could easily replicate Watt's invention, working only from the specification. The experts were called to accomplish different tasks. For example, Jean-André Deluc largely focused on explaining the theoretical principles of steam combustion, yet he would still attest to the obviousness of Watt's specification.<sup>93</sup> Robison's suggested part was largely confined to expanding on and affirming the origin story of Watt's invention. All together the case presented by the plaintiffs stressed

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<sup>91</sup> "Letter 163" in Robinson and McKie, eds., *Partners in Science*, 232-3.

<sup>92</sup> Robinson, "JWLP," 127; Dickinson and Jenkins, *James Watt*, 325.

<sup>93</sup> "Watt v. Hornblower Trial Transcript," *WC*, 3219/4/224, 53-77

the labor, largely intellectual, which Watt had vested into his invention. This rendered the alleged infringement of the pirates into what a jury would interpret as clear property theft.

Like actors in a rehearsed play, these partisan expert witnesses—who were first and foremost friends of Boulton and Watt—came to trial with their statements carefully vetted and well-prepared.<sup>94</sup> Watt, further attempting to sway Robison to travel to London, laid out his own health challenges noting that he “also labors under low spirits.”<sup>95</sup> Watt continued his plea by giving Robison some recommendations of remedies, noting that even though he himself was “reasonably rich I am bowed down almost to the grave with cases of various kinds to say nothing of half a dozen chronic diseases.”<sup>96</sup> Watt’s not so subtle meaning, that Robison, like Watt, should push on and through any pain did not have the desired effect. Robison’s response made clear that although he appreciated Watt’s commiseration on matters of health, Robison maintained his position writing that he could only be in London by May at the earliest for his “pain is so grievous that it would be impossible for me to come up except by very easy journey.”<sup>97</sup> Robison further excused himself noting that he was scheduled to teach throughout December and despite wishing that Watt might “depend on every service I can render you...It fills me with regret that it is most likely that I can do you none.”<sup>98</sup> Having provided his written opinion Robison respectfully signed off wishing Watt and his family his best.<sup>99</sup>

Watt, fully committed to not taking no for an answer, wrote twice more to Robison encouraging his presence in London.<sup>100</sup> Watt began by informing Robison just how “pleased”

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<sup>94</sup> Tann, “Watt, James”; Paul Wood, “Robison, John” (2013) *ODNB*; Both Watt and Robison in addition to having worked together at Glasgow were by the 1790s well-established fellows of the Royal Society of Edinburgh.

<sup>95</sup> “Letter 163” in Robinson and McKie, eds., *Partners in Science*, 233.

<sup>96</sup> *Ibid.*

<sup>97</sup> *Ibid.*

<sup>98</sup> “Letter 164” in *Ibid.*, 235.

<sup>99</sup> *Ibid.*, 237.

<sup>100</sup> “Letters 165, 167, and 168” in *Ibid.*, 237-8, 241-2.

his legal team was with Robison's letter, reminding him that "Your opinions as a theoretical and practical Mechanick on the sufficiency of the specification which will receive additional weight from your Profession and from your appearance [sic]." <sup>101</sup> As far as Watt was concerned the world-traveled professor of mathematics was simply too persuasive a witness to pass up on and so Watt persisted. Through a lost first letter and a November 14 and 19 follow up, Watt refined his best possible case to persuade Robison. <sup>102</sup> He first returned to the subject of Robison's well-being, suggesting that if such a request would hurt his good and admired friend's health, he would not ask such a thing. However, "on the contrary," Watt believed and made the case that such a rapid journey, although temporarily painful, would actually be good for Robison's long term health, a kind of preventive therapy that "will give more elasticity on your nerves and promote your future ease." <sup>103</sup> Having made this personal argument as a similarly ailed friend, Watt went even further and suggested that he would personally arrange for a replacement teacher to assume Robison's lectures. Finally, he provided an extraordinary £100 stipend to cover travel and living expenses for Robison's week in London, an amount that exponentially exceeded Robison's possible expenditures. <sup>104</sup>

Evidently persuaded by Watt's incentives, Robison relented and made the painful yet well-funded trip to London to appear before the court on Watt's behalf. <sup>105</sup> The above correspondence shows that securing experts was not just a matter of a pecuniary arrangement but one that tapped into, and made good on, extensive personal networks. Arkwright, as was shown earlier, had embarked on a similar quest to secure the testimony of Watt, Darwin and Moore. However, when the Arkwrights reached out beyond their more immediate friends to

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<sup>101</sup> "Letter 164" in Robinson and McKie, eds., *Partners in Science*, 235.

<sup>102</sup> In a November 14 letter Watt referenced "a few hasty lines from Newcastle, to prepare you for the probable call we may be obliged to make upon your kindness"; "Letter 165" in *Ibid*, 237; To date, I have been unable to source these "few lines" in either published editions of Watt's correspondence or the letter books in *WC*.

<sup>103</sup> "Letter 165" in *Ibid*, 237.

<sup>104</sup> "Letters 167" in *Ibid*, 241-2.

<sup>105</sup> "Letters 162, 163, and 165" in *Ibid*, 229-38.

other fellow Lunar Society members, such as John Michell, they were unsuccessful.<sup>106</sup> Watt too had a number of advantages from networks in both England and Scotland and by the time of his trials had close to another decade of establishing himself as a successful and brilliant engineer and businessman. Furthermore, Watt had the advantage of his close partnership with the master networker, man of influence and exceptionally well-connected Boulton. Indeed, Boulton had assisted and served as an integral intermediary for Arkwright when he helped to secure Watt's and Darwin's presence as expert witnesses. Here, Boulton was more than a mere intermediary; he was a co-defendant with a significant vested interest in a successful outcome to the case and as we have examined, deeply anxious about pursuing trial. Watt made this point explicitly to Robison noting that "At present had not Mr. Boulton and myself the assistance of our sons we must give it up, though the stake is very great."<sup>107</sup> It seemed that Watt Jr's "considerations" proved most persuasive and reassuring. Ultimately, the cogs of his partnership were in motion and Boulton had little choice but to resolve himself and prepare fully for trial. However, his underlying nervousness was well justified considering they had yet to fully win at trial; while their injunction against infringers was upheld, the court had demurred regarding the validity of their specification. This uncertainty may well have motivated Watt Sr. and Boulton into "call[ing] all who are willing to help us."<sup>108</sup> In short, between Boulton and Watt the list of witnesses to call ran high and long.

Beyond reaching wide and being able to push friends to assist in the non-trivial matter of testifying to the broad successes of Watt's patent, Watt's correspondence with Robison clarifies that there was extensive pretrial witness preparation. The trial most likely took place on December 23, 1796, held in the city of London before a special jury of merchants. This group was deliberately assembled by Watt's counsel because of their likelihood of being

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<sup>106</sup> Fitton, *Arkwrights*, 110; Also see Chapter 2, 122-3.

<sup>107</sup> "Letter 162" in Robinson and McKie, eds., *Partners in Science*, 231.

<sup>108</sup> "Letter 163" in *Ibid*, 233.

sympathetic to Boulton and Watt's business interest.<sup>109</sup> As Watt had communicated to Robison on November 19 his lawyers "desire us to have our witnesses in town by the 5<sup>th</sup> but better they... [arrive] by the 3rd of De[cembe]r."<sup>110</sup> Watt and Boulton's legal team hoped to have over two weeks to prepare for trial, to ensure witnesses were present and their accounts were as favorable as possible. However, the micromanaging of a witness, a respected gentleman of science, could prove thorny—as micromanaging could be seen as an offensive challenge to their expert knowledge, skill or competence. Indeed, after being so involved and having made such a laborious journey Robison wished to maintain a degree of control and was clearly unhappy with how the preparations were going with Watt's legal team.<sup>111</sup> At one point he wrote to Watt requesting further leeway in his presentation, whereupon Watt delivered the letter to his counsel noting that Robison "wishes to give his evidence in his own way and desires to know when he is to receive his instructions."<sup>112</sup> Although Robison conceded that he had a tendency to ramble, something Watt's attorneys may well have flagged as a potential problem, Robison assured them that should he be allowed to tie his treads together he could sketch a deeply personal and persuasive story sure to "have considerable weight with a jury of men of liberal minds."<sup>113</sup> In a passage that strongly suggested that there were question by question rehearsals Robison wrote:

You must excuse me to your Counsel for appearing to direct them in the Choice of their questions. This is not for Vanity, but from a Wish to have such interrogatories put to me, and in such an Order, as shall suggest and give room for my narration.<sup>114</sup>

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<sup>109</sup> As the *English Reports* do not provide a precise date for this trial, this date is sourced from a letter sent by Robison to Watt Jr. dated Tuesday, December 27 in which he referred to the trial as having occurred last Friday (December 23) "Letter 170: Draft Advertisement" in in Robinson and McKie, eds., *Partners in Science*, 244.

<sup>110</sup> "Letter 163" in *Ibid*, 241.

<sup>111</sup> "Letter 168" in *Ibid*, 242-3.

<sup>112</sup> *Ibid*.

<sup>113</sup> *Ibid*, 243.

<sup>114</sup> *Ibid*.

As we have seen, although the rise of the expert witness was relatively rapid—from largely unilateral testimony during Liardet’s trial to the widespread use of such personnel during Arkwright’s disputes—it is notable that in less than twenty years the legal profession and skilled plaintiffs had thoroughly adapted to this nascent figure. In the case of Robison’s testimony, many of the nascent themes present in the Arkwright trials were rendered in even greater clarity. Firstly, there was the undeniable fact of the expert witness’s clear relevance and power made evident by Watt’s desperation and unrelenting activity to solicit Robison’s services. Secondly, the strategy was to secure the most esteemed expert as possible, with considerable planning and effort placed on the micro tactics of making the said expert as effective or rather as persuasive as possible. Thirdly, there was the complex interplay between the expertise of the expert and the expertise of the trial lawyers, a tension brought forth even more so when Watt acted as the plaintiff. Watt was uniquely qualified and immersed in the minutiae and development of patent law and in his own right a consulting legal expert.<sup>115</sup>

Watt was well aware of the best approach and most likely avenue for victory and, as we have seen, was not just aware of the defects of his patent specification but also “fear[ed]” the fate of his patent as a result.<sup>116</sup> Indeed, his keen awareness that his specification revealed so little and was so broad further required him to demand the presence of all and any experts who could attest to the apparently practical validity of the patent specification. Watt knew exactly what he wanted his experts to say and how they should say it. This raises the question of the extent to which Watt’s experts can be thought of as mere rubber stamps to Watt’s own opinions. Additionally, the strength of Watt’s convictions on what his experts ought to say opened a complex strategic and interpersonal predicament as his counsel considered whether

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<sup>115</sup> Robinson, “JWLP,” 117-8.

<sup>116</sup> Taken from Watt’s comments on his own specification quoted in Dickinson and Jenkins, *James Watt and the Steam Engine*, 327.

they should compromise control in order to have the greatest number of experts—even if some might stray off topic. At the same time, Watt considered how directly he should steer the opinions of his knowledgeable confidants such as Professor Robison.

The presence and influence of Watt's own opinions is evident the first time he reached out to Robison. He did not merely solicit Robison's impartial opinion but also included his own thoughts on the questions regarding originality and specification clarity. To this end, Watt not only provided a favorable account of the infringement cases to date but also promptly supplied Robison with his own views on the very merits of the case.<sup>117</sup> This effort to influence Robison was continued in Watt's October 24 response, in which he reminded Robison that:

You will see from the papers sent you the objections and consequently the proper answers...The point is to establish I was the [sole and original] inventor.... And that the specification is sufficient to enable a Mechanick understanding Newcomen Engine to have constructed one with these properties [sic].<sup>118</sup>

Clearly, Boulton and Watt sought to run as tight a ship as possible and intended their expert witness to stay on topic. However, as Robison's correspondence revealed, this was not a straightforward story of Watt efficiently and coldly strong-arming his friend into compliance. Indeed, Robison himself was deeply worried about his ability to speak on the stand due to his use of opium. As he wrote to a mutual friend Joseph Back prior to confirming his appearance in London "I am sorry to feel myself so much enfeebled in mind (by use of opium) as well as in body that I cannot give much force to anything that I have to say."<sup>119</sup> Again, when writing

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<sup>117</sup> "Letter 162" in Robinson and McKie, eds., *Partners in Science*, 230.

<sup>118</sup> *Ibid.*

<sup>119</sup> "Letter 166" in *Ibid.*, 239.

to Watt sometime later, he noted he would “pray” that on the day of the trial he would not be required to take “much opium, which always hurts my recollection.”<sup>120</sup> As Robison explained, he hoped to receive additional counsel from Watt’s lawyers and appeared to have wanted to be even more involved in pretrial preparation as he found himself quite listless in the days preceding the trial.

The portrait depicted by Watt and Robison’s correspondence paints a multifaceted picture, one in which Robison and Watt carefully managed Robison’s wish for guidance and freedom to speak freely. Robison was comfortable with assistance should he forget details or be otherwise impaired, but he was not without an ego or the sense that he was an independent expert who had freedom to spin his own version of Watt’s story. Nevertheless, above all else, Robison was willing to work with Watt and, as his letters indicated, he clearly hoped for a favorable outcome referring to his long-term friendship with Watt and belief that such success warranted protection.<sup>121</sup> His letters often stated that he genuinely believed he was in a greater position of knowledge and authority when it came to crafting the full arch of his testimony, testimony he thought would do Watt considerable good when delivered to the jury. Watt, for his part, had his own well-informed view of the kind of testimony that ought to be presented to the court and worked with his legal team to ensure cooperative and value-aligned witnesses. He did this by tweaking and collaborating on Robison’s original written account of Watt as the sole inventor of the condenser. Furthermore, he was most forceful and sustained in the essential task of persuading Robison to journey to London and present some form of favorable evidence. Nevertheless, Watt compromised with his friend and delivered on Robison’s requests regarding freedom on the stand. In summary, the courting of an expert witness, especially one within the context of a pre-existing relationship, was a delicate affair,

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<sup>120</sup> “Letter 168” in Robinson and McKie, eds., *Partners in Science*, 243.

<sup>121</sup> “Letter 166” in *Ibid*, 239-40.

and in this instance, Watt eventually succeeded: Robison informed Black that considering the gravity of the matter he felt obliged to serve stating, “I must need go-it will be with great satisfaction if I render him any essential service.”<sup>122</sup>

***Boulton and Watt v. Hornblower and Marbly: The Evidence of Robison  
(1796)***

Watt’s legal team was led at trial by the experienced patent law barrister Serjeant James Adair.<sup>123</sup> As lead counsel, Adair received additional support from Ambrose Weston, Boulton and Watt’s long-time counsel, Weston’s team of solicitors and clerks, plus at least four additional trial barristers.<sup>124</sup> Adair’s pretrial strategy included close to two weeks’ worth of witness preparation.<sup>125</sup> As a result, he requested that the nine witnesses, including Robison, arrive in London for the December 16 trial by December 3, or at the latest, December 5.<sup>126</sup>

This formidable legal entourage for the plaintiffs spoke to the extraordinary wealth the industrialists had at their disposal as well as to the speed with which the legal profession had expanded, professionalized, and perfected common law advocacy in the previous decade.<sup>127</sup> For example, Arkwright, despite having comparable resources to Boulton and Watt, had in 1781 not considered it necessary to embark on the same scope of pretrial preparation as his peers.<sup>128</sup> By the mid-1790s, the number of patent trials held before Common Pleas was increasing yet still negligible when compared to the bulk of the court’s purview.<sup>129</sup> As discussed, Watt was a dual expert: he had studied and developed a

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<sup>122</sup> “Letter 166” in Robinson and McKie, eds., *Partners in Science*, 239.

<sup>123</sup> “Boulton and another v. Hornblower and Another Trial Transcript,” *WC*, MS 3219/4/272/, 11-2.

<sup>124</sup> “Invoices from Ambros and James Weston to Boulton and Watt 1796-1800,” *WC*, MS 3219/4/228.

<sup>125</sup> “Watt to Robison,” November 19, 1796 Letter 167 in Robinson and McKie, eds., *Partners in Science*, 241.

<sup>126</sup> *Ibid.*

<sup>127</sup> On Watt’s wealth: Dickinson, *James Watt*, 120; Tann, “Watt, James”; Bottomley, *BPS*, 250-1, 261.

<sup>128</sup> Arkwright did come to regret this mistake as Boulton and Watt knew well; *op cit.* Chapter 2, n.93.

<sup>129</sup> It is estimated that by the mid-eighteenth century the King’s Bench was hearing on average “between 200-300 trials per term”; Oldham, *EM*, 48. In comparison, from 1750-1850 Dutton tentatively estimates that the maximum bound of patent cases heard before all three superior courts of Westminster was 22. This is clearly an undercount as Dutton relies on cases reported by B. Woodcroft’s missing unreported trials such as *Dollond v. Watkin and Smith*, yet the true number almost certainly did not exceed a single case, on average, per term; Dutton, *PIA*, 71; Gubby, *DLPP*, 20-2.

considerable mastery on patent law jurisprudence; this theoretical experience was further informed by his participation in Arkwright's patent law trials which culminated in his critical commentary of Justice Buller's ruling.<sup>130</sup> Therefore, in contrast to previous plaintiffs, Watt was equally versed on the nature of his invention and on the power and sway of expert testimony. Finally, considering how wary the ever-anxious Watt was of putting the fate of his patent before a judge and jury coupled with his long-held concerns regarding the legality of his 1769 specification, it is unsurprising that with a major trial looming no expense or effort was spared.<sup>131</sup>

Despite meticulous planning, letter records indicate that Robison only arrived in London on Sunday, December 11, and waited a day before he contacted Watt regarding the next steps of pretrial preparation.<sup>132</sup> The slow journey to London and delay in getting in touch with Watt's senior counsel were due to Robison's poor health and chronic pain, which he feared could, with or without the assistance and hindrance of opium, impact his testimony at trial. Robison hoped to be given as much freedom from Watt's counsel to tell the story of their experiments from nearly thirty years prior, writing, "should I in this manner give vent to that affection which is naturally excited by the recollection of our careless days and gay scenes in a mind not hackneyed in the bustle of life, and softened by suffering."<sup>133</sup> Robison's general concern about his ability to testify was in stark contrast to his confidence in his capacity to tell a favorable and engaging story to the jury. For the plaintiffs, this simply required him to be given "room" to reminisce and recall a naturalistic story that resonated with the jury.<sup>134</sup>

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<sup>130</sup> "Watt to Arkwright, October 27, 1785," *WC*; Robinson, "JWLP," 135.

<sup>131</sup> The trial would cost Boulton and Watt nearly £6,000; Marsden, *Watt's Perfect Engine*, 145-6.

<sup>132</sup> "Letter 168" in Robinson and McKie, eds., *Partners in Science*, 242-3.

<sup>133</sup> "Letter 168" in *Ibid*, 243.

<sup>134</sup> *Ibid*.

As expressed in correspondence with Watt and by extension Adair and the legal team, Robison was adamant that to win over the jury, his testimony had to be presented through a pathos-laden performance.<sup>135</sup> Based on this description, Robison's self-conception of the role of the expert witness was unique: he believed that the jury would view an expert witness as a conveyor of opinions, presented through an objective and dispassionate frame, and their opinions would be interpreted as incontrovertible fact. In order to properly convey his expansive story, Robison contended that the expert witness had to be above all relatable through his passion and narrative flair. Of the expert witnesses examined in detail, the persuasiveness of men such as Bryan Higgins, John Smeaton, John Immison, and Samuel Moore lay precisely in their capacity to make their opinions resemble fact. The jury was told that their testimony was informed by subject matter expertise and was unaffected by the interests of their clients. For example, Immison simply and coldly explained to the jury that a beating hammer had no place in the production of cotton, just as it was Smeaton's discipline and background that, in the mind of Mansfield, allowed him to justly present an authoritative opinion on the nature of harbors.<sup>136</sup>

However, Robison contended that it is the lawyers who he "fears" with their "forensic tastes" that will put off a jury as "their habits have worn off from their minds the feelings of common life."<sup>137</sup> It is not the barrister but rather the expert witness who Robison believed "would have a better effect on persons of an ordinary way of thinking and feeling."<sup>138</sup> Through this reversal, Robison considered himself more akin to a lay fact-based witness whose recounting of past events would emotionally resonate with the jury rather than the traditional expert witness, whose pedigree and subject matter mastery must persuade the jury

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<sup>135</sup> "Letter 168" in Robinson and McKie, eds., *Partners in Science*, 143; Also see letters 164, 167, 169, 170, 171.

<sup>136</sup> See Chapter 4, 204-7; Roscoe, *Reports*, vol. III, 159.

<sup>137</sup> "Letter 168" in Robinson and McKie, eds., *Partners in Science*, 243.

<sup>138</sup> *Ibid.*

to defer to their knowledge. For all of Robison's commentary on the nature of persuasive witness testimony he ultimately conceded to do as Serjeant Adair and his legal team thought best.<sup>139</sup>

The trial, formally known as *Boulton and Watt v. Hornblower and Maberley*, was held at Guildhall in the City of London on December 16, 1796, before a special merchant jury with Chief Justice of Common Pleas James Eyre presiding.<sup>140</sup> The 62-year-old judge was, as Watt wrote soon after the trial, in poor health, "and requested that the trial might be shortened."<sup>141</sup> To appease Justice Eyre and with Watt's blessing, his counsel omitted Robison and Roebuck from their roster of planned expert witnesses.<sup>142</sup> Watt specifically cited Robison's poor health on the day of the trial as his motivation. Yet, this rationale provided to a mutual friend is unlikely to be a full and transparent admission of the motivations for striking Robison after such effort, expense, and ingratiating outreach. Perhaps it was Robison's strong view on how he ought to testify, in conjunction with his uncertain mental state, that made striking him a safe choice. With this decision made early in the trial, Adair proceeded as planned, and following his opening statement, the patent was read in full to the jury.<sup>143</sup> Justice Eyre interjected with his own context and analysis stated that Watt's patent is specifically for the "lessening" of fuel and steam used in steam engines and that considering its use is not material to the trial.<sup>144</sup> Therefore, the jury must understand that if Watt's patent is valid then all others are "prohibited from using it [Watt's steam engine]."<sup>145</sup> Watt's 1769 patent broadly emphasized the principles that enabled a separate condenser, alternatively

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<sup>139</sup> "Letter 168" in Robinson and McKie, eds., *Partners in Science*, 243.

<sup>140</sup> "Watt v. Hornblower Trial Transcript," 1.

<sup>141</sup> James Watt to Joseph Black, January 15, 1797, Letter 176 in Robinson and McKie, eds., *Partners in Science*, 262-3.

<sup>142</sup> *Ibid.*

<sup>143</sup> "Watt v. Hornblower Trial Transcript," 1-52.

<sup>144</sup> *Ibid.*, 52-3.

<sup>145</sup> *Ibid.*

referred to as a “steam vessel” or “cylinder,” to function.<sup>146</sup> As a result, the task for Boulton and Watt’s counsel was as follows:

Firstly, they argued that the specification provided enough detail that any competent mechanic could conceivably build a working model based on the language of Watt’s specification.<sup>147</sup> This had the twofold effect. Firstly, it rendered Watt’s patent to encompass a patentable method rather than merely an unpatentable principle of nature and showcased that the patent was indeed meaningfully instructive and complied with post *Liardet v. Johnson* precedent. Secondly, Adair went through great lengths to emphasize the genius and importance of Watt’s invention, which, most importantly, Watt was the sole inventor.<sup>148</sup> This deliberate act of mythologies—showcasing the creative genius of Watt in particular—was expressed in Adair’s opening lines to the courtroom:

May it please your lordship—Gentlemen of the Jury—In this case I have the honor of addressing you as counsel for Misters Boulton and Watt—names with which it is impossible to suppose any Gentleman of your consideration and situation in life are unacquainted—and it is equally impossible to suppose that you should be unacquainted with the general nature of the very valuable discovery to the public as well as to the proprietors with is the subject of this present action.<sup>149</sup>

Adair’s not-so-subtle suggestion to the jury was that it was common knowledge, irrespective of what happened in court, that Watt had perfected the steam engine, which they all ought to know as an invention of unmatched importance to the realm. It is probable that the courtroom

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<sup>146</sup> “Watt’s patent,” Appendix I. b.

<sup>147</sup> See summary of opening statement in “Watt v. Hornblower Trial Transcript,” 35-52.

<sup>148</sup> *Ibid*; Davenport, *James Watt and the Patent System*, 33-4.

<sup>149</sup> “Watt v. Hornblower Trial Transcript,” 1.

and specifically patent law trials, with their formal requirement for original invention, helped stoke the early refashioning of the inventor as a heroic figure.<sup>150</sup> This myth making was deeply premeditated and a key reason for Watt's persistent insistence that the trial be held before a commercial jury, this is, merchant men of the city of London who most likely knew of his invention and unlike mine owners of Cornwall or Birmingham, were far less likely to have animosity towards him, mostly due to the licensing fees he and Boulton charged. Regardless of who comprised the jury, as was required, Watt and Boulton covered the cost of paying a stipend to its members.<sup>151</sup>

Thirdly and finally, Watt's counsel pointed to specific discrete elements of Watt's patent and asserted that they were blatantly stolen by Hornblower and Maberley.<sup>152</sup> This alleged theft by Hornblower and Maberley supposedly occurred after their failed attempts to improve Newcomen's engine without Watt's separate condenser. In their aim to make Watt's specification appear as instructive as possible, a number of the witnesses called on behalf of the prosecution spoke specifically to principle seven as outlined in Watt's patent specification because it described specific materials Watt might use to render his engine "air and steam-tight."<sup>153</sup> The likely aim behind this extensive testimony on principle seven was to suggest to the jury that the whole of Watt's patent specification was of exemplary detail, even specifying possible lubricants and sealants.<sup>154</sup> This was met with cross-examination largely asserting that the relative proportions between the component parts of Watt's engine (all unspecified in the patent) was not general trade knowledge available to the average

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<sup>150</sup> A process that began in earnest after Watt's death; *op. cit.* 1.

<sup>151</sup> As James Watt wrote to Thomas Wilson in the lead up to this trial "War are plaintiffs and shall have a special jury Captain Morcom should not sell the bear skin till he has killed the beast, to be certain of setting our patent aside is rather too bold, we have good reason to hope the contrary" quotes in Gubby, *DLPP*, 25.

<sup>152</sup> "Watt v. Hornblower Trial Transcript," 90-100.

<sup>153</sup> *Ibid.*; Expert witnesses whose testimony touched on this issue included the eminent continental natural philosophers Jean-André Deluc and William Herschel.

<sup>154</sup> "Watt's patent specification," Appendix I. b.

engineer.<sup>155</sup> Adair continued his defense of Watt's patent undeterred and called an optician, identified only as Mr. Ramsden in the trial transcript, to the stand. This expert witness was most likely Jesse Ramsden, FRS, a continentally remounted scientific instrument maker. Ramsden's meticulously executed designs for a dividing engine allowed for the construction of unprecedentedly precise astronomical instruments.<sup>156</sup> His success was such that he received a grant from the Commissioners of Longitude for the further production of his sextants as well as the disclosure of his method.<sup>157</sup> Additionally, Ramsden had previous involvement with both Boulton and Watt in assisting in the construction of a steam engine for the King of Naples.<sup>158</sup> This deal was coordinated between all the interested parties by Sarah Ramsden, previously Sarah Dollond, daughter of the refracting telescope dynasty.<sup>159</sup>

Identifying himself as an optician, Ramsden was instructed by friendly counsel to re-read Watt's specification, most likely to further bolster Watt's claim that any reasonable engineer would be able to derive the appropriate ratios of the engine based solely on the principles as outlined in Watt's patent.<sup>160</sup> This point, however, was interrupted by Serjeant Le Blanc, lead barrister for the defense, who, following the re-reading of the specification, interjected and specifically asked to halt the testimony of Ramsden in favor of calling Robison to the stand. Le Blanc's rationale appeared to be rooted in the fact that Robison was visibly ill and, as a witness, it would be prudent to call him "at this present stage of the Cause."<sup>161</sup> The trial transcript notes no objection from the plaintiffs or additional comments

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<sup>155</sup> "Watt's patent specification," Appendix I. b.

<sup>156</sup> Gee, *WDTC*, 227.

<sup>157</sup> Allan Chapman, "Ramsden, Jesse (1735–1800), maker of scientific instruments." *ODNB*; his work amounted to an astonishing 600% improvement in accuracy: Gee, *WDTC*, 277.

<sup>158</sup> Chapman, "Ramsden, Jesse".

<sup>159</sup> *Ibid*; Gee, *WDTC*, 226-7.

<sup>160</sup> "Watt v. Hornblower Trial Transcript," 104.

<sup>161</sup> *Ibid*, 105.

from Justice Eyre; therefore, he must have agreed to have Robison promptly sworn in and examined first by Le Blanc.

Le Blanc had effectively halted the momentum of the plaintiffs' case, and, most notably, during the plaintiffs' presentation of their evidence, was able to examine Robison first, even though Robison was not a witness for the defense. If the aim was to catch Robison off-balance and unprepared to testify, it was unsuccessful. The main thrust of Le Blanc's approach was to tease out that Robison had been sworn to secrecy years before the filing of the patent. Following an introduction in which Robison enthusiastically asserted he had "been acquainted with Mr. Watt ever since the very beginning of his invention and [I] assisted in almost every experiment that was made."<sup>162</sup> Le Blanc pressed Robison, no less than four times, as to whether Watt had instructed Robison to keep the precise method of piston packing a secret.<sup>163</sup> Each time Robison gave an emphatic answer in the negative, his statement was cut off by Le Blanc, who rephrased and asked again.<sup>164</sup> This cross-examination in everything but official designation was evidently premeditated by Le Blanc, who referred to specific lectures Robison had given on Watt's patent in which, Le Blanc emphasized, Robison himself claimed he could provide no details on the precise construction of the separate condenser because "it was a secret."<sup>165</sup> Le Blanc's strategy was clear: in this dynamic confrontation before the jury, Robison, a man who should have been privileged to the earliest experiments necessary for the construction of the steam engine—someone who in their own words was there for "almost every" aspect of its initial construction—could not reveal the precise construction of the cylinder.<sup>166</sup> What Robison did not know, or whether he was sworn to secrecy, was material, as following the publication of Watt's patent, under

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<sup>162</sup> "Watt v. Hornblower Trial Transcript," 105.

<sup>163</sup> *Ibid.*, 107.

<sup>164</sup> *Ibid.*

<sup>165</sup> *Ibid.*; It is not clear if Le Blanc submitted copies of the lecture in question to the court for their review.

<sup>166</sup> *Ibid.*, 105.

formal patent protection, Watt had surrendered the privilege to work in secret. Yet the cylinder's internal mechanism, nearly 30 years later, was still unknown to the general public, including Robison's students.

In response, Robison affirmed that "I never considered that [the construction of the condenser] as any secret" and stated that he did not know the details of "the most perfect manner" in which Watt came to execute his engine in the following decade.<sup>167</sup> This Robison explained was not something he ought to know, as he was not a stakeholder in Watt's patent. Similar to Samuel Moore, Robison was confronted with the complex challenge of asserting his expertise and fulfilling his role as a partisan expert witness paid to assist in the vindication of his clients' and friends' case. This meant that despite having just testified his close hand in helping to develop the steam engine (a statement indicative of his expertise) Robison, when pressured under oath, conceded to gaps in his knowledge as it pertained to the precise construction of the separate condenser.<sup>168</sup>

Core to the function and success in the courtroom of the expert witness is the confident presentation of scientific opinion. Yet in practice, the expert witness would often be encouraged to admit to a lack of precise knowledge; this might be to keep their client's invention secret or to emphasize a deficient patent specification. Of course, when it came to the testimony of generalized natural philosophers such as Darwin, Moore or Robison, these gaps in knowledge may very well have been genuine as they were more figures of epistemic authority than working engineers. Moreover, the witness stand was a confined, high-pressure, and in theory, oath-bound area in which deflection could only be maintained for so long. Under Le Blanc's repeated question, Robison eventually conceded that at the time of the experiment, Watt desired "to keep the whole [invention] secret."<sup>169</sup> However, Robison

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<sup>167</sup> "Watt v. Hornblower Trial Transcript," 106.

<sup>168</sup> On Samuel Moore see discussion of *Rex v. Arkwright*, 201-8.

<sup>169</sup> "Watt v. Hornblower Trial Transcript," 105.

recognized the dangers of this admission and reaffirmed that this was before the filing of the patent.<sup>170</sup> With this natural setup provided by Robison, Le Blanc inquired if, in the time since, Watt had instructed him to conceal any parts of his patent. In response, Robison demurred, stating that since they first met in 1764, “many things” had been discussed which ought not to be shared with the public.<sup>171</sup> Satisfied with this admission, Le Blanc soon surrendered the witness.

The combined effectiveness of forcing Robison to concede a lack of specific knowledge regarding the condenser’s connection and admit to keeping experimental details secret was soon overshadowed by a dramatic friendly examination led for the plaintiff by Mr. Rous.<sup>172</sup> Demonstrating a familiarity the barristers had so rapidly developed in examining expert witnesses, Rous began his questioning of Robison and returned to the matter consistently emphasized by Watt during pretrial preparation: if in Robison’s judgment the specification alone was sufficient to instruct anyone acquainted with Newcomen’s engine on how to construct Watt’s improvements.<sup>173</sup> Robison responded with an emphatic affirmative, which crucially emphasized that the patent specification would be to “any person acquainted with the principle and management of Newcomen engine.”<sup>174</sup> This is an essential clarification as Watt’s counsel maintained throughout their patent law disputes that their patent specification was “certainly not obliged to teach any blockhead in the notion to construct master engines.”<sup>175</sup> Rather, the standard of patent intelligibility ought to only apply to a

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<sup>170</sup> “Watt v. Hornblower Trial Transcript,”.

<sup>171</sup> *Ibid.*, 105-6.

<sup>172</sup> *Ibid.*, 106. The trial transcript identifies Rous as leading the “cross examination” of Robison. This attribution by Gurney is likely due to the fact that Le Blanc, during the plaintiff’s presentation of the evidence, called Robison to the stand. Yet, Rous was one of the trial attorneys employed by Watt and thus this was not a cross-examination as Robison was a friendly witness.

<sup>173</sup> *Ibid.*

<sup>174</sup> *Ibid.*

<sup>175</sup> Serjeant James Adair during previous common law patent trial *Boulton and Watt v. Bull* (June 24, 1794) quoted in Davenport, *James Watt and the Patent System* (British Library, 1989), 28.

“reasonable” mechanic.<sup>176</sup> The details then rested upon persuading the judge and jury just how knowledgeable a mechanic needs to be.

With this in mind, Rous followed up by asking Robison if “anything occurred in your experience to convince you that you have formed a right judgment” that this specification is instructive to most mechanics.<sup>177</sup> This was a direct invitation for Robison to demonstrate to the court his experience, skill, and personal knowledge not just of Watt’s engine in the experimental phases of its development but also its practical usage. With the groundwork well laid, Robison launched into a lengthy and colorful story, just as he had planned pretrial, in which he showed the interpretability of the specification.<sup>178</sup>

Robison described how, in 1770, he began teaching at the Imperial Academy of Marines in Russia. During this time, the docks near his employer-provided home were being drained by two windmills. Robison, struck by the extraordinary cost and inefficiency of this operation, informed the heads of the Admiralty College that they should build a steam engine that could drain the docks more cost-effectively and efficiently. Importantly, Robison emphasized how he wrote to Watt asking for the construction of an engine for this purpose. However, Watt delegated the tasks fully to Robison and his Russian employers, believing, as Robison told the court, they were fully capable of constructing a working engine similar to Watt’s design. This element of Robison’s extended story was of legal importance as he both received permission to proceed with the construction of an engine and, more pertinently, did not receive any additional information, such as more detailed technical drawings from Watt on how to construct an engine with a separate condenser. Robison described how he received an “official report” on Watt’s invention and read it aloud to a Russian “gentleman of science”

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<sup>176</sup> This argument foreshadows the development of the reasonable man construct in common law. *Vaughan v. Menlove* (1837).

<sup>177</sup> “Watt v. Hornblower Trial Transcript,” 106.

<sup>178</sup> The following testimony spans: *Ibid*, 107-9.

referred to as Mr. Model.<sup>179</sup> According to Robison, upon hearing this description of Watt's invention, "the gentleman immediately made a sketch upon the paper."<sup>180</sup> Robison produced the sketch and informed the court that:

I have that sketch here and I submit that it is an instructive sketch of Mr. Watt's engine – it happens to be preserved in – consequence of being drawn upon the back of an official report I received that morning and have kept it as a great curiosity.<sup>181</sup>

No objection was made to the spontaneous and unexpected dissemination of an alleged drawing made over 26 years before Robison's day in court.<sup>182</sup> Moreover, this illustration, suddenly produced from Robison's pocket into the hands of the judge and jury, was not simply a new style steam engine but a steam engine with a separate condenser similar in form to Watt's patented invention. As previously seen and analyzed, evidence and material for the jury to consider were discussed during the pretrial pleading phase. This was the case during the trials concerning the Dollond refracting telescope patent, in which the opinion-laden testimony of opticians was never introduced in court.<sup>183</sup> Similarly, Smeaton's report was provided to the jury weeks preceding the trial and was still successfully challenged on evidentiary grounds during the July 25, 1782 assize trial.<sup>184</sup> Yet, the common law courts, perhaps due to their rapid growth and ever-expanding caseload and jurisdiction during the latter half of the eighteenth century, could be a place that was governed more by norms and the whims of the presiding judges rather than the strict black letter of existing procedure.

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<sup>179</sup> "Watt v. Hornblower Trial Transcript," 108.

<sup>180</sup> *Ibid.*

<sup>181</sup> *Ibid.*

<sup>182</sup> *Ibid.*

<sup>183</sup> "The Several Answer of James Champneys, William Eastland and Christopher Stedman, Defendants to the Bill of Complaint of Peter Dollond, Complainant, 29th October 1765" Quoted in Gee, *WDTC*, 176-89.

<sup>184</sup> "Arguments of Counsel," MS 486, *NRO*, 57-8.

Indeed, Justice Eyre seemed more interested in whether the illustration contained a representation of a separate condenser and if it was used to make a working model.<sup>185</sup> It may be inferred that for Justice Eyre, the drawing was material so long as it pertained to the specific disputed elements of the specification, mainly the presence of a secondary condenser. Like Loughborough and Mansfield before him, it seemed that to Justice Eyre it was not conceivable to contradict the word and story of a gentleman and esteemed professor of natural philosophy such as Robison.<sup>186</sup> So, with the providence of the illustration left untouched by the court, Robison continued and conceded that although no model was ultimately built by Mr Model, the separate condenser was depicted in the illustration.<sup>187</sup> Moreover, as emphasized by Rous through careful questioning, the official description used by Mr. Model to render this illustration in question was emphatically affirmed by Robison as even less revealing than Watts' 1769 patent, thereby furthering the case that said specification ought to be more than sufficient.<sup>188</sup>

### **Watt and Robison's Self-Assessment of Their Victory at Trial**

Robison's unusual testimony proved effective as the jury swiftly and unanimously found in Watt's favor. Watt, himself, assigned considerable credit to Robison's testimony and the surprise illustration wrote that it "had considerable effect in convincing the judge and the jury how few hints were necessary to enable a man of mechanical knowledge to execute the invention."<sup>189</sup> Yet, Watt further demonstrated his autodidact legal education when he conceded to the overall peculiarity of the court's decision to include Robison's evidence, describing in a letter about a month following the conclusion of the trial, "I believe this [illustration] was not strictly legal evidence, but the court permitted it, and the force of truth

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<sup>185</sup> "Watt v. Hornblower Trial Transcript," 109.

<sup>186</sup> Golan, *Law of Men*, 50-1.

<sup>187</sup> "Watt v. Hornblower Trial Transcript," 109.

<sup>188</sup> *Ibid.*

<sup>189</sup> Letter 176" in Robinson and McKie, eds., *Partners in Science*, 163.

is great, even when against law.”<sup>190</sup> Watt was content to accept that the court had justly bent the letter of the law in his favor due to his predetermined and, as far as Watt was concerned, obvious connection in the enforcing and securing of his long-held patent, and took the victory in stride. More generally, following the loss of Arkwright’s patent before the common law courts and Watt’s numerous failed attempts to push towards patent law reform, it is clear that when it came to the protection of inventions and the court’s ability to interpret complex inventions, Watt was deeply skeptical.<sup>191</sup> The trial transcript nor the associated materials held at the Boulton and Watt collection in Birmingham do not provide any material insights as to why the experienced advocate Serjeant Le Blanc interrupted the plaintiffs’ counsel to call Robison to the stand, yet did not challenge the veracity of the evidence provided. Perhaps Le Blanc feared that to openly be seen as attacking the honor and integrity of Robison would backfire with both the judge and the jury. Alternatively, Le Blanc knew that regardless of the outcome of the trial, the losing side always intended to file for a writ of error. Indeed, following the verdict, this is precisely what Le Blanc did with the proceeding for the possible writ of error beginning on January 26, 1797.<sup>192</sup> The writ was not granted until early February of 1797, and with it, the enforceability of Watt’s patent specification returned to a legal limbo: a process that would not be settled until a King’s Bench ruling in January of 1799.<sup>193</sup>

Robison was delighted with both the trial’s outcome and his effective performance on the stand. In the weeks following the trial he wrote to Watt Jr. a draft version of his summary of the trial proceedings to be published as an advertisement.<sup>194</sup> Robison wrote to Watt Jr.

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<sup>190</sup> Letter 176 in “Letter 168” in Robinson and McKie, eds., *Partners in Science*, 163.

<sup>191</sup> Letters from James Watt to Richard Arkwright, April 4, 1785, April 11, 1785, October 11, 1785, and October 27, 1785, *WC*; “Watt’s proposals for patent law reform” in Davenport, *James Watt and the Patent System*, 22-5; Robinson, “JWLP,” 115-39.

<sup>192</sup> “Writ of Error” quoted in Davenport, *James Watt and the Patent System*, 34.

<sup>193</sup> Davenport, *James Watt and the Patent System*, 35-7; For the full summary of the Justices opinions see: James P. Muirhead, *The Origin and Progress of the Mechanical Inventions of James Watt*, vol. III (John Murrar, 1854) 252-72.

<sup>194</sup> “Robison to James Watt Jr. December 27, 1796 Letter 169” in Robinson and McKie, eds., *Partners in Science*, 224-48.

stating, “I am sorry for having undertaken the proposed intimation of your victory to the public” and signed his letter “yours in great truth.”<sup>195</sup> Robison proceeded to include his dramatic recounting of the trial events commenting on the “most able manner in which Serjeant Adair oversaw the trial” as well as the “impartiality and a complete knowledge of a very abstruse and difficult subject” as demonstrated by Justice Eyre much to his “infinite honor.”<sup>196</sup> Robison’s praise was similarly extended to “astuteness,” “perspicuity,” and “dexterity” in which Serjeant Le Blanc managed the cause for the defendants.<sup>197</sup> Most notable about his summary is that Robison did not include an explicit reference to himself, yet spent numerous lengthy clauses triumphantly describing the quality and explicit expertise of the witnesses called by Watt’s legal team:

[Who provided a] body of the most respectable evidence witnesses to prove the superabundance of information sufficiency of the specification...gentlemen eminent for their physical knowledge, and the most reputable engineers and even had workmen, who all declared the specification to be fully adequate to the communication of the necessary instruction.<sup>198</sup>

This high praise was contrasted by the quality of the defenses’ experts, who “called themselves engineers” and claimed to possess familiarity with steam engines.<sup>199</sup> Yet to Robison’s explicit shock they could not make sense of Watt’s specification. As forcibly articulated by Robison, to be an expert witness speaking out against the intelligibility of

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<sup>195</sup> “Letter 169” in Robinson and McKie, eds., *Partners in Science*, 224.

<sup>196</sup> *Ibid.*, 245-6

<sup>197</sup> *Ibid.*, 246.

<sup>198</sup> *Ibid.*, 245.

<sup>199</sup> *Ibid.*, 246.

Watt's patent specification revealed that said individual was not in fact an expert or skilled engineer at all.

Finally, Robison concluded his suggested advertisement by linking Boulton and Watt's commercial and scientific success to the glory and "natural superiority" of England.<sup>200</sup> Here, the patent is framed as an essential element of protection from international industrial espionage and the ability of English workmen to interpret Watt's patent is a further benefit to the country wrote:

We were happy in observing the evidence given that this trial such proof of the skill and philosophical information of our practical engineers that we need not fear that any efforts of British genius will ever be lost for want of hands fully able to execute its most difficult projects...by which the almost unparalleled energy of this highly favored country... may be still farther exhibited to the admiration of the surrounding nations.<sup>201</sup>

This jingoist appeal did not sit in the abstract. Less than two months before the trial, on October 5, 1796, following a lengthy British blockade of the Iberian Peninsula, Spain was pressed by its French allies into provoking war with Britain. This in turn further complicated the global warfare that backdropped the final quarter of the eighteenth century.<sup>202</sup> This conflict was an essential part of The War of the First Coalition (1792-1797) and the prolonged series of conflicts against a revolutionary France had, in effect, due to early British military blunders, become a war primarily of espionage, arms funding and funneling.<sup>203</sup>

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<sup>200</sup> "Letter 169" in Robinson and McKie, eds., *Partners in Science*, 247.

<sup>201</sup> Ibid.

<sup>202</sup> Anthony McFarlane, *War and Independence In Spanish America* (Routledge, 2014), 28.

<sup>203</sup> Boyd Hilton, *A Mad, Bad & Dangerous People* (Clarendon Press, 2006), 82-91.

Robison, in a time of great industrial acceleration and war, sought to remind the public of the credit such gentlemen of knowledge do for their country. A patent, as Watt, Arkwright, and the Dollonds had previously argued, was not simply *carte blanche* to institute a monopoly but the just desserts of pioneering men of science.<sup>204</sup> Of course, Robison was careful not to mention how a Russian engineer came to understand the total of Watt's work based on the simplest of generalized descriptions. An additional wrinkle to Robison's nationalistic frame was the fact that among Watt's esteemed lineup of natural philosophers serving as expert witness were polymaths John Andrew De Luc and William Herschel both continental Europeans expatriates hailing from Geneva and Hanover respectively.<sup>205</sup> The expert witness remained ever marred in paradox and contradiction as Robison had during the trial successfully argued, as the law required, that Watt's specification was readily intelligible to practically any engineer. Yet, outside the courtroom, Robison trumpeted the unimpeachable and lofty genius of Boulton, Watt and the many philosophers and practical engineers present at trial.

In practice, Robison's lofty claims and purple prose never made it past Watt's lawyers or newspaper editors. In the suggested edits returned to Robison, his four-page summary was reduced to four short, dispassionate fact-based paragraphs.<sup>206</sup> Following the work of the newspaper editor the expert witnesses called by Watt retained the smallest semblance of rhetorical puffery, as they were simply described as "most respectable" of witnesses.<sup>207</sup>

### **Conclusion**

Whatever he may have believed, Robison's credibility on the stand relied on his reputation as a gentleman of knowledge when he introduced to the court what was in fact an

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<sup>204</sup> MacLeod, *IIR*, 182-4, 196-200; Bottomley, *BPS*, 203-4, 264.

<sup>205</sup> Theodore S. Feldman, "Deluc, Jean-André" (2013); Michael Hoskin, "Herschel, William," *ODNB* (2008).

<sup>206</sup> "Letter 169" in Robinson and McKie, eds., *Partners in Science*, 247-8.

<sup>207</sup> *Ibid*, 248.

extreme form of hearsay. This was true even by the evidentiary standards of the 1790s in which the rules of evidence, still in their relative infancy, had yet to formally consolidate into a robust, predictable and binding body of law.<sup>208</sup> Yet the eighteenth century was a period of legal consolidation, as legal writers and judges placed increasing emphasis on evidentiary practices. Geoffrey Gilbert's *The Law of Evidence* predominantly focused on the role of written evidence and articulated the "best evidence rule."<sup>209</sup> First published in 1754, *The Laws of Evidence* went through seven runs of publication and became the most popular volume on evidence during the eighteenth century.<sup>210</sup> This overriding principle throughout procedural law stated that the best, that is most visible, form of documentary evidence ought to be used.<sup>211</sup> Emphasis was to be placed on original documentation and forms of authentication such as seals and signatures; Gilbert's short treatment of hearsay focused on the fact that the alleged provider of the statement was not present in court to confirm their statements under oath.<sup>212</sup> Gilbert's outlines on the rule of evidence were closely followed by eighteenth-century treatises on evidence such as Henry Bathurst's, *The Theory of Evidence*.<sup>213</sup> As John Langbein has demonstrated, some judges such as Sir Dudley Ryder (1754-1756) in practice consider Gilbert's suggestion with great care, and standards of evidence—and their admissibility in court—were key foci of interest in the courtroom.<sup>214</sup> As we have seen, Mansfield issued a number rulings on the admissibility of expert evidence, while Justice Gould objected to Smeaton's testimony on evidentiary grounds.<sup>215</sup>

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<sup>208</sup> John H. Langbein, "Historical Foundations of the Law of Evidence" *Columbia Law Review* 96 (1996), 1170; Development was gradual: John H. Wigmore, "The History of the Hearsay Rule" *Harvard Law Review* (1904), 437-58.

<sup>209</sup> Gilbert, *The Law of Evidence*. For more analysis on Gilbert's views, see: Chapter 3, 175-6.

<sup>210</sup> Ibid, Langbein, "Historical Foundations of the Law of Evidence," 1172-3; Thomas P. Gallanis, "The rise of modern evidence law," *Iowa Law Review* 84 (1998), 505-16.

<sup>211</sup> Langbein, "Historical Foundations," 1173-4.

<sup>212</sup> Gilbert, *The Law of Evidence*, 108.

<sup>213</sup> Henry Bathurst, *The Theory of Evidence* (Dick's Coffee-House, 1761)

<sup>214</sup> Langbein, "Historical Foundations of the Law of Evidence," 1168-202.

<sup>215</sup> Oldham, *EM*, 64-6.

The court's acceptance of Robison's letter without either the testimony of its author Mr. Model or an effort to verify the illustration's authenticity, complicates a neat Whiggish narrative of gradual and consistent progression towards a recognizable law of evidence. The court remained a deeply idiosyncratic forum for adjudication in which procedure or norms, within limits, did not always apply. Watt, as a practiced expert witness, commentator and substantive expert on patent law, and a vested patent holder, recognized these limits and consciously and effectively attempted to steer the verdict in his favor—as was his legal right. Robison, as an expert witness and a renowned professor of natural philosophy, loomed large and central in Watt's plans although his testimony proved disruptive and helpful in equal measures. Indeed, as has been examined by David Philip Miller, Watt's strategy at trial specifically hung on constructing a particular category of person of skill whom the patent was intended for, as Watt himself was a "philosopher" and had written the specification not for "blockheads" but also for philosophers.<sup>216</sup> Here, the status of Watt's patent, and with it his ability to wield the accusation pirate as a legally vindicated category against his rivals, hung on the performance and perceived credibility of the ailing professor. Yet this prescribed role Robison was selected to fill was in practice less stable than Watt hoped it to be, a matter only exacerbated by Robison's own personal qualities and relationship with Watt. To be sure, Watt never intended or foresaw the introduction of Robison's alleged illustration nor expected it to be permitted by Justice Eyre. Yet to introduce an expert witness to the stand, with their highly technical testimony, was to create the risk that the standard operations of a trial court could be bent and pushed by an additional figure of authority.

In summary, this chapter has functioned not just as a continued examination of the ever-growing role of the expert witness in patent law disputes but as a comprehensive picture of the complex personal, social and legal landscape that surrounded the patent trial process.

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<sup>216</sup> Miller, "Watt in Court," 50, 69-70.

The technical complexities of filing for and defending a patent was a high wire act between legal demands, industrial interest, and the unsettled nature of invention that had to be resolved into a favorable and coherent story at trial. This task demanded a person who was both technically proficient and possessed generalized authority. As such, it is only with this determinative background in mind that one can make sense of the immense effort which Watt undertook to convince Robison to testify. It was Watt's own experience as an expert witness and legal commentator that explained his skepticism towards enforcing his patent through a common law trial. The resulting trial proved to be as unpredictable as Watt had feared; it just so happened that it was Watt's own expert witness that introduced what ultimately proved to be a favorable form of disruption.

## Conclusion

### The Evolving Role of the Early Expert Witness and the “Industrial Enlightenment”

This project’s detailed re-examination of this transitional period prior to the mass participation of the expert witness during the nineteenth century has revealed a rich history that has previously received only passing attention.<sup>1</sup> The four decades covered in this thesis tell a distinct story regarding the character, conduct, and development of the expert witness, who was a unique creation of the legal, intellectual, and socio-political conditions of the late eighteenth century.<sup>2</sup> As such, the early expert was as much a product of specific changes to the particular operation of the English common law courts as orchestrated by the jurisprudential ideals of particular judges, most notably Mansfield, as it was facilitated by broader legal, cultural, economic and intellectual forces.

Due to the unique questions of technological propriety and disciplinary norms patent trials required the court to contend with, patent law proved to be the specific forum that welcomed the testimony of the expert witness. From the perspective of inventors, common law clarification on the scope and rules which governed the letter patent was essential because, as recently as 1750, the enforcement and management of these royal grants was a sequestered practice governed by the whims of the Lord Chancellor. Resultantly, litigants placed pressure on the common law courts to stabilize the ambiguities of patent law, a need which itself reflected the explosion of innovative activity that occurred during the latter half of the eighteenth century.<sup>3</sup> As Joel Mokyr has argued, it was the communication and cross-

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<sup>1</sup> Golan mentions these patent trials in passing; Golan, *Laws*, 42; On the nineteenth century expert witness: *op. cit.*, Introduction n.5, 2.

<sup>2</sup> Peter M. Jones, *Industrial Enlightenment* (Manchester University Press, 2008); Joel Mokyr, *The Enlightened Economy* (Yale University Press, 2009); Roy S. Porter, “England” in *Encyclopedia of the Enlightenment* (Oxford University Press, 2002).

<sup>3</sup> Gubby, *DLPP*, 14-9.

pollination between natural philosophers and their theories of knowledge with manufacturers that enabled the Industrial Revolution, or to use Mokyr's terminology—which reflects his thesis—the Industrial Enlightenment.<sup>4</sup> To historians of the British Industrial Revolution, particularly those interested in the flow of ideas, such as Mokyr, MacLeod, Michele Boldrin, and David Levine, the English patent system is fundamentally defined by its dysfunction and ultimate marginality, if not a limiting factor, in the story of England's industrialization.<sup>5</sup> Pointing to the prohibitive cost of filing for a patent, the arbitrary and similarly expensive nature of litigation, such historians, but Mokyr in particular, look beyond the patent system when attempting to understand the primary causes and facilitators of Britain's process of industrialization.

However, to do so is, as we have seen, to miss a dynamic and essential realm of both knowledge transmission and construction. Paradoxically, for a system designed to protect an inventor's workings, the nature of litigation forced the extensive examination of the true workings of an invention. The expert witness and their increasing professionalization and skill lay at the heart of these presentations. During the early patent trials of Arkwright, workmen such as Thomas Bell and J. Barnes divulged key mechanical facts, such as the necessary use of weights in order to solve the “spinning problem.”<sup>6</sup> Such unforced errors from the perspective of the industrialist would not be repeated again especially under the watchful and fully engaged eye of James Watt. Even Watt who was comparatively successful in using his prolonged monopoly to cut off competitors, struggled to prevail at trial and only

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<sup>4</sup> Generally see: Joel Mokyr, “Enlightenment and Economy” and “Useful knowledge and Technology” in *The Enlightened Economy* (London: Yale University Press, 2009), 30-62; Mokyr “The Enlightenment an Economic Change” in *A Culture of Growth: The Origins of the Modern Economy* (Oxford: Princeton University Press, 2016) 267-86.

<sup>5</sup> Mokyr, *The Enlightened Economy*, 92-5, 410; Joel Mokyr, *The Gifts of Athena: Historical Origins of the Knowledge Economy* (Princeton University Press, 2005), 295-6; MacLeod, *IIR*, 115-43; Michele Boldrin and David K. Levine, *Against Intellectual Monopoly* (Cambridge: Cambridge University Press, 2008)

<sup>6</sup> Oldham, *MM*, 763-5.

achieved approximately 25% of the market on steam engines.<sup>7</sup> Moreover, once in the courtroom the fate of Watt's patent empire rested fully in the hands of his experts, council and ultimately the jury. As demonstrated throughout this thesis, although the common law courts could be far more consistent regarding patent law jurisprudence than traditionally thought, prevailing at trial was closely intertwined with the perceived skill, competence, persuasiveness and trustworthiness of expert witness.<sup>8</sup> Evidently, it was this very testimony which came to define the patent law trial during the final decades of the eighteenth century.

Here, the testimony of the expert witness loomed large as they both defended and attacked the relevant inventor, as they continually asserted their status as authoritative "gentlemen of science." This thesis has explained the factors which lead to said expert witness emergence and shown the complications implicated in maintaining one's credibility as well as functioning as an effective partisan witness. Taken together it is evident that both the expert witness and the patent trials they participated in remain a fruitful area of study for historians of divergent interests. For it is during the intensity of trial that questions of knowledge, authority, invention, property, performance and epistemology, just to name a few, present themselves.

### **The Impetus for the Informal Acceptance of Expert Testimony Adjudicating the Patent Specification**

Originally, in the wake of common law's full inheritance of patent law jurisdiction from the Privy Council, the common law courts resisted hearing the testimony of persons of skill. Instead, during the Dolland telescope disputes of the 1760s, the court, under the supervision of Mansfield during his early tenure as chief justice, ruled only on the fact-intensive question of originality and restricted the record to testimony specifically related to

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<sup>7</sup> John Kanefsky and John Robey, "Steam Engines in 18th-Century Britain," *Technology and Culture* 21, no. 2 (1980), 161-86.

<sup>8</sup> On this traditional view: MacLeod, *IIR*, 58, Dutton, *PIA*, 79.

intellectual priority.<sup>9</sup> Even so, a variety of expert testimony filled the folios of pretrial proceedings as instrument makers such as James Champneys, Christopher Stedman, and William Eastland attempted to explain to the court how it was impossible to grind a lens based on the information in Dollond's telescope specification.<sup>10</sup>

Yet, such stringent restrictions on the use of persons of skill as witnesses could not last much longer, a point referenced by Lord Mansfield's growing interest in clarifying the relevance of the patent specification. The uncontested acceptance of Higgins and Moore into the courtroom, in 1778 and 1781, respectively, betrays the fact that the formal structures of the law could be increasingly bent by unspoken agreements between the parties before the court.<sup>11</sup> Patent law disputes were between inventors, and it followed that members of this very profession were obliged to give testimony on matters of opaque detail.

Moreover, even as Mansfield formalized the court's acceptance of the testimony of persons of skill—thereby carving out qualifiers to what a lower court had found to be mere opinion—he was channeling inspiration from the parallel intellectual movement of the day.<sup>12</sup> This was the milieu of the so-called “late Enlightenment” as described by Mokyr and Mansfield reflected an optimism in the power of natural philosophy, both theoretical and applied, to dramatically transform the world to the benefit of the country.<sup>13</sup> Such a grounding and confidence in this climate of rationalism gave reform-minded judges such as Mansfield the license to turn increasingly to the explanatory power and promise of persons of skill.<sup>14</sup> It is no accident, as the work of Joel Eigen has shown, that during this exact period, a similar

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<sup>9</sup> *Dollond v. Watkins and Smith* (1763).

<sup>10</sup> “The Several Answers of James Champneys, William Eastland and Christopher Stedman, Defendants to the Bill of Complaint of Peter Dollond, Complainant, 29th October 1765” quoted in Gee, *WDTC*, 177-80.

<sup>11</sup> *Liardet v. Johnson and Arkwright v. Mordaunt*.

<sup>12</sup> On Mansfield and the Enlightenment: Norman S. Poser, *Lord Mansfield Justice in the Age of Reason* (McGill-Queen's University Press, 2013).

<sup>13</sup> Mokyr, *The Enlightened Economy*, 34-6; Clare Jackson, “Progress and Optimism” in Martin Fitzpatrick et al., ed., *Enlightenment World* (Taylor & Francis, 2004); George Sebastian Rousseau, “Doctrines of Optimism” *XVII-XVIII. Revue de la Société d'études anglo-américaines des XVIIe et XVIIIe siècles* 52, no. 1 (2001), 7-20.

<sup>14</sup> James Oldham, “Murray, William, first earl of Mansfield (1705–1793),” *ODNB* (2008).

transformation occurred as a new species of the partisan medical expert entered criminal law in the form of the “mad-doctor.”<sup>15</sup> The rise of the courtroom expert during the latter half of the eighteenth century, be it the philosophers and mechanics who testified during patent law trials or the ever-increasing pivot to medical witnesses during criminal trials, as attested to by the records of the Old Bailey, was both the symptom and cause of the consolidation of English law into an adversarial system.<sup>16</sup>

### **The Expert Witness and the Growth of English Adversarial Law**

Adversarial law, as argued by Stephan Landsman, is not merely a singular technique, governing statute, or even a collection of laws but rather a systematic and cohesive milieu to legal adjudication that prioritizes a “clash of proofs” orchestrated by rival or *adversarial* representatives of both parties.<sup>17</sup> The dispute is overseen by a neutral and non-invasive judge and ruled on by a similarly nonpartisan jury of peers.<sup>18</sup> Legal scholars have long emphasized the procedural changes that enabled the gradual evolution of English common law into an adversarial system, a process with roots dating back to the twelfth century.<sup>19</sup> Therefore, this evolution is closely linked with, if not fundamentally a part of, the development of common law itself.<sup>20</sup> However, these changes were highly sporadic and often did not represent a

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<sup>15</sup> Joel Peter Eigen, *Witnessing Insanity* (Yale University Press, 1995), ix-xiii.

<sup>16</sup> Stephan Landsman, “One Hundred Years of Rectitude: Medical Witnesses at the Old Bailey, 1717-1817,” *Law and History Review* 16, no. 3 (1998): 445-94; Allyson May, “Advocates and Truth-Seeking in the Old Bailey Courtroom” *The Journal of Legal History* 26, no.1, (2005) 83-90; Thomas Rogers Forbes, *Surgeons at the Bailey: English Forensic Medicine to 1878* (London, Yale University Press, 1985).

<sup>17</sup> Stephan Landsman, “A Brief Survey of the Development of the Adversary System” *Ohio State Law Journal* 44, (1983), 714.

<sup>18</sup> On the developing role and character of the judge though early modern England: Michael Lobban, “Blackstone and the Science of Law” *The Historical Journal* 30, no. 2 (1987), 311-35; Peter Murrell, “Did the Independence of Judges Reduce Legal Development in England, 1600–1800?,” *The Journal of Law and Economics* 64, no. 3 (2021), 539-65; Barbara Shapiro, “Law reform in seventeenth century England,” *American Journal of Legal History* 19, (1975), 280; Wilfrid Prest, “Judicial corruption in early modern England” *Past & Present* 133.1 (1991): 67-95.

<sup>19</sup> Landsman, “Development of the Adversary System,” 720; S F C Milsom, *Historical Foundations of the Common Law* 2nd ed. (London: Butterworths, 1981); John Baker, *Introduction to English Legal History*, 5th ed. (online ed., *Oxford Academic*, 2019); John H. Langbein, “The Treason Trials Act of 1696: The Advent of Defense Counsel” in *The Origins of Adversary Criminal Trial* (Oxford: Oxford University Press, 2003), 67-105.

<sup>20</sup>Maximo Langer, “In the Beginning Was Fortescue: On the Intellectual Origins of the Adversarial and Inquisitorial Systems and Common and Civil Law in Comparative Criminal Procedure,” *UCLA School of Law*

singular or consistent philosophy of law. For example, by the mid-1300s, the fairness of individual jurors could be challenged, and yet a juror might still rely on their firsthand knowledge of a dispute until the 1670s.<sup>21</sup> Such firsthand knowledge fundamentally implied some kind interest if not outright bias.

What is less clear is the extent to which procedural changes begot an increasingly adversarial system or whether it was increasing adverse practices by barristers and authorities that required the court to accommodate, in statute, such practices. Specific instances of turmoil such as the English Civil War and with it fears of royal abuse of power triggered a range of reforms that further shifted the English courts towards one defined by its adversarial nature.<sup>22</sup> As Daniel Klerman has shown, accommodation was a powerful force in the development of adversarial law because for the early modern English court, trials were the predominant source of revenue, a development that incentivized the construction of increasingly favorable rules for potential litigants. This was a process that ultimately bestowed considerable power to the barrister.<sup>23</sup> What is clear is that the growth of the adversarial court functioned like a one-way ratchet insofar that once powers or accommodations were extended to plaintiffs or defendants they proved nigh impossible to claw back.

This thesis has shown the comprehensive manner in which the admission of the partisan expert witness functioned to further entrench, if not accelerate, adversarial practices.

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*Research Paper*, No. 16-03 (2015), 1-34; Robert C. Palmer, "The Origins of the Legal Profession in England," *Irish Jurist* 11, no. 1 (1976), 126-46.

<sup>21</sup> Landsman, "Development of the Adversary System," 723; J. S. Cockburn and Thomas A. Green, eds., *Twelve Good Men and True: The Criminal Trial Jury in England, 1200-1800* (Princeton: Princeton University Press, 1988), 358-400.

<sup>22</sup> Landsman, "Development of the Adversary System," 730; Shapiro, Barbara J., "The Restoration chapter in the history of English law reform," *Law and Humanities* 10, no.1, (2016), 31-58.

<sup>23</sup> Daniel Klerman, "Jurisdictional Competition and the Evolution of the Common Law," *University of Chicago Law Review* 74, (2007), 1181-3; The growth of the Bar and professionalization of lawyers is an acknowledged and formative factor in the development of adversarial law: Langbein, *The Origins of Adversary Criminal Trial*, 106-177; Daniel Duman, "Pathway to professionalism: the English Bar in the eighteenth and nineteenth centuries," *Journal of Social History* 13, no. 4 (1980), 615-28.

Firstly, the expert witness amounted to a further stripping of the knowledge gathering role from the judge or impartial appointees and to the parties before the court. Secondly, the expert witness further established the jury as a dispassionate arbiter of facts. As examined in *Liardet v. Johnson*, in the trials of Arkwright and Watt, with few exceptions, the jury was asked to evaluate which set of experts they found most persuasive. Thirdly and finally, the expert witness encouraged and awarded a particular kind of lawyer: the skilled rhetorician and master not just of technical legal facts but of presentation and theater as embodied by men such as Thomas Erskine, Edward Bearcroft, and George Hardinge, who perfected the hostile cross-examination and colorful presentation of evidence.<sup>24</sup>

This style of litigation proved necessary as philosophers of skill and authority, such as Samuel Moore, could if not sufficiently or forcefully challenged, easily sway the jury. Or, a barrister such as Adair might act as an intermediary between expert and lay jury in order to emphasize a favorable statement. In the absence of clearly codified and enforced rules of evidence, the court, reflecting Klerman's assessment, provided accommodations to the parties before them.<sup>25</sup> Yet, as we have seen, the court's acceptance of expert testimony was no mere appeasement; it reflected the realities of attempting to resolve competing truth claims in an increasingly technological and industrial world. Furthermore, the expert witnesses themselves as gentlemen of science represented an increasingly assertive and respected authority in their own right; to not engage as Mansfield repeatedly alleged during the Wells Harbour saga was for the court to undermine its own ability to accurately settle the truth.<sup>26</sup> The turn to the expert witness represented a kind of surrender of authority, and as seen by the resistance of the steadfast Baconian Justice Gould, a relinquishing of the epistemic foundations of the trial

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<sup>24</sup> The escalating pressure and feedback loop between hiring both expert witness and skilled lawyer is a clear manifestation of the "wealth effect" as described by Langbein: Langbein, *The Origins of Adversary Criminal Trial*, 1-9.

<sup>25</sup> Klerman, "Jurisdictional Competition and the Evolution of the Common Law," 1220.

<sup>26</sup> *Folkes v. Chadd* in *Henry Roscoe, Reports of cases... vol. III* (1831), 157-61.

court. Yet, reciprocally, it also represented an opportunity for the court to further assert its role as the nonpartisan and final adjudicator of truth. It was the “men of knowledge” who squabbled and the judge and jury who rendered the final verdict.

### **The Epistemic and Authoritative Nature of the Expert Witness**

The work I have presented has shown how civil disputes required a wide range of tools which together came to demonstrate one’s expertise and authority: personal experience, vocational know-how, experimental familiarity, mechanical problem-solving, and in some cases, the abstruse language of natural philosophy.<sup>27</sup> The specific background of the expert witness dictated the form in which their testimony was unveiled, with notable differences in form, if not effectiveness, demonstrated between “practical mechanics” and natural philosophers. The natural philosopher embodied the most decisive break from the long-standing norms governing the fact-finding capacity of the lay jury.<sup>28</sup> Unlike traditional witnesses, the testimony of the natural philosopher reached beyond sense perception and provided testimony that pointed to the invisible mechanisms of the natural world. This constituted a profound challenge to the jury’s presumed command of all possible facts at trial, raising fundamental questions about the celebrated English tradition that placed such great esteem and trust in the “lay fact-finding” of one’s peers.<sup>29</sup> Yet, such an epistemic and jurisprudential challenge was not unique to the natural philosopher as a subset of the expert witness; rather, it proved inherent to the very conceit of the expert witness. Indeed, the ultimate description of these persons of skill as “expert witnesses” is a misnomer, and not merely on the grounds that it is strictly an anachronism. What made these witnesses expert

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<sup>27</sup> Ann Blair, “Natural Philosophy” in Katherine Park and Lorraine Daston, eds., *The Cambridge History of Science: Volume 3, Early Modern Science*, 365-405; (Cambridge University Press, 2006); James Franklin, “Artifice and the Natural World: Mathematics, Logic, Technology” in Knud Haakonssen, ed., *The Cambridge History of Eighteenth-Century Philosophy*, vol. II (Cambridge University Press, 2006) 815-53.

<sup>28</sup> Shapiro, *A Culture of Fact* (Cornell University Press, 2000), 208-9; J. S. Cockburn and Thomas A. Green (ed.) *Twelve Good Men and True* (Princeton University Press, 2014).

<sup>29</sup> Shapiro, *A Culture of Fact*, 209.

and so novel to the eighteenth-century courtroom was that they specifically presented testimony that went beyond what they had directly witnessed.

During a trial, the court was asked to consider the testimony of natural philosophers such as Erasmus Darwin, Jean-André Deluc, William Herschel, Samuel Moore, and, of course, John Smeaton. Much of their knowledge was deeply theoretical and served more to ground a legal strategy, such as Deluc and Herschel's extended presentations on the nature of steam.<sup>30</sup> The experts, brought forth for their particular mechanical knowledge rather than their renown as generalist natural philosophers, drew their opinions from accumulated knowledge and a tactile understanding of certain principles of mechanics, not from specific and abstracted scientific principles. Such was precisely the case with the testimony of Samuel Wise, Thomas Wood, William Whitmore, William Allen, and John Stead, the five machine makers assembled by Arkwright to demonstrate that his patent was indeed truly instructive.<sup>31</sup>

Due to a confluence of factors—namely the heightened and combative nature of an adversarial setting, the unpredictable personal values and views of the jury, and the presiding judges' variable enthusiasm for the speculative knowledge of the expert witness—no singular attribute or behavior solely determined the success of the early expert witness, and no one discovered this more than Richard Arkwright, as even his most carefully calculated legal strategies eventually backfired. In 1781, during his trial against Charles Mordaunt, Arkwright's roster of insufficiently prepared factory floor technicians proved to be too easily pressured under cross-examination.<sup>32</sup> This contrasted with the polished and confident critique launched by the generalist and natural philosopher Samuel Moore, who assured the jury that Arkwright's patent specification was unintelligible even to the most skilled mechanics.<sup>33</sup> In

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<sup>30</sup> As seen in "Boulton and another v. Hornblower and Another Trial Transcript," WC, MS 3219/4/272 and detailed in Chapter 5, 247, 263-4.

<sup>31</sup> *Arkwright v. Nightingale* in Davies, *ICRP*, 59-60.

<sup>32</sup> *Arkwright v. Mordaunt* in Oldham, *MM* vol. I (The University of North Carolina Press 1992), 763.

<sup>33</sup> *Arkwright v. Mordaunt* in Oldham, *MM* vol. I, 765.

1785, less than four years later, Arkwright hired Moore as part of his deep bench of expert witnesses. Yet, this time his generalist conclusions and attempts to problem-solve the apparent gaps in Arkwright's specification rendered him, in the eyes of the jury, too adept to be a representative expert witness.<sup>34</sup> On a trial-to-trial basis, the same individual had both succeeded and failed in swaying the jury. And so, the relevance and success of the general and often speculative knowledge of the natural philosopher, as opposed to the technical knowledge of the trade professional, oscillated on a case-by-case basis. For example, both Bryan Higgins in *Liardet v. Johnson* and John Smeaton in *Folkes v. Chadd* offered testimony rooted in principles as reaffirmed by their observations drawn from personally conducted experiments and measurements.<sup>35</sup> In contrast to this more philosophical or theory-laden approach, John Immison provided persuasive testimony in *Rex v. Arkwright* when he drew on his trade knowledge regarding the construction of cotton carding and spinning machines.<sup>36</sup>

Despite this lack of consistency as to what specific conduct constituted "winning testimony," it nevertheless remained apparent that the testimony of these persons of skill had an inordinate influence on both judge and jury. To enter the courtroom without an extensive list of natural philosophers and technicians simply proved to be too high a risk, especially for industrialists who could afford any legal strategy yet not to lose. And so, just as plaintiffs enthusiastically turned to the expert, they were more likely to encounter rival expert testimony. Yet, the contest between rival experts, along with barristers' escalating familiarity with the deployment of such testimony in the process, meant that trial lawyers were increasingly prepared to meet expert evidence in kind. As I have argued, by the time of *Rex v. Arkwright* it was no longer sufficient to be an expert witness; one had to be a particularly effective communicator and able to withstand vigorous cross-examination. In a recursive

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<sup>34</sup> *Rex v. Arkwright Trial Transcript* (1785), 138-44.

<sup>35</sup> *Liardet v. Johnson* in Oldham, *MM* vol. I, 749; *Folkes v. Chadd* in Roscoe, *Reports of cases*, 157-61.

<sup>36</sup> *Rex v. Arkwright*, 33-5.

fashion, the expert witness now needed to be trained to become an accomplished and useful expert witness. In no uncertain terms, by the mid-1780s the partisan expert witness had not merely arrived but had become the very flywheel which propelled patent law disputes before the common law courts into such a distinctly adversarial frame. With the expert witness so clearly in the center of such major disputes upon which personal fortune and reputation both rode, it naturally follows that it would not take long for the expert witness to become a figure of criticism and controversy outside the walls of the courtroom.

### **The Expert Witness as a Figure of Derision Eighteenth Century Beginnings**

Existing work on nineteenth-century expert witnesses has revealed that they were frequently subject to public derision, and widely understood to have a propensity for outright lying.<sup>37</sup> This widespread public discourse helped to cement the expert witness as a discrete figure in the nineteenth-century English zeitgeist, but as my work has shown, the expert had a meaningful and very different history before this. The late eighteenth-century figure bore some resemblance to his successor, and despite a lack of extensive and precise terminology and regulation, he was recognized by some contemporaries as a novel and disruptive figure. For example, as explored in Chapter 1, Bryan Higgins, an Irish Catholic medical doctor turned lecturer on chemistry, claimed at trial in 1778 that his efforts to experimentally reproduce John Johnson's cement specification as described, revealed blatant deception. Higgins discovered that without the addition of lead, Johnson's prescribed stucco mixture would not set.<sup>38</sup> Following the trial, it was Higgins's ability to determine the precise heterogeneous components of the stucco that was so ridiculed.<sup>39</sup> Indeed, a hostile pamphlet framed Higgins's experimental work as diametrically opposed to the public's intuitive

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<sup>37</sup> Generally see: Introduction, *op. cit.* 9.

<sup>38</sup> David Knight, "Higgins, Bryan," *ODNB*, (2004); Oldham, *MM* vol. I, 749-54.

<sup>39</sup> *Observations on two trials at law, respecting Messieurs Adams's new invented patent stucco, etc.* (Printed for Fielding and Walker in Pater Noster Row, 1778), 12-3.

understanding of the truth, which anonymous critics described as nothing less absurd than extrapolating conclusions from “animal organs.”<sup>40</sup> It was Higgins’s practice of chemistry that was framed as in opposition to truth, implicitly defined as observable facts, which they claimed would ultimately prevail in the eyes of the public if not the law.<sup>41</sup>

As touched upon in Chapter 3, in 1782 John Smeaton received a similar attack in which hyperbolic and sardonic language was employed in a bid to undermine his apparent authority.<sup>42</sup> Here, despite his immense reputation, his participation on behalf of the unpopular local land barons of Norfolk all but guaranteed such derision. Smeaton’s claim that the decay of Wells Harbor, an inevitable natural phenomenon and poorly managed by the local community, was unlikely ever to receive a warm reception. This was exacerbated when Smeaton’s claims, rooted in his analysis and theories on the nature of harbors, were contrasted with the reports of the defenses’ engineers, who first and foremost turned to the eyewitness evidence of the local workers who frequented the harbor.<sup>43</sup> As such, Smeaton’s analysis asked a local jury to disregard the sense experience of familiar harbormasters and mariners who had personally lived with the increasing difficulties of navigating Wells Harbor.

These examples, including public pamphlets and anonymous letters to newspaper editors and members of the jury penned during trial, represent the range and specificity with which eighteenth-century attacks were leveled at the expert witness. Although they lack the generality and widespread nature of the late nineteenth-century attacks, they nevertheless show the fundamental ability of expert testimony to incite divisive reactions. To an extent, these instances of antagonism targeted at the novel expert witness may be understood in the

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<sup>40</sup> Ibid.

<sup>41</sup> Ibid.

<sup>42</sup> Anonymous letter to the editor of *The Norfolk Chronicle* in “Reports and a Narrative....about the Harbor of Wells,” *NRO*, MS 486.

<sup>43</sup> John Smeaton, “The Report of John Smeaton...” in *NRO*, MS 486.

context of the jury-centric culture of English law that prized lay common sense intuition.<sup>44</sup> Yet more fundamentally, it reveals the manner in which the reception and success of the early expert witness was so closely tied to attributes best described as showmanship and rhetorical skill targeted at the limited audience within the courtroom.

Indeed, whatever attacks Higgins ignited outside of the courtroom, when he testified before a jury, he was exceptionally effective, and his employers won their jury trial. Although Smeaton and Moore failed by the standards of jury persuasion, this reveals more about the specific contexts of the trial and the persons they represented than it does about the general attitude towards the expert witness. In 1781, Moore had effectively and categorically swayed a jury against his eventual employer, Richard Arkwright.<sup>45</sup> However, it was likely his switching of sides between trials that did the most damage to his testimony in the *Rex v. Arkwright* case of 1785. For, although the partisan expert witness could elicit controversy, they emerged when they did precisely because their testimony proved so essential in the adjudication of patent disputes.

Predating the formal coinage of the term “scientists,” let alone the codification of the university system and practice of science as an institutionalized profession, the very notion of the expert witness was a provocative challenge to common law’s long-held practices, procedures, and moral grounding.<sup>46</sup> As a result, the early expert was not rushed into the courtroom to speak absolute scientific truth to an uninformed judge and jury. Nor were they dragged through a robust system of assessments and vetting. If anything, the partisan expert witness was less formalized and accountable than the judicially summoned experts (be it a

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<sup>44</sup> Shapiro, *A Culture of Fact*, 208-18.

<sup>45</sup> Oldham, *MM*, 765.

<sup>46</sup> The term “scientist” is a nineteenth-century construction specifically coined in 1833 by William Whewell; Richard Yeo, *Defining Science* (Cambridge University Press, 1993), 5, 110-1; Ross Sydney, “Scientist,” *Annals of Science* 18, no. 2 (1962), 65-85; On the moral seriousness of jury deliberation; James Oldham, “Truth-Telling in the Eighteenth-Century English Courtroom.” *Law and History Review* 12, no. 1 (1994), 95-121; Barbara J. Shapiro, *Beyond Reasonable Doubt and Probable Cause* (UC Press, 1993).

jury of matrons or Elder Brethren of Trinity House) that they began to replace. Brought into the courtroom gradually by the increasingly plaintiff- and defendant-led trials, their generally unremarked upon presence fulfilled the specific function of clarifying or complicating the details of a patent.

These men did not represent a formalized discipline, nor did they possess extensive institutional support; even their chosen professional titles, such as medical doctor, chemist, scientific instrument maker or civil engineer, were too narrow to describe the variety of questions and interests on which they offered their expert opinions. Until the early nineteenth century they were not explicitly discussed in legal treatises and through the late eighteenth century they received only the most passing of mentions in select law reports.<sup>47</sup> Yet during patent disputes their significance was understood both in the courtroom and among the wider public. The pretrial notes, letters, and correspondence of both Arkwright and Watt make ample reference to their overwhelming interest in, and commitment to securing the testimony of persons of skill. Offered in the right way, their opinions, rife with apparent objective answers and predictive claims, were too persuasive for the court, plaintiff or defendant to ignore. Taken all together, it was clear that the expert witness had, in an increasingly mechanized world, become a figure of unique and unrivaled omniscience. And so, the expert witness was here to stay.

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<sup>47</sup> The earliest entry in a legal treatise discussing the rules of the expert evidence that I have found is Samuel March Phillipps, *Law of Evidence* (1815), 275-6; Importantly, the term “person of skill” remained the term of art. There are, however, earlier references to the permissibility of the testimony of “persons of skill” in law reports: Charles Durnford and Edward Hyde East, *Reports* (1799), 497-9.

## Appendix Table of Contents

### I. Patents, Specifications, and Acts of Extension

a. John Dollond's Patent for the Invention of a New Method of Making Object Glasses of Refracting Telescopes (April 19, 1758)

b. James Watt's Specification for a "New Invented Method of Lessening the Consumption of Steam and Fuel in Fire Engines" (Specification Enrolled April 25, 1769)

c. Richard Arkwright's Patent Specification For "A new Piece of Machinery never before found out, practised, or used, for the Making of Weft or Yarn from Cotton, Flax, and Wool, which would be of great Utility to a great many Manufacturers in this His Kingdom of England, be well as to His Subjects in general, by Employing a Number of Poor People in Working the said Machinery, and Making the said Weft or Yarn much Superior in Quality to any ever heretofore Manufactured or Made" (Specification Enrolled July 16, 1769)

d. John Liardet's Patent for "A Composition or cement for all the branches concerning buildings to which the same is applicable" (April 3, 1773)

e. "An Act for vesting in James Watt. Engineer. His executors. Administrators. And assigns, The sole use and property of certain Steam Engines, commonly called Fire Engines, of his Invention, described in the said Act, throughout His Majesty's Dominions, for a limited time." (May 22, 1775)

f. Richard Arkwright's Patent Specification "for certain machines for preparing silk, cotton, flax, and wool, for spinning" (December 16, 1775)

g. "An Act for vesting in John Liardet, his, &c., the sole use and property of a certain composition or cement of his invention throughout his Majesty's kingdom of Great Britain for a limited time" (February 10, 1776)

h. John Johnson's Patent for "A Cheap and Durable Composition for the Covering the Fronts and Tops and Ornamenting of Houses and Buildings, and for other Purposes in the Building Trade, and which will adhere to Surfaces that are Wet as well as those that are Dry, at any Season of the Year" (March 29, 1777)

i. Bryan Higgins is granted a patent for a "cheap and durable Cement, for Building, Incrustation or Stuccoing, and artificial Stone" (January 8, 1779)

### II. Timeline:

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b. Boulton and Watt's Patent Law Disputes

### III. Institution of Civil Engineers (ICE), London, England:

- a. Letter from John Smeaton to John Forster – December 12, 1781
- b. Letter from John Smeaton to John Forster – December 26, 1781
- c. Letter from John Smeaton to John Forster – January 27, 1782
- d. Letter from John Smeaton to John Forster – May 18, 1782
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(First name unknown.)
- i. Letter from John Smeaton to H. Eastburn – November 25, 1782  
(First name unknown.)
- j. Letter from John Smeaton to John Forster – June 15, 1783
- k. Letter from John Smeaton to John Forster – July 1, 1783
- l. Letter from John Smeaton to John Forster – November 4, 1783

IV. Wolfson Center (WC), Library of Birmingham, Birmingham, England:

- a. Letter from James Watt to Richard Arkwright – October 12, 1780.
- b. Letter from James Watt to John Smeaton – November 6, 1780
- c. Letter from James Watt to Mr. Henderson – November 7, 1780  
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- d. Letter from James Watt to Richard Arkwright – April 4, 1785
- e. Letter from James Watt to George Goodwin – April 11, 1785
- f. Letter from James Watt to Richard Arkwright – October 11, 1785
- g. Letter from Letter from James Watt to Richard Arkwright – October 26 & 27, 1785
- h. Letter from James Watt to Richard Arkwright – October 27, 1785  
(Watt's opinion on his June 25, 1785 testimony in *Rex v. Arkwright*.  
Enclosed with letter dated October 26 & 27, 1785.)
- i. Letter from James Watt to George Goodwyn [Goodwin] – February 4, 1786
- j. James Warroch testimonial for case against Jabez Carter Hornblower –  
November 26, 1796
- k. Testimony of Professor John Robison in *Boulton and another v. Hornblower and another* – December 16, 1796  
(Joseph Gurney's notes of the trial – Pages 105–114)

V. Norwich Records Office (NOR), Norwich, England:

- a. Letter from John Forster to Martin Folkes – August 30, 1780

- b. Summons from Henry See Warner to James Smyth – June 25, 1782  
(Sir Martin Browne Folkes Baronet and Robert Hales Esq., Plaintiffs  
against George Chadd Esq. and others, Defendants)
- c. Folkes & Hales' special juryman request sent to James Smyth – July 2, 1782
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(Response to summons.)
- e. Letter from Dan Jones to James Smyth – August 7, 1783
- f. Letter from James Smyth to Dan Jones – August 15, 1783
- g. Letter from Robert Mylne to George Hardinge – July 24, 1784  
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- h. Letter from George Hardinge to Robert Mylne – August 4, 1784  
(Final apology for treatment at trial.)
- i. Privately Commissioned Trial Transcript – Pages 50–51
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- o. Maps of Wells Harbor
  - a. Robert Mylne's and Mr. Biederman's Map (1780)
  - b. Print of John Smeaton's Map (1782)
  - c. Map supplied by Joseph Hodskinson (1782)
  - d. Detail from Hodskinson's Map (1782)

## Notes on Transcriptions

When transcribing source material, I retained their original writing conventions such as:

- Grammar
- Sentence structure
- Capitalization and underlining for emphasis
- Hyphens represented as either “-” or “=
- Lines ended by a single or double “x”
- A single or double “/” used to prevent altering of text
- A double “/” contextually representing quotation marks
- Sentences ended with a dash, line or comma in place of a period
- Words hyphenated according to space permitted on a page
- Pages ended with the last word followed by a single “)”
- The last word on a page repeated on the following page
- Quotation marks carried over to the beginning of each line of quoted text

### Archival Context of MS 486

The letterbook referred to as “Narrative of the Three Trials Arguments of Counsel and Judgment of the Judges about the Harbor of Wells” (MS 486, NRO) are, in fact, a compiled collection that includes copies of all engineer reports completed for the trial, trial transcripts, summaries of proceedings from varying anonymous perspectives, an annotated index, and looseleaf original letters pertinent to the trial, such as jury summons.

Some of the individual accounts included in this source were published by the *Norfolk Chronicle* in their coverage of the trial. The style and level of detail varied greatly throughout this source, yet most often appeared as a line-by-line summation of the trial, akin to notes taken by a shorthand reporter. In other instances, the descriptions are largely summative and were likely sent as a letter to the editors of the *Norfolk Chronicle*.

Due to the composite nature of this source, there are multiple sets of page numbers. The page numbers provided in parentheses and left justified are the handwritten page numbers that run through the full length of the collection and are used whenever this letterbook is cited in the body of this thesis. The page numbers centered on the page and circled are the page numbers as they appear in each of the individual records that comprise this letterbook. Regarding the provenance of this source, the compiler is unknown, and all records that might identify them appear to be lost.

This document was acquired by the then-Norwich Free Public Library on November 5, 1931, from a private collector. Consulting and researching with the NRO archivists, Ian Palfrey, Jenny Watts, Francesca Nelson and Vaughan Griggs, has revealed that this document was acquired at the same time the library came into possession of a tranche of materials originally from the collection of Sir Thomas Phillipps (1792-1872), a known collector of manuscript material, including legal records from the Norwich Assize courts. Handwriting cannot confirm that Sir Phillipps edited this source, and to assign authorship to him would be premature. This correlation between the Norwich Free Public Library’s acquisition of this otherwise unlabeled letterbook and Phillipps’ collection from the Norfolk Assize courts of the same period comprises the total of the facts known at the time of writing.

## Transcription Legend

- [ ] Current spelling and punctuation in American English.
- {...} One to three words that are illegible due to an ink blot, or the page is faded, cropped, torn, or folded.
- {...+} Four or more words that are illegible due to an ink blot, or the page is faded, cropped, torn, or folded.
- = or - Represents a hyphen.
- –, — or ≠ End a line or a sentence, when a period is not used.
- – Represents a comma when used after a salutation.
- \xxx/ Inserted text either between the lines or in the margins.
- ~~xxx~~ Crossed-out words or letters.
- Contractions and abbreviations, often written in superscript, are shown in italics, followed by the expanded word in brackets, for example, “*wth*” [with].
- (?) Uncertain transcribed word.
- [#] Page number inserted for clarity.
- (#) Page number penned by the author or scribe.

I. a. John Dollond's Patent for the Invention of a New Method of Making Object Glasses of Refracting Telescopes (April 19, 1758)<sup>1</sup>

*George the Second* by the Grace of God of Great Britain France and Ireland King Defender of the Faith &c. [etc.] To *all* to whom all these presents Shall come Greeting *Whereas* John Dollond of the parish of Saint Martin in the Fields in the County of Middlesex Optician has by his Petition humbly represented unto us that he hath by Application and Study and at Considerable Expense at last Invented and brought to perfection a new method of making the Object Glasses of Refracting Telescopes by compounding mediums of different Refractive Qualities whereby the Errors arising from the different refrangibility of Light as well as those which are produced by the Spherical Surfaces of the Glasses are perfectly corrected *That* this improvement which has been in vain sought after by Severall [Several] others above a Century past will be a great benefit to the publick [public] in General but Especially to the Navy where good Refracting telescopes are of the utmost Importance and as he is the first and Sole Inventor thereof and that no other person has to the best of his knowledge or belief practiced the same he hath therefore most humbly prayed us to Grant to him his Executor Administrator and Assigns our Royal Letters Patent under our Great Seal of Great Britain for the Sole benefit and advantage of the said Invention within that part of our Kingdom of Great Britain called England and Dominion of Wales and Town of Berwick upon Tweed for the Term of fourteen years pursuant to the Statute on such are made and provided *We* being willing to give Encouragement to all Arts and Inventions which may be for the publick [public] Good are graciously pleased to condescend to his request *Know ye* therefore that *We* of our Especial Grace certain knowledge and mere motion *Have given* and Granted and by those presents for us in our Heirs and Successors *Do* give and Grant unto the said John Dollond his Executors Administrators and Assigns our Especial Licence full power Sole priviledge and authority that he the said John Dollond his Executors Administrators and Assigns and any of them by himself and themselves or by his and their Deputy or Deputy Servants or Agents or such others he the said John Dollond his Executors Admons and Assigns shall and lawfully may have and Enjoy the whole profit benefit commodity and advantage from time to time and at all times hereafter during the term of years herein

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<sup>1</sup> From the transcription provided by Gee, *WDTC*, 329-30; There are three known versions of Dollond's patent: the original unsealed request (referred to as the "king's bill," the granted and sealed patent, and finally a copy of the granted patent record by Peter Dollond. There are expected discrepancies between the two, for example the "king's bill" contains an addendum addressed to the king summarizing the patent and requesting his seal. The final patient replaces this request with the Great Seal itself thereby formalizing the enrolment of the patent. The version provide here is true to the "king's bill."

expressed Shall and Lawfully may make use exercise and vend his said Invention within that part of our Kingdom of Great Britain called England and our Dominion of Wales and Town of Berwick upon Tweed as such manner as to him the said John Dollond his Executors Administrators and Assigns or any of them shall in their directions seem moot *And* that he the said John Dollond his Executors Admons and Assigns Shall and Lawfully may have and Enjoy the whole profit benefit commodity and advantage from time to time coming growing accruing and arising by reason of the said Invention and during the term of years herein mentioned *To have* hold Exercise and Enjoy the said licence power priviledges [privileges] and Advantage herein before granted or mentioned to be Granted unto the said John Dollond his Executors Admons and Assigns for and during and unto the full end and Term of fourteen years from the date of those presents next and immediately Ensuing and to be fully Compleat and Ended according to the Statute in such case made and provided *And* to the End that the said John Dollond his Executors Admons and Assigns and every of them may have and Enjoy the full benefit and the Sole use and Exercise of the said Invention according to our Gracious Intention herein before declared *We* do by those presents for us our Heirs and Successors require and strictly commend all and every person and persons Bodies politick [politic] and corporate and all other Subjects whatsoever of what Estate Quality Degree name or condition so ever they be within that said part of our Kingdom of Great Britain called England and Dominion of Wales and Town of Berwick upon Tweed aforesaid that neither they or any of them at any time during the continuance of the said Term of fourteen years hereby Granted either directly or indirectly do make use of put in practice the said Invention of any part of the same so attained unto by the s<sup>d</sup> [second] as aforesaid in any wise Counterfeit Imitate or resemble the same nor shall make or cause to be made any addition thereunto or Subtraction from the same whereby to pretend himself or themselves the Inventor or Inventors Devisor or Divisors thereof without the Licence consent or agreement of the said John Dollond his Executors Admons or Assigns in writing under his and their Hand and Seals first had and obtained in that behalf upon such pains and penalties as can or may be Justly Inflicted on such Offendor [Offender] for their contempt of this our Royal Command and further to be Answerable to the said John Dollond his Executors Admons and Assigns according to Law for his and their Damage thereby Occasioned *And moreover We* do by these presents for us our Heirs and Successors will and command all and singular the Justices of the Peace Mayors Sheriffs Bayliffs [Bailiffs] Constables Headboroughs and all other Officers and Ministers whatsoever of us our Heirs and Successors for the time being that they or any of them do not nor shall at any time hereafter during the said Term hereby

Granted in any wise Molest Trouble or Hinder to said John Dollond his Executors Amors or Assigns or any of them or his or their Deputys [Deputies] Servants or Agents in or about the due and Lawfull [Lawful] use or Exercise of the aforesaid Invention or anything relating thereto *provided* always and these our Letters Patent are and shall be upon this Condition that if at any time during the said Term hereby Granted it should be made appear to us our House or Successors or any six or more of our or their privy Council that this our Grant is Contrary to Law or prejudicial or Inconvenient to our Subjects in General or that the said Invention is not a new Invention as to the publick [public] use and Exercise thereof in that part of the Kingdom of Great Britain and Dominion of Wales and town of Berwick upon Tweed aforesaid or not Invented and found out by the said John Dollond as aforesaid then upon Signification or Declaration thereof to be made by us our House or Successors under our or their Signet or Privy Seal or by the Lords and those of our or their Privy Council or any Six or more of them under their hands these our Letters Patent shall forthwith cease determine and be utterly Void to all intents and purposes anything herein before contained to the contrary thereof in any wise notwithstanding *provided* also that those Our Letters Patent or anything herein contained shall not Extend or be constructed to Extend to give priviledge [privilege] unto the said John Dollond his Executors Administrators or Assigns many of them to have or Imitate any Invention or work whatsoever which hath heretofore been found out or Invented by any other of our Subjects whatsoever and publickly [publicly] used or Exercised in that said part of our Kingdom of Great Britain called England our Dominion of Wales or Town of Berwick upon Tweed aforesaid unto whom the Letters Patent or privilege have been already Granted for the Sole use Exercise and benefit thereof it being our will and pleasure that the said John Dollond and his Exors<sup>s</sup> [Exors] Admons and Assigns and all and every other person and persons to whom like Letters Patent or priviledges [privileges] have been already Granted for the sole use and benefit thereof it being Our will and pleasure that the said John Dollond his Executors Admons and Assigns and all and every other person and persons to whom the Letters Patent or priviledges [privileges] have been already Granted as aforesaid shall distinctly live and practice their Severall [Several] Inventions by them Invented and found but according to the full Intent and Meaning of the same Letters Patent and of these present *provided* likewise nevertheless and these our Letters Patent are upon their express condition that if the said John Dollond his Executors or Administrator or any person or persons which shall or may at any Time or Times hereafter during the continuance of this Grant have or Claim any Right Title or Interest in Law or Equity of in or to the Power priviledge and Authority of the sole use and benefit of the said Invention hereby Granted

shall make any Transfer or Assignment or any Pretended Transfer or Assignment of the said Liberty and priviledge [privilege] or any Share or Shares of the Benefit or profit thereof or shall declare any Trust thereof to or for any Number person exceeding the Number of five or shall Open or cause to be Opened any Book or Books for publick [public] subscriptions to be made by any number of persons Exceeding the number of five in Order to the raising any Sum or Sums or Money under pretence of carrying on the said Liberty or priviledge [privilege] hereby granted or shall by him or themselves or his or their Agent or Servants receive and Sum or Sums of Money whatsoever any number of persons Exceeding in the whole the number of five for such or the like Intents or purposes or shall presume to act as a Corporate Body or shall divide the benefitt [benefit] of these our Letters Patent or the Liberty & priviledge [privilege] whereby by us granted into any number of shares exceeding the number of five or shall commit or do or procure to be committed or done any act matter or thing whatsoever during such Time as such person or persons shall have any Right or Title either in Law or Equity in or to the said promises which will be contrary to the true Intent and meaning of a certain Act of Parliament made in the Sixth Year of the Reign of our late Royal Father King George the First Intitled *An Act* for the Better securing Certain powers and priviledges [privileges] Intended to be Granted by his Majesty by two Charters for the Assurance of Ships and Merchandizes at Sea and for lending Money upon Bottomry and for Restraining several Extravagant and Unwarrantable practices therein Mention'd [Mentioned] or in case the said power priviledge [privilege] or authority shall at any time hereafter become Vested in or in Trust for more than the Number of five person or their representatives at any one time (Reckoning Executors or Administrators in whatever as and for the single person whom they represent as to such Interest as they are or shall be entitled to in Right of such their Testator or Intestate) that then and in any of the said Cases these our Letters Patent and all Liberties and Advantages whatsoever hereby Granted shall latterly cease determine and become Void any thing [anything] therein before contained to the contrary thereof in any wise notwithstanding *provided* also that if the said John Dollond shall not particularly Describe and Ascertain the Nature of the said Invention in what manner the same is to be performed by an Instrument in Writing and or his hand or Seal and cause the same to be Inrolled [Enrolled] in our High Court of Chancery within three Kalendar [Calendar] months thereof shall be in and by all things good firm Valid sufficient and Effectual in the Law according to the true Intent and Meaning thereof and shall be taken construed and adjudged in the most favourable and beneficial Sense for the best advantage of the said John Dollond his Executors Administrators and Assigns as well in all our Courts of Record as Elsewhere

and by all and singular the Officers and Ministers whatsoever of Us our Heirs and Successors in that part of our said Kingdom of Great Britain called England our dominion of Wales and Town of Berwick upon Tweed Aforesaid and Amongst all and Every the subjects of Us our Heirs and Successors whatsoever and whosoever notwithstanding the not full and certain describing the Nature or Quality of the said Invention or of the Materials thereto conducing and belonging *In Witness &c Witness &c...*

*...May it Please your Most Excellent Majesty*

*This* contains Your Majestys [Majesty's] Grant unto John Dollond of the parish of Saint Martin in the Fields in Your County of Middlesex Optician of the Sole Benefit and Advantage of his Invention of a new method of making the Object Glasses of Refracting Telescopes by compounding mediums of different Refractive Qualities whereby the Errors arising from the Different Refrangibility of Light as well as those which are produced by the spherical surfaces of the Glasses are perfectly corrected *To hold* to him his Executors Administrators and Assigns within England Wales and Town of Berwick upon Tweed for the Term of fourteen years according to the Statute in that Case made and *provided* that he doth within three calendar months from the date of the Grant hereby Intended Cause a particular Description of the Nature of his said Invention by writing under his hand and seal to be Inrolled [Enrolled] in Your High Court of Chancery otherwise Your said Grant to be void and all such Clauses prohibitions and privisous [provisos] are inserted there in a scroll such in Grants of the like Nature and this Bill is proposed.

*By warrant under your Majestys [MajesFty's] Royal Sign Manual*

Ap<sup>l</sup> [April] 12 1758

[signed] C. Pratt

*... In witness* whereof we have caused these our Letters to be made patent *Witness ourself* at Westminster the Nineteenth day of April in the Thirty first Year of Our reign by writ of Privy Seal ...

I. b. James Watt's Specification for a "New Invented Method of Lessening the Consumption of Steam and Fuel in Fire Engines"  
(Specification Enrolled April 25, 1769)<sup>2</sup>

A.D. 1769 ..... N° 913.

Steam Engines, &c.

WATT'S SPECIFICATION

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JAMES WATT, of Glasgow, in Scotland, Merchant, send greeting.

WHEREAS His most Excellent Majesty King George the Third, by His Letters Patent under the Great Seal of Great Britain, bearing date the Fifth 5 day of January, in the ninth year of His said Majesty's reign, did give and grant unto me, the said James Watt, His special licence, full power, sole priviledge [privilege] and authority, that I, the said James Watt, my exors [executors], admors, and assigns, should and lawfully might, during the term of years therein expressed, use, exercise, and vend, throughout that part of His Majesty's Kingdom of Great Britain called England, the Dominion of Wales, and Town of Berwick upon Tweed, and also in His Majesty's Colonies and Plantations abroad, my "NEW INVENTED METHOD OF LESSENING THE CONSUMPTION OF STEAM AND FUEL IF FIRE ENGINES ;" in which said recited Letters Patent is contained a proviso obliging me, the said James Watt, by writing under my hand and seal, to cause a particular description of the nature of the said Invention to be inrolled [enrolled] in His Majesties High Court of Chancery within four calendar months after the date of the said recited Letters Patent, as in and by the said Letters Patent, and the Statute in that behalf made, relation being thereunto respectively had, may more at large appear.

NOW KNOW YE, that in compliance with the said provisoe [proviso], and in pursuance of the said Statute, I, the said James Watt, do hereby declare that the following is a particular description of the nature of my said Invention, and of the manner in which the same is to be performed (that is to say) :—

My method of lessening the consumption of steam, and consequently fuel, in fire engines consists of the following principles :—

First, that vessell [vessel] in which the powers of steam are to be employed to work the engine, which is called the cylinder in common fire engines, and which I call the steam vessel

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<sup>2</sup> This is a transcription of the specification enrolled by Watt following the granting of his patent on January 5, 1769; "Watt's Patent Specification," The British Library: Business & IP Centre, GB176900913A, 7-9; This copy is reformatted from a scanned printed copy originally published by George Edward Eyer and William Spottiswoode. Printers to the Queen's most Excellent Majesty, 1855.

[vessel], must during the whole time the engine is at work be kept as hot as the steam that enters it, first, by enclosing it in a case of wood or any other materials that transmit heat slowly ; secondly, by surrounding it with steam or other heated bodies ; and, thirdly, by suffering neither water or any other substance colder than the steam to enter or touch it during that time.

Secondly, in engines that are to be worked wholly or partially by condensation of steam, the steam is to be condensed in vessells [vessels] distinct from the steam vessells [vessels] or cylinders, although occasionally communicating with them. These vessells [vessels] I call condensers, and whilst the engines are working, these condensers ought at least to be kept as cold as the air in the neighbourhood of the engines by application of water or other cold bodies.

Thirdly, whatever air or other elastic vapour is not condensed by the cold of the condenser, and may impede the working of the engine, is to be drawn out of the steam vessells [vessels] or condensers, by means of pumps wrought by the engines themselves, or otherwise.

Fourthly, I intend in many cases to employ the expansive force of steam to press on the pistons, or whatever may be used instead of them, in the same manner as the pressure of the atmosphere is now employed in common fire engines. In cases where cold water cannot be had in plenty, the engines may be wrought by this force of steam only, by discharging the steam into the open air after it has done its office.

Fifthly, where motions round an axis are required, I make the steam vessells [vessels] in form of hollow rings or circular channels, with proper inlets [inlets] and outlets [outlets] for the steam, mounted on horizontal axles like the wheels of a water mill ; within them are placed a number of valves that suffer any body to go round the channell [channel] in one direction only. In these steam vessells [vessels] are placed weights, so fitted to them as intirely [entirely] to fill up a part or portion of their channels, yet rendered capable of moving freely in them by the means herein-after mentioned or specified. When the steam is admitted in these engines between these weights and the valves, it acts equally on both, so as to raise the weight to one side of the wheel, and by the reaction on the valves successively to give a circular motion to the wheel, the valves opening in the direction in which the weights are pressed, but not in the contrary. As the steam vessel moves round it is supplied with steam from the boiler, and that which has performed its office may either be discharged by means of condensers, or into the open air.

Sixthly, I intend in some cases to apply a degree of cold not capable of reducing the steam to water, but of contracting it considerably, so that the engines shall be worked by the alternate expansion and constraction [contraction] of the steam.

Lastly, instead of using water to render the piston or other parts of the engines [engine's] air and steam tight, I employ oils, wax, rosinous bodies, fat of animals, quicksilver and other metals [metals], in their fluid state.

In witness whereof, I have hereunto set my hand and seal, this Twenty-fifth day of April, in the year of our Lord One thousand seven hundred and sixty-nine.

JAMES WATT. (LS.)

Sealed and delivered in the presence of

COLL. WILKIE.

GEO. JARDINE.

JOHN ROEBUCK.

Be it remembered, that the said James Watt doth not intend that any thing [anything] in the fourth article shall be understood to extend to any engine where the water to be raised enters the steam vessell [vessel] itself, or any vessell [vessel] having an open communication with it.

JAMES WATT.

Witnesses,

COLL. WILKIE.

GEO. JARDINE.

AND BE IT REMEMBERED, that on the Twenty-fifth day of April, in the year of our Lord 1769, the aforesaid James Watt came before our said Lord the King in His Chancery, and acknowledged the Specification aforesaid, and all and every thing [everything] therein contained and specified, *in form above* written. And also the Specification aforesaid was stamp't [stamped] according to the tenor of the Statute made in the sixth year of the reign of the late King and Queen William and Mary of England, and so forth.

Inrolled [Enrolled] the Twenty-ninth day of April, in the year of our Lord One thousand seven hundred and sixty-nine.

LONDON:

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,  
Printers to the Queen's most Excellent Majesty. 1855

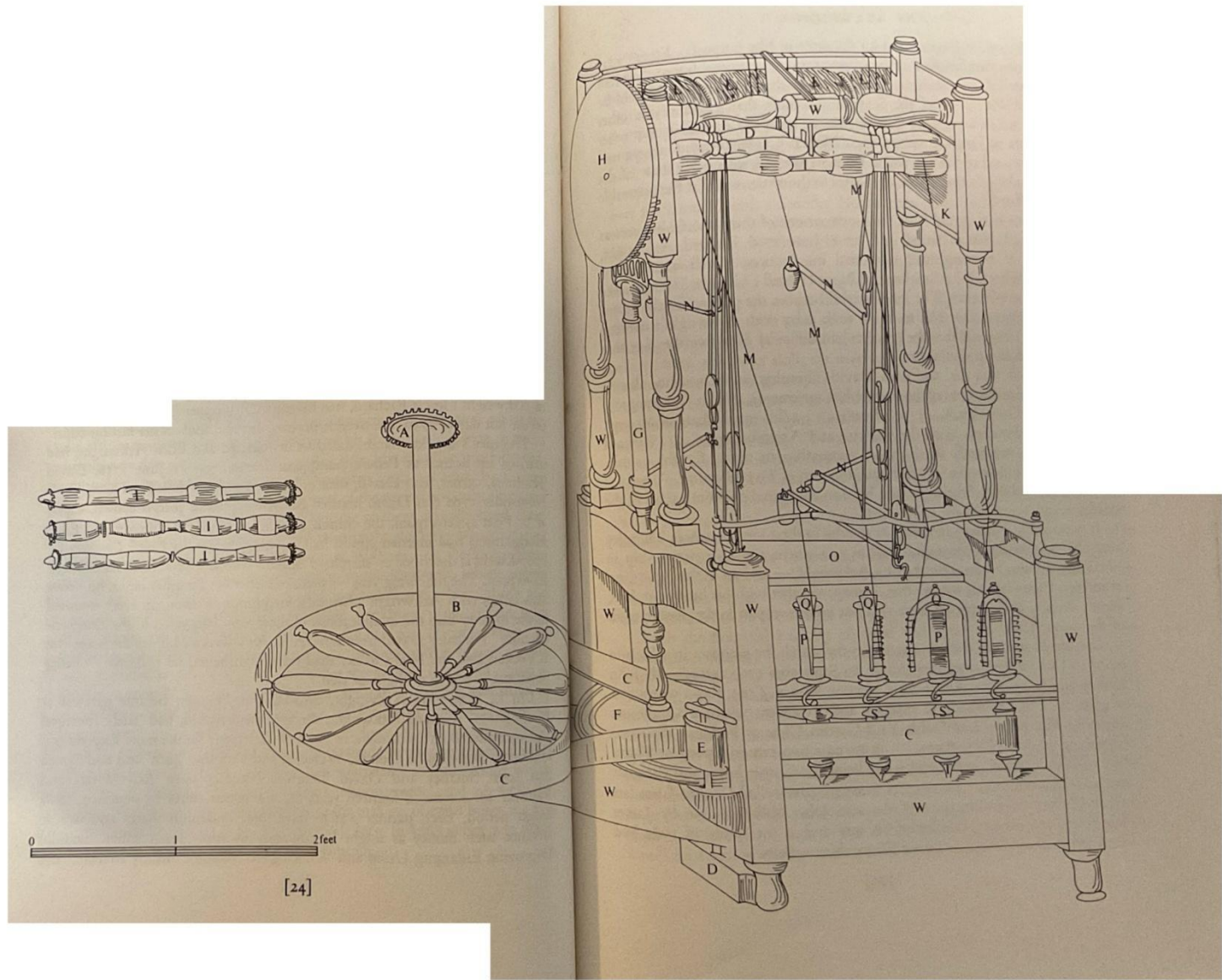
I. c. Richard Arkwright's Patent Specification For "A new Piece of Machinery never before found out, practised, or used, for the Making of Weft or Yarn from Cotton, Flax, and Wool, which would be of great Utility to a great many Manufacturers in this His Kingdom of England, be well as to His Subjects in general, by Employing a Number of Poor People in Working the said Machinery, and Making the said Weft or Yarn much Superior in Quality to any ever hertofore [heretofore] Manufactured or Made" (Specification Enrolled July 16, 1769)<sup>3</sup>

Arkwright's spinning machine patent, 1769

The specification in the petition for royal letters patent reads: 'NOW KNOW YE, that I, the said Richard Arkwright, in compliance with the said proviso, do hereby describe and ascertain the nature of my said Invention, and declare that the Plan thereof drawn in the margin of these Presents is composed of the following particulars (that is to say): A, the cogg [cog] wheel and shaft, which receive their motion from a horse; B, the drum or wheel which turns C, a belt of leather, and gives motion to the whole machine; D, a lead weight which keeps F, the small drum, steady to E, the forcing wheel; G, the shaft of wood which gives motion to the wheel H, and continues it to I, four pair of rollers (the form of which are drawn in the margin), which act by tooth and pinion, made of brass and steel nutts [nuts], fixt [fixed] in two iron plates K. That part of the roller which the cotton runs through is covered with wood, the top roller with leather, and the bottom one fluted, which lets the cotton, &c.[etc.] through it, and by one pair of rollers moving quicker than the other, draws it finer for twisting, which is performed by the spindles T. K, the two iron plates described above; L, four large bobbins with cotton rovings on, conducted between rollers at the back; M, the four threads carried to the bobbins and spindles, by four small wires fixt [fixed] across the frame in the slip of wood V; N, iron leavers with small lead weights, hanging to the rollers by pulleys, which keep the rollers close to each other; O, a cross piece of wood to which the leavers are fixed; P, the bobbins and spindles; Q, flyes [flies] made of wood, with small wires on the side which lead the thread to the bobbins; R, small worsted bands, put about the whirl of the bobbins, the screwing of which tight or easy causes the bobbins to wind up the thread faster or slower; S, the four whirls of the spindles; T, the four spindles which run in iron plates V, explained in letter M; W, a wooden frame of the whole machine.'

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<sup>3</sup> This description and illustration are specifically an expert of Arkwright's specification submitted on July 16, 1769. Arkwright's patent was granted on July 3, 1769; From the transcript provided by R. S. Fitton in R. S. Fitton, *The Arkwrights* (Manchester University Press, 1989), 24-5.



I. d. John Liardet's Patent for "A Composition or cement for all the branches concerning buildings to which the same is applicable" (Patent granted April 3, 1773; Patent enrolled August 3, 1773)<sup>1</sup>

The specification was in these words :— "To all to whom these presents shall come, I, John Liardet, of Great Suffolk-street, in the parish of Saint Martin's-in-the-Fields, in the city of Westminster, clerk, send greeting. Whereas I the said John Liardet did, by my petition, humbly represent to his present most excellent Majesty King George the Third, that by much study and expence [expense] I had invented a composition or cement for all the branches concerning buildings, to which the same is applicable, with a grease for frictions, preserving steel, iron, and various other uses. And that in regard, I was the first inventor thereof, I therefore most humbly prayed his said Majesty that he would be graciously pleased to grant unto me, my executors, administrators, and assigns, his royal letters patent, for the sole use and benefit of the said invention within that part of his said Majesty's kingdom of Great Britain called England, his dominion of Wales, and town of Berwick-upon-Tweed, and also in all his colonies and plantations abroad, for the term of fourteen years, according to the statute in that case made and provided. His said Majesty being willing to give encouragement to all arts and inventions which might be for the publick [public] good, was graciously pleased to condescend to my request, and therefore by his royal letters patent bearing date at Westminster the third day of April, in the thirteenth year of his reign, of his especial grace, certain knowledge and mere motion for himself, his heirs and successors, did give and grant unto me the said John Liardet, my executors, administrators, and assigns, his especial licence, full power, sole privilege, and authority, that I the said John Liardet, my executors, administrators, and assigns, and every of them, by myself and themselves, or by mine or their deputy or deputies, servants or agents, or others as I the said John Liardet, my executors, administrators, or assigns, should at any time agree with, and no others, from time to time, and at all times thereafter, during the term of years therein expressed, should and lawfully might make, use, exercise, and vend my said invention within that part of his said Majesty's kingdom of Great Britain, dominion of Wales, town of Berwick-upon-Tweed, and also in all colonies and plantations abroad, in such manner as to me the said John Liardet, my executors, administrators, and assigns, or any of us should in our discretion seem meet; and that I the said John Liardet, my executors, administrators, or assigns and lawfully might have and enjoy

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<sup>1</sup> From the printed copy provided in, William Carpmael, *Law Reports of Patent Cases* (A. MacIntosh, 1843), 35-6; John N. Adams and Gwen Averley, "The patent specification the role of *Liardet v. Johnson*," *The Journal of Legal History* 7, no. 2 (1986), 162, 174.

the whole profit, benefit, commodity, and advantage from time to time coming, growing, accruing, and arising by reason of the said invention, for and during the term of years therein mentioned; to have, hold, exercise, and enjoy the said licence, powers, privileges, and advantages, thereinbefore granted or mentioned to be granted unto me the said John Liardet, my executors, administrators, or assigns for and during, and unto the full end and term of fourteen years from the date of the said letters patent next and immediately ensuring, and fully to be complete and ended according to the statute in such case made and provided : in which said letters patent is contained a proviso, that, if I, the said John Liardet, should not particularly describe and ascertain the nature of my said invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, and cause the same to be enrolled in his said Majesty's High Court of Chancery within four calendar months next and immediately after the date of the said letters patent, that then the said letters patent and all liberties and advantages whatsoever thereby granted should utterly cease, determine, and become void, any thing [anything] thereinbefore contained to the contrary thereof in anywise notwithstanding, as in and by the said letters patent (relation being thereunto had) may more fully and at large appear. Now know ye, that I, the said John Liardet, in compliance with the said proviso do hereby describe and ascertain the nature of my said invention, and declare that the same is composed of the several particulars following, that is to say, composition of the new cement : drying oil, any kind of absorbent matters, white or any coloured lead, solid whatsoever (gravel, sand, &c.) as circumstances will require it. Composition of the new grease for preserving steel, iron, &c. from the rust, and for frictions : take oil, any kind of absorbent matters mixed together, coloured as you please ; the steel and iron must be covered with the said grease in the same manner as if painted. In witness whereof, I the said John Liardet have hereunto set y hand and seal this third day of August, in in the year of our Lord 1773, and the thirteenth year of the reign of our said sovereign lord George the Third, by the grace of God of Great Britain, France, and Ireland, king, defender of the faith, and so forth.

**“JOHN LIARDET.”**

### I. e. Watt's Extension<sup>2</sup>

An Act for vesting in JAMES WATT. Engineer, his executors, administrators, and assigns, the sole use and property of certain Steam Engines, commonly called Fire Engines, of his Invention, described in the said Act, throughout His Majesty's Dominions, for a limited time. (22 May 1775)

WHEREAS His most Excellent Majesty King George the Third, by His Letters Patent under the Great Seal of Great Britain, bearing date the Fifth day of January, in the ninth year of His reign, did give and grant unto James Watt of the City of Glasgow, Merchant, his executors, administrators, and assigns, the sole benefit and advantage of making and vending certain engines by him invented for lessening the consumption of steam and fuel in fire engines, within that part of His Majesty's Kingdom of Great Britain called England, the Dominion of Wales, and the Town of Berwick-upon-Tweed, and also in His Majesty's Colonies and Plantations abroad, for the term of fourteen years, with a proviso, obliging the said James Watt, by writing under his hand and seal, to cause a particular description of the said Invention to be inrolled [enrolled] in His Majesty's High Court of Chancery within four months after the date of the said recited Letters Patent: And whereas the said James Watt did, in pursuance of the said proviso, cause a particular description of the said engine to be inrolled [enrolled] in the said High Court of Chancery upon the Twenty-ninth day of April. in the year of our Lord One thousand seven hundred and sixty-nine, which description is in the words and form or to the effect following: that is to say, my method of lessening the consumption of steam, and consequently fuel, in fire engines, consists of the following principles : — First, that vessel in which the powers of steam are to be employed to work the engine, which is called the cylinder in common fire engines, and which I call the steam vessel, must during the whole time the engine is at work be kept as hot as the steam that enters it, first, by enclosing it in a case of wood, or any other materials that transmit heat slowly : secondly, by surrounding it with steam or other heated bodies : and thirdly, by suffering neither water or any other substance colder than the steam to enter or touch it during that time. Secondly, in engines that are to be worked wholly or partially by condensation of steam, the steam is to be condensed in vessels distinct from the steam vessels or cylinders,

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<sup>2</sup> Original record: *Parliamentary Archives*, HL/PO/PU/1/1775/15G3n83; From a reformatted scan of a printed copy: *The British Library: Business & IP Centre*, GB176900913A, 1-6.

although occasionally communicating with them : these vessels I call condensers, and whilst the engines are working, these condensers ought at least to be kept as cold as the air in the neighbourhood of the engines. by application of water or other cold bodies. Thirdly, whatever air or other elastick [elastic] vapour is not condensed by the cold of the condenser, and may impede the working of the engine, is to be drawn out of the steam vessels or condensers by means of pumps wrought by the engines themselves or otherwise. Fourthly, I intend in many cases to employ the expansive force of steam to press on the pistons, or whatever may be used instead of them, in the same manner as the pressure of the atmosphere is now employed in common fire engines : in cases where cold water cannot be had in plenty, the engines may be wrought by this force of steam only, by discharging the steam into the open air after it has done its office [which fourth article the said James Watt declares in a note affixed to the Specification of the said engine should not be understood to extend to any engine where the water to be raised enters the steam vessel itself. or any vessel having an open communication with it]. Fifthly, where motions round an axis are required, I make the steam vessels in form of hollow rings or circular channels, with proper inlets and outlets for the steam, mounted on horizontal axles, like the wheels of a water mill : within them are placed a number of valves that suffer any body to go round the channel in one direction only : in these steam vessels are placed weights, so fitted to them as entirely to fill up a part or portion of their channels, yet rendered capable of moving freely in them by the means hereinafter mentioned or specified. When the steam is admitted in these engines between these weights and the valves, it acts equally on both, so as to raise the weight to one side of the wheel, and by the reaction on the valves successively to give a circular motion to the wheel, the valves opening in the direction in which the weights are pressed, but not in the contrary : as the steam vessel moves round, it is supplied with steam from the boiler, and that which has performed its office may either be discharged by means of condensers or into the open air. Sixthly. I intend in some cases to apply a degree of cold not capable of reducing the steam to water, but of contracting it considerably, so that the engines shall be worked by the alternate expansion and contraction of the steam. Lastly, instead of using water to render the piston or other parts of the engines [engine's] air and steam-tight, I employ oils, wax. resinous bodies, fat of animals, quicksilver, and other metals in their fluid state : And whereas the said James Watt hath employed many years and a considerable part of his fortune in making experiments upon steam and steam engines, commonly called fire engines, with a view to improve those very useful machines, by which several very considerable advantages over the common steam engines are acquired : but upon account of the many difficulties which always arise in the

execution of such large and complex machines, and of the long time requisite to make the necessary trials, he could not complete his Invention before the end of the year One thousand seven hundred and seventy-four, when he finished some large engines as specimens of his construction, which have succeeded so as to demonstrate the utility of the said Invention : And whereas in order to manufacture these engines with the necessary accuracy, and so that they may be sold at moderate prices, a considerable sum of money must be previously expended in erecting mills and other apparatus, and as several years and repeated proofs will be required before any considerable part of the publick [public] can be fully convinced of the utility of the Invention and of their interest to adopt the same, the whole term granted by the said Letters Patent may probably elapse before the said James Watt can receive an advantage adequate to his labour and Invention : And whereas by furnishing mechanical powers at much less expence [expense] and in more convenient forms than has hitherto been done, his engines may be of great utility in facilitating the operations in many great works and manufactures of this kingdom, yet it will not be in the power of the said James Watt to carry his Invention into that complete execution which he wishes, and so as to render the same of the highest utility to the publick [public] of which it is capable, unless the term granted by the said Letters Patent be prolonged and his property in the said Invention secured not only within that part of Great Britain called England, the Dominion of Wales, the Town of Berwick-upon-Tweed, and His Majesty's Colonies and Plantations abroad, but also within that part of Great Britain called Scotland, for such time as may enable him to obtain an adequate recompence for his labour, time, and expence [expense]. To the end, therefore, that the said James Watt may be enabled and encouraged to prosecute and compleat [complete] his said Invention, so that the publick [public] may reap all the advantages to be derived therefrom in their fullest extent, may it please your most Excellent Majesty (at the humble petition and request of the said James Watt), that it may be enacted : and be it enacted by the King's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, that from and after the passing of this Act the sole privilege and advantage of making, constructing, and selling the said engines herein-before particularly described within the Kingdom of Great Britain and His Majesty's Colonies and Plantations abroad, shall be and are hereby declared to be vested in the said James Watt, his executors, administrators, and assigns, for and during the term of twenty-five years, and that he, the said James Watt, his executors, administrators, and assigns, and every of them, by himself and themselves, or by his and their deputy or deputies, servants or agents, or such others as he, the said James Watt,

his executors, administrators, and assigns, shall at any time agree with, and for no others, from time to time and at all times during the term of years herein-before mentioned, shall and lawfully may make, use, exercise, and vend the said engines within the Kingdom of Great Britain and in His Majesty's Colonies and Plantations abroad, in such manner as to him, the said James Watt, his executors, administrators, and assigns, shall in their discretions seem meet, and that the said James Watt, his executors, administrators, and assigns, shall and lawfully may have and enjoy the whole profit, benefit, commodity, and advantage from time to time coming, growing, accruing, and arising by reason of these his said Inventions for the said term of twenty-five years, to have, hold, receive, and enjoy the same for and during and to the full end and term of twenty-five years as aforesaid : and that no other person or persons within the Kingdom of Great Britain, or any of His Majesty's Colonies or Plantations abroad, shall at any time during the said term of twenty-five years, either directly or indirectly, do make, use, or put in practice the said Inventions, or any part of the same so attained unto by the said James Watt as aforesaid, nor in anywise counterfeit, imitate, or resemble the same, nor shall make or cause to be made any addition thereunto or subtraction from the same, whereby to pretend himself or themselves the inventor or inventors, deviser or devisors thereof, without the licence, consent, or agreement of the said James Watt, his executors, administrators, or assigns, in writing under his or their hand and seal, or hands and seals, first had and obtained in that behalf, upon such pains and penalties as can or may be justly inflicted on such offenders for their contempt of this Act, and further, to be answerable to the said James Watt, his executors, administrators, and assigns, according to law, for his and their damages thereby occasioned.

Provided always, and be it hereby declared, that nothing in this Act contained shall extend or be construed to extend to prejudice or hinder any person or persons from making or using any fire or steam engine, or any particular contrivance relating to the same. which is not at present of the Invention of the said James Watt, or which has been publickly [publicly] used or exercised by any other person or persons before the time of the date of the said Letters Patent herein recited, but that all such engines and contrivances which are not at present of the said Invention of the said James Watt, or are not particularly specified in this Act, shall be and remain to the publick [public] and to the respective Inventors thereof as if this Act had never been made, any thing [anything] herein contained to the contrary notwithstanding.

Provided also, that every objection in law competent against the said Patent shall be competent against this Act to all intents and purposes, except so far as relates to the term hereby granted.

Provided always, that if the said James Watt, his executors, administrators, or assigns, or any person or persons who shall at any time during the said term of twenty-five years have or claim any right, title, or interest in law or equity, of, in, or to the power, privilege, or authority of the sole use and benefit of the said Invention, shall make any transfer or assignment, or pretended transfer or assignment, of the said liberty or privilege hereby granted, or any share or shares of the benefit or profits thereof, or shall declare any trust thereof to or for any number of persons exceeding the number of five, or shall open or cause to be opened any hook or books for publick [public] subscriptions to be made by any number of persons exceeding the number of five, in order to the raising any sum or sums of money under pretence of carrying on the said liberty or privilege hereby granted, or shall by him or themselves, or his or their agents or servants, receive any sum or sums of money whatsoever of any number of persons exceeding in the whole the number of five, for such or the like intents or purposes, or shall presume to act as a corporate body, or shall divide the benefit of the liberty or privileges hereby granted into any number of shares exceeding the number of five, or shall commit or do, or procure to be committed or done, any act, matter, or thing whatsoever during such time as such person or persons shall have any right or title, either in law or equity, which shall be contrary to the true intent and meaning of an Act of Parliament made in the sixth year of the reign of His late Majesty King George the First, intituled An Act for the better securing certain Powers and Privileges intended to be granted by His Majesty, by Two Charters for Assurance of Ships and Merchandises at Sea and for lending Money upon Bottomry, and for restraining several extravagant and unwarrantable Practices therein mentioned: or in case the said power, privilege, or authority shall at any time become vested in or in trust for more than the number of five persons or their representatives at any one time, otherwise than by devise or succession (reckoning executors and administrators as and for the single persons whom they represent as to such interest as they are or shall be intituled [entitled] to in right of such their testator or intestate), that then and every of the said cases, all liberties and advantages whatsoever hereby granted shall utterly cease, determine, and become void, any thing [anything] herein-before contained to the contrary thereof in anywise notwithstanding.

And be it further enacted by the authority aforesaid, that this Act shall be adjudged, deemed, and taken to be a publick [public] Act, and shall be judicially taken notice of as such by all judges, justices, and other persons whomsoever without specially pleading the same.

Redbill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.

[Wt. 25-25/9/1912.]

I. f. Richard Arkwright's Patent Specification  
"for certain machines for preparing silk, cotton, flax, and wool, for spinning"  
(patent granted December 16, 1775; Specification Enrolled April 13, 1776)<sup>3</sup>

[Second Edition.]

A.D. 1775 ..... N<sup>o</sup> 1111.

Machinery for Preparation of Fibrous Materials for Spinning.

ARKWRIGHT'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, RICHARD ARKWRIGHT, of Cromford, in the County of Derby, send greeting.

WHEREAS I, the said Richard Arkwright, did, by my petition, humbly represent to His present, most Excellent Majesty King George the Third, that I had, by much study, application, and expence [expense], contrived, invented, and brought to perfection "CERTAIN INSTRUMENTS OR MACHINES WHICH WOULD BE OF PUBLICK [PUBLIC] UTILITY IN PREPARING SILK, COTTON, FLAX, AND WOOL, FOR SPINNING, AND CONSTRUCTED ON EASY AND SIMPLE PRINCIPLES VERY DIFFERENT FROM ANY THAT HAD EVER BEEN CONTRIVED ;" that in regard I was the first and sole Inventor thereof, and that the same had never been practised by any other person or persons whomsoever, to the best of my knowledge and belief, I humbly prayed His said Majesty to grant unto me, my executors, administrators, and assigns His Royal Letters Patent for the sole use, benefit, and advantage of my said Invention, within that part of His said Majesty's Kingdom of Great Britain called England, His dominion of Wales, and Town of Berwick-upon-Tweed, and also in His Colonies and Plantations abroad, for the term of fourteen years, according to the Statute in that case made and provided, His said Majesty being willing to give encouragement to all arts and inventions that might be for the publick [public] good, was graciously pleased to condescend to my request ; and therefore by His Royal Letters Patent, bearing date at Westminster, the Sixteenth day of December, in the sixteenth year of His reign, of His especial grace, certain knowledge and meer [mere] motion, did give and grant unto me, the said Richard Arkwright, my executors, administrators, and assigns, His especial licence, full power, sole priviledge [privilege] and authority, that I, the said Richard Arkwright, my executors, administrators, and assigns, and every of us, by myself or themselves, or by mine and their deputy or deputies, servants or agents, or such

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<sup>3</sup> "Arkwright's Specification," *The British Library: Business & IP Centre*, GB177501111A, 4-5; This copy is reformatted from a scanned printed copy originally published by Love & Malcomson, Ltd, 1902.

others as I, the said Richard Arkwright, my executors, administrators, or assigns, should at any time agree with and no others, from time to time and at all times thereafter during the term of years therein expressed, should and lawfully might make, use, exercise, and vend my said Invention within that part of His said Majesty's Kingdom of Great Britain called England, His Dominion of Wales, and Town of Berwick-upon-Tweed, and also in His Colonies and Plantations abroad, in such manner as to me, the said Richard Arkwright, my executors, administrators, and assigns, or any of us should in our discretions seem meet, and that I, the said Richard Arkwright, my executors, administrators, and assigns, should and lawfully might have and enjoy the whole profit, benefit, commodity, and advantage, from time to time coming, growing, accruing [accruing], and arising by reason of the said Invention, for and during the term of years therein mentioned to have, hold, exercise, and enjoy the said licence, powers, privileges [privileges], and advantages therein before granted or mentioned to be granted unto me, the said Richard Arkwright, my executors, administrators, and assigns, for and during and unto the full end and term of fourteen years from the date of the said Letters Patent next and immediately ensuing and fully to be compleat [complete] and ended according to the Statute in such case made and provided ; in which said Letters Patent is contained a proviso that if I, the said Richard Arkwright, should not particularly describe and ascertain the nature of my said Invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, and cause the same to be inrolled [enrolled] in His said Majesty's High Court of Chancery within four calendar months next and immediately after the date of the said Letters Patent, that then the said Letters Patent, and all liberties and advantages whatsoever thereby granted, should utterly cease, determine, and become void, anything therein-before contained to the contrary thereof in anywise notwithstanding, as in and by the said Letters Patent (relation being thereunto had) may more fully and at large appear.

NOW KNOW YE, that I, the said Richard Arkwright, in compliance with the said proviso, do hereby describe and ascertain the nature of my said Invention, and declare that the Plan thereof drawn in the margin of these Presents is composed of the following particulars, (that is to say) : –

No. 1: a beater or breaker of seeds, husks, &c., and a finer of the flax, hemp, and other articles which are to be prepared for dressing, in which is *a* is a wheel with teeth, which, by acting upon a lever, raises the hammer *c*, the lever being movable upon the centre *d*.

No. 2: an ironframe [iron frame] with teeth at *a* working against a lower frame with like teeth at *b* ; this lower frame is firmly connected to a wooden frame by means of the skrews

[screws] *c, c*. The upper teeth are made to act against the lower by means of the joints *d, d, d, d*.

No. 3 is a piece of cloth, with wool, flax, hemp, or any other such materials spread thereon, as at *a*. No. 4 is a crank and a frame of iron with teeth at *a*, being movable at the joints *b, b, b, b*, by means of cranks and by a cord turning the pulley or wheel *c*. This motion of the teeth *a* works them backwards and forwards upon the cylinder No. 5, and dischargeth the cotton, wool, &c. from it at *d*. No. 5 is the last-mentioned cylinder, which hath fillet cards ; behind this cylinder.

No. 3 delivereth its contents upon another cylinder. No. 6 consists of rollers fixed to a wooden frame, the contents of No. 5 being brought to it at *a*, and going through at *b*, produceth it a proper size *f. c; c*, are brushes for clearing the machine. No. 7, a cylindrical box for twisting the contents of No. 6 at *b; a, a*, are two rollers, one moving the other, between which the contents of No. 6 passeth into the cylinder *b; c* is a dead pulley fixed to the frame ; *d* a cord, which, passing from the pulley *c*, moves the rollers *a, a*; *F*, a wheel, the movement of which is brought from *F*, No. 10, and is fixed to No. 6. No. 8. a machine for twisting the contents of No. 6, in which *d, d*, is a frame of iron; *b* a roller on which a bobbin *e* is fixed; this is turned the same as No. 7, that is by a dead pulley or wheel fixed to a wooden frame at *g*. No. 9, a spindle and flyer, being fixed to No. 6, for twisting the contents from *b* in No. 6 ; *d* is pulley under the bobbin, which hath a communication by a band to No. 10 at *d, d*, it being a conical or regulating wheel, which moves the bobbin quicker or slower as required. No. 10, a spindle, which being fixed to No. 6 at *a*, worketh No. 7, No. 8, or No. 9, at *F, F, F*, by the pulley *F c; d*, a regulator for No. 9 ; *b*, a socket, having a bolt going through *d, d*, and *F c* to *G*, stops or sets the whole going by means of a catch *a* ; for, the pulley *G, G*, being loose upon the spindle, *o*, a lever movable about *k*, raiseth or falleth the bolt *h*.

In witness whereof, I, the said Richard Arkwright, have hereunto set my hand and seal, the Tenth day of April, in the sixteenth year of the reign of His said most Excellent Majesty George the Third, by the grace of God, of Great Britain, France, and Ireland King, Defender of the Faith, and so forth, and in the year of our Lord One thousand seven hundred and seventy-six.

RICH<sup>d</sup> [RICHARD] ARKWRIGHT. (LS.)

Sealed and delivered, by the above-named Richard Arkwright (being first duly stamp  
[stamped]), in the presence of

JOHN HARKER,

J. F. D. CROFTS,

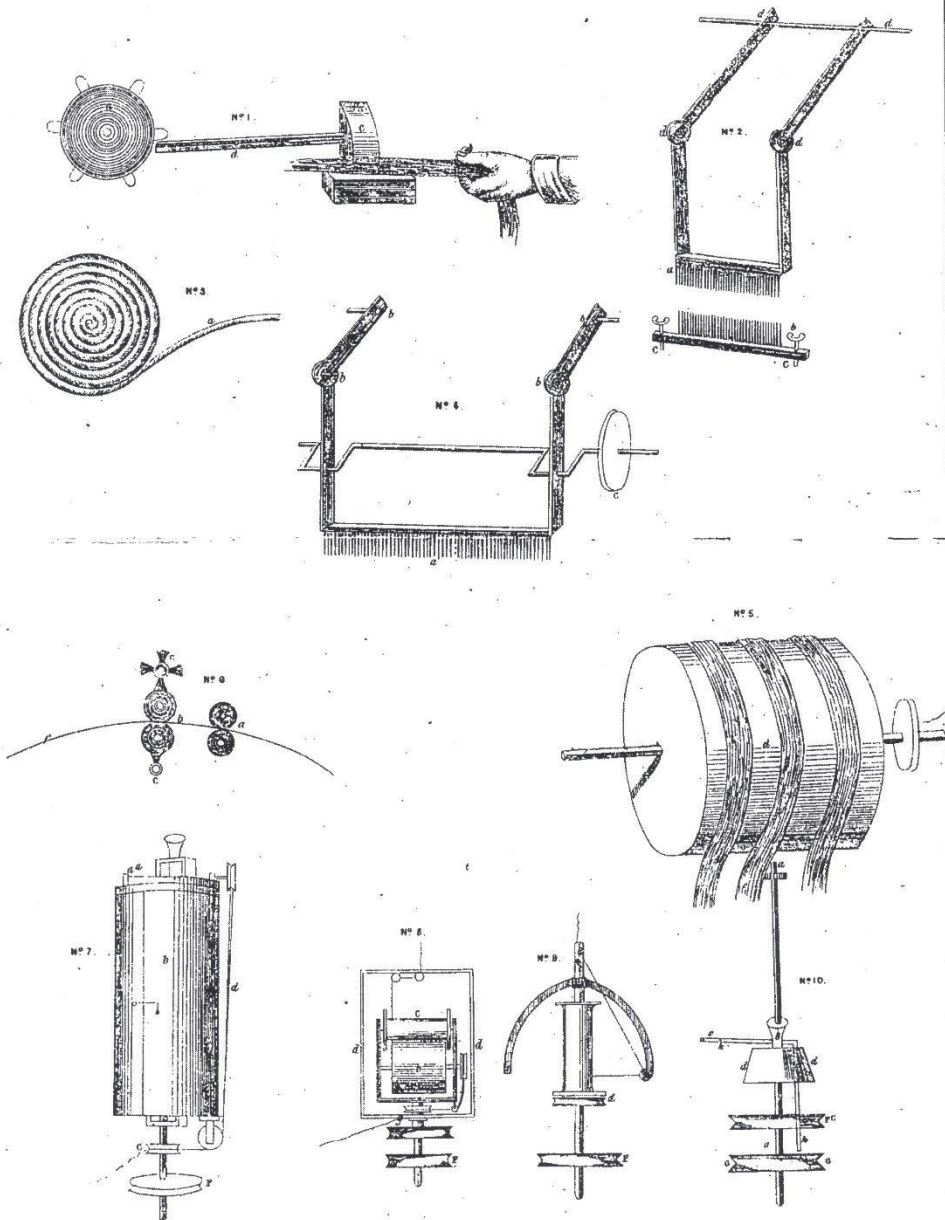
Clerk to Mr. Evans, in Nottingham.

AND BE IT REMEMBERED, that the Tenth day of April, in the year above written, the aforesaid Richard Arkwright came before our said Lord the King in His Chancery, and acknowledged the Instrument aforesaid, and every thing [everything] therein contained and specified, in form above written. And also the Instrument aforesaid was stampd [stamped] according to the tenor of the Statute made in the sixth year of the reign of the late King and Queen William and Mary of England, and so forth.

Inrolled [Enrolled] the Thirteenth day of April, in the year One thousand seven hundred and seventy-six.

Redbill : Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.

[G. 6423-25-2/1902.]



The enrolled drawing is partly coloured.

Waltby & Sons, Photo-Litho.

I. g. “An Act for vesting in John Liardet, his, &c., the sole use and property of a certain composition or cement of his invention throughout his Majesty’s kingdom of Great Britain for a limited time” (The bill received royal assent on May 13, 1776)<sup>4</sup>

Act A. D. 1776.

An Act for vesting in John Liardet, his, &c., the sole use and property of a certain composition or cement of his invention throughout his Majesty’s kingdom of Great Britain for a limited time.

Recompense to the inventor and advantage to the public.

After reciting the grant of the letters patent, and further reciting, “unless the term granted by the said letters patent be prolonged, and the property of the said John Liardet in the said invention better secured, not only within that part of Great Britain called England, the dominion of Wales, the town of Berwick upon Tweed, and in his Majesty’s colonies and plantations abroad, but also within that part of Great Britain called Scotland, it will neither be possible for the said John Liardet to receive an adequate recompense for his labour, expense and time, nor for the public at large to a greater one than is advantages in point of utility and economy, as well as ornament in building, which would arise from this invention were its use universally diffused, and its price lowered, upon which the demand, and consequently the profits of the proprietor, must depend : And whereas the cement from its nature grows too hard for use if not used soon after it is made, and therefore must be made where used, or near it, from which circumstance the use thereof has hitherto been confined to the metropolis and a few miles about it, as training workmen and erecting works is difficult and expensive : And whereas, if the term is not enlarged, the same narrow plan must be continued, a general plan of erecting works and training men all over the kingdom, which is necessary if the use of the cement is to be universal, cannot upon so short a prospect be undertaken, the circle cannot be enlarged, and the price must continue such as may indemnify the proprietor for his expense, out of the profits arising from a very small consumption only during his present term ; to the end therefore that the said John Liardet may be enabled and encouraged to prosecute and complete his said invention, so that the public may reap all the advantages to be derived therefrom in their fullest extent,” it is enacted, that the said letters patent should be vested in the said Liardet, his, &c., for 18 years from the passing of the act.

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<sup>4</sup> From the printed copy provided in Thomas Webster, *Report and Notes of Cases on Letters Patent for Inventions* (Thomas Blenkarn, Law Bookseller, 1844), 52-3; *Journals of the House of Commons, From November the 29th, 1774, in the Fifteenth Year of the Reign of King George the Third, to October the 15th, 1776, in the Sixteenth Year of the Reign of King George the Third*, vol. 35, 782.

That price shall not exceed a certain amount.

S. 2. And whereas the said John Liardet has hitherto furnished the said cement at the rate of sixpence per foot square on the surfaces of all plain buildings, and twopence per foot running measure for arises [arises] ; to the end therefore that the public may be assured of the advantage of this invention at the same price, be it further enacted, by the authority aforesaid, that it shall not be lawful for the said John Liardet, his, &c., during the continuance of this act, to ask, demand, or take any greater price than sixpence by the foot square, and twopence per foot as aforesaid for arises [arises], so covering any plain work with the aforesaid cement or composition.

The use of the composition not to be hindered.

3. Proviso, that the act shall not hinder the making any composition or cement not the invention or application of the said Liardet, or which has been publicly used or exercised before the date of the letters patent ; but that all such not the invention of the said Liardet, or not particularly ascertained and described in the specification thereafter mentioned, should remain to the public or inventor as if the said act had not been made.

Objections to patent saved.

4. That every objection which might have been made to the said cement, not being a new invention within the true intent and meaning of an act of the 21st of James the First, may be made in bar to any action brought by virtue or in consequence of this act.

5. Proviso against transfer to more than five persons.

6. Proviso that Liardet shall enrol [enroll] a specification within four months after the passing of the act.

I. h. John Johnson's Patent for "A Cheap and Durable Composition for the Covering the Fronts and Tops and Ornamenting of Houses and Buildings, and for other Purposes in the Building Trade, and which will adhere to Surfaces that are Wet as well as those that are Dry, at any Season of the Year" (March 29, 1777)<sup>5</sup>

A.D. 1777 ..... N° 1150.

Composition or Cement for Building Purposes.

JOHNSON'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JOHN JOHNSON, of Berners Street, in the Parish of Saint Mary le Bone, otherwise Mary Bone, in the County of Middlesex, Architect, send greeting.

WHEREAS I, the said John Johnson, did, by my humble Petition, represent to His present most Excellent Majesty King George the Third, that, by study, application, and expence [expense] in trying experiments, found and invented "A CHEAP, AND DURABLE COMPOSITION FOR THE COVERING THE FRONTS AND TOPS AND ORNAMENTING OF HOUSES AND BUILDINGS, AND FOR OTHER PURPOSES IN THE BUILDING TRADE, AND WHICH WILL ADHERE TO SURFACES THAT ARE WET AS WELL AS THOSE 10 THAT ARE DRY, AT ANY SEASON OF THE YEAR ;" and that in regard I was the first Inventor thereof, I therefore most humbly prayed His Majesty that He would be graciously pleased to grant unto me, my executors, admors, and assigns, His Royal Letters Patent, for the sole use and exercise of his said Invention within that part of His said Majesty's Kingdom of Great Britain called England, His Dominion of Wales, and Town of Berwick-upon-Tweed, for the term of fourteen years, according to the Statute in that case made and provided ; His said Majesty, being willing to give encouragement to all arts and inventions which might be for the publick [public] good, was graciously pleased to condescend to my request, and therefore, by His Royal Letters Patent, bearing date at Westminster, the Twenty-ninth day of March, in the seven-teenth year of His reign, of His especial grace, certain knowledge, and meer [mere] motion, for Himself, His heirs and successors, did give and grant unto me, the said John Johnson, my executors, admors, and assigns, His especial licence, full power, sole privilege and authority, that I, the said John Johnson, my executors, admors, and assigns, and every of them, by myself and themselves, and by my or their deputy or deputies, servants or agents, or such others as I, the

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<sup>5</sup> "Johnson's Specification," *The British Library: Business & IP Centre*, GB177701150A, 1-3; This copy is reformatted from a scanned printed copy originally published by George Edward Eyre and William Spottiswoode, 1856.

said John Johnson, my executors, admors, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term of years therein expressed, should and lawfully might make, use, exercise, and vend my said Invention within that part of His said Majesty's Kingdom of Great Britain called England, His Dominion of Wales, and Town of Berwick-upon-Tweed, in such manner as to me, the said John Johnson, my executors, admors, and assigns, or any of us, should in our discretions seem meet, and that I, the said John Johnson, my exors, admors, and assigns, should and lawfully might have and enjoy the whole profit, benefit, commodity, and advantage from time to time coming, growing, accruing, and arising by reason of the said Invention, for and during the term of years therein mentioned, to have, hold, exercise, and enjoy the said licence, powers, privileges [privileges], and advantages therein-before granted or mentioned to be granted unto me, the said John Johnson, my exors, admors, and assigns, for and during and unto the full end and term of fourteen years from the date of the said Letters Patent next and immediately ensuing, and fully to be compleat [complete] and ended, according to the Statute in such case made and provided ; in which said Letters Patent is contained a proviso that if I, the said John Johnson, should not particularly describe and ascertain the nature of my said Invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, and cause the same to be inrolled [enrolled] in His said Majesty's High Court of Chancery within four calendar months next and immediately after the date of the said Letters Patent, that then the said Letters Patent, and all liberties and advantages whatsoever thereby granted, should utterly cease, determine, and become void, anything therein-before contained to the contrary thereof in anywise notwithstanding, as in and by the said Letters Patent, relation being thereunto had, may more fully and at large appear.

NOW KNOW YE, that I, the said John Johnson, in compliance with the said proviso, do hereby describe and ascertain the nature of my said Invention, and declare that the same is composed of the several particulars, and used in the manner following (that is to say) :-

Take any quantity of the serum of blood, to which add an equal quantity of linseed oil ; mix this liquid with a quantity of dry large-grained river sand or other sand cleared from its loomy particles, and slaked lime or whiting sufficient to make the composition or cement of the consistence of stiff mortar, which is to be well beat with an instrument that is commonly used for stucco. Let there be two thirds of sand to one third of lime. It may be used with the tools commonly used by bricklayers and plaisterers [plasters]. If it is required to cover the fronts of buildings, &c., let the surface be first well moistened with the liquid above

described, and, after the first coat is laid on, let it be pierced with an instrument with iron teeth of the form described in the margin, which will prevent the composition from blistering. If the colour is to be attended to, then for the outer coat, take the materials as above described, with the whitest sand, to which add a proper quantity of painters' colours to make it of such colour as may be required, subtracting from the liquid a quantity in measure equal to the colour added.

In witness whereof, I, the said John Johnson, have hereunto set my hand and seal, this Twenty-fifth day of July, in the year of our Lord One thousand seven hundred and seventy-seven, and in the seventeenth year of the reign of our said Sovereign Lord George the Third, by the grace of God of Great Britain, France, and Ireland King, Defender of the Faith, and so forth.

JOHN (L.S.) JOHNSON.

Sealed and delivered in the presence of

JN<sup>o</sup> BACON,  
Newman Street.  
DANIEL FABIAN.

AND BE IT REMEMBERED, that on the Twenty-sixth day of July, in the year of our Lord 1777, the aforesaid John Johnson came before our said Lord the King in His Chancery, and acknowledged the Indenture aforesaid, and all and every thing [everything] therein contained and specified, in form above written. And also the Indenture aforesaid was stamp [stamped] according to the tenor of the Statutes made in the sixth year of the reign of the late King and Queen William and Mary of England, and so forth, and in the seventeenth year of the reign of His Majesty King George the Third.

Inrolled [Enrolled] the Twenty-sixth day of July, in the year of our Lord One thousand seven hundred and seventy-seven.

LONDON:

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,  
Printers to the Queen's most Excellent Majesty. 1856.

I. i. Bryan Higgins is granted a patent for a “cheap and durable Cement, for Building, Incrustation or Stuccoing, and artificial Stone”<sup>6</sup> (Patent granted on January 8, 1779)

[184]

**SECTION XXIII,**  
*The Specification made in Consequence of Letters*  
*Patent, illustrated with Notes.*

IN order to guard against abuses, and to make some compensation for the expenses and risques [risks] of the artists who publicly and boldly executed, on the great scale, what I had designed; I secured an exclusive right in my cement, by virtue of his majesty’s letters patent, on the eighth of January 1779: I authorized Mr. James Wyatt the architect of Queen-Ann-street Cavendish-Square, to use it in the fullest extent, knowing that he, by his knowledge of this subject and his distinguished taste in architecture, will unite in it all the advantages of duration and elegance: I likewise extended this right to Samuel Wyatt the builder in Berwick-street Soho, who is well instructed, and provided with the means of executing any work with this cement, in the highest perfection: And I intend to reserve this privilege to them,

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until the public convenience requires that it should be extended to others, who are capable of making the same dispositions for the benefit of their employers, and for preserving the reputation of my invention free from the usual exactions of monopolists and the abuses of under-jobbers,

As the specification of these letters patent comprehends the most useful practical instructions deduced from the foregoing experiments and observations, and may serve as a concise recapitulation, I subjoin a transcript of it.

SPECIFICATION.

To all to whom these presents shall come &c.

Now know ye that in compliance with the said proviso, I the said B. H. do hereby declare that my invention of a water cement or stucco, for building repairing and plastering walls, and for other purposes, is described in the manner following (that is to say) drift sand, or quarry<sup>7</sup> sand, which

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<sup>6</sup> Bryan Higgins, *Experiments and Observations Made with the View of Improving the Art of Composing and Applying Calcareous Cements, and of Preparing Quick-lime: Theory of These Arts: and Specification of the Author’s Cheap and Durable Cement for Building, Incrustation, Or Stuccoing, and Artificial Stone*, (T. Cadell, 1780), 184-205.

<sup>7</sup> This is commonly called pit-sand.

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consists chiefly of hard quartose flat faced<sup>8</sup> grains with sharp angles; which is the freest, or may be most easily freed by washing, from clay, salts, and calcareous gypseous or other grains less hard and durable than quartz; which contains the smallest quantity of pyrites or heavy metallic matter inseparable by washing; and which suffers the smallest diminution of its bulk in washing in the following manner, is to be preferred before any other<sup>9</sup>. And where a coarse and a fine sand of this kind, and corresponding in the size of their grains with the coarse and fine sands hereafter described, cannot be easily procured, let such sand of the foregoing quality be chosen, as may be sorted and cleansed in the following manner.

LET the sand be sifted in streaming clear water, through a sieve which shall give passage to all such grains as do not

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exceed one sixteenth of an inch in diameter; and let the stream of water and the sifting be regulated so that all the sand which is much finer than the Lynn-sand commonly used in the London glass-houses, together with clay and every other matter specifically lighter than sand, may be washed<sup>10</sup> away with the stream, whilst the purer and coarser sand, which passes *thro'* [through] the sieve, subsides in a convenient receptacle, and whilst the coarse rubbish and shingle<sup>11</sup> remain on the sieve, to be rejected.

LET the sand which thus subsides in the receptacle, be washed in clean streaming water, through a finer sieve, so as to be further cleansed and sorted into two parcels; a coarser, which will remain in the sieve which is to give passage to such grains of sand only as are less than one thirtieth of an inch in diameter, and which is to be saved apart under the name

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of coarse sand; and a finer, which will pass through the sieve and subside in the water, and which is to be separated apart under the name of fine sand.—Let the coarse and the fine sand be dried separately, either in the sun, or on a clean iron plate set on a convenient furnace, in the manner of a sand heat.<sup>12</sup>

LET lime be chosen,<sup>13</sup> which is stone lime, which heats the most in flaking, and flakes

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<sup>8</sup> The twelfth section treats of this.

<sup>9</sup> The reasons of this preference are given in the fifteenth, sixteenth nineteenth, and twentieth sections.

<sup>10</sup> THE grounds of this treatment appear in the twelfth and thirteenth section.

<sup>11</sup> I find that I have used this word improperly, on bad authority. The reader is requested to read rubble instead of shingle throughout this specification.

<sup>12</sup> The sand ought to be stirred up continually until it is dried, and is then to be taken off; for otherwise the evaporation will be very flow, and the sand which lies next the iron plate, by being overheated, will be discoloured.

<sup>13</sup> THE grounds of the instructions comprized in this paragraph, appear in the second, fourth, fifth and eleventh sections. The preference given to stone lime is founded on the present practice in the burning of lime, and on the closer texture of it, which prevents it from being so soon injured by exposure to the air, as the more spongy chalk lime is; not on the popular notion that stone lime has something in it whereby it excels the best chalk in the cementing properties. The real difference between these will be [shewn] shown in the next section.

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the quickest when duly watered; which is the freshest made and closest kept; which dissolves in distilled vinegar with the least effervescence, and leaves the smallest residue insoluble, and in this residue the smallest quantity of clay gypsum or martial matter.

Let the lime chosen according to these important rules, be put in a brass-wired sieve to the quantity of fourteen pounds. Let the sieve be finer than either of the foregoing; the finer, the better it will be: Let the lime be flaked<sup>14</sup> by plunging it in

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A butt filled with soft water and raising it out quickly and suffering it to heat and fume, and by repeating this plunging and raising alternately and agitating the lime, until it be made to pass through the sieve into the water; and let the part of the lime which does not easily pass through the sieve be rejected: and let fresh portions of the lime be thus used, until as many<sup>15</sup> ounces of lime have passed through the sieve, as there are quarts of water in the butt. Let the water thus impregnated stand in the butt closely covered<sup>16</sup> until it becomes clear; and through wooden<sup>17</sup> cocks placed at different heights in the butt, let the clear liquor

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THE gypsum contained in lime stone remains unaltered or very little altered in the lime, after the burning; but it is not to be expected that clay or martial matter should be found in their native state, in well burned lime; for they concrete or vitrify [vitrify] with a part of the calcareous earth, and constitute the hard grains or lumps, which remain undissolved in weak acids, or are separable [separable] from the slaked lime by sifting it immediately through a sieve.

<sup>14</sup> This method of impregnating the water with lime is not the only one which may be adopted. It is however preferred before others, because the water clears the sooner in consequence of its being warmed by the flaking lime, and the gypseous part of the lime does not diffuse itself in the water so freely in this way, as it does when the lime is flaked to fine powder in the common method and is then blended with the water; for the gypseous part of the lime flakes, at first, into grains, rather than into fine powder, and will remain on the sieve, after the pure lime has passed through, long enough to admit of the intended separation; but when the lime is otherwise flaked the gypseous grains have time to flake to a finer powder, and passing through the sieve, dissolve in the water along with the lime. I have imagined that other advantages attended this method of preparing the lime water, but I cannot yet speak of them with precision.

<sup>15</sup> If the water contains no more acidulous gas than is usually found in river or rain water [rainwater], a fourth part of this quantity of lime, or less, will be sufficient.

<sup>16</sup> THE calcareous crust which forms on the surface of the water ought not to be broke, for it assists in excluding the air and preventing the absorption of acidulous gas whereby the lime water is spoiled.

<sup>17</sup> Brass cocks are apt to colour a part of the liquor.

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be drawn off as fast<sup>18</sup> and as low as the lime subsides, for use. This clear liquor I call the cementing liquor<sup>19</sup>. The freer the water is from saline matter, the better will be the cementing liquor made with it.

LET fifty-six pounds of the aforesaid chosen lime be flaked, by gradually sprinkling on it, and especially on the unflaked pieces, the cementing liquor, in a close<sup>20</sup> clean place. Let the flaked part be

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immediately<sup>21</sup> sifted through the last mentioned fine brass-wired sieve: Let the lime which passes be used instantly or kept in air-tight vessels, and let the part of the lime which does not pass through the sieve, be rejected<sup>22</sup>.—This finer richer part of the lime which passes through the sieve, I call purified lime.

LET bone-ash be prepared<sup>23</sup> in the usual manner by grinding the whitest burnt bones, but let it be sifted to be much finer

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than the bone-ash commonly sold for making cupels.

THE most eligible materials for making my cement being thus prepared: Take fifty-six pounds of the coarse sand and forty-two pounds of the fine sand; mix them on a large plank of hard wood placed horizontally; then spread the sand so that it may stand to the height of six inches with a flat surface on the plank; wet it with the cementing liquor; and let any superfluous<sup>24</sup> quantity of the liquor, which the sand in the condition described cannot retain, flow away off the plank. To the wetted sand add fourteen pounds of the purified lime in several successive portions, mixing and beating them up together in the mean time

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<sup>18</sup> LIME water cannot be kept many days unimpaired, in any vessels that are not perfectly air-tight. If the liquor be drawn off before it clears, it will contain whiting, which is injurious; and if it be not instantly used, after it is drawn limpid from the butt into open vessels, it will grow turbid again, and deposite [deposit] the lime changed to whiting by the gas absorbed from the air. The calcareous matter which subsides in the butt, resembles whiting the more nearly, as the lime has been more sparingly employed; in the contrary circumstances, it approaches to the nature of lime; and in the intermediate state, it is fit for the common composition of the plasterers for inside stucco.

<sup>19</sup> At the time of writing this specification I preferred this term before that of lime-water, on grounds which I had not sufficiently examined.

<sup>20</sup> The vapour which arises in the flaking of the lime contributes greatly to the flaking of these pieces which lie in its way; and an unnecessary waste of the liquor is prevented, by applying it to the lime heaped in a pit or in a vessel which may restrain the issue of the vapour, and direct it through the mass. If more of the liquor be used than is necessary to flake the lime, it will create error in weighing the slaked powder, and will prevent a part of it from passing freely through the sieve. The liquid is therefore to be used sparingly, and the lime which has escaped its action is to be sprinkled apart with fresh liquor.

<sup>21</sup> WHEN the aggregation of the lumps of lime is thus broken, it is impaired much sooner than it is in the former state, because the air more freely pervades it. This is shewn [shown] in the fifth section.

<sup>22</sup> BECAUSE it consists of heterogeneous matter, or of ill burnt lime; which last will flake and pass through the sieve, if the lime be not immediately sifted after the flaking, agreeable to the text. The reason of this may be drawn from the fourth section.

<sup>23</sup> This art is taught in the twenty-second section.

<sup>24</sup> THE grounds of this practice are shewn in the twelfth section.

[meantime] with the instruments generally used in making fine mortar: then add fourteen pounds of the bone-ash in successive portions, mixing and beating all together. The quicker and the more perfectly these materials are mixed and beaten together, and the sooner the

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cement thus formed is used, the better<sup>25</sup> it will be. This I call the water cement coarse grained, which is to be applied in building, pointing, plastering, stuccoing, or other work, as mortar and stucco now are; with this difference chiefly, that as this cement is shorter than mortar or common stucco and dries sooner, it ought to be worked expeditiously in all cases, and in stuccoing it ought to be laid on by sliding the trowel upwards on it; that the materials used along with this cement in building, or the ground on which it is to be laid in stuccoing, ought to be well wetted<sup>26</sup> with the cementing liquor, in

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the instant of laying on the cement; and that the cementing liquor is to be used when it is necessary to moisten the cement, or when a liquid is required to facilitate the floating of the cement.

WHEN such cement is required to be of a finer texture; take ninety-eight pounds of the fine sand, wet it with the cementing liquor and mix it with the purified lime and the bone-ash in the quantities and in the manner above described, with this difference only, that fifteen pounds of lime, or<sup>27</sup> thereabouts, are to be used instead of fourteen pounds, if the greater part of the sand be as fine as Lynn sand. This I call water cement fine grained. It is to be used in giving the last coating or the finish to any work intended to imitate the finer grained stones or stucco. But it may be applied to all the uses of the water cement coarse grained, and in the same manner.

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WHEN for any of the foregoing purposes of pointing, building, &c. such a cement is required much cheaper and coarser grained, then, much coarser clean sand than the foregoing coarse sand, or well washed fine<sup>28</sup> shingle is to be provided. Of this coarse sand or shingle<sup>22</sup> take fifty-six pounds, of the foregoing coarse sand twenty-eight pounds and of the fine sand fourteen pounds; and after mixing these and wetting them with the cementing liquor in the foregoing manner, add 14 pounds, or somewhat less, of the<sup>29</sup> purified lime, and then fourteen pounds or somewhat less of the bone-ash, mixing them together in the manner already described. When my cement is required to be white, white sand, white lime, and the whitest

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<sup>25</sup> THESE proportions are intended for a cement made with sharp sand, for incrustation in exposed situations, where it is necessary to guard against the effects of hot weather and rain. In general half this quantity of bone-ashes will be found sufficient; and altho [although] the incrustation in this latter case will not harden deeply so soon, it will be ultimately stronger provided the weather be favourable.

THE injuries which lime and mortar sustain, by exposure to the air, before the cement is finally placed in a quiescent state, appear in many parts of the foregoing pages; and therefore our cement is the worse for being long beaten, but the better as it is quickly beaten untill [until] the mixture is effected, and no longer.

<sup>26</sup> SEE section vii. and page 75.

<sup>27</sup> SEE section xiii. The quantity of bone-ashes is not to be increased with that of the lime, for the reason given in page 176; but it is to be lessened as the exposure and purposes of the work will admit. See section xxii.

<sup>28</sup> Rubble.

<sup>29</sup> BECAUSE less lime is necessary as the sand is coarser Section xii and xiii.

bone-ash are to be chosen. Grey sand and grey bone-ash formed of half burnt bones, are to be chosen to make the cement grey; and any other<sup>30</sup> colour

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of the cement is obtained, either by chusing [choosing] coloured sand, or by the admixture of the necessary quantity of coloured talc in powder, or of coloured vitreous or metallic powders, or other durable<sup>31</sup> colouring ingredients commonly used in paint.

To the end that such a water cement as I have described may be made as useful as is possible in all circumstances; and that no person may imagine that my claim and right under these Letters Patent may be eluded by divers variations which may be made in the foregoing process without producing any notable defect in the cement; and to the end that the principles of this art as well as the art itself of making my cement, may be gathered from this specification and perpetuated to the public, I shall add the following observations.

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THIS my water cement, whether the coarse or fine grained, is applicable in forming artificial stone, by making alternate layers of the cement and of flint, hard stone, or brick, in moulds of the figure of the intended stone, and by exposing the masses so formed, to the open<sup>32</sup> air to harden.

WHEN such cement is required for water<sup>33</sup> fences, two thirds of the prescribed

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quantity of bone ashes are to be omitted; and in the place thereof an equal measure of powdered terras is to be used; and if the sand employed be not of the coarsest sort, more terras must be added, so that the terras shall be by weight one sixth part of the weight of the sand.

WHEN such a cement is required of the finest grain<sup>34</sup> or in a fluid form, so that it may be applied with a brush, flint powder, or the powder of any quartose or hard earthy substance

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<sup>30</sup> The outlines of these arts are given in section xx.

<sup>31</sup> THE known chemical properties of the several finer ingredients used in paint or water colouring, and the experienced effects of the materials mentioned in the fifteenth, sixteenth, seventeenth, eighteenth, nineteenth and twentieth sections, are sufficient to direct the artist in the choice of those things which will induce colour, with the smallest injury to the incrustation.

<sup>32</sup> But they must not be exposed to the rain, until they are almost as strong as fresh Portland stone; and even then they ought to be sheltered from it, as much as the circumstances will admit. See pages 68, 69, 114. These stones may be made very hard and beautiful, with a small expense of bone-ash, by soaking them, after they have dried thoroughly and hardened, in the lime-liquor, and repeating this process twice or thrice, at distant intervals of time. The like effect was experienced in incrustations, and is mentioned in page 114

<sup>33</sup> To what I have said on this subject in page 134, I must add that, in my experiments, mortar made with terras powder, in the usual method, does not appear to form so strong a cement for water fences, as that made according to the specification, with coarse sand; and I see no more reason for avoiding the use of sand in terras mortar, than there would be for rejecting stone from the embankment. The bone-ashes meant in this place are the dark grey or black fort: I am not yet fully satisfied about the operation of them in this instance.

<sup>34</sup> The qualities and uses of such fine calcareous cement are set forth in the thirteenth and twentieth sections. They are recommended chiefly for the purpose of smoothing and finishing the stronger crustaceous works, or for washing walls to a lively and uniform colour. For this last intention, the mixture must be as thin as new

may be used in the place of sand, but in a quantity smaller as the flint or other powder is finer; so that the

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Flint powder or other such powder shall not be more than six times the weight of the lime, nor less than four times its weight. The greater the quantity of lime within these limits, the more will the cement be liable to crack by quick drying, and vice versa.

WHERE such sand as I prefer cannot be conveniently procured, or where sand cannot be conveniently washed and sorted, that sand which most resembles the mixture of coarse and fine sand above prescribed, may be used as I have directed, provided due attention is paid to the quantity of the lime, which is to be the greater<sup>35</sup> as the sand is the finer and vice versa.

WHERE sand cannot be easily procured, any durable stoney body, or baked earth grossly powdered<sup>36</sup> and sorted nearly

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to the sizes above prescribed for sand, may be used in the place of sand, measure for measure, but not weight for weight, unless such gross powder be as heavy specifically as sand.

SAND may be cleansed from every softer lighter and less durable matter and from that part of the sand which is too fine, by various methods preferable<sup>37</sup> in certain circumstances, to that which I have described.

WATER may be found naturally free from fixable gas selenite or clay: such water may, without any notable inconvenience, be used in the place of the cementing liquor; and water approaching this state will not require so much lime as I have ordered, to

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make the cementing liquor; and a cementing liquor sufficiently useful may be made by various methods of mixing lime and water in the described proportions, or nearly so.

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cream, and laid on briskly with a brush, in dry weather; and a thick and durable coat is to be made by repeated washing, but is not to be attempted by using a thicker liquor; for the coat made with this last is apt to scale, whilst the former endures the weather much longer than any other thin calcareous covering that has been applied in this way. Fine yellow ochre is the cheapest colouring ingredient for such a wash, when it is required to imitate Bath stone, or the warm- white stones.

<sup>35</sup> FURTHER instructions may be gathered from the thirteenth section. If sea sand be well washed in fresh water, it is as good as any other *round* sand.

<sup>36</sup> THE cement made with these and the proper quantities of purified lime and lime-water, are inferior to the best, as the grains of these powders are more perishable and brittle than those of sand. They will not therefore be employed, unless for the sake of evasion, or for want of sand; in this latter case the finer powder ought to be washed away.

<sup>37</sup> THIS and the next paragraph is inserted with a view to evasions, as well as to suggest the easier and cheaper methods which may be adopted in certain circumstances, by artists who understand the principles which I have endeavoured to teach.

WHEN stone lime cannot be procured, chalk lime or shell lime which best resembles stone lime, in the characters above written of lime, may be used in the manner described, except that<sup>38</sup> fourteen pounds and a half of chalk lime will be required in the place of fourteen pounds of stone lime. The proportion of lime which I have prescribed above may be increased [increased] without inconvenience, when the cement or stucco is to be applied where it is not liable to dry quickly; and in the contrary circumstance this proportion may be diminished; and the defect of lime in quantity or quality may be very advantageously

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supplied<sup>39</sup>, by causing a considerable quantity of the cementing liquor to soak into the work, in successive portions and at distant intervals of time, so that the calcareous matter of the cementing liquor, and the matter attracted from the open air, may fill and strengthen the work.

THE powder of almost every well dried or burnt animal substance may be used instead of bone-ash; and several earthy powders, especially the micaceous and the metallic; and the elixated ashes of divers vegetables whose earth will not burn to lime; and the ashes of mineral fuel, which are of the calcareous kind, but will not burn to lime; will answer the ends of bone-ash in some degree<sup>40</sup>.

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THE quantity of bone-ash described may be lessened without injuring the cement, in those circumstances especially which admit the quantity of lime to be lessened, and in those wherein the cement is not liable to dry quickly. And the art of remedying the defects of lime may be advantageously practised to supply the deficiency of bone-ash, especially in building and in making artificial stone with this cement.

N. B. For inside work, the admixture of hair with this cement is useful.

In witness whereof I the said B. H. &c.

THE excellence of my cement depends first, on the figure size and purity of the sand; secondly on the purity of the lime, obtained in the choice of lime-stone, and in the perfect burning, and secured in the preservation of it from air, in my method of flaking, and in the separation of heterogeneous parts; thirdly on the use of strong and pure lime water in the place of common water; fourthly on the proportion of sands lime water and lime; fifthly, on the manner of mixing them; sixthly, on the knowledge of

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<sup>38</sup> THIS relates to chalk lime burned with a sufficient quantity of fuel in kilns of the common construction. Chalk lime prepared as I shall shew in the next section, will go as far as stone lime, if not farther.

<sup>39</sup> This practice is noticed, as the remedy which may be used for the defects arising from evasive measures, and as the method of giving spongy incrustations containing bone-ashes, the greatest degree of hardness.

<sup>40</sup> The useful substitutes for bone-ashes, have been treated of in the foregoing sections: the metallic micaceous and earthy powders are not recommended in the text, but only enumerated for reasons which influenced the style of this specification, and which lawyers will perceive.

Ingredients and circumstances which are injurious or useful; seventhly, on the use of bone-ashes of determinate size; eighthly, on the art of suiting some of these to the several purposes; and finally on so many other particulars, as render it very difficult to give a more candid specification, in the usual compass, than this which I have enrolled, or to guard otherwise against evasions, than by anticipating them.

I do not think it necessary to insist more minutely on the mechanical arts of applying the coarser or finer calcareous cement, to produce the most agreeable effects, because they are known to so many workmen employed under Mess. Wyatt, and are so nearly related to those already known to the plasterers, that they are not likely to be missed or lost.

SECTION

## II. a. Boulton and Watt's Patent Law Disputes 1792-1800

### Timeline Key

General Events ----- 

*B & W v. Bull* ----- 

*B & Watt v. Hornblower and Maberley* ----- 

Both Bull and Hornblower ----- 

1792

c. "Early" 1792

At Balcoath mine in Cornwall, Edward Bull and Richard Trevithick Jr. begin their construction of an inverted engine that is similar to Watt's earlier pump engines due to a shared use of a submerged steam condenser.<sup>1</sup>

October 11, 1792

Foreshadowing the substantial use of technical evidence to be presented and challenged by expert witnesses Watt requests a detailed sketch of Bull's Balcoath engine.

The sketch includes engine dimensions, with special attention paid to any valves that cover the air pump or piston.<sup>3</sup>

November 13, 1792

With pretrial preparation underway Watt writes to Wilson, requesting he find those who can testify to having witnessed Bull's construction and operation of his infringing engine.<sup>5</sup>

Following Arkwright's lead, a model for trial demonstration purposes of Watt's engine was completed. Additionally, work begins on a model of Bull's engine based on Murdock's diagram.

The task of securing expert witnesses begins.<sup>6</sup>

July 4, 1792

Watt writes to Thomas Wilson, the Cornwall-based financial agent and general fixer of Boulton and Watt's firm, informing Wilson that Watt fears that Bull has left "us no choice" but to bring an action against in Common Pleas.<sup>2</sup>

In Chancery, Watt seeks an injunction against Bull and the users of his engine.

October 14, 1792

With Bull receiving more requests to construct his engine Watt warns the mine operators at Godolphin that "Bull's engine is [built] entirely on our principles & that we are now bringing an action against him which will be tried next term."<sup>4</sup>

Most likely, Watt aims for the trial to be at the start of Hilary Term in January of 1793.

1793

February 8, 1793

The originally scheduled trial date passes as Watt's and Bull's counsel fight over the trial location.<sup>7</sup> Bull wisely hopes for the trial to be heard in Cornwall where Watt's licensing fees have not made him many friends.

Watt's counsel defeated Bull's motion for a Cornwall trial.<sup>8</sup>

April 18, 1793

Watt to J. A. De Luc: "In consequence of these delays we are trampled upon in Cornwall, a Dozen & More Engines are erecting by Bull & Hornblower in open defiance of us."<sup>9</sup>

In response to the practical failure of their injunction, Watt pushes ahead towards a June 1793 trial.<sup>10</sup>

June 22-23, 1793

*Boulton and Watt v. Bull* is heard before Chief Justice Eyre and a special jury in the Court of Common Pleas.<sup>12</sup>

Of Boulton and Watt's 11 witnesses, 8 were expert witnesses. Bull calls 7 expert witnesses including Jonathan and Jabez Hornblower.<sup>13</sup>

The jury finds for Boulton and Watt that Bull infringed on their patent, yet Eyre raises "very great doubt whether this specification is sufficient".<sup>14</sup>

Therefore, the jury's verdict is left outstanding as the court is to review, in a Special Case, the soundness of Watt's 1769 specification.

March 22, 1794

Watt is granted a new injunction by Alexander Wedderburn (Lord Loughborough) requiring Bull to cease both the production of new engines and the completion of engines currently under construction.<sup>17</sup>

The jury finds that Bull is guilty of infringement. However, the underlying legitimacy of Watt's patent remains unsolved.

The injunction, much to Watt's dismay, did not require Bull to halt operations of his already operational engines.

1793

June 8, 1793

Watt writes to Wilson informing him to discuss payment of expert witnesses beforehand cautioning that the amount agreed "must be such as cannot be deemed a bribe."<sup>11</sup>

June – August 1793

Following an ambiguous verdict Bull receives two more engine orders "soon after his return to Cornwall" signaling that the Cornish miners are confident that Watt's patent would soon be voided just as Arkwright's had been 8 years earlier.<sup>15</sup>

1794

January 20, 1794

Communication between Watt's and Bull's legal teams breaks down, delaying the hearing of the Special Case.<sup>16</sup>

March 29, 1794

Bull unsuccessful appeals the Chancery's injunction. The construction of his engines at Ding Dong and Hallman must remain halted.<sup>18</sup>

October 1794

The hearing of the Special Case continues to be delayed due to the Treason Trial of Warren Hastings in which both Chief Justice Eyre and Watt's own chief counsel are deeply involved in.<sup>19</sup>

1794

June 27-28, 1794<sup>20</sup>

The Special Case concerning *Boulton and Watt v. Bull* is revisited before Chief Justice Eyre joined by Justices Rook, Heath and Buller at Common Pleas. The court reviews Watt’s 1796 patent and the extension as granted by Watt’s 1775 Act for “the sole Use and Property of certain Steam Engines...of his Invention...”.<sup>21</sup>

Boulton and Watt’s counsel “was driven to repeated inconsistency” as they attempted to clarify that Watt had invented a novel method or principle regarding the use of the separate condenser.<sup>22</sup> As the defense pressed, it became clear the differences in wording between Watt’s 1796 patent and the 1775 Act made it difficult for Watt’s counsel to settle the meaning of practical technical terms. The defense objects to the fact that Watt’s patent was for selling an engine composed of specific parts rather than a general yet novel method for improving engine efficiency.

No verdict is reached. Therefore, the trial was scheduled for rehearing as Chief Justice Eyre saw the case to be so “clogged” with ambiguity.<sup>23</sup>

To shed light on whether a patent need only discuss principles and not methods both parties are asked, by the court, to search for patents that describe “unorganized” inventions.<sup>24</sup>

By December 1794

Watt and counsel submit their findings in two categories: the patents of steam engines and “miscellaneous patents.”<sup>25</sup>

Counsel argues that it was not until the year 1781 that specifications for mechanical inventions became more specific in their descriptions. The discrepancies between Watt’s 1769 patent, The Act, and Watt’s later patents are explainable if Watt’s original patent is understood as a “philosophical” invention.<sup>26</sup>

1795

February 3, 1795

The Special Case concerning *Boulton and Watt v. Bull* resumes with the defense presenting their case.<sup>28</sup>

With arguments concluded Chief Justice Eyre maintains that the validity of Watt’s patent requires further consideration. Eyre shows a clear desire to favor Watt and reward him for his invention yet maintains that he could not deny the inconsistency between a 1769 patent which appears to be for a principle and a 1775 Act which appears to be for a machine.

January 31, 1795

Arguments resume regarding the special case concerning *Boulton and Watt v. Bull* before Common Pleas and the four-judge panel hears the plaintiff’s case.<sup>27</sup>

March 25, 1795

Due to Watt’s further findings regarding the required clarity of instruction in past patents, Watt and counsel reaffirm that “Chemical and philosophical inventions have always been and still continue to be specified in general terms.”<sup>29</sup>

April 2, 1795

In a letter to Joseph Black, Watt expresses his displeasure with the all-consuming trials which he believes revolve around semantical distinctions writing, “If so we mean to remove it to the King’s Bench where we hope there will be less quibbling upon words.”<sup>30</sup>

June 24, 1795

Watt, writes a letter to Willson, mentioning Bull's plans to seek a retrial through a writ of *Scire Facias*.

While this process contributed to Arkwright’s undoing, Watt is deeply skeptical of Bull's likelihood of success noting the £2,000 to £3,000 that Bull will have to pay Chancery.<sup>36</sup>

c. July 26, 1795

Chancery continues to reject Bull’s attempt to lift the injunctions against him.<sup>33</sup>

Bull threatens to sue as Boulton and Watt consider pursuing a new trial. Neither party follows through on their threat.<sup>34</sup>

The legality of Watt’s patent remains unresolved by the courts until January 25, 1799, in which Watt is vindicated in a separate action brought against Jabez Hornblower and Stephen Maberley.

c. January 16, 1796

Bull’s writ of *Scire Facias* fails.<sup>38</sup>

1795

May 16, 1795

*Boulton and Watt v. Bull* is heard for the fourth and final time in the Court of Common Pleas before Chief Justice Eyre, Justices Rook, Heath and Buller.

The specific issue being revisited is the legality of Watt’s 1769 Patent specification on the merits of its legibility and whether it could legitimately entitle “him [Watt] to the monopoly of a method.”<sup>31</sup>

The justices split 2 to 2 on their ruling with Eyre and Rook finding for Watt and Heath and Buller finding for Bull.<sup>32</sup>

As a result, no ruling was issued. The validity of Watt’s 1796 patent and the associated Act remains a legally unresolved question.

1796

January 5, 1796

Watt Jr. in a letter to Wilson summarizes Bull's failed attempts to bring a new challenge against Watt through *Scire Facias*.

The attorney general refuses to sign Bull's petition, all but ensuring an unsuccessful claim to be filed at Chancery.<sup>35</sup>

c. January 16, 1796

Boulton and Watt's injunction against Hornblower and Maberley is accepted by Chancery.<sup>37</sup>

This injunction is more ambitious in scope as the engines of Hornblower were of substantially different construction, yet they did include the use of Watt's separate condenser.

The injunction requires the immediate ceasing of all engines currently in operation and bars Hornblower from the production of any future engines.

February – May 1796

Hornblower and Maberley respond by filling affidavits in Chancery contesting the legality of Watt's 1769 patent.<sup>40</sup>

By May 13 they have filed 9 of these affidavits outlining their complaints that Watt's invention is neither new nor properly disclosed in the specification.<sup>41</sup>

June 3, 1796

Watt confirms with their legal team that nearly all the alleged Cornish pirates (Thackeray, Bateman, Sherratt, Sturgess, and Symington) have accepted the injunction and signed leasing agreements, noting that "Only Hornblower [and Maberley] holds out."<sup>44</sup>

Watt moves to have Hornblower and Maberley imprisoned for contempt of the now affirmed injunction.<sup>45</sup>

October 5, 1796

Watt Jr in a letter to Ambrose and James Weston's law office lays out a pro and con list of pursuing trial. Emphasizing the expert witnesses they can call, Watt Jr. aggressively recommends going to trial.<sup>47</sup>

February 4, 1796

Letter from James Watt to his father-in-law James McGrigor confirms the successful granting of their injunction at Chancery.<sup>39</sup>

June 2, 1796

Hornblower and Maberley's legal team appear before Chancery and move to have their injunction dissolved on the grounds of the court's split verdict in *Boulton and Watt v. Bul*.

Lord Chancellor Loughborough upholds the injunction and suggests there must be a new trial.<sup>42</sup>

Watt Jr. emphasizes how an extremely favorable ruling by Loughborough allows them to bring the case before the Common law courts as "we please" with the option to bring a new trial against Bull or counter with litigation against Hornblower and Maberley.<sup>43</sup>

June 16, 1796

Boulton and Watt's legal team prepare to bring a trial at Common Pleas by December.<sup>46</sup>

October 10, 1796

The ongoing negotiations between the parties that began in June continue to fail. All correspondence between the parties is now exclusively conducted through the rival legal teams. Both parties proceed to prepare in earnest for trial.<sup>48</sup>

December 5, 1796

The last day Watt aims to have all relevant witnesses in London in preparation for the trial.<sup>50</sup>

October 11, 1796

Watt reaches out to Dr John Robison hoping to secure him as an expert witness.<sup>49</sup>

December 16, 1796

*Boulton & Watt v. Hornblower & Maberley* is heard in the Court of Common Pleas before Chief Justice Eyre with a special jury.<sup>51</sup>

Robison's dramatic testimony regarding the ability of a Russian engineer to sketch Watt's engine based on abstract description alone resonates with the jury.<sup>52</sup>

The jury "immediately" finds for Watt. This result is confirmed by the court with the understanding that Hornblower and Maberley will seek a writ of error.<sup>53</sup>

January 26, 1797

First hearing before the Court of Common Pleas on a "motion for a Rule to show cause why there should not be a new trial" or whether the court should consider Hornblower and Maberley's writ of error.<sup>54</sup>

November 11, 1797

Watt Jr.'s illness through autumn causes the King Bench pretrial proceedings to slow down.<sup>56</sup>

c. February 11-13, 1797

Court of Common Pleas resumes consideration of the writ of error. Chief Justice Eyre affirms the legitimacy of the writ of error and allows it to proceed.<sup>55</sup>

c. November 16, 1798

*Hornblower & Maberley v. Boulton & Watt*, in error is heard before the King's Bench for the first time.<sup>57</sup>

No decision is reached as arguments are left incomplete and a second argument is scheduled.

1798

November 23, 1798

The writ of error is formally entered into the record at Westminster and soon confirmed by Chief Justice Eyre.<sup>58</sup>

1799

January 25, 1799

*Hornblower & Maberley v Boulton & Watt* in error is heard before the King's Bench for the second and final time before Chief Justice Lloyd Kenyon, Justices William Henry Ashhurs, Nash Grose, and Soulden Laurence.

In concurrence but not in agreement the four judges find in favor of Boulton and Watt, upholding Watt's 1769 patent specification.<sup>59</sup>

January 25, 1799

Immediately, Boulton, Watt and Watt Jr. seek to create a list of all those who have failed to pay for their licensing fees since 1794.<sup>60</sup>

This process continues for the remainder of the year.<sup>61</sup>

October 21, 1799

Based on the strength of the *Jabez Hornblower and Maberley* ruling, Jonathan Hornblower is served an injunction to cease the operation of his engines.<sup>62</sup>

1800

c. Hilary 1800

After 31 years of extended protection Watt's 1769 patent expires as the extension granted by his Act of Parliament sunsets.<sup>63</sup>

April 5, 1800

Watt's Income Tax discloses an approximate yearly earning of £6,290.00.<sup>64</sup>

1800

June 1800

With the expiry of their Act, the original Boulton and Watt partnership dissolves with ownership largely passing to their children.<sup>65</sup>

October 11, 1800

Watt Jr. confirms in a letter to William Wilkison that they have settled with the Hornblowers out of court.<sup>66</sup>

November 5, 1800

Writs are served to all the active mines using Jonathan Hornblower's engine.

The mines eventually all fold and settle with Watt Jr and the company's partners by 1802.<sup>67</sup>

December 31, 1799

Legal fees from August 1796 to December 31, 1799, total £6,409s12.1d. This figure does not include "journeys & Stays in London" or the payment of expert witnesses leading Watt to estimate his total expenditures in excess of £8,000 by the end of 1800.<sup>68</sup>

c. 1800

Through settlements and court awards, Watt recovers the astronomical number of £30,000 to £40,000 in outstanding royalties. The exact amount is unknown.<sup>70</sup>

The court awarded £6,000 in damages in the wake of Watt's victory.<sup>69</sup>

Finished

## Boulton and Watt's Patent Law Disputes Endnotes

1. H. W. Dickinson and Rhys Jenkins, *James Watt and the Steam Engine* (Oxford: Clarendon Press, 1927) 310; A. N. Davenport, *James Watt and the Patent System* (London: The British Library Board, 1989), 27; Jennifer Tann, "Mr Hornblower and His Crew: Watt Engine Pirates at the End of the 18th Century," *Transactions of the Newcomen Society* 51, no. 1 (1979): 95-109; Richard L. Hills, *James Watt Triumph through Adversity, 1785-1819*, vol. 3 (Derbyshire: Landmark Publishing, 2006), 183–186.
2. "J. Watt to T. Willson July 4, 1792," *Wilson Papers at Cornwall Couty Record Office*, DDX 318/5 quoted in Richard L. Hills, *James Watt*, vol. 3, 185; Dickinson & Jenkins, *James Watt and the Steam Engine*, 289–90.
3. The sketch was to be prepared by William Murdock: "Letter from J. Watt to T. Willson October 11, 1792," *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/5/49.
4. "J. Watt to T. Willson October 14, 1792," *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/5/50.
5. "J. Watt to T. Willson November 13, 1792," *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/5/59.
6. "M. Boulton to T. Willson November 21, 1792," *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/5/64; Boulton notes his regret that an unmade "gentleman" has decided to testify for Bull; Richard L. Hills, *James Watt*, vol. 3, 196.
7. "Letter from James Watt to Gilbert Hamilton February 8, 1793," Library of Birmingham Wolfson Centre, MS 3219/4/2/2/3, Item 202.
8. Richard L. Hills, *James Watt*, vol. 3, 196.
9. "Letter from J. Watt to J. A De Luc April 18, 1793," Library of Birmingham Wolfson Centre, MS 3219/4/2/2/3, Item 221.
10. Richard L. Hills, *James Watt*, vol. 3, 196; regarding Bull's final push to delay see "Letter from J. Watt to T. Willson June 14, 1793," *Boulton & Watt Letter Books*, Kresen Kernow, AD 1583/6/34.
11. "Letter from J. Watt to T. Willson June 8, 1793," *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/6/31.
12. Richard L. Hills, *James Watt*, vol. 3, 197-98; Davenport, *James Watt and the Patent System*, 27–28.
13. "Extracts from 'Boulton and Watt versus Bull. Copy of the Short hand Writer's Notes of the Trial in the court of Common Pleas. June 1793.'" In Eric Robinson and A. E. Musson, *James Watt and the Steam Revolution*, (London: Adams & Draft, 1969), 172–78.
14. *Ibid*, 178.
15. Quotation from "Letter from J. Watt to T. Willson August 7, 1793," *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/6/39; Richard L. Hills, *James Watt*, vol. 3, 198.
16. "J. Watt to T. Willson January 20, 1794," *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/7/10.
17. "A. & J. Weston to Thomas Wilson, March 22, 1794," *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/7/19.

18. "A. & J. Weston to Thomas Wilson, March 29, 1794," *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/7/22.
19. Richard L. Hills, *James Watt*, vol. 3, 199–200; "Letter from James Watt to Gilbert Hamilton October 23, 1794," Library of Birmingham Wolfson Centre, MS 3219/4/2/2/3, Item 360.
20. "A. & J. Weston to Thomas Wilson, June 29, 1794, 1794," *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/7/56.
21. "An Act for vesting in James Watt, Engineer...the sole Use and Property of certain Steam Engines...of his Invention... throughout his Majesty's Dominions for a limited time" (1775), *Parliamentary Archives*, HL/PO/PU/1/1775/15G3n83.
22. Davenport, *James Watt and the Patent System*, 28; Richard L. Hills, *James Watt*, vol. 3, 200–201.
23. Justice Eyre quoted in Richard L. Hills, *James Watt*, vol. 3, 201.
24. Ibid; "Extracts from 'Boulton and Watt versus Bull. Copy from Mr. Gurney Short-hand Notes of the Argument in the court of Common Pleas, June 27, 1794.'" In Robinson and Musson, eds., *James Watt and the Steam Revolution*, 178–180.
25. Richard L. Hills, *James Watt*, vol. 3, 201–202.
26. "General Information respecting the Specifications of the Patents, Collected by the Plts in the case of *Boulton v. Bull*" quoted in Ibid.
27. Richard L. Hills, *James Watt* vol. 3, 201–202; Davenport, *James Watt and the Patent System*, 28.
28. Ibid; Richard L. Hills, *James Watt* vol. 3, 201–202.
29. "General Information respecting the Specifications of the Patents, Collected by the Plaintiffs in in the case of *Boulton v. Bull* 25 March 1795" quoted in Eric Robinson and A. E. Musson, *James Watt and the Steam Revolution*, 181–82.
30. "Letter from James Watt to Dr. Black April 2, 1795, Library of Birmingham Wolfson Centre, MS 3219/4/2/2/3, Item 386.
31. Justice Heath quoted in Davenport, *James Watt and the Patent System*, 30.
32. Ibid, 28–33.
33. "Letter from WJ & G Weston to Thomas Wilson, June 11, 1795," *Boulton & Watt Letter Books* at Kresen Kernow, AD1583/8/27.
34. Richard L. Hills, *James Watt* vol. 3, 204.
35. "Letter from Watt Jr. to Wilson January 5, 1796," *Boulton & Watt Letter Books* at Kresen Kernow, AD1583/8/30.
36. "J. Watt to Wilson June 24, 1795," *Boulton & Watt Letter Books* at Kresen Kernow, AD1583/9/3.
37. "Letter from Watt Jr. to Wilson January 16, 1796," *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/9/3; The Scire facias was likely voided prior to January 16, 1796; however, this is Watt's earliest mention of this development.
38. Ibid; In a single letter dated January 16, 1796, Watt summarizes his current legal entanglements yet does not provide specific dates.
39. "James Watt to Mr. McGrigor February 4, 1796," Library of Birmingham Wolfson Centre, MS 3219/4/2/2/3, Item. 442.
40. Hills, *James Watt* vol. 3, 205.
41. "Watt Jr. to Wilson May 13, 1796," *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/9/24. The affidavits are by Jonathan, Jethro, Jesse & Jabez Hornblower. As

- well as Joseph Bramah, David Watson, Rowntree, Strode & Wolffe [likely, Arthur Woolf].
42. Davenport, *James Watt and the Patent System*, 33.
  43. “James Watt Jr to Mr. McGrigor. June 4, 1796,” *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/9/30.
  44. “James Watt Jr to Mr. McGrigor. June 3, 1796,” *Boulton & Watt Letter Books*, Kresen Kernow, AD1583/9/29; Dickinson & Jenkins, *James Watt and the Steam Engine*, 325.
  45. Hills, *James Watt*, vol. 3, 205.
  46. “James Watt to James Watt Jr. June 16, 1796,” Library of Birmingham Wolfson Centre, MS 3219/4/2/2/3, Item 474.
  47. “Document 53” in Jennifer Tann, ed., *The Selected Papers of Boulton and Watt The Engine Partnership, 1775–1825* (MIT Press, 1971), 36–140.
  48. “James Watt to Gilbert Hamilton. October 10, 1796,” Library of Birmingham Wolfson Centre, MS 3219/4/2/2/3, Item 498.
  49. “James Watt to John Robison October 11, 1796,” in Eric Robinson and Douglas McKie, eds., *Partners in Science: Letters of James Watt and Joseph Black*, (England: Harvard University Press, 1970), 229.
  50. “Watt to Robison on November 19, 1796,” in *Ibid*, 241.
  51. Joseph Gurney, *Boulton and another v. Hornblower and another: Copy of Mr Gurney’s Notes of the Trial; Part 1 plaintiff’s Case and Evidence*, (1796) LBWC, MS 3219/4/11.
  52. “Watt to Black January 15, 1797,” In Robinson and McKie, eds., *Partners in Science*, 262–63.
  53. Hills, *James Watt*, vol. 3, 207.
  54. Boulton and Watt vs. Hornblower et al. “Copy shorthand writers Notes of what passed in the Court of Common Pleas in Hilary Term 1797 in reference to the Defendants motion for a new trial, on the following days... 26 January, 11 and 13 February 1797,” vol. 1, (January 26, 1797) Library of Birmingham Wolfson Centre, MS 3219/4/13.
  55. Boulton and Watt vs. Hornblower et al. “Copy shorthand writers Notes of what passed in the Court of Common Pleas in Hilary Term 1797 in reference to the Defendants motion for a new trial, on the following days... 26 January, 11 and 13 February 1797,” vol. 2–3, (January 26, 1797) Library of Birmingham Wolfson Centre, MS 3219/4/14.
  56. Hills, *James Watt*, vol. 3, 208.
  57. “James Watt Jr. to James Watt November 16<sup>th</sup>,” quoted in Hills, *James Watt* vol. 3, 209.
  58. “Writ of Error,” quoted in Davenport, *James Watt and the Patent System*, 34.
  59. Davenport, *James Watt and the Patent System*, 35-37; For the full summary of the Justices’ opinions see: James P. Muirhead, *The Origin and Progress of the Mechanical Inventions of James Watt*, vol. III (London: John Murray, 1854) 252–72.
  60. “Watt Jr. to Wilson January 25, 1799,” Boulton & Watt Letter Books at Kresen Kernow, 1799 AD1583/11/2.
  61. Hills, *James Watt* vol. 3, 213.
  62. Westons to Wilson October 16, 1799,” *Boulton & Watt Letter Books*, Kresen Kernow, 1799 AD1583/11/19.

63. Watt's patent expired in either January or May of 1800. The language of the act does not name a specific day rather it emphasizes the timeframe in years noting: "James Watt, his executors, administrators, and assigns shall and lawfully may have and enjoy the whole profit, benefit, commodity, and advantage, from time to time coming, growing, accruing, and arising, by reason of these his said inventions, for the said term of twenty-five years, to have hold, receive, and enjoy the same, for and during and to the full end and term of twenty-five years as aforesaid." The text of the Act is dated January 5, 1775; however, the bill did not receive the royal assent, and formally become law, until May 22, 1775. It is certain that Watt's patent had lapsed by June of 1800: "An Act for vesting in James Watt, Engineer...the sole Use and Property of certain Steam Engines...of his Invention... throughout his Majesty's Dominions for a limited time" (1775); Eric Robinson "Matthew Boulton and the Art of Parliamentary Lobbying," *The Historical Journal*, vol. 7, No. 2 (1964), 221.
64. Calculated from "One Income Tax Return for 1800" quoted in Hills, *James Watt* vol. 3, 216. Ten percent of Watt's income is reported as £629 therefore his total income equaled approximately £6,290.00.
65. Dickinson & Jenkins, *James Watt and the Steam Engine*, 346; Eric Roll, and J. G. Smith. *An Early Experiment in Industrial Organisation, Being a History of the Firm of Boulton & Watt, 1775–1805* (Abingdon; Frank Cass and Co., 1930)
66. "Watt Jr. to Wilson, November 5, 1800," quoted in Hills, *James Watt*, vol. 3, 215.
67. Hills, *James Watt*, vol. 3, 215.
68. "Bill of costs from Ambrose and James Weston. 1796-1808," *Library of Birmingham Wolfson Centre*, MS 3219/4/228; *James Watt* Vol. 3, 215; Hills, *James Watt*, vol. 3, 214. Roughly adjusted for inflation, Watt and Boulton spent about £456,000 on litigation or about 146 years' worth of a skilled tradesman's labor; "Currency converter: 1270-2017", The National Archives [Accessed 5/29/2024]; *Bank of England Inflation Calculator* [Accessed 5/29/2024]
69. Hills, *James Watt*, vol. 3, 214.
70. Davenport, *James Watt and the Patent System*, 37; Hills, *James Watt* vol. 3, 215.

III. a. Letter from John Smeaton to John Forster – December 12, 1781

1. Mr Forster –

2. Austrope 12<sup>th</sup> Dec. 1781

3. Sir

4. If our favour of the 6<sup>th</sup> cause here {... ...} exceeds need
5. which I {...} on {... ..} from an \_\_\_\_\_ I think
6. myself obliged by the Confidence Sir Martin Folkes
7. & Mr Hales are please to {... ..} through the
8. recommendation of my good friends {...} Attorney General
9. and Mr Lee. I cannot with any possible convenience
10. Set forward from home till about the Middle of February
11. and then it will be equal to me to set forward Either for
12. London or to take {... ..} my way to London for in either
13. Case you may have my report by the End of February.
14. In the {... ..} my Answer to your former Letter
15. and your Letter of the 6<sup>th</sup> I received a Letter from Mr Danl.[Daniel]
16. Jones *Junr*/ [Junior] of Thakenham<sup>41</sup> [Thakeham] Desiring me to view the Harbour and Ground
17. On behalf of the Commissioners to give my Opinion to them
18. and to support my opinion at a future Tryal [Trial] before a Court
19. of Law; answer this application intimated the same kind of
20. Confidence in the weight of my Opinion, I took the Liberty in
21. my answer to Mr Jones (previous also to the Receipt of Yours of the 6<sup>th</sup>)
22. to Suggest that being already engaged to view the premises on
23. the part of Mr Martin Folkes & Mr Hales it might possibly/ be for
24. the advantage of both Parties to proceed upon the Business Jointly
25. for ~~xxx~~ there seemed an opening (in case they thought it proper)
26. for an application to you that I might determine the matter
27. as an arbitrator; in consequence of which I should become
28. possessor of the whole scope of the Argument on both Sides.
29. The weighty business of a Judge is not however what I would

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<sup>41</sup> Thakeham, a village and civil parish in West Sussex. Dan Jones' place of residence; see "Dan Jones to James Smyth August 7, 1783".

30. wish to take upon me I shall feel myself much more at  
31. my best {... ...} very my opinions as a witness, and therefore  
32. I wish it not unless it {... ...} Eligible to all  
33. concerned [concerned].  
34. I thought it proper to you the {... ...} from that  
35. in case you should have an appeal {...+}  
36. you may be {...} upon {...+}.  
37. I am Sir  
38. Your most humble Servant  
39. J. Smeaton

III. b. Letter from John Smeaton to John Forester – December 26, 1781

1. To Mr Forster –

2. Austhorpe 26<sup>th</sup> Dec 1781

3. Sir

4. My last to you, would Suggest an Idea of the possibility  
5. of you having an application from the Commissioners of Wells  
6. Harbour, that I might proceed upon business jointly; on  
7. the inclosed [enclosed] is a copy of Bill I offer in answer to {...}  
8. {...} that I thought it proper  
9. to be \_\_\_\_\_ your government. I should be therefore be glad  
10. to know of {... ...} you {... ...} any {...} guesses, about what  
11. {... +}  
12. not be short of Time to be \_\_\_\_\_ informed and prepared.

13. I am Sir

14. Your most humble Servant

15. J. Smeaton

16. {... +}

17. {... +}

18. {... +}

III. c. Letter from John Smeaton to John Forster – January 27, 1782

1. To Mr Forster –

2. Austhorpe 27<sup>th</sup> *Jany* [January] 1782

3. Sir

4. As you desired as much notice as you could, after the  
5. time of my going to Town was settled [settled], I now beg leave  
6. to acquaint you, that I propose being in Town on Fryday [Friday]  
7. or Saturday of the 15<sup>th</sup> or 16<sup>th</sup> of February {... ..} at any rate  
8. to Enter upon Buifness upon Monday the 18<sup>th</sup> and there to  
9. be at your Discretion as to the {...} of my going down to Wells.  
10. I cannot wonder that the determination of no Jury should  
11. be satisfactory, that determines the cause against us: As  
12. you seem desirous to have my free and unbyass'd [unbiased] opinion;  
13. the more you can acquaint me with matters of fact, and the  
14. less with mens [men's] opinions and arguments thereupon till I know [know]  
15. with my own Eyes open and considered the Subject, the  
16. more likely you will be to have any Simple Judgement  
17. of the weather such as it \_\_\_ have been had I been  
18. the first that had {... ..} to have considered it; for though  
19. I can give myself credit to not {... ..} herein, by  
20. Authority, \_\_\_ or affection {...} it seem! \_\_\_ \_\_\_ \_\_\_  
21. that first impressions will have a degree of weight in  
22. consequence of being the first.  
23. I have known {...} of \_\_\_ whose residence inclosed [enclosed] or  
24. is occasional like my own to have had these Lodgings in  
25. Chambers in the Temple {...} are any such to be hired by  
26. the week or month! or has is happened that they have fallen  
27. in for the use of a friends [friend's] Chambers who might not have occasion  
28. to use them for the time! I find myself sadly woked in upon  
29. in common Lodgings; by visitors, who \_\_\_ I \_\_\_ call impertinent;  
30. yet by no means pay a proper regard is the value of anytime  
31. if therefore the former should be the case I thoughtly [thoroughly] suppose that  
32. I should had myself more better off if I could place myself among  
33. those whose house [house] is known to be {... ..} if {...} have all

34. such things as Chambers to be hired I should like to make a  
35. Tryal [Trial], but the other chance is {...} much against me that it  
36. is not worth Inquiry. I think a friend of mine was Lodged  
37. N 5 King's bench Wells.  
38. I am Sir  
39. Your most humble Servant  
40. J. Smeaton

III. d. Letter from John Smeaton to John Forster – May 18, 1782

1. To Mr Forster –

2. Austhrope 18<sup>th</sup> May 1782

3. Sir,

4. As I hapned [happened] not to know the pleafure of seeing you in  
5. \Town/ after the Delivery of the Draft of my report Concerning  
6. Wells Harbour, I trust that it proved Satisfactory, and  
7. herewith you will Receive my account of the total charge  
8. that has hitherto occurred on account of \_\_\_ Bufinefs,  
9. upon which there appears to be a Ballance [Balance] due to me  
10. of £10, which if approved; and you are pleafed to  
11. pay to Mr Holmes; his receipt will be a discharge from  
12. me. & Though I make it a rule to acquaint my Employers  
13. with my recode [record] of Charge before I begin, yet I equally make  
14. it a Rule to make my charge agreeable [agreeable] to my Employers  
15. after the bufinefs is done: if therefore the above is not satis  
16. -factory [satisfactory], I beg you or the gentlemen for whome [whom] I have been Em  
17. ployed [Employed], to make it so; which Mr Holmes will receive his  
18. discharge of the whole, or if more agreeable [agreeable], a payment  
19. to Mr Holmes on *Acc* [Account] will be acceptable.

20. The plans and papers you delivered to me I left in  
21. the Hands of Mr Holmes to be redelivered to your order;  
22. and as soon as you can say when the tryal [trial] will be; or give  
23. me the first notice in cafe as it should be otherwise dispoised of,  
24. Shall be much obliged; as to be there I shall be made restric  
25. -tion [restriction] in point if Time and other Disagreements (?).

26. I remain Sir

27. Your most obliged humble Servant

28. J. Smeaton

III. e. Letter from John Smeaton to John Holmes – June 1, 1782

1. To Mr. Holmes

2. Austhorpe 1<sup>st</sup> June 1782

3. Dear Brother Holmes

4. As you desire an answer to be in Town on Monday, I will begin  
5. with the matter you most press for an answer, and that I think is  
6. whether the Action is to be brought in our own Name or Mr. Simmes.  
7. The Reason given by Serjeant Walker I think a very good one, for  
8. its Simmes; and I leave it to you to determine whether or no  
9. that Should Weigh Against this Contrary Reason; that I think our  
10. own name would probably carry some weight in a Court, that is  
11. to say so far as to have the grounds of our Action attended to  
12. for you see by Serjeant \_\_\_ [symbol] \_\_\_ upon the alteration of the mill  
13. force a corn to a \_\_\_ mill, that the Lawmen have not yet taken  
14. into their Code, the true foundation of Mill property, I would \\_\_\_/ have you  
15. therefore, as there are reasons both ways, in regard to the Naming of  
16. their Suit, which I find in my mind no matter to decide upon; to  
17. determine if according to your feelings, now that I have told you all  
18. that I can Say to it: and yet it does not appear to me, why it  
19. be \_\_\_ to bring the Action and fail, why that should preclude  
20. Mr Simms as Tennant, from maintaining an Action safe.

21. In reality it appears to me of the greatest consequence to me  
22. that the true foundation of Mill property should be fully understood  
23. and Strenuously adhered to: and if I was to State a new Cause upon  
24. the general Principle with\out/ attending to the particular Circumstances  
25. of our own; I would do it upon their Questions.

26. Whether a person having a Stream of water running through  
27. his Freehold<sup>42</sup> property in which there is a fall<sup>43</sup> from the Entry into  
28. his premises to his \its/ Departure; in consequence of which Circumstance

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<sup>42</sup> “Permanent and absolute tenure of land or property with freedom to dispose of it at will,” *OED*, “freehold (n. & adj.),” March 2025.

<sup>43</sup> “A cascade of water falling from a height, formed when a river or stream flows over a precipice or ledge”; Also “a fast-flowing, turbulent section of a stream or river caused by a downward slope of the bed; a rapid.” *OED*, “fall (n.2),” June 2025.

29. the owner by means of his own Ingenuity, or the assistance of other  
 30. ingenious [ingenious] men, is enabled to erect a machine, capable of ascertaining [asserting]  
 31. power to do work, whereby the Labour of many men and it uses  
 32. can be saved, and thereby redoubled [redoubled] to the profit of the owner; as great  
 33. or greater than the value of all the Surfaces considered as cultivated  
 34. \_\_\_\_\_, and of the water \also/ with respect to \_\_\_\_\_ & I say has not  
 35. this freeholder is a right of putting his design in Decection<sup>44</sup>; provided  
 36. he can do it without preventing the neighbouring freeholder either  
 37. above or before him, from doing the same thing and receiving the same  
 38. advantage in case he thinks proper so to do.

39. \_\_\_\_ [symbol] If out of the preveledges [privledges] and advantage \_\_\_\_ from, and  
 40. arising out of his freehold, he is enabled to make these profits; whether  
 41. if his neighbour below him in endeavouring to avail himself in a  
 42. Similar way, shall attempt to get a greater fall than naturally [naturally] ~~xxx~~  
 43. ~~between the entry and departure of that perform xxx~~, \belongs to his own/ by raising  
 44. the water to Such an height, as to diminish [diminish] the natural fall that ori-  
 45. ginally [originally] subsisted in the premises first mentioned; Whereby the powers,  
 46. and in consequence the profit thereof will be diminished [diminished] in proportion to  
 47. the Loss of fall; may not this person maintain an action against the  
 48. \_\_\_\_, if the disadvantage can be proved [proved] by persons Skill {...} [Skilled]  
 49. {...} these matters.

[Symbol for page 2]

1. If the first person in Is \_\_\_\_ Asking his Machine, is ordered  
 2. to create a greater fall (and thereby a greater power) than {...}  
 3. resides in his own premises, raises the water to High, as to raise  
 4. the ~~water within~~ \surface thereof in the/ channel of the River (but without overflowing  
 5. the grounds) within the property of his neighbor above; and  
 6. hereby obtains an Advantage to himself without any immediate  
 7. Injury to his Neighbour above; may not this Neighbour above,  
 8. the making no immediate use of the fall within his own premises,  
 9. maintain his Action against the Erector of the machine, upon this

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<sup>44</sup> As of 1647: “The undoing of creation; depriving of existence; annihilation,” *OED*, “decreation (n.),” December 2024; Based on context it is likely Smeaton wrote “decreation” as an improvised conjugation of “decree.”

10. principle; that the Erector of the machine has taken away from  
11. him a part of that power, whereby he is enabled to make a sime-  
12. lar [similar] profit and advantage in sight of his freehold, that the erector  
13. of the machine had done respecting his.

14. What the Law of higland [highland] will say in anfwer to these questions  
15. I shall not take upon me to determine; but the answers that should  
16. be given to them, upon the principles of Natural Justice is to  
17. me very clear: oiy [oi]! That the benefit that can be made of a  
18. fall of water, though, it was only now first discovered, yet  
19. being an Development and advantage \_\_\_ and arifing out  
20. of the freehold, was as much the property of the freeholder as, and  
21. to be preferved without infringement; as if a Quarry a Bed  
22. of Clay a Seam of Coal or a ~~xxx~~ [symbol] Mine was discovered therein.

23. In this way of confidering the Subject you see it never comes  
24. in question whether the Machine is a Mill or an Engine; or whether  
25. it grinds corn, wine or oyl [oil]; or whether the water is drawn through  
26. a round hole or a Square hole. It is the power alone \_\_\_ \_\_\_  
27. water and fall \together/ in which the advantage resides; and that advantage  
28. may be made, by working upon Gold, Silver, Copper, or old Raggs, as  
29. the owner of the power has occafion to employ it.

30. The Idea that Mills depend upon prefcription, and can therefore  
31. be applyed [applied] only to the ufe, they had been in ufe to be applyed [applied] to  
32. is certainly a very narrow way of confidering that kind of property,  
33. depriving a man of the advantages of his own freehold, and that in  
34. cafes where that very kind of advantage is far greater than is both  
35. to the owner, and the publick [public] benefit, than the mens [men's] soyl [soil] as an  
36. object of cultivation: and I remember on this Heard very distinctly  
37. a Cafe must respecting the Descent water to Mr Hufsey then and {...}  
38. of Greenwich Hospital. A person who had the \_\_\_ of a mill that had  
39. twice inconspicuously been a falling mill, converted it to a corn mill,  
40. and interfered with the Hospital Mill in grinding the grist of  
41. the Grains. The question was, as the mill was held by prefcription, what  
42. he could convert it into a corn mill from a falling mill Mr Hufseys [Hussey's]  
43. Answer was, that a perfon who could prefcribe for a mill, could do

44. it generaly [generally], without specifying what kind of mill it was: &  
45. I remember, that on this occasion Mr Hufsey said, that I had  
46. contrived to ask him all the \_\_\_ Questions about the matter  
47. of Mills, that I would possibly think of; there being several  
48. there besides the above.

49. [3] Time is now grown Short I hope this will find you &  
50. family recovered from you \_\_\_ Situation, the bad  
51. weather here Still continues but we all remain well &  
52. don't hear of any general complaints \_\_\_ in these parts  
53. I drew the Bill for £30 payable to Mr H. Eastburn Upon  
54. the Day mentioned in my last.

55. If you please I will be £30 to Nephew \_\_\_\_\_  
56. and you the remainder.

56. All here Join in best \_\_\_\_\_ & I am

57. Yours most Sincerely

58. J. Smeaton

III. f. Letter from John Smeaton to John Forster – July 6, 1782

1. Mr Forster –

2. Austhorpe 6<sup>th</sup> July 1782

3. Sir

4. Inclosed [Enclosed] herewith is the Report for Wells Harbour made ready for  
5. the Prefs with which I have taken a good deal of Pains to have correct – you  
6. will be pleased to acquaint the Printer, that with regard to the Spelling, & the  
7. Propriety of putting Capitals he must use his own Judgement; but as to the  
8. Printing, & the drawing Lines under particular Parts, which is intended to be  
9. printed in Italics, I have been very particular therein, so as to exprefs my  
10. Meaning in my own Way, & which he must be very attentive to, or otherways [other  
ways]  
11. it may destroy the Strength of the Argument.

12. I expect to be in Town Myself in a few Days, having had the Misfortune since  
13. I saw You to be engaged in a Law Suit [Lawsuit] on my own Account, & in a Matter of  
14. very great Concern which I shall have to attend at the Maidstone Assizes<sup>45</sup> so that  
15. it will be impofsible for me to go down again to Wells before the Trial; which  
16. is luckily of little Consequence as I think Myself perfectly clear, & Master of the  
17. Subject — But it will require some Management to keep the two Trials  
18. clear of each other so no to attend both —

19. I have made some small Alterations in the Original, by which you will  
20. find the things you have touched upon made more clear and intelligible, and  
21. doubt not but the whole, will be so to any that chooses to attend to it, where a  
22. perfect Copy is made by the Prefs.

23. I remain - Sir

24. Your most *hble* [humble] *Sern* [Servant]

25. J. Smeaton

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<sup>45</sup> Maidstone, Kent, was one of many towns that frequently served as a venue for the Assize Home Circuit, which covered the Southeast of England. Due to the increasing population density of the Southeast throughout the early modern period, there was a great proliferation of possible assize venues that comprised the Home Circuit. By the beginning of the eighteenth century, the county of Kent alone had hearings held in the towns of Gravesend, Greenwich, Dartford, Sevenoaks, Canterbury, and Rochester in addition to Maidstone. Throughout the eighteenth century, the Home Circuit incorporated the counties of Essex, Kent, Surrey and Sussex.; J. S. Cockburn, *The English circuits 1558-1714* (Cambridge University Press, 1972), 24-9; “Criminal court cases: assize courts 1559-1971,” *The National Archives Research guide*.

III. g. Letter from John Smeaton to John Holmes – November 7, 1782

1. To Mr Holmes –

2. Austhorpe 7<sup>th</sup> Nov 1782

3. Dear Mr Brother Holmes,

4. I got home very safely on Saturday Evening last  
5. of which I should have acquainted you before, had I had  
6. any other thing material to have said. The most moving  
7. Cause now is, that having had a couple of Days haed<sup>46</sup> [have]  
8. past Mr Brooke is in great fear of his oyl [oil], having suffered  
9. a good deal thereby last winter, as well as much trouble  
10. a council being called this morning. I have advised to get  
11. Something in the nature of a Date & *Thou*. [Though] I remember  
12. when he London going through to the Court and Court  
13. I believe it is called that goes out of princefs Street \_\_\_\_  
14. oppofite Compton Street; and there seeing one \at the door of a Barbaur [Barber] Shop/ of  
15. Cast from of a Cubical form me standing upon 4 Leggs' [Legs]; that  
16. Struck me at the time as being likely to \_\_\_\_ for  
17. Mr Brookes [Brooke's] Oyl [Oil] Houfe; if you can Either find that, or  
18. any other to the Same amount \_\_\_\_ on Square, ~~xxx~~ new  
19. or old, that you think will answer the \_\_\_\_ and at \_\_\_\_  
20. time be a able \_\_\_\_ than thofe we ufed, when I  
21. lived at the \_\_\_\_ of Lincolns \_\_\_\_ \_\_\_\_, so as to be at  
22. Carriage & C [and so forth/etc.]; and at the Same time as me at a moderate  
23. Sum of money, pleafe to pick it up and Send it  
24. by the \first/ Carriage to Lords; directed to be left for Mr  
25. Brooke Skyefield Mill Austhrope. If there happens to  
26. be Elbow pipes & C [etc./and so forth], to [too] many thofe \_\_\_\_ out of a \_\_\_\_ \_\_\_\_  
27. it is well, otherwife they can be made here to fill the  
28. place. The Reason of sending to London is on account  
29. of Expedition otherwife, by being bespoke, they may be  
30. had from Rotherham, under the same of a \_\_\_\_  
31. Cockle pleafe to advife Mr Brooke of me when he

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<sup>46</sup> Past participle of have; *OED*, “have (v.),” June 2025.

32. affairs is forwarded \_\_\_\_\_, if any, what pipes there

33. is: and at it will \_\_\_\_\_ upon a Stone floor, there is no

34. objection to the ashes upon it.

35. I have now responded [responded] your Letter of the 22 \April/ received from  
36. your own hand in London; I think the maine [main] thing not fully  
37. talked of in London, was the Affair of pafsmore<sup>47</sup>, which should be  
38. soon fully confidered, from what you have \_\_\_\_\_ from Mr Duafon  
39. the Bricklayer; (and he fee) the bricklayers [bricklayer's] apprentice at the Jobb [Job]  
40. in \_\_\_\_\_ of Mr \_\_\_\_\_, I doubt not that it will fully  
41. appear that there was no \_\_\_\_\_ as he \_\_\_\_\_ of the floor; either  
42. on \_\_\_\_\_ is the New Wheel of the flock mill or where, it was  
[page 2]

1. first Laid; except the \_\_\_\_\_ Specified [Specified] by Mr Gray (at which  
2. time if I apprehend pafsmore was not there) and Consequents  
3. that pafsmore has swore to a positive fallity; to which it does  
4. not appear that he was interrogated, even by his own Council  
5. but went into it a Volunteer; and when he went about to  
6. Explain himself, his Explanation is absolute Jargon. When  
7. he was asked "did you sink or Lower the apron of that  
8. "Mill"? he answers "Yes, and I will give you the refason why,  
9. "he was obliged to Lengthen the Spindle of the wheel we  
10. "took it out of the old Sockitt [Socket], and we Sunk it 4 Inches to  
11. "make it Lower for the ufe of the floor mill". Yet, as it does  
12. not appear by what follows from Lord Mansfield, though caught [caught]  
13. at by the Jury, that the verdict turned upon his Evidence,  
14. it may be a query whether an Indeightment [Indictment] for perjury may  
15. be looked \rather/ upon as a vindictive affair, or intended to intimidate  
16. him against another Tryal [Trial], than proceeding \_\_\_\_\_ hone (?)  
17. a wieas [wise] love of Justice; and therefore it will remain a  
18. Question; which I am Sure I am not able to refolve; {...}  
19. We shall upon the whole leave ourfelves by such a profecution  
20. in respect of further proceedings is not. I am only clear in

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<sup>47</sup> Possibly a name, not capitalized.

21. this, that if we do it, we should do it Vigorously.

22. You observe that on finishing over \the/ Years we have

23. met with a Rub, in the way of the Law, and a Bad neighbour

24. I can only say we have been always in some meafured in

25. Expectation of the former; and the latter is what our men

26. are Subject to: I trust that all is for the best; for by a

27. longer continuance of Smooth Dealings, such as me had

28. both Curry & Byles I am clear we should have lost

29. our rights; I hope therefore that the conquering of that

30. Rubb [Rub], with refolution and Spirit, will be the means of

31. ourfelves and Children, \_\_\_ eafy and \_\_\_ in \our & \_\_\_ / these {...}

32. -ions — I am alfo glad the Law has left us any thing [anything]

33. to pay us is our Labour and attention: but give \_\_\_ \_\_\_

34. to Say on that occafion; that as, even when in Town it does

35. not fuit me to attend thofe bufineffes, which can be done by

36. yourfelf, as well as both: and fince both then, and all other

37. times, you have naturally [naturally] from your constant \_\_\_ & {...}

38. of your time taken up by attending me the \_\_\_ of the \_\_\_

39. I am defirous, that you fhould have an allowance on that

40. account is big as the \_\_\_ \_\_\_; having no objection

41. to putting any fhould as to be whatever it is pofitively warranted

42. \_\_\_ look about in your houfe, and try to find a kind of {...}

43. \_\_\_ about 10 Inches Long 16 Inches high & 10 broad; \_\_\_ the

44. gyrating Machine where with by \_\_\_ on Mechanichs [Mechanicks] properly

45. applyed [applied] to generate Motion, were tryed [tried]. pray [Pray] pack it Carefully and

46. return it back into the Country by the waggon [wagon]. Perhaps it may be

47. left it Mr Binhams [Binham's] it is 4 or 5 Years fince. My wife and the {...}

48. family, are well, Save that Mr Brooke has got a complaint in his face.

49. All join in every \_\_\_ wish & I remain yours J. Smeaton

III. h. Letter from John Smeaton to Mr. Rooke – November 12, 1782  
(First name unknown.)

1. To Mr Rooke –

2. Austhorpe 12<sup>th</sup> November 1782

3. Dear Sir

4. I duly received Mr Giles [Gile's/Giles'] letter of the \_\_\_\_ \_\_\_\_ defiring  
5. to hasten my report upon Sewardstone Mill but as while I  
6. was upon the subject of the River Lee and fresh memory  
7. I found it most convenient to dispute both that and \_\_\_\_ \_\_\_\_  
8. I face with unless them both; and flatter myself that so  
9. {...} as they go, they will give satisfaction to all partys [parties] I  
10. {...} as usual accompany then with my charge for  
11. the bufiness which if you will compare with the terms of  
12. my Letter of the 21<sup>st</sup> July, you will find to be a very moderate  
13. charge: especially when I tell you that of the week I was in  
14. Town, the River Lee, either in attendance or calculations, {...}  
15. {...} every day except one and that you must be feafible  
16. {...} inclofed [enclosed] Reports must necesarily have taken me some  
17. {...} here; I don't therefore charge so little money, for so much  
18. time, becaufe I can afford it; or becaufe I suppose the trust is  
19. not {...} to pay me, but becaufe the time having been pro-  
20. tracted [protracted] by unfavorable incidents, I have charged as much  
21. {...} my opinion the trust ought to be paid charged for  
22. the bufiness. I must therefore beg the favour of you to take the  
23. first opportunity of Laying the Bill before the Trustees, not  
24. doubting but they will order prompt payment, and of obsesoning [obsessing]  
25. to you, that the more readily my charge is paid, the more ready  
26. you will find me to engage in their bufiness the next time.  
27. And if after all, the trustees think my charge more than is  
28. Suitable to the bufinesss I am ready to accept whatever they  
29. think proper, only would with my time not to be further enhanced  
30. by attendance of application for payment.

31. I remain Dear Sir

32. Your most humble Servant

33. J. Smeaton

34. P.S. The Receipt of

35. Mr Holmes Watchmaker

36. near Somerset Houfe London

37. will be a full Discharge of what

38. you pay him is my Account.

III. i. Letter from John Smeaton to H. Eastburn – November 25, 1782  
(First name unknown.)

1. To Mr Eastburn

2. Austrope 25<sup>th</sup> Nov 1782

3. Dear Brother Eastburn –

4. I propofe god [God] willing to be at York on Wednesday
5. Evening next; of which be so obliging as advertife Mr Kidd:
6. and to bring Mifs Holmes with me, of which pleafe to advertife
7. our Brother Clarke; and if you think You can stop Thursday
8. and Fryday [Friday], I propofe to putt [put] in the new Working Geer [Gear]
9. Pleafe to tell Mr Petch and Ralph, that if the back legg [leg] or
10. Standard is not got tyed [tied] up ready, from \or out of/ the first propofed
11. Plugg [Plug] Frame<sup>48</sup> or otherways [other ways], that it be got ready; with whatever
12. is relative to that bufinefs, I left orders for when last at York
13. be pleafed alfo to admonish Mr Croft that he be ready
14. with what I gave him orders for about the Injection Pipe & C. [etc./so forth]
15. It will be well if we can procure an additional Handy \_\_\_\_
16. for Thursday, and fryday [Friday] alfo if we want him we had better
17. give double price than be short handed [shorthanded], while the Engine is
18. stopped.

19. Be pleafed alfo to use your best Endeavour to find out
20. a proper person man or woman for Mifs Holmes to accompany
21. to London some time about the middle of next week or in the
22. Compafs<sup>49</sup> \of/ it that is going by any of the Coaches or Dillys<sup>50</sup>
23. All here are well and Join in every good wish to you & yours

24. & I remain yours most sincerely

25. J Smeaton

26. I believe some things were ordered at the Smiths

27. relative to that Plugg [Plug] frame.

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<sup>48</sup> “A device attached to the beam of a steam engine, for opening and closing the valves of the cylinder.” *OED*, “plug-frame (n.)” June 2025.

<sup>49</sup> “Moderate space, moderation, due limits (Johnson)...i.e. within or beyond the bounds of moderation.” *OED*, “compass (n.1, adj., & adv.)” June 2025.

<sup>50</sup> Short for diligence: “A public stagecoach,” *OED*, “diligence (n.2)” December 2024; The *OED* lists 1786 as the first recorded use of dilly as the abbreviated form of diligence; this usage by Smeaton predates the *OED* listing by approximately four years.

III. j. Letter from John Smeaton to John Forster – June 15, 1783

1. Newcastle 15 June 1783

2. To Mr Forster

3. Dear Sir,

4. Today received {...} of the {... ...} & was in reality sensibly hurt by the  
5. first Paragraph. It does not stand to my Knowledge or Remembrance that I  
6. promised to go into {...} before I left Town I never expected to be able so  
7. to do, & therefore never expected to be able so to do & therefore I never or could  
8. think of making such a Promife; You however I suppose have so understood  
9. what I did say that I could engage to go to Wells again before the Trial. But  
10. yet I then said, & I beg leave to repeat it, that I cannot by any Means engage  
11. or attend the Trial, unless it stand entirely clear of our Trials at Maidstone.  
12. I attended Your Businefs last Year in preference of my own & for this plain  
13. Reason because I had engaged Myself to your Businefs before I had foreseen  
14. Myself to be likely to be engaged in any of that kind of my own: But this  
15. Year the Case is otherwise, & I must like other Men, be expected to give a  
16. preference to my own Concerns; And should I have told you the clear annual  
17. Value of the Property concerned in this dispute to Mr Holmes & Self is not less  
18. than £500.- And that if the Issue goes against us our Property will be  
19. diminished in Value in as great a proportion as the 64 Acres of Land will be  
20. by being overflowed by the Tydes [Tides] & therefore our Cafe will be as much greater  
21. than Yours as £500 is more than the present improved Value of the 64 Acres  
22. You will see I have weighty Reasons so that was I now to prefer a lesser good  
24. to my Friends before a greater to Myself, those that taxed me with Don Quixotism  
25. last Year may very well be entitled to do it this.

26. With respect to my Report I have never yet had time to read it over since  
27. last Year, but it stands in my Mind from every thing [everything] I heard or thought  
28. of since it was Composed to be firm & valid; as to all the principal & material  
29. points thereof that can affect this Cause And therefore, what neither Mr Nichols  
[Nickalls]  
30. nor Myself can take it to pieced {... ...} it in reality to be infirm & invalid.  
31. In regard to the philosophical part (?) of it, it was thrown in to show people of  
32. intelligent Minds that from the necessary Consequence of the Situation of things

33. & Afsemblage of Nature at that place that the Goodness of the Harbour must  
34. have been in a progressive State from tolerable to good from good to very  
35. good \&/ then back to good, & to tolerable, & that unless some controuling [controlling]  
Means

36. are used from \_\_\_ it will from tolerable become bad & *a.* [et al]. But whether the  
37. Philosophy of it is admitted or not that part of my Report material in  
38. determining the present Question rests upon this as a Matter of fact; that the  
[Page 2]

1. {... ...} have by the continual depreciation of Sea Mud (or otherwise) in  
2. in height, & are Yearly increasing; {...} found this as a certain fact all the Inferences  
3. as to the present progressive Decay of the Harbour are clearly(?) deducible: If this in  
4. point of fact is not so then all my Reasoning therefore must of Course fall  
5. to the Ground. You will therefore see how to point your Evidence.

6. If there should be any Necessity of reprinting the Report I think it should  
7. \_\_\_ a Revision by which some palpable Evidence will be corrected & it  
8. may also be shortened by the Omifision of some paragraphs which being \_\_\_  
9. demonstrative the whole will perhaps be rendered more clear to those whose  
10. Minds cannot readily follow a Chain of Reasoning by the Simple Assertion  
11. of the fact & its Inference.

12. I now beg leave to acquaint you that I expect my own Affairs will oblige  
13. me to be in Town about the 20. of July & that in the Summer Season it would  
14. suit me to cross the Country and meet you, or whom you may appoint, at  
15. Wells so as to get done there & get to Town at that time: I shall take my  
16. Level with me & take the measuring Levels Myself, in which I should need no  
17. Assistance but a Labourer or Yourself. Mr Boedermans [Borderman's] Levels do not  
18. tally with my Idea of the Ground but there is Nothing more Deceitful  
19. than Levels by the Eye. I expect to be at home again by the {... ...}  
20. the {... ...} time; if needful a Letter directed to me at the George Gateshead (?)  
21. will always find me.

22. If you could engage Mr Mylne to give me the Marking at Wells it would  
23. doubtless add Weight to the Evidence as far as Opinion will be allowed to go;

24. Mr Jefsop<sup>51</sup> who was a Pupil of Mine very acute & very fair I heard was  
25. engaged for the other Party before I left Town, so that I scarcely know an  
26. Engineer remaining of any Name in the Harbour Branch who is not  
27. engaged on one Side or the other, except Mr Wooler, who I think would  
28. strengthen your Cause if he could \be/ prevailed upon to attend but he {...}  
29. to me to think himself tyed [tied] up by an honorary Engagement not to  
30. intermeddle on either Side.

31. I am {...}

32. Yours very Sincerely

33. J. Smeaton

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<sup>51</sup> William Jessop a former apprentice (1759-1767) then assistant (1776-1772) to Smeaton. Jessop went on to open his own highly successful practice as a consulting engineer. Jessop and Smeaton shared a long-standing and near familial relationship with Smeaton enrolling Jessop in the Society of Civil Engineer. Additionally, Smeaton had worked closely with Jessop's father, Josias Jessop, a quartermaster who came to oversee the masonry work for Smeaton's lighthouse projects. R. Angus Buchanan, "Jessop, William (1746–1814), civil engineer" *ODNB* (2004).

III. k. Letter from John Smeaton to John Forster – July 1, 1783

1. To Mr Forster –

2. Austrope 1<sup>st</sup> July 1783

3. Dear Sir

4. Your recollection of my mention of \_\_\_ Sunday \_\_\_  
5. makes is perfectly clear that you misunderstood my mea-  
6. -ning [meaning]: I had been here a fortnight at that houce [house] and I had  
7. been detained above & keeps in Town ~~about 3 weeks~~ longer  
8. than I had otherwife reaſion [reason] to have stayed, on account  
9. of a particular affair happing [happening] to detain me: otherwife had  
10. no pafsed for some weeks before to have Set forward for  
11. this \place/ the 1<sup>st</sup> of May.

12. I now propofe God willing to set forward from houce [house]  
13. on Monday the 11<sup>th</sup> *Auſt.* [August] and to go by way of Lynn and  
14. proceed to Coastways from houce [house] by Brancaster or to Wells  
15. and after finishing my obſervations there, to proceed again  
16. Coastways to \_\_\_; and would if pofsible, be back to  
17. London on or about the 20<sup>th</sup> *Augt.* [August] I am to reach Lynn  
18. on Tuesday leaving the 15<sup>th</sup> so that I think thoſe you mean  
19. to conduct me, had best meet me there. I ſhall go to  
20. the \_\_\_ beſt hen, which once years ſince, if I remember  
21. right, was the Bulls [Bull's] Head in the markettplace [marketplace]

22. Be pleaſed to make my fact \_\_\_ to my  
23. friend Mr Mylne and tell ~~& xxx~~ him that I very  
24. much wiſh to meet him on this Sunday; or if he cannot  
25. do that; to go down together to the afsizes at Norwich.  
26. I am ſure that his opinion will not only be of great  
27. weight with a Jury, and therefore of great importance  
28. to the caufe; but that his abſence (as it ſeemed very  
29. Strongly to operate the laſt time) will be confidered  
30. as a dereliction of this Theſis: and this, is a matter of  
31. opinion amongst Artists, to thoſe who cannot (when real  
32. Artist) ſee the full merit of the caſe, will always  
33. be confidered as a drawback upon the opinion of any

34. other, *tho* [though] in direct confirmation of the first; as I confider  
35. mine to be of Mr Mylnes [Mylnes]: I shall therefore, not only for  
36. the sake of Justice in the determination of the cause,  
37. but for my own sake as an individual, wish not to  
38. Stand Single and unsupported against a Legion: though  
39. I think our Joint Thesis \_\_\_ so right: and in this  
40. Case, Mr Mylne having been first consulted; I shall  
41. Think it was duty to waive all \_\_\_ of \_\_\_  
42. giving the Prof [Proof] of {...} to {...} and as {...}  
43. assistance a personal obligation: and hope that Arts  
44. and Sciences will receive that protection [protection] from a  
45. Loughborough that could not be expected from a Gould.

46. I remain Dear Sir

47. Your most humble Servant

48. J Smeaton

III. 1. Letter from John Smeaton to John Forster – November 4, 1783

1. To Mr Forster

2. Austhorpe 4<sup>th</sup> Nov. 1783

3. Dear Sir,

4. Notwithstanding Mr Counfellow Cole was pleased to say  
5. in court that there was not, nor could not be any answer from  
6. Mr Jones to my Letter; because it was in its own Nature  
7. unanswerable: Yet since I got home, curiosity prompted me  
8. to look into the correspondence which had laid unopened  
9. since the time it past; and from hence I find that the  
10. Ingenuity of Mr *Danl.* [Daniel] Jones, has prompted him to Shape  
11. an answer, to this unanswerable Letter: and that; you may  
12. have complete copys [copies] of this Whole correspondence I beg  
13. leave to inclose [enclose] it to You.

14. What a uneliked [unliked] opinion must the Council have of that  
15. cause who could suppose it needed supporting, by torturing  
16. the poor little word must into a meaning that was never meant;  
17. and upon that alone found \an affidavit [affidavit] upon/ the destruction of a private mans  
[man's]  
18. Character [Character], who they themselves acknowledged stood unimpressed  
19. in every other Instance: For as to the Idea \taken up/ that a man  
20. is not to expect, and therefore noway [no way] obligated to ask for in-  
21. -formation [information] from the party, hostile to that by whom he is em-  
22. -ployed [employed] I beg leave to avow it, insist upon it, & will \_\_\_  
23. it; For what can he expect from the adverse party but  
24. misinformation [misinformation] ! O! But I hear Mr Jones say, had you \_\_\_  
25. to us for information; we could have told You \_\_\_ things you  
26. could not otherwise \have known/, and would have told you nothing but  
27. what was simple; pure and genuine. That may be Mr Jones;  
28. but how could I know that? if it would have become [become] So, it would  
29. have been contrary to the Experience of my whole Life, hither to [hitherto]; &  
30. from what has occurred since, I have the strongest reasons to induce  
31. me to believe, that in the present Case it would not have been  
32. so.

34. I conceive that a witness, by whichever side he is employed,  
35. is under a moral obligation, not to give his testimony \_\_\_ be-  
36. cause [because] he came from his Opinion upon grounds, clearly Satisfactory  
37. to himself; unbiassed [unbiased] by favour or dislike to Either: party; and when  
38. that is the Case what has he to do with another mans [man's] opinion!  
39. But when by becoming an arbitrator for he becomes a Judge, then he  
40. has to do with another mans [man's] opinion; And in this case I might  
41. have been unfalsified [unfazed] what weight to have given to Engineer Jessops [Jessop's]  
42. opinion; when he declared that the inbankment [embankment] was a very great  
43. \Detriment/ to the Harbour: and yet there is but one word, one \_\_\_, that differs  
44. as: for if instead of Saying very great, he had said very small  
45. our testimonys [testimonies] would not have very materialy [materially] have differed.

[page 2]

1. but as a witness what \have/ I to do with the opinion of Mr Jessop!

2. the Judge and the Jury had; but as a witness I had not.

3. This doctrine of the duty of a witness is to face \_\_\_ new,

4. that it is totally adopted in Mr Jones [Jones'] last Letter of the 20<sup>th</sup>

5. Dec. 1781; and had my report made in consequence of my

6. view of this Subject, come fully up to Mr Jones [Jones'] Mark, \_\_\_

7. that the bank was not only "one of the causes" (or rather as I should

8. be inclined to express myself a peice [piece] of one of the causes) "of the

9. "decay of Wells Harbour, but (as he would have it)" the principle

10. "cause" we should never have heard from Mr Jones or the learned

11. Council Harding [Hardinge] of Mr Smeaton \that man of reputed integrity's [integrity]/  
having sold himself upon

12. the change of the very first Letter with Mr Forster (a gentleman

13. to whom at the time he was personally unknown) to the adverse party

14. right or wrong to give a certain Testimony: No: those Ideas have

15. totally [totally] Sprung up, after it appeared that Mr Smeatons [Smeaton's] opinion gave

16. no countenance, to those of Mr Jones: For if there was in reality

17. any \thing/ [anything] faulty in the Ideas contained in Mr Smeatons [Smeaton's] Letter of

18. the 8<sup>th</sup> December, they were as faulty when it was answered by

19. Mr Jones the 20<sup>th</sup> following as they could be afterwards.

20. I will only add this fact; there was not a Single cir

21. -cumstance [circumstance] of information \beyond what I was before \_\_\_ / came out upon the two tryls [trials], upon which

22. I can form; any relyance [reliance] but what is either Nugatory<sup>52</sup>; or when

23. properly (& I will dare to add, Scientifically) Explained makes against

24. the propofition adopted by the Commifisioners of Wells Harbour.

25. I remain Dear Sir

26. Your most humble Servant

27. J. Smeaton

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<sup>52</sup> “trifling, negligible; *OED*, “nugatory (adj.),” December 2024.

IV. a. Letter from James Watt to Richard Arkwright – October 12, 1780

1. Birmingham Oct 12, 1780

2. To Mr Arkwright

3. Sir,

4. You ask the size of an Engine to raise ten
5. tons of water every minute to 40 18 feet high
6. 10 tons water \is/ 360 cubic feet nearly which supposing
7. the engine to make 10 strokes *p* [per] minute is 36 cubic
8. feet each stroke which supposing the effective stroke
9. equal to 7 feet 9 inches requires a working barrel
10. 29 ½ inches diameter. The weight of the water is *wch* [which] (?)
11. is 5600 pounds which will require a 27 inch Cylinder
12. loaded to 10 pounds on the inch, such an Engine
13. will consume 112 pounds of coals *p* [per] hour, and our
14. premium for that time will \be the price of/ 75 pounds of coals, and
15. we guarantee that upon trial the engine shall not
16. require more than what we have stated – our premium
17. will then amount to 125 pounds of coals for every
18. Thousand strokes – but we cannot agree at the
19. above rate unless your uses require the Engine to be \_\_\_\_
20. more than half the year

21. I find by

[page 2]

1. by an Invoice of an Engine with a 28 inch cylinder
2. that the casting, of the Engine part amounted to £195,
3. exclusive of the pumps, and the materials we commonly
4. furnish which are the Piston rod the eduction pipe
5. the Steam case and some others, will amount to about
6. £50 – The cost \_\_\_\_ of the \_\_\_\_, buckets & Clasps
7. will cost about £100 – I cannot pretend to tell
8. you the expense of the House \Boiler/ wood work [woodwork], hammered
9. Iron work [ironwork] & then putting together, but should
10. fear that it would amount to as much as the
11. above articles - Indeed I cannot expect that the

12. Engine will cost less than £700 & may perhaps cost ~~xxx~~
13. ~~xxx~~ more I should be sorry to lead you into any error
14. and have therefore put down all the articles I have had
15. any opportunity of being certainly informed about at
16. their full price – I believe the boiler which will be
17. 8 feet *dia* [diameter] will cost about £50 but am not quite
18. Certain – as to the time when it could be finished I can-
19. not \be positive/, but should give you an answer
20. soon If you were otherwise determined —

[Letter ends without a signature.]

IV. b. Letter from James Watt to John Smeaton – November 6, 1780

1. Birmingham Nov 6<sup>th</sup> 1780

2. Dear Sir

3. Your Obliging letter of the 1<sup>st</sup> instant to W. Playfair

4. found its way here only today – In answer to which in the

5. first place I am to ask your pardon for the innattention [inattention] of our

6. Clerks in sending off your Machine without the Welling and

7. Drying books, which are capital matters — They should be made

8. of Paper not sized which may imbibe the moisture & not puckcer [pucker]

9. much by the moisture — They shall be sent immediately. After you

10. have wetted the copying paper you should raise it up and lay it

11. *flatd* [flattened] in the working book before you \_\_\_ the book — when I

12. wett [wet] a half sheet of paper I begin at the middle on the left

13. hand side and pafs the brush from the middle to the top, and

14. so proceed untile [until] I have done the upper Quarto<sup>53</sup> and beginning

15. at the same place I use the brush downward to do the under

16. quarto by which means very little puckering takes place

17. we have cured the oiled papers of slicking disagreeably and should

18. send you some — mean while may mend your own by rubbing

19. them with powder of pumice and water – The want of sharpnefs

20. you complain of is arising partly to the paper and partly to the

21. ink principally to the latter — This fluid you know is an

22. imperfect compound which is continuously undergoing some change

23. or other, and moreover It is extremely difficult to prepare 2 quantities

24. of it with the same qualifications in paint of Copying, what we

25. had at the time you saw Mr Boulton was luckily very good, but

26. what was sent you with the machine was not so good though

27. made by the same receipt — Mr Heir and myself have tried

28. numberlefs experiments upon ink & though we have gained

29. some knowledge, yet we are still at a lofs to give to ink all

30. the necessary properties, however we can now make better than

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<sup>53</sup>“The size of paper obtained by folding a whole sheet twice, so as to form four leaves.”; *OED*, “*quarto* (*n.& adj.*),” December 2024.

31. that sent you, & of which \better/ we will send you same —

32. It would at first sight appear that whatever disposes the  
33. ink to penetrate the paper would also disposed it to spread  
34. laterally; but it is not so: there are inks made accidentally  
35. which will penetrate the paper and yett [yet] not sensibly  
36. diffuse

37. [Watt drew a line]

37. Mr Smeaton

[Page 2]

1. diffuse, and there are substances with which if the paper be impregnated  
2. the \caps/ writing will be defined and strong, but all such substances have  
3. two faults the one is discolouring the paper the second is that the  
4. Copy so \_\_\_\_ fades in a month or two sometimes sooner, this we  
5. Could only learn from experience and did not know it at the  
6. time Mr B. used one of these liquors, with which we intended to impregnate  
7. all the paper; but luckily discovered its defects in time to prevent  
8. it doing any hurt — After trying many thousand experiments  
9. on preparations we have been obliged to adhere to one that  
10. does not contribute in the least to the beauty of the imprefsi<sup>o</sup>n  
11. but adds to its blacknefs and durability. Of this preparation  
12. I have had the longest experience being the first I used, almost  
13. 2 years ago — The paper market Amsterdam is the best weave  
14. had made for taking a sharp impression and is also prepared {...}  
15. one of these liquors which renders it more so, but that {...}  
16. is not in that paper in such quantity as to render it {...}  
17. to the durability. But the preparation were so troublesome and —  
18. uncertain and discoloured the paper so much that we were obliged  
19. to give it up — I have many copies of letters on that paper as  
20. sharp as the originals, but it is so nice in its degree of moisture  
21. that we durst<sup>54</sup> not venture to introduce it into common use  
22. nor could we gett [get] sufficient quantities of it made — The other  
23. paper market Bigg, takes excellent copies but is difficult

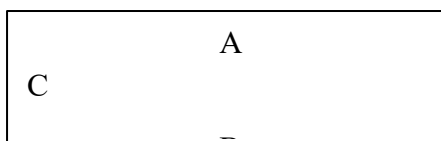
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<sup>54</sup> “To have boldness or courage (to do something)”; *OED*, “dare (v. 1)” December 2024.

24. to hit the due degree of moisture — There is no size nor {...}
25. in any of them, only hard prefsing gives that capability of
26. bearing Ink – from the specimen you was so kind as to send
27. I conjecture that you would succeed better if your prefs were hard
28. set – and you may preserve the sharpness of your impressions
29. by drying them at the fire but as this will pucker them you
30. must run them through the prefs to set them flat again
31. We are getting some paper made which we expect will be better than
32. that sent you and shall send you sample of it as soon as comes
33. to hand — Good and evil are mixed with all the affairs on this {...}
34. it is so in the copying business when we attempt to prevent diffusion
35. we

[Page 3]

1. oppose penetration, and the ink which does not diffuse when copied as
2. a short date refuses to give a copy at a long date – Mr Heir and I
3. labour hard to reconcile these opposites but in the mean time [meantime] we
4. thank nature which has allowed the possibility of taking, even a
5. diffused, copy. We have not yett [yet] sent you any ink for copying drawings
6. on thick paper but shall send some and paper for the purpose with
7. the wetting book I find that branch of the art the most useful as
8. I copy the outlines of all our drawings by means of it and the Copies
9. of that kind are not in the least diffused and generally as perfect as
10. the originals in every thing [everything] except being reversed which being
11. \_\_\_ is no great inconvenience – the writing we add afterward,
12. I send inclosed [enclosed] engraving of a proper stand for which the following is a proper
13. hinge as it permits the leaf to fold either up or down



14. The Joints A & B are connected by a piece
15. of Steel, so that when you want to fold
16. the movable leaf, upon C the Joint it
17. works, and when it is wanted to hang
18. down the Joint B comes in play — The use of the folding down is to prevent
19. the leaf from warping which those which lie upon one another card table
20. fashion are exceeding apt to do and the folding up is to allow you

21. to get at the drawer — The price of making the table in mahogany  
22. is about 15/Journey mans wages and the wood about 21/ in {...}  
23. the \_\_\_ 10/ [symbol] & wood 7/ — this for your government, The Shelves  
24. may be made to draw out wardrobe fashion in which case the  
25. table must be made 25 inches between the legs to allow for the  
26. thickness of the ends of the shelves and to permit the books to be laid  
27. in open — I must now thank you for your obliging advice  
28. which we shall avail ourselves of as far a nature admits — As  
29. to your paying for the press neither Mr Boulton nor I ever dreamt  
30. of such a thing and we shall feel ourselves very much hurt if you  
31. refuse acceptance of it ut amicitie pignus<sup>55</sup> and though it were of  
32. ten times the value you owe us nothing — I should beg pardon for  
33. not writing to you sooner, but Mr. B. has taken himself to Cornwall  
34. about the time you got the press and I have had much to do and  
35. a small quantity of health or spirits to do it with — we have  
36. agreed with the great mine of Wheal Virgin for 5 engines  
37. and one \more/ for \_\_\_ which will occupy us all next year  
[Letter end without a signature.]

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<sup>55</sup> *Trans*: “as a token of friendship,” Jon R. Stone, *Latin for the Illiterati* (Routledge, 2009), 132.

IV. c. Letter from James Watt to Mr. Henderson – November 7, 1780  
(First name unknown.)

Birmingham Nov 7<sup>th</sup> 1780

1. Dear Sir

2. We are very much disappointed and vexed at not
3. hearing from you nor Mrs Boulton these two posts
4. especially, after Mr *Bn*: [Boulton:] account of himself in this last
5. letter to Mrs Boulton. – I hope that some other accident
6. than his bad health has prevented you from writing but
7. at the same time I am very uneasy, and Mrs Boulton is
8. most exceedingly unhappy — I beg therefore that if
9. you have not wrote before that you will write
10. immediately on the receipt of this, and if Mr Boulton
11. is in any dangerous way that you send to Exeter for
12. a Physician of Skill for I fear that much reliance
13. cannot be had on your Cornish Physicians, though they
14. may be good enough for any thing I know, having
15. no acquaintance with any of them —
16. On Monday morning went *pr* [per] coach a box containing
17. one volume of your dictionary, 6 quire<sup>56</sup> folio<sup>57</sup> post paper
18. and 12 quire Quarto<sup>58</sup> do — The Drawings for Coal Engine
19. \_\_\_ (1)<sup>59</sup> Section — (2) ground plan — (3) plan first floor —
20. (4) Crofs Section — [no number 5] (6) outside front view — (7) List of materials,
- 21 for Wheal Virgin<sup>60</sup> (1) Section — (2) front view & (3) ground plan of an
22. Engine house for a 50 or 56 inch Cylinder —

[Page 2]

1. \_\_\_ [symbol] 3 drawings for a 50 inch 9 feet \_\_\_\_\_

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<sup>56</sup> “Consisting of a set of four sheets of parchment or paper folded in two so as to form eight leaves,” *OED*, “*quire* (n.),” March 2025.

<sup>57</sup> “A leaf of paper, parchment, etc. (either loose as one of a series, or in a bound volume) which is numbered only on the front.”; *OED*, “*folio* (n. & adj.),” December 2024.

<sup>58</sup> “The size of paper obtained by folding a whole sheet twice, so as to form four leaves.”; *OED*, “*quarto* (n. & adj.),” December 2024.

<sup>59</sup> In the original letter all the following numbers were written without parentheses and above the corresponding word.

<sup>60</sup> Mine in Cornwall operated by Wheal Virgin and Co.; James Patrick Muirhead, *The life of James Watt*, (John Murray, Albemarle Street, 1858), 272, 507.

2. \_\_\_ [symbol] 3 drawings for a 52 0 feet \_\_\_\_\_
3. [Watt drew a short line]
4. Titles and table of contents for engine directions —
5. [Watt drew a short line]
7. Some extract of Galls<sup>61</sup> for making copy ink, to use
8. which, Takes (?) extract 6 drams<sup>62</sup> — Copper as 2 drams
9. Allum [Alum<sup>63</sup>] one dram, Gum 2 ½ drams water a half pint
10. dissolve the Gum & extract in hot water when
11. dissolved [dissolved] and Cold add the copper and Allum [Alum]
12. leave it in an open vessel such as 6 Glafs
13. tumbler for 2 days — decant off the Clear & keep
14. it close \_\_\_\_\_
15. [Watt drew a long line]
16. In the same box was sent your Slip of oil stone, and
17. two Clutch wheals [wheels] from Mr \_\_\_\_\_.
18. The box was directed to Mr Fland (?) at exeter [Exeter]
19. please make my compliments to Mr Boulton, but if he be ill
20. you need not mention any thing in this which may may make
21. him uneasy — I ever remain Dear Sir
22. Yours Sincerely
23. James Watt
24. We have had most excefsively stormy weather from the
25. N.W. and today the ground is covered with snow
26. & most excefsively Cold
27. [Watt drew a long line]
28. Mr Henderson

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<sup>61</sup> Gall grows “on oak leaves and twigs in response to attacks by wasps and other insects. The galls, created through a combination of plant hormones and chemicals released by insects, are rich in tannins. Tannins also provide a color source for dyes and inks.”; Usha Lee McFarling, “Making Ink from Oak Galls,” *Huntington Verso Blog*, May 1, 2019 [https://www.huntington.org/verso/2019/05/making-ink-oak-galls].

<sup>62</sup> “A fluid dram = 1/8 fluid ounce,” *OED*, “dram (n.1),” September 2024.

<sup>63</sup> “An astringent mineral salt, typically occurring as colorless or whitish crystals, that is used as a mordant for dyeing, in tanning, for sizing paper and fireproofing materials; It occurs naturally in alum shales and other rocks” *OED*, “alu, (n.1),” June 2025.

IV. d. Letter from James Watter Letter to Richard Arkwright – April 4, 1785

1. Mr Arkwright

2. *Birmm*: [Birmingham] *Ap* [April] 4

1785

3. Sir

4. The following advertisement having appeared in

5. The *Birmm*: [Birmingham] paper of today, and not knowing whether

6. that paper circulates with your neighborhood I

7. thought I might to give you the earliest information

8. and to advise you further that I believe Mr Boulton

9. knows where the model of the \\_\_\_/ mill now is, he is {...}

10. at London at No 6 Green Lettice Lane.

11. Cotton Spinning Mill in the upper priory *Birm*{...} [Birmingham]

12. about ~~xxx~~ \_\_\_ year {...}

13. //<sup>64</sup>If any of the people be now living who were either

14. //employed on this, work or can describe any Part of

15. //the machinery thus in ufe, they are requested to take

16. //the trouble of leaving their names & places of abode

17. //with the printer, and they will be satisfied for

18. any information they can give//

19. I should suppose that Mr Charles Wyatt at

20. {...} Burton upon I rent, wood \_\_\_ maker, who is

21. {...} the son of Mr John Wyatt the inventor may have

22. {...} something about the model — I remain

23. with regard

24. Sir

25. Your Obedient Servant

26. James Watt

---

<sup>64</sup> Notation as depicted in Watt's original letter likely used here in lieu of quotation marks.

IV. e. Letter from James Watt to George Goodwin – April 11, 1785

1. *Birmm* [Birmingham] *Ap* [April] 11,

1785

2. Sir

3. This day I received your obliging letter of the 9<sup>th</sup>

4. covering Mr Arkwrights [Arkwright's] draft on London, value Forty Guineas,

5. which you mention to be for my time and expenses in attending

6. at London, as a witness in the Action, brought by Mr Arkwright

7. against Mr Nightingale

8. I cannot help thinking the above sum, a greater one

9. than is due to me as a simple evidence, and I consider

10. any other little service which I had it in my power to be

11. of as more than paid by the acknowledgment of it —

12. My views in taking my part in the matter were merely to give

13. all the help I could to a man of ingenuity whom I conceived

14. to be illused [ill-used] by the infringers on his patent, and I had not any

15. wish to be paid for the service, except a compensation for my

16. expenses. I therefore must insist on receiving no more than

17. is allowed in taping your bill, which I presume will not be

18. so much as Mr *A.* [Arkwright] has generously sent me; In order however

19. that you make out your charge I have retained the Draft, but

20. shall be accountable for whatever part of it is not allowed

21. by the court —

22. I remain with *Compt* [Complements] to Mr Arkwright & Mr Ince

23. with much esteem

24. Sir, Your most *Obed* [Obedient] *Servt* Servant

25. James Watt

26. Mr *G.* [George] Goodwin

IV. f. Letter from James Watt to Richard Arkwright – October 11, 1785

1. *Birmm* [Birmingham] *Octr* [October] 11, 1785

2. Mr Arkwright

3. Sir

4. If no accident intervene to prevent me I propose

5. setting for London on Thursday night, and will be heard of

6. at Mr Matthews's in Green Lettice Lane.

7. If you go to London as proposed shall be glad to hear

8. where you are to be found & shall be of any service to you

9. which the shortness of my stay will permit.

10. I remain with Esteem

11. Sir

12. Your *Obedt* [Obedient] humble *servt* [servant]

13. James Watt

IV. g. Letter from James Watt to Richard Arkwright – October 26 & 27, 1785

1. Mr Arkwright *Birmm* [Birmingham] *Octr* [October] 26, 1785

2. Sir

3. This day I received Mr Listers [Lister's] letter with copy  
4. of the Judges [Judge's] summing up of the case in your last trial  
5. on which I shall send some observations with this but  
6. the time you have allowed me is much too short to  
7. attempt to answer the whole of so long an argument.

8. I am very lately returned from London & had a  
9. little conversation on your case with some friends there  
10. It is said that the Great Lawyers: the *Chanr:* [Chancellor] *L:d* [Lord] Camden  
11. *L:d* [Lord] *Mansf:d* [Mansfield] & *ea* [et al] are all against you on the footing of  
12. your not being the inventor & of your intentionally withholding  
13. a clear description of your invention. And the prejudices  
14. of the public are against you because you are said to  
15. have got money by it, which many of the Lauded  
16. gentlemen esteem an unpardonable crime in a  
17. tradesman or artist. On looking over the paper now  
18. sent me and endeavoring to form an impartial Judgment  
19. from it, and \from/ what I have heard argued for & against you  
20. in conversation. I am clearly of opinion that without {...}  
21. you can undeniably set aside the evidences which  
22. your opponents brought against you in the last trial  
23. to prove that you are not the first inventor of the  
24. several parts of the machine, no jury will give a verdict

[Page 2]

1. a verdict in your favour. If therefore you cannot  
2. prove these witnesses perjured to the satisfaction of all  
3. impartial people, I would as your sincere friend  
4. advise you not to attempt a new trial, as it could  
  
5. only serve to give a fresh cause of triumph to your  
6. adversaries [adversaries]. But on the contrary if you can prove  
7. that they have stole the invention from you & called

8. them their own. It will, even though they should
9. have used them before the patent, serve to vindicate
10. your character from the aspersions which have so
11. Illiberally been thrown out against it.
12. Wishing good counsellors & success I remain
13. Sir
14. [Signature is covered by an additional letter dated the following day.]

[Page 3]

1. Oct 27 I have now finished the writing my opinion on your
2. case as far as relates to the specification, but I cannot bid
3. you rely upon it, I may have unknowingly a partiality
4. in *yr* [your] favours [favour], which though I have endeavoured to divest
5. myself of as much as possible yet it may have lead me
6. to think more favourably of the cause than others
7. may do. Yet as far as I am a judge my opinion
8. is impartially given, & agreeable to my notions of Jury

[Page 4]

1. \_\_\_\_\_ that the counsel were uncommonly civil to me
2. any other service I can do you I am willing to perform.
3. When you know what you can prove against the
4. testimony of their witnesses; take the opinion of your
5. most intelligent friend upon it as well as of your
6. counsel and do not risque [risk] a defeat.
7. I remain your sincere well wisher
8. James Watt

IV. h. Letter from James Watt to Richard Arkwright – October 27, 1785  
Watt's opinion on his testimony in *Rex v. Arkwright* held on June 25, 1785.  
Enclosed with letter dated October 26 & 27, 1785.

1. \1/ The objection to the Roller not being drawn in the specification is in my opinion  
2. a weak one, because it can be used without it, and if it were found to be necessary  
3. the addition of it is very obvious. In General I cannot suppose that having a patent  
4. precludes a man from making additions or improvements to his machine, but  
5. such additions cannot be covered { ...<sup>65</sup>} by the patent; & it is said to be necessary  
6. that the way described be one that will answer the end —

1. Arkwright Patent (1)

2. A very erroneous opinion prevails in relation to the laws of specifications  
3. they uncommonly said to be enjoined or required by the act 21<sup>st</sup>  
4. \_\_\_\_, Whereas that act makes not the smallest mention of any such  
5. proviso, but permits the King to grant patents for new Inventions for  
6. the term of 14 years under such restrictions and limitations as he shall  
7. judge proper. On the strictest Enquiry I have been able to make I  
8. do not find that there is any other statute whatsoever that has  
9. any relation to the subject. I am also informed that the law books  
10. are extremely defective in their reports of decisions on that subject  
11. On searching in the records of chancery no specification is found  
12. prior to the year 1717, and the Marquis of Worcester & *Capt* [Captain] \_\_\_\_  
13. patents had no clause enjoining specifications, nor does More seem  
14. to have been any other than what is contained in the title of these  
15. patents. The \necessity of a/ Specification seems then to rest wholly [wholly] on the  
proviso  
16. in the patent; and in my opinion, which however I give with due deference  
17. to the Gentlemen learned in the Case, it was originally intended not so much  
18. to secure the publick [public] in the property of the invention as to discriminate  
19. our Inventors property from that of another and from that which belonged  
20. to the publick [public] by being in common use, and also to prevent a second  
21. patent from being granted for the same inventions. And I think  
22. this opinion of mine warranted by the words of the proviso required

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<sup>65</sup> Page is folded and damaged rendering the writing illegible. Speculatively, the missing words may be “and obscured.”

23. the Specification, which are //<sup>66</sup> that the \_\_\_ A. B. shall particularly describe  
 24. // and ascertain the nature of his said Invention & in what manner {...}  
 25. // Same is to be performed, by an instrument in writing// Now here {...}  
 26. Strefs seems to be laid on the describing and ascertaining the nature of  
 27. the Invention, and not \on/ particularizing the constituent parts of it  
 28. In short it seems to be intended that the principles on which it process  
 29. should be clearly set forth thus others may not interfere with this  
 30. \I cannot tell/ At [at] what time the present doctrines began to prevail, that the  
 31. Specification should be so drawn that any body [anybody] by means of it  
 32. alone, without any previous knowledge of the subject should be  
 33. able to put it in practice; but I am sure that if such meaning  
 34. is strictly adhered to, no man can draw a Specification of any (?)  
 35. complicated machine that may not be over thrown [overthrown] for want of  
 36. clearness. The question on Mr Arkwrights [Arkwright's] specification seems to {...}  
 37. upon the determination whether, a person is to be instructed by the specification  
 38. alone to make the machine without exercising any invention of his own

(2)

1. or applying knowledge which he has otherwise acquired, or whether  
 2. supposing a man to have a previous stock of mechanical knowledge  
 3. and some inventive faculties, ~~with~~ and to be conversant in the state  
 4. of such machines at the time Mr Arkwright got his patent, he is to  
 5. consider the specification as a short \& General/ account of the alterations made  
 6. by Mr Arkwright & is to apply to his own previous knowledge & \_\_\_  
 7. for the minutiae. In the former case I should consider the specification  
 8. as imperfect; but on the latter supposition I think it would have  
 9. enabled me to make similar machines.  
 10. It has been strongly dwelt upon that Mr *Arkt* [Arkwright] purposely drew an  
 11. obscure specification to keep his bufiness from the publick [public] after the end  
 12. of his term. If he argued so he argued weakly, because no useful  
 13. invention which is entrusted to 10000 [10,000] people as has been can  
 14. ever be lost to the publick [public] nor made properly of by being kept private

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<sup>66</sup> Notation as depicted in Watt's original letter likely used in lieu of quotation marks.

15. beside, whatever were his intentions at that time the invention is certainly  
16. now in the hands of the publick [public], and what is more it is in his hands by  
17. Mr Arkwrights [Arkwright's] own acts in teaching those Gentlemen to whom he  
18. granted licenses. To take away his *patt* [patent] therefore for an imperfect  
19. Specification is like punishing a man for intending to commit a crime  
20. which it was not in his power to do

21. The machine N 1. is said to be taken from Iverson Mechanicks [Mechanics]  
22. \In fac/t a similar machine is then described and said to be a way of working  
23. a hammer by a water mill, but it is not said to be applied or  
24. applicable to beating flax or cotton, however such machines have  
25. been in use in Scotland for that purpose. The machine N 2 is alleged  
26. not to be used in his present procefs, it however might be so & perhaps  
27. advantageously — I think the figure 3<sup>rd</sup> with its description so plain  
28. that I am surprized it was not understood by every body [everybody], though I confefs  
29. that the application if it to the carding machine was not so plain to me  
30. because I did not understand the old carding machine having never  
31. seen one before the specification was put into my hands, but I think  
32. to those who knew the old feeder the application of N 3 could \_\_\_\_  
33. be other wise [otherwise] than plain. The cranks (which I think is No 4.) I readily  
34. understood but did not at first see its application to take off the collars  
35. though I did at last after consideration. As to the fillet cards I  
36. conceived them to go round the cylinder parallel to the ends, but if the  
37. objection had occurred of things not {...} off the whole card I think

(3)

1. I think, & I speak from my own experience, \in this very case/ that several ways would  
have  
2. readily occurred to any person conversant in mechanicks [mechanics], of removing that  
3. difficulty; but my opinion was that at the time Mr Arkwright took it  
4. off in separate fillets which pafsed directly to the sizing rollers, & from  
5. them to the roving \_\_\_\_, which method would \in my opinion/ certainly answer though not  
6. so well. If Mr Arkwright can prove that such was his practice at the  
7. time of taking the patent, it must remove one considerable objection to (?) {...}  
8. any rate the proof that the method described will answer in practice, shall

9. weigh in his favour, particularly as it shows the grand principle of his improvements (?)  
 {...}

10. which is the taking off a continued or endless carding, which however  
 11. ought to have been more expressly mentioned. There is a great failing  
 12. in the specification at this place, which is the not clearly expressing that  
 13. the intermediate *Cylr* [Cylinder] was the carding *Cylr* [Cylinder] of the old machine.  
 There

14. I was quite at loss, until [until] I saw the old machine and was informed that  
 15. Mr Arkwright did not claim it as his invention thus I thought that  
 16. if I had seen the old machine before the specification, I should have  
 17. understood the connection; but this could only be matter of opinion

18. In regard to the sizing of Cylinders. I understood their operation  
 18. immediately, because I had heard that Mr *A.* [Arkwright] used such a contrivance  
 19. in his Spinning machines, and therefore I ~~should~~ looked on the mention  
 20. of them in the case \as/ sufficient without any particular description  
 21. as being a part of machines then in common use, ~~but~~ \though/ this application of {...}  
 22. was ~~xxx~~ \new/ as \a/ step in making the roving. It should however been said  
 23. that they were such as were used in the spinning and described in  
 24. that patent. I look upon it that if any machine or utensil which  
 25. is in common use is made a part of a new machine that it cannot  
 26. be incumbent on the patentee to describe particularly such common  
 27. machine or utensil nor the materials of which it is made, only to mention  
 28. its use and application to the new machine. If this opinion be  
 29. well founded, the questions are whether a part of a patent machine  
 30. publicly used is to be considered as publickly [publicly] known? and whether  
 31. the application of a common machine to a new purpose can be made  
 32. property by a patent? Lastly whether on the principles advanced by  
 33. the Court, it was not incumbent on Mr *A.* [Arkwright] to ~~describe~~ \mention/ the rollers  
 34. as a step in the process, though it should be decided that he could  
 35. not have a patent for that particular part, or rather that {...}  
 36. part could not be covered by the patent as being in common use & not  
 37. new thing

1. a new thing)?<sup>67</sup> It appears to me that applying an old instrument to  
2. a new use ought to be capable of being secured by patent, otherwise few  
3. patents could exist for inventions merely mechanical. Thus Rollers have  
4. long used for stretching metals yet nobody contested the propriety of  
5. a patent for the sole use of {...} in stretching cotton in spinning:  
6. nay though they were in common use for rolling flat slips & sheets of  
7. metal yet patents are so \_\_\_ good for rolling round rods & for  
8. moldings. Yet in those cases this transition was greater than between  
9. the application to spinning & to roving, the modus operandi being  
10. exactly the same in both the latter cases.

11. I understand no 7. the roving box from the specification as well as  
12. I did afterward when I came to see it. But a question arises here  
13. Several of the witnesses confirmed that an open Cann [Can] was in use for that purpose  
14. before the patent. Is so the roving box cannot be ~~good~~ secured but in so far [insofar]  
15. as it differs from the open Cann [Can], and the use of open cann [can] must  
16. remain to the publick [public]. In question then is whatever such open cann [can]  
17. was used publicly [publicly] before the patent? & whether any roving was made by  
machines before that time? & how?

18. As to N 8 & 9 I think the specification ways they were \ (or might be) / ~~to be~~  
19. used instead of No 7. is so the specifying then was in my opinion  
20. very proper, as surely an inventor may describe all the modes  
21. he can think of carrying his invention into execution, otherwise  
22. by leaving such things unnoticed [unnoticed] the patent might be defeated

23. The Main question seems to be whether the whole machines are  
24. to be taken in cumula<sup>68</sup> as producing a certain effect, and consequently  
25. as parts of one apparatus; or if they are to be considered as so {...}  
26. separate machines. In the former case the objective lies that the connection  
27. of the parts & the modus operandi are not sufficiently described so as to be  
28. understood by every person, nor by mechanicks [mechanics] unless they are acquainted  
29. with the business to be done, and with the state of the machines  
30. before Mr At [Mr Arkwright's]: patent. To men of mechanical invention furnished with

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<sup>67</sup> Notation as used by Watt. There is no visible open parenthesis.

<sup>68</sup> Likely abbreviation for cumulatively.

31. such previous knowledge my opinion is that they are intelligible though  
32. at the same time I must say they might and ought to have been more  
33. clearly described. This is in my opinion, the strongest state of the case  
34. for Mr *A*: [Arkwright]; for on the latter no owner of stating; It will be proved that  
35. the beater was used for flax & for Iron Ore the needle barr [bar] was used in  
36. the stacking frame, the cylinders or sizing rollers in the spinning, and the  
37. roving box

[5, unnumbered]

1. given of the means, men of Ingenuity will be able to make out the  
2. minutia and though in describing such machines as are in question  
3. the sizes of Rollers and the pullies which give \_\_\_ motion, with  
4. the comparative velocities, should \ought to/ be mentioned, yet if they had been \so,  
5. it is ten to one, if they had been the best \proportions/ possible, and consequently  
6. the more description the more room for cavil.<sup>69</sup>

7. In relation to Mr Harrison's Evidence, as he affirmed positively //that he  
8. //was no way interested in the event of the cause and that he could not  
9. //be any way hindered in the exercise of what he was about in the  
10. //certain way let the cause be determined as it would//. The truth of  
11. his depositions [depositions] should be enquired into

12. The Judge has either not understood the evidence I gave or has  
13. not taken the proper notes of it for it is absolutely contradictory to  
14. my meaning. As I was much \_\_\_ and confused by the noise in  
15. the court and the manner in which I was questioned I have not a  
16. clear Idea of what I said, but must refer to the short hand [shorthand]  
17. notes of my evidence, which if handed to me I will correct & return.

18. I have now given my opinion on the specification with as  
19. much precision as the time would permit, and hope the inaccuracy  
20. and want of order will be excused, as I send the first draft as it  
21. fell from the pen having no time for correction.

22. ~~xxx xxx~~ I must add that if Mr Arkwright can disprove what  
23. was alleged against his priority of invention, the minds of \the/ Jury will

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<sup>69</sup> "A captious, quibbling, or frivolous objection"; OED, "cavil (n.," March 2025.

24. be better disposed, to attend to what may be said in favour of his  
25. Specification —— N.B.<sup>70</sup> It is worthy of remark that when the judge  
26. put it to the Jury to give a verdict on the specification alone  
27. they declined it & desired he might go on.

28. James Watt

29. [Watt drew an irregular line.]  
30. Birmingham *Octr* [October] 27 1785}

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<sup>70</sup> N. B. is most likely *nota bene*, Latin for take well or note well; Jon R. Stone, *Latin for the Illiterati* (Routledge, 2009), 89.

IV. i. Letter from James Watt to George Goodwin – February 4, 1786

1. Mr *G.* [George] Goodwyn<sup>71</sup> *Birmm* [Birmingham] *Feby* [February] 4  
1786
2. Sir,
3. On the 26<sup>th</sup> of April last I sent to Mr
4. Arkwright my Draft in his *fav* [favour] on Mr *Willm* [William] Matthews
5. value £21\_ \_ \_ at \_ \_ \_ \_ date<sup>72</sup>
6. As my stay in London waiting for the last trial
7. was exceedingly inconvenient, and \_ \_ \_ with some
8. disagreeable consequences, I did not return him any
9. part of the 50 Guineas he was so kind as to send
10. me through your hands, though I was very much
11. inclined to do so, from the little service my evidence
12. was of to him & the other circumstances of his Cafe
13. If however it should appear that he now \_ \_ \_ \_
14. that sum too much I shall readily return any part
15. of it which may be thought proper
16. With respectful *Compt* [Complements] to Mr Arkwright
17. I remain, with esteem
18. Sir
19. Your Obedient
20. humble *Servt* [Servant]
21. James Watt
22. I find Mr Matthews has in his *acct* [account] and charged me with the Bill
23. drawn on him, a letter to him will procure information
24. \_ \_ \_ \_ to whom paid if {...}

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<sup>71</sup> Common alternative spelling of Goodwin.

<sup>72</sup> Use of dashes throughout line 5 is as written.

IV. j. James Warroch testimonial for case against  
Jabez Carter Hornblower – November 26, 1796

1. Glasgow 26<sup>th</sup> November 1796

2. Sir

3. Having heard that some people are endeavouring to defeat  
4. the Effects of your Patent for Fire Engines, and that Mr Joseph Hateley pretends  
5. to ascribe the invention to the late Doctor Roebuck in whose employment he  
6. was for about Eighteen Months, viz<sup>73</sup> from December 1766 to July 1768, during  
7. which time the Doctor appeared to me to be frequently disatisfied with his conduct,  
8. Having been Clerk to Doctor Roebuck for Seven years prior to February  
9. 1768 And continued in strict friendship with him from that period to the  
10. time of his death, it appears strange to me that Mr. Hateley should pretend  
11. to attribute an invention to Doctor Roebuck, which on every occasion during  
12. a twenty Seven [twenty-seven] years intimate acquaintance with the Doctor, He had  
avowed  
13. to me, & to others in my hearing, to be solely yours.

14. I am confident Mr Hateley cannot with truth alledge [allege] that he enjoyed  
15. much of Doctor Roebucks [Roebuck's] confidence, nor is it probable that the Doctor ever  
gave  
16. him reason to suppose or believe that he was the Inventor of the Engine in question,  
17. And therefore Mr Hateley must deviate from truth if he makes the Averment<sup>74</sup>  
18. And as some things may appear from the Doctors [Doctor's] books kept by me at the time  
19. in contradiction to the Evidence he may give, I have advised Mr Roebuck to  
20. carry them with him to London, Wishing you a decision upon the principles  
21. of truth & Justice I remain

22. Sir

23. Your Most Humble Servant

24. James Warroch

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<sup>73</sup> Abbreviated form of videlicet; "That is to say; namely, to wit," *OED*, "videlicet (adv. & n.)," December 2024.

<sup>74</sup> "Law. Formal offer to prove or justify a plea; the proof or justification offered, verification," *OED*, "averment (n.)," December 2024.

IV. k. Testimony of Professor John Robison in  
*Boulton and another v. Hornblower and another* December 16, 1796  
Joseph Gurney's notes of the trial – Pages 105–114

1. Mr Serjeant Le Blanc stated that —
2. ~~Doctør~~\Mr/ Robinson one of the Witnesses he –
3. meant to call was very much indisposed he
4. therefore requested that he might examine him
5. in the present stage of the Cause.
6. ~~Doctør~~ Mr Robinson (Sworn)
7. Examined by Mr Serjeant Le Blanc
8. \Q/ Have you ever had any conversation with Mr
9. Watt relative to his improved Engine. –
10. \A/ I have been acquainted with Mr Watt ever since
11. the very beginning of his invention and was with
12. him during the whole process of it — I saw and
13. assisted in almost every experiment that was made
14. I know the day when the invention was completed
15. and know several particulars of it.
16. \Q/ Whether you were not particularly desired by Mr
17. Watt himself to make a secret of the manner
18. of his packing his piston —
19. \A/ Never —
20. \Q/ I need hardly ask you if that was the case –
21. whether you ever said that you were desired by –
22. Mr Watt to keep it secret and therefore could
23. not discover it
24. \A/ As I never was desired by Mr Watt I think it
25. is hardly using me well to suppose so –
26. \Q/ I understand you had said in Lecturing upon

27. 105

1. this very machine that you could not discover
2. this part because it was a secret.
3. \A/ I never considered that as any secret I –
4. may have stated in my Lectures on Mr Watts [Watt's]

5. Engine that there were circumstances relating to  
6. the most perfect manner of his making his –  
7. Engine that I was not at liberty to make –  
8. known to the public – I was not his publisher –  
9. I never said that Mr Watt had given to me  
10. any part or circumstance of his invention to be  
11. known by me and no other – he never did so –  
12. and whoever has reported that (for I suppose  
13. from some report you have heard this has  
14. reported a falshood [falsehood]. –  
15. \Q/ Did Mr Watt ever desire you to keep any –  
16. part of his machine a secret.  
17. \A/ At the time he invented it he desired me  
18. to keep the whole secret.  
19. \Q/ That was before his Patent  
20. \A/ Yes –  
21. \Q/ Since his Patent has he desired you to keep –  
22. any part secret.  
23. \A/ It is since the year 1764 that Mr Watt and  
24. I have been engaged in the same Study together  
25. and many things may have occurred during the  
26. course of that time that were not to ≠

27. 106

1. communicate to the public.  
2. Mr Rous – That was preceding the Patent –  
3. \A/ Yes –  
4. ~~Docter~~ Mr Robinson \Robison/  
5. Crofs Examined by Mr Rous —  
6. Mr Rous – as you are called I will ask you  
7. whether the specification in your judgment is –  
8. sufficient to communicate to any person acquainted  
9. with Newcomens [Newcomen's] Engine the invention of Mr Watt  
10. \A/ Any person acquainted with the principles and –  
11. management of Newcomens [Newcomen's] Engine will receive —

12. sufficient communication of the principle to enable
13. him to make a \the/ Machine invented by ~~Mifsrs~~ [Misters] —
14. ~~Boulton and~~ \Mr/ Watt for the purpose of saving the
15. consumption of Steam and Fuel which I take to
16. be the object of their Patent.

17. Has any thing [anything] occurred in your experience to
18. convince you that you have formed a right ≠
19. judgment upon that subject —
20. \Q/ Hearing that question put on a former occasion —
21. I had some doubts as to my own competency to
22. answer the question because I knew too much of it
23. from the beginning and therefore could not be so
24. candid a judge of whether I were or not able
25. to construct an Engine according to the specification
26. and therefore I was happy to have proof of the

27. 107

1. fact of persons that did not know it so well as
2. I did — I was absent by accident a fortnight —
3. during the time the invention was completed I —
4. did not see Mr Watt but I got hold of the
5. invention by the single expression of a separate
6. condenser which I heard from another Gentleman —
7. I went home to the Country where I live —
8. I sent to a Neighbouring Town for a little Tin
9. apparatus and the next day I set about making
10. a Machine which completely answered the purpose
11. The third day I completed it by means of the
12. hint I got from the Gentleman I allude to —
13. \Q/ Do you know whether the same thing has —
14. happened to others to whom you have commu=
15. =nicated [communicated] it verbally —
16. \A/ Yes —In the year 1770 I sent to Rufsia
17. to take the direction of the Imperial Academy
18. of Marine in that Country — my House was —

19. adjoining to the Bason [Basin] into which the Docks  
20. of Rufsia were drained – the Water was drawn  
21. out by two expensive Windmills – it occurred to  
22. me that a Steam Engine would answer the  
23. purpose better and as that Country was at a  
24. great distance from Pit Coal it occurred to me  
25. that Mr Watts [Watt's] Engine was the best – I recommended  
26. to the Admiralty College to erect a Steam Engine

27. 108

1. this occasioned a good deal of conversation between  
2. me and the Gentlemen of Science in that Country  
3. particularly a Mr Model a Gentleman of  
4. great reputation – I wrote to Mr Watt desiring  
5. him to undertake the erecting an Engine Mr –  
6. Watt with that liberality, which is natural to –  
7. himself declined interfering in it – The expression  
8. of his Letter was I think you are fully –  
9. able to conduct that project and it will do  
10. you credit in the Country where you are –  
11. I repeated this to Mr Model.  
12. The substance here omitted must be obtained  
13. from Mr Robison  
[Lines 12-13 written in pencil followed by approximately 4 blank lines]  
14. I took an official report out of my Pocket and  
15. the Gentleman immediately made a sketch upon  
16. the paper I have that sketch here and I  
17. submit that it is an instructive sketch of Mr  
18. Watts [Watt's] Engine – It happens to be preserved in –  
19. consequence of being drawn upon the back of an  
20. official Report I received that Morning and  
21. I have kept it as a great curiosity.  
22. \Q/ Was the communication from the –  
23. Gentleman had made that sketch as correct  
24. precise and full as this specification. –

25. 109

1. \A/ Very far from it indeed
2. \Lord/ Chief Justice Eyre Did ~~you~~ \he/ make a Model
3. a Sketch or erect this Engine.
4. \A/ Only made a Sketch
5. \Mr/ Rous And you think that Sketch is sufficient
6. \A/ I think the sketch is almost a Model of the first
7. thought that occurred to Mr Watt – it is not in the
8. form the Engine is now placed but it is sufficient
9. to show any Engineer that model that understands
10. it –
11. \Lord/ Chief Justice Eyre Has that got the condenser
12. out of the Vessel in which the Piston worked –
13. \A/ Yes –
14. ~~Doctor~~/ Mr Robinson –
15. Re-examined by Mr Serjeant Le Blanc
16. \Q/ In what year was it that you made this tin –
17. apparatus from the hint you had –
18. \A/ Some day between the end of April and the
19. middle of May 1765 when I left Town in the
20. month of April Mr Watt did not know how to
21. keep the Cylinder continually hot, when I returned
22. to Town I called at Mr Watts [Watt's] house he had
23. done it –
24. \Q/ Had you made a Model of a Steam Engine
25. with a distinct condensing Vessel in 1765 –
26. \A/ You may call it a Steam Engine, it was for an

27. 110

1. Air Pump but it operated upon the same principle
2. as Mr Watts [Watt's] Engine
3. \Q/ And the condensation was in a Vessel distinct –
4. \A/ The term Vessel may be applied to bodies of such
5. different forms it was in a pipe which communi=  
6. =cated [communicated] with the Vessel from which I wanted to –

7. extract the condensed Steam –
8. \Q/ It was not in the same Vessel or Cylinder in
9. which the piston worked –
10. \A/ No it was not.
11. \Q/ And this answered the purpose perfectly well –
12. \A/ It produced a complete condensation –
13. \Q/ Was there any injection of Cold Water into the –
14. condensing Vessel –
15. \A/ Certainly – that I thought of at the first –
16. \Q/ You inserted an injection of cold Water into –
17. your condensing Vessel –
18. \A/ There was an injection made of cold Water into –
19. the Vessel in which I made the condensation –
20. \Q/ Did you ~~soon~~ after the year 1769 or about the
21. year 1769 see any Engine made or constructed by Mr
22. Watt –
23. \A/ In the beginning of the year 1770 I left this Country
24. and went to Rufsia –
25. \Q/ Before you went to Rufsia had you seen any –
26. Engines made by Mr Watt.

27. 111

1. \A/ I saw his great working Model erected at –
2. Kinneil after he was afsociated with Doctor Roebuck
3. in his invention –
4. \Q/ A formed Machine –
5. \A/ Yes –
6. \Q/ Do you know whether in that formed Engine
7. of his there was any injection Pipe if I may so
8. call it to throw a jet of Water into the condensing
9. Vessel –
10. \A/ I cannot pofsibly say at the time I looked at it
11. because I know that though the whole invention –
12. was completely in Mr Wats [Watt's] mind and almost completely
13. executed in the course of three days yet Mr Watt

14. made several subordinate alterations in it and as his  
15. private fortune did not enable him to proceed in it –  
16. alone he associated therefore with himself Doctor –  
17. Roebuck but if he had been left to the guidance of  
18. his own opinion he would have made fewer of these  
19. subordinate alterations and in half a year or three  
20. quarters of a year I have no doubt that it would  
21. have been as perfect as now but Doctor Roebuck  
22. was a Gentleman of great practical abilities and –  
23. of a bold spirit – Mr Watt a Gentleman of great  
24. modesty and timidity easily thwarted by difficulties  
25. and he paid a deference to Doctor Roebucks [Roebuck's] greater  
26. practical experience and by that means he retarded

27. 112

1. frequently his own progress it is my Opinion that if  
2. he had attended to the train of his own thoughts –  
3. simply he would sooner have brought his Engine  
4. to perfection [spaces by author] I think he injected a stream of cold  
5. water at the first, I am quite certain, but long  
6. since that time I know Mr Watt made use of an  
7. injection of cold water – Doctor Roebuck thought  
8. it might be done without Mr Watt was of a –  
9. contrary opinion in some experiments the condensa=  
10. =tion was made with it in some without it but to –  
11. what particular state in that respect that Engine  
12. was brought when Mr Watt obtained his Patent I –  
13. cannot say [spaces by author] I never saw the condenser of that Engine  
14. it was under Water –  
15. \Q/ Frequent experiments had been made by Mr Watt  
16. \A/ Undoubtedly –  
17. \Q/ And a formed Machine had been made whether  
18. as a Model or actual working Machine is not  
19. material which if I understand you had –  
20. seen before you left Britain –

21. \A/ Yes in 1769 –  
22. \Mr/ Rous – was this model for the purpose of –  
23. experiment or an Engine applied to work.  
24. \A/ Entirely for the purpose of experiment it was –  
25. not set to do any Work –  
26. \Q/ I understand you got the hint of a separate –

27. 113

1. condenser which led to the discovery from a person  
2. that got it from Mr Watt.  
3. \A/ It was from a Gentleman who was every hour –  
4. with Mr Watt as I was –  
5. Mr Ramsdens – Examination proceeds –  
6. Mr Rous – you have seen the specification  
7. \A/ I have  
8. \Q/ Could a Mechanic acquainted with Newcomens [Newcomen's] –  
9. Engine from that specification execute the invention  
10. of Mr Watt.  
11. \A/ I have no doubt in the world of if – I think  
12. any Mechanic of moderate abilities could easily  
13. have made a model from this specification a great  
14. deal has been mentioned relative to the proportions  
15. The proportions of the Pump it would be –  
16. impossible to ascertain it would depend upon the  
17. quantity of injection Water there would be to take  
18. out – being big enough it could not be erroneous –  
19. being too small it would not take out the quantity  
20. of injected Water and would not answer the  
21. purpose –  
22. \Q/ Could the uncondensed vapour be drawn out  
23. by a pump without drawing out the Water –  
24. \A/ I think it would operate for both – the Water  
25. would be at the bottom and consequently must  
26. be drawn out first. –

27. 114

[End of transcription.]

V. a. Letter from John Foster to Martin Folkes – August 30, 1780

1. Temple August 30<sup>th</sup> 1780

2. Dear Sir,

3. I have looked into your Grandfathers [Grandfather's] Will

4. and I am inclined to think that the \_\_\_\_\_ Fee<sup>75</sup>

5. of Hudsons Estate expectant on your Wealth without

6. Issue Male or female (for it is limited to Daughters

7. a failure of Sons) passed by & is subject to

8. the limitation in your Grandfathers [Grandfather's] Will

9. as far they avail in Law — and as —

10. you have now Children you have no Means

11. of defeating those limitations by a Recovery

12. or otherwise —

13. The proper \_\_\_\_\_ money and other

14. willening [willing] (?) act will be after the award is —

15. executed till [till] (?) which you are not invested —

16. with any Property in or Power of \_\_\_\_\_

[Page 2]

1. allotment to be made you. How much

2. shall you want to receive [receive] & can you provide

3. with \_\_\_\_\_ Money? If you shall have Occasion

4. for my assistance you will give me Notice

5. & I will endeavour to accommodate you.

6. Bealy Apothecary was with me a Day

7. or two since to request a few Days longer

8. he says the Man has agitated himself into

9. a fit of illness he really believed on *Acct* [Account]

10. of this Inability to pay his Debt.

11. I perchance now setting out on Saturday or

12. Monday for \_\_\_\_\_ where I shall

---

<sup>75</sup> Common law: “An estate of inheritance in land. (A fee is either a fee-simple n. or a ‘fee-tail n.’; but ‘in fee’ is usually = ‘in fee-simple’); *OED*, “fee, (n.2),” March 2025; in fee-simple; “an estate in land, etc. belonging to the owner and his or her heirs forever, without limitation to any particular class of heirs”; *OED*, “fee-simple (n.),” December 2023; fee-tail; “an estate of inheritance entailed or limited to some particular class of heirs of the person to whom it is granted”; *OED*, “fee-tail (n.),” June 2024.

13. spend a Week and thus go to the Sea or to
14. Lord \_\_\_\_\_ in Hampshire for
15. another Week or perhaps a fortnight

[Page 3)

1. from whence I hope without any Stop
2. ~~xxx~~ at this Place (which you will believe
3. are heartly weary of) to proceed to \_\_\_\_
4. you shall hear *fur* [further] from me as I
5. make any Progreſs.
6. \_\_\_\_\_ & his Wife are gone to a House
7. he has {...} at Herne near Canterbury
8. I will mention your kind \_\_\_\_ to him
9. when I write or see him as I poſſibly may.
  10. Remember me to Lady Folkes & \_\_\_\_
  11. me
  13. Most ſincerely & gratefully
  14. *yrs* [yours]
  15. John Forſter

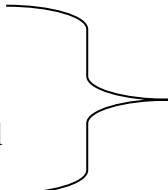
[Envelope]

1. To
2. Sir Martin B. Folkes *Bar* [Baronet]
3. Hillington Hall
4. Near Lynn
5. & Norfolk

V. b. Summons from Henry See Warner to James Smyth – June 25, 1782  
Sir Martin Browne Folkes Baronet and Robert Hales Esq, Plaintiffs  
against George Chadd Esq and others, Defendants

25<sup>th</sup> June 1782

Folkes *Bart* [Baronet]  
& al  
*agt* [against]  
Chad [Chadd] Esq & al



Summons for View

1. Sir

2. By Virtue of the writ afor [afore] Sovereign Deed

3. the King to me Directed, I do hereby Summon and Require

4. you to take a view of the place in Question, in a certain

5. Cause Depending in his Majestys [Majesty's] court of Kings [King's] Bench

6. at Westminster, Between Sir Martin Browne Folkes *Bart* [Baronet]

7. and Robert Hales Esq *Plts* [Plaintiffs] and George Chad [Chadd] Esq and others

8. Defendants on friday [Friday] the twenty Eight day of this Instant<sup>76</sup>

9. June, And you are to meet at the house of Philip Batchelor

10. known by the Sign of the Standard<sup>77</sup> at Wells in Norfolk and

11. to proceed from thence to View the said place Dated this

12. twenty fifth day of June one thousand seven hundred and

13. Eighty two. —

14. Henry See Warner Esq Sheriff

15. To James Smyth Esq

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<sup>76</sup> “Existing or following in time; Said of the current calendar month,” *OED*, “instant (adj.), sense II.2.b,” June 2025.

<sup>77</sup> “A military, naval, or ceremonial flag or ensign; Something likened to a standard, esp. in being a rallying point for a group of followers,” *OED*, “standard (n.), sense I.1.b” June 2025.

V. c. Folkes & Hales' special juryman request sent to James Smyth – July 2, 1782

[Envelope]

LYNN [stamped upside down]

James Smyth Esq

West Bradenham

Norfolk

Turn at Thetford

1. Sir Martin B Folkes & Mr Hales present
2. their Compliments to Mr Smyth and beg the favour
3. of his attendance as a Special Juryman at the next
4. Afsizes in a Cause between them as Plaintiffs and
5. George Chadd *Esqr* [Esquire] and the Town of Wells as Defendants
6. Hillington
7. July 2<sup>nd</sup> 1782

[Letter ends without a signature.]

V. d. Letter from James Smyth to Martin Folkes – July 6, 1782  
(Response to summons.)

1. 6<sup>th</sup> July 1782
2. *answr* [answer] to Sir Martin Folkes
3. *Lr* [Letter]

[Second page]

1. Mr Smyth returns Compliments to Sir Martin
  2. Folkes & Mr Hales and having on the Sheriffs [Sheriff's] Summons
  3. taken a View at Wells thinks it a Duty to attend as a
  4. Juror the Trial the Cause of the Afsizes
5. Bradenham 6 July 1782
6. Sir Martin Folkes *Bart* [Baronet]
  7. Hillington
  8. *Norf* [Norfolk]
  9. By Thetford
- [Response ends without a signature.]

V. e. Letter from Dan Jones to James Smyth – August 7, 1783

Mr Jones's *Lr* [Letter] & copy of my  
Answer

James Smyth Esq  
West Bradenham  
Near E Dereham  
Norfolk

1. Dear Sir

2. Thakenham [Thakeham]

3. Aug [August] 7 1783

4. I take the liberty of informing you

5. that the View of Wells was attended by 12

6. Jurymen — a Circumstance which I dare say

7. never happened in the Course of your practice:

8. I have Every reason to be Satisfied with the

9. View: The Viewers were

Mr Lane	Mr Payne &
Mr Bacon	Mr Woodward
Mr Cauldwell	10. Our friend Mr C (?)
Mr Wilson	11. seems Entirely in our
Mr Billingsley	12. favour — I wish that
Mr Lloyd	13. you would see him,
Mr Watts	14. talk with him & Show
Mr Barrett	15. him the Copy of
Mr Worrell	16. Lord Mansfields [Mansfield's]
Mr Grigson	17. opinion, which I lent
Mr Barlow	

[page 2]

1. you, of which *wd* [would] Explain the matter to him

2. fully — The Engineers [Engineers'] Reports have been

3. delivered to the Jury.

4. Poor Springold is dead, but the

5. notes of his Evidence on the last trial

6. are to be ued [used] as Evidence — Mr Mansfield

7. Comes down for our opponents — Mr Hardinge

8. for us.

9. I am *Dr* [Dear] *Sr* [Sir]

10. *yr* [your] obliged \_\_\_ *Servt* [Servant]

11. Dan: Jones *Jur* [Junior]

V. f. Letter from James Smyth to Dan Jones – August 15, 1783

1. Dear Sir

2. On Tuesday I made a visit so Mr C (?)

3. discoursed freely on the Subject & showed him a State of

4. Facts & *obsns* [observations] made more than 19 *mos* [months] ago & *wch* [which] determined

5. *gentlm* [gentlemen] in a former Decision & — I think he is convinced

6. — and with Pleasure I inform you that *abt* [about] a Month since

7. I had \a/ Conference with Mr *B-n* (?) to \with the \_\_\_ \_\_\_ / \_\_\_ Reasons for

8. that former *Judgmt* [Judgment] were explained & enforced \Evidence/.

9. ~~xxx xxx~~ \I am persuaded/ your Journey will be safe & prosperous {...}

10. Mr Crisp by \_\_\_ Fast will send you a Copy of the

11. *obsns* [observations] I am

12. *Dr* [Dear] Sir

13. Your very *obt* [obedient] *Servt* [Servant]

14. *Ja S* [James Smyth]

15. 15<sup>th</sup> *Aug* [August]

V. g. Letter from Robert Mylne to George Hardinge – July 24, 1784  
(As printed in a broadsheet dated September 20, 1784.)

1. To —— Hardinge, Esquire.<sup>78</sup>

2. New River Head July 24, 1784

3. Sir,

4. THE injurious and illiberal treatment which I received, at the laft

5. Summer Affizes, at Norwich, from you, in your capacity of Counsel at the Bar, re-  
6. quires fome reparation.

7. A twelvemonth is almoft elapsed, by the fame Affize time being now come round ;  
8. during which I have left you, without notice taken, at full liberty to fubftantiate thofe  
9. charges, againft my character, which you threw out on the remarkable trial of the  
10. Wells-harbour caufe ; and, for your attempting that profecution for perjury, which you  
11. not only hinted before you heard a word from me, as an evidence, but more than  
12. threatened, in your inflated, noify frothy fpeeches of reply.

13. I can have but little or no expectation in this addrefs, that a mind of fo illiberal a  
14. turn, as the being capable of and actually committing fuch an outrage to decency, and  
15. to every quality that conftitutes a Gentleman, fhould not feel from this remonftance,  
16. the neceffity of a proper reparation.

17. It is not enough for me , that the Gentlemen at the Bar felt the difgrace done them,  
18. by your audacity, in a character common to them all ; and that the Judge took all the  
19. pains he could, in juftice to me, on the threshold of his charge to the Jury, to do away  
20. the foul afperfions you attempted to fix on my reputation, not as an Artift, but as an  
21. honeft man.—— Something more is neceffary ; —and it muft come from yourfelf.

22. The intention of this letter, is to leave it to yourfelf ; and if you felt, as you ought,  
23. and every good man would do, on fuch an occafion, you will embrace this  
opportunity,  
24. fince it has not occurred to yourfelf, in refpect of me, as well as of Mr. Smeaton.

25. If hurried on, by this impetus of a heated and unguarded imagination at the time,  
26. you fhould not now recollect, that which gave offence in fo publick a manner, you can  
27. eafily be informed by the Short-hand writer.

28. If you decline all or any reparation, you will not think it extraordinary in hearing  
29. from me again.

30. I am your very humble Servant,

31. ROBERT MYLNE

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<sup>78</sup> Hardinge's first name is left blank.

V. h. Letter from George Hardinge to Robert Mylne – August 4, 1784  
(Final apology for treatment at trial.)

1. To Robert Mylne *Esqr* [Esquire]

2. Great Ormond Street

3. 4<sup>th</sup> Aug [August] 1784

4. Sir

5. In answer to the requisition, which you have made —

6. by Mr Greenland, I assure you, that I am extremely concerned, for the

7. offence which I gave to you at the Summer Assizes for Norwich in the years,

8. 1782 and 1783; when; operating as an Advocate, in the Wells = Cause I charged

9. you with perjury and menaced you with Prosecution for it. —

10. I lament sincerely, that my Zeal, as an advocate, in both of

11. those hearings, betrayed me into such reflections, which could not be Justified by

12. your Conduct or Character, and for which you had a sufficient Ground of —

13. Claim to every degree of reparation; that a Man of Honor<sup>79</sup> can make. —

14. I mean to Convey the Idea of such a Reparation, in the —

15. utmost extent of it, by the words that I have used, And I am Sir,

16. Your most humble Servant,

17. *G*: [George] Hardinge

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<sup>79</sup> As spelled in original document.

(50)

1. From the Norwich Mercury of *Sat* [Saturday]

2. 30<sup>th</sup> Nov 1782

3. \application by *Plts* [Plaintiffs] for a new or 3<sup>rd</sup> Trial:/

4. On Thursday the 21<sup>st</sup> Just: the Verdict given at the Last

5. afsizes for the County of Norfolk, in the important

6. Cause between Sir Martin Folkes, *Bart* [Baronet] & Robert Hales,

7. Esq Lords of the Manor of Wells, Plaintiffs and the

8. Commifsioners for the Preservation of the Port of

9. Wells, *Defts* [Defendants], came under the Review of the Court of Kings [King's]

10. Bench, in Consequence of an application made by the

11. Plaintiffs for a new Trial.

12. The Question to be tried was, whether an Embankment

13. made by the late Sir John Turner; *Bart* [Baronet], in the year 1758,

14. acrofs a Creek communicating with the Channel, which

15. forms Wells Harbour, had been of Prejudice to the Port,

16. by diminishing the Quality & force of its Back water.

17. The Cause was first tried at the Summer Afsizes

18. held at Norwich, 1781, 10<sup>th</sup> on the Opinion of Mr Mylne, the

19. Engineer (who attributed the Decay of the Harbour to

20. natural causes only) the Jury found a verdict for the

21. *Plts* [Plaintiffs]; but the *Defts* [Defendants] alledging [alleging], that they were  
unprepared

22. at the Instant to examine & controvert the Principles

23. of Mr Mylne's Opinion (which was new to them) the

24. Court of Kings [King's] Bench, on their Application, granted

25. them a new Trial (on Payment of Costs) for that Purpose.

26. \obsns [observations] on 2<sup>nd</sup> Trial/

27. The Cause accordingly came on to be tried a second

28. Time at the last Afsizes, when the Evidence of Mr Smeaton

29. the celebrated Engineer (who entirely coincided in Opinion

30. with Mr Mylne) was refused to be heard, and the *Plts* [Plaintiffs]

31. were not permitted to give any Evidence tending to

32. show, that other Harbours on the same coast, of the  
33. Same Nature & subject to the same winds; had in the  
34. same Space of Time, undergone similar alterations  
35. to those which had happened at Wells; and the  
36. Jury therefore found a verdict contrary to that  
37. (on

(51)

1. on the former Trial.

\Reasons for granting a 3<sup>rd</sup> Trial/

2. The court on the present application, unanimously -//  
2. disapproved of the rejecting the Evidence above mentioned  
3. declaring the whole Question to be a mere Matter of  
4. Scientific Opinion, incapable of being properly —  
5. discufsed without the Evidence of Men of Science,  
6. conversant in the nature of Harbours; and that the  
7. State of the other Harbours on the same Coast (where no  
8. such Embankments were) was very material Evidence  
9. to illustrate the Truth of the Engineer's Opinion; and  
10. ought therefore to have been admitted. on [On] this —  
11. ground the Court ordered the verdict to be set aside,  
12. and granted a new Trial.  
13. Lord Mansfield pafsed high Encomiums<sup>80</sup> on the con=  
14. =summate [consummate] Skill & Integrity of Mr Smeaton, who had  
15. on several occasions been examined in causes of a  
16. similar nature, tried before his Lordship.

[End of transcription.]

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<sup>80</sup> “a formal or high-flown expression of praise,” *OED* “encomium (n.), sense a,” July 2023.

(56)

1. Length, and over 66 acres of Sand, as was proved by 20 witnesses
2. upon the Trial of the Cause in July last.
3. Having cleared the way of all the Rubbish, & all the Jargon
4. with which A. B. has (for what Purpose he knows best) attempt=
5. =ted [attempted] to mislead the public; I will now use my utmost Endeav=
6. =ours [Endeavours] to give a short & true account of the Cause, & the x
7. grounds upon which Sir Martin Folkes and Mr Hales moved
8. for, and obtained a new Trial.

\ \_\_\_ Trial: 1781 verdict for *Plts* [Plaintiffs]/

9. This Cause was first tried at Norwich Assizes 1781, when
10. Mr Robert Mylne, an Engineer, deposed (in Contradiction
11. to all the other witnesses examined in the Cause) that the
13. Bank was \not/ of Detriment to the Harbour; and he imputed
14. its Decay to the other Causes, viz<sup>81</sup>, to the Operation of the Ebb
15. Tides from the River Humber & Lynn Channel — to the x
16. opposite meeting of the Tides between Flamborough Head &
17. \_\_\_ — and to the Retreat of the Sea from the Coast.
18. — whereupon the Jury, relying upon the weight of x
19. Mylne's abilities & knowledge, & not having the Least
20. Doubt of the Truth of his Evidence, found a Verdict for the Plaintiffs.

\Verdict: \_\_\_ set aside & *sd* [second] Trial granted/

21. This Verdict was afterwards set aside by the Court of
22. King's Bench, & a New Trial granted, in order to enable
23. the *Defts* [Defendants] to enquire into & ascertain the Truth or \_\_\_
24. Falsehood of Mylne's Testimony — and Lord Mansfield
25. in delivering the opinion of the Court, said, that if the
26. Bank was detrimental to the Harbour, it was a Nui=
27. =sance [Nuisance], and that was sufficient for the Point; and that in
28. such case the Commissioners were right in pursuing it
29. into that Court.

---

<sup>81</sup> Abbreviated form of “videlicet”; “that is to say; namely; to wit,” *OED*, “videlicet (adv.,” December 2024.

\Report of Engineers *et* [court] of buller [Buller] Jury/

30. The Report of the Engineers on both Sides were by x  
31. Agreement delivered to the Jury more than a week x  
32. before the second Trial. — The Engineers on the Part  
33. of the Commifioners having visited and spent some Time  
34. at Wells in making \_\_\_ measurement & calculations, and  
35. informing themselves of Facts & Circumstances, necefsary  
36. to guide them in their Judgment upon the matter in  
37. (Question

(57)

1. Question; by their Reports, declared their Opinion that the Decay of  
2. the Harbour was not owing to any external Cause, But was to be imputed  
3. to Embankments, and in a greater measure, if not wholly, to the \_\_\_  
4. Embankment in Question.  
5. Mr Mylne & Mr Smeaton in their Reports entered into a scien=  
6. =tific [scientific] Discufion of the Question; and imputed the Decay of the  
7. Harbour to certain latent and imperceptible operations of  
8. Nature, which (they said) had been destroying this Harbour  
9. for centuries past.

\\_\_\_ 2<sup>d</sup> [second] Trial & *Obsns* [Observations]/

10. Upon the second Trial it was proved, that the Ebb Tides from  
11. The River Humber & Lynn Channel, acted in quite contrary  
12. Directions, and not towards Wells Harbour, as Mr Mylne  
13. had sworn. — That there was no meeting of opposite Tides  
14. between Flamborough Head & \_\_\_, as Mr Mylne had sworn  
15. — That the Sea had not retreated, as Mr Mylne had sworn — and  
16. that Wells Harbour could not pofsibly have been affected by the  
17. causes afsigned upon Both by Mylne; who did not appear  
18. at the second Trial to repeat & support the Evidence which  
19. he had delivered at the first.  
20. The Commifioners then proved by a Variety of mariners and  
21. other witnefses, that the Bank in Question, had been detrimental  
22. to the Harbour, and the chief cause of its Decay; which was  
23. from the erection of the Bank in 1758; before which Time the

24. Navigation was good, & no Ships or Lives had ever been lost within the Harbour.

25. The *Plts* [Plaintiffs] then attempted to controvert several Facts proved

26. by the Commifioners with Regard to the Body and Force of

27. the Back water [backwater]; and offered Evidence to show that other

28. Harbours on the same Coast, of the same Nature, and subject

29. to the same winds, had undergone Similar Alterations to

30. those which has happened at Wells. — The counsel for the

31. Commifioners objected to this Kind of Evidence; insisting

32. that they could not pofsibly be prepared to enter into any

33. Proof concerning the State, or \the/ cause of the Decay of any

34. other Harbour then that of Wells; and the Judge, upon

35. being appealed to, sustained the Objection, declaring x

36. that such Evidence might lead to see Inquiries into the x

37. circumstances of other Harbours, and create<sup>82</sup> see different

38. Ifsues.

39. (at

(58)

1. At last appeared the great, the skillful, the celebrated, the omniscient

2. Mr Smeaton, with a View of giving his Opinion upon the Evidence

3. of the other witnesses, and of afsigning by his Opinion & Conjectures

4. other Causes of the Decay of the Harbour, Besides and exclusive

5. of the Cause proved by the Commifioners.

6. The Counsel for the Commifioners, knowing that the Jury had

7. been in Pofsefsion of \Mr/ Smeaton's Report for upwards of a week;

8. were desirous, if pofsible, to save them the Trouble of // –

9. hearing it repeated in court; and therefore (& for no other

10. Reason whatever) they endeavoured to shorten the

11. Trial (which had then lasted near two Days) by insisting

12. that, unleft Smeaton's Opinion was founded upon Facts —

13. within his own knowledge, he ought not to be permitted to

14. speak to were Matters of Opinion alone; and the Judge,

---

<sup>82</sup> Appears as though the scribe intended to replace the word “create” with “see” yet neglected to cross out “create.”

15. on being appealed to, sustained his Objection also;  
16. and considering the Question as a plain & simple Matter of  
17. Fact, and not imperceptible to, but capable of being investi=  
18. gated [investigated] and judged of by plain common Sense; refused to xx  
19. balance the speculative Doctrines, scientific Opinions, and  
20. visionary conjectures of \Mr/ Smeaton, against the direct and  
21. positive Evidence of Facts, proved by a variety of x –  
22. mariners and other witnesses; whose Experience and  
23. Observations had enabled them to point out the Injury  
24. done to the Harbour by the Bank in Question, without  
25. referring to those latent Operations of Nature, which  
26. actording [according] to the Reports of Mylne and Smeaton, were not  
27. perceptible to human Observation at the Time.  
28. When the Jury gave their Verdict, the Commifisioners enter {=}=  
29. =tained [entertained] some Hopes of an End to their Labours, and from  
30. some works began after the second Trial; they were  
31. induced to believe that the Plaintiffs themselves were  
32. Satisfied with the Decision. — However in the last  
33. Term, the *Plts* [Plaintiffs] applied for the Court of King’s Bench  
Application for 3<sup>rd</sup> Trial/  
34. (for

(59)

1. for a new Trial, not because they had been surprised with  
2. new Evidence on the Part of the Commifisioners, not because the  
3. Jury had given {...} a Verdict contrary to Justice; but for  
4. the two following Reasons; first, because the Judge who had  
5. tried the Cause had refused to admit Evidence of the Decay,  
6. and causes of the Decay of other Harbours on the Eastern  
7. Coast of Norfolk — secondly, because he refused to admit  
8. Smeaton to give his Opinion on the cause as a witness.  
[Scribe inserted distinct spacing between lines 8 and 9.]  
9. Inquiries being made whether there were any Embankments  
10. in the Harbours, concerning the Decay of which, the Plaintiffs,  
11. offered to give Evidence; the court of King’s Bench was informed

12. that the Harbours of Heacham, Brancaster, Burnham, Cley  
13. and Blakeney, were in the same Predicament with Wells;  
14. for that there were Embankments in each of them; and  
15. Lord Mansfield, in delivering the Opinion of the Court,  
16. declared; that if there were Harbours on the Eastern  
17. Coast without Embankment, Evidence of the State & decay  
18. of such Harbours was admifsible; but that, were there  
19. are Embankments, it was not admifsible, for in that case  
20. it would be Sitem quod Site resolvit.<sup>83</sup>  
21. Lord Mansfield, as to the other Objection, declared, that \_\_\_\_  
22. Smeaton ought to have been permitted to give his Opinion  
23. if founded on the Facts of the Cause; and therefore a New  
24. Trial was granted — But the Judge’s Report, containing  
25. a State of the Evidence, was not read in Court.  
26. The circumstance of a New Trial being granted, cannot  
27. alter the Merits of the Cause, nor the Nature or Import –  
28. of his Evidence, and the only Difference (as to the Merits)  
29. between the second & third Trials, consists in this; that  
30. the next Jury, will have the Trouble of hearing the  
31. Opinions of Smeaton and other Engineers ore tenus<sup>84</sup>  
32. in open Court, instead of reading & digesting their long  
33. Reports (as the last Jury did) in their Closets — what  
34. (Difference  
[End of transcription.]

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<sup>83</sup> See page following this transcription for a translation of *Sitem quod Site resolvit*.

<sup>84</sup> Trans: “By word of mouth; orally; without written statements”; *OED*, “ore tenus (adv.),” July 2023.

### Supplement on translating *Sitem quod Site resolvit*

The phrase “Sitem quod Site resolvit” is an allusion to a legalistic phrase from Horace’s *Satires* (2.3.103). The original phrase from Horace, “nil agit exemplum, litem quod lite resolvit,” translates to “an example which resolves a quarrel with a quarrel accomplishes nothing” or “an illustration that settles one dispute by means of another accomplishes nothing.”<sup>85</sup> When compared to Horace’s original phrase, “litem” and “lite” have been replaced with “Sitem” and “Site,” transforming the phrase “litem quod lite resolvit” into “Sitem quod Site resolvit.” The exact meaning of this transformation requires an analysis of both Latin and English wordplay.

Neither “sitem” nor “site” are grammatically correct Latin words; no word exists that declines like these. Similar words do exist, however, such as “sitis” (thirst). Yet “sitis” makes little sense in this context. As such, the only other option possible would be “situs,” meaning either “site” or “decay,” among other things. This would cohere with the nature of the case at hand. However, “situs” does not yield “sitem” or “site” in the accusative and ablative cases, respectively, but “situm” and “situ.”

This could be a simple grammatical error; yet we could also attribute this to a pun. Rather than an error, this is likely a deliberate play on words through the use of the English word “site” in reminiscence of its Latin etymological ancestor “situs.” The speaker jarringly quotes Horace with English words, drawing attention to the double Latin meanings. Indeed, the double meaning of the original term “lis,” which can mean not only “quarrel” but “lawsuit,” draws further attention to legal ‘doublespeak’ underlying this literary reference. Therefore, Mansfield’s ruling, as described here by *A.B.C* (anonymous court reporter loyal to the defense), included this themed pun which could be read as: “resolving the decay of the site (at Well’s Harbor) by inviting disputes at other ‘sites’ (harbors) in decay would accomplish nothing.”

Recalling that, in short, the position of the plaintiffs is that the decay of Wells Harbor is a natural phenomenon; whereas the defense argued that the plaintiffs’ embankments are the specific cause of the harbor’s decay. This allusion to Horace is logical: Mansfield is clarifying that while accepting the defense’s premise that the embankments are responsible for the decay of the similarly embanked harbors of Heachman, Bracaster, Burnham, Cley and Blakeney might help settle the issue at stake in *Folkes v. Chadd* it would open up the landowners at the other locations to similar suits, creating further quarrels which in turn would “accomplish nothing” or in other words be a *litem quod lite resolvit*.

Translation and Latin textual analysis generously provided by Angus Docherty, personal communication to the author, July 2, 2025.

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<sup>85</sup> Freudenburg, K. *Horace Satires Book II* (1976), *ad loc.*

(61)

1. Facts which appeared \to me and the *obsns* [observations] made by me/ upon View of Wells

2. Harbour \_\_\_ 27<sup>th</sup> & 28<sup>th</sup> June 1782 – *Ja S* [James Smyth]

3. That the Harbour is ancient, was formed & can

4. be preserved only by Tidal or Back waters [Backwaters] ~~xxx~~

5. not having any Rivers to scour the Channel.

6. That till the Erection of the Bank in 1758 the

7. Tidal waters overflowed a \Valley/ or the Tract of Law

8. Land called the Slade containing *abt* [about] 27 *a* [acres] — and

9. the Harbour's {account} (?) was then *abt* [about] 10 furlong

10. more West & in a Straight Direction to

11. the *Se of pli* [Sea Palling<sup>86</sup>] and the Channel was scoured

12. by the \Tidal waters from *E* [the]/ Slade and the Harbour could

13. ~~xxx~~ be entered with Safety & \_\_\_ \ \_\_\_ was/ Depth

14. of waters in *E* [the] Channel

15. That soon after Erection of the Bank

16. in 1758 the mouth of the Harbour began

17. to shift to *E* [the] East and has continued shifting

18. ever Since and is *abt* [about] 10 Furlongs more

19. East than the Entrance before 1758 and of

20. ~~xxx~~ very dangerous Entrance, and the Channel

21. is much Shallower by *Sedgmts* [Segments] of Sands & Sediments.

22. That the Tidal waters covering the Marshes

23. cant [can't] have \any or but/ little Effect to scour the Channel, ~~xxx~~ \after/

24. \greatest part/ expanding & ebbing off as Surface Water.

(62)

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<sup>86</sup> Village and civil parish in Norfolk; also spelled as Pawling and Pauling.

1. That the Sands rise on each Side the Slade form
2. ~~xxx xx x xxx~~ a Reservoir of *abt* [about] 67 *a* [acres] ~~fore (?) the~~
3. ~~Tidal water and the Sand rising greatly xxx xxx~~
4. and confines the \Tidal/ waters {...} in the Slade
5. {...} from washing or expanding over other Lands.
  
6. That the Tidal waters would ~~xxx all 5 Sluices in a~~
7. ~~year xxx~~ overflow the Slade and that
8. the {...} keep back till (?) half Ebb, or
9. the Surface water are ebbd off.
  
10. That the Tidal waters *wch* [which] covered the
11. Slade *wd* [would] return thro [through] the Space of *abt* [about] 38
12. Rods<sup>87</sup> ~~xxx~~ where the Bank was erected in
13. 1758 and be all {...} {...} discharged
14. by the Channel only
15. and that the Tidal waters thus confined &
16. \discharged/ must operate powerfully in scouring
17. and preserving the Channel & Harbour

Showers { *Wm* [William] Stoke *Gentm* [Gentlemen] – for Plaintiffs  
 Joseph Hodskinson for *Defts* [Defendants]

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<sup>87</sup>A unit of length used esp. for land, fences, walls, etc., varying locally but later standardized at 5 ½ yards, 16 ½ feet (approx. 5.03 meters); here used as “a unit of land area equal to a square rod...later standardized to 30 ¼ square yards,” *OED*, “rod (n.1), sense II.8.a. and b,” March 2025.

V. 1. Privately Commissioned Trial Transcript – Pages 73–74  
List of jury members and their verdict for the third and final trial  
at the Norfolk Summer Assizes in August of 1783.

(73)

1. The Special Jury on the Trial (3<sup>rd</sup> &

2. last) in August 1793

3. Viewers

1...1...*Thos* [Thomas] Lane of Barningham

2...2...Philip Bacon of Carbrook

3...3...Ralph Cauldwell of Hilborough

4...4...Henry *Willm* [William] Wilson of Didlington

5...5...*Edwd* [Edward] Billingsley of Hockwold cum Wilton

6...6...John Lloyd of Pentney

7...7...Henry Palmer Watts of Horstead

8...8...*Robt* [Robert] Barrett of the Same

9...9...Jonathan Warrell of Haynford [Hainford]

10..10...*Thos* [Thomas] Barlow of Attleborough

11..11...*Thos* [Thomas] Grigson Payne of Hardingham

12..12...*Thos* [Thomas] Woodward of Ditchingham

4. Verdict for the *Defendts* [Defendants]

5. The Jury all agree that the Continuance

6. of the Bank is some Degree of Injury to

7. the Harbour, but are not all agreed to its

8. being a material Injury, that it did

9. appear to the Jury, from the Evidence

(74)

1. that any legal Proceeding were

2. had within the Space of twenty years

3. from the Time of the Erection of the

4. Bank

5. Philip Bacon

6. Henry *Wm* [William] Wilson

7. Johnathan Warrell

8. *Thos* [Thomas] Grigson Payne

9. The only 4 —  
10. of the Jury, who —  
11. were for the Words  
12. scored under —  
13. but this was not  
14. endorsed on the  
15. Postea<sup>1</sup>

\M:/ (?)

16. On this Trial one of the Jury on the
17. Trial on this Cause in 1782, gave
18. Evidence from his minutes of the
19. Evidence then given by Mr Springold
20. who was a material witness
21. for the Defendants and died after

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<sup>88</sup> “The record of the trial proceedings and the verdict in a civil process,” *OED*, “postea (n.),” July 2023.

V. m. Privately Commissioned Trial Transcript – Pages 78–79  
George Hardige addressed Lord Mansfield during the final King’s Bench hearing.  
(78)

1. In the Kings [King’s] Bench
2. Folkes Bart; & *anor* [another] *agst* [against] Chad [Chadd] *Esqr* [Esquire] and others
  3. Notes taken in short hand [shorthand] of the arguments of Council
  4. delivered on 27<sup>th</sup> November 1783 on the *Defts* [Defendants] showing
  5. Cause why the last Verdict should not be entred [entered] for
  6. the *Plts* [Plaintiffs] or a Fourth Trial had.
7. Mr Hardinge, I am to show your Lordship Cause,
8. Mr [James] Mansfield<sup>89</sup> – My Lord – I understood that Mr Justice Ashurst
9. would have attended, when this Cause came on
10. Lord Mansfield<sup>90</sup> – No, he will not, He has made his Report,
11. Mr Mansfield – I know it was his Intention particularly – I do
12. not know what his opinion may be none – Your Lordship may
13. remember, I suggested Mr Justice Ashurst stated that the
14. Jury did not find the Verdict for the *Defts* [Defendants] {...} first;
15. Lord Mansfield – He has made his Report upon that, —
16. Mr Mansfield – I do not know whether his Recollection is the
17. same as at the Time of the Trial – I know the Associate
18. who was present at the Time and spoke with him upon the
19. Subject —
20. Lord Mansfield – If he means to come in, he will come in
21. before it is over,
22. \Mr Hardinge/
23. Mr Hardinge – My Lord, I have the Honour to attend your
24. Lordship as Counsel for the *Defts* [Defendants], I am to show your Lordship
25. Cause why the Verdict, which purports to be a Verdict for them,
26. should not be received in this Court, as a Verdict against them,
27. or at least why it should not be set aside — That is the only
28. point in Issue between the Parties before this Court —

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<sup>89</sup> Mr. Mansfield refers to Solicitor General James Mansfield. Born Manfield when attending university he changed his name to Mansfield; Michael T. Davis “Mansfield [formerly Manfield], Sir James,” *ODNB*, 2008

<sup>90</sup> George Hardinge’s address to Mansfield during the final King’s Bench hearing.

29. If I recollect the Argument urged by the Sollicitor [Solicitor] the other day  
30. it stands thus — That twenty years had run since the Bank  
31. was erected before any local Proceedings were had for the  
32. abatement of it — That this Circumstance of Fact and the  
33. Law attaching upon it, were Stated by the Sollicitor [Solicitor] at the Last  
34. Trial as constituting a Bar to the action, — That the Point  
35. was saved by the Judge (with the absent of the Court for

4.

(79)

1. the *Defts* [Defendants] for the opinion of this Court, upon which the fate of the  
2. Verdict was to depend, That if it is a Bar, it is so found a Bar, that  
3. your Lordships may act upon it here, and may mould [mold] and fashion  
4. the Verdict according to it — And the Sollicitor [Solicitor] General compared  
5. it to some Cases upon the Oxford and Western Circuit relative  
6. to the obstruction of a way — He concerned that those Cases bear  
7. strictly upon the Present — He added, that if it could ever be a Bar,  
8. it was particularly fit and it should so operate in the Case  
9. before us — if I am correct in stating the outline of his —  
10. Argument thus, I shall endeavour to point out what occurs to me  
11. against it, being to understood, —

12. In the first place, in Regard to the fact of Twenty years, I beg  
13. to make one Distinction before your Lordships — There is no  
14. such thing as Twenty years having run against those *Defts* [Defendants], and  
15. I am very glad to have an opportunity early in the Cause of  
16. saying it, because it strikes me that your Lordship and the Court  
17. upon the former Proceedings seems to have misunderstood that fact;  
18. For the Commisfioners of the Harbour, for whom I have the  
19. Honour to attend your Lordships, had nothing to do in this Concern  
20. till the year 1768, and therefore, as against them, with Submifsion  
21. to the Court, whatever the Import of the Bar may be, Ten years  
22. only have run —

23. My Lord, I will tell your Lordship as accurately as I can to the  
24. best of my Recollection, in what way this was Stated by the Sollicitor [Solicitor] as

25. a Bar — He argued for upwards of an Hour with great ability and  
26. great Zeal, not to the Judge, but to the Jury, that this ought to be  
27. considered by them as constituting such a Ground of Presumption  
28. against us, that it should not be believed by them to be a real Injury,  
29. because we had not complained of it, nor consequently seemed to  
30. feel it — Not a Syllable was said by the Sollicitor [Solicitor] about a Bar, till  
31. the Judge had some Doubt or was suming [summing] up the whole of the Cause,  
32. and then (Mr Justice Ashurst having been suddenly struck with the  
33. circumstance of Twenty Years) Then it was, after the Cause was —  
34. completely closed, and after the Sollicitor [Solicitor] General had addresssed the  
35. Jury upon the Subject, Then for the first Time the Sollicitor [Solicitor] General  
36. said, I think this so strong, your Lordship should tell the Jury they  
37. should not at all hazard *findg* [finding] for the *Defendts* [Defendants], because of its  
38. not being disputed in Twenty Years —

(120)

1. Upon this the *Plts* [Plaintiffs] (as they alledge in a Bill afterwards  
2. brought) made several applications to stay the proceedings by  
3. *Defts* [Defendants] to remove this Nuisance [Nuisance], but they go on — Upon which they  
4. file a Bill in Chancery which states, what I have now stated, but -  
5. more at Length; which is, that they threatened to destroy this Bank;  
6. Whereas “We are willing to try it either by Indictment or by any  
7. “Action they think fit, or the Court shall approve of” — Whether  
8. “we are entitled or Sir John Turner had not outright to make this  
9. “Erection and we to continue it, or whether they have any —  
10. “Right to complain of it, as a Nuisance [Nuisance]” — And praying an  
11. “Injunction upon this foundation (?) —” We are willing to have it hide  
12. “in an Indictment or any other way,” for it is complained of,  
13. “not as a private Nuisance [Nuisance], but as a Public Nuisance [Nuisance] to the  
14. “King and all his Liege Subjects, — This is the Nature of the  
15. Case —” We desire only that irreparable Mischief may not be,  
16. done to the Bank, till it is tried — That is the Ground in  
17. Equity, and the *Plts* [Plaintiffs] exprefsly offer to have it tried in an  
18. Indictment.

19. When it came on before the Court, the Court thought the  
20. method of Trial was better in the way that they direct —  
21. which is thus —

22. The *Plts* [Plaintiffs] were to bring an Action of Trespafs if the  
23. *Defts* [Defendants] had actually removed the Nuisance [Nuisance], and cut it down, and  
24. the *Defts* [Defendants] were to admit a Trespafs —Then that, put the Question  
25. upon the *Defts* [Defendants] to justify by showing that this was a Nuisance [Nuisance]  
26. — Such a Nuisance [Nuisance], which any of the Kings [King’s] Subjects had a Right  
27. to abate, for the Trespafs, was not justified, unlesf they could  
28. show that, — That was all, that was to be proved in that Action.

29. There is no Direction I should say in this to endorse the  
30. *Postea*<sup>91</sup>, because there was no Idea it would be material —

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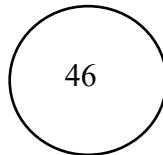
<sup>91</sup> “The record of the trial proceedings and the verdict in a civil process,” *OED*, “*postea* (n.),” July 2023.

30. for the only Question to be tried was the direct Question

31. “Nuisance abateable [Nuisance abatable] or no Nuisance abateable [Nuisance abatable]”

32. If Nuisance abateable [Nuisance abatable], the Defts [Defendants] were in the Right,  
33. if not, they were in the wrong —

34. But the *Plts* [Plaintiffs] applied to the Court that the *Defts* [Defendants] should  
35. be directed to justify in a Special Plea — The Court did not  
36. think proper to put them upon a Justification in a Special



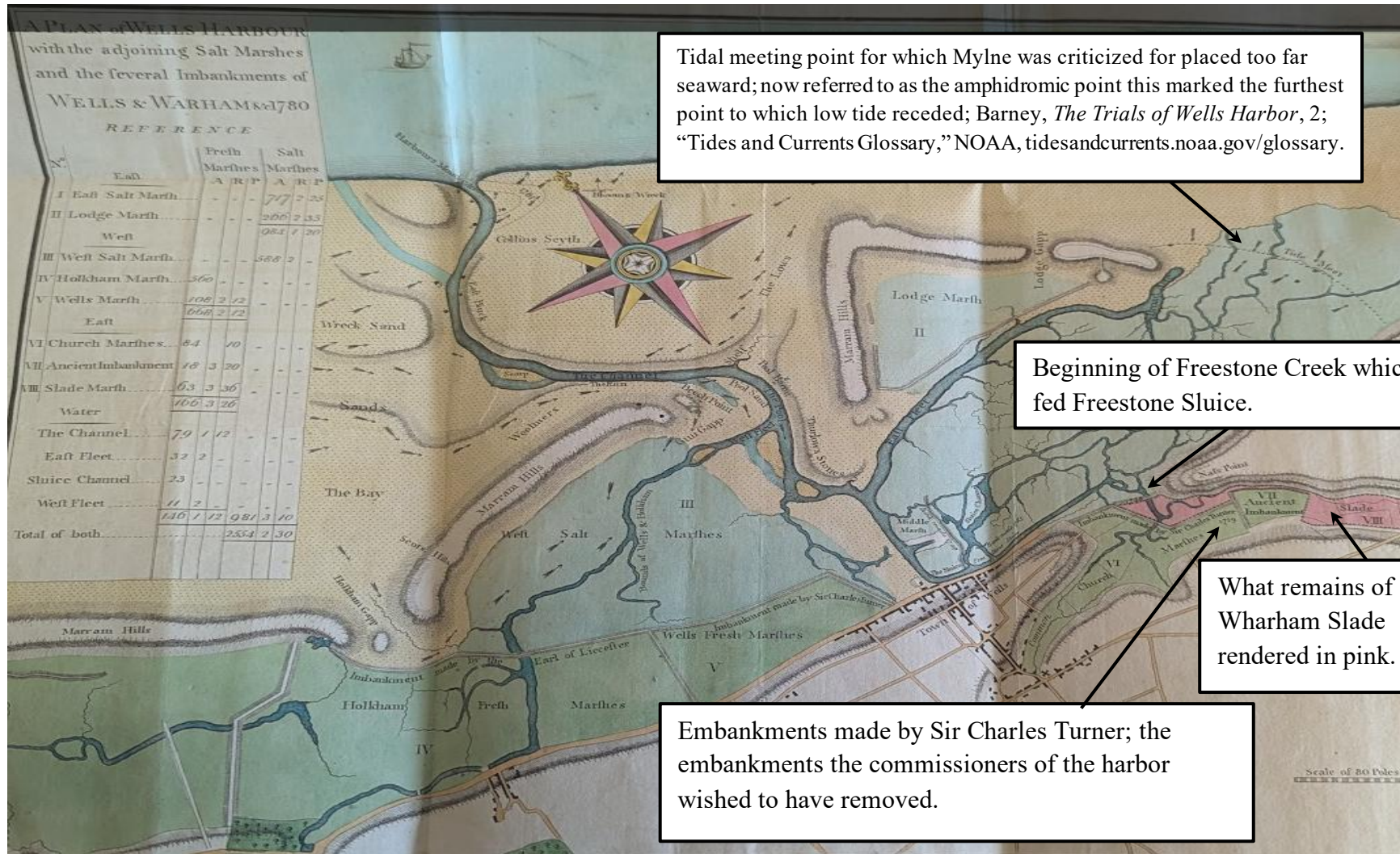
(121)

1. Pleas, but directed the Postea to be Endorsed – That is, if any
2. Benefit was to be got by any Thing [anything] special that arises out of the
3. Cause, or could arise upon a Speical Plea, it Should be endorsed
4. upon the Postea – Thus it went to Trial. –

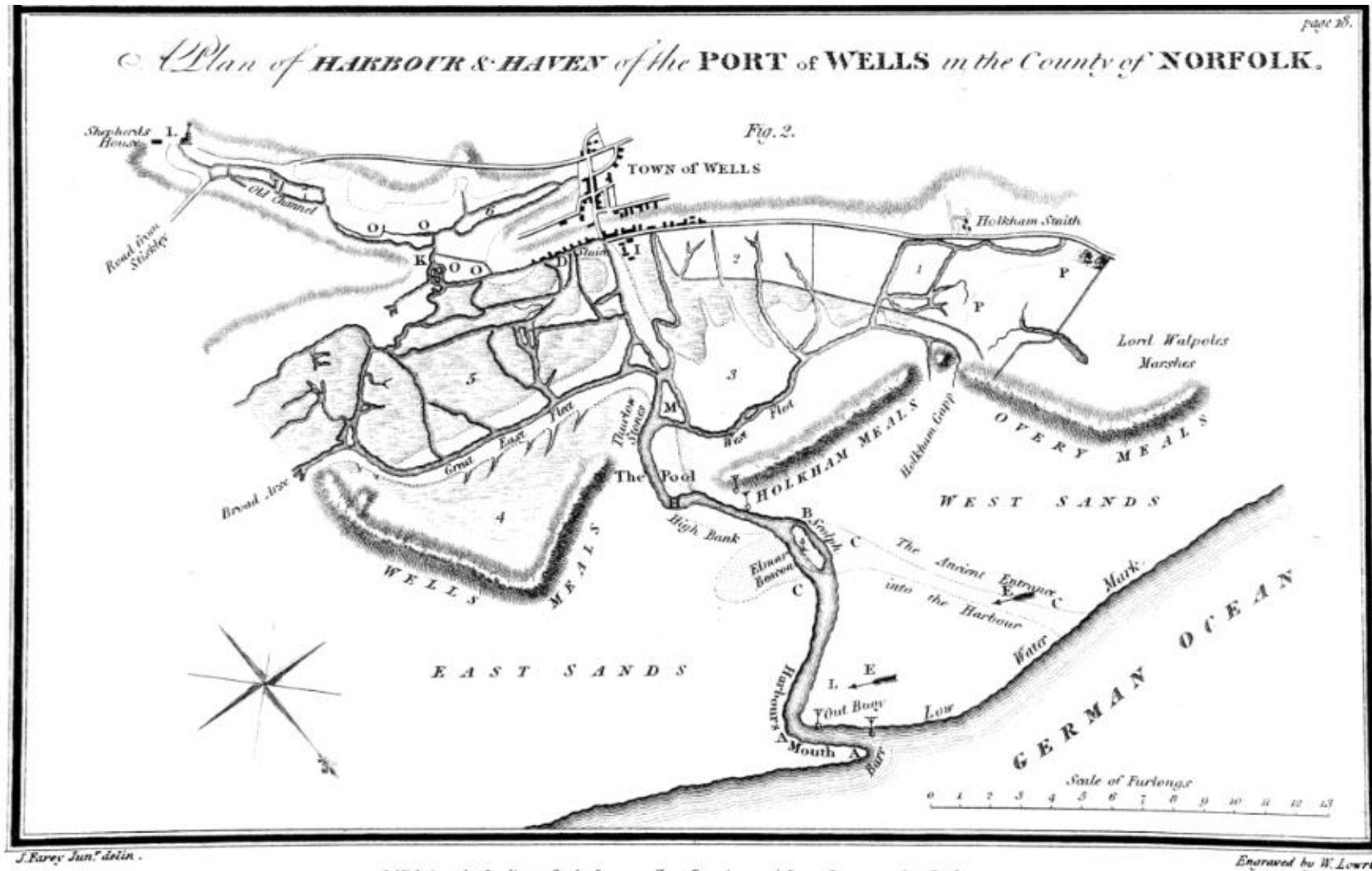
[End of transcription.]

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V. o. a. Robert Mylne's and Mr. Biederman's Map (1780); This map was produced by Robert Mylne's investigation on behalf of the inheritors of Lord Turner's land; MS 486, NRO.



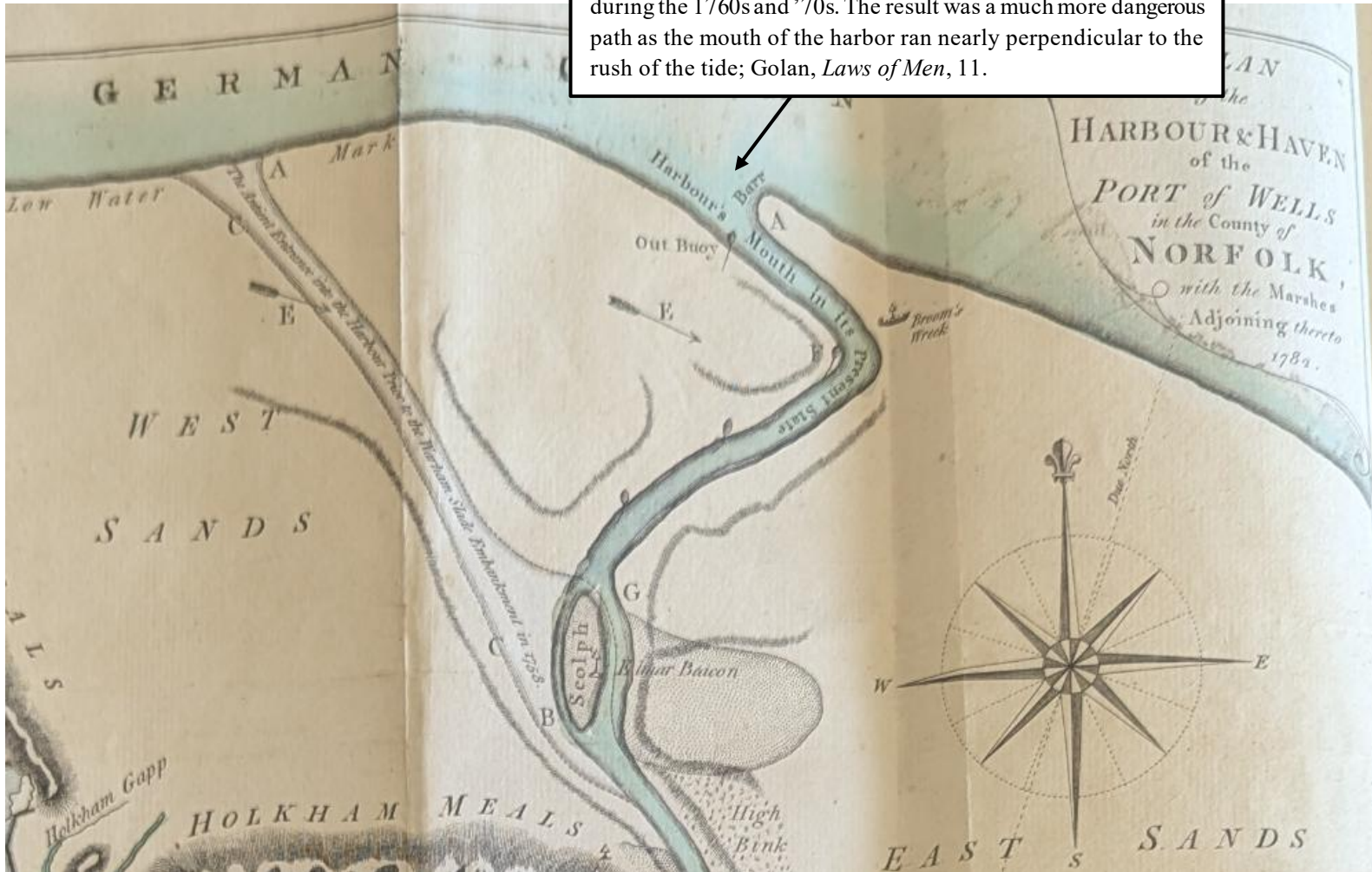
V. o. b. Print of John Smeaton's Map (1782); A Plan of the Port of Wells completed by Smeaton on behalf of the inheritors of Lord Turner's land; Smeaton, *Reports of the Late John Smeaton*, Vol. II (M. Taylor, 1837), plate XX.00IV.





V. o. d. Detail from Hodskinson's Map (1782)

Due to sediment build up the mouth of the harbor shifted eastward during the 1760s and '70s. The result was a much more dangerous path as the mouth of the harbor ran nearly perpendicular to the rush of the tide; Golan, *Laws of Men*, 11.



## Long Abstract

Under English common law, a jury weighs the veracity of courtroom testimony provided by a direct eyewitness. Following instructions from the judge on matters of law, the jury renders its verdict, which in practice is a confirmation or refutation of the statements of fact made by the witness. By the nineteenth century, the partisan expert witness was a well-accepted disruptor to the standard operating procedures of a trial. This was because the expert, specifically due to their skill, training, experience and study, was permitted to provide the jury not just descriptive facts but also their informed opinion. Moreover, the expert witness contrasted with the epistemic grounding that supported the theory behind the dependability of the eyewitness, as their informed speculations stretched beyond the direct observations rooted in sense perception, which constituted the generally accepted limitations of the lay witness.

The official standing of the expert witness by the common law courts is universally attributed to Lord Mansfield's 1782 ruling in the landmark case of *Folkes v. Chadd*. Here, Mansfield found that the jury should hear the testimony of civil engineer John Smeaton FRS regarding the decay of a harbor. Notably, Smeaton's report and testimony were deeply theoretical, as in his capacity as a natural philosopher, he posited that it was natural forces that shaped the harbor, forces invisible to the untrained eye. Mansfield, invoking the spirit of the Enlightenment, argued that it was only sensible that the most knowledgeable person on a given subject should provide the court with their insight; even if they were opinions, they were opinions worthy for the jury to consider.

By the mid-nineteenth century, the terms scientist and expert witness had entered widespread usage. Public debate swirled around the corrupting force of the expert witness, in effect, epistemic authority for hire, seemed to have on the legal system. It is for this reason that accounts of the expert witness from the early legalistic accounts of James B. Thayer and

John Henry Wigmore to the more recent and holistic surveys by Tal Golan and Jennifer L. Mnookin begin with *Folkes v. Chadd* before continuing into the nineteenth century. Indeed, as both Golan and Graeme Gooday argue, by the mid-nineteenth century, the very term expert witness and scientific witness had, in popular consciousness, coalesced into a pejorative. For what *Folkes v. Chadd* unintentionally ushered in by permitting the parties of the cases to source and bring forth their own experts was a system primed for exploitation. As such, the nineteenth century presents a rich and colorful arena in which to explore the trials and tribulations of the expert witness within the context of a robust and comparatively codified system of adversarial law. However, the conduct of Smeaton that Mansfield welcomed into the courtroom did not emerge spontaneously; rather, the preceding decades had laid the groundwork for the court's formal acceptance of the expert witness.

In this thesis, I re-examine the neglected eighteenth-century history of the expert witness. I argue that it was the common law court's hearing of patent disputes, which began in earnest in the early 1760s, that pressured the court to informally consider opinionated testimony by persons of skill.

The patent of the mid to late eighteenth century was a fourteen-year protection awarded to the inventor of an original invention, giving them the exclusive right to produce and thereby profit from their invention. Guaranteed by the 1624 Statute of Monopolies, the granting of a patent was administered by the Lord Chancellor and Privy Council in the name of the monarch. Formally referred to as a letter patent, it was legally a royal grant to hold a limited monopoly. By 1742, for a patent to be granted, the patentee was required to file a patent specification with the Chancery Office. The specification, which at the time ranged widely in terms of specificity, was a technical description of the invention being granted patent protection. Some early specifications were merely extended titles of an invention. Yet, by the mid-eighteenth century, most were descriptions of the methods used to construct the

invention. With no legislative intervention to the patent system from 1624 until 1835, the task of clarifying the many ambiguities in the law fell to the courts. This matter became only more urgent as the Industrial Revolution gathered speed and pattern-filing increased exponentially. Lord Mansfield, who remained England's highest common law judge from 1756 to 1788, proved highly receptive towards intellectual property rights and gradually clarified elements of patent law in a series of rulings during the 1760s and 1770s. In *Dollond v. Watkins and Smith* (1763), Mansfield found that merely being the original inventor was not enough to be granted the rights to a patent. Instead, the patent was rightly awarded to the first inventor to publicly disclose their invention or otherwise attempt to profit from it. In *Liardet v. Johnson* (1778), Mansfield found that for a patent to be valid, the associated patent specification must be generally instructive to the public and not falsely disclose information through an attempt to mislead future makers of the invention. To Mansfield, the reward of state protection and exclusive rights to an invention came with a trade-off: once the term of the patent expired, the whole of the realm must benefit from the invention; therefore, true disclosure of the invention was required.

A patent trial was a dispute between two or more trade professionals skilled in a particular craft or trade. As a result, the very persons who participated in patent disputes were experts in their given crafts and possessed more knowledge than either judge or jury regarding the technical minutiae of, for example, flint glass grinding. Initially, the court resisted attempts for explicit and extended opinionated testimony by persons of skill and focused solely on the legalistic and fact-oriented question of originality. This proved untenable as plaintiffs and defendants alike continued to object to specific elements of the invention during pretrial proceedings. The elevation of the specification as the grounds on which a patent would prevail or be voided only served to accelerate the involvement of the expert witness. In practice, the intelligibility of a specification was not self-evident; it

required the testimony of skilled trade professionals who would assure the jury that, in their opinion, any competent mechanic could easily interpret and construct the invention. Such testimony would soon be matched by the reciprocal claim made by the opposing side. In short, the disputed legality of a patent specification proved to be a moveable goalpost ripe for an increasingly adversarial and trial-oriented legal profession to make the most of, a process that was fully realized by the testimony of a friendly expert witness.

This thesis shows how patent law, and particularly the patent specification, led to the informal debut of the partisan expert witness. This parallel legal history to cases explicitly about the rules of evidence is placed in context alongside *Folkes v. Chadd*, drawing out a continuity in practice that Mansfield's ruling merely formalized. Additionally, utilizing trial transcripts, personal correspondence, notes taken by judges, and newspaper and pamphlet summaries, I focus on the specific practice and conduct of the early expert witness, finding that presentational skills, pretrial preparation, and the general reputation of the witness often proved to be more important than their command of the specific technical details pertinent to the trial. By the mid-1780s, as well-capitalized inventors such as Richard Arkwright and James Watt began to defend their patents through the courts, I show how the success of their efforts hinged on the effective mustering of expert witnesses. Drawing from their peers and friends at the Lunar Society and the Society for the Encouragement of Arts, they rapidly discovered that well-respected gentlemen of learning, such as Erasmus Darwin, Samuel Moore, or even James Watt himself, could be particularly persuasive to a jury. However, the trial and indeed the courtroom was an unpredictable place in which numerous agents, from judges and legal counsel to juries, all exerted varying degrees of control during the often-chaotic process of a trial. Jury members could interrupt both defense and plaintiff counsel to pose a question to the witness and judges might allow new evidence to be spontaneously presented to the court mid-trial. For example, with the testimony of Samuel Moore,

Arkwright learned firsthand that a jury could perceive a witness as too well-informed—an unrepresentative mechanical genius—whose judgment on the specification did not speak to the specification’s general intelligibility. The eighteenth-century expert witness, as they sought to win over the jury, proved to be a deeply theatrical and performative role. The exploration of this aspect of expert testimony is a major and novel undertaking of this thesis.

My project is the first extended historical investigation into the connection between patent law and the expert witness. Similarly, novel are my findings that the court’s growing focus on the patent specification primed the court to interact with expert testimony. A truly interdisciplinary work, I draw upon legal history, economic history, history of science, and social history, building upon existing work across disciplines that have not before been placed together in conversation. For example, neither H. I. Dutton’s, Christine MacLeod’s, nor Sean Bottomley’s landmark work on English patent law during the eighteenth century makes even a singular reference to the participation of the expert witness. Similarly, Golan’s monograph on the history of the expert witness in Anglo-American common law addresses eighteenth-century patent law in a single sentence. This, I contend, is an oversight that my thesis rectifies as I show the emergence and swift ascension of the expert witness, in all but name, in the late 1700s.

I accomplish this through five chapters beginning in 1763 with the first major patent law case heard by the King’s Bench under Lord Mansfield. This thesis concludes in the year 1800, which also marks the final rulings that settled the patent disputes of James Watt.

In Chapter 1, “Encountering the expert witness in pre-1782 patent law,” I trace the rise of the patent specification and its intertwined elevation to jurisprudential importance with the participation of the expert witness during patent trials. Additionally, I demonstrate the pressure the court received regarding the participation of the expert witness and its early hesitancy to consider such testimony during the patent trial of Peter Dollond in the 1760s. By

1778, with the trial of *Liardet v. Johnson*, specific objections to Johnson's specification proved too material to ignore, resulting in Mansfield welcoming the experimental evidence provided by a London-based chemist and lecturer, Bryan Higgins.

Chapter 2, "The Rapid Development and Persuasive Power of the Expert Witness in the Early Patent Trials of Richard Arkwright (1781-1785)" covers Arkwright's first two patent trials held in 1781 and 1785. In *Arkwright v. Mordaunt* (1781), it was not a matter of dispute that Charles Mordaunt had pirated Arkwright's invention. However, through a strategy devised by his counsel with input from subject matter experts, Mordaunt prevailed at trial as the defense successfully argued that Arkwright's patent must be voided as his specification was designed to mislead. Success at trial hung on the testimony of several experts, most notably Samuel Moore. Following this loss, no member of the Lunar Society would ever again appear before a judge in a patent dispute without a deep roster of expert witnesses. Implementing a creative strategy for his retrial, Arkwright hired Samuel Moore, who, in *Arkwright v. Nightingale* (1785), flipped his position, arguing to the jury that Arkwright's patent was certainly legible to any skilled mechanic. Resultantly, this chapter demonstrates how quickly expert witnesses had become an essential player in patent law disputes.

In Chapter 3, "The Emergence of the Civil Engineer as Partisan Expert Witness (1780-1784)," I turn from patent law to the most impactful contemporary development regarding the permissibility of the expert witness: *Folkes v. Chadd*. Rather than re-examine Mansfield's well-trodden ruling, I focus on the conduct of engineers, the trials themselves, and the local controversy and division the experts invited. I show how both the plaintiff and defendant came prepared to present expert testimony; however, the lead counsel for the defense, George Hardinge, chose a calculated strategy: not to call his own engineers to testify. Instead, he challenged the epistemic grounds upon which Smeaton's testimony rested.

This chapter, in addition to showing the continuity between patent law and civil disputes and the increasing role of the expert witness, also demonstrates the substantial impact the determinative adversarial structure that eighteenth-century common law had on ensuring the rapidity of the expert witness's emergence.

Chapter 4, "Examining the Practice, Conduct, and Theatrics of Established Courtroom Experts," is dedicated to a close study of the expert witness during Arkwright's final trial. Enabled by the rare survival of a full trial transcript, I show the precise exchanges and arguments made by the numerous experts called by both the prosecution and the defense. I argue that by 1785, what had emerged, most clearly to the legal profession and attentive patent holders, was the *expert* expert witness. The disruption typified by the uncontested testimony of Bryan Higgins in 1778 or Samuel Moore in 1781 was no longer possible, as both sides regularly appeared in court fully prepared to contest any authoritative claim made by the opposing side. What remained was the deeply imperfect science of perfecting the persuasive testimony of the expert witness.

This theme of the *expert* expert witness is continued in Chapter 5, "The Chaos of the Expert Witness at the Trial of Boulton and Watt," which covers the patent trials of James Watt during the final decade of the eighteenth century. Watt is a unique figure; in addition to being a patent holder and plaintiff, he had previously served as an expert witness during Arkwright's trials and possessed considerable self-studied knowledge on the English patent system. Watt's comprehensive expertise is matched by a deep cautiousness towards pursuing a trial. As such, this chapter explores the reasons for Watt's concerns regarding the validity of his 1769 specification and the extreme length and extensive pretrial preparation Watt and his son James Jr. underwent prior to *Boulton & Watt v. Hornblower and Maberley* (1796). Central to Watt's pretrial efforts was the elaborate courting of the ailing professor, John Robison, as a star expert witness. Decades earlier, Robison had assisted Watt during his

initial experiments which ultimately led to Watt's first patent for a series of improvements to the steam engine. Ultimately, Watt successfully convinced Robison to travel to London and testify. To Watt's great benefit, and the surprise of all, during the trial Robison took never-before-seen documents from his pocket and presented them to the jury, thereby introducing novel evidence.

Overall, the trial remained deeply unpredictable and, for all its procedural rules and air of formality, a place often governed by inertia and the personalities before it. It so happened that for the final four decades of the eighteenth century, the expert witness was another dominant personality that contested and complicated the authority, procedures, and very outcomes of the common law trial.

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