ENTREPRENEURSHIP AND TECHNOLOGICAL CHANGE: THE BIRMINGHAM AND DISTRICT CUT-NAIL TRADE, c. 1811-1913

by

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ABSTRACT

This thesis examines the evolution of the nineteenth-century Birmingham and district machine-cut nail trade through the lenses of entrepreneurship and technological change. Cut-nail manufacture was a small but economically-significant and technologically-advanced West Midlands industry, and yet it has been largely ignored by historians. The lack of academic record can, in part, be explained by the absence of a discrete business archive for the trade. This research, however, shows that there are substantial surviving records to enable an evaluative history to be written. Guided by its two main themes, on the one hand, and by product life-cycle theory, on the other, the thesis analyses the development of the West Midlands trade from its origins in the United States to its decline at the turn of the twentieth century caused by, among other things, competition from American producers. In doing so, it crosses the disciplinary boundaries of economic, business and social history, as well as venturing into the realms of print and material culture.

This thesis is dedicated to the memory of a true friend and mentor

DENNIS STAMPS

(1936 – 2015)

ACKNOWLEDGEMENTS

This thesis developed from my dissertation on the Birmingham cut-nail trade, which I completed in 2010 as part of the MA in West Midlands History course at the University of Birmingham. My interest in the trade had been stimulated by a chance conversation in 1999 with Dr Robert Colquhoun, formerly of Goldsmith's College, University of London, who was then researching the family of John Reynolds (1816-1880), a notable Birmingham cut-nail manufacturer.

Three people were most helpful in my search for records of the Reynolds business: Dayrell McArthur, Chief Executive of the McArthur Group; Keith Noronha, Managing Director of Reynolds Technology (UK) Ltd; and Dennis Stamps, Managing Director of John Reynolds & Sons (Birmingham) Ltd from 1976-1997. Dennis Stamps was an enthusiastic, exceptionally generous and knowledgeable guide through the intricacies of the cut-nail trade. Not only did he donate his private collection of United Cut Nail Trade Association records to me, but he also spent many hours fielding questions about the technical aspects of the trade.

I gratefully acknowledge the support of the staff at the State Library of New South Wales (Sydney), The National Archives, the British Library, the Staffordshire County Record Office, the Wolfson Centre for Archival Research at the Library of Birmingham, the Wolverhampton City Archives, the Dudley Archives and Local History Centre, the Cadbury Research Library (University of Birmingham), the Museum of English Rural Life (University of Reading), and the Modern Records Centre (University of Warwick). I am also indebted to Caroline Archer-Parré, Professor of Typography at Birmingham City University; and to Dr Roger Bruton, Dr Janet Sullivan and John Townley at the University of Birmingham. Christopher How, a doctoral researcher at the Université catholique de Louvain, Belgium, and independent researcher Susan Darby were liberal with their time and research findings. My thanks are also due to David Beattie for his meticulous proof-reading, and to my fellow doctoral researchers Elaine Mitchell and Susan Thomas for their enduring friendship and support.

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Guy Sjögren

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ABBREVIATIONS

ABG	*Aris's Birmingham Gazette*
BDG	*Birmingham Daily Gazette*
BDP	*Birmingham Daily Post*
BJ	*Birmingham Journal*
BL	The British Library
EHR	*Economic History Review*
I&MTA	*The Ironmonger and Metal Trades Advertiser*
LoB	Library of Birmingham
MERL	Museum of English Rural Life, University of Reading
NA	The National Archives
SCRO	Staffordshire County Record Office
SLNSW	State Library of New South Wales, Sydney, Australia
UCNTA	United Cut Nail Trade Association
UCNTA-AR	United Cut Nail Trade Association. Annual Report
UCNTA-MEC	United Cut Nail Trade Association. Minutes of Executive Committee Meetings
UCNTA-MGM	United Cut Nail Trade Association. Minutes of General Meetings
VCH Warwicks VII	*Victoria County History of England, Warwickshire* Vol. VII, Birmingham

The Birmingham and District Cut-nail Trade

A Chronology

Overseas		England
	1750	
1766 – Jacob Perkins born Newburyport MA		1769 – Joseph Ashton's first patent for cast nails 1772 – Completion of the Birmingham and Wolverhampton Canal
	1775	
1775-1883 – American War of Independence 1780 – Joseph Dyer born Stonnington Point MA		1781 – James Watt patents rotary motion 1789 – Birmingham and Fazeley Canal opened 1790 – First steam-powered rolling mill 1790 – William Finch's first patent
1792 – Start of French Revolutionary Wars 1795 – Perkins' first US patent		
	1800	
1809 – Non-Intercourse Act passed by US Congress		1803 – Booth Hodgett's patent 1808 – Willmore-Tonks patent 1810 – Dyer's first patent 1811 – Dyer settles in London
1812-1815 – Anglo-American War		1812 – Dyer's second patent 1814 – Dyer's third patent 1814 – Britannia Nail Works in Aston operational
1815 – Napoleonic Wars end		
	1825	
		1825 – A & J Salt's Phoenix Nail Co. established in Birmingham 1827 – Dyer's patents expire 1828 – Daniel Ledsam establishes cut-nail factory in Edmund Street, Birmingham 1837 – 1843 Commercial crisis 1847 – John Reynolds cut-nail business formed 1849 – Reynolds relocates to 209 Newtown Row, Aston
	1850	
1853-1856 – Crimean War		1850 (?) Crown Nail Co., Wolverhampton formed 1851 – Great Exhibition, London 1855 – Stamp duty on newspapers abolished 1861 – Duty on paper repealed 1862 – International Exhibition, London 1864 – Hadley Brothers open factory in Eyre Street, Birmingham
1855 – Exposition Universelle – Paris		
1867 – Exposition Universelle – Paris 1870-1871 – Franco-Prussian War		1866 – 1868 Economic recession 1868 – United Cut Nail Trade Association formed
	1875	
1879 – Sydney International Exhibition 1880 – Melbourne International Exhibition		1882 – United Cut Nail Trade Association dissolved
1883 – Calcutta International Exhibition		
1887 – Adelaide Jubilee Exhibition		1895 – Felix Hadley & Co, acquired by Kynoch's; Felix Hadley resigns
	1900	
		1903 – Danks, Walker & Co, Wolverhampton closes 1904 – Cut Nail Association formed 1907 – Samuel Webb bankrupt 1908 – Thomas Pritchard's Globe Works closes 1910 – Crown Nail Co. ceases nail production
1914 – Outbreak of First World War		
	1915	

CHAPTER 1

INTRODUCTION

1.1. Introduction

In 1873, the Commissioner of Patents noted that 'there is nothing more generally useful or more efficient in its universal application, than a nail'.[1] Whilst the functionality of nails cannot be disputed, they remain simple, drab and unappealing objects. Their appearance has altered little over time; they are rarely to be found in museums; and these insignificant metal objects have attracted little scholarly interest in the past. This is, perhaps, hardly surprising. What is rather more surprising, however, is the dearth of academic interest in the transformation of nail production during the eighteenth and nineteenth centuries and in the significance of the trade in these essential items of hardware. One notable exception was the historian W. H. B. Court who, in his study of industrialisation in the West Midlands, devoted two chapters to the regional nail trade arguing that

> It would be impossible to understand the industrial evolution of the district, without assigning to this apparently trivial and uninteresting occupation a high place as one of the factors making for change from the first large movements towards industrialisation in the seventeenth century, down to the decline and fall of the nail trade after 1830.[2]

Court recognised the contribution that the hand-made nail industry had made to the development of both the regional iron trade and the overall industrial infrastructure during the seventeenth and eighteenth centuries. He also pinpointed 1830 as a climacteric, after which, he said, the nail trade began to decline. Court, however, was only partly correct. The regional nail trade did not go into decline: only that element that had produced hand-made nails on the putting-out system since the

[1] Commissioner of Patents, *Patents for Inventions. Abridgements of Specifications Relating to Nails, Rivets, Bolts, Screws, Nuts and Washers, AD 1618-1866* (London: Eyre & Spottiswoode, 1873), p. xiii.
[2] W. H. B. Court, *The Rise of the Midland Industries, 1600-1838* (London: Oxford University Press [hereafter OUP], 1953), p. 100.

early seventeenth century began to wane, whereas the manufacture of machine-made nails, which had been slowly developing in Birmingham since 1811, began to take off after 1830.

Court's analysis of the West Midlands nail trade concluded in 1838 with an intimation of what lay ahead, namely a 'long […] and socially disastrous battle with the machine-cut nail trade'.[3] *The Times* was in no doubt about the outcome when, in 1852, it reported that the machine-cut nail trade had 'almost annihilated […] the wrought-nail trade'.[4] Of the protagonists in this battle, far greater attention has been paid to the losing side than to the 'winners'. When the third report of the Royal Commission on the Employment of Children (1862) was published in 1864, it listed the twelve 'most important' manufactures of [Birmingham] and district.[5] Included in the list were manufactures such as glass, guns and jewellery, buttons and brass, steel pens and screws; and it is these products that frequently appear in studies of nineteenth-century Birmingham and district industry.[6] They are also currently well represented in the city's museums: at Thinktank – Birmingham's science museum – and at specialist museums, of which the Museum of the Jewellery Quarter and the Pen Museum are examples.[7] Also included in the Commission's list were machine-cut nails. However, unlike the other eleven manufactures considered by contemporaries to be 'most important', machine-cut nails have singularly failed to attract the attention of both modern-day historians and museum curators. Such indifference may have arisen for several reasons: the intrinsically unappealing nature of nails; an under-estimation of the significance of the nail trade, particularly in the West Midlands; or, more likely, the apparent paucity of available documentary evidence.

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[3] Court, p. 215. See also Guy Sjögren, 'How David slew Goliath: the industrial and social impact of machinery on nail making in the West Midlands, 1760-1860' in Chris Wrigley (ed.), *Industrialisation and Society in Britain: Cromford and Beyond in the Era of the Industrial Revolution* (Cromford: The Arkwright Society, 2016), pp. 99-120.
[4] *The Time*s, 16 Aug 1852.
[5] 1864 (3414-1) Children's Employment Commission, 1862. Third Report of the Commissioners, with appendix [hereafter CEC 3 1864], p. 328.
[6] See, for example, Conrad Gill, *History of Birmingham*, vol. 1 (Oxford: OUP, 1952), pp. 292-295; Carl Chinn, *Birmingham: The Great Working City* (Birmingham: Birmingham City Council, 1994), pp. 5-45; Eric Hopkins, *Birmingham: The Making of the Second City, 1850-1939* (Stroud: Tempus, 2001), pp. 12-16 and 34-36; Andrew Lorenz, *GKN: The Making of a Business, 1759-2009* (Chichester: Wiley, 2009), pp. 50-53.
[7] See the websites of these museums at http://www.birminghammuseums.org.uk/thinktank, http://www.birminghammuseums.org.uk/jewellery, and https://penmuseum.org.uk (accessed 17 May 2018).

Seen through the lenses of entrepreneurship and technological change, the aim of this study is to examine the evolution of the Birmingham and district machine-cut nail trade during the nineteenth and early twentieth centuries with a view to establishing, firstly, how and why it rose to a position of industrial significance and, secondly, why it failed to retain that position by the outbreak of the First World War. In doing so, it has a threefold purpose: to assess the validity of including cut nails in the list of 'most important' manufactures; to extend the history of the West Midlands metal industries into hitherto uncharted territory; and to restore a balance to the previously one-sided accounts of the regional nail industry.

The study has two linked objectives. The first is to determine the extent to which technological change influenced the development of nail manufacture in Birmingham and the neighbouring hardware district between 1811 and 1913. To achieve this objective, several questions need to be answered. The first of these is a conceptual one: what is meant by 'technology' and 'technological change'? Answers to that will help to answer further questions. What was the state of nail-making technology at the start and the close of the period? What evidence is there that technological change occurred during the intervening years? What impact, if any, did technological change have on the organisation of the district's nail trade?

The second objective concerns the human activity underpinning the implementation of technological change, namely entrepreneurship. Entrepreneurship is both an intellectual and practical activity in that it concerns the perception of opportunity and the ability to act on that perception. Entrepreneurs are agents of change. In the first instance, entrepreneurs may have a vision of the future necessitating technological or organisational innovation. Alternatively, they may recognise the existence of an unfulfilled need or perceive a better way of doing something. Once an idea matures into possibility, human activity assumes a more practical and organisational character. Planning is required to transform ideas into action; resources need to be mobilised and organised, development must be monitored, and plans modified whenever necessary. Change, however, whether technological or organisational, is often shrouded in a fog of uncertainty and involves varying degrees of risk. Thus, the second objective of this study is to establish how and to

what extent entrepreneurship was influential in the evolution of the cut-nail trade in Birmingham and its hinterland during the nineteenth century. What was the nature of entrepreneurship in the nail trade? Did it remain constant throughout the period? Entrepreneurship is, however, more than an economic construct. This thesis will also examine entrepreneurship in its social and cultural contexts, where these can encourage or constrain entrepreneurial behaviour.

This study is about the cut-nail trade. At one level, the word 'trade' can refer to the occupation of a nail-maker, in so far as 'she was a nailer by trade'. At another level, it can refer to a business or an industry, and throughout this study the 'cut-nail trade' will be used synonymously with the cut-nail industry. A third meaning refers to the activities of buying and selling, and the word is used frequently here in the context of businesses acquiring raw materials and selling the finished products at home and overseas.

It is also necessary to define the duration of the period under discussion. To all intents and purposes, the beginning of the cut-nail trade in Britain was marked by the arrival in England in 1811 of Bostonian merchant Joseph Dyer who brought with him an American patent for a nail-making machine. As Chapter 4 explains, Dyer established a cut-nail factory on the banks of the Birmingham and Fazeley Canal and this business, the first of its kind in Britain, began trading in 1814. The reason for choosing 1913 as the end date for the study is rather more arbitrary. Although cut-nail production in this country continued until 2013 – when the last surviving manufacturer of cut nails, the Glasgow Steel Nail Company, relocated to Massachusetts[8] – the heyday of the West Midlands cut-nail trade was over by the outbreak of the First World War. Defining the geographical boundaries of this study is a less clear-cut exercise, as the analysis in the Literature Review indicates.

The remainder of this chapter is divided into four sections. Section 1.2 is a review of the historiography not only of the nail trade but of the two core concepts that underpin this study: technological change and entrepreneurship. There are very few academic studies of the nail trade,

[8] See the Glasgow Steel Nail Company's website at www.glasgowsteelnail.com (accessed 7 March 2018).

whilst those of the two concepts are extensive. A third concept – the product life-cycle – is introduced in Section 1.3. The purpose of this section is to explain how the product life-cycle model serves as a methodological framework for the chronological analysis of the cut-nail trade in Chapters 3 to 6 and Chapter 8. Lacking a body of secondary material upon which to base this study, it was necessary to adopt a forensic approach to the research. Section 1.4 is, therefore, a critical review of the primary sources used to inform this analysis. The concluding section provides an overview of the content and direction of the chapters that follow.

1.2. Literature Review

Before reviewing the historiography of the study's three main themes, the district within which the thesis is set requires some preliminary definition. At the outset, the geographical area covered by this study was to be the 'West Midlands'. It soon became clear, however, that this was too vague a description. In her study of the historical landscape of the West Midlands (2006), Della Hooke hinted at the difficulty of trying to define the region, declaring that it 'is not one around which simple hard boundaries can be drawn'.[9] Hooke's analysis was painted on a broad canvas, setting the banks of the River Mersey as the region's northern limits and the Forest of Dean as its southern extremity. When the magazine *History West Midlands* was first published in 2013 its geographical reach extended to the counties of Derbyshire, Herefordshire, Shropshire, Staffordshire, Warwickshire and Worcestershire. Marie Rowlands's *West Midlands from AD 1000* (1987), on the other hand, excluded four of these six counties, restricting her study to Staffordshire, Warwickshire and the post-1974 metropolitan county of the West Midlands.[10]

When Pat Hudson's contribution to the aggregatist/gradualist debate about historical approaches to industrialisation, *Regions and Industries,* was published in 1989, it included a further essay by Rowlands.[11] The subject was continuity and change in the West Midlands industries between 1500

[9] Della Hooke, *The West Midlands* (London: Collins, 2006), pp. 9-11.
[10] Marie B. Rowlands, *The West Midlands from AD 1000* (London: Longman, 1987), p. 1.
[11] Marie B. Rowlands, 'Continuity and change in an industrialising society: the case of the West Midlands industries' in Pat Hudson, *Regions and Industries* (Cambridge: Cambridge University Press [hereafter CUP], 1989), pp. 103-131.

and 1830 and was thus concerned with the West Midlands as an economic region. The boundaries of such regions are rarely, if ever, the same as those defined by administrative boundaries, and Rowlands restricted her study to what she referred to as 'the West Midlands manufacturing area': an area of roughly one hundred square miles of south Staffordshire, north Worcestershire and north-west Warwickshire.

The spatial delineations of Rowlands's 'manufacturing area' were not new: Samuel Timmins (1866) and G. C. Allen (1929) had made similar if not identical geographical demarcations. Timmins was not specific about the boundaries of his 'hardware district' but asserted that 'the hardware wants of the world are practically supplied' within a radius of thirty miles of Birmingham.[12] Allen was more precise and defined the area as enclosed by a line drawn from the north-eastern boundary of Birmingham to Walsall, Wolverhampton, south to Stourbridge, then east to Halesowen and north-east to Birmingham.[13] The Allen and Rowlands boundaries are very similar and are shown superimposed on the map at Figure 1.1. Since they also incorporate the geographical limits of this thesis, they define the 'district' in its title.

As the label 'Birmingham and district' was in common usage by the end of the eighteenth century,[14] its use here may seem rather archaic. Nevertheless, it encompasses both Birmingham and the Black Country: two districts which, according to Keith Gale, 'developed independently and accidentally collided while expanding'.[15] When combined, these two industrially different localities form a mini-region within the indeterminate West Midlands region. Figure 1.1 shows the approximate extent of the area covered by Birmingham and its district. The map also shows the area within which the hand-made nail trade operated from the seventeenth until the mid-nineteenth century, after which its focal point moved south to Bromsgrove. The cut-nail trade, however, was to be found along the

[12] Samuel Timmins (ed.), *The Resources, Products and Industrial History of Birmingham and the West Midland Hardware District: A Series of Reports* (London: Hardwicke, 1866), p. viii.
[13] G. C. Allen, *The Industrial Development of Birmingham and the Black Country 1860-1927* (London: Allen & Unwin, 1929; repr. Cass, 1966), pp. x and 3-4.
[14] Peter M. Jones, *Industrial Enlightenment: Science, Technology and Culture in Birmingham and the West Midlands 1760-1820* (Manchester: Manchester University Press [hereafter MUP], 2008), p. 22.
[15] W. K.V. Gale, *The Black Country Iron Industry* (London: Iron and Steel Institute, 1966), p. 23.

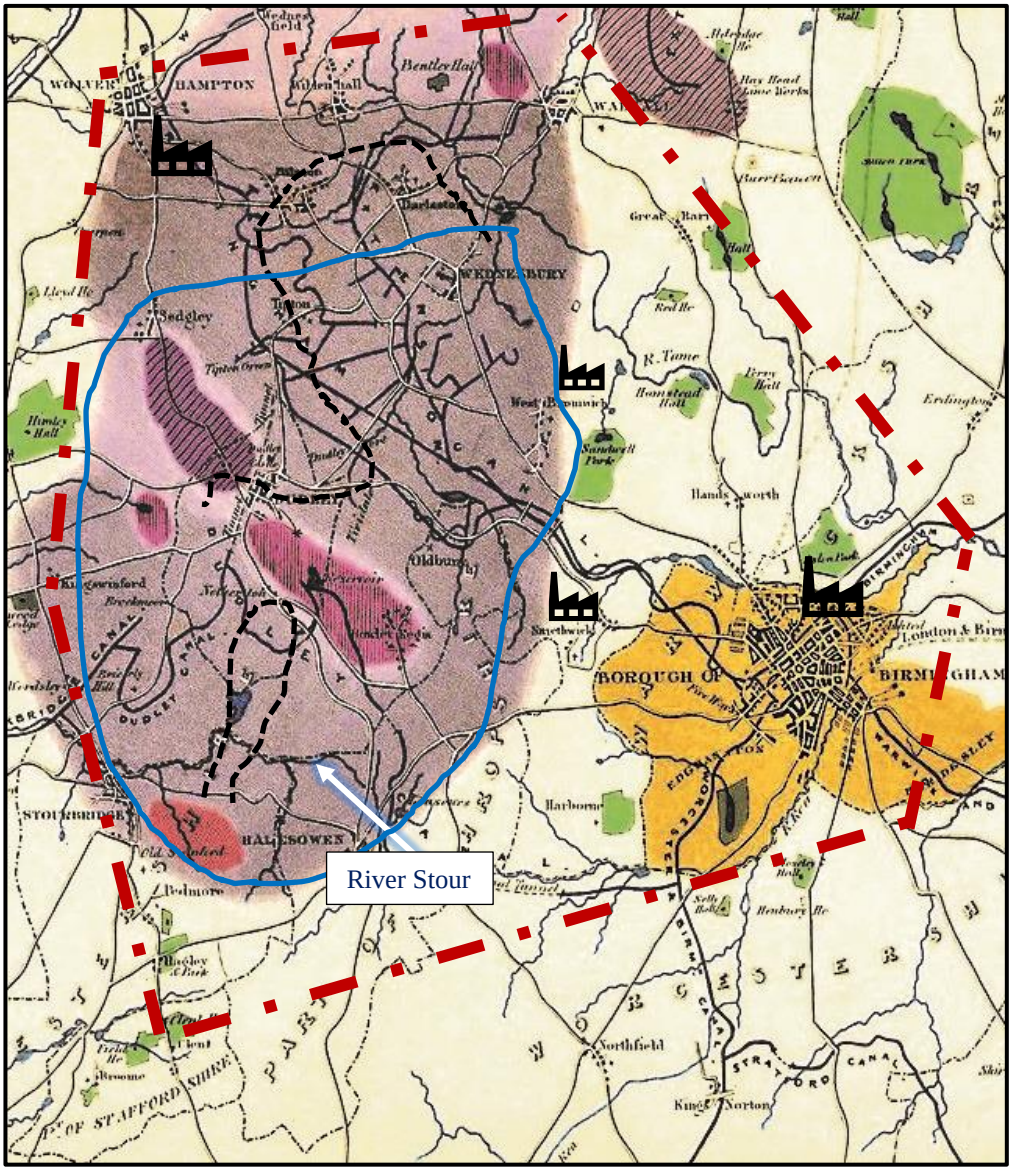


Figure 1.1. Birmingham and the Hardware District

Source: Radclyffe's Map of the Mining and Manufacturing Districts. Staffordshire and Worcestershire. 1836 (repr. Mapseeker Archive Publishing, 2013. Adapted by the author);
Marie B. Rowlands, *Masters and Men in the West Midland Metalware Trades before the Industrial Revolution* (Manchester: MUP, 1975), p. 4.

Birmingham-Wolverhampton axis, with the canal linking the two towns acting as the main industrial artery.

The concept of proto-industrialisation is introduced in Chapter 2 to help account for the commercial success of the Black Country hand-made nail trade.[16] It explains how the geographical reach of the trade was largely determined by the existence of a 10-yard seam of coal topped by iron-ore impregnated rock beneath its surface at the southern end of the south Staffordshire coalfield, the coal out-cropping in many places. The map at Figure 1.1 shows the nail-making district lying at the southern end of the south Shropshire coalfield, with Dudley at its hub. It also shows the River Stour, the banks of which were lined with forges and mills producing the nail-rod which fed the trade's voracious appetite. The siting of the cut-nail trade, on the other hand, was not dependent on an immediate proximity to raw materials.

Three factors differentiated the cut-nail trade from its long-established hand-made counterpart. First, the latter was largely a diffuse, rural industry, while the cut-nail trade was urban-based, concentrated in Birmingham and Wolverhampton, with smaller units in West Bromwich and Smethwick. Second, the factory-based cut-nail trade required a concentrated local supply of skilled and semi-skilled metal-workers, and these were to be found in the industrial towns. Third, whereas the hand-made trade had relied on road and river transport, the cut-nail trade benefited from the canal system, and later the railway, both for the transport of bulky input materials, such as coal and iron sheets, and for the distribution of finished nails to domestic markets and the ports. As Stobart and Raven have argued, towns were much more than concentrations of a group of production functions. Rather, they were dynamic agents in economic, social and cultural change, creating favourable conditions for investment and growth (Chapter 5).[17] Studying the growth of the cut-nail

[16] There is only one reference to the 'Black Country' in Timmins (see the index at p.712 and its use at p. 25), whereas the label had become common-place by the time that Allen's book was published in 1929. He simply describes it as 'that part of South Staffordshire and North Worcestershire which is known as the Black Country' (p. 3). Peter Jones notes that the label was first used in the 1840s (Jones, p. 22). This notwithstanding, 'Black Country' is used in the current study as a shorthand for this particular district.
[17] Jon Stobart and Neil Raven (eds), *Towns, Regions and Industries: Urban and Industrial Change in the Midlands, c. 1700-1840* (Manchester: MUP, 2005), p. 4.

trade is, however, hampered by a paucity of literature concerning the British nail industry in general and the cut-nail element in particular.

In his study of the American cut-nail trade, Amos Loveday made the point that 'historians have all but ignored the nail'.[18] This is also true of the British experience. Echoing Loveday's comment, British industrial historian Hugh Bodey claimed that 'the history of nail making has never attracted much interest in the past'.[19] The main problem for historians is that, as D. E. C. Eversley observed, 'of the nail trade itself, we have few records'.[20] The West Midlands hand-made nail trade was organised on the putting-out system and employed what one nail-ironmonger described in 1842 as 'a dilatory, idle, and ill-disposed sort of people': hardly the compilers of memoirs.[21] Nail-ironmongers – who, according to Court, lacked an 'agility of mind' – also appear to have been reluctant to retain (and archive) their business records.[22]

Drawing upon his doctoral thesis, Loveday's *Rise and Decline of the American Cut Nail Industry* was published in 1983. Whilst the title of the book suggests a nation-wide study, its geographical reach is limited to the cut-nail manufacturing district around the West Virginia town of Wheeling on the Ohio River. A further limitation is, as one reviewer noted, that it is confined to the internal evolution of the industry and is not related to the wider context of American economic and business history of the nineteenth century.[23] Nevertheless, the study remains the sole academic account of the cut-nail trade on either side of the Atlantic.

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[18] Amos J. Loveday Jnr, *The Rise and Decline of the American Cut Nail Industry* (Westport, CT: Greenwood, 1983), p. 3.
[19] Hugh Bodey, *Nailmaking* (Botley: Shire, 2008), p. 7.
[20] D. E. C. Eversley, 'Industry and Trade, 1500-1880' in W. B. Stephens (ed.), *The Victoria County History for Warwickshire, vol. VII, City of Birmingham* (London: OUP, 1964) [hereafter *VCH Warwicks VII*], pp. 81-139 at p. 87. This remains the case. In an emailed response to the author's enquiry about the Centre's holding of records of the cut-nail trade (dated 9 May 2016), the Modern Records Centre, University of Warwick explained that it held 'very little material for the nail industry in general'. It held no records of the cut-nail trade.
[21] Parliamentary Papers [hereafter PP]. 1842 (417) Report from the Select Committee on the Payment of Wages, p. 56.
[22] Court, p. 196.
[23] Jeremy Atack's review of Loveday in *Journal of Economic History*, vol. 44 (4), December 1984, pp 1118-1119 at p. 1118.

Another of Loveday's reviewers referred to cut-nail manufacture as an 'important industry' and this hints at a far greater interest in nails and nail-making in the United States, where their appeal is rooted in the history of the American construction industry, than in Britain.[24] Ever since the arrival of the earliest settlers, timber was a prime building material and nails were an essential means of securing wooden structures. As Scott Kreilick's 27-page annotated bibliography 'The Ubiquitous Nail' (1999) indicated, nails are of interest to several branches of historical enquiry, particularly those studying the history of building technology and those who use nails as a means of dating old buildings.[25] Outside America, Christopher How, a retired Australian structural engineer, has written several articles on American, British and French nails for the Construction History Society.[26]

The British nail trade has not been so well served by academic historians. Two University of Birmingham theses have been written about the Birmingham and district nail trade. Both were produced before 1934 and both dealt with the hand-made nail trade.[27] As with Court's *Midland Industries* and Peter Jones' 2008 study of industrial enlightenment in Birmingham and the West Midlands, both theses stopped short of the technological transformation of the trade after 1830. When R. H. Sherard published his *White Slaves of England* (1897), he quoted a Bromsgrove nailer describing his occupation as 'one of the disgracefullest of trades', [28] and it is the history of the hand-made nail trade in the Black Country and in the Bromsgrove area that has captured the imagination

[24] See Gary L. Browne's review of Loveday in *American Historical Review*, vol. 89 (5), 1984, pp. 1399-1400; Loveday, p. xiv.
[25] T. Scott Kreilick, 'The ubiquitous nail: an annotated bibliography' (1999). thttp://www.cr.nps.gov/history/online_books/nail/bibliography.pdf (accessed 7 August 2017); and see, for example, Lee H. Nelson, 'Nail chronology as an aid to dating old buildings', American Association for State and Local History, Technical Leaflet 48, Nov 1968; Maureen. K. Phillips**,** '"Mechanic geniuses and duckies", a revision of New England's Cut Nail Chronology before1820', *Association for Preservation, Technology Bulletin*, vol. 25, (3/4), 1993, pp. 4-16 ; William H. Adams, 'Machine-cut nails and wire nails: American production and use for dating nineteenth-century and early-twentieth-century sites', *Historical Archaeology*, vol. 36 (4), 2002, pp. 66-88.
[26] See, for example, Christopher How, 'An historical look at English roofing nails', *The Construction Historian*, Issue 1, August 2016, pp. 52-61.
[27] K. Henn, 'The Hand-made Nail Trade of Dudley and District' (Unpublished M.Comm. thesis, University of Birmingham, 1927); E. I. Davies, 'The Hand-made Nail Trade of Birmingham and District' (Unpublished M.Comm. thesis: University of Birmingham, 1933).
[28] Robert Harborough Sherard, *The White Slaves of England* (London: Bowden, 1897), p. 98. Sherard also relates that a former secretary of the Nailmakers' Union referred to nailmaking as 'one of the worst trades in the Kingdom'.

of social and local historians rather than that of the economic historian.[29] An exception is Eric Hopkins' 1977 article on the decline of the family unit in Black Country nailing, which examines the impact of factory nail-production on Stourbridge nailing families in the mid-nineteenth century.[30]

In her 2014 doctoral thesis on the impact of industrialisation on the Black Country town of Oldbury, Janet Sullivan identified two strands of literature relating to the history of the district. The first was what she referred to as the 'overview' approach, consisting of factual and descriptive accounts of events, people and local traditions: literature that lacked referenced source material.[31] Arthur Willetts' booklet *The Black Country Nail Trade* (1987) and Norman Jones' *Among the Nailers* (1990) are both examples of brief, factual accounts of the hand-made nail trade.[32] Sullivan's second approach comprised works focusing on the social conditions of the Black Country. Bill Kings and Margaret Cooper's *Glory Gone* (1989) is a history of nail-making in Bromsgrove, whilst Michael Hall's *In Cramped and Sooty Caverns* (2014) draws on the novels of Francis Brett Young (1884-1954) as a way of examining nail-making in the Black Country.[33] Although both books are well-researched and referenced social histories of the hand-made nail trade, neither falls into the category of academic works. Writing in *The Birmingham Historian* in 1988, Stephen Price observed that 'the full history of nail making in Birmingham has still to be written'.[34] Indeed, not only is the story of nail making in Birmingham and district incomplete but also nothing comparable to Loveday's treatise on the American cut-nail trade has been published about its British counterpart. This thesis goes some way towards redressing the balance.

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[29] See, for example, Alan Williams and Leonard G. Day, 'The Nailmakers of Northfield', Northfield Conservation Group Occasional Papers, No. 7, 1976; Stuart Davies, 'The nailmakers of Harborne' and Stephen Price, 'The nailmakers' workshops of Birmingham', *Birmingham Historian*, Spring 1988, both at http://www.bdlha.org (accessed 4 August 2009).
[30] Eric Hopkins, 'The decline of the family working unit in Black Country nailing', *International Review of Social History*, vol. 22 (2), 1977, pp.184-197.
[31] Janet Sullivan, 'Paying the Price for Industrialisation: the Experience of a Black Country Town, Oldbury, in the Eighteenth and Nineteenth Centuries' (Unpublished PhD Thesis: University of Birmingham, 2014), pp. 9-11.
[32] Arthur Willetts, *The Black Country Nail Trade* (Dudley: Dudley Libraries, 1987); Norman H. Jones, *Among the Nailers* (Halesowen: Halesowen History Society, 1990).
[33] Bill Kings and Margaret Cooper, *Glory Gone: the Story of Nailing in Bromsgrove* (Bromsgrove: Halfshire, 1989); Michael Hall, *In Cramped and Sooty Caverns* (Kingswinford: Black Country Society, 2014).
[34] Price, ibid.

Referring to his research, Loveday pointed out that 'information on the [cut-nail trade] is confined to sources in which nail-making was strictly incidental'.[35] The same is true of the British experience, requiring researchers to consult texts dealing with topics of a broader nature. One example is Allen's *Industrial Development of Birmingham and the Black Country 1860-1927* (1929). Its coverage is wide-ranging and provides a peerless analysis of the technological and organisational changes that occurred in the district during periods of economic prosperity and recession. Allen also examines the factors influencing the rise and decline of the cut-nail trade and compares them with those affecting other fastener trades, such as screws, nuts and bolts, and locks. Clive Behagg noted that Allen's study 'drew heavily' on Timmins' 1866 work.[36] This may be so as far as Part 1 of Allen's study is concerned but cannot be a valid criticism for a work that extended more than half a century beyond that covered by Timmins. No serious historical study of Black Country industry has succeeded Allen's book, and, in Andrew Popp's opinion, it remains the 'still unsurpassed industrial history of the Birmingham and Black Country district'.[37]

Gale's account of the development of industrial technology in the Black Country between 1700 and 1900 made no reference to the cut-nail trade, even though in the second half of the nineteenth century there were at least four large cut-nail factories operating in Wolverhampton.[38] Hopkins too ignored the nail trade in his two-volume history of Birmingham (c.1750-1939); and whilst Victor Skipp's account of Victorian Birmingham (1983) acknowledged the place of the cut-nail trade among the new industries that developed between 1830 and 1870, it made no further reference to it.[39] More recently, in his overview of Birmingham's industrial development between 1700 and

[35] Loveday, p. 4.
[36] Clive Behagg, *Politics and Production in the Early Nineteenth Century* (London: Routledge, 1990), p. 24.
[37] Andrew Popp, 'Building the market: John Shaw of Wolverhampton and commercial travelling in early nineteenth-century England', *Business History*, vol. 49 (3), May 2007, pp. 321-347 at p.322. Note that Malcolm Dick, David J. Eveleigh and Janet Sullivan (eds), *The Black Country: A History in 100 Objects* (Alcester: History West Midlands, 2019) had not been published before completion of this thesis.
[38] W. K. V. Gale, 'Development of industrial technology in the Black Country 1700-1900', in M. J. Wise (ed.), *Birmingham and its Regional Setting: A scientific survey; prepared for the meeting held in Birmingham, 30th August-6th September 1950* (Birmingham: British Association for the Advancement of Science, 1950), pp. 193-210.
[39] Eric Hopkins, *The Rise of the Manufacturing Town: Birmingham and the Industrial Revolution* (Stroud: Sutton, 1998); Eric Hopkins, *Birmingham: The Making of the Second City 1850-1939* (Stroud: Sutton, 2001);

1945, Malcolm Dick observed how few analytical studies have been made of Birmingham's metal trades during the Industrial Revolution and beyond.[40] With the exception of Allen, secondary sources are of limited value in piecing together a picture of the Birmingham cut-nail trade. Unlike the limited historiography of the nail trade, however, those of entrepreneurship and technological change are ever-burgeoning ones; and attention now turns to the historiography of these two concepts.

Early in their book, *Innovation, Entrepreneurship and Technological Change* (2007), Albert Link and Donald Siegel stressed that their title was not intended to suggest a linear connection between the three concepts but rather their interrelatedness over time.[41] Maxine Berg also referred to this interdependence, albeit in an historical context, when she described eighteenth-century Birmingham as 'a creative and inventive city; a place where inventors came to find the skills and tools to develop prototypes, and entrepreneurs came to invest in their projects'.[42] Like Link and Siegel, Berg made the connection between technological change and entrepreneurship. Unlike them, however, she made the implicit assumption that innovation bridged the two concepts rather than being a separate one. She referred to the process of technological change – in which both invention and innovation played such a crucial role – and to the entrepreneurs who facilitated the innovation and diffusion of new technology. Building upon Berg's description of Birmingham, there follows, firstly, an examination of the notion of technological change as it relates to the evolution of the cut-nail trade and, secondly, an analysis of the concept of the entrepreneur and entrepreneurship. It was human endeavour that not only underpinned the inception, development and organisation of the cut-nail trade but also created the crucial technological base upon which it was founded.

Victor Skipp, *The Making of Victorian Birmingham* (Birmingham: Skipp, 1983). Skipp's only reference to the cut-nail trade appeared on p. 38. There he listed nine of 'the more important' new industries, including the cut-nail trade.

[40] Malcolm Dick, 'The city of a thousand trades, 1700-1945' in Carl Chinn and Malcolm Dick (eds), *Birmingham. The Workshop of the World* (Liverpool: Liverpool University Press, 2016), pp. 125-158 at p. 126.

[41] Albert N. Link and Donald S. Siegel, *Innovation, Entrepreneurship and Technological Change* (Oxford: OUP, 2007), p. 2.

[42] Maxine Berg, 'The genesis of 'useful knowledge'', *History of Science,* vol. 45 (2), June 2007, pp. 123-133 at p. 130.

In its narrowest sense, technology consists of manufactured objects, the purpose of which is either to enhance human capabilities or to enable humans to perform tasks they could not otherwise perform.[43] Hand-held hammers were used by Hittite craftsmen around 1400 BC to forge weapons from heated blooms of iron, just as they enabled nineteenth-century ship-builders to secure decking planks with six-inch deck spikes. Technology, however, is much more than simple hardware.

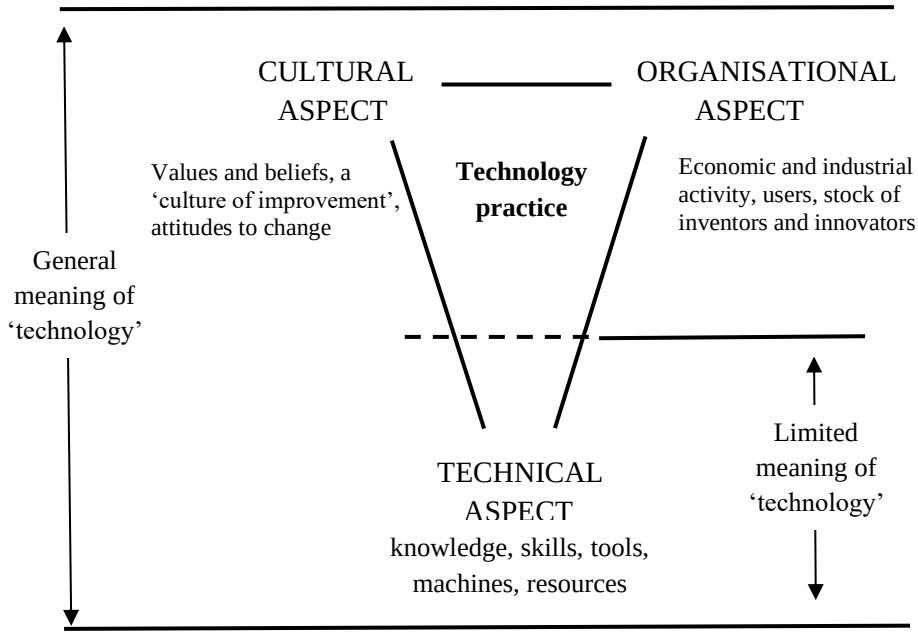


Figure 1.2. Diagrammatic definitions of 'technology' and 'technology practice'

Source: Adapted by the author from Arnold Pacey, *The Culture of Technology* (Cambridge MA: MIT Press, 1996) p. 6.

Arnold Pacey expanded the definition of technology to one he referred to as 'technology practice' (Figure 1.2). This he defined as 'the application of scientific and other knowledge in practical tasks by ordered systems that involve people and organisations, living things and machines'.[44] The hardware needs to be invented, designed and produced: processes that require human skill and human knowledge – both codified and tacit – as well as inputs of labour, energy and raw materials. Ultimately, argued Arnulf Grübler, institutions, social norms and attitudes determine how particular artefacts and combinations of artefacts originate, which ones are rejected, and which become

[43] Arnulf Grübler, *Technology and Global Change* (Cambridge: CUP, 1998), p. 21.
[44] Arnold Pacey, *The Culture of Technology* (Cambridge, Mass: MIT Press, 1983), p. 6.

successful.[45] In short, technology cannot be separated from the economic and social context from which it evolves.

As Chapter 3 explains, the roots of the Birmingham and district cut-nail trade were to be found in the United States, where a rapidly expanding population and economy led to an increasing demand for nails. When Joseph Dyer brought American patents for cut-nail machinery to England,[46] Birmingham offered him the appropriate entrepreneurial 'atmosphere', institutions and knowledge base in which to introduce innovative technology. Birmingham was, as the contemporary historian William Hutton remarked, a town where 'invention is ever at work'.[47]

Variations in any of Pacey's three 'aspects' have the potential to lead to technological change which, owing to the positive nature of change in this context, is also referred to as 'technological progress' and 'improvement'.[48] As Deirdre McCloskey famously observed: 'The Industrial Revolution was neither the age of steam, nor the age of cotton, nor the age of iron. It was the age of improvement'.[49] Contrary to the view of 'the great bulk of economists' who, according to Nathan Rosenberg, have treated technological change as if it were solely cost-reducing in nature, both he and Mokyr emphasised both the quantitative and qualitative effects of technological progress that enable either the production of a given output with fewer resources or the production of new or better products.[50]

Given the range and complexity of the variables identified by Pacey which affect the direction and rate of technological change, it is not surprising that it is an uncertain, dynamic and cumulative process.[51] Technological change occurs continuously yet in a highly unpredictable fashion,

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[45] Grübler, p. 20; and see Christine MacLeod, 'The springs of invention and British industrialisation', *Research Findings in Economic and Social History*, 20, Spring 1995, p. 1.
[46] See Chapter 4 for a full account of this instance of technology transfer.
[47] William Hutton, *The History of Birmingham*, 4th edn (London: Nichols, 1819), p. 102
[48] Joel Mokyr's book *The Lever of Riches* (Oxford: OUP, 1990) is subtitled 'Technological creativity and economic progress', whilst Robert Friedel's study of 'technology and the western millennium' is entitled *A Culture of Improvement* (Cambridge Mass: MIT Press, 2007).
[49] Deirdre McCloskey, 'The Industrial Revolution: A Survey' in Roderick Floud and Donald McCloskey (eds), *The Economic History of Britain Since 1700, vol. 1* (Cambridge: CUP, 1981), pp. 103-127 at p. 118.
[50] Nathan Rosenberg, *Inside the Black Box: Technology and Economics* (Cambridge: CUP, 1982), pp. 3-4; Mokyr, *Lever*, p. 6.
[51] Grübler, p. 21.

governed by the supply of what Mokyr referred to as macro- and micro-inventions and by the need to replace capital stock.[52] It is also 'path-dependent', meaning that technological change depends primarily on its own past. It is thus the result of 'technological drift': the continuous accumulation of incremental, almost imperceptible, changes brought about by a large number of anonymous people.[53] In his *Industrial Biography* (1863), Samuel Smiles quoted Robert Stephenson's comments on the development of the locomotive: 'It has not been the invention of any one man, but of a race of mechanical engineers.'[54]

Invention is just one in a sequence of stages of technological change that flow from idea to adoption: distinct stages defined by Schumpeter as invention, innovation and diffusion. Although the linearity of this model has been a source of debate since the 1960s, a comprehensive review of the debate concluded that efforts to modify or replace the model have had limited impact.[55] Therefore, in the absence of a more suitable model, it is used as a framework for this discussion.

According to Gerhard Rosegger, an invention is 'the first demonstration of the principal, physical feasibility of a proposed new solution'.[56] At the conceptual stage, however, an invention is no more than an *idea* for a new product or process of production. It is merely an addition to society's stock of knowledge and has no intrinsic economic or social significance. An invention assumes significance only through its practical application and tentative economic exploitation, namely innovation.[57] The inventive and innovative stages of technological change, however, should not be seen in isolation. The premise of Mokyr's *Lever of Riches* is that, in a technologically creative society, invention and innovation are complements: without invention, innovation eventually slows down and grinds to a halt, whilst without innovation, inventors will lack focus and have little

[52] Mokyr, *Lever*, p. 152.
[53] Ibid, p. 12.
[54] Samuel Smiles, *Industrial Biography: Iron Workers and Tool Makers* (repr. of 1863 edn, Newton Abbot: David and Charles, 1967), p. 168.
[55] Benoît Godin, 'The linear model of innovation: the historical construction of an analytical framework', *Science, Technology and Human Values*, vol. 31 (6), November 2006, pp. 639-667 at pp. 655 and 660.
[56] Gerhard Rosegger, *The Economics of Production and Innovation*, 3rd edn, (Oxford: Butterworth-Heinemann, 1996), p. 8.
[57] Rosegger, p. 125; Giovanni Dosi and Richard R. Nelson, 'Technical change and industrial dynamics as evolutionary processes' in Bronwyn H. Hall and Nathan Rosenberg (eds), *Economics of Innovation.* vol. 1 (Oxford: North-Holland, 2010), p. 91.

economic incentive to pursue new ideas.[58] From a human perspective, the inventor tends to work alone, while the innovator provides a link with the human environment of competitors, customers and suppliers. The significance of this partnership between inventor and entrepreneurial innovator becomes clear in Chapter 3, when the relationship between nail-machine inventor Jacob Perkins and innovator Joseph Dyer is examined.

It is also necessary to examine what motivated Perkins and other inventors to focus their attention on machine-made nail production. Fritz Machlup listed five possible reasons: inventing for fun, for fame, in the service of human kind, for money, or for recognition.[59] In 1966, Jacob Schmookler argued for a demand-induced explanation of inventive activity.[60] Put simply, 'necessity is the mother of invention'; and this belief that necessity spurs inventive effort is one that has been evoked to account for the greatest part of technological activity.[61] For instance, Christine MacLeod has argued that the inventions that underpinned Britain's technical prowess were neither haphazard nor exogenous.[62] Rather, inventions were linked to several distinct problems and opportunities for profit. Mokyr, on the other hand, has long held the view that the adage is 'clearly nonsense', even if only in the context of why technological change occurs in some societies and not others. 'Necessity is always there; the ability to satisfy it is not.'[63] Further criticism of Schmookler's thesis also suggested that invention is not necessarily an endogenous activity.[64] However, as this study argues in Chapter 3, the activity that led to the invention of nail-making machinery was very much demand-induced: inventive activity carried out by Mokyr's 'tinkerers', men who did not have much formal technical schooling but whose genius lay in their mechanical ingenuity.[65]

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[58] Mokyr, *Lever,* pp. 10-11.
[59] Fritz Machlup, 'The supply of inventions and inventors' in National Bureau of Economic Research, *The Rate and Direction of Inventive Activity: Economic and Social Factors* (Princeton: Princeton University Press, 1962), pp. 143-170 at p. 144.; Rosseger, p. 130.
[60] Jacob Schmookler, *Invention and Economic Growth*, (Cambridge, Mass: Harvard University Press, 1966).
[61] See for example, George Basalla, *The Evolution of Technology* (Cambridge: CUP, 1988), p. 6; Rosseger, pp. 130-131.
[62] MacLeod, 'Springs of invention', p. 1.
[63] Mokyr, *Lever,* p. 151.
[64] H. I. Dutton, *The Patent System and Inventive Activity during the Industrial Revolution 1750-1852* (Manchester: MUP, 1984), pp. 105-106.
[65] Mokyr, *Lever,* p. 244.

If not in the same league as radical inventions such as the steam engine and the railway, the invention of nail-making machinery was certainly radical within the context of nail-making. Chapter 4 describes how and why nail machines were first introduced in Birmingham. It also discusses the methods that the owners of Williams, Jones & Company adopted to preserve the integrity of its innovative assets, one such protective measure being the three patents granted to Joseph Dyer between 1810 and 1814. These patents effectively stifled further developments in nail making by machinery for fourteen years, but their expiry in 1827 fired the starting gun for decades of inventive activity: activity that focused not on producing new methods of mechanised production but on a stream of improvements.

As becomes clear in Chapters 5 and 6, these micro-inventions were frequently made by inventors other than 'professional' inventors like Jacob Perkins. Instead, they were made by individuals who Ralph Meisenzahl and Joel Mokyr have referred to as 'tweakers' and 'implementers'.[66] Although Meisenzahl and Mokyr admitted to a blurred distinction between the two, 'tweakers' contributed to the myriad small and medium cumulative micro-inventions that improved and debugged existing inventions, whilst the 'implementers' made up the ranks of a large army of skilled workmen capable of building, installing, operating and maintaining new and complex equipment. It was the contribution of these two groups, Meisenzahl and Mokyr argued, that provided a hitherto little-recognised British advantage during the Industrial Revolution.[67]

The apparent simplicity of the linear model of innovation should not obscure the difficulties created by conditions of risk and uncertainty that permeate each stage. It is no coincidence that risk and uncertainty are features of entrepreneurship just as they are of technological change, and only serve to emphasise the link that exists between the two. Mokyr highlighted the connection when he wrote: 'Sustained innovation requires a set of individuals willing to absorb large risks [….]

[66] Ralph Meisenzahl and Joel Mokyr, 'The rate and direction of invention in the British industrial revolution: incentives and institutions' in Josh Lerner and Scott Stern (eds), *The Rate and Direction of Inventive Activity Revisited* (Chicago: University of Chicago Press, 2012), pp. 443-479 at p. 446.
[67] Ibid.

Changing a known and trusted production method […] involves something of a gamble.'[68] According to Grübler, such gambles and uncertainty prevail at all stages of technological evolution, from initial design choices to success or failure in the market place, it being nearly impossible to guess the ultimate or potential significance of an innovation.[69] The following section focuses on the people who make such choices in a world of uncertainty, namely the entrepreneur.

Thus far a universally-accepted definition of entrepreneurship has remained elusive.[70] One attempt to reach a workable understanding of 'entrepreneurship' was made by Steve Gedeon.[71] In an article asking the question 'What is entrepreneurship?', Gedeon identified thirty-two separate definitions of entrepreneurship. These he assigned to six theoretical schools of thought: the risk theory of profit (11), the dynamic theory of profit (5), the Austrian dynamic theory (4), the behavioural school (4), and the traits school (2); the sixth consisted of combinations of two of the previously mentioned schools (6).[72]

The 'risk theory of profit' school has its roots in the mid-eighteenth century, with Irish-born Frenchman Richard Cantillon (1680-1734) being the first person to acknowledge that there was an entrepreneurial function within the economic system.[73] According to Cantillon, farmers and merchants were specialists in taking risks. They 'insured' workers by buying their output for resale before consumers had indicated how much they were willing to pay for it: they bought at a certain price and sold at an uncertain price. The associated concepts of 'risk' and 'uncertainty' were refined by the American economist Frank Knight (1921). Knight distinguished between risk, which is

[68] Mokyr, *Lever*, p. 153 and pp. 157-158.
[69] Grübler, pp. 21 and 23.
[70] See William J. Baumol, 'Entrepreneurship in economic theory', *American Economic Review*, vol. 58 (2), Papers and Proceedings of the Eightieth Annual Meeting of the American Economic Association (May 1968), pp. 64-71 at p. 64; Harold C. Livesay, 'Entrepreneurial history' in Calvin A. Kent, Donald L. Sexton and Karl H. Vesper (eds), *Encyclopaedia of Entrepreneurship* (Englewood Cliffs, NJ: Prentice-Hall, 1982), pp. 7-15 at p. 8; P. L. Payne, *British Entrepreneurship in the Nineteenth Century* (Basingstoke: Macmillan, 1988), p. 11; William D. Bygrave and Charles W. Hofer, 'Theorizing about entrepreneurship', *Entrepreneurship Theory and Practice*, Winter 1991, pp. 13-22 at p. 13; Robert F. Hébert and Albert N. Link, *A History of Entrepreneurship* (Abingdon: Routledge, 2009), p. xvii.
[71] Steve Gedeon, 'What is entrepreneurship?', *Entrepreneurial Practice Review,* vol. 1 (3), Summer 2010, pp. 16-35.
[72] Ibid, pp. 19-21.
[73] C. Mirjam van Praag, 'Some classic views on entrepreneurship', *De Economist,* 147 (3), 1999, pp 311-335 at p. 313.

insurable, and uncertainty, which is not.[74] As Mark Casson and others have argued, 'risk refers to recurrent events whose relative frequency is known from past experience, while uncertainty relates to unique events whose probability can only be subjectively estimated'.[75] Chapter 4 deals with the establishment of the Britannia Nail Works in Birmingham, the first cut-nail factory in Britain. It was unquestionably a gamble, its foundation fraught with uncertainty. There was no precedent, for one thing. Furthermore, there was antipathy from Black Country nail-masters and nailers alike; the model machines that Joseph Dyer brought with him from America failed to work effectively; the workforce he assembled was utterly untested; and his market was an unknown quantity. Risk and uncertainty characterised the introduction of cut-nail manufacture and remained a feature of the trade throughout the nineteenth century.

In 1947, Joseph Schumpeter, a leading exponent of the 'dynamic theory of profit', published a seminal article in the *Journal of Economic History* entitled 'The creative response in economic history'.[76] Schumpeter argued that 'innovation' was fundamental to an understanding of entrepreneurship. He started his analysis from the premise of a static economy without the entrepreneur, his 'circular flow'. Entrepreneurs were then thrown into the mix. They fulfilled their functions by introducing new combinations of productive means – innovations – and by doing so upset the circular flow. By 'innovations' Schumpeter meant the introduction of a new product, a new quality of product, or the introduction of a new method of production; the opening of a new market or the creation of a new organisational system within an industry. He later summarised the defining characteristics of entrepreneurial innovation as 'simply the doing of new things, or the doing of things that are already being done in a new way'.[77] Despite this rather low-key summary, he nevertheless felt strongly that, if innovation was the extraordinary outcome of entrepreneurial activity, only extraordinary people could bring about such transformative events.[78] The

[74] Frank H. Knight, *Risk, Uncertainty and Profit* (Boston, Mass: Houghton Mifflin, 1921), pp. 19-20.
[75] Mark Casson *et al*, 'Introduction' in Mark Casson, Bernard Yeung, Anuradha Basu and Nigel Wadeson (eds), *The Oxford Handbook of Entrepreneurship* (Oxford: OUP, 2006), pp. 1-30 at p. 3.
[76] Joseph A. Schumpeter, 'The creative response in economic history', *Journal of Economic History*, vol. 7 (2), Nov 1947, pp. 149-159.
[77] Schumpeter, p. 151.
[78] David Deakins and Mark Freel, *Entrepreneurship and Small Firms*, 6th edn, (Maidenhead: McGraw-Hill, 2012), pp. 9-10.

Schumpeterian entrepreneur was an 'heroic' figure although, as Crouzet pointed out, if Schumpeter is taken literally, 'entrepreneurs can, historically, only be rarities'.[79] Chapter 4 argues that Dyer was just such a 'rarity': a Schumpeterian entrepreneur whose innovative activities, in comparison to subsequent developments in the cut-nail trade, verged on the radical, if not the spectacular – even if historians have not acknowledged him as such. Yet Dyer's contribution to the establishment of the trade, although of considerable significance, was nevertheless a fleeting one. He arrived in England in 1811, but by 1816, 'after a brief residence in Birmingham', had moved to Manchester where he remained for the rest of his life.[80] As Chapters 5 to 8 demonstrate, most of the trade's entrepreneurs were not of the Schumpeterian mould but were often owner-managers.

In an article on entrepreneurship published in 2009, *The Economist* explained that 'the main constraint on entrepreneurs has traditionally been a shortage of finance, not of ideas'.[81] One interpretation of the final phrase might be that entrepreneurs themselves are the primary sources of creativity. Yet entrepreneurship is less about generating ideas and more about recognising them, and then perceiving and pursuing opportunities arising from those ideas. In 1973, Israel Kirzner developed the concept of 'creative alertness', which emphasised the entrepreneur's alertness to currently unexploited opportunities for trade.[82] Whilst Schumpeter stressed the entrepreneur's role in creating new technology, Kirzner argued that the entrepreneur operated on the opportunities that arose from new technology.[83] Bygrave and Hofer too argued that the identification and exploitation of opportunities lay at the heart of entrepreneurship. 'The entrepreneurial process', they wrote, 'involves all the functions, activities, and actions associated with the perceiving of opportunities and the creation of organizations to pursue them'.[84] While Dyer clearly demonstrated such behaviour, Chapter 5 shows that other Birmingham businessmen also recognised and exploited

[79] François Crouzet, *The First Industrialists* (Cambridge: CUP, 1985), p. 12.
[80] See *Manchester Weekly Times*, 13 May 1871.
[81] Anon, 'Entrepreneurship', *The Economist*, 27 Apr 2009 at https://www.economist.com/news/2009/04/27/entrepreneurship (accessed 5 Jul 2018).
[82] Israel M. Kirzner, *Competition and Entrepreneurship* (Chicago: University of Chicago Press, 1973), pp. 146-151.
[83] See Deakins and Freel, pp. 8-10.
[84] Bygrave and Hofer, p. 14.

the opportunities arising from the mechanisation of nail manufacture. Coupled with the expiry of Dyer's patent in 1827 and the opportunities offered by the increasing availability of steam power, the number of cut-nail manufacturers in Birmingham rose from one in 1826 to eighteen by 1850, with a further two in Wolverhampton.

Entrepreneurial activity is not related simply to the creation of a business; there are other opportunities for the 'alert' entrepreneur to exploit. One such opportunity for the cut-nail manufacturer lay in marketing. Research into marketing in the entrepreneurial firm is comparatively recent, to the extent that, as with entrepreneurship in general, no strong consensus has yet emerged.[85] Nevertheless, in the context of the nineteenth-century cut-nail trade, marketing as an entrepreneurial activity cannot be ignored. Thus, Chapter 6 is devoted to questions relating to why, how and by whom marketing activity was conducted, and to what effect. As Martin Carter explained, 'the nexus between marketing and entrepreneurship is clear. Firms which successfully identify entrepreneurial opportunities depend on marketing skills to help them understand, influence and, above all, attract customers.'[86] Advertising during the first half of the nineteenth century was largely factual, announcing who made what products and where. After that, a more persuasive form of advertising gradually became apparent, one that stressed the benefits of certain products rather than simply their features. This was crucial in an industry producing such seemingly-identical articles as machine-cut nails. Carter summed up the importance of marketing in these conditions when he wrote: 'competitive advantage is achieved by engaging in an unending search to differentiate products from those of competitors'.[87]

Earlier, it was noted that the Schumpeterian entrepreneur was visualised as being concerned with a 'high-level' kind of entrepreneurship that led to major, spectacular (but infrequent) events – such as the introduction of gas-lighting and the creation of the railways – which drastically altered the economic scene. However, to leave it there would be to ignore the more common, but no less

[85] Martin Carter, 'Entrepreneurship and marketing' in Casson *et al*, *Entrepreneurship*, pp. 114-137 at p. 128.
[86] Ibid, p. 119.
[87] Carter, p. 119.

important, 'low-level' instances of entrepreneurship. As Donald Coleman argued, much activity with an equal right to be called entrepreneurial is carried on in short- or medium-term situations: 'The continuous adaptation of the technical and/or organizational structure of an existing business to minor changes in the market both for factors and for final products.'[88] These entrepreneurs were part of what John Wilson referred to as 'the great army of industrialists who were dependent for their prosperity, even survival, on good management in an uncertain world; and their function was to take judgemental decisions relating to the co-ordination of scarce resources so vital to the firm's survival'.[89] Whilst Dyer was an example of a Schumpeterian entrepreneur, most of the Birmingham and district cut-nail manufacturers were 'low-level' entrepreneurs who served in the ranks of Wilson's 'great army'.

It remains the case that no single universal definition of entrepreneurship exists. It is, as Gedeon suggested, 'a multi-dimensional concept that includes owning a small business (risk theory), being innovative (dynamic theory), acting as a leader (traits school) or starting up a new company (behavioural school)'.[90] Entrepreneurship also includes the identification and exploitation of opportunities and, as Schumpeter maintained, is concerned with 'simply the doing of new things or the doing of things that are already being done in a new way'.[91] This study therefore examines entrepreneurial activity in the nineteenth-century Birmingham and district cut-nail trade at both 'high' and 'low' levels.

1.3. Methodology

That both machine-cut nails and the machinery used to make them were 'products' is self-evident; that they were 'new' products might not be so. A 'new product' is defined as one that opens up an entirely new market, replaces an existing product or specifically broadens the market for an existing product.[92] In the context of cut-nail manufacture, one could argue that a nail produced by a

[88] D. C. Coleman, 'Gentlemen and players', *Economic History Review*, vol. 26 (1), (1973), pp. 92-116 at p. 112.
[89] John F. Wilson, *British Business History, 1720-1994* (Manchester: MUP, 1995), pp. 21-22.
[90] Gedeon, p. 30.
[91] Schumpeter, p. 151.
[92] Jain Ashok, *Principles of Marketing* (New Delhi: PVK Enterprises, 2009), p. 212.

machine as opposed to one made by hand did not 'open up an entirely new market'; that it merely supplemented the existing range of similar products already available in the market. On the other hand, the nail-making machine certainly did meet the criteria set by the definition. Yet the definition takes us only a little way towards understanding the rise and decline of this new element of the nail trade. We need to look beyond the 'new' product and establish a way of looking at the whole life of the machine-cut nail trade. Life-cycle theory offers just such a way, and its application is used here as a means of analysing the evolution of the trade.

The life-cycle model has been used to analyse a range of economic and technological phenomena. Mokyr identified a three-stage model for analysing technological progress: 'the vigour of youth, followed by the caution of maturity and finally the feebleness of old age'.[93] Life-cycle models have also framed contributions to the debate over the development of industrial districts and clusters: Popp and Wilson used a six-stage model whilst, in their essay on the Manchester industrial district, Wilson and Singleton used a four-stage model. Swann and Prevezer also used a four-stage model to structure their study of industrial clustering.[94] The present author first used a five-stage model in his article on the evolution of the Birmingham cut-nail trade published in *Midland History* (2013).[95] Referring to the product life-cycle as 'the grandfather of concepts for predicting the probable course of industry evolution', Michael Porter employed the model as a tool for forecasting the probable course of industry evolution and of technological evolution.[96] For the purpose of this study, however, the model serves as an analytical tool rather than as a predictive one.

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[93] Mokyr, *Lever,* p. 261.

[94]Andrew Popp and John Wilson, 'Life cycles, contingency, and agency: growth, development and change in English industrial districts and clusters', *Environment and Planning A,* vol. 39, 2007, pp. 2975-2992 at pp. 2977-2978; John F. Wilson and John Singleton, 'The Manchester industrial district, 1750-1939: clustering, networking and performance' in John F. Wilson and Andrew Popp (eds), *Industrial Clusters and Regional Business Networks in England, 1750-1970* (Aldershot: Gower, 2003), pp. 44-67 at p. 48; G. M. Swann, Martha Prevezer and David Stout, *The Dynamics of Industrial Clustering* (Oxford: OUP, 1998), p. 6.

[95] Guy Sjögren, 'The rise and decline of the Birmingham cut-nail trade, c. 1811-1914', *Midland History,* vol. 38 (1), Spring 2013, pp. 36-57.

[96] Michael E. Porter, C*ompetitive Advantage: Creating and Sustaining Superior Performance* (New York: The Free Press, 1998), p. 194.

Despite the different applications, nomenclature and number of stages, life-cycle models are all similar in construction. A product or an industry is assumed to pass through certain phases which are marked by points at which the rate of growth of industry sales changes. A five-stage model is illustrated at Figure 1.3.

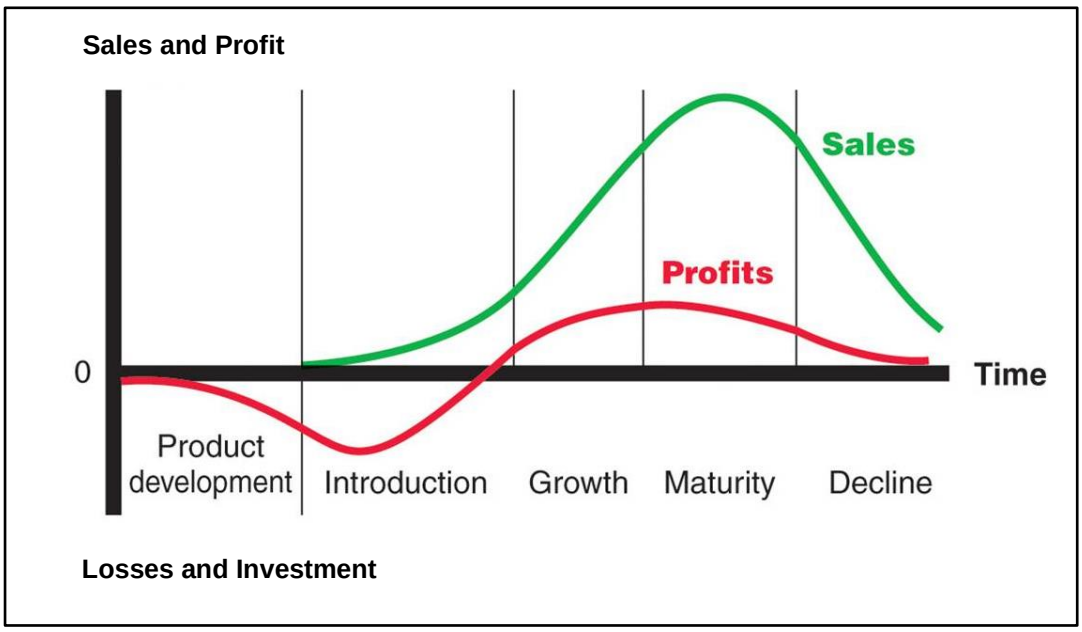


Figure 1.3. The five-stage product life-cycle model

Source: Adapted by the author from Maximillian Claessens, *Product Life Cycle Stages* at https://marketing-insider.eu/product-life-cycle-stages (accessed 8 Oct 2015)

Each stage of the model is defined by several characteristics, and each has a range of strategic options associated with it. For example, one characteristic of the 'growth' phase is that new competitors enter the market. One of the associated options is for a business to invest more in advertising to promote its products and to differentiate them from those of its competitors. Apart from Chapter 7, Chapters 3 to 8 are ordered chronologically, with each based on one of the five stages. Each chapter critically analyses the evolution of the cut-nail trade in the light of the relevant characteristics and strategic options. By examining the two core themes of technological change and entrepreneurship within the framework of the product life-cycle, the purpose is not only to analyse the evolution of the cut-nail trade but also to suggest a model that could be used to study the development of other industries.

Discussion of the product life-cycle starts with a few assumptions about a product. The first is that all products have a limited life. Changes in taste or technology dictate that no product will remain in demand by consumers indefinitely. The second assumption is that products pass through a series of distinct stages – the product life-cycle. Thirdly, profits will rise and fall at distinct stages in the life-cycle. Finally, the marketing effort required by a business, the value of its sales, its distribution network and the level of financial investment will all be affected by a product's life-cycle.

Every product, be it a machine-cut nail or an iPhone, progresses through a life-cycle. Depending on the product, the duration of the stages will vary; Pride *et al* gave the example of how the Rubik's Cube passed through the cycle in the matter of a few years, whilst Parker Brothers' Monopoly game has not gone into decline after more than eighty years.[97] Accounts of the product life-cycle usually refer to four specific stages: introduction, growth, maturity, and decline. Occasionally, however, a fifth stage is included at the start of the cycle, namely a 'development' stage. The development stage is significant when the product is a novel introduction to the market as opposed to an improvement of an already existing product. Since this stage is relevant to the nascent cut-nail trade, it is included here.

Edgar Pessemier described development times of between two and five years as common for well-understood products requiring significant development or design work.[98] At the turn of the nineteenth century, however, the mechanics of nail-making machines were by no means well-understood and, as Chapters 2 and 3 show, the development phase of such machinery would be measured in decades rather than just a few years. As Figure 1.3 indicates, the development stage is characterised by zero sales and negative profits: development costs are incurred but revenue is nil. It is a period of uncertainty, with a substantial risk of failure.

Even if the product passes on to the next stage – introduction – there is no guarantee that it will be accepted by the market. Without the sophisticated marketing techniques available to twenty-first-

[97] William M. Pride, Robert J. Hughes and Jack R. Kapoor (eds), *Business*, 11th edn, (Mason OH: South-Western, 2012), p. 366.
[98] Edgar. A. Pessemier, *Product Management*: *Strategy and Marketing* (New York: Wiley, 1977), p. 24.

century producers, it took twenty years for machine-cut nail manufacture in the early nineteenth century to pass through the introduction stage. The lengthy duration of this stage was caused by tight patent restrictions and the lack of awareness of the new product. In theoretical terms, such impediments mean that the introduction stage is characterised by slow growth and almost non-existent profit. In fact, there may well be negative profits as revenue is insufficient to compensate for both fixed and operating costs. In the case of an early nineteenth-century business, such costs would have been payments for rent and power, for wages and raw materials, and possibly for advertising. However, it also means that the business introducing the new product into the market has few competitors at this stage and, being somewhat ahead of the field, can use this period of minimal competition to detect and eliminate the defects in production.

Once the market is aware of the new product and has accepted it, sales begin to increase rapidly. This creates even greater awareness, not only of the product itself but also of its success. Prospective competitors who have been waiting in the wings whilst monitoring the take-up of the new product enter the market and are able to take advantage of the development activities undertaken by the originator.[99] The product thus enters the 'growth' phase of the cycle. As an increasing number of manufacturers enter the market so the quest for product differentiation and competitive advantage becomes a significant factor. Product promotion costs increase. At the same time, economies of scale become possible; and these, coupled with an increase in total output and the need to be competitive, lead to a reduction in unit price. Chapter 5 shows how the theory of the growth stage played out in practice during the twenty-five years following the expiry of Dyer's patents in 1827.

As more and more businesses enter the market, so the market becomes saturated.[100] Although in the early part of the 'maturity' stage, sales continue to rise, the rate at which this occurs begins to slow.

[99] Donald. R. Lehman and Russell. S. Winer, *Product Management*, 2nd edn (New York: McGraw Hill, 1997), p. 75.
[100] The 'maturity' stage is sometimes divided into two sub-stages – 'maturity' and 'saturation'. See, for example, Ashok, p. 217; Dave Needham and Rob Dransfield, *Advanced Business* (Oxford: Heinemann, 2000), p. 378; Porter, p. 441. In this study, 'saturation' will be considered as part of the 'maturity' phase in Chapter 6.

Profits also begin to decline and, to reduce the impact of this, the business may take certain actions. It can increase its advertising activities with the aim of popularising the brand-name of its product. It can add new products to its existing range to further differentiate its products from those of its competitors; and it may drop its unit price to undercut the competition. This may signal the start of a 'price war'; and in such circumstances the weaker firms are forced to leave the industry or are taken over by their stronger rivals. A period of rationalisation ensues. Just how appropriate the maturity stage of the model was to the development of the midland cut-nail trade is examined in Chapters 6, although two examples of how the trade did conform to the model will suffice for the moment. Between 1862 and 1868, the leading Birmingham manufacturer, John Reynolds & Son, acquired three of its competitors, whilst the formation of the United Cut Nail Trade Association (UCNTA) in 1868 stemmed from the imminent beginnings of a price war within the trade.

A further rapid fall-off in sales indicates that the product has moved into the final stage – 'decline'. Invariably, this is caused by the advent of new product competition and changes in consumer preference. A decline in sales may lead to a further reduction of prices, particularly when a business feels that it is overstocked. As revenue falls, savings may be achieved by reducing expenditure on advertising and other forms of sales promotion. The result is that, unless the business can diversify or adapt to the new conditions, it will be forced to cease production.[101] Thus, as in nature, a product is born, thrives and eventually dies. Although, as Chapter 8 reveals, the cut-nail trade did not die out altogether: nail manufacture entered what Popp and Wilson referred to as a 'renaissance' stage, when the industry changed not only its product base but also its main geographical focus, one that took it away from the West Midlands.[102]

The product life-cycle model is not without its critics. Shelby Hunt criticised it on the grounds that, if the level of sales determines the stage of the life-cycle, then the stage in the life-cycle cannot be used to explain the level of sales.[103] Others have pointed out that, while many new products never

[101] John. L. Thompson, *Strategic Management*, 3rd edn (London: Chapman and Hall, 1997), p. 325.
[102] Popp and Wilson, 'Life cycles', p. 2978.
[103] Shelby D. Hunt, *Marketing Theory* (New York: Sharpe, 2010), p.121.

progress beyond the development stage, the most successful products never die.[104] Even if they do, explained Porter, the duration of the stages varies widely from industry to industry, and it is not always clear what stage an industry is in.[105] Furthermore, some industries skip the maturity stage, passing straight from growth to decline. Despite these limitations, there does appear to be general agreement that the model provides a useful analytical framework within which to examine the life of a product.[106] In the case of this thesis, the product in question is the nail-making machine. Although the end-product – the machine-cut nail – is significant, the emphasis here is on the evolution of the production process. Reflecting Loveday's experience, researching this process relied heavily on sources in which nail-making was incidental; and attention now turns to a critical examination of these sources.

1.4. Review of Primary Sources

Despite the absence of records for individual businesses, documents relating to UCNTA were fortuitously discovered by the author in a private collection. John Reynolds & Sons (Birmingham) Ltd were trading until 2014, although the company was then importing nails from China rather than manufacturing its own. The business was part of the Bristol-based McArthur Group. While the firm held no historical records, the CEO put the author in touch with a former managing director of John Reynolds & Sons, Dennis Stamps. At their initial meeting, Stamps donated a book containing the hand-written minutes of UNCTA's general and executive committee meetings held between 1868 and 1882, copies of the association's printed annual reports, and additional ephemera.[107] The discovery of these documents was revelatory. Except for two reports in the local press, no further evidence concerning UCNTA's activities has yet come to light.[108] These documents offer a unique insight into why the association was formed, its aims, organisation and decision-making process.

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[104] O. C. Ferrell and Michael D. Hartline, *Marketing Strategy*, 5th edn (Mason OH: South-Western, 2012), p. 215.
[105] Michael E. Porter, *Competitive Strategy: Techniques for Analysing Industries and Competitors* (New York: The Free Press, 1998), p. 157.
[106] Ibid; Thomas. L. Wheelen and J. David Hunger, *Strategic Management and Business Policy*, 8th edn (New Jersey: Prentice Hall, 2002), p. 90. Mokyr has argued that, while the predictive power of the model is limited, it does suggest to economic historians where to look for specific evidence. Mokyr, *Lever*, p. 263.
[107] The documents, previously held in the private collection of the late Dennis Stamps (1936-2015), are now held in the author's private collection with a view to their eventual donation to an appropriate archive.
[108] *Birmingham Daily Post* [hereafter *BDP*], 17 and 30 Jun 1873.

They also add to our understanding of the cut-nail trade during the difficult operating conditions of the 1870s and of our perception of the association's effectiveness (Chapter 8). Primary sources concerning the development of the Britannia Nail Works between 1812 and 1818 were found in the Boulton & Watt Collection at the Library of Birmingham and at the Staffordshire County Record Office.

Printed primary sources were more readily available. Parliamentary papers in the form of the reports of two royal commissions on the employment of children begun in 1843 and 1862 proved to be particularly informative.[109] These enquiries investigated a wide range of factors affecting the employment of children in factories; the age and sex of child workers, their hours of work, the nature of employment, and workplace conditions. In 1843, two cut-nail factories in Wolverhampton and one in Birmingham were visited by the sub-commissioner. Twenty years later, reflecting the expansion of the trade, three factories in Wolverhampton were visited along with four in Birmingham. One Wolverhampton factory, John Neve's, was visited on both occasions, making it possible to assess the changes that had occurred during the intervening two decades. The evidence provided by employers and child employees to the commission is also illuminating. For example, in his evidence to the later commission, Birmingham nail-maker Alexander Parkes explained that 'the hands change very fast from one place of work to another'.[110] This comment on the mobility of labour was subsequently supported by a young nail packer who said that he had 'worked in several parts of the country'.[111] This example highlights a number of dangers arising from using the commission's reports as source material. One lies in generalising from a relatively small sample and reinforces the need to use a variety of sources. Another, which cannot be proved, is the extent to which the children were influenced by their employers in their testimony. A third relates to the accuracy of the reports. Five children were interviewed during the sub-commissioner's visit to the Parkes factory: one was a girl named Sarah Herbert and another was an eight-year-old

[109] PP. 1843. (430. 431. 432) Royal Commission on Children's Employment in Mines and Manufactories. Second Report [hereafter CEC 2 1843]; 1864 (3414-1) Children's Employment Commission., 1862. Third Report of the Commissioners [hereafter CEC 3 1862].
[110] CEC 3 1862, p. 462.
[111] Ibid.

boy recorded as Thomas Airbut. By cross-referencing the boy's name with the 1861 census, it became clear that Sarah and Thomas were siblings, and that the commissioner had been deceived by the boy's accented pronunciation of his surname.

Census returns, particularly those produced in the second half of the nineteenth century, proved an invaluable source of data for constructing a demographic profile of the cut-nail labour force (Chapter 6). At the other end of the scale, the decennial census not only offered an insight to the domestic life of employers – their residential location and the extent of their household staff, for instance – but also provided additional information about the size and composition of their labour force.[112]

Although nails were exported widely, particularly to the colonies, their inclusion under the generic heading of 'hardware' made it very difficult to identify the quantities and values of cut-nail exports. For example, in a report on the 'British hardware trade with the US', published in the trade journal *The Ironmonger* in 1867, nails appeared under a sub-heading of 'Anvils, vices and nails'.[113] In the same year, the official catalogue of British exhibits at the Paris Exhibition included nails under the heading 'Hardware and cutlery of all sorts'.[114] Even when nails were distinguished from other items of hardware, no distinction was made between hand-made and machine-cut nails.[115]

Without the availability of secondary sources to guide the researcher towards an appropriate start point, one can heed the advice of Samuel Johnson. 'When we enquire into any subject', he wrote, 'the first thing we have to do is to know what books have treated of it. This leads us to look at catalogues.'[116] Johnson was reflecting the eighteenth-century compulsion to classify and organise: one demonstrated by the burgeoning array of publications calling themselves 'guides', 'lists',

[112] The 1851 census, for example, showed that 32-year old John Danks was a cut-nail manufacturer living in Waterloo Road, Wolverhampton (since demolished) employing three 'house servants' and '149 men'.
[113] *The Ironmonger and Metal Trades Advertiser* [Hereafter *I&MTA*], 30 Apr 1867, p. 95.
[114] *Catalogue of the British Section: Paris Universal Exhibition 1867* (London: 1867), p. 42.
[115] PP. 1849 (L445). Accounts of Iron and Hardware Imported and Exported from the United Kingdom in 1848, p. 5.
[116] R. W. Chapman (ed.), *Boswell's Life of Johnson,* 2nd edn. (Oxford: OUP, 1965), pp. 625 and 627.

'companions' or, more usually, 'directories'.[117] Trade directories have been widely used in the research for this study and were accessed from two main sources. The Library of Birmingham holds an extensive collection of printed nineteenth-century trade directories covering Birmingham, Warwickshire and Staffordshire. These were supplemented by the digitised collection of directories covering England and Wales from the 1760s to the 1910s available online from the University of Leicester.[118]

The driving force behind the advent of directories was a commercial one, their development reflecting improvements in communications, industrialisation, the growth of internal trade and an increasingly mobile population; and, by the early nineteenth century, directories were being published regularly if not annually. Early examples, such as Wrightson's 1818 *New Triennial Directory of Birmingham,* classified trades alphabetically with a similarly alphabetical list of tradesmen shown beneath each trade heading. Wrightson listed twenty-five nail-makers under the heading of 'Nail Manufacturers'.[119] Such information, however, was of only limited use to both contemporary customers and modern-day researchers alike. In the same year that Wrightson published his directory, James Pigot published *The Commercial Directory for 1818-19-20* covering fifty-two Midland towns. Although published in the same year, the two lists of nail manufacturers were not identical.[120] Nevertheless, Pigot's directory benefited from showing not only the names of the manufacturers but also their workplace address and, in the case of nail-makers producing 'non-standard' hand-made nails, details of their products.[121] Whereas Wrightson merely informed us that Richard Lander was a manufacturer of nails, Pigot offered additional information to the effect that Lander produced coffin nails in Henrietta Street. By the 1840s, as Chapter 5 explains, the cut-nail trade was experiencing a period of sustained growth in Birmingham, and this was reflected in directory listings which began to distinguish machine-cut nail producers from other categories of

[117] Penelope J. Corfield and Serena Kelly, 'Giving directions to the town: the early town directories', *Urban History Yearbook*, vol. 11, 1984, pp. 22-35 at p. 26.
[118] University of Leicester, *Historical Directories of England and Wales* at http://specialcollections.le.ac.uk/digital/collection/p16445coll4 (accessed 2015-2018).
[119] Wrightson's *New Triennial Directory of Birmingham, 1818*, p. 162.
[120] Pigot's *Commercial Directory for 1818-19-20*, p. 48.
[121] Nails other than the 'standard' iron nails were brass, cast, coffin and saddlers' nails.

nail maker.[122] This practice continued for the rest of the period covered by this thesis. After 1820, trade directories began to carry an ever-expanding section of advertisements, and these provided a valuable insight into not only how manufacturers saw themselves but also how they wanted others to see them.

Both Gareth Shaw and Neil Raven have argued that trade directories represent 'the most useful source' for researching and analysing the evolution of business communities.[123] Nevertheless, as historical sources, they have their shortcomings. One limitation from a business history perspective is that directories give no indication of the size, importance or markets of individual firms. That information must be sought elsewhere. Additional weaknesses stem from their degree of accuracy, completeness and currency. Early directories were often out-of-date as soon as they appeared and, when a new edition was published, it was not uncommon for them to be, if not pirated texts, copies of previous editions with little, if any, revision.[124] The standard of their content varied from publisher to publisher, and inconsistency and inaccuracy can lead to confusion when trying to identify specific individuals and trades. For example, the Birmingham cut-nail manufacturer George Trinfield is shown in Cornish's 1861 directory as 'Prinfield' (and 'Tunfield' in a *Birmingham Daily Post* report of his bankruptcy).[125] Two Birmingham directories were published in 1850 by different companies, White's and Slater's. In White's directory John Poultney is shown as a cut-nail maker; in Slater's he is not mentioned at all.[126] But, as Corfield and Kelly have argued, directories were never intended to be 'censuses of final record'; they offered immediacy rather than complete accuracy.[127] Directories are a valuable starting point but, with their

[122] See, for example, Slater's *Directory of Important English Towns, 1847*, p. 26.
[123] Gareth Shaw, 'Directories as sources in urban history: a review of British and Canadian material', *Urban History Yearbook*, vol. 11, 1984, pp. 36-44 at p. 37; Neil Raven, 'The trade directory: a source for the study of early nineteenth century urban economies', *Business Archive Sources and History*, 88, November 1997, pp. 13-30 at p. 15.
[124] See Jane E. Norton, *Guide to the National and Provincial Directories of England and Wales, excluding London, published before 1856* (London: Royal Historical Society, 1984), pp. 17-18; W. B. Stephens, *Sources for English Local History* (Chichester: Phillimore, 1994), pp. 26, 67, 84, and 125; and see C. W. Chilton, 'The Universal British Directory – a Warning', *The Local Historian*, 15 (3), August 1982, pp. 144-146 at p. 144.
[125] Cornish's *Corporation, General and Trades Directory of Birmingham 1861*, p. 497; *BDP*, 16 Feb 1864.
[126] White's *History, Geography and Directory of Warwickshire, 1850*, p. 364; Slater's *Directory of Warwickshire, 1850*, p. 111.
[127] Corfield and Kelly, p. 22.

questionable accuracy, occasional vagueness and not infrequent omissions, they cannot be used as historical documents in isolation. They need the support of other sources to verify and develop their contents.[128]

Newspapers and trade journals proved to be invaluable sources for expanding the limited detail about people, place and products offered by directories. Whereas directories tell the researcher that a partnership existed, newspapers often provided details of when the partnership was formed and dissolved; and whether it was dissolved because of bankruptcy or sale of the business. In the case of bankruptcy, even a short press report often reveals valuable facts. In the case of John Adams, a small cut-nail manufacturer operating in the Spring Hill district of Birmingham at the end of the nineteenth century, the report of his bankruptcy in 1900 revealed his residential and work addresses, his existing capital and the extent of his debts, the size of loans from relatives, and the number of nail-making machines on his premises.[129] Other relevant information available from press reports covered such varied topics as business acquisitions and business relocation, workplace accidents, industrial relations, and the place of business owners in civic society.

In the second half of the nineteenth century, national newspapers – *The Times* and the *Morning Post* especially – proved useful not only for comparing the development of the Birmingham and district cut-nail trade with its competitors in other English districts but also in setting the cut-nail trade in the context of the overall 'state of trade'. Reports on the state of the iron and hardware trades were also common features of the regional press. During the first half of the century, the main vehicles for such reports were *Aris's Birmingham Gazette* and the *Birmingham Gazette*.[130] In 1855, Gladstone repealed the duty on newspapers that had been in place for half a century. Whether by coincidence or because of what Kate Tiller referred to as 'the repeal of taxes on knowledge', the

[128] See Norton, p. 24; Shaw, p. 43.
[129] *BDP*, 12 Apr 1900.
[130] *Aris's Birmingham Gazette*, founded in 1741, was considered by Joseph Allday, editor of a rival Birmingham newspaper, *The Monthly Argus and Public Censor*, to have been one of the best local papers, along with the *Leeds Mercury* – 'the provincial *Times*', as Allday called it. Stephen Roberts, *Now Mr Editor!* (Birmingham: Library of Birmingham, 2015), p. 1.

Birmingham Daily Post was established in the following year; and it was the *Post* that became the leading regional newspaper, providing a rich source of industrial information.[131]

The repeal of the duty on newsprint also led to the rapid growth of specialist trade journals, the most significant of which for the cut-nail trade was the *Ironmonger and Metal Trades Advertiser*, launched in 1859.[132] A local journal was *Martineau and Smith's Monthly Trade Circular* published by the owners of a Birmingham brass manufacturing business, and research using both journals was conducted at the Museum of English Rural Life at the University of Reading, where complete runs of both journals are held.[133] These journals are available in paper form only, and the absence of indexes makes research a difficult task unless specific dates are known. Since 2007, however, the British Library's ever-expanding digitised British Newspaper Archive (BNA) has made available millions of pages from British and Irish newspapers, and most of the references to newspaper items in this thesis have resulted from keyword searches of the BNA.[134]

Nineteenth-century newspaper reports were often so detailed that they can be regarded as 'journals of record'. A report of the first general meeting of Hadley & Shorthouse Ltd. in 1900, for instance, not only gave details about the composition of the new board of directors but also provided an insight into the state of the cut-nail trade at the time.[135] Newspapers not only reported *what* was happening but also what people *thought* was happening. When *The Times* reported in 1852 that 'cut nails have taken almost complete possession of the market' and had 'annihilated […] the wrought nail trade', the paper's correspondent exaggerated the demise of the Black Country nail trade.[136] Nevertheless, in the immediate aftermath of the Great Exhibition, and at a time when the cut-nail trade was rapidly becoming one of the most mechanised industries in Birmingham, the

[131] Kate Tiller, *English Local History: An Introduction*, 2nd edn (Stroud: Sutton, 2002), p. 231.
[132] See Geoffrey Tweedale, '*The Ironmonger*. King of the Hardware Journals'. PDF (2014_ at http://www.wkfinetools.com/contrib2/TweedaleG/theIronmonger/theIronmonger-01.asp (accessed 4 January 2015).
[133] In 1878, the title was changed to *Martineau and Smith's Monthly Trade Journal* and, in 1890, it was changed once more to *The Hardware Trade Journal*.
[134] By 29 March 2019, over 31,000,000 pages were available online. See https://www.britishnewspaperarchive.co.uk (accessed 29 March 2019).
[135] *BDP* 14 Jun 1900.
[136] *The Times*, 16 Aug 1852.

report characterised a sense of confidence and pride in the state of the trade. Of course, newspapers as source material are not without their flaws. Many articles were unattributable, and the author of the 1852 article may well have been associated with the cut-nail trade. Bias and partiality, both personal and political, was as evident then as it is now, and a rush to put a newspaper together sometimes militated against accuracy and reliability. In the case of partnerships, patents and bankruptcy, however, cross-referencing newspaper material with information in the *London Gazette* has helped to eradicate such inaccuracies.

If newspapers and census returns have helped to develop an understanding of the 'people' in the cut-nail trade, contemporary maps have been essential aids in understanding 'place'. By plotting business locations taken from directories it has been possible not only to locate factory sites with a reasonable degree of accuracy but to identify the way in which cut-nail factories clustered in two districts of Birmingham and, to a lesser extent, in Wolverhampton (Chapter 5). Cartographic accuracy, however, cannot be taken for granted. Whilst Ordnance Survey maps after 1880 were reliable, earlier ones were not. William Hunt's map of Birmingham published in 1834 was, its publisher proudly stated, 'taken from accurate surveys in the year 1834'. The map shows the Britannia Brewery lying to the east of Newtown Row, even though the brewery had closed more than twenty years earlier and the buildings had been converted into a cut-nail manufactory (Chapter 4). Even by 1818, John Kempson's map was showing the site as a 'nail manufactory'. Henshall's 1849 map of Birmingham shows Lord Street (the site of Samuel Webb's factory) lying to the south of Lister Street, but Pigot-Smith's map (1855) shows it to the north. Nevertheless, maps, both contemporary and modern, proved helpful in undertaking a physical search for evidence of surviving cut-nail factory sites – a search that proved largely unsuccessful. The redevelopment of Birmingham since the 1960s has led to the demolition of all but one site: the factory buildings originally built in 1863-64 for Hadley Brothers in Eyre Street still stand. Perhaps with thoughts of industrial espionage in mind, a request by the author to view the interior of the buildings was

refused by the current owners.[137] This was regrettable since few examples of material culture have survived.

Whilst this thesis is not a study of material culture, it acknowledges not only the growing historical literature on the subject but also, more specifically, the part played by 'objects', large and small, in providing evidence for the exploration of entrepreneurship and innovation in the cut-nail trade.[138] Frank Trentmann appeared to exclude the cut-nail trade when he asserted that 'material culture stops at the domestic doorway, rarely connecting to the brutal materialilty of iron, steel and bullets'.[139] Jules Prown's functional classification, on the other hand, included a broad range of objects, and three of his five categories are relevant to this study.[140] His 'Art' category included paintings, drawings and prints. Henri met de Bles's early sixteenth-century painting of an iron foundry (Figure 2.2), the Boulton & Watt Company drawings of the Britannia Nail Works (Figures 4.2 and 4.5), and Arthur Lockwood's paintings of the Crown Nail Works in Wolverhampton before its demolition in 2005 (Figure 6.5) are, as Leora Auslander put it, 'visual representations of objects that have […] disappeared'.[141] Medals, such as the one awarded to John Reynolds at the 1879 Sydney International Exhibition (Figure 7.9), fall into Prown's fourth category of 'Applied Arts'.

Under the heading of 'Modifications to the Landscape', Prown included architecture. Whilst the architecture of the former Hadley works in Eyre Street (Figure 6.3) is unremarkable, that of the surviving residences of some nail manufacturers is decidedly not. According to Richard Grassby, 'objects can be read as well as counted'.[142] The rise of manufacturer John Reynolds through the

[137] The original factory buildings not only still stand but they also remain in use today by a firm of steel strip manufacturers.
[138] See, for example, Jules D. Prown, 'Mind in Matter: An Introduction to Material Culture Theory and Method', *Winterthur Portfolio,* vol. 17 (1), Spring, 1982, pp. 1-19 ; Frank Trentmann, 'Materiality in the Future of History: Things, Practices, and Politics', *Journal of British Studies,* vol. 48 (2), Special Issue on Material Culture (April 2009), pp. 283-307; Karen Harvey, *History and Material Culture,* 2nd edn (London: Routledge, 2017).
[139] Trentmann, p. 287.
[140] Prown, p. 3. Prown's categories were: Art, Diversions, Adornments, Modifications of the Landscape, Applied Art, and Devices.
[141] Leora Auslander, 'Beyond words', *American Historical Review*, vol. 110 (4), October 2005, pp. 1015-1045 at p. 1024.
[142] Richard Grassby, 'Material culture and cultural history', *Journal of Interdisciplinary History*, vol. 35 (4), Spring 2005, pp. 591-603 at p. 593.

ranks of Birmingham's cut-nail élite can be discerned, for example, through a 'reading' of his various residences. In 1839, aged twenty-two, he worked as a patent tack cutter and lived in a terraced house at 12 Howard Street in the Jewellery Quarter.[143] When he established his own business in Aston's Newtown Row in 1849, his residence was adjacent to the factory: 'a house with a large garden', as his grandson later described it.[144] The 1861 census showed him living in a regency-style house in Edgbaston's Carpenter Road whilst ten years later, then 'the largest [cut nail] employer in Birmingham',[145] he had moved to a neo-classical residence in nearby Wellington Road (Figure 1.4).



Figure 1.4. John Reynolds' Edgbaston residences at
37 Carpenter Road (left) and 45 Wellington Road (right)

Source: Photographs by the author

Prown's fifth category, 'Devices', included objects connected to the 'brutal materiality of iron and steel', namely machinery and, of course, cut nails. The indifference shown towards the history of the cut-nail trade is reflected in the rarity of examples of early nail-making machinery. The Birmingham Museums Collection holds a small wire-nail machine dating from the 1920s.[146] For earlier cut-nail machines, however, researchers are forced to rely on visual representations, whether

[143] Robert Colquhoun, *Reynolds of Birmingham* (Unpublished typescript, 1999), p. 28.
[144] Letter from Ernest Reynolds (grandson of John Reynolds) to his niece Ann Hines dated 4 Feb 1952 (Author's private collection).
[145] See Reynolds's evidence to the Children's Employment Commission at CEC 3 1864, p. 491.
[146] See *The Engineer*, 21 Nov 1924 for a short article about this machine.

they be illustrations in nineteenth-century periodicals such as the one in an 1844 issue of the *Penny Magazine* (Figure 5.9) or the few surviving photographs held in local archives, of which those taken with the closure of the Crown Nail Works in 2004 and now held by the Wolverhampton Archives are examples.[147]

1.5. Thesis Structure

This thesis operates at several distinct levels. At one level it is a regional study. At another, it is a study of the rise and decline of the largely-ignored Birmingham and district cut-nail trade, from its inception in 1811 to its decline in the two decades preceding the First World War. At a third level it is a study of how technological change and entrepreneurship influenced and shaped the direction of this relatively short-lived trade. A fourth level is created by superimposing both the chronological and the conceptual analyses onto a framework formed by the five stages of the product life-cycle model. In doing so, it tests the validity of using this modern-day model to analyse the evolution of the cut-nail trade over a period of a hundred years.

Chapter 2 is a contextual chapter. It begins by examining the part played by 'technology push' and 'demand pull' factors in establishing a proto-nail industry in Britain. It then narrows its focus and considers the question of why the district of south Staffordshire and north-east Worcestershire known as the Black Country became the pre-eminent nail-making district in Britain by the early nineteenth century and why, in doing so, it replaced Birmingham as a major centre of hand-made nail production. The chapter concludes with an assessment of the extent to which technological change affected the development of the regional nail trade up to 1809.

Chapters 3 and 4 are concerned with the first two phases of the product life-cycle, namely the 'development' and 'introduction' phases. The focus of Chapter 3 is on technological change, although not in Britain but in the United States. In a country where wood was the primary construction material, the demand for nails was intense. With the demand for nails far outstripping

[147] See Anon, 'A second day at the Birmingham factories', Supplement to *The Penny Magazine*, vol. XIII, December 1844, pp. 501-508 at p. 504; and see the photograph of a nail-making machine c.1870 at www.blackcountryhistory.org/collections/getrecord/GB149_P_3097 (accessed 7 December 2018).

supply, however, a Congress-inspired initiative led to a race to increase productivity through the development of a mechanised method of nail production. Whilst describing the nature of this race, the chapter also examines the relationship between invention and innovation, exemplified in the association of the inventor Jacob Perkins and the innovator Joseph Dyer. This link is further explored in Chapter 4 where the emphasis switches from technological change to the influence of entrepreneurship. At a descriptive level this chapter is an account of how a disused Birmingham brewery was converted into a nail factory. At another level, however, it is about how the visionary Dyer introduced the seeds of change into a long-established West Midlands industry by setting up an untested manufacturing process, in the face of powerful competition, and at a time of difficult trading conditions: in short, in the face of extreme uncertainty. The chapter argues that Dyer was a classic example of Schumpeterian 'heroic' entrepreneurship.

The 'growth' phase of the cycle, from 1827 to 1853, forms the basis of Chapter 5. At the start of the period there were just two producers of machine-cut nails in Birmingham. This chapter examines what technological changes had to occur to facilitate what, in 1852, *The Times* referred to as the 'immense powers of production' characterising the trade at the end of the period. Technological change is brought about by human activity and, because of the inherent risks in introducing change, is an entrepreneurial activity. However, it is argued in this chapter that the 'growth' phase witnessed a different form of entrepreneurship, one that moved away from high-level, 'heroic' entrepreneurship to low-level entrepreneurial activity performed by business owners who may not have perceived the longer-term implications of their actions but who were driven by a quest for competitive advantage, and thus risked investing in innovation.

Chapter 6 examines the interplay of strategic low-level entrepreneurship and technological change during the cut-nail trade's 'maturity' phase from 1854-1873. After a period of frenetic growth during the late 1830s and 1840s, the market for cut nails became saturated. This chapter examines the options for survival open to the entrepreneur in such circumstances and the extent to which their adoption proved successful. Those that remained in business did so because they were able to

implement technological improvements, however minor, as well as organising and managing an efficient business.

John Wilson and Andrew Thomson have noted how British marketing history has not been well treated by historians and, with particular significance for the current study, observed that 'little has been written about marketing at all outside the consumer-oriented industries'.[148] This is unfortunate as marketing is now regarded as a key entrepreneurial function. Chapter 7 diverges from the chronological path of the thesis and examines the marketing opportunities available to the nineteenth-century nail-trade entrepreneur. Given that product differentiation of very standardised items such as nails was extremely difficult to achieve, product promotion techniques offered virtually the only means of doing so. This chapter examines the range of marketing tools available and the extent to which they were used. The chapter concludes with an assessment of the degree of success that entrepreneurs achieved.

Chapter 8 deals with the final phase of the product life-cycle, the 'decline' phase, which for the Birmingham and district cut-nail trade lasted from 1874 to 1913. The conclusion that the trade experienced a protracted period of decline is reached after examining the evidence for regression. This is followed by an analysis of the causes of decline, and of the steps that were taken to reverse it and their degree of success. Chapter 9 draws conclusions from the research and suggests possible areas for future study.

[148] John F. Wilson and Andrew Thomson, *The Making of Modern Management: British Management in Historical Perspective* (Oxford: OUP, 2006), p. 246; Roy Church, 'New perspectives on the history of products, firms, marketing, and consumers in Britain and the United States since the mid-nineteenth century', *Economic History Review*, vol 52 (3), August 1999, pp. 405-435 at p. 406.

CHAPTER 2

THE ENGLISH NAIL TRADE BEFORE 1809

2.1. Introduction

Nineteenth-century publications about nail-making invariably began by reminding their readers about the antiquity of the trade. 'The art of nail-making is one of the most ancient among us' wrote Birmingham historian, William Hutton.[1] The 1888 Board of Trade report on the condition of nail- and chain-makers in south Staffordshire and north-east Worcestershire noted that the hand-wrought nail trade was of 'considerable antiquity', whilst Thomas Higgs, a radical Halesowen nailer, opened his *Nail Maker's History* with the rhyming couplet: 'Nail making is a very ancient trade / Thousands of years since the first nail was made'.[2] Such remarks were put beyond dispute when, in 1959, a pit containing 870,000 nails was discovered at the site of an unfinished Roman fort in Perthshire, providing early evidence of the use of iron nails in building construction.[3]

Ancient as nail-making may have been, however, it was a laborious and time-consuming occupation. Time meant money and, by the Middle Ages, the prohibitive cost of producing nails was enough to restrict sales to wealthy clients. Because they were expensive, nails were suitable objects for conspicuous displays of wealth and were often used as decorative features on the doors of churches and manor houses. By the early sixteenth century, nails were being put to more prosaic use. In 1519, the churchwardens in Halesowen paid 4d for nails to secure the church leads. A few years later, the churchwardens in Ludlow paid 8d for 'wire and nails to mend the chimes' and,

[1] William Hutton, *The History of Birmingham*, 4th edn (London; Nichols, 1819), p. 117.
[2] Parliamentary Papers [hereafter PP] 1888 (385) Report as to the Condition of Nail Makers and Small Chain Makers in South Staffordshire and East Worcestershire by the Labour Correspondent of the Board of Trade, p. 3; Thomas Higgs, *The Nail Maker's History* (Halesowen: np, 1862?), p. 1.
[3] A. F. Moseley, 'Nailmakers', *Journal of West Midland Regional Studies*, 1968 (2), pp. 6-38 at p. 8. Estimates vary as to the size of the cache. See http://www.glasgowsteelnail.com/romans2.HTM (accessed 07 March 2018), which gives the amount as 'over three quarters of a million' nails; and Henry Cleere and David Crossley, *The Iron Industry of the Weald* (Leicester University Press: Leicester, 1985), p. 83, where the authors give a round one million.

tellingly perhaps, 4d 'for nails to hang up cloths when the images were pulled down'.[4] The Ludlow accounts explained that payment for nails was due to a local blacksmith.[5] Most settlements had a blacksmith who made nails as part of their day-to-day work. By the early sixteenth century, however, concentrations of specialist nail-makers were beginning to form: in south Staffordshire and north-east Worcestershire, in the Wigan area of Lancashire, in north Derbyshire and south Yorkshire, and around Newcastle-upon-Tyne.[6] This chapter explains why these concentrations occurred. Then, focusing on the West Midlands, it addresses three key questions. Firstly, what factors caused the area of south Staffordshire and north-east Worcestershire to become the pre-eminent nail-making district in Britain by the early nineteenth century? Secondly, what caused the decline of nail-making in Birmingham by the same time? Thirdly, to what extent did technological change contribute to the development of the regional nail trade up to the patenting of a nail-cutting fly press in 1808?

2.2. Technology Push: Demand Pull

When John Leland visited Birmingham in 1538, he made his oft-quoted observation about the 'great many naylors' he saw in the town.[7] At the time of his visit, regional nail-making on any commercial scale was restricted to Birmingham, Wednesbury, Dudley and Stourbridge. Sixty years later, the number of nail-making parishes had risen to fourteen; and, as the number of nail-making communities grew, so too did the range of nails being made. Entries in the Ludlow churchwarden's accounts referred to 'clote [clout] and rossen [probably rose head nails] nayle's; 'tache [tack] nayle, borde [board] nayles' and 'spicke [spike] nayles'.[8] The question is, of course, why did the nail trade expand so markedly during the sixteenth and seventeenth centuries?

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[4] F. Somers (ed.), *Halesowen Churchwardens' Accounts (1487-1582)* (Worcester Historical Society, 1957), np; T. Wright (ed.), *Churchwardens' Accounts of the Town of Ludlow* (1540-1603) (London: Camden Society, 1869), pp. 34 and 37.
[5] Wright, p. 136.
[6] Hugh Bodey, *Nailmaking* (Botley: Shire Publications, 2008), p. 7.
[7] John Leland, *The Itinerary of John Leland the Antiquary. Vol. the Fourth*, 3rd edn (Oxford: Thomas Hearne, 1769), p. 114. The nailers were clustered in the 'Dirtey' (Deritend) district of the town
[8] Wright, pp. 77, 128, 129 and 136. For a brief description of common nails and their uses, see Appendix 1. Although the nails illustrated are cut nails, their hand-made equivalents were used for similar purposes.

During the 1950s and 1960s, two broad theories of technological change emerged: 'technology push' and 'demand pull'. Whilst the technology-push concept assumed a supply-side-driven linear process from invention to innovation and ultimately to diffusion, the demand-pull hypothesis postulated that anticipated market demand was a key determinant of technological change by stimulating research in new directions.[9] The debate that ensued in the 1970s ended effectively with the publication of a seminal paper by David Mowery and Nathan Rosenberg (1979), where the authors were highly critical of the 'exclusive preoccupation' with the demand-pull set of forces. Rather, they concluded, because of the close interaction, 'both demand- and supply-side influences are crucial to understanding the innovation process'.[10] The evolution of the nail trade is therefore examined in the light of both these driving forces.

2.2.1. Technology-Push Forces in Practice

Until the late medieval period, the production of iron was slow and laborious. Iron ore was smelted in a charcoal-fuelled furnace, each smelt yielding iron in the form of a 'bloom', a substance of spongy molten iron mixed with glassy molten slag. The bloom then had to be hammered to squeeze out the residues of slag and to consolidate and weld the iron together. Further refining occurred, the iron being brought to white heat such that it could be hammered into a long bar. The bar then had to be heated and hammered into a sheet, the iron having to be constantly re-heated for it to remain workable. Once hammered into the right thickness for the nail, the sheet was cut manually into rods using a pair of shears.[11] The innovation of three specific water-powered technologies during the sixteenth century – the blast furnace, the tilt hammer, and the slitting mill – radically changed the production process.

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[9] Michael Peters, Malte Schneider, Tobias Griesshaber and Volker H. Hoffmann, 'The impact of technology-push and demand-pull policies on technical change – does the locus of policies matter?', *Research Policy,* 41 2012, pp. 1296-1308 at p. 1297.

[10] David Mowery and Nathan Rosenberg, 'The influence of market demand upon innovation: a critical review of some recent empirical studies', *Research Policy*, 8 1979, pp. 102-153 at p. 102; Giada Di Stefanoa, Alfonso Gambardella and Gianmario Verona, 'Technology-push and demand-pull perspectives in innovation studies: current findings and future research directions', *Research Policy,* 41 2012, pp. 1283-1295 at p. 1283; Peters et al, p. 1297.

[11] For a more detailed account of the early production of iron see W. V. K. Gale, *Iron and Steel* (London: Longman, 1969), pp. 11-13. See also Richard Hayman, 'The Shropshire wrought-iron industry c.1600-1900: a study of technological change' (Unpublished PhD thesis: University of Birmingham, 2003), pp. 19-21.

Swedish researchers have found evidence of furnaces operating in south-east Sweden in the twelfth century.[12] Diffusion, however, was a slow process. Bertrand Gille placed them in Liège in the late fourteenth century, and it was not until the 1490s that the blast furnace was first introduced into Britain, in the iron-producing district of the Weald.[13] By 1560, blast furnaces had reached the West Midlands, where one was established on the Paget estate at Cannock Chase and a second a few miles to the west at Shifnal.[14] The benefit of the blast furnace was that it enabled a much greater output of iron to be produced in a given time. Whereas the traditional, direct-reduction furnace produced blooms weighing only a few pounds, the constant blast provided by two alternating water-powered bellows generated much higher temperatures and changed profoundly the smelting reaction, enabling the blast furnace to produce cast iron weighing up to two hundredweight.[15]

Although quantities of iron produced remained small, they were, wrote Keith Gale, 'getting beyond the unaided muscular power of man to handle'.[16] After 1500, the spread of the blast furnace was accompanied by an increasing use of water-powered tilt hammers of the type shown in Henri met de Bles's 1535 painting (Figure 2.1). That the two technologies should be introduced around the same time should come as no surprise. Both the blast furnace and the tilt hammer were powered by water; and both operated using a series of cams fitted to a horizontal shaft to work the bellows and lift the hammer. Tilt hammers had their limitations, however, as they were unable to forge bars smaller than three-quarters of an inch square. Below this size the bars became too long and too flexible when hot and cooled down too quickly.[17] Nail-makers, however, required rods of smaller size, and it was the introduction of the slitting mill into England in the late sixteenth century that transformed not only the production of nail rods but also the very nature of the nail trade.

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[12] See, for example, Jon Karlsson, 'Tracing modern environmental conditions to their roots in early mining, metallurgy and settlement in Gladhammar, south-east Sweden', *The Holocene*, vol. 25 (6), 2015, pp. 944-955, at p. 945. Robert Friedel, however, places their appearance 'in the West' in 'probably the fifteenth century'. Robert Friedel, *A Culture of Improvement: Technology and the Western Millennium* (Cambridge, Mass: MIT Press, 2007), p. 82.
[13] Bertrand Gille, 'The transformation of matter' in Maurice Daumas (ed.), *A History of Technology and Invention vol. 2. The First Stages of Mechanization* trans. by Eileen B. Hennessy (London: John Murray, 1980), pp. 69-88 at p. 73.
[14] Marie B. Rowlands, *The West Midlands from AD 1000* (London: Longman, 1987), p.146.
[15] Friedel, p. 45.
[16] Gale, p. 19.
[17] Ibid, p. 21.



Figure 2.1. 'Landscape with a Foundry' (detail) Henri met de Bles, 1535. The images show a tilt hammer and hand forging (top) and a water-powered blast furnace (bottom).

By kind permission of the Czech National Gallery, Schwarzenberg Palace, Prague.
(Photograph by the author)

According to W. H. B. Court, the slitting mill was unsurpassed in importance for the nail trade until the advent of machinery for cutting nails in the early nineteenth century; and Chris Evans and Göran Rydén considered it to be the key to Britain's pre-eminence in nail-making.[18] As Figure 2.2

[18] W. H. B. Court, *The Rise of the Midland Industries, 1600-1838* (London: Oxford University Press, 1953) p. 103; Chris Evans and Göran Rydén, *Baltic Iron in the Atlantic World in the Eighteenth Century* (Leiden: Brill, 2007), p. 188; and see Bill Kings and Margaret Cooper, *Glory Gone: The Story of Nailing in Bromsgrove* (Bromsgrove: Halfshire, 1989), p. 15.

illustrates, bars of iron were cut into lengths of about a foot. They were then heated and rolled into sheets some four feet long before being passed through the slitting rolls which cut the sheets into as many as eight separate rods. The rolls were adjustable and could produce rods of different gauge to suit the needs of the type and size of nail to be made.[19] As with the blast furnace, the slitting mill was originally developed in the Liège district of Flanders during the early sixteenth century, with the first English slitting mill being set up in Dartford, Kent.[20] Peter King's 2003 doctoral thesis on

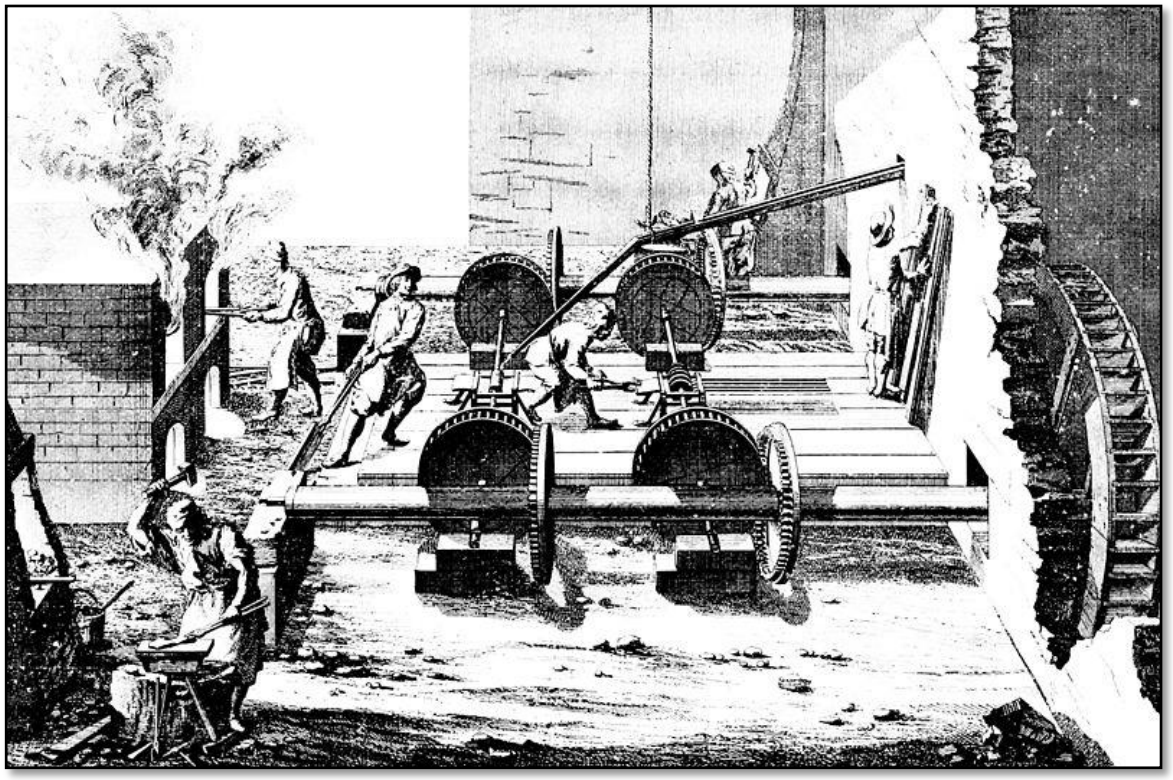


Figure 2.2. A Swedish water-powered slitting mill in operation, 1734.

A bar of iron is heated in the furnace. It is then rolled before being passed through the slitting rolls. The finished rods are being stacked in bundles against the wall.

Source: *Popular Science Monthly*, Vol. 38, 1890, p. 318

[19] Evans and Rydén, pp. 188-189. For a contemporary account of the workings of a slitting mill see J. Thomson (ed.). *Four Topographical Letters [signed, R. P... i.e. Resta Patching] ... upon a Journey thro' Bedfordshire, Northamptonshire, Leicestershire, ... from a Gentleman of London to his brother and sister in town, &c.* (Newcastle upon Tyne, 1757), p. 57.

[20] Whilst there seems to be little doubt about where the first slitting mill was set up, there is less certainty about the date when this occurred. Court and Gale have both suggested 1590, whilst H. W. Dickinson placed it at 1599. Recently, Australian scholar Chris How has challenged both dates. Drawing on William Lambarde's *Peregrinations through Kent* (1576), How placed the origin as 1575 or early 1576. See Court, p. 105; Gale p. 20; Dickinson, p. 11; Chris How, 'Early steps in nail industrialisation' in James W. P. Campbell et al (eds), *Studies in Construction History* (Cambridge: Construction History Society, 2015), pp. 81-90 at pp. 81 and 85.

the development of the iron trade in England and Wales between 1500 and 1815 provides information about the subsequent geographical spread of slitting mills in England during the seventeenth century (Table 2.1). Three points of note emerge from King's data. Firstly, having originated in Kent, the subsequent geographical diffusion of slitting mills during the seventeenth century took a north- Lancashire and Yorkshire by the 1660s and had reached Northumberland by the close of the century. Secondly, the diffusion of slitting-mill technology was a gradual process, taking a full century to spread from Kent to Northumberland. The third and most significant point was the tenfold increase in slitting mills that occurred in south Staffordshire and north-east Worcestershire throughout the seventeenth century. The question is: what motivated entrepreneurs, such as Dudley-born Richard Foley (c.1580-1657), to invest in their construction?

Decade	Kent	S Staffs & NE Worcs	Gloucs	Salop	Yorks	Lancs	N East
1601-1610	2						
1611-1620	2	1					
1621-1630	2	3					
1631-1640	2	4					
1641-1650	2	5	1				
1651-1660	2	5	1	1	1		
1661-1670	2	7	1	1	4	1	
1671-1680	2	7	1	2	4	1	
1681-1690	2	8	1	2	4	1	
1691-1700	1	10	1	2	4	1	1

Table 2.1. Slitting-mill diffusion in England by decade, 1601-1700

Source: Based on Peter King, 'The Iron Trade in England and Wales 1500-1815' (Unpublished PhD thesis: University of Wolverhampton, 2003), pp. 415-417.

2.2.2. Demand-Pull Forces in Practice

While technological innovation facilitated a more efficient and inexpensive way of producing nail rods of appropriate gauges, a 'demand-pull' effect was also beginning to make itself felt; and the technological developments that occurred from the late sixteenth century onwards did so at a most propitious time. In 1720, Isaac Gervaise, a contemporary of Daniel Defoe, published one of the first treatises on political economy, *The System or Theory of the Trade of the World*. In it he

described three levels of manufactures: those in Bare Proportion, those in Great Proportion and those in Small Proportion.[21] 'Manufactures in Bare Proportion', he argued, 'were just sufficient to answer the entire demands of the inhabitants', whilst 'Manufactures in Great Proportion' were 'those which, besides the demand of the inhabitants, furnish the overplus which is transported to the rest of the world'. As we have seen, early methods of making nails meant that they could only be manufactured in 'Bare Proportion'. Accompanying the technological changes occurring in the late sixteenth century, however, was a sustained increase in demand generated by social, architectural, and economic changes that would lift the manufacture of nails firmly into the category of 'Great Proportion'.

The sixteenth and seventeenth centuries were times of agricultural improvements and of increased yields; and, whether by cause or effect, the population of England doubled between 1520 and 1700, with rapid growth being particularly marked between 1560 and 1640. Demand for all commodities grew, especially for foodstuffs, and the larger landowners benefited from high returns on produce.[22] The impact of a growing population overall and of increasing levels of wealth in the upper echelons of society was both quantitative and qualitative. Not only was there an increase in the demand for housing but also for a more refined form of architecture. Referring to the period from c.1570 to the 1640s, W. G. Hoskins called it the 'great rebuilding' of rural England.[23] With church-building at a standstill, the construction of country houses by powerful statesmen, successful merchants and the newly enriched gentry proliferated. Lower down the social ladder, yeomen, husbandmen and craftsmen also began to build anew. Cottages, smithies and barns began to appear in the countryside, and a new developing sense of privacy led to the introduction of an increasing number of rooms, staircases, floorboards, doors and glazed windows.[24] These new architectural elements, fittings and forms of decoration required new methods of fixing building materials, and were accompanied by demand for a more diverse range of nails: lath nails for walls

[21] Isaac Gervaise, *The System or Theory of the Trade of the World* (London: Woodfall, 1720), p. 21.
[22] Kate Tiller, *English Local History: An Introduction,* 2nd edn (Stroud: Sutton, 2002), pp. 121-122.
[23] W. G. Hoskins, 'The rebuilding of rural England, 1570-1640', *Past and Present,* 4, November 1953, pp. 44-59 at pp. 45 and 54.
[24] Ibid.

and ceilings; battin nails to secure panes of glass; brads to secure floorboards and staircases, and dog nails to fix hinges. Records of nail usage in this period are hard to find. However, Chamber's *Cyclopaedia* published in 1741 stated that it was usual in house-building to allow 500 nails per bundle of five-foot laths for roofing, and 240 per square yard of flooring.[25] These figures, whilst published a century after the 'great rebuilding', give some idea of the appetite for nails which new architectural developments had created.

At the same time as the 'great rebuilding' was occurring, so Britain was extending its interests overseas. The Pilgrim Fathers had landed in America in 1620, and by the time that Jamaica was secured in 1655, a British presence in the Caribbean was well-established. The flag had been planted across the Atlantic and, inevitably, trade and people followed. Even by the mid-seventeenth century, it was clear that sugar was the greatest asset to be drawn out of the West Indies. Between the late 1660s and the late 1720s, imports of sugar into England and Wales rose from about 26.2 million lbs per annum to over 90 million lbs.[26] The implications of colonisation and a burgeoning overseas trade for the English nail trade are clear, even if they are not supported by available documentary evidence. Trade required ships and shipbuilding required nails such as deck spikes and scupper nails. Sugar was transported in wooden casks, thus stimulating the production of cask nails; and nails were required for the construction of fortifications, dwellings, mills, refineries, wagons and warehouses. Thus the improved supply of nails facilitated by technological innovation was progressively matched by an ever-increasing demand both at home and overseas. However, while this may help to explain the growth of British nail production, it fails to throw light on the geographical development of the English nail-producing districts. Why did nail-making thrive in the places it did, and why did a relatively small part of the West Midlands region become the dominant nail-producing district in the country? One way of answering these questions is by using proto-industrialisation as an analytical tool.

[25] Rowlands, *Masters and Men* (Manchester: Manchester University Press [hereafter MUP], 1975), pp. 125-126.
[26] Ibid, p. 266.

2.3. Proto-industrialisation

The concept of proto-industrialisation was first expounded in the *Journal of Economic History* in 1972.[27] The author was Franklin Mendels and the article was based on his doctoral study of the relatively rapid population growth experienced in an internal region of eighteenth-century Flanders, where a peasant population combined agriculture with part-time linen manufacture, much of the output of which was sold through overseas markets. According to Donald Coleman, the theory 'rattled around in the corridors of economic history' throughout the 1970s, causing Mendels to modify his concept.[28] This amended version emphasised five key features, the first of which was that the unit of reference was the region. Secondly, and central to the theory, was that the regional growth of rural industry involved peasant participation in handicraft production for the market. A third feature was that the market for the goods produced by this activity lay *outside* the region, often beyond the national frontier. Fourthly, there was an essential linkage between proto-industrial activity and commercial agriculture. Finally, towns within the region were associated with the process because of their marketing facilities and because they provided the merchants of the putting-out system who directed the manufacturing activity dispersed in the surrounding countryside.[29]

The concept has not been without its critics, particularly in cases where it is applied to the British experience.[30] As Julie Marfany pointed out, many empirical studies have demonstrated the lack of a connection between the spread of dispersed rural manufacturing in early modern Europe and the later development of factory industry.[31] Nevertheless, she argued in support of the continued use of proto-industrialisation as a 'research strategy'. One reason, she claimed, was that 'it is

[27] Franklin R. Mendels, 'Proto-industrialization: The First Phase of the Industrialization Process', *Journal of Economic History*, vol. 32 (1), March 1972, pp. 241-261.
[28] D. C. Coleman, 'Proto-industrialization: a concept too many', *Economic History Review*, vol. 36 (3), August 1983, pp. 435-448 at p. 435.
[29] See Coleman, pp. 436-437.
[30] In addition to Coleman, see, for example, Rab Houston and K. D. M. Snell, 'Proto-industrialization? Cottage industry, social change, and Industrial Revolution' *The Historical Journal*, vol. 27 (2), June 1984, pp. 473-492; and Sheilagh C. Ogilvie, 'Proto-industrialization in Europe', *Continuity and Change*, 8 (2), 1993, pp. 159-179.
[31] Julie Marfany, 'Is it still helpful to talk about proto-industrialization? Some suggestions from a Catalan case study', *Economic History Review*, vol. 63 (4), November 2010, pp. 942–973 at p. 942.

undeniable that many areas of Europe between the sixteenth and eighteenth centuries witnessed the rise of a new form of industrial production for non-local markets, production that usually remained rural and domestic in nature, and was practised alongside agriculture'.[32] Coleman, however, was sceptical about the alleged special status of the theory of proto-industrialisation: he was not alone. Peter Musgrave argued that, to be valid, proto-theory had to clearly represent a new departure in the ownership of the means of production and in the relationship of worker to employer, and of labour to capital. He concluded that 'it is by no means clear that it does so'.[33]

For every sceptic, however, there have been those, such as François Crouzet, who found the concept 'useful'.[34] Maxine Berg, Pat Hudson and Michael Sonenscher were more enthusiastic, claiming that the concept had provoked sophisticated analysis and research on a vast spectrum of socio-cultural experience.[35] Jordan Goodman and Katrina Honeyman were more specific. Proto-industrialisation theory, they argued, was valuable as a conceptual tool rather than a simple description since it correctly emphasised the dynamic of rural industrial production from 1600 onwards. Another significant point was made by Pat Hudson when she stressed that the industrial revolution did not displace proto-industrialisation but rather encompassed, integrated and further developed it.[36] The concept is, above all, an essential tool in helping to understand how and why the West Midlands nail trade developed.

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[32] Marfany, p. 943; and see Coleman, p. 443, where he challenged the term 'de-industrialisation', a term used by Mendels. Coleman argued, that 'de-industrialisation is happening *today* in some parts of the older industrialised countries' but that 'in the context of the pre-industrial *past* the term must logically be 'de-proto-industrialisation'. 'Proto-industrialisation" is bad enough,' he concluded, 'but de-proto-industrialisation is barbarous.'

[33] Peter Musgrave, *The Early Modern European Economy* (Basingstoke: Macmillan, 1999), p. 73.

[34] François Crouzet, *A History of the European Economy, 1000-2000* (Charlottesville, VA: University of Virginia Press, 2001), p. 62.

[35] Maxine Berg, Pat Hudson and Michael Sonenscher (eds), *Manufacture in Town and Country Before the Factory* (Cambridge: CUP, 2004), p.16.

[36] Pat Hudson, 'Industrial organisation and structure', in Roderick Floud and Paul Johnson (eds), *The Cambridge Economic History of Modern Britain, vol. 1, Industrialisation, 1700-1860* (Cambridge: CUP, 2004), pp. 28-56 at p. 34.

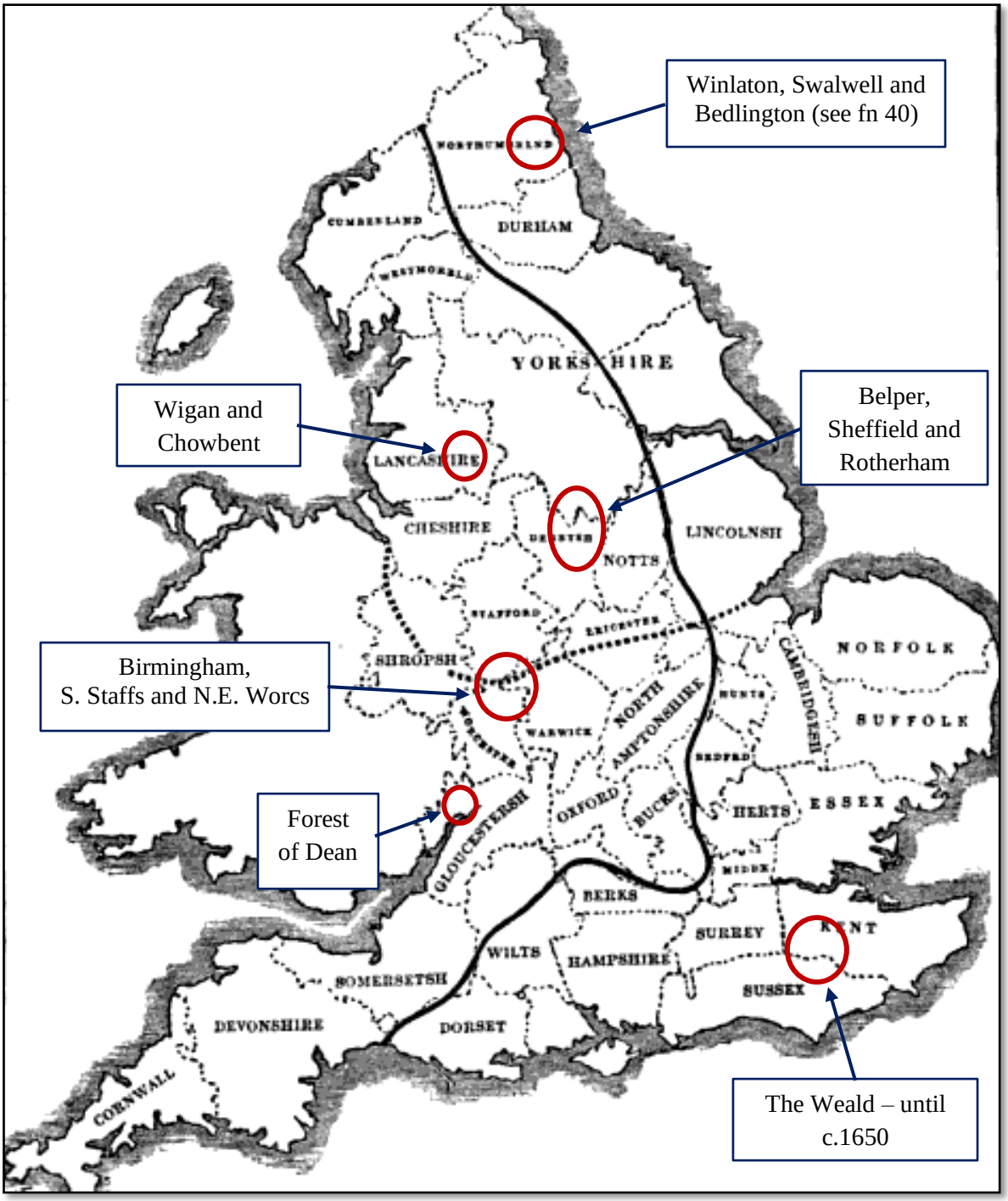


Figure 2.3. Sir James Caird's agricultural map of England (1852) with the nail-making districts superimposed

Source: Adapted by the author from Sir James Caird, *English Agriculture in 1850-51* (London: Longman, Brown, Green and Longmans, 1852), frontispiece

Two elements of current thinking about proto-industrialisation in England serve as a backdrop to the discussion of the proto-nail trade that follows. They concern the timeframe of proto-industrial development and the location of proto-industry within a national agrarian context. The generally-accepted time frame of proto-industrial growth in England is from the mid-sixteenth century onwards. Despite Coleman's counter-argument that this was three hundred years too late, since England was feeding overseas textile markets from the thirteenth century, proto-industrialisation is now specifically associated with the extension and development of world markets for mass-produced goods throughout the seventeenth and eighteenth centuries: markets that grew at a pace to which the traditional urban producers could not respond.[37]

Hudson emphasised the association between the location of rural industries with areas of less fertile soils, where growing populations could not be sustained by the agrarian sector alone.[38] Such areas were to be found in the West Midlands and the north of England. These areas contrasted with those in the south and east that had benefited from the improvements of the 'agricultural revolution', which in turn had given them a comparative advantage. In 1729, Defoe had commented on this agro-geographical divide, noting the tenfold increase in the land values of the 'corn countries' during the seventeenth century.[39] The split was later referred to in agriculturist Sir James Caird's *English Agriculture in 1850-1851* (1852). On a map of England (Figure 2.3) Caird superimposed a line dividing the country in two, explaining that counties to the east of the north-south line were regarded as the chief corn districts whilst those to the west were the principal 'grazing, green crop and dairy districts'.[40] It was in these grazing districts that the English proto-nail industry developed from the mid-seventeenth century onwards.

[37] Coleman, p. 440.
[38] Pat Hudson, 'Proto-industrialization in England', in Sheilagh. C. Ogilivie and Markus Cerman (eds), *European Proto-industrialization* (Cambridge: CUP, 1996), pp. 49-66 at p. 49.
[39] Daniel Defoe, *A Humble Proposal to the People of England for the Increase of their Trade and Encouragement of their Manufactures* (London: Charles Rivington, 1729), p. 12.
[40] Sir James Caird, *English Agriculture in 1850-51* (London: Longman, Brown, Green and Longmans, 1852), frontispiece.

2.3.1. The English Proto-nail Trade

Whilst hardly equating to the harsh, mountainous regions that underpinned Mendels's thesis, the districts in which the English proto-nail industry was located were invariably areas of relatively low-quality soil. The heavily-wooded Forest of Dean; the heathland and wooded countryside of south Staffordshire and north Worcestershire; and the Pennine uplands of Derbyshire, Lancashire and south Yorkshire all shared a common form of agriculture and all supported a proto-nail-making industry.[41] The soil and terrain of these districts made them unsuitable for arable farming. In the West Midlands, the southern Feldon parts of Warwickshire and Worcestershire were, according to Leland, 'for the most part champion, somewhat barren of wood, but very plentiful of corn'.[42] Much of the region, however, was pasture and grassland. In Lancashire, too, the 'industrial zone' was to be found in areas of upland pastoral farming, while in the Hallamshire area of Yorkshire farming consisted of meadow, pasture and arable. The significance of pastoral farming was that it made fewer demands on labour than arable farming. This, combined with the seasonality of farming, meant that farmers and smallholders were free to supplement their incomes by adopting a second form of employment; and in those areas where resources of iron and coal were readily available, the second occupation was often nail-making.

David Hey referred to nail-making as 'the most humble and least skilled of all the metal crafts of the Sheffield district'.[43] The word 'humble' in this context is ambiguous. Modest and simple, certainly; but was nail-making really 'the poorest and most despised of all trades', as Maxine Berg maintained?[44] 'The nailers', she wrote, 'used their plots to eke out a subsistence which they failed to maintain out of the measly piece rates paid by the nail factors and putting-out ironmongers'.[45] Berg argued that nailing was an essential occupation for the low-income smallholder rather than

[41] While nail-making also occurred in the north-east around Winlaton, Swalwell and Bedlington, it did not fit the proto-industrial mould. See Section 2.4.1.
[42] Della Hooke, *England's Landscape: The West Midlands* (London: Collins, 2006), p. 234-235.
[43] David Hey, *The Rural Metalworkers of the Sheffield Region: A Study of Rural Industry before the Industrial Revolution*, Leicester University Department of English Local History Occasional Papers 2nd Series, no. 5 (Leicester: Leicester University Press, 1972), p. 31.
[44] Maxine Berg, *The Age of Manufactures, 1700-1820*: *Industry, Innovation and Work in Britain* 2nd edn (London: Routledge, 1994), p.268.
[45] Ibid, p. 92.

one that offered the opportunity for additional income and thus security against poor harvests or a downturn in trade. This argument, however, has not gone unchallenged. Musgrave was clear: 'It cannot be repeated enough', he wrote, 'that it is inappropriate and misleading to project back on to the economic activities of the early modern period judgement derived from the different economic circumstances of the Industrial Age.'[46] Hey too argued that the conditions prevalent in the Victorian era should not be allowed to obscure the fact that, before the advent of machines, the rural industrial communities were not ones of squalor and misery: 'the average nail-maker had as adequate a standard of living as the majority of other rural metalworkers'.[47] Rowlands added to this clamour by claiming that 'it was emphatically not the case' that the West Midland nail-makers, as with others involved in the region's rural industries, were forced to eke out an inadequate living through 'bye employments'.[48]

This slight yet relevant digression aside, Figure 2.4 shows how the key nail-making areas of England lay outside the commercial grain-producing belt. What it does not show is that large-scale nail-making occurred close to ready supplies of charcoal wood and coal, on the one hand, and of iron on the other – the basic raw materials required by the nail-maker. In the second half of the seventeenth century, the search for lower costs through a more plentiful supply of woodland fuel together with better transport facilities began to drive the iron trade north and westwards from the Weald, and with it the focus of nail-making shifted as well.

2.3.2. The Northern Proto-nail Trade.

Proto-nail trades were to be found in south-west Lancashire, Derbyshire and south Yorkshire: districts where smallholders relied on the dual occupations of pastoral farming and nail-making to sustain them.[49] The topographical and agricultural conditions of these areas were suited to a proto-nail industry. To the east of the central Lancashire plain lay an upland area unsuited to arable

[46] Musgrave, p.42.
[47] Hey, *Metalworkers*, pp. 5, 32 and 39.
[48] Rowlands, *Masters and Men*, p. 13. See also Evans and Rydén, p. 190.
[49] Jon Stobart, *The First Industrial Region: North-west England c.1700-1760* (Manchester: MUP, 2004), p. 113; C. B. Phillips and J. H. Smith, *Lancashire and Cheshire from AD 1540* (London: Longman, 1993), p. 53.

farming. Derbyshire, as Caird explained, was 'a dairy and rearing district, the growth of corn being of quite inferior consideration', and a comparable situation was also found on the western side of the south Yorkshire coalfield, which reached down from Leeds to Rotherham. In Lancashire nail-making was carried on in the settlements surrounding the villages of Upholland and Chowbent, five miles to the east of Wigan. The Derbyshire nailers plied their trade around Belper, Wirksworth and along the Derwent valley, their Yorkshire counterparts operating within a few miles' radius of Sheffield, in the upland areas around Ecclesfield to the north and the villages of Norton and Eckington to the south. All three districts had access to local supplies of coal although, whereas the Derbyshire and Yorkshire nail districts benefited from local supplies of iron, those around Chowbent had to rely on Yorkshire iron brought by packhorse across the Pennines.

The presence of slitting mills partly determined the size of the nail trades of Lancashire, Yorkshire and Derbyshire. As Table 2.1 shows, there was only one slitting mill in Lancashire in 1700, the mill lying on the banks of the River Douglas six miles north-west of Chowbent, whereas by 1670 there were possibly three slitting mills within a ten-mile radius of Sheffield, with none of the nail-making communities being more than three miles from a mill.[50] When the Swedish industrialist Reinhold Angerstein visited Derbyshire in 1754, he recorded slitting mills at Derby and Marmey: by 1789, according to Stanley Chapman, there were no fewer than seven slitting mills lining the River Derwent.[51]

Derbyshire nailers supplied nails to the newly-built textile mills, whilst in Lancashire some nailer families set up shops and warehouses of their own in places such as Preston, and Warrington, from where they supplied iron and sold the finished nails. When Angerstein visited Chowbent, he noted that the town had a 'considerable trade in nails with Liverpool, and in the town and its

[50] Water-powered mechanisms such as blast furnaces and slitting mills were not well represented in Lancashire's main industrial zone until the mid-eighteenth century. Geoffrey Timmins, *Made in Lancashire: A History of Regional Industrialisation* (Manchester: MUP, 1998), p.41; Hey, *Metalworkers,* p.6.
[51] R. R. Angerstein, *R. R. Angerstein's Illustrated Travel Diary, 1753-1755: Industry in England and Wales from a Swedish Perspective*, trans. by Torsten and Peter Berg (London: Science Museum, 2001), pp. 202-203; Stanley Chapman, 'The Strettons and the Lowes: Sir Richard Arkwright's builders and millwrights' in Chris Wrigley (ed.), *Industrialisation and Society in Britain: Cromford and Beyond in the Era of the Industrial Revolution* (Cromford: The Arkwright Society, 2016), pp. 15-38 at p. 20.

surroundings there are estimated to be 300 nailers'.[52] The Yorkshire trade, dominated by the Spencer Syndicate, was more powerful than both its Lancashire and Derbyshire neighbours. The Syndicate was formed by a closely-connected group of ironmasters who owned iron mines, furnaces and forges, and who produced nail rod at their three slitting mills.[53] Although the Syndicate produced nails for the local market, it also had agents in London. Given the difficulty of transporting nails over the Pennines to Liverpool, nails were sent from the Syndicate's warehouse at Rotherham Wharf via the new River Don Navigation to Hull. From Hull they were taken to London (often serving as ballast) and thence sold on the London market or exported to the West Indies and the American colonies.[54] To a greater or lesser extent, therefore, the nail-making areas lying adjacent to the southern Pennines fitted the framework of a proto-nail industry. Nail-making was one element of a dual occupation undertaken by smallholders operating on the putting-out system. This system was managed by merchants who not only produced and supplied the nailers with rod iron but also sourced the markets through which the nails were sold, both at home and overseas.

The northward march of slitting-mill technology throughout the seventeenth century reached the North East by1700. As Chris Evans has argued, however, 'the North East owed nothing to a proto-industrial phase of development in which cottage industry penetrated the interstices of rural society'.[55] To begin with, the link with part-time agriculture was missing. The region was not one of fragmented landholdings owned by farmer-nailers as it was in Wigan and Sheffield, but comprised large, commercially-farmed estates. Neither was nail-making carried out through the putting-out system. Rather, it was founded upon a highly-centralised method of production instigated in the 1680s by Ambrose Crowley. Crowley had served an apprenticeship in London, subsequently establishing himself as an independent ironmonger. Frustrated by the slow and costly

[52]Angerstein, p. 303.
[53] A. Raistrick and E. Allen, `The south Yorkshire ironmasters, 1690-1750', *Economic History Review*, Old series, vol. 9 (2), May 1939, pp. 168-185 at p. 168.
[54] Hey, *Metalworkers*, pp. 42-44.
[55] Chris Evans, 'Manufacturing iron in the North East during the eighteenth century: the case of Bedlington', *Northern History,* vol. 28, 1992, pp. 178-196 at p. 179.

carriage of nails from the West Midlands, Crowley moved north. Eventually, in 1701, he established a manufactory at Winlaton, six miles south-east of Newcastle upon Tyne and, six years later, strengthened his market position by acquiring a competing business at nearby Swalwell.[56] When Angerstein visited Swalwell in 1754, he found a centralised production unit comprising a foundry, forges and a slitting mill; and, in addition to workshops producing hardware such as hoes, machetes and harpoons, there were two workshops producing ship's nails and ten more for the manufacture of smaller nails.[57] A mile up-river lay Winlaton Mill where a slitting mill produced nail rods for the 300 nailers.[58] Together, the Swalwell and Winlaton slitting mills consumed about 800 tons of Swedish and Russian iron per annum, 'mostly for nails'.[59] A similar centralised business was formed by the London-based firm of Harrison, Bannister & Hallett at Bebside, sixteen miles north-east of Swalwell and sitting alongside the River Blyth.[60] Both the Crowley works and those at Bebside were conveniently located for the despatch of finished nails to the North Sea ports at Newcastle, Shields and Blyth; and from there, nails entered what Evans and Rydén evocatively referred to as 'the coils of the international market'.[61]

2.3.3. The West Midlands Proto-nail Trade

If nail-making in the North East owed nothing to a proto-industrial form of production, nail-making in the West Midlands epitomised it. The first criterion of the Mendels concept was the need to establish the region as a point of reference. Although considerable numbers of people were occupied in the hand-made nail trade by the late eighteenth century –with numbers measured in tens of thousands rather than in hundreds, as was the case in the northern nailing districts – the geographical area in which commercial nail-making occurred was relatively small. Known as the Black Country after c.1840, the district covered an area of roughly seventy-five square miles, and there are several topographical and geological features of the district that are crucial to an

[56] David Cranstone, 'From slitting mill to alloy steel: the development of Swalwell ironworks', *Industrial Archaeology Review*, vol. 33 (1), 2011, pp. 40-57 at pp. 41-42; Evans and Rydén, p.188.
[57] Angerstein, p. 260.
[58] Ibid.
[59] Ibid, p. 266.
[60] Evans and Rydén, p.195.
[61] Ibid.

understanding of why the proto-nail industry became established where it did. The district not only lies on the western margin of the Birmingham Plateau but there is also a diagonal ridge rising above 700 feet running south-east from Sedgley to Northfield. The ridge, the western edge of which is dissected by deep, steep-sided valleys, separated the two main sections of the nail-making district. Much of the district lay on the south Staffordshire coalfield, which outcropped around Tipton, Dudley and Lye. Whilst it is difficult to generalise about the soils of this upland area, ranging as they did from the thin soils on the ridge, to the acid soils of West Bromwich Heath, to the 'stiff, tenacious, and often water-logged clays on the coal measures and glacial drifts', they possessed one common feature in their unsuitability for arable farming.[62] A further characteristic was the existence of large expanses of common ground: 'wastes' such as Stourbridge Common, Short Heath and Lye Waste.

Running north-south along the western edge of the West Midlands nail-making district was another vital physical feature, the River Severn. The Severn was a broad toll-free waterway navigable by cargo vessels for over 120 miles from Pool Quay in mid-Wales to Bristol. Much smaller than the Severn, but of considerable significance for the nail trade, were the fast-flowing Rivers Stour and Tame. The Stour rose in the Clent Hills and flowed south-west to join the Severn a few miles south of Bewdley, whilst the Tame rose at Oldbury before flowing east and then north to its confluence with the River Trent near Alrewas.

The second of Mendels's criteria for proto-industrialisation was that the regional growth of rural industry involved peasant participation in handicraft production for the market. As noted above, pastoral farming is generally regarded as less labour-intensive than arable farming.[63] Pauline Frost noted that the upland stock-rearing districts of England suffered from a considerable degree of concealed under-employment in the seventeenth century and that smallholders sought alternatives

[62] Pauline Frost, 'Yeomen and metalsmiths: livestock in the dual economy in South Staffordshire 1560-1720', *Agricultural History Review,* vol. 29, 1981, pp. 29-41 at p. 31; E. S. Twyman, 'Soils' in M. S. Wise (ed.), *Birmingham and its Regional Setting,* (Birmingham: British Association, 1950), pp. 55-64 at p. 56.
[63] But see Timmins, p. 38. Timmins questions this orthodoxy and says that it is 'not clear why pastoral farming should have generated significantly more surplus labour than arable farming'.

to agriculture as a way of supplementing meagre incomes.[64] This was particularly so given both the seasonality of farming and a median herd size of only six animals.[65]

Inventories help to provide a picture of the dual occupations of some of these smallholders. For example, Sedgley nailer William Wilkes's inventory, dated 13 May 1653, listed: one pig trough, one brown cow, one old cow, two calves as well as 'corn in the field'. The inventory also included a broad selection of nails – small hob nails, tenter hooks, clout nails, frost nails, lath nails, horse nails and ox nails.[66] Frost nails were fixed to a horse's hoof to prevent the animal from slipping on icy ground, yet Wilkes's inventory did not include a horse; and since very few craftsmen would have owned, or even needed, oxen to help cultivate the land, it is probable that William Wilkes was a typical farmer-nailer. But Wilkes and his like were not the only economic class to inhabit the coalfield parishes of the plateau. The large open wastes encouraged the immigration of landless families from the surrounding fielden counties and they, along with the area's poorer husbandmen and landless agricultural labourers, swelled the potential industrial labour force.

Nail-making was a classic handicraft and putting-out industry, one that suited both employee and employer alike. All that the nailers required were small workshops attached to the side of their dwellings with a hearth and bellows. Tools were cheap – hammers, heading tools and an anvil (often no more than a block of stone) – and coal was readily available, sometimes breaking through the surface of the ground. Nail-masters' needs were also simple: a warehouse to store both nail rods and finished nails and, depending on the size of the business, a counting house and a clerk. Just such a warehouse was the 'large, strong-built nail warehouse, with a remarkably well-timbered store room and counting house over' that was advertised for sale in Stourbridge in 1814.[67] Larger concerns would have a main warehouse in a prominent town, such as Dudley or Stourbridge, with smaller warehouses in the outlying districts.

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[64] Frost, p. 32.
[65] Ibid, p. 36.
[66] John S. Roper, *Sedgley Probate Inventories 1614-1787* (Woodsetton: privately printed, 1960), p. 16.
[67] *Aris's Birmingham Gazette,* 11 Apr 1814.

Doubtless, this form of organisation was replicated in other English nail-making districts, but it was the sheer size of the workforce that set the West Midlands nail trade apart from the others. As members of a putting-out industry, nailers were scattered across the district. Although the employment of women and children was rare in the seventeenth century, as the eighteenth century progressed nail-making increasingly involved both sexes from the age of seven across the generations. For these reasons alone, calculating the number of people who worked as nail-makers was never exact. In April 1812, while giving evidence to the parliamentary committee assessing the impact of the Orders in Council, Birmingham banker and nail-ironmonger Thomas Attwood was asked how many people worked in the nail trade within fifteen miles of Birmingham. He replied: 'I speak within bounds when I say 30,000, it may be 50'.[68] Appearing before the same committee, William Whitehouse, a West Bromwich nail-ironmonger was asked how many nailers he employed, to which he replied: 'From five to seven hundred'.[69] Both answers appear to have been nothing more than informed guesswork. Likewise, Berg's assertion that 'by 1770 there were 10,000 employed in the trade in the Midlands' needs to be treated with caution.[70] Not only is it geographically vague but the figure seems too precise. Even more vague and unsubstantiated was an article by Charles Hibbs in *The Technical Educator* (1871), who stated that 'at one period, it was computed that 60,000 persons earned their existence' through employment in the nail trade.[71] Parish registers offer more reliable evidence of the high density of nailers in Birmingham and its neighbourhood from the 1650s onward. For example, in West Bromwich between 1653 and 1659, of the 212 baptisms where the father's occupation was given, 122 were of nailers' children (57.6 per cent); and Harborne burial registers between 1732 and 1766 showed that 37 out of 57 burials were of former nailers (64.9 per cent).[72] Court described West Bromwich as 'a nest of nailers',

[68] PP. 1812 (210) Minutes of evidence taken before the Committee of the whole House of Commons relating to the Orders in Council. vol 3, p. 2.
[69] Ibid, pp. 19-20.
[70] Berg, *Manufactures,* p. 268.
[71] Charles Hibbs, 'Great Manufactures of Little Things – IX. Nails' in *The Technical Educator, an Encyclopaedia, vol. IV* (London: Cassell, Petter & Galpin, 1871), pp. 11-12 at p. 11.
[72] M. W. Greenslade and J. G. Jenkins (eds), *Victoria County History, Staffordshire,* vol. 2, (London: OUP, 1967), p. 239; Stuart Davies, 'The nailmakers of Harborne', *The Birmingham Historian,* vol. 2, Spring/Summer 1988, pp. 1-9 at p. 3.

while the poet William Shenstone's house and park at the Leasowes in Halesowen was said to be surrounded by nailers.[73]

So numerous a labour force, and one so geographically dispersed, could not have operated effectively without some form of overarching management structure. This was provided by an industrial organisation outlined in Figure 2.4. Two of the key players were the iron-masters and the nail-ironmongers. In the early eighteenth century, thirty or so ironworks lined the banks of the River Stour. Four of these were owned by the most powerful iron-making concern in the Midlands, the Knight Partnership, and could produce 2,000 tons of bar iron annually.[74] By the 1740s, upwards of seventy ironmongers were dealing with the Knight Partnership alone.[75] Some of these were petty chapmen; others were major employers supplying dozens of nailers at a time. The nail-ironmongers bought nail rods from the iron-masters, which were put into 60lb bundles. The bundles were then sold to the nailers on credit. The nailers worked the rods into nails and would then sell them back to the ironmonger or his agent.

The ironmongers came from a variety of backgrounds. The elder Francis Homfray was born near Rotherham but moved to Old Swinford where he became involved in the local iron industry, setting himself up as a dealer in iron goods and later as a slitter.[76] Joseph Turton was the son of a Wolverhampton ironmonger; Sampson Lloyd was a farmer in Herefordshire before moving to Birmingham; and the Jessons were West Bromwich yeomen.[77] Disparate as their backgrounds may have been, almost all had one thing in common: they belonged to a network of carefully cultivated ties made through business, on the one hand, and through Quakerism, on the other.

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[73] Court, p. 111; Hugh Miller, *First Impressions of England and its People* (Boston MA: Gould and Lincoln, 1865), pp. 170, 173 and 198-199. I am grateful to Dr John Hemingway for the latter reference.
[74] Evans and Rydén, *Atlantic World*, p.192.
[75] Ibid.
[76] Jacob M. Price, 2004, "Crowley, Sir Ambrose (1658-1713), ironmaster." *Oxford Dictionary of National Biography.* at. http://www.oxforddnb.com/view/10.1093/ref.odnb/9780198614128.001.0001/odnb-9780198614128-e-37328 9 (accessed 11 February 2015).
[77] Rowlands, *Master and Men*, pp. 110-111.

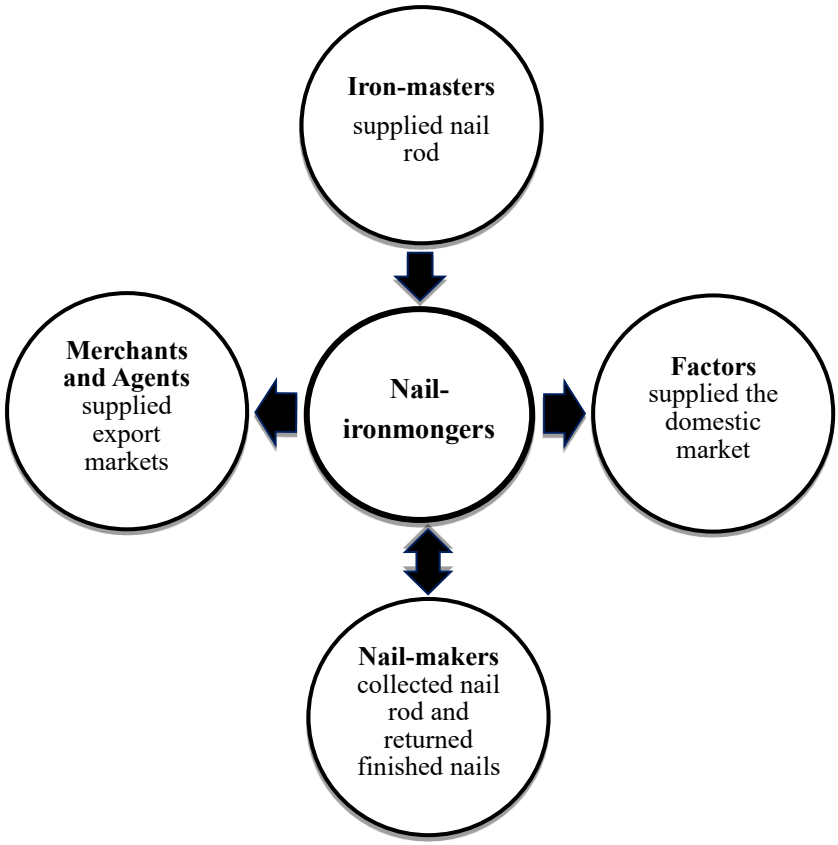


Figure 2.4. Outline organisation of the hand-made nail trade

The network of nail-ironmongers formed by such alliances had hubs in the major towns of the district – Wolverhampton, Dudley and Birmingham – and created a shared pool of both technical knowledge and a knowledge of markets. The Quaker connection was particularly strong in Birmingham. The younger Sampson Lloyd moved to Birmingham in 1698, where he established his nail-ironmongery business, opened a warehouse in Worcester Street, and took up residence in 1710 in a commodious house in Edgbaston Street.[78] Lloyd's brother-in-law, John Pemberton, also an ironmonger, lived on the high ground at Bennetts Hill, whilst Richard Parkes – ironmonger and property developer – moved from Wednesbury to Birmingham in 1713.[79] Paradoxically, as the nail-ironmongers began to concentrate in the town so the nature of Birmingham's metal trades began to change. Ferrous metal, used for so long by the town's craftsmen, began to be replaced by

[78] Humphrey Lloyd, *The Quaker Lloyds in the Industrial Revolution* (London: Hutchinson, 1975), pp. 81-8
[79] Ibid, pp. 97-100.

other metals such as brass. Birmingham was becoming a town of specialist workshops characterised by a division of labour, where the production of guns, jewellery and other sophisticated luxury items gradually replaced the manufacture of simple hardware such as nails. Changes in manufacturing methods and materials necessitated new methods of working; no longer was the traditional family enterprise an appropriate form of industrial organisation. Hutton summarised changes in the nail trade:

> We cannot consider it a trade *in*, so much as *of* Birmingham; for we have but few nail-makers left in the town: our nailers are chiefly masters, and rather opulent. The manufacturers are so scattered round the country, that we cannot travel far, in any direction, out of the sound of the nail-hammer. But Birmingham, like a powerful magnet, draws the produce of the anvil to herself.[80]

Yet it would be wrong to suggest that the new trades had 'pushed' nail-making out of Birmingham and into the Black Country. Birmingham industry may have modernised, but so too had the organisation and infrastructure of the commercial nail trade in the Black Country. The demand for nails assured the prosperity of the great iron dynasties and of the nail-ironmongers; and, according to Humphrey Lloyd, 'it also nourished a race of camp-followers': ironmongers' agents and nail-factors, warehouse-keepers and clerks, packhorse owners and boatmen.[81] The term 'camp-followers' undervalues the part that such people played in enabling the nail trade to function.

Although there were sources of ironstone in the district, they were never enough to meet the nail-makers' needs. Though they may not have known it, the nailers hammered iron bought from Swansea, Shropshire and Cumberland: and from Sweden, Spain and Russia. Much of the iron was carried by boat along the Severn and off-loaded at the inland ports of Wribbenhall and Bewdley. There, both sides of the river were lined with warehouses operated by long-established families of warehousemen. From the port, iron bar was carried by packhorse to the slitting mills. The same process was used in reverse for the distribution of finished nails. Nailers took nails to the ironmongers' warehouses, where they were sorted, weighed and stored. Some of the warehouses

[80] William Hutton, *The History of Birmingham*, 2nd edn (Birmingham: Nichols, 1783), p. 83.
[81] Lloyd, p. 111.

were small, often single rooms in an ironmonger's own home; others were larger, the Crowley Company's warehouses at Stourbridge holding 131 tons of nail rods when inventoried in 1728.[82]

One of the key elements of Mendels's concept of proto-industrialisation was that the market for goods produced by a rural industry was to be found outside the region, often beyond the national frontier. Such was the case with the West Midlands nail trade. Another addition to the Quaker network of iron-masters and nail-ironmongers was the Bristol merchant Graffin Prankard. Emerging into the commercial life of Bristol during the first decade of the eighteenth century, Prankard became the leading iron merchant in western England; and it was he who linked the bar-iron producers of central Sweden with the trans-Atlantic markets in the American colonies and the West Indies. In the spring, his ship sailed for Stockholm to collect a cargo of iron, returning to Bristol in July. From there, Prankard sold the iron in markets stretching from Dorset in the south to Shrewsbury in the West Midlands.[83] By far his largest market was to be found in Birmingham and the nail-making district of south Staffordshire and north-east Worcestershire which, between 1732 and 1739, took 74 per cent of his imported Swedish iron.[84] Bags of finished nails, each one of which would hold between 10,000 and a million nails, were collected from Bewdley, carried down the Severn to Bristol, from where Prankard's ship would convey them to South Carolina. Whilst local production figures are poorly documented, aggregate figures for the export of British nails between 1725 and 1750 reveal an increase of 156 per cent, with 14,442 cwt exported in 1725 and 36, 971 cwt by mid-century.[85]

2.4. Early Developments in British Nail Manufacture Technology

Despite the existence of large iron dynasties, British nail production in the mid-eighteenth century was indisputably lodged in the epoch of 'handicraft technology'. Although hand-tool technology would remain a significant feature of midland nail production throughout the nineteenth century,

[82] Rowlands, *Masters and Men*, p. 84.
[83] Chis Evans, Owen Jackson, Göran Rydén, 'Baltic iron and the British iron industry in the eighteenth century', *Economic History Review*, vol. 55 (4), November 2002, pp. 642-665 at pp. 646-647.
[84] Ibid, p.653.
[85] Paul Langford, *A Polite and Commercial People. England 1727-1783* (Oxford: Clarendon Press, 1998), pp. 169-170.

green shoots of change began to appear in the late 1760s as new methods of producing nails were explored. The first signs of change emerged in 1769 when Bordesley iron-founder Joseph Ashton was granted a patent for 'a method of casting and making coffin nails and tacks out of a form of pig iron commonly called cast metal'.[86] But was casting the way ahead for British nail manufacture? If not, what was the nature and extent of domestic inventive activity?

Casting was cheaper than forging in that it obviated the need for time-consuming and costly processes such as hammering, rolling and slitting; and in 1771 Ashton was granted a second patent, which extended the range of nails produced by casting to ten different types.[87] However, although casting as a method of producing nails continued throughout the nineteenth century and into the twentieth, and despite the cheapness of the product, cast nails had limited usage.[88] As *The Engineer's and Mechanic's Encyclopaedia* (1836) explained: 'From their great brittleness, [they] are applicable to comparatively few purposes, such as the nailing of fruit trees to garden walls, the lathing of plasterers, coarse shoes and boots etc.'[89] A few years earlier, *The Register of Arts* (1828) had explained: 'In the state that [cast nails] come from the mould, they are frequently nearly as brittle as glass; by the common process of annealing, that brittleness is lessened.'[90] Annealing is a method by which metal is heated to a pre-determined temperature, held at that temperature for a certain time, and then cooled to room temperature. The procedure improves the ductility of the metal and reduces its brittleness. The limitations of cast iron as a material for nail-making were such that Gale believed that 'it would never serve for, say, a knife, an axe or a nail'.[91] Whilst this

[86] Joseph Ashton (1769), Making and casting coffin nails and tacks out of cast-iron. Patent No. 938; See T. S. Ashton, *Iron and Steel in the Industrial Revo*lution (Manchester: MUP, 1963), p. 39; Richard B. Prosser, *Birmingham Inventors and Inventions, being a contribution to the industrial history of Birmingham* (Birmingham, 1881; repr. Wakefield: S. R. Publishers, 1970), pp. 70-71. The tacks were to secure lace to the coffin.
[87] Joseph Ashton (1771), Casting and making nails […] from pig-iron. Patent No. 992; see E. J. Lenik, 'A study of cast iron nails', *Historical Archaeolo*gy, vol. 11, 1977, pp. 45-47. Casting was also suited to producing the complex shapes of decorative nails.
[88] The Ashton foundry at 36-39 Cheapside, Bordesley appeared in trade directories from the early nineteenth century onwards. See, for example, Wrightson's *New Triennial Directory of Birmingham* (1818), p. 162 and Bennett & Co's *Business Directory for Warwickshire* (1914), p. 155.
[89] Luke Herbert (ed.), *The Engineer's and Mechanic's Encyclopaedia*. vol. 2 (London: Thomas Kelly, 1836), p. 184.
[90] Luke Herbert (ed.), *The Register of Arts, and Journal of Patent Inventions* (London: Steill, 1828), p. 179.
[91] Gale, p. 112.

was evidently not the case, cast nails were necessarily small and short, and thus of limited use; and, although nails continued to be made by casting, no further patent for cast nails was granted for more than sixty years.[92] Cast nails were certainly no substitute for the hand-wrought variety, and neither did the production process constitute the beginning of revolutionary change.

It was not until the 1830s that the hand-made nail trade began to be seriously troubled by technological innovation. Until then, there was simply no pressing need to find alternative methods of production. In the West Midlands, the putting-out system had worked effectively for well over a century and there was no reason for investors to devote capital to the development of nail-making machinery. Furthermore, in the late eighteenth century, a sentiment pertained in certain quarters that alternative means of production would lead to a waste of human resources. In 1780, a letter to the *Birmingham Gazette* from 'A friend of the iron trade' expressed concern about the effect that making nails by the more labour-efficient method of casting would have on levels of employment, concluding with the question: 'Shall the welfare of forty thousand useful subjects be put in competition with the forty?'[93] New nail-making technology was perceived as a threat not just to the livelihoods of nailers but also to the operating system in the nail-making district and, specifically, to the workforce of women and children.[94]

Nevertheless, a few people were beginning to think about the mechanisation of nail production (Table 2.2). Two patentees were Bristol merchants. Samuel Guppy was a business partner of Jacob Perkins, an American inventor, for whom he also acted as agent. Guppy's 1796 patent was effectively Perkins's patent.[95] Not that the patent stood Guppy in particularly good stead, *The*

[92] Richard Prosser (1835), Making nails. Patent no. 6775; Prosser, p.71.
[93] Quoted in John Alfred Langford, *A Century of Birmingham Life: or a Chronicle of Local Events, vol. 1 1741-1841* (Birmingham: Osborne, 1868), p. 236. Such concern was not restricted to the nail trade. In 1776, cotton workers had petitioned Parliament to suppress the jennies that threatened the livelihoods of the 'industrious poor'. See Joel Mokyr, *The Enlightened Economy: Britain and the Industrial Revolution 1700-1850* (London: Penguin, 2009), p. 73.
[94] Berg, *Manufactures*, p. 181.
[95] See Chapter 3 for Perkins's role in the development of nail-cutting machinery.

Granted	Patent No.	Patentee	Occupation	Location	Method
1790	1762	Thomas Clifford	Merchant	Bristol	Rolling
1790	1768	William Finch	Nail ironmonger	Dudley	Hammering
1790	1785	Thomas Clifford	Merchant	Bristol	Pressing
1796	2133	Samuel Guppy	Merchant	Bristol	Rolling
1801	2482	John Bennoch	?	?	Rolling
1801	2517	John Spencer	Nail-ironmonger	Duffield	Pressing
1803	2739	Booth Hodgetts	Nail-ironmonger	Dudley	Rolling
1804	2800	Samuel Guppy	Merchant	Bristol	Pressing
1808	3137	Joseph Wilmore and John Tonks	Silversmith Engineer	Birmingham Birmingham	Pressing

Table 2.2. British mechanised nail-making patents granted between 1790 and 1808

Source: Bennett Woodcroft, *Subject-Matter Index of Patents of Invention March 1617-October 1852 Part II,* (London; Eyre & Spottiswoode, 1857), pp. 509-510.

Monthly Magazine (1797) complaining that his nails were too brittle.[96] The other Bristolian was Thomas Clifford, and he too had interests in America. At the time when he was granted his two patents (1790), Clifford was in partnership with Sheffield-born Richard Wells. Wells had emigrated to America in 1750 and, by 1790, had established a successful wholesale and retail hardware business in Philadelphia.[97] As such, Clifford would doubtless have been aware of the shortage of nails that existed in America at the time, and this may explain Clifford's involvement in seeking a mechanised method of improving productivity and increasing output. It seems that, unlike Guppy, Clifford was not merely an agent but an inventor in his own right, having invented and patented a rolling mill for the manufacture of nails.[98] Only two of the fifty or so West Midland nail-ironmongers took out patents: William Finch of Wombourne and Booth Hodgetts of Dudley.[99]

If no pattern emerged regarding patentees, their locations and occupations, there was some common technological ground among the inventions. Apart from Finch's invention, the

[96] *The Monthly Magazine and British Register, January–June 1797, vol. III* (London, 1797), p. 300.
[97] Whitfield J. Bell Jnr, *Patriot Improvers: Biographical Sketches of Members of the American Philosophical Society, vol.1, 1743-1768* (Philadelphia: American Philosophical Society, 1997), p. 445.
[98] Ibid, p. 445; and see K. Henn, 'The hand-made nail trade of Dudley and district' (Unpublished M.Comm. thesis, University of Birmingham, 1927), p. 28.
[99] Court, p. 198. Nor were the other nail-making districts represented.

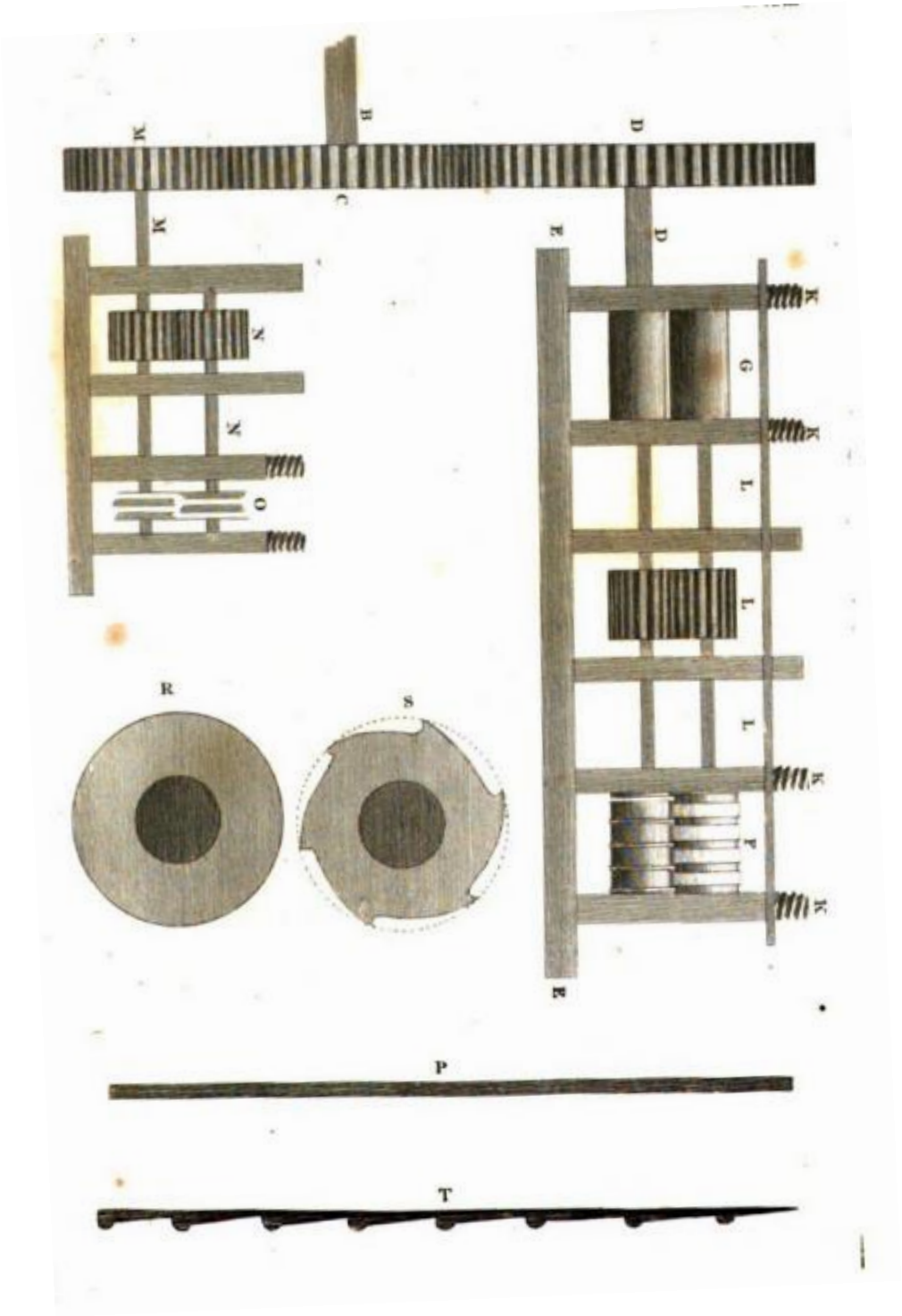


Figure 2.5. Detail from Booth Hodgett's patent specification (1803) showing the incised roller (S) and the 'string of nails'(T).

Source. Booth Hodgetts (1803), Machinery for rolling iron for shanks and for forming the same into shanks for nails. Patent No. 2739.

manufacturing processes involved either rolling or pressing. Hodgett's 1803 patent specification (Figure 2.5) envisaged a rolling process where a heated metal rod was drawn between two rollers, one of which was incised to form the shape of a nail. This resulted in the rod being converted into a string of nails linked point to head. The nails were then sheared from each other by hand. The other method for producing nails was the fly-press, a variant of the screw-press. First used in Florence around 1530 to strike bronze medals, this manually-operated device underwent modifications over the centuries and, from the latter part of the seventeenth century was being used in Birmingham's button and toy trades.[100] The great advantages of the fly-press lay in the unlimited capacity of the tool in cutting out thin metal and in forcing it into any shape, its rapid operation and its cheapness for repetition work.[101] It therefore leant itself to nail manufacture in all but one aspect, which was that it could be used only with relatively thin metal. This, of course, limited the size and strength of the nail that could be made using this technique. The Willmore-Tonks fly-press patented in 1808 (Figure 2.6) was, the patentees proclaimed, a 'new method and process for the manufacturing of nails'.[102] In truth, novel as it may have been, it was simply an example of the 'drift' theory of technological change, where almost all inventions consist mostly of anonymous, small, incremental improvements to already existing techniques.[103] Just as Ashton's invention involved the application of metal-casting methods that had been used for centuries, so the rolling mill and the fly-press had been in use since the sixteenth century. Joseph Willmore was a Birmingham silversmith and would probably have been using fly-presses in his workshop.

[100] Bertrand Gille, 'The transformation of matter' in Maurice Daumas (ed.), *A History of Technology and Invention. First Stages of Mechanization, 1450-1725* (London: John Murray, 1980, p. 144.
[101] Dickinson, p. 13.
[102] Joseph Willmore and John Tonks (1808), Methods and processes in the manufacture of nails. Patent No. 3137.
[103] Joel Mokyr, *Lever of Riches* (Oxford: OUP, 1990), p. 12.

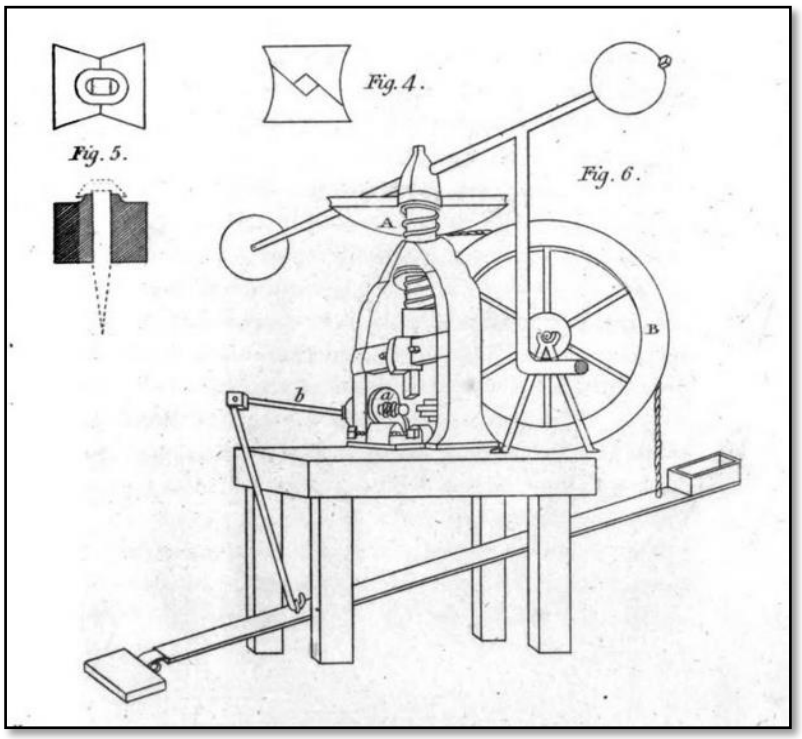


Figure 2.6. The Willmore-Tonks nail-making fly-press (1808)

Source. Joseph Willmore and John Tonks (1808), Methods and processes in the manufacture of nails. Patent No. 3137.

While technical details are revealed through patent specifications, the motives of inventors underpinning their patents are rarely so apparent, and it remains unclear as to what drove this small number of patentees to invest time and money in trying to find alternative ways of producing nails. The case of Dudley nail-ironmonger William Finch, however, is an altogether different matter. Eleven days after Clifford was granted his first patent, Finch was granted a patent for 'certain new methods of making nails and spikes […] by means of certain machinery […] instead of making them by hand'.[104] From a purely technical point of view, Finch's invention was again rooted in the past. As R. B. Prosser later wrote dismissively: 'It consisted in little more than the use of hammers worked by power instead of by hand.'[105] Prosser was quite right. Finch's patent specification clearly explained that his invention was centred on a series of water- or steam-powered tilt

[104] William Finch (1790) Machinery […] for making nails and spikes of iron…. Patent No. 1768. The text of p. 2 is reproduced at Appendix 3.
[105] Prosser, p.72.

hammers. As was noted earlier, tilt hammers were first introduced in the sixteenth century, and thus were hardly novel tools in the late eighteenth century.[106] To historians of technology, such as Akos Paulinyi, a water-powered tilt hammer was just a mechanised tool.[107] Nevertheless, Finch's explanation that 'a man, woman or child will, with one hand, not only form the largest sized nail, but a far greater number in the same given time' suggests an underlying drive for increased productivity.[108]

The technical details of Finch's unremarkable invention are the least interesting aspect of his patent for, unlike all other nail-related patent specifications, his included several intriguing non-technical elements. Firstly, there were several references to his invention facilitating a division of labour. Secondly, Finch was clearly interested in centralising production; and, thirdly, there was a distinctly humanitarian theme running through the specification. Finch envisaged a division of labour such that one person would carry a heated rod from the hearth to the hammer; a second, using the powered hammer, would make the shank; whilst the third would head and finish the nail. The second non-technical feature of Finch's patent was that 'the manufacturer […] will have his business done at one place, or under one roof'. Thus, Finch envisaged the nail production of the future to be centralised rather than being conducted through the putting-out system. Centralisation obviated the need for nailers to fetch and carry bundles of nail rod and finished nails between warehouse and nail-shop. Echoing William Hutton's observation that the nailer 'submits to the scanty gleanings of penury, a thin habit, an early old age, and a figure bending towards the earth',[109] Finch claimed that, through the use of his invention, 'the limbs of those employed in the manufactory will be preserved to the end of life, whereas, in the old method of working, men are frequently lamed in seven or ten years'.[110]

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[106] Gille, p. 83.
[107] Akos Paulinyi, 'Revolution and technology' in Roy Porter and Mikuláš Teich (eds.), *Revolution in History* (Cambridge: CUP, 1986), pp. 261-289 at p. 267.
[108] *The Repertory of Arts and Manufactures. vol. IX* (London, 1798), p. 391.
[109] Hutton, p.118.
[110] Finch, Patent No. 1768, p.2.

William Finch was also concerned with the problems of managing and administering an increasing and dispersed workforce. Whilst putting-out was undoubtedly a flexible and powerful system of production, it was by no means perfect. Given the number of individual nailers and the wide range of nails being made, managing the warehouse necessitated a considerable amount of book-keeping. And, as Court noted, a vigilant eye was required if waste was to be avoided and embezzlement of materials by men as poor as nailers was to be prevented.[111] Perhaps the greatest weakness of the putting-out system was the inability of the nail-master to exercise any degree of supervision and quality control. Finch specifically referred to this in his patent specification. 'A farther and considerable benefit [of centralisation]', he wrote, 'will arise to the manufacturer […] namely that he will have his business done at one place […] whereas, by the old method, the workmen live many miles asunder, and cannot be overlooked.'[112]

Whilst, on the one hand, the growing workforce was a positive sign, on the other, as Myron Gutmann has argued, the costs of administering a dispersed workforce did not decline as the number of workers grew; rather, they increased more rapidly.[113] As soon as there was competition for labour, worker fraud and unreliability increased. In other words, he concluded, cottage industry organisation was not infinitely expandable.[114] With that in mind, Gutmann argued that factories and mechanisation were natural and gradual outgrowths from a flourishing cottage industry system. Faced with administrative problems and rising costs, 'the largest industrialists turned to new forms of organisation, the factory and later the machine'.[115] Gutmann's argument is persuasive, although the sequencing of the creation of factories *before* the development of machinery is open to question.[116]

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[111] Court, p. 200.
[112] Finch, Patent No. 1768, p.2.
[113] Myron P. Gutmann, 'War and industrial development', in R. Leboutte (ed.) *Proto-industrialisation* (Geneva: Libraire Droz S.A, 1996), pp. 153-180 at p. 173.
[114] Ibid.
[115] Ibid.
[116] Ibid. p. 176. My italics.

'One must be careful not to put too much faith in the professed motives' of patentees, warned Christine MacLeod.[117] However, while some patent specifications may well have been unduly boastful, Robert Friedel has offered an alternative view. He urged historians to account for technological change, 'not by reference to the eventual effects of these changes, but by looking at the particular changes that individuals have in mind in pursuing a particular change'.[118] If very real, practical problems of management and quality control lay close to the surface of Finch's patent, it can be argued that deeper undercurrents were also at play. Was Finch's invention simply born out of practical necessity, arising from the problems of labour and quality control? Or could it be that his patent had more to do with the 'spirit of the age' and was influenced by factors other than those of a mere technical nature? The technical element of the patent, as we have seen, was the application of 'old' technology. But the other aspects of the patent had altogether more recent antecedents. Finch realised that the introduction of powered hand-tools would have necessitated the construction of 'manufactories'.[119] The concept of a division of labour was a relatively new one when Finch was granted his patent in 1790. Adam Smith had expounded the benefits of the division of labour in the opening chapter of *The Wealth of Nations* which had been published only fourteen years earlier. Finch appears to have been aware of the advantages that Smith's hypothesis offered to a manufacturer: advantages such as an increase in productivity through labour specialisation; increased individual worker dexterity; and a saving of time. But there is another, more compelling reason why Finch would have been in touch with contemporary thinking about industrial development.

Rowlands noted that almost all the ironmongers in the West Midlands maintained a close network of assiduously cultivated ties based on family, marriage, religion, or simply neighbourhood.[120] Finch was caught up in such a network. In 1786, he married Sarah Priestley, the daughter of

[117] Christine MacLeod, *Inventing the Industrial Revolution: The English Patent System 1660-1800* (Cambridge: CUP, 1988), p. 159.
[118] Friedel, p. 3.
[119] Paulinyi defines a 'manufactory' as a 'centralised enterprise based on the division of labour and hand-tool technology'. Paulinyi, p. 269.
[120] Rowlands, *Masters and Men,* p. 112.

fellow-Unitarian Dr Joseph Priestley. Priestley arrived in Birmingham in September 1780, moving into Fair Hill, a house belonging to the Quaker banker Sampson Lloyd and found for him by his brother-in-law, John 'Iron Mad' Wilkinson. Therefore, it is not too fanciful to surmise that, as leading West Midland ironmongers, the Finches and the Lloyds must surely have known each other. If not connected by family and neighbourhood, the Priestleys and the Finches shared a common religion, Unitarianism.[121] Not only did the network of ironmongers spread throughout the West Midlands but it became closely enmeshed with other networks.

Prosser believed that Finch's process was actually put into practice, although he failed to provide the evidence to support his opinion.[122] In fact, it appears that Finch's business was in serious trouble. When Priestley wrote to Wilkinson in June 1793, he complained that his anxiety over Finch's business affairs had led to a recurrence of his 'gall-stone complaint'.[123] Finch was declared bankrupt in 1797. Having sold his house in Wombourne, he moved to Birmingham where he eventually re-established himself.

2.5. Summary

The debate that occurred in the 1970s over whether technological change was driven by supply-side factors or whether market demand was its key determinant concluded that both were crucial to understanding the innovation process. This was the case with the evolution of the nail trade between 1500 and 1809. Early sixteenth-century developments in the production of iron through the introduction of the blast furnace and the tilt hammer made no immediate impact on the manufacture of nails, although the increased output of bar iron facilitated by these innovations would later be highly significant. It was the introduction and subsequent diffusion of slitting-mill technology in the late sixteenth century, together with a combination of cultural, social and economic forces, that led to a closing of the gap between the supply of and demand for nails. As

[121] A. Rollason, 'The Old Meeting House, Dudley' (1899) at http://www.blackcountry-unitarians.org.uk/old_meeting_house (accessed 14 June 2013).
[122] Prosser, p. 72.
[123] Letter from Priestley to John Wilkinson, 16 May 1793, reprinted in *The Christian Reformer; or, Unitarian Magazine and Review*, vol. VII, no. LXXV, March 1851, p. 133.

Mokyr has argued, the 'demand' for technology is a derived demand in that it depends ultimately on the demand for the goods technology helps to produce.[124] The innovation of slitting-mill technology developed in Flanders proved to be the key that unlocked the door to the commercial nail trade in England.

The hand-made nail trade was not restricted to the West Midlands, with other centres of production established in Lancashire, Derbyshire, south Yorkshire and the North East. The formation of a critical mass of factors, however, transformed a small area of south Staffordshire and north-east Worcestershire into a 'classic proto-industrial' district on the lines that Franklin Mendels had conceived.[125] Pastoral farming created an underemployed labour force: one boosted by an influx of labouring poor intent on taking advantage of the common land in the district. Readily available sources of coal and iron offered the opportunity of alternative employment in the production of nails and, as demand increased, the need for a form of overarching organisation was met by a network of locally-based iron producers who were able to take advantage of fast-flowing rivers and streams to power the forges and slitting mills. This network also incorporated the all-important nail-ironmongers who were to be found at the hub of the organisation. The nail-masters orchestrated not only the distribution of raw materials to the nailers scattered throughout the locality but also the supply of finished nails to the merchants and factors who, in turn, fed the voracious domestic and overseas markets.

Although highly significant technological innovations had underpinned the origins of the commercial nail trade, technological change in its broadest sense contributed very little to its subsequent development. As this chapter has shown, demand for nails both at home and abroad increased dramatically. The number of people employed in the trade expanded accordingly and, in 1798, the industrialist James Keir wrote that output was 'perhaps greater than in any other equal part of the world'.[126] Some metal manufacturers – iron-founders, silversmiths and nail-masters

[124] Mokyr, *Lever*, p. 151.
[125] Evans and Rydén, *Atlantic World*, p. 192.
[126] James Keir, 'Mineralogy of the south-west part of Staffordshire' in Stebbing Shaw, *The History and Antiquities of Staffordshire* (1798), pp. 116-125 at p. 116.

among them – had begun to consider ways of adapting existing technology to nail production although, when the Willmore-Tonks patent was granted in 1808, nail-making remained firmly in the era of hand-tool technology. Across the Atlantic, however, the situation was radically different. As Chapter 3 explains, technological developments and the entrepreneurial activity of one Bostonian merchant were to introduce technical and organisational changes that would challenge the *status quo* of nail manufacture in Birmingham and its neighbouring district.

CHAPTER 3

THE USA AND NAIL-MAKING IN THE ENGLISH WEST MIDLANDS, c.1790-1810:

3.1. Introduction

Sandwiched between an account of the abdication of the King of Poland and another concerning a young Templar fined twenty pounds for wearing hair-powder without a licence, the *Staffordshire Advertiser* of Boxing Day 1795 carried a brief report about the nail trade. It read:

> The export of nails from Britain to America has lately been carried on to a considerable extent. The last papers from the United States mention the success of an invention at Newberry Port [sic], where nails and brads are cut by an engine. Each of these engines, it is said, can turn out 3,600,000 nails weekly, more perfect than wrought nails and 20 per cent under the price of those imported.[1]

How much attention the nail-masters of South Staffordshire paid to these few lines, tucked away as they were on the back page of the newspaper, is not known. Suffice to say that, had they been aware of the threat to their business posed by this newly-invented 'engine', their Christmas celebrations might have been somewhat muted.

There are two clear inferences that can be drawn from the report. The first is that the British hand-made nail trade of the late eighteenth century was clearly in good shape. Maxine Berg showed that employment in the midland nail trade, which had been estimated at about 10,000 people in 1770, had risen to between 35,000 and 40,000 in 1798.[2] Even allowing for the difficulty in calculating employment figures alluded to in the previous chapter, a three- or four-fold increase in under thirty years is indicative of an expanding trade. Exports also remained buoyant, with an estimated 150,000 people being directly or indirectly involved in the export of hardware, much of

[1] *Staffordshire Advertiser*, 26 Dec 1795.
[2] Maxine Berg, *The Age of Manufactures, 1700-1820*, 2nd edn (London: Routledge, 1994), p. 268.

which consisted of nails.[3] With hindsight, however, it is the second point in the report that was of far greater significance for British nail manufacturers, although one that appears to have been largely ignored at the time. It is apparent from the newspaper report that at least one American inventor was engaged in developing a machine to manufacture nails: a machine which, if the output suggested in the report was to be believed, had the potential to revolutionise the nail trade.[4] This American invention raises several questions. Firstly, was it the outcome of a lone inventor's quest to create a nail-making machine, or was it indicative of a concerted drive to mechanise nail production in America? Secondly, did this invention become commercially viable, and were other similar machines being developed? Thirdly, what impact did it have on American nail production? Finally, of particular significance to this study, to what extent, if at all, were the origins of the West Midlands cut-nail trade influenced by technological developments occurring in the United States?

This chapter focuses primarily on the first stage of the product life-cycle, the developmental stage. In doing so, it examines the complementary processes of invention and innovation: the first a technological process conducted largely by individuals; the second an entrepreneurial activity involving groups of people. The chapter starts by considering the condition of the nail trade in America within the context of the late eighteenth-century American economy, with a view to assessing the need for mechanisation. It then examines the relationship between inventor and innovator by means of a case study involving two Massachusetts men, Jacob Perkins and Joseph Dyer. The chapter concludes with answers to the questions posed in the previous paragraph.

Whilst nothing of substance has been written to date about the British cut-nail trade, the American trade has fared a little better. The significance of the nineteenth-century US cut-nail industry was recognised by contemporary American historians such as John Leander Bishop, James M. Swank; nowadays, it remains of particular interest to conservationist organisations such as the Association

[3] Joseph E. Inikori, *Africans and the Industrial Revolution in England: A Study in International Trade and Economic Development* (Cambridge: CUP, 2002), p. 68.
[4] The output referred to in the report was, in fact, purely theoretical and would not be achieved for many years.

for Preservation Technology and the Construction History Society.[5] Amos Loveday Jnr's book on the *Rise and Decline of the American Cut Nail Industry*, published in 1983, remains the only academic treatise on the trade.[6] Unlike the current study, Loveday had the advantage of being able to draw upon the management records of at least nine nineteenth-century iron and cut-nail producers in the Wheeling district of West Virginia; and therein lies the main limitation of the book.[7] Rather than examining the 'American' cut-nail trade, as stated in the title, Loveday's study is restricted to 'a small segment of the Upper Ohio Valley', and the question has to be asked if the US cut-nail trade really can be understood by focusing on a small number of plants around Wheeling, as the author contends.[8] Even in a country the size of Britain, it would be rash to assert that cut-nail manufacture in Birmingham reflected the trade in Bristol, Leeds and Newcastle. Despite this shortcoming, Loveday's narrative focuses on the growth and decline of the trade during the nineteenth century and thus provides useful points of comparison and contrast with the Birmingham and district trade: On the one hand, for instance, there were common experiences in the process of innovation and obsolescence whilst, on the other, the extent of vertical integration that occurred in the Wheeling and the Midland industries differed considerably.

3.2. Nail Manufacture in America at the Turn of the Nineteenth Century

When permanent settlement in America began in the early seventeenth century, nails were considered essential items for survival along with food, clothing and weapons. Vital as they were, nails were a scarce and precious resource; so scarce, in fact, that it was by no means uncommon for unwanted dwellings and barns to be burnt down so that the nails used in their construction could be

[5] John Leander Bishop, *A History of American Manufactures from 1680 to 1860, vol. III*, 3rd edn (Philadelphia: Young, 1868); James M. Swank, *History of the Manufacture of Iron in All Ages*, 2nd edn (Philadelphia: AISA, 1892); and see, for example, Maureen K. Phillips, '"Mechanic geniuses and duckies": a revision of New England's cut-nail chronology before 1820', *Association for Preservation Technology Bulletin* [hereafter *APT Bulletin*], vol. 25 (3/4), 1993, pp. 4-16; and Chris How, 'The American cut nail' in Miles Lewis (ed.), *The Pacific Connection Seminar* (Melbourne: University of Melbourne, 2009), pp. 1-16.
[6] Amos J. Loveday Jnr, *The Rise and Decline of the American Cut Nail Industry* (Westport CT: Greenwood, 1983).
[7] Ibid, pp. 151-152.
[8] Ibid, p. xiii.

recovered.[9] By the mid-eighteenth century, the situation was no better. In 1759, George Washington was forced to provide a prominent Glasgow merchant, Dugald Bannantine, with a list of well over a hundred items he required 'because America was not in a condition to supply such furnishings' – 'furnishings' that included four casks of nails.[10] In 1776, the construction of barracks and other buildings in New York and New Jersey was so seriously delayed through the scarcity of nails that the General Court of Massachusetts Bay ordered a prize vessel lying at Newburyport to be 'so far unloaded as to take out of her such quantity of nails as will be sufficient to answer the present urgent call from General Schuyler'.[11]

Before the War of Independence, the worst effects of a limited domestic supply were ameliorated by importing nails and nail rod from England. Attempts to reinforce such dependency on British imports were made in parliament, and legislation was passed with the aim of protecting the home trade and inhibiting the development of a domestic nail trade in the American colonies. An act of 1750, for example**,** was designed 'to prevent the erection of any mill or other engine for slitting or rolling of iron**'.**[12] Despite these restrictions, however, such legislation was more honoured in the breach than in the observance. Both colonists and British officials often ignored laws prohibiting nail rod manufacture when entrepreneurs and legislators found it expedient to do so.[13] Not only were these laws ignored but their imposition merely added fuel to the revolutionary fire that was smouldering in America.

By the time war broke out in 1775, a substantial nail-making capacity had developed in Massachusetts, Connecticut and Pennsylvania, although domestic output was never enough to satisfy the colonists' demand. War disrupted trade with Britain and nail imports fell dramatically.

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[9] See, for example, James M. Fitch, *Historic Preservation: Curatorial Management of the Built World* (Charlottesville VA: University Press of Virginia, 1990), p. 29; Eric Sloane, *American Barns and Covered Bridges* (New York: Dover Publications, 2002), p. 33.
[10] James Clelland, *Enumeration of the Inhabitants of the City of Glasgow and County of Lanark*, 2nd edn, (Glasgow: Smith, 1832), pp. 305-6.
[11] Greville and Dorothy Bathe, *Jacob Perkins: His Inventions, his Times, and his Contemporaries* (Philadelphia: Historical Society of Pennsylvania, 1943), p. 13. General Phillip Schuyler (1733-1804) was one of four generals appointed at the outset of the American War of Independence.
[12] Parliamentary Papers [hereafter PP] 1749. A Bill, intituled, An Act to Encourage the Importation of Pig and Bar Iron from His Majesty's Colonies in America.
[13] Loveday, p. 5.

In 1760, between 40 and 50 per cent of British metal exports to America consisted of nails; by 1800 the figure had fallen to 14 per cent, although exports began to increase again by 1804.[14] In the face of such restrictions, the burden of nail production was borne by the domestic hand-wrought nail- makers, as was the case in the West Midlands. In a speech made in 1789, Congressman Fisher Ames of Massachusetts explained that 'it has become common for the country people in Massachusetts to erect small forges in their chimney corners; and in the winter, and in evenings, when little other work can be done, great quantities of nails are made, even by children'.[15] Unlike the situation in the Black Country, however, with its many thousands of nailers, the supply of labour remained inadequate. A labour-intensive method of manufacture coupled with a short supply of manpower clearly limited output and pushed up the price of nails. But it was not simply a shortage of labour that continually caused demand to outstrip supply. If one word were to characterise the American economy, particularly between 1780 and 1820, that word would be 'expansion' – trade expansion, population expansion, urban expansion and geographical expansion – and such growth had implications for the nail trade.[16]

Hard on the heels of the American War of Independence came the French Revolutionary Wars (1792-1815), a period of international turmoil and of consequent vicissitudes in foreign trade. As far as the American economy was concerned, however, the impact of the war was positive. Britain and France were anxious to keep open the trade links with their colonies and both agreed not to interfere with neutral shipping. Thus, there developed a system of re-exports, a system dominated by a neutral America. Working on the assumption that trade statistics are accurate, exports of American merchandise in 1793 amounted to $24 million while re-exports totalled $2 million.[17] By

[14] Malcolm Wanklyn, 'National and international trade in the Midlands economy' in Jon Stobart and Neil Raven (eds), *Towns, Regions and Industries* (Manchester: MUP, 2005), pp. 193-209 at p. 200. And see Loveday, p. 8.
[15] Swank, p. 133; Loveday, p.15.
[16] See, for example, Albert W. Niemi Jnr, *US Economic History*, 2nd edn (Lanham MD; University Press of America, 1980), pp. 39-40; George R. Taylor, 'American urban growth preceding the railway age', *Journal of Economic History*, vol. 27 (3), September 1967, pp. 309-339 at p. 309; Gary M. Walton and Hugh Rockoff, *History of the American Economy* 10th edn (Mason OH; South Western, 2005), pp. 147-8.
[17] Almost sixty years ago, William Ashton counselled the historian to draw on statistics abundantly but, in doing so, 'to apply to them that element of scepticism which should be one permanent constituent of his [sic] professional character'. William Ashton, *An Economic History of England, 1870-1939* (London: Methuen, 1960), p. 3.

1807, the situation was reversed: exports had increased to $49 million, but re-exports had risen dramatically to $60 million.[18] Among the cargoes that were unloaded at American ports during these early years of the nineteenth century were British nails – 27,248 cwt in 1802, rising to 35,043 cwt in 1804 – though whether these were destined for the home market or for re-export is unclear.[19] Nevertheless, they would have been welcomed either as products for re-export or as imports to feed the voracious domestic demand for nails.

To some extent, the level of demand for nails was indirectly generated by this expansion of trade, which in turn had led to a boom in shipbuilding. In 1791, the residents of the small Massachusetts seaport of Salem owned 9,031 tons of shipping; by 1807, their tonnage had reached 43,570.[20] It is often the case that developments in one sector of an economy have a knock-on effect in another sector. In America, the rapid increase in trade and shipping had an impact on dock, wharf and warehouse construction; on the manufacture of wagons, crates and barrels; and on the construction of dwellings and commercial premises for those in mercantile and associated occupations. All required significant quantities of nails: nails that ranged from ten-inch deck spikes to Flemish tacks measuring no more than an eighth of an inch. Even the construction of houses using stone and brick required nails to secure interior woodwork, roofing, windows and door frames. When Senator Thomas Worthington built a large stone mansion near Chillicothe, Ohio in the early years of the nineteenth century, his workmen used over 600 pounds of nails. The roofing alone required almost 33,000 shingle nails.[21]

Stimulated by the boom in trade, shipping and shipbuilding, the population of the four great eastern seaports grew at an unprecedented rate. Between 1790 and 1820, the populations of Baltimore and New York trebled, while those of Boston and Philadelphia more than doubled.[22] But the growth of

[18] Niemi, pp. 39-40.
[19] US Treasury Department, 'Imports from Great Britain and her Dependencies for the Years 1802, 3 and 4' in *Documents, Legislative and Executive, of the Congress of the United States* (Washington: Gales and Seaton, 1832), p. 599.
[20] Peter T. Tarpgaard, *US Shipping and Shipbuilding: Trends and Policy Choices* (Washington D.C. : US Government Printing Office, 1984), p. 6.
[21] Loveday, pp. 27-28.
[22] Taylor, p. 311.

these ports was not simply caused by inward migration from their rural hinterlands. During the same period, the overall population of the United States grew by 84 per cent: from 3.93 million to 7.24 million.[23] Nevertheless, the United States of 1815 was still overwhelmingly rural in aspect and agricultural in occupation. Indeed, in the most heavily populated north-eastern areas, only about 10 per cent of people lived in urban concentrations of two-and-a-half thousand inhabitants or more.[24] The ready availability of land offered farm employment – and, more particularly, farm ownership – to the growing population. At the same time, pioneering Americans were pushing west beyond the Appalachian Mountains. In 1790, there were 120,000 settlers; by 1812, the number of people who had passed through the Cumberland Gap or who had followed the Ohio River westwards had risen to 1.5 million.[25] Settlements tended to be small and isolated. In 1820, there were only five 'western cities' with populations in excess of 2,500.[26]

Unlike England, America was devoid of a canal system, and consequently communications between dispersed settlements and markets were both slow and costly. Robert Heilbroner noted that freight charges made the price of corn so high as to make it unmarketable outside a radius of a few miles from its origin.[27] Markets therefore tended to be local; settlers grew and made what they needed. With US manufacturing dominated by household production, specialisation could not occur, and associated economies of scale remained unachievable. Even in the major cities on the eastern seaboard, where occupations focused largely on the pursuit and execution of trade, industry was apparently an unusual calling.[28] In 1815, the number of people employed in mills or manufactories amounted to no more than 15,000 across the whole nation.[29] Those production units that did exist, such as saw mills and textile mills, were technologically inferior to their British counterparts. Waterpower predominated, with all the vagaries of drought, flooding and ice to

[23] Taylor, p. 322.
[24] Robert L. Heilbroner, *The Economic Transformation of America* (New York; Harcourt, Bruce, Jornovich, 1977), p. 27.
[25] Sidney Ratner, James H. Soltow and Richard Sylla, *The Evolution of the American Economy.* 2nd edn (New York; Macmillan, 1993), p. 110.
[26] Taylor, pp. 314-315.
[27] Heilbroner, p. 28.
[28] Ibid, p. 27.
[29] Ibid.

contend with. Even in 1840, steam power cost five times as much as waterpower. Over-riding all these factors, however, was one very simple truth: America was awash with timber, and wood was used in almost all walks and at all stages of life – literally from cradle to coffin. And wood needed nails to hold it all together.

3.3. The Mechanisation of Nail Manufacture in America

In his 'survey of technological creativity and economic progress', as Joel Mokyr subtitled his *Lever of Riches* (1990), Mokyr argued that the reason some industries changed during Britain's industrial revolution and others did not had little to do with either the demand side of the economy or with the supply side of raw materials and coal. Technological opportunities and constraints, he maintained, by and large determined where and when improvements were to occur.[30] But was this true of the late eighteenth-century American nail trade? Was it not the almost insatiable demand for nails that drove some dexterous and mechanically-inclined people in America's north-eastern states to seek a way of meeting a level of demand that was incapable of being met either by domestic hand-wrought nail-makers or by imports? Should we not believe the nineteenth-century American historian, John Leander Bishop, when he wrote: 'It was during the emergency of the Revolutionary War, which called into exercise the inventive talent of the country, that the first attempt to produce cut nails and tacks was made.'[31] Bishop was inferring that the wartime demand for nails had outstripped supply to such a degree that here was a clear case of necessity being the mother of invention. This aphorism has, however, been given short shrift by Mokyr and others.[32] Mokyr's argument rested upon the contention that the demand for technology is a derived demand: one that ultimately depends upon the demand for the goods and services that technology helps to produce. There is little or no demand for the technology for its own sake.[33] What existed in America was a demand for a solution to the problem of an inadequate supply of nails: a mechanical

[30] Joel Mokyr, *Lever of Riches* (Oxford: OUP, 1990), p. 85.
[31] Bishop, p. 324.
[32] Mokyr, *Lever*, p. 151.
[33] Ibid.

solution, noted Bishop, which derived from 'a necessity of an age fruitful in every form of labour-saving expedient'.[34]

While technological inventions cannot occur simply in response to a demand, they may well be encouraged if a culture of technological creativity is present. Such a culture will only exist, argued Mokyr, if three conditions are satisfied. Firstly, there must exist a cadre of ingenious and resourceful innovators willing and able to challenge their physical environment for their own improvement. Secondly, economic and social institutions have to encourage potential innovators by presenting them with the right incentive structures. Finally, innovators require diversity and tolerance: an ability to overcome protective, entrenched and vested interest concerned with the retention of the status quo.[35]

As far as the last of these three conditions is concerned, there were no deeply entrenched forces resisting progress in the development of nail manufacture. In the English West Midlands, as this study will show, the situation was rather different. The key to understanding the reason for this dichotomy lay in the markets for nails. In America, the rural population was widely dispersed, and transport costs were high. This meant that nail-makers made nails either for their own use or for a very local market. A sparse and scattered population coupled with poor communications also meant that any attempt to create a nail industry was unlikely to succeed.

In the West Midlands, the rural population was far more concentrated. Distances were shorter, and the regional canals and the navigable River Severn meant that transport costs were low in comparison and access to markets greatly facilitated. These were just two of the factors that underpinned the extensive and highly-organised nail trade in the West Midlands at the turn of the nineteenth century. Therefore, any threat to the trade constituted a threat to the livelihoods of nail-makers, nail-masters, warehousemen, carriers, nail-sack makers and many others. It is therefore hardly surprising that in the West Midlands the transition from a hand-wrought to a mechanised

[34] Bishop, p. 324.
[35] Mokyr, *Lever*, pp. 11-12.

nail industry would be both a protracted and a painful one. Indeed, throughout much of the nineteenth century, the hand-made nail trade fought doggedly to resist the onslaught of the machine-made nail.

In America, there was no such conflict. There, the invention and development of nail-making machinery was viewed not as sealing the fate of thousands of people, as it was in the West Midlands, but with a sense of relief and national pride. Writing in 1868, John Leander Bishop told of how Albert Gallatin, Secretary to the Treasury, had reported to Congress as early as 1810 on the immense value of cut-nail machinery. Two-thirds of the whole quantity of iron flattened in the United States was used in the manufacture of cut nails, Gallatin reported, and production of cut nails had spread throughout the country. He concluded that cut-nail machinery, 'being altogether an American invention, substituting machinery for manual labour, deserved particular notice'.[36]

During the War of Independence, a Rhode Island textile card maker named Jeremiah Wilkinson had found it difficult to obtain card tacks and, 'owing to the tediousness of making them by the old process of hammering, tried the experiment of cutting from the plate of an old chest lock a number of tacks which he headed in a smith's vice'.[37] According to the nineteenth-century American historian, Aaron Hobart, the metal 'was cut into angular points with lever shears. The points were then taken up one by one, by hand, put into a common vice and headed with a hammer'.[38] Whilst this may have been the first-ever instance of tacks being cut from a cold metal plate, and although James Swank claimed that the process was extended to small nails 'cut from old Spanish hoops', a lack of hard evidence caused Loveday to remain unconvinced.[39] Also, it hardly constituted a major technological advance.

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[36] Bishop, pp. 326-7.
[37] *Transactions of the Rhode Island Historical Society 1872-3* (Providence, RI: Rhode Island Historical Society, 1873), p. 69. And see *Transactions of the Rhode Island Society for the Encouragement of Domestic Industry* (Providence, RI: Knowles, 1860), pp. 100-1.
[38] Aaron Hobart, *An Historical Sketch of Abington, Plymouth County, Massachusetts* (Boston MA: Dickinson, 1839), p 90.
[39] Swank, p. 134; Loveday, p. 8.

Nevertheless, the quest for a mechanical means of manufacturing nails slowly got under way during the 1780s, mainly in the eastern districts of Massachusetts. To begin with, developments during this period were restricted to hand-operated nail-cutting machines. Around 1780, Ezekiel Reed, of Abington and Bridgewater, invented a machine, the operation of which was described in a late nineteenth-century account: 'The mode [of cutting nails] was much improved by moveable dies, placed in an iron frame, in the shape of an ox bow, the two ends, in which were placed the dies, being brought together by a lever pressed by the foot.' This was a great improvement and the inventor, Ezekiel Reed, was entitled to a patent.[40] 'Great improvement' as Reed's invention may have been, further developments in cutting nails from hoops or plates were relatively few and far between. Nevertheless, if such beginnings were slow and uncertain, the advance in nail-machine technology during the two decades from 1790-1810 was, according to architectural conservator Maureen Phillips, 'so rapid that it can easily be compared to the rise of calculators and computers in the 1960s and 1970s'.[41]

How can this rapid acceleration in the development of nail-making machinery in America be explained? As was mentioned earlier, Joel Mokyr set three conditions for technological innovation, the second of which requires the existence of economic and social institutions capable of offering encouragement to potential innovators by presenting them with the right incentive structures.[42] By 1790, the United States government had put such structures in place. The effect was dramatic. In 1789, Congress imposed a duty on imported nails as an inducement to the development of domestic nail production, independent of foreign sources and aimed at reducing unit costs.[43] The second step, taken the following year, was the passing of the first US Patent Act. This brought patent law into federal hands rather than leaving it to the rather haphazard

[40] Phillips, pp. 4-16 at p. 5. The reason for the imprecise date of Reed's invention is that, in 1836, a catastrophic fire destroyed the US Patent Office in Washington DC. A report to Congress in December that year stated that 'everything belonging to the Office was destroyed – nothing was saved'. In all, some 9,000 drawings and 10,000 descriptions and specifications were lost. See Bathe, p. 7.
[41] Phillips, p. 5.
[42] Mokyr, *Lever*, pp. 11-12.
[43] Loveday, p. 15.

arrangements of individual state legislatures. Taken together, these two strategies signalled the start of a race to develop the first commercially viable nail machines.

Between 1790 and 1810, whilst nine nail-related patents were granted in Britain, no fewer than 37 American patents were granted.[44] Bishop described the situation in unashamedly nationalistic terms. 'Several of the most distinguished of early American inventors', he wrote, 'employed their powers […] in devising machines for cutting nails – while others in England, about the same time, laboured, though less successfully, to accomplish the same end'.[45] American inventors 'devised'; their English counterparts 'laboured'. Table 3.1 clearly indicates the disparity.[46]

Patent Activity	United States	Great Britain
Nails, cutting	11	2
Nails, cutting and heading	14	3
Nails, heading	5	0
Nails and brads, cutting	5	0
Nails, cutting and rolling iron	1	4
Nails, cutting, rolling iron and plating	1	0
Total	37	9

Table 3.1. Cut-nail-related patents granted in the USA and Great Britain, 1790-1810

Source: US Patent Office, *List of Patents for Invention and Design issued by the United States 1790-1847* (Washington; Gideon, 1847), pp. 51-54; Bennett Woodcroft, *Subject-Matter Index of Patents of Invention March 1617-October 1852 Part 1* (London; Eyre & Spottiswoode, 1857), pp. 509-510.

Even if some of the thirty-seven nail-cutting machines patented by American inventors were never developed commercially, Loveday argued that the intense inventive activity that engulfed the nail trade between 1790 and 1810 'suggests the extraordinarily important role of cut nail innovations in

[44] US Patent Office, *List of Patents for Invention and Design issued by the United States 1790-1847* (Washington: Gideon, 1847), pp. 51-54. Cut-nail patents accounted for 50.7 per cent of all nail-related patents granted during this period.
[45] Bishop, p. 324.
[46] See Nathan Rosenberg, *Perspectives on Technology* (Cambridge: CUP, 1976), p. 37, where Rosenberg states that 'Apparently 23 patents for nail-making machinery had been granted by the patent office even before 1800'. According to the US Patent Office records only thirteen of these were specifically for cut-nail machinery, the remainder were for non-specific 'nail manufacture'. See US Patent Office, *List of Patents*, pp. 51-54.

the history of American invention in the early republic'.[47] Loveday is surely right, for even if a number of patentees failed to take their inventions further, the very fact that so many patents were taken out indicates the intensity of the competition.

The race itself took two separate routes, although both sets of competitors – Mokyr's 'cadre of ingenious and resourceful inventors' – had the same goal of eliminating several of the manual steps in the manufacturing process with a view to speeding up production. One group of inventors constructed machines that used dies either to strike nails from a nail rod as it passed through the machine, or to squeeze an iron bar as it was fed between heavy rollers with moulds incised in their faces. Studying nails is a common means of dating old buildings in America, and Loveday has noted that, as only a few samples of nails made by these methods have survived, it is apparent that large numbers were never produced.[48]

The second group of American inventors followed the lead set by Jeremiah Wilkinson in the 1770s, in so far as they developed machines that sheared nails from rolled plates of wrought iron. Plates were sheared into strips, the width of which was determined by the length of the nail. The strips were then fed into a cutter comprising a fixed bed and a reciprocating blade. With each strike of the blade, a thin slice of metal was cut from the strip. This was held by a gripping die, the head end of this shank projecting beyond the die. A shaped heading die was then 'caused to come forward and press the thick end of the nail into the shape of an head [sic]'.[49] The finished nail was then ejected into a bin below the machine. Such a method had the advantage of obviating the time-consuming and costly process of producing nail rod at the slitting mill. As the race gathered momentum, so too did the friction between the competitors. One contemporary observer, the Reverend William Bentley, commented that 'the little squabbles of these mechanic geniuses and duckies are as

[47] Loveday, p. 11.
[48] Ibid; and see, for example, Lee H. Nelson, *Nail Chronology as an Aid to Dating Old Buildings* (Nashville: American Society for State and Local History, 1968), and Jay D. Edwards & Tom Wells, *Historic Louisiana Nails: Aids to the Dating of Old Buildings* (Baton Rouge, LA.: Louisiana State University, 1993).
[49] Dyer, Joseph (1814) Improvements in machinery for manufacturing nails. Patent No.3798, p. 6.

curious as between our itinerant Baptist and Methodist preachers'.[50] However, Maureen Phillips believed that Bentley understated the situation: one in which emotions ran high amidst the rough-and-tumble of an emerging high-stakes industry.

Space does not allow a detailed account of this highly fractious race or of the inventions spawned by it. Rather, the focus turns on two Massachusetts men from very different backgrounds who were to play a pivotal role in establishing the cut-nail industry in Britain. The first was Jacob Perkins, the son of a Newburyport tailor who, more than any other inventor – American or British – was to change the very nature of nail-making in the English West Midlands. The second was Joseph Chessborough Dyer, the son of a Rhode Island naval captain, who would act as Perkins's agent in England. Together, it is argued, these two men were responsible not only for introducing machinery into West Midlands nail manufacture but also for altering the geographical focus of nail-making in the region and, arguably, for causing a protracted period of social upheaval in the Black Country.

3.4. Jacob Perkins – 'The American Inventor'

Jacob Perkins (Figure 3.1) was born in 1766 and spent his childhood in the Massachusetts town of Newburyport. At the age of twelve he was apprenticed to a goldsmith.[51] Three years into the apprenticeship his master died, leaving a widow and a large family. Rather than leave the family destitute, the 15-year-old Perkins took over the business to provide for them, the *Boston Commercial Gazette* later recording that 'the establishment […] was more lucrative than it was during the time of his master'.[52] Perkins produced gold beads and ornamental shoe buckles, which were then in vogue. When the fashion for such decorative wear declined, the young goldsmith turned his attention to other projects. But was he a serious inventor or merely a 'tinkerer'?

[50] Maureen K. Phillips, 'Mechanic geniuses and duckies redux: nail makers and their machines', *Association for Preservation Technology Bulletin*, vol. 27 (1/2), A Tribute to Lee Nelson. 1996, pp. 47-56 at p. 47.
[51] Bathe, pp. 5-7.
[52] Anon, *Miscellanies Selected from the Public Journals, vol. III* (Boston MA: Buckingham, 1824), p. 219.

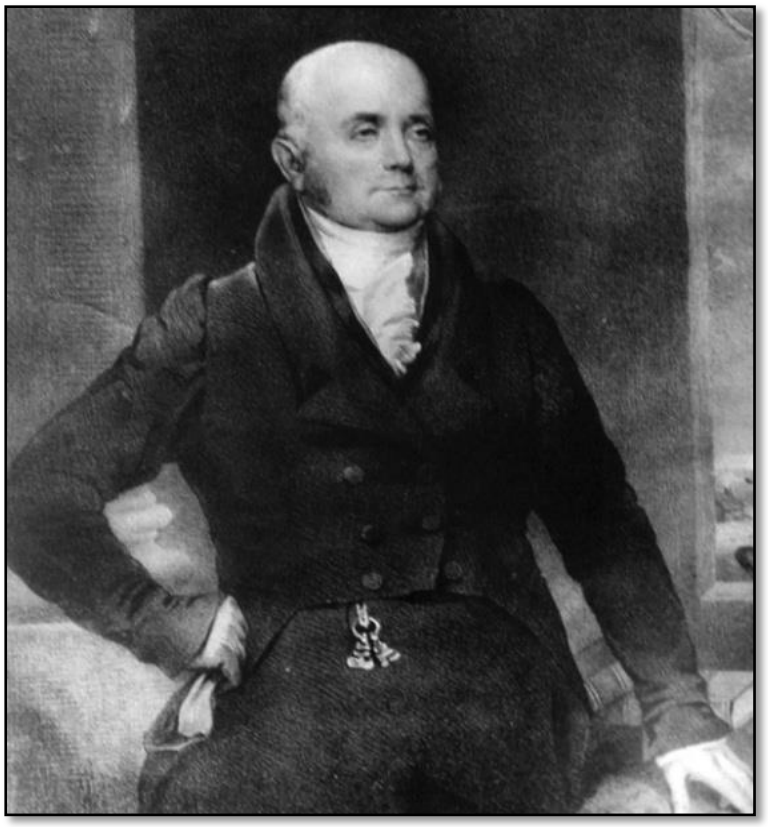


Figure 3.1. Jacob Perkins (1766-1849)

Lithograph by Richard James Lane, 1826
By permission of the National Portrait Gallery, London

Christine MacLeod has identified three categories of inventor and patentee. The first was the amateur inventor, 'for whom mechanics or chemistry was an amusing diversion that might one day open up a lucrative side-line'.[53] The second category was the professional inventor, for whom inventing was not a hobby but a livelihood. And the third was that of 'the businessman – the artisan or manufacturer, the millwright or the machine-maker – who appeared in force after 1760 and dominated the system for the rest of the century'.[54] As this chapter shows, British patentees working on ways of manufacturing nails by means other than by hand fitted neatly into the third category. Jacob Perkins, on the other hand, was a prime example of MacLeod's 'professional inventor'.[55]

[53] Christine MacLeod, *Inventing the Industrial Revolution* (Cambridge: CUP, 1988), p. 78.
[54] Ibid, p. 79.
[55] Euphemia Vale Smith, *History of Newburyport* (Boston: Damrell and Moore, 1854), p. 380; Phillips, 'Redux', p. 47.

Even before he had reached the age of thirty Perkins had been described as 'a gentleman of great mechanical genius'.[56] Between 1795 and 1836, he demonstrated this genius by being granted no fewer than forty patents: twenty-one in the United States and, after he had settled in London in 1819, a further nineteen in Britain. Known as 'the American inventor' on both sides of the Atlantic, this 'man of compact and athletic frame', as one contemporary described him, produced inventions the subjects of which were almost as wide-ranging as they were numerous: from pumps to paddle wheels; from a method of polishing and graining Moroccan leather to one for manufacturing spoons; and, surely the most fanciful of all, a gun that discharged a projectile by force of steam.[57]

Several of Perkins' inventions, the gun included, would never achieve commercial success; and one contemporary observer noted wistfully that 'his inventions have not all been as useful in practice as his friends might have wished'.[58] However, those concerned with nail-making most certainly were, even if the road to success was not always a smooth one. Jacob Perkins invented his first nail-making machine between 1790 and 1792, but just why he became interested in nail manufacture is unclear. It is probably safe to say, however, that, even if he was not conscious of the two government actions described above, he would have undoubtedly been aware of the huge potential market for cheap nails. Whilst no model or drawing of the machine have been found, the specifications of the patent have survived.

The water-powered machine consisted of two 'engines': the curiously-named Ostrich which sheared the nails to length, and the aptly-named Vulcan which headed them. By 1793, the prototype machine had shown promise, but Perkins needed both more room and more power to prove his invention. A new woollen mill had recently been built on the falls of the Parker River in Byfield, six miles to the south of Newburyport. Among the promoters of the new venture were

[56] Jedidiah Morse, *The American Gazetteer* (Boston MA: Etheridge, 1804). There are no page numbers in this lengthy publication. The quote is taken from the section on Newburyport.
[57] See *The London Mechanics Register, vol.* 1, 6 Nov 1824, p. 1; Bathe, pp. 200-1; Phillips, 'Redux', p. 47; Vale Smith, p. 380.
[58] Henry Howe, *Memoirs of the Most Eminent American Mechanics* (New York: Peckham, 1840), p. 194.

two Englishmen, Bristolians Samuel Guppy and John Warren Armstrong. Impressed by Perkins' machine, Armstrong persuaded him to move down to Byfield, and there Perkins established himself in a large barn adjoining the mill. The great advantage to Perkins was that he could use the mill's water wheel to power his machine. Sufficiently confident in the operation of the machine, Perkins applied for a patent, and one was duly granted in January 1795. This was quickly followed by the signing of a business agreement between Perkins, Guppy and Armstrong for the commercial manufacture of nails and for the construction of further nail machines. So confident were the partners that Guppy successfully applied for a British patent for the Perkins machine.[59]

For the next two years, all went well for the partnership. During that time, Perkins experimented on combining the mechanism of the cutting and heading machines into one operation with a view to boosting output. This seems to have become a source of friction between the business associates, eventually leading to a breakdown of the partnership in 1798. Contemporary American accounts give the impression that responsibility for the split lay squarely at the feet of the two Englishmen. Guppy and Armstrong were described as 'two unprincipled adventurers from abroad' and 'knaves [reaping] what industry sowed'.[60] Elsewhere, they were accused of 'greedily snatching up' and appropriating the pecuniary profits of Perkins' endeavours.[61] More recent accounts of Perkins and his partners, however, throw a rather different light on the breakdown of the relationship.

Perkins' early machine suffered from several defects. The first was revealed in the 1795 specification which read: 'one cutting engine may with ease be drove by water two hundred and fifty revolutions in a minute, each revolution produces two nails.' But while Perkins thus claimed that his machine could cut five hundred nails a minute, the overall production rate was greatly reduced by the less-efficient heading machine with its capacity of only sixty operations per

[59] Samuel Guppy (1796), Cutting and heading nails by two separate engines. Patent no. 2133.
[60] *Miscellanies,* p. 221.
[61] Vale Smith, p. 380. And see Howe, p. 188.

minute.[62] This would be an issue for some time to come, and nail-makers were still required to forge the head of machine-cut nails manually. Claims made in 1804 that the Perkins machine could turn out two hundred thousand nails a day therefore seem optimistic.

The imbalance between the cutting and heading operations was a major problem. Perkins, being first and foremost an inventor, devoted his time and energy to solving these teething troubles rather than concentrating on the business itself. By the spring of 1798, he was sufficiently confident that the problem had been solved and, in April of that year, he applied for a second patent.[63] The new 'one operation' machine, however, was not an immediate success, as the nails became stuck between the cutting and the heading mechanisms and jammed the machine.[64] When this occurred, output was reduced to no more than forty nails per minute. Perkins disassembled the machine to try to discover the cause of the problem, but his efforts were in vain. Without notice, the partnership was dissolved. Guppy returned to England and Armstrong kept the business going for only a further three years before selling it.[65] This experience might have put an end to Perkins' inventive endeavours, but this was not the case and, as was mentioned earlier, he continued to apply his mind to an extraordinarily broad range of inventive challenges. So great was the esteem in which Perkins was held that a ship registered in Newburyport was named after him. Whilst the ship was later wrecked off Key West, no such ignominious fate awaited the inventor or his nail machine which he continued to develop.[66]

Joel Mokyr has observed that 'most techniques before 1800 emerged as a result of chance discoveries, trial and error, or good mechanical intuition and often worked quite well despite nobody's having much of a clue as to the principles at work'.[67] Such a generalised description of

[62] Phillips, 'Mechanic Geniuses', p. 6.
[63] US Patent Office, *List of Patents,* p. 53. The patent was awarded on 14 February 1799.
[64] This was a frequent problem. Nathan Read, one of Perkins' competitors based in Salem, experienced similar jamming difficulties at the same time as Perkins. See Maureen K. Phillips, 'Mechanic geniuses and duckies redux: nail makers and their machines', *Association for Preservation Technology Bulletin,* vol. 27 (1/2), A Tribute to Lee Nelson, 1996, pp. 47-56 at p. 50.
[65] Opinion is divided as to how successfully Armstrong managed the business. The Bathes stated that it was carried on 'in a perfunctory manner'; whilst Phillips says that it 'became a major concern that employed 165 workers'. See Bathe, p. 21 and Phillips, 'Redux', p. 49.
[66] *Morning Chronicle* 30 Oct 1839; *Morning Post* 22 Nov 1848 and 03 Jan 1851.
[67] Joel Mokyr, *The Gifts of Athena* (Princeton: Princeton University Press, 2002), p. 32.

the inventive process seems to be applicable to Jacob Perkins. Without relevant practical experience or precedent upon which to base his deliberations, Perkins had to feel his way laboriously towards his goal. Along the way he was frequently buffeted by difficulties, not merely those of a mechanical nature but in his business dealings and at the mischievous hands of his rivals.[68] Despite this, he was eventually granted a second patent in 1799 and, in July 1810, he was awarded a third. It was the latter patent that was to be the catalyst in transforming the West Midlands nail trade.

When Jacob Perkins died in July 1849, he had been living in London for thirty years. Following his death, an obituary appeared in the US Commissioner of Patents report for that year. While extolling the virtues of such an 'eminent […] remarkable […] and ingenious man', the obituarist noted that 'he lacked one quality to secure success in the world – financial thrift. Everybody but himself profited by his inventions. He was, in fact, too much in love with the excitement of the chase to look very strongly at the pecuniary value of the game'.[69] It seems that this had long been the case. As early as 1810, the weekly journal, *The Philadelphia Repertory*, had noted that Perkins was 'more intent upon [his] machinery than upon his pecuniary affairs'.[70]

There is no intrinsic reason, of course, why inventors should be concerned with the commercial marketability of their inventions; there is nothing to prevent an inventor tinkering for the pure satisfaction of doing so or for pursuing a quest for knowledge. However, as Mokyr has argued, without innovation – the complementary process to invention – inventors will lack focus and have little *economi*c incentive to pursue innovative ideas.[71] Mokyr's implicit assumption here is that invention is driven by economic motivation. Not everyone agrees. Harold Dutton has argued that the notion of the inventor as 'economic man' has not been readily accepted by economists and

[68] Jesse Reed, another major player in nail machine development, was accused of basing an 1807 invention on Perkins' 1799 design. However, Perkins had reportedly 'borrowed' Reed's 1807 design for his 1810 machine. Phillips, 'Redux', p. 52.
[69] *Report of the Commissioner of Patents 1849, Part 1, Arts and Manufactures* (Washington: Office of the Printers to the Senate, 1850), p. 545.
[70] *The Philadelphia Repertory*, vol. 1 (10), 7 Jul 1810, p. 79. See also Howe, pp.188-194.
[71] Mokyr, *Lever*, p. 11.

economic historians.[72] Joseph Schumpeter asserted that invention 'produces of itself no economically relevant effect at all' and that it was 'touched by no economic spring'. Despite argument and counter-argument, there remains a lack of consensus about invention as an economic activity.[73]

Jacob Perkins was an inventor who pitched his tent in both camps. On the one hand, he was a true inventor, designing everything from the highly useful, unforgeable plates for banknotes to the utterly impractical steam artillery. But when lodged in the other camp, there can be little doubt that Perkins and his fellow American inventors were motivated by an economic need: the need to devise a machine for making nails that would solve the problems caused by a shortage of labour, an inadequate output and an expensive product. However, this did not make Perkins an 'economic man' in the sense of being both inventor and innovator. Inventors and innovators are seldom one and the same people. Mokyr has argued that, whilst inventors ultimately function alone in their attempts to make something work, 'innovation […] requires interaction with other individuals, depends on institutions and markets, and is thus largely social and economic in nature'.[74]

Carroll Pursell has maintained that, throughout much of the nineteenth century, American inventors were responsible for the transfer of American technology eastwards across the Atlantic to the lucrative markets in Britain: 'Britain was, after all, the "workshop of the world", and to gain acceptance there was to give life to the old saw about sending coals to Newcastle'.[75] Although it might seem a question of semantics, the American inventors of nail-making machinery were *not* the ones to take the initiative for the transfer of this technology. Rather, they relied on the entrepreneurial innovative actions of an intermediary to provide the link between the inventor and British markets.

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[72] H. I. Dutton, *The Patent System and Inventive Activity during the Industrial Revolution, 1750–1852* (Manchester: MUP, 1984), p 104.
[73] Ibid, pp. 104-106.
[74] Mokyr, *Lever,* p. 11.
[75] Carroll Pursell, *The Machine in America: A Social History of Technology,* 2nd edn (Baltimore: Johns Hopkins University Press, 2007), p. 179.

In 1785, Samuel Ogden, a New York ironmaster, tried to have his nail-cutting machine accepted in Britain. Ogden's brother Isaac was based in London and was clearly a business acquaintance of Matthew Boulton. Writing to Boulton in November 1785, Isaac Ogden explained that he had recently received a letter from his brother describing his machine for cutting nails.[76] In the letter, Samuel Ogden had said that he was certain that 'Mr Boulton will at once see that we worked our shears by a small water wheel crank and [illegible]. With this we cut 175 nails in a minute. He will erect this as an appendage to his steam engine. The additional friction will be so very small that the power will not be missed'. Simple and efficient as Ogden's machine may have been, however, there is no evidence that Boulton ever acted as intermediary on this side of the Atlantic. A decade later, Jacob Perkins employed Samuel Guppy to bring his first patent for a nail machine to Britain; and in 1810, his third patent was brought over by a Bostonian merchant, Joseph Dyer. While Guppy appears to have been little more than an agent, Dyer's role was far more comprehensive. In Joseph Schumpeter's view 'the inventor produces the idea, the entrepreneur "gets things done"'.[77] Perkins produced the idea, but to what extent did Dyer 'get things done'?

3.5. Joseph Dyer – an American Entrepreneur

Joseph Chessborough Dyer (Figure 3.2) was born in November 1780 at Stonnington Point, Connecticut, and thus, like Perkins, he was a New Englander; and, like Perkins, he too developed a partiality for all things mechanical.[78] But there, comparisons between the two men end. Whilst Perkins came from humble stock, Dyer was cultured, well-educated, and wealthy both by inheritance and subsequently through dint of his own business acumen. Having designed an unsinkable life-boat in his early teens, Dyer's mechanical interests led him to invent a fur-shearing

[76] Library of Birmingham [hereafter LoB], MS 3782/12/30. Boulton & Watt Collection. General Correspondence, October to December 1785: letter to Matthew Boulton from Isaac Ogden, 27 November 1785.
[77] Joseph A. Schumpeter, 'The creative response in economic history', *Journal of Economic History*, vol. 7 (2), November 1947, pp. 149-159 at p. 152.
[78] Lance Day and Ian McNeil (eds), *Biographical Dictionary of the History of Technology* (London: Routledge, 1996), pp. 395-396. In 1832, Dyer wrote to the *Manchester Courier* concerning his nationality. The newspaper explained that the object of Dyer's letter was 'to assure the public that Mr Dyer, although a native of America, and a citizen of the United States, was born a British subject, and that not having forfeited his rights, he shall continue to exercise them'. *Manchester Courier and Lancashire General Advertiser*, 22 Sep 1832.

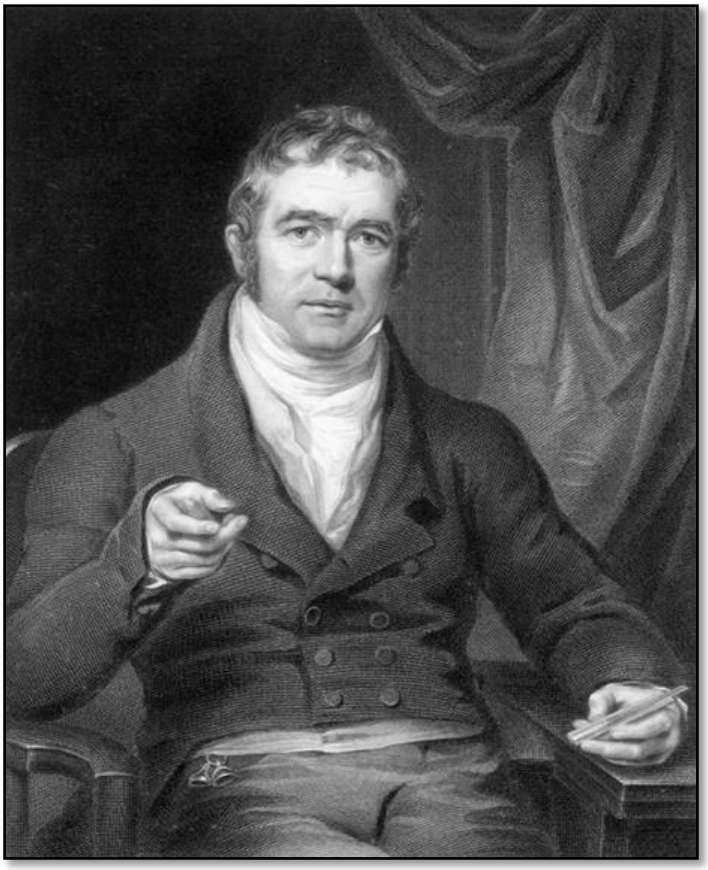


Figure 3.2. Joseph Chessborough Dyer (1780-1871)

Engraving by Edward Scriven, after Joseph Allen.
By permission of the National Portrait Gallery, London

machine in 1810, a carding machine a year later and, in 1825 when living in Manchester, he obtained a patent for a roving frame used in cotton spinning. His business interests were as numerous as they were varied. He was a promoter of the *Manchester Guardian* (1821); a committee member of the Sheffield and Manchester Railway (1830); a fervent Anti-Corn Law supporter (1832); a major investor in the Liverpool and Manchester Railway (1837); a long-time member and subsequent vice-president of the Manchester Literary and Philosophical Society; and a director of the ill-fated Bank of Manchester, the collapse of which resulted in his losing £96,000.[79]

[79] *Manchester Times,* 18 Apr 1829; *Manchester Courier,* 4 Sep 1830; Archibald Prentice, *History of the Anti-Corn Law League* (1853), 2nd edn (Abingdon: Routledge, 1968), pp. 73 and 91; *Manchester Courier*, 20 Feb 1866; Lance Day and Ian McNeil (eds.), *Biographical Dictionary of the History of Technology* (London: Routledge, 1966), p. 396. Dyer died on 3 May 1871, leaving an estate valued at less than £300. See C. W. Sutton, 'Dyer, Joseph Chessborough (1780–1871)', revised by Anita McConnell. *Oxford Dictionary of National Biography*, edited by H. C. G. Matthew and Brian Harrison. Oxford: OUP, 2004. Online edition edited by Lawrence Goldman at http://www.oxforddnb.com/view/article/8351 (accessed 6 Dec. 2013).

However, the story of Dyer's sojourn in Manchester is of no consequence here, other than to illustrate his abundant energy and breadth of activity. Of specific relevance to the advent of cut-nail manufacture in Britain are the two decades of his life from 1796 to 1816.

At the age of sixteen, Dyer was employed as a clerk by a French merchant named Nancrède who was based in Boston. Many of Nancrède's goods were imported from England. When the merchant decided to return to France, Dyer and a colleague took over the business and, between 1802 and 1811, Dyer made several trips to England so that he could deal directly with his suppliers.[80] Yet Dyer was more than an inventor and more than a merchant; he was also the equivalent of today's venture capitalist, using his wealth in seeking out inventions which could be profitably developed to his own and to public advantage.

Dyer first met Jacob Perkins in Boston in 1809, at a time when Perkins was working on his third nail machine.[81] Perkins gave Dyer the details of the machine with a view to applying for a patent in England 'for their mutual benefit', and thus began Dyer's role as a promoter of American inventions in Britain. Dyer was greatly impressed with Perkins' nail machine and was quick to realise its potential in England, where nail-ironmongers were attempting to meet a ravenous demand for nails both at home and overseas with methods that must have seemed to Dyer to be, if not obsolete, increasingly obsolescent.[82]

On 1 March 1809, the United States Congress passed the Non-Intercourse Act, which forbade US trade with Great Britain, France and their colonies. Although the legislation was largely ineffective, Dyer feared that it had the potential to ruin his importing business. He consequently decided to leave America for good, and in 1811 he sailed for England. The year before he left his homeland, he had obtained a British patent for 'an invention communicated to me by a certain foreigner

[80] Sutton, ibid; S. McKenna, 'Joseph Chessborough Dyer', M*emoirs and Proceedings of the Manchester Literary and Philosophical Society*, vol 117, 1974-1975, p. 105.
[81] Bathe, p. 37.
[82] The Bathes refer to 'the tremendous export of British nails from the Midlands, and especially Coventry'. Bathe, p. 37. In fact, Coventry was never a centre of nail manufacture. Its industries at the outset of the nineteenth century were dominated by watchmaking and the production of silk ribbon. See Peter M. Jones, *Industrial Enlightenment* (Manchester: MUP, 2008), p. 23.

residing abroad'.[83] The fact that the patent specification refers to a 'foreigner' in the singular suggests that, in view of the Dyer-Perkins relationship, the patent was for Perkins' third nail machine. This is supported by a review in the *London Journal of Arts and Sciences* (1837). Commenting on a recent nail machine patent, the author noted that the new machine 'possesses the same sort of features as the old American machinery of Perkins and Dyer'.[84]

The waters are muddied, however, by a paper that Dyer read to the Manchester Literary and Philosophical Society in February 1866. During the previous three months, he had delivered two papers in a series entitled 'Notes on the origin of several mechanical inventions, and their subsequent application to different purposes'. The third paper was entitled 'On Nail Making by Machinery'. Having explained how, in the early years of the century, 'the great consumption of nails in America […], and the high rate of skilled labour, had led to many attempts to make nails by a more summary process than that of the hammer and the anvil', Dyer continued:

> For this purpose, a machine was invented and patented by Mr J. Odiorne, and another by Mr Jacob Perkins, about the year 1806. These two patents, though for the same object, differed so far in construction that they were held to be distinct inventions. A third machine was invented by a Mr Reed, which, however, was a combination of the former two and I believe was not held valid as a patent. In 1810, Messrs Wells and Co. of the Charles River Iron Works, near Boston, having arranged with the patentees, sent out models of the nail machine to me in London, to be patented for our joint account.[85]

To confuse matters even further, Richard Prosser, a late nineteenth-century patent examiner, asserted a decade or so after Dyer's address that Dyer had, in 1810, 'obtained a patent on behalf of a company in Boston, which included several forms of nail machine, the invention of three Americans named Odiorne, Perkins and Reed'.[86] Quite apart from the ambiguity surrounding the

[83] Joseph Dyer (1810), Machinery for cutting and heading nails and brads. Patent no. 3365.
[84] W. Newton, *The London Journal of Arts and Sciences and Repertory of Patent Inventions, vol. IX* (London: Office for Patents, 1837), p. 344.
[85] *Manchester Courier,* 20 Feb 1866.
[86] Richard B. Prosser, *Birmingham Inventors and Inventions* (Birmingham, 1881; repr. Wakefield: S. R. Publishers, 1970)), p.73.

location of the 'several forms of nail machine', the implication that the patent arose from the *joint* inventive efforts of the three men working together seems most unlikely. As has already been mentioned, Jesse Reed and Jacob Perkins were keen competitors and neither showed any compunction in 'borrowing' from the other: and, whilst Thomas and George Odiorne paid $42,000 for the patent rights to Reed's one-operation machine in 1807, there is little evidence to suggest that they too were anything other than competitors.[87] There remains, therefore, an element of doubt as to which of the Wells models Dyer chose to demonstrate the revolutionary means of making nails. Nevertheless, it is only the thinnest sliver of a doubt. Bishop, in his 1868 history of American manufactures, recorded how 'the mechanism of Perkins and Dyer was […] put in operation at the Britannia Nail Works in Birmingham, which was the first manufacturer of cold cut nails in that country', a statement later supported by Greville and Dorothy Bathe.[88] In the absence of hard evidence, the assumption must be that it was a model of the Perkins machine.

Whichever model it was, Dyer experienced considerable difficulties in getting it to work as he hawked it around the nail-making districts of the West Midlands.[89] It was thus hardly surprising that he failed to persuade the Black Country nail-masters to change their existing system of manufacture: a system which, at the turn of the nineteenth century, was experiencing considerable growth. The putting-out system of industrial organisation also had several inherent benefits for the nail-ironmongers. Overheads were comparatively few when compared to a centralised, factory-based system that the adoption of machinery assumed. While nailers supplied their own tools, workshops, fuel and light, in a factory these costs would be met by the owner. In brief, the putting-out system worked. Another reason for a lack of interest in Dyer's innovative ideas undoubtedly stemmed from the economic climate prevailing at the time. Of all the Napoleonic War years, 1811 proved to be the worst for Britain's economy. Exports to Europe fell by 80 per cent of the previous year's total; to the United States by 76 per cent and to South America by 65 per cent.[90]

[87] Phillips, 'Redux', p. 54.
[88] Bishop, p. 325; Bathe, pp. 37-40.
[89] See Prosser, p. 73.
[90] Eric Hopkins, 'The Birmingham economy during the revolutionary and Napoleonic wars 1793-1815', *Midland History*, vol. 23, June 1998, pp. 105-20 at p. 111.

While the absence of precise figures for Birmingham and district makes it impossible to measure quantitatively the loss of overseas trade, it is not unreasonable to assume that the pervading economic atmosphere was one of pessimism rather than optimism, and thus hardly conducive to investment in an unproven innovation and the acceptance of unnecessary risk.

Just as William Finch had foreseen at first hand the problems of supervision and quality control arising from an expansion of the nail trade, so Dyer – albeit drawn from a completely different experience – had seen clearly the direction in which nail manufacture was headed. For both men the future of nail-making would be machine-based and centralised in a factory rather than remaining in a myriad of what the Black Country novelist Francis Brett Young referred to as 'cramped and sooty caverns'.[91] However, Finch's solution was far less technologically advanced than the American model; and there is no evidence to indicate whether or not his patent was put into commercial use. On the other hand, Dyer remained undaunted by the lack of interest shown by the Black Country nail-masters and, as the following chapter explains, was to put his visionary ideas into practice on the banks of the Birmingham and Fazeley Canal.

3.6. Summary

An increasing demand for nails throughout the eighteenth century had been met in Britain by the expansion of a proto-industrial system that had been in place since the middle years of the previous century. In the newly-independent United States a growing economy coupled with territorial expansion and a rapidly increasing population also led to a high level of demand for nails: a demand that could never be met, given the fragmented nature of nail production. The means to achieve a far higher level of productivity had to be found, and this was dependent on what Mokyr referred to as a culture of technological creativity.

Such a culture existed in America. By placing tariffs on imported nails and by introducing new patent legislation, the US government created a competitive environment in which a group of New England inventors worked their way towards the eventual creation of a nail-making machine. The

[91] Francis Brett Young, *They Seek a Country* (London: Heinemann, 1937), p. 17.

duration of this incubation stage of the product life-cycle is dependent on the stock of relevant knowledge and skills available at the time. In the late eighteenth century, the skills to invent such a machine clearly existed. The knowledge, however, had to be developed through trial and error, and this meant that the development stage of the nail machine's life-cycle lasted for almost twenty years, marked by a deluge of patent activity between 1790 and 1810.

The rate at which patents are granted may provide an indication of inventive, developmental activity, but it says nothing about the next stage of the life-cycle – the 'Introduction', a process of innovation. The inventors of nail machines were rarely also innovators. Wealthy merchant Thomas Odiorne and his two brothers were the financial backers for Jesse Reed's invention, establishing two factories just outside Boston. Another Boston merchant was Joseph Dyer, and it was Dyer's vision and determination in the face of considerable uncertainty that brought Jacob Perkins' invention to England in 1810. There was an element of serendipity about his doing so. Had the short-lived Non-Intercourse Act not been passed by Congress in 1809, Dyer might never have emigrated to England, Perkins' invention might have remained in America, and the West Midlands nail trade might have remained a hand-tool proto-industry. Dyer, however, has not been accorded the recognition that some other enterprising Americans have achieved, and yet, as far as the Birmingham and district nail trade is concerned, he looms as a very significant figure:[92] one whose innovations were to change the face of nail-making in the West Midlands, as the following chapter explains.

[92] W. H. G. Armytage, 'American enterprise in Britain's industrial revolution: radical entrepreneur: J. C. Dyer', *The American Journal of Economics and Sociology*, vol. 14 (2), January 1955, pp. 193-198 at p. 193.

CHAPTER 4

ENTREPRENEURIAL ACTIVITY AND TECHNOLOGICAL INNOVATION, 1810 -1827: THE BRITANNIA NAIL WORKS

4.1. Introduction

During the winter of 1865-66, Joseph Dyer read three papers at meetings of the Manchester Literary and Philosophical Society. He had been a member for forty-eight years and, by then, was vice president of the Society. The theme of his lectures was 'Notes on the Origin of Several Mechanical Inventions'. The first two papers had dealt with machinery for lace-making and steel-plate engraving. The subject of his third paper, read in February 1866, was nail-making by machinery. Two years later, the *Memoirs* of the Society recorded yet another address, during which he had explained to his audience how he had first established a nail works.

> I succeeded in forming a company in London for establishing a patent nail factory on a large scale, to which company I transferred the patents, and undertook to superintend the building and starting of the machines for a period of six months; after which the concern was left wholly in the charge of the company, the principal party in which was then an eminent London banker, who supplied the capital, and, as head of the concern, selected the parties to be charged with the management of the business.[1]

This brief extract is a distinctive account of how the cut-nail trade in Britain began. Even so, it is frustratingly devoid of vital detail and prompts several questions. What was the nature of the London-based company? Dyer referred to 'a patent nail factory on a large scale'. What did he mean

[1] Joseph C. Dyer, 'On nail-making by machinery', *Memoirs of the Literary and Philosophical Society of Manchester*, 3rd Series, vol. 3, 1868, pp. 253-259 at p. 257. The patents to which Dyer referred comprised the original Perkins-provided patent (Joseph Dyer (1810), Machinery for cutting and heading nails and brads. Patent No. 3365) together with two further patents taken out in Dyer's name for improvements to the machine (Joseph Dyer (1812), Machinery for cutting and heading nails. Patent No.3543, and (1814), Machinery for manufacturing nails. Patent No.3798). Also, see Richard B. Prosser, *Birmingham Inventors and Inventions*, (Birmingham, 1881; Wakefield: S.R. Publishers, 1970), p.73.

by this, and where was this factory located? Why did Dyer commit to staying with the business for such a limited time? Who was the 'eminent London banker' who supplied the capital and headed the business? In addition to the questions arising from Dyer's paper, there are other matters that need to be addressed, such as the success or otherwise of the new venture and the technology it employed. In providing answers to these questions, the chapter is divided into three parts. The first deals with the translation of Dyer's vision into reality: the establishment of what was known as Britannia Nail Works. With this as context, the second part focuses on Dyer himself and argues the case for seeing him as an example of a Schumpeterian 'heroic' entrepreneur and innovator. Using the 'introduction' phase of the life-cycle model as a comparative framework, the chapter concludes with an examination of the Britannia's development between Dyer's departure from Birmingham in 1816 and the expiration of his third patent in 1827.

4.2. Establishing the Britannia: The Dyer Era

The account of the Dyer-Perkins relationship referred to in the previous chapter might have given the impression that Dyer's main objective on taking up residence in England was to ensure the commercialisation of Jacob Perkins' patent nail machine. Whilst this was certainly one of his projects, he had others, devoting his attention to what W. H. G. Armytage referred to as 'the naturalisation of American inventions in England'.[2] Between 1810 and 1815 Dyer 'naturalised' nine American patents. Five of these concerned the fur and cotton trades; one was Perkins's patent for steel engraving; and the remaining three related to 'machinery for cutting and heading nails and brads from strips or plates of iron'.[3] Dyer's interest in the cotton patents may go some way to explaining his move to Manchester in 1816; but what was it that attracted him to Birmingham as the location for his nail-making project?

In a study of the maritime-industrial region of north-east England, Graeme Milne examined the factors which, when coalescing, formed a critical mass that explained both the development of

[2] W. H. G. Armytage, 'American enterprise in Britain's industrial revolution: radical entrepreneur: J. C. Dyer', *The American Journal of Economics and Sociology*, vol. 14 (2) January 1955, pp. 193-198 at p. 194.
[3] See Footnote 1 for details of the nail-related patents.

localised clusters of activity and the creation of industrial districts: explanations that were founded on the availability of both tangible and intangible resources. The former included the availability of natural resources, an appropriate labour force and sources of capital; the latter an all-pervading atmosphere of entrepreneurial drive, vibrant business networks, and the competitive and/or collaborative characteristics of firms working in close proximity.[4] Just as these factors can be used to explain the growth of Birmingham as a dynamic industrial district, they can also be used to explain Birmingham's attraction for Dyer's nail-making project.

In a historical study of Birmingham, ranging from prehistoric times to the present day, Malcolm Dick observed how the West Midlands had become a focus for technological innovation. It was, he argued, 'the Silicon Valley of the eighteenth century'.[5] If this is so, then Birmingham was its San Jose. It was, according to Maxine Berg, 'a creative and inventive city […] a place where inventors came to find the skills and tools to develop prototypes and entrepreneurs came to invest in their projects'.[6] As Richard Prosser was keen to point out, 'Birmingham stood first amongst the provincial towns as regards the number of grants of letters patent': by the close of 1809, 122 patents had been granted to Birmingham inventors, whilst Manchester could claim only 43.[7] Whilst there are drawbacks in using patent data as indications of innovation, they are nevertheless symptomatic of inventive activity.

When William Hutton first came to Birmingham in 1741, he found its inhabitants 'possessed a vivacity [he] had never beheld'.[8] Intellectual vivacity was the stuff of the small, loosely-organised yet dynamic Lunar Society, which itself lay at the very heart of Britain's industrial enlightenment. Birmingham was, said Jenny Uglow, 'a city of makers and traders', where 'almost every second

[4] Graeme J. Milne, *North East England, 1850-1914: The Dynamics of a Maritime-industrial Region* (Woodbridge: Boydell, 2006), p. 51.
[5] Malcolm Dick, 'The City of a Thousand Trades, 1700-1945' in Carl Chinn and Malcolm Dick (eds), *Birmingham, The Workshop of the World* (Liverpool: Liverpool University Press, 2016), pp.125-157 at p. 133.
[6] Maxine Berg, 'The genesis of 'useful knowledge'', *History of Science*, vol.45 (2), June 2007, pp. 123-133 at p. 130.
[7] Prosser, p. 3.
[8] William Hutton, *The History of Birmingham,* 4th edn (London: Nichols, 1819), p. 92.

man, it seemed, was working on new processes or tools'.[9] Although there is no hard evidence to support this, Dyer must surely have been aware of Birmingham's reputation both as a hub of intellectual creativity and as the centre of Britain's hardware trade: an awareness gleaned from both his mercantile dealings in England between 1801 and 1811, and through the network of American merchants that was beginning to form in the town. Birmingham must have seemed the right place in which to put his radical ideas into practice.

In his *Poetic Survey Around Birmingham* published in 1800, James Bisset included the lines:

> Near north by east, Barr Beacon greets your eye,
> More to the right, you'll Aston's turrets spy.
> Britannia Brew'ry, nearer view, between,
> And o'er that Conic Tow'r lies Nechell's Green.[10]

John Kempson's map of 1811 (Figure 4.1) shows the Britannia Brewery lying on the north-eastern fringe of Birmingham, adjacent to the Birmingham & Fazeley Canal. The Britannia Brewery Company was established in December 1791 and, when the foundation stone was laid the following year, the *Birmingham Gazette* recorded how 'the designs for this building are allowed to be most elegant, and will render it the most convenient of any building in the kingdom'.[11] Of the three Birmingham breweries in existence, not only was the Britannia the most extensive but it was also 'the largest concern of its kind in the kingdom, London excepted'.[12] Size, however, is no guarantee of a business's long-term viability, and such was the case with the Britannia.

In February 1810, an announcement appeared in London's *Morning Post* stating that the 'most substantial and spacious premises' of the Britannia Brewery were to be sold 'at a price very inferior to the value of such truly capital buildings'.[13] It appears, however, that a sale was not made. In April the following year, the *Morning Post* once again carried a notice to the effect that the premises,

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[9] Jenny Uglow, *The Lunar Men: The Friends who Made the Future, 1730-1810* (London: Faber and Faber, 2002), pp. 19 and 78.
[10] James Bisset, *A Poetic Survey Round Birmingham* (Birmingham: Swinney and Hawkins, 1800), p. 13. Barr Beacon is a hill rising to 227 metres to the east of Walsall; Aston's turrets are those of Aston Hall; and the Conic Tow'r is a reference to the Aston glass manufactory of Messrs Smart, Jones & Co.
[11] *Aris's Birmingham Gazette* [hereafter *ABG*], 16 Apr 1792.
[12] R. Jabet, *A Concise History of Birmingham,* 4th edn (Birmingham: Jabet, 1808), p. 55.
[13] *Morning Post*, 2 Feb 1810.

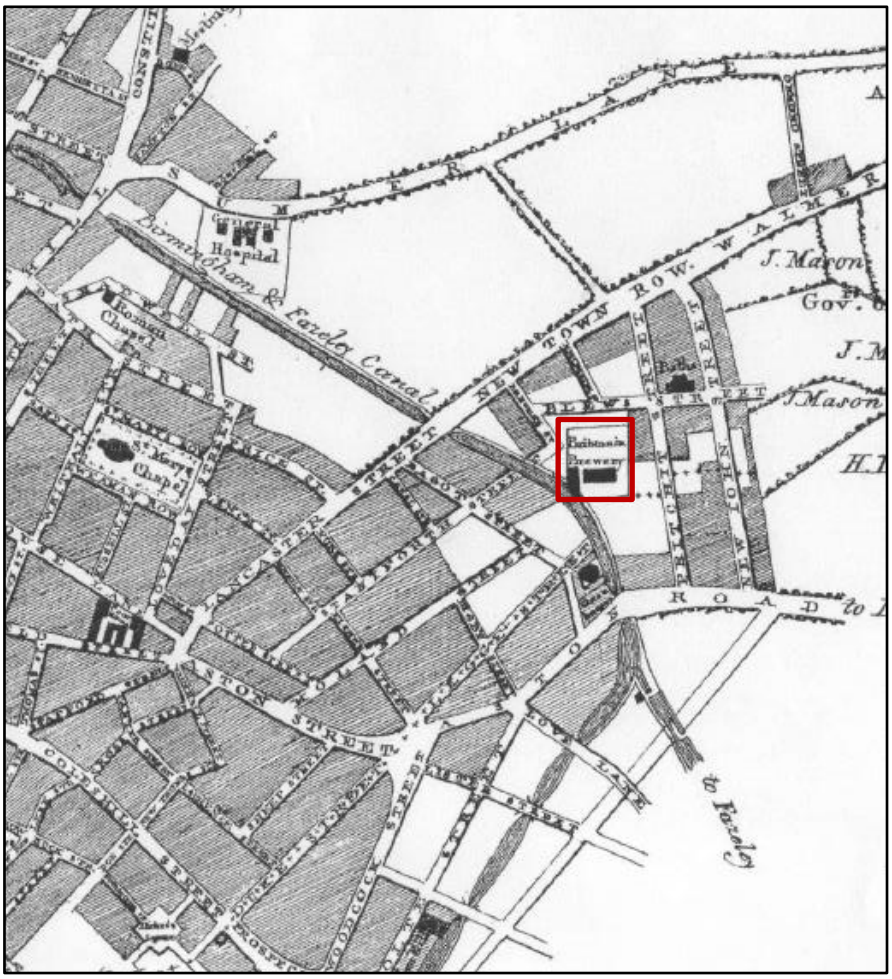


Figure 4.1. Detail from John Kempson's map of Birmingham (1811) showing the location of the Britannia Brewery on the banks of the Birmingham and Fazeley Canal

Source: Library of Birmingham L/./85/1; 295795. Panoramic view of Birmingham (Ackerman and Co.) 1847

'lately occupied as a brewery', were available to be let or sold, emphasising that they were 'equally proper for any purpose where extensive buildings and much room are required, and will be sold for less than half their value.'[14] Whether it was the latter announcement in the *Post* that attracted Dyer or whether the news about the availability of the brewery buildings reached him by some other means is unclear. What is clear is that the brewery buildings offered Dyer premises ideally suited for establishing a 'nail factory on a large scale': not only large but also architecturally impressive. In 1808, Birmingham printer R. Jabet had described the buildings as 'large and commodious and […] erected at vast expense'.[15] Writing about Lancashire cotton mills, Mark Girouard argued that,

[14] *Morning Post*, 4 Apr 1811.
[15] Jabet, p. 55.

while they were impressive on account of their size and in the way that they contrasted with the town 'in their shadow', their architecture was not especially remarkable.[16] The design and position of Boulton & Watt's Soho manufactory, on the other hand, was deliberately striking in its appearance and, as such, held some considerable tacit marketing value. In the same way, the imposing Britannia Building offered Dyer a similar competitive advantage. The scale and architecture of the building – more like a country house than a commercial house – are evident in Figure 4.2, which shows the north-west-facing façade of the main building.



Figure 4.2. The façade of the Britannia Building. 1814

Source: Library of Birmingham. MS 3147/5/807. Williams, Jones & Co. Gas lighting apparatus, 1814

In a letter to the editor of the *London Magazine* on the subject of the 'architecture of manufactories', a correspondent wrote that such buildings should have a look of permanence, adding that 'when I see a tottering building, I always feel as if I was looking at a tottering house – a tottering house in the mercantile sense of the word'.[17] Travellers passing along Walmer Lane, the road between

[16] Mark Girouard, *The English Town* (New Haven, NY: Yale University Press, 1990), p. 252.
[17] *London Magazine*, 1 Dec 1825, p. 472.

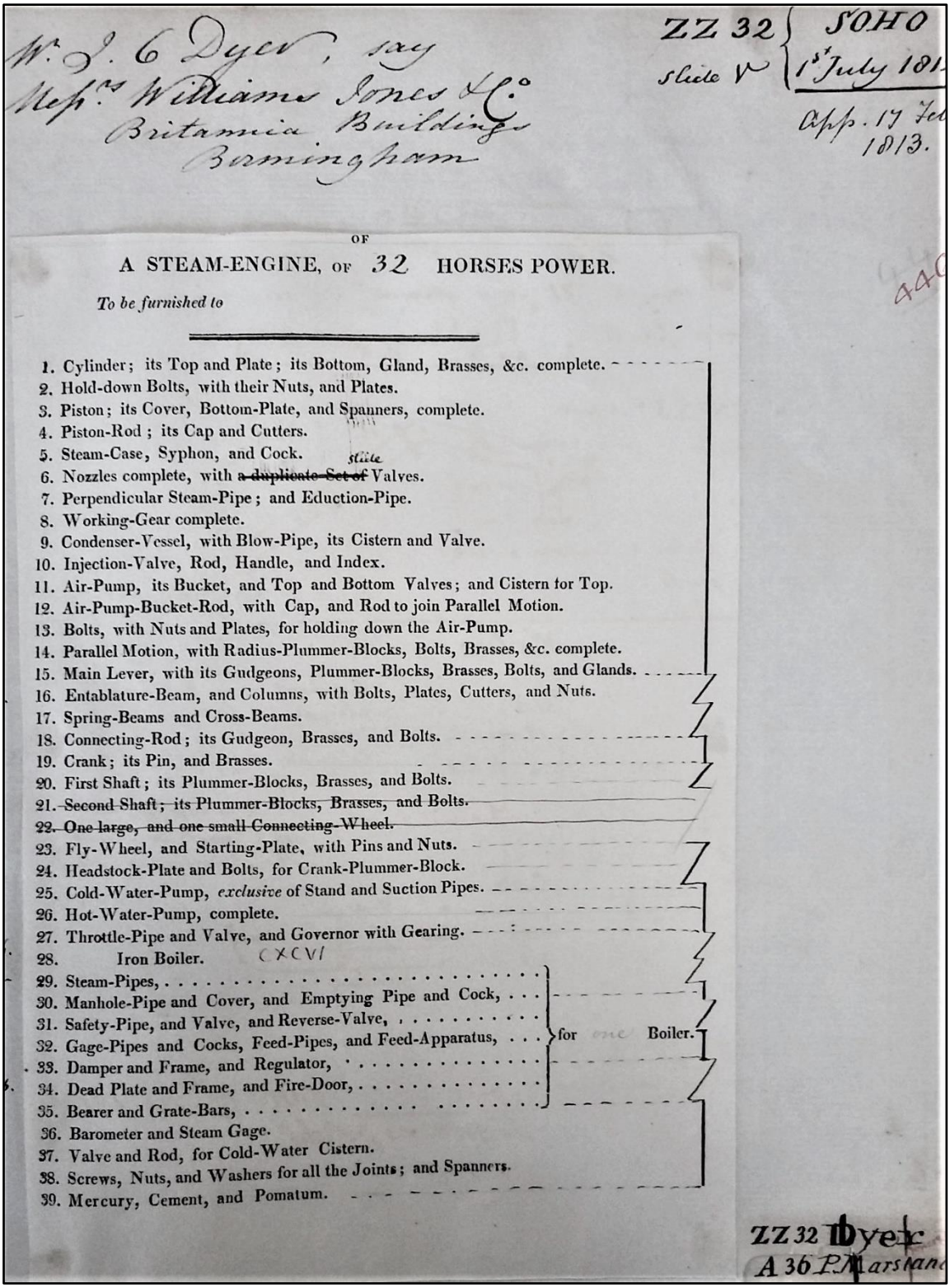
Birmingham and Walsall, would not fail to be impressed by the sheer scale of the building and its representation of permanence, both physical and commercial.

The Bathes recorded how 'Birmingham was, even by that time, a thriving city of factories'.[18] Whilst such a description may have been relevant to Manchester, it was certainly not appropriate to Birmingham. At the time that Dyer was setting up his new company, Birmingham remained a town characterised by the small workshops of the gun trade, the jewellery trade and other similar small metal trades.[19] It was certainly not 'a city of factories'. Thus, the contrast between the Britannia Buildings and the more typical industrial premises of the time would have been stark.

Dyer had arrived in England in 1811, the same year that the brewery buildings were put on the market for the second time. It was to be a busy year. He bought a house in Camden Town and was married to Ellen Jones, the daughter of Charles Jones of Gower Street, whom he had first met during his visit to England in 1802.[20] According to the Bathes, 'shortly after his arrival in England, Dyer went to Birmingham to have the machines constructed and put into operation'.[21] This is surely stretching Dyer's busy schedule too far. Why would Dyer have had machines constructed – let alone put into operation – when, at the time, he had nowhere to install them? It seems more likely that he would have spent 1811 searching for suitable premises before having the early machines made or, more likely, imported from America. Even when he had found a place to establish his business, the site would have had to be modified to suit the needs of a nail-making manufactory, and there is no evidence to suggest that this occurred before 1812.

Among the archives of the Boulton & Watt Collection held at the Library of Birmingham are thirteen Engine Order Books. Book No. 8 spans the period from July 1811 to December 1815 and

[18] Greville and Dorothy Bathe, *Jacob Perkins: His Inventions, his Times, and his Contemporaries* (Philadelphia: Historical Society of Pennsylvania, 1943), p. 39.
[19] See, for example, Eric Hopkins, *The Rise of the Manufacturing Town: Birmingham and the Industrial Revolution* (Stroud: Sutton, 1998), p. 103.
[20] Lance Day and Ian McNeil (eds.), *Biographical Dictionary of the History of Technology* (London: Routledge 1966), p. 396.
[21] Bathe, p. 39.



W.m L. & Dyer, esq
Messrs Williams Jones & Co
Britannia Buildings
Birmingham

ZZ 32 { SOHO
slide V { 1st July 181

Appr. 17 Feb 1813.

OF

A STEAM-ENGINE, OF 32 HORSES POWER.

To be furnished to

1. Cylinder; its Top and Plate; its Bottom, Gland, Brasses, &c. complete.
2. Hold-down Bolts, with their Nuts, and Plates.
3. Piston; its Cover, Bottom-Plate, and Spanners, complete.
4. Piston-Rod; its Cap and Cutters.
5. Steam-Case, Syphon, and Cock.
6. Nozzles complete, with ~~a duplicate Set of~~ Valves.
7. Perpendicular Steam-Pipe; and Eduction-Pipe.
8. Working-Gear complete.
9. Condenser-Vessel, with Blow-Pipe, its Cistern and Valve.
10. Injection-Valve, Rod, Handle, and Index.
11. Air-Pump, its Bucket, and Top and Bottom Valves; and Cistern for Top.
12. Air-Pump-Bucket-Rod, with Cap, and Rod to join Parallel Motion.
13. Bolts, with Nuts and Plates, for holding down the Air-Pump.
14. Parallel Motion, with Radius-Plummer-Blocks, Bolts, Brasses, &c. complete.
15. Main Lever, with its Gudgeons, Plummer-Blocks, Brasses, Bolts, and Glands.
16. Entablature-Beam, and Columns, with Bolts, Plates, Cutters, and Nuts.
17. Spring-Beams and Cross-Beams.
18. Connecting-Rod; its Gudgeon, Brasses, and Bolts.
19. Crank; its Pin, and Brasses.
20. First Shaft; its Plummer-Blocks, Brasses, and Bolts.
21. ~~Second Shaft; its Plummer-Blocks, Brasses, and Bolts.~~
22. ~~One large, and one small Connecting-Wheel.~~
23. Fly-Wheel, and Starting-Plate, with Pins and Nuts.
24. Headstock-Plate and Bolts, for Crank-Plummer-Block.
25. Cold-Water-Pump, *exclusive* of Stand and Suction Pipes.
26. Hot-Water-Pump, complete.
27. Throttle-Pipe and Valve, and Governor with Gearing.
28. Iron Boiler. CXCVI
29. Steam-Pipes,
30. Manhole-Pipe and Cover, and Emptying Pipe and Cock,
31. Safety-Pipe, and Valve, and Reverse-Valve,
32. Gage-Pipes and Cocks, Feed-Pipes, and Feed-Apparatus,

} for one Boiler.

33. Damper and Frame, and Regulator,
34. Dead Plate and Frame, and Fire-Door,
35. Bearer and Grate-Bars,
36. Barometer and Steam Gage.
37. Valve and Rod, for Cold-Water Cistern.
38. Screws, Nuts, and Washers for all the Joints; and Spanners.
39. Mercury, Cement, and Pomatum.

ZZ 32 Dyer
A 36 P Marsland

Figure 4.3. Extract from Boulton & Watt Co. Engine Order Book No. 8 showing Dyer's order for a 32 hp steam engine. 1813.

Source: Library of Birmingham. MS 3147/4/94. Engine Order Book No. 8, July 1811-December 1815

contains an entry 'ZZ32' dated 1 July 1812.[22] The relevant page is headed 'Mr J. C. Dyer, say Messrs Williams, Jones & Co, Britannia Buildings, Birmingham' (Figure 4.3). In the absence of any further evidence, it provides an incontrovertible link between Dyer and the Britannia nail works.[23] 'Between 1812 and 1814', wrote the Bathes, 'presumably the nail-making business was getting under way, but of this nothing is definitely known for these years are not covered by the Birmingham directories'.[24] The Engine Order Book now confirms their assumption, although it seems most unlikely that cut nails were being produced at the Britannia before 1814. While the brewery may have been a failing business, the company still had ownership of the premises in 1814; indeed, a piece of land adjoining the Britannia Buildings was assigned by its owner, John Patteson of Norwich, to the proprietors of the brewery in March of that year.[25] A week later, however, the short life of the Britannia Brewery came to an end, and the proprietors signed a document leasing the buildings and land for sixty-two years to a Samuel Williams of Finsbury Square, London.[26] An informal record of this transfer of ownership subsequently appeared on the drawing of the Britannia's façade (Figure 4.2), when an unknown hand wrote in the top left-hand corner: 'Once an ale manufactory, now a nale manufactory' (Figure 4.4).

According to the *Post Office Annual Directory* (1808), Samuel Williams was an American merchant; elsewhere he was described as 'an American agent and factor for merchants and planters'.[27] Significantly, Williams was also co-partner in the London banking house of Welles &

[22] Library of Birmingham. Boulton & Watt Collection. [hereafter LoB B&W]. MS 3147/4/94. Boulton & Watt Co. Engine Order Book No. 8. July 1811-December 1815.
[23] There are three entries in the Boulton & Watt Company Drawing Office Day Book. The first refers to the 'Britannia Nail Co.'; the second to 'Dyer (or Williams, Jones & Co.)'; whilst the third is shown as 'Williams, Jones & Co. (or Dyer)'. See LoB B&W. MS 3147/4/149. Boulton and & Watt Co. Drawing Office Index.
[24] Bathe and Bathe, p. 40.
[25] Stafford County Record Office [hereafter SCRO]. D 4452/5/9/1/1/15. 'Appointment of a piece of land adjoining the Britannia Brewery Buildings in Birmingham, John Patteson to Messrs Farley, Wakeman, Wheeley and Hanson, plan incorporated 25 March 1814'.
[26] SCRO. D 4452/5/9/1/1/16. 2 April 1814. 'Lease of the Britannia Brewery Buildings and land in Birmingham for 62 years, Proprietors of the Britannia Brewery Buildings to Samuel Williams, plan incorporated 2 April 1814'.
[27] *Post Office Directory for 1808* (London, 1808), p. 312; Thomas Sergeant and John C. Lowber (eds), *Cases Argued and Determined in the English Courts of Common Law, vol. XV* (Philadelphia: Nicklin & Johnson, 1830), p. 320.

Williams, well known as financiers to Americans doing business in Britain.[28] Acquiring the long lease of the brewery site in his own name was an astute move since ownership of the property would give him an advantage over other investors. The conditions of the lease implied that the buildings had been neglected and that they were 'within six months to be substantially repaired and repainted'. Clearly, the brewery buildings were to be renovated and put to some new use.

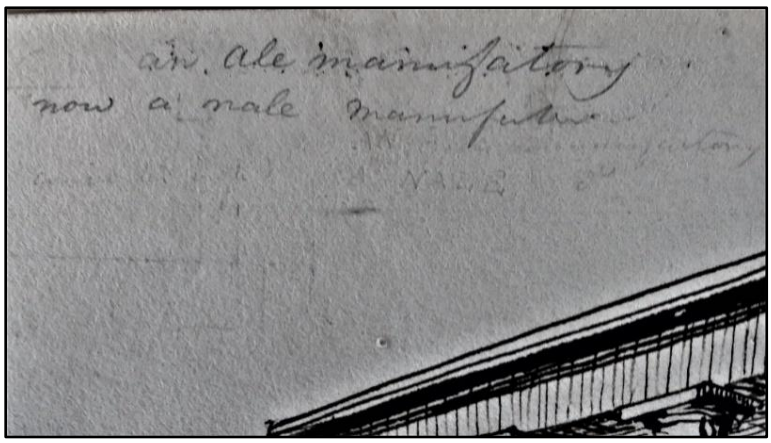


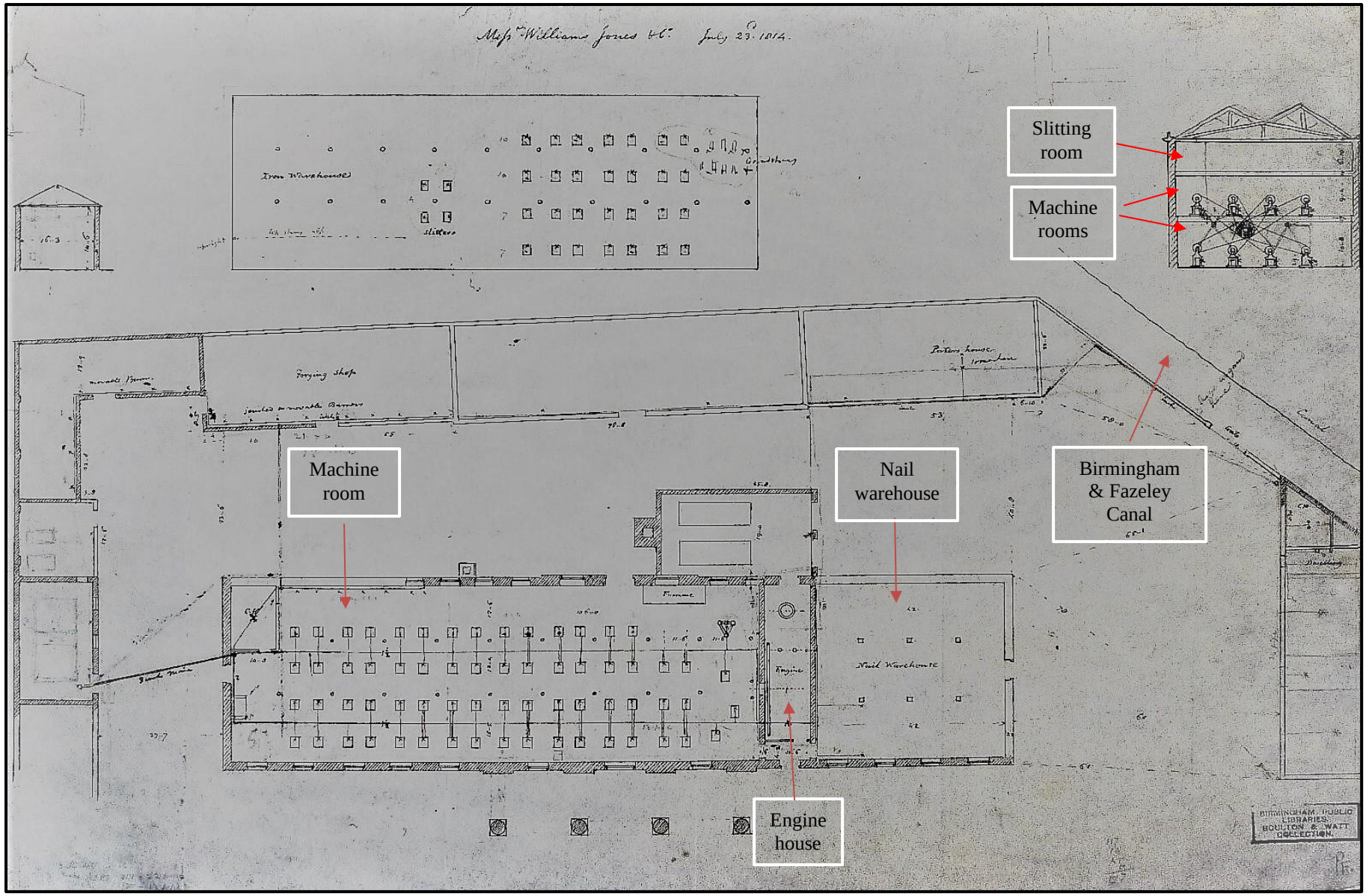
Figure 4.4. Pencilled note on the drawing of the Britannia Building's façade

Source: Library of Birmingham. MS 3147/5/807. Williams, Jones & Co. Gas lighting apparatus. Aug- Nov 1814

When Samuel Williams acquired the lease of the Britannia Buildings on behalf of Joseph Dyer's new company, the signing of the transfer document marked the end of a period of planning and negotiation that had begun some time before the summer of 1812. Dyer's entry in Engine Book No. 8 (Figure 4.3) covers two pages. In the top right-hand corner of the right-hand page there are two dates: the first reads 'Soho 1st July 1812'; the second 'app. 17 Feb 1813'. It is not clear to what these dates refer. However, 1 July 1812 must represent the *latest* date at which Dyer made contact with the Soho manufactory. If this is the case, it is safe to assume that Dyer must have been considering the Britannia Buildings as suitable premises for some time before that.

[28] Chaim N. Rosenberg, *The Life and Times of Francis Cabot Lowell 1775-1817* (Plymouth MA: Lexington, 2011), p. 189.

Figure 4.5. Boulton & Watt Co. Plan for the Britannia Nail Works. 1814



Source: LoB. B & W MS 3147/5/807. Gas Lighting Apparatus for Williams, Jones & Co. August-November 1814. (Labels inserted by the author)

There is one further, seemingly insignificant, piece of evidence to indicate that Dyer's company was formed in 1812. It concerns a brief notice in the *Birmingham Gazette* of 17 January 1831 recording the death of Matthew Cooper at the age of sixty-eight, noting that 'for nineteen years [he] faithfully and honestly discharged the duties of porter at the Britannia Nail Manufactory […]'.[29] Simple arithmetic, therefore, reveals that Cooper was an early employee of Dyer's company in 1812.

In addition to the Engine Book, the results of Dyer's deliberations are to be found in three other sections of the Boulton & Watt papers: the Drawing Office Index, the Drawings Day Book, and a series of loose papers concerning plans for fitting gas-lighting apparatus at the Britannia Buildings.[30] Entries in these three books all refer to an order for a 32 horse-power, double-acting crank engine made on behalf of 'J. C. Dyer or Williams, Jones & Co.'.[31] When completed, the plans and a printed inventory of the engine's components were sent to Dyer in London. If the drawings of the engine and engine house are of interest, those concerning the gas-lighting apparatus produced in 1814 are even more so, for they include sketches of the building's exterior and plans of the proposed layout of the factory (Figure 4.5).[32]

The plan shows what a convenient location the building occupied. It was sited alongside the Birmingham and Fazeley Canal, allowing easy access for heavy water-borne supplies of coal, iron and other bulky materials from the Black Country, and facilitating the distribution of finished nails to domestic markets and to the ports of London, Bristol, Liverpool and Hull. The plan also shows how nail machines were to occupy the first two floors of the building and were to be driven by belts connected to the steam engine by a shaft running the length of the machine-shops. The top floor housed several slitting machines, which were used to cut rolled-iron plates into strips of appropriate width.

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[29] *ABG*, 17 Jan 1831.
[30] LoB B&W. MS 3147/4/94. Engine Order Book No. 8. July 1811-December 1815; MS 3147/4/145. Drawings Day Book; MS 3147/4/149. Drawing Office Index; MS 3147/5/807. Williams, Jones & Co. Gas lighting apparatus. August-November 1814.
[31] Boulton & Watt recommended this size of engine for the rolling and slitting of iron. See Jennifer Tann, *The Development of the Factory* (London: Cornmarket, 1970), p. 37.
[32] The Britannia Nail Works was the first manufactory in Birmingham to be lit by gas. Ibid, p. 131.

4.3. Joseph Dyer: Heroic Entrepreneur?

Joseph Dyer died at his son's house in Macclesfield on 3 May 1871 at the age of ninety.[33] Since he had lived in Birmingham for only six months in 1815 but in Manchester for fifty-five years his obituarists naturally focused on his many activities in the north-west of England. It was in Birmingham, however, that this former merchant from Boston, then in his early thirties, demonstrated his remarkable entrepreneurial skills.

Dyer had arrived in England at a time of economic hardship, bringing with him patents for nail-making machinery for which there was no precedent on this side of the Atlantic. Having chosen the West Midlands as an appropriate region in which to introduce such machinery, his early attempts at marketing the innovative technology were met with indifference. The market for cut nails was totally unknown, and the labour force that he needed to operate and maintain the machines was untested. In almost all respects, the base from which he planned to launch his project was one of uncertainty and risk. Firstly, Dyer was taking a gamble in competing with the industrial might of the Black Country nail-masters. Secondly, he planned to use new and relatively unproven machinery: machinery powered by a large and expensive steam engine. Thirdly, the whole operation was to be conducted in a building that needed costly modification to suit it to its new role. Fourthly, as part of the refurbishment, Dyer was planning to install gas lighting throughout the factory. At the time, gas-lighting was still very much in its technical infancy and, while lighting the factory by gas would be seen as the crowning glory to Dyer's plans, such an innovation was yet another gamble. The Boulton & Watt Company had been employed to carry out the work and yet, according to Leslie Tomory, after 1812 the company's gaslight business was barely alive.[34] Despite the uncertainty surrounding the decision, it appears that it was put into action. Tomory recorded that an apparatus

[33] C. W. Sutton, 'Dyer, Joseph Chessborough (1780-1871), inventor, *Oxford Dictionary of National Biography*, http://www.oxforddnb/view/10.1093/ref.odnb/9780198614128.001.0001/odnb-97801986128-e-8351 (20 May 2018). Surprisingly, the exact date of Dyer's death is not clear. See Day and McNeil, p. 395, which gives the date as 2 May 1871. An obituary in the *Manchester Weekly Times* of 13 May 1871 gives it as 3 May, whilst the *Leeds Mercury* of 9 May 1871 gives it as 5 May.

[34] Leslie Tomory, *Progressive Enlightenment: The Origins of Gaslighting* (Cambridge, MA: MIT Press, 2012), p. 113. Dyer was ahead of his time as lighting factories by gas was exceptional until the mid-nineteenth century; and see Tann, p. 131

was sold in 1814 for £219, '*probably* to William Jones', although as the Boulton & Watt Company's plans were dated 23 July 1814, it seems more likely that the apparatus was sold not to William Jones but to Williams, Jones & Company, the name by which Dyer's company was known until 1818.[35]

So strong was his vision of the future of nail-making, and so alert was he to the opportunity presented by the availability of the canal-side premises in a town renowned as a magnet for innovation, that Dyer clearly thought the risks were worth taking. In Joseph Schumpeter's view, innovation lay at the heart of entrepreneurship. Innovation meant the introduction of a new product or a new quality of product; the introduction of a new method of production; the opening of a new market; the conquest of a new source of supply of raw materials; or the creation of a new organisational system within an industry. In short, he said, entrepreneurial innovation was 'simply the doing of new things, or the doing of things that are already being done in a new way'.[36] Although one can argue that 'a nail is just a nail', Dyer's innovation heralded an era in which cheaper nails would be produced in far greater quantities by a new organisational system within the nail trade. Schumpeter felt strongly that, if innovation was the extraordinary outcome of entrepreneurial activity, only extraordinary people could bring about such transformative events.[37] The Schumpeterian entrepreneur was an 'heroic' figure and, unfashionable as it may seem, it is not unreasonable to see Dyer in this light.

In his essay on the *Origins of the Industrial Revolution* (1966), M. W. Flinn defined an entrepreneur as one who 'brought together the capital (his own or somebody else's) and the labour force, selected the most appropriate site for operations, chose the technologies of production to be employed, bargained for raw materials and found outlets for the finished product'.[38] One can argue that certain of Flinn's entrepreneurial functions fall more within those of management, yet most

[35] LoB B&W. MS 3147/5/807.Gas Lighting Apparatus for Williams, Jones & Co. August-November 1814.
[36] Joseph A. Schumpeter, 'The creative response in economic history', *Journal of Economic History*, vol. 7 (2) November 1947, pp. 149-159 at p. 151.
[37] David Deakins and Mark Freel, *Entrepreneurship and Small Firms*, 6th edn (Maidenhead: McGraw-Hill, 2012), pp. 9-10.
[38] M. W. Flinn, *Origins of the Industrial Revolution* (London: Longman, 1966), p. 79.

apply to Dyer. His powers of persuasion must have been considerable as, through the network of American businessmen in London, Dyer was able to find a promoter willing to supply the capital required to buy the Britannia Brewery premises, to refurbish them, and to transform them into a fully-equipped manufacturing unit. He was also alert to the marketing value of both the architecturally-impressive Britannia Buildings and their proximity to the famous Soho manufactory. He was alert to the opportunity for change. As William Baumol remarked, for the entrepreneur 'today's practice is never good enough for tomorrow', and this was true of Joseph Dyer.[39]

Dyer's time in Birmingham was short-lived. As he told his audience at the Manchester Literary and Philosophical Society meeting in 1866, '[I] undertook to superintend the building and starting of the machines for a period of six months; after which the concern was left wholly in the charge of the company'.[40] Once Dyer had completed his mission of establishing the business, he clearly had no intention of becoming involved in its future operational management. By the end of 1816, he had left for Manchester.[41]

Samuel Williams had undoubtedly taken a considerable risk in providing the capital for the Britannia Nail Works, although his description as an 'excellent man of business', one considered to be 'as safe as the Bank of England', suggests that it was a well-considered one.[42] Williams strengthened his position when he secured the transfer of Dyer's patent rights to the new company in exchange for a share in the company's profits. The arrangement did not last long. As Dyer later explained

> [T]he lack of mechanical knowledge and business talents that appeared in the management, and also from differences about the capital in the concern, I was induced to consent to an

[39] William J. Baumol, 'Entrepreneurship in economic theory', *American Economic Review*, vol. 58, (2), Papers and Proceedings of the Eightieth Annual Meeting of the American Economic Association (May 1968), pp. 64-71 at p. 65.
[40] Dyer, 'On nail-making by machinery', p. 257.
[41] Exactly when Dyer moved to Manchester is unclear. Patent No. 3798, granted him in 1814, states that he was 'formerly of Boston […], now of Manchester'. Day and McNeil give 'c.1816' (p. 396); Armytage said it was 'after 1816' (p. 81); Dyer's obituary in the *Manchester Weekly Times* of 13 May 1871 surprisingly omits a date altogether.
[42] Harrison Ellery and Charles Pickering Bowditch, *The Pickering Genealogy*, vol. 1 of 3 vols (Cambridge, Mass: University Press, 1897), pp. 239-240; Roger A. Welchans, 'Washington Allston: Portrait of Samuel Williams', *The Bulletin of the Cleveland Museum of Art*, vol. 60 (1), January 1973, pp. 4-8 at p. 4.

> outright sale to the company of my contingent share of its profits at a price which did not exceed what my share ought to have produced *per annum* if the affairs had been conducted with judgement and prudence.[43]

Dyer severed all links with the Britannia, leaving Samuel Williams as the managing partner in Williams, Jones and Co.

An entry in Wrightson's *Directory of Birmingham 1815* suggests that the company had begun trading by then, although it was fortunate to survive beyond infancy.[44] In the aftermath of the Napoleonic Wars, Britain tottered under the triple blows of a stunted harvest, a trade depression and a glutted labour market. Hutton noted how 'many thousand were thrown out of employment by the peace of 1814 who had previously been engaged in the manufacturing of the various military implements' required during the protracted conflict with France.[45] It was not just the manufacturers of weaponry guns, small arms, bayonets and swords who were hit, but the West Midlands iron and coal industries too. So unstable was the labour market that the government became deeply concerned about the potential for civil unrest such that, on 4 July 1816, the Home Secretary, Lord Sidmouth, wrote to the authorities of all major English towns to enquire if incidents of civil disorder were occurring.[46]

Replies flooded back to the Home Office. In Shropshire, workmen in Shifnal were reportedly 'wandering about in numbers begging relief'; in Whitchurch, a body of colliers from Darlaston, near Walsall had 'spread themselves about the town […] begging the inhabitants render contributions'; and in Bridgnorth, the magistrates were 'apprehensive of disturbance' and asked that a troop of cavalry be quartered in the town.[47] The dire economic conditions clearly had an impact on the Black Country hand-made nail trade as well. On 3 August, a letter from magistrate William

[43] Prosser, pp. 73-74.
[44] Wrightson's *New Triennial Directory of Birmingham 1815*, (Birmingham, 1815), p. 160.
[45] William Hutton, *The History of Birmingham*, 6th edn (Birmingham: James Guest, 1836), p. 82.
[46] National Archives [hereafter NA]. HO 42.152. Home Office: Domestic Correspondence, George III. Letters and Papers.
[47] NA HO 42.152/465. Letter from William Wickstead to Lord Sidmouth dated 10 July 1816; NA HO 42.152/423. Letter from George Wyatt to Lord Sidmouth dated 14 July 1816; NA HO 42.152/425. Letter from Joseph Smith to Lord Sidmouth dated 16 July 1816.

Matthews, writing from the south Staffordshire town of Rowley, informed the Home Secretary that:

> In consequence of the nail ironmongers again reducing their workmen's wages and so many being wholly out of employ, a plot is forming […] of a dangerous tendency to disturb the peace in this country, as the nailers look upon the newly-invented machinery to press nails to be the principal cause of the trade being so bad. One of the principal of these manufactories is in the outskirts of Birmingham and known by the name of the Britannia Brewery and another about a mile out of Birmingham called Bromford Mill, these are the most extensive works.[48]

The plan was for two groups of nailers, some of whom were to be armed, to attack the two manufactories and destroy the machines. If this was not possible, the buildings were to be set on fire. Fortunately for the fledgling enterprise the raid does not appear to have been put into effect. Nevertheless, other, less violent, upheavals were to characterise the development of the Britannia nail works during the first decade of its existence.

4.4. Cut-nail Manufacture, 1815-1827: The 'Introduction' Phase.

Throughout much of the nineteenth century, the typical business unit was either the sole trader or the partnership. The Britannia was no exception. What is interesting , however, is not the form of business organisation itself but the extent of American involvement in the partnerships that ran this Birmingham business during the first twenty years or so of its existence.[49] In an obituary of Samuel Goddard, an American merchant resident in Birmingham for many years, the writer noted how, 'after the peace of 1814 [Americans] had flocked to the capital of the Midland Counties' where they had played 'a not unimportant part in the more limited and exclusive society of that period'.[50] Dyer had clearly been in the vanguard of this influx. After his departure for Manchester, the American-led partnership of Williams, Jones & Co ran the business until its dissolution in 1818.

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[48] NA HO 42.152/132 and 133. Letter from William Matthews to Lord Sidmouth dated 3 August 1816. See Appendix 2 for a facsimile and transcript of the letter.
[49] I am grateful to Susan Darby for her generous assistance in helping me to untangle the complex business relationships involved in the ownership and management of the Britannia during the 1820s and 1830s.
[50] *Birmingham Daily Post* [hereafter *BDP*], 27 Jul 1886; and see *Birmingham Journal*, 7 Mar 1835, which shows that Goddard had been Deputy Chairman of the Bordesley Steel Company, the Chairman of which was fellow American Henry van Wart.

Pigot's *Commercial Directory* for 1818 shows that a new partnership of Lloyd, Hancorne and Willoughby then assumed control of the business, although one of the partners, Plumstead Lloyd, left the partnership shortly afterwards.[51] He was never sound financially, having been declared bankrupt in 1813, when a partner in the Britannia Brewery, and again in 1824, suggesting that his departure from the nail works was triggered by personal financial difficulties.[52] Lloyd was replaced by Henry Winkfield. Whether Winkfield was an American or not is unclear. He certainly knew Henry van Wart – a New York-born merchant resident in Birmingham since 1808 – whom he had appointed trustee in a land settlement in Boonton, New Jersey occupied by the Boonton Iron Company, in which he owned shares.[53] The new partnership continued until June 1827 when John Willoughby left.[54] The partnership had lasted six years and had traded in both London and Birmingham as merchants, factors and manufacturers. By the time of Willoughby's departure, the Britannia Patent Nail Manufactory had been in operation for twelve years. It is therefore not unreasonable to think that, after such a lapse of time, the business would be flourishing. This does not, however, appear to have been the case.

A new product is seldom an immediate success, and the 'introduction' phase of the product life-cycle is often the most expensive one for a company introducing a new product. One reason for this is that the size of the market is initially small, and this is reflected in the volume of sales. At the same time, unit costs tend to be high: the factory must be powered and lit, and interest payments on the capital outlay need to be met. Another factor having a negative impact on unit costs concerns the inevitable teething problems that face the makers of new products using relatively untested machinery. All these affected the Britannia in its early years. Although the size of the market for nails was considerable, it was almost entirely catered for by the hand-wrought trade. The cut nail was an unknown product; prospective customers were unaware of its potential advantages, particularly of cost. Whilst modern start-up businesses have a range of marketing tools available to

[51] Pigot's *Commercial Directory for 1818-19-20*, p. 48.
[52] *Bristol Mirror*, 29 May 1813; *Northampton Mercury*, 1 Sep 1821; *London Gazette*, 30 Oct 1824.
[53] Pers. comm. Susan Darby.
[54] *ABG*, 22 Oct 1827.

them, their early nineteenth-century equivalents were restricted to entries in trade directories, and the persuasiveness of travellers and factors.

In his second patent, Dyer had explained the need for the drawings 'on account of the utter impracticability of specifying such improvements separately and by themselves, so as to be understood'.[55] It was not only the specifications that were complex but the machinery itself. R. F. Martineau, writing about the cut-nail trade in 1865, explained that 'a manufacturer's success depends almost entirely on the perfection of his machinery', adding that 'there is scarcely another trade in Birmingham in which the proportion of failures has been so large'.[56] Prosser also commented on the unreliability of the machinery, explaining that the early machines at the Britannia had been subject to 'numerous breakages' and how these teething problems had eventually been solved by an 'extremely ingenious' young American engineer named Sewell Barker. Barker had 'taken [the machine] in hand, remodelled it and created what is, to all intents and purposes, the machine now in use'.[57] On this evidence, Sewell Barker was undoubtedly one of Meisenzahl and Mokyr's 'tweaker inventors': one of the rank and file of an army of skilled workmen capable of building, installing, operating and maintaining new and complex equipment.[58]

Prosser related how, once the technical problems had been solved, 'the next thing was to induce the public to buy the articles, and this proved very difficult'.[59] For the first two years of production, the London ironmongers refused to have anything whatever to do with machine-cut nails, and it was not until 1817 that sales began slowly to pick up. Early clients included the contractors employed to rebuild the Custom House in London, which had been destroyed by a fire in February 1814, and those involved in the construction of the Brighton Pavilion, which had begun the following year.[60]

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[55] Joseph Dyer, (1812), Machinery for cutting and heading nails. Patent 3543, p. 2.
[56] R. F. Martineau, 'Cut nails' in Samuel Timmins (ed.), *The Resources, Products and Industrial History of Birmingham and the West Midland Hardware District* (London: Hardwicke, 1866), pp. 613-616 at p. 613.
[57] Prosser, p. 74.
[58] Ralph Meisenzahl and Joel Mokyr, 'The rate and direction of invention in the British industrial revolution: incentives and institutions' in Josh Lerner and Scott Stern (eds), *The Rate and Direction of Inventive Activity Revisited* (Chicago: University of Chicago Press, 2012), pp. 443-479 at p. 446.
[59] Prosser, p. 74.
[60] Prosser, p. 74; J. C. Platt, 'The Custom House' in Charles Knight (ed.), *London* vol. *2* (London: Knight, 1842), pp. 401-416 at p. 408;

Nowadays, the marketing challenge at the introduction stage of the product life-cycle is to make potential customers aware of the product's existence, its features, benefits and uses. Inserting an entry in an early nineteenth-century trade directory did little to achieve such objectives. Even by 1828, the Britannia's entry in Pigot's *Commercial Directory* gave only the current owners and the location – 'Hancorne, Winkfield & Co. (patent) Britannia buildings' – with no mention of the product.[61]

There is one further characteristic of a business at the introduction stage of its life-cycle and that is initial low-capacity utilisation. There is evidence to suggest that the Britannia experienced this during the first decade of its existence. In his *Picture of Birmingham*, published in 1825, James Drake wrote that the Britannia building 'is now occupied by the works of various mechanical experimentalists, of these a manufactory of cut nails is the principal; there is also established or establishing a printing concern on a new and ingenious plan'.[62] This extract implies that the realisation of Dyer's vision was a gradual process. It also illustrates Jennifer Tann's point made in her discussion of factory architecture that the main structural problem was 'to provide adequate space to accommodate the machinery which would be *gradually* installed'.[63] Whilst cut-nail manufacture was taking place at the Britannia, there was evidently spare capacity as the machine rooms were not yet fully equipped. The Britannia Buildings had, in fact, become a hub of American business activity in Birmingham. Henry van Wart – the American merchant involved with the export of Birmingham-made goods to the United States and a some-time partner of Samuel Goddard – had been in residence since 1817; the young engineer, Sewell Barker, was there; and, as Drake noted, the prolific Vermont-born inventor Dr William Church was working on an improved method of printing at the Britannia.[64] Church was later to become closely involved in the operation of the Britannia Nail Works after the expiry of the Dyer patents in 1827.

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[61] Pigot's *National Commercial Directory for 1828-9*, p. 799. A more extensive discussion of marketing techniques can be found in Chapter 7 of this study.
[62] James Drake, *The Picture of Birmingham* (Birmingham: Drake, 1825), p. 64.
[63] Tann, p. 149. My italics.
[64] *Morning Post*, 18 Aug 1824; *Mechanics' Magazine,* No. 686, 1 Oct 1836, p. 463; E. Edwards, *Personal Recollections of Birmingham and Birmingham Men* (Birmingham: Midland Educational Trading Company, 1877) at http://www.gutenberg.org/files/18821/18821-h/18821-h.htm#FIRST (accessed 19 May 2018).

4.5. Visitors to the Britannia

Referring to Birmingham industry in the mid-eighteenth century, Marie Rowlands noted that 'the large workshop with elaborate machinery and numerous employees aroused the admiration of visitors to the Midlands […] precisely because it was exceptional'.[65] This continued to be the case well into the nineteenth century. If the 'large workshops' had drawn visitors, the grandeur of the Britannia with its columned façade had a similarly magnetic attraction. Some visitors came for enlightenment, others for entertainment. A third group, however, came with industrial espionage in mind. As was the case with several Birmingham manufactories, access to the Britannia Nail Works was by no means open to anyone who wished to visit. The Swiss industrialist Johann Bodmer planned to visit the Britannia in November 1816. His diary entry for 22 November records how (seemingly without an appointment) he went to the works 'to see the machines for making nails. We were told that no visitors were allowed and went home again'.[66]

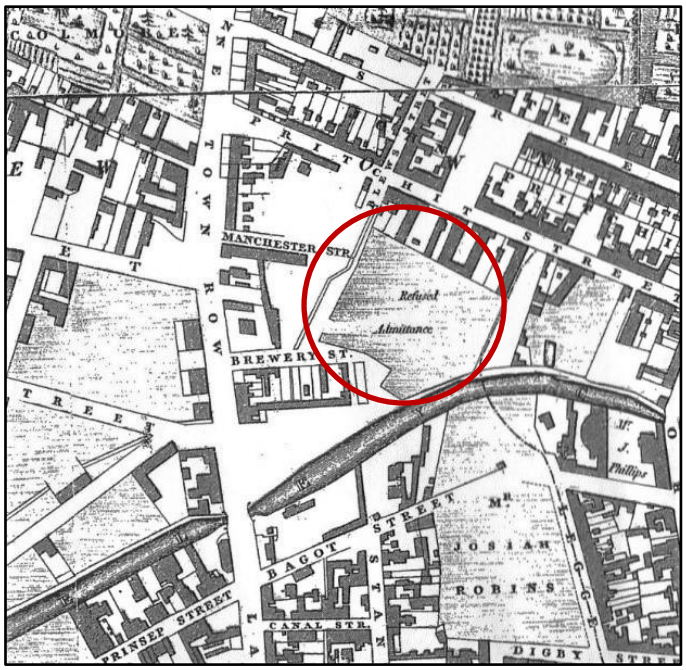


Figure 4.6. Pigott-Smith's 1828 map of Birmingham (detail) showing the site of the Britannia Nail Works where the surveyor was 'Refused Admittance'.

Source: Library of Birmingham. MS 2/B/12/3/1. Map of Birmingham from the survey made in 1824 and 1825, Surveyor J. Pigott-Smith

[65] Marie B. Rowlands, *Masters and Men* (Manchester: Manchester University Press, 1975), p. 156.
[66] W. O. Henderson, *Industrial Britain under the Regency. The Diaries of Escher, Bodmer, May and de Gallois 1814-18* (London: Cass, 1968), p. 91.

This, it seems, was still the case more than a decade later. When John Pigott-Smith's map of Birmingham was published in 1828, the extent of the Britannia Nail Works was represented by a shaded area with the words 'Refused Admittance' printed across it (Figure 4.6). Perhaps this should come as no great surprise. In 1825, James Drake noted that 'generally speaking, there is a strong feeling of objection against admitting any stranger, partly from the apprehension of the operations being occasionally witnessed by those who may make improper use of the information acquired, and partly from the inconvenience and loss of time consequent on the admission of visitors'.[67] This was still an issue in 1840, Osborne's *Railway Guide* observing that, among a few other manufactories, the Britannia was 'seen with difficulty'; not perhaps so much from jealousy of their secrets being discovered, as from the disruption that visitors would cause.[68] The Britannia's gates were not closed to all visitors, however. Rather it seems that the company's policy was to admit only those visitors whose presence would add prestige to the business and whose visits would be reported widely in the press – an inexpensive marketing ploy. On 12 October 1818, Sir William Congreve, equerry to the Prince Regent and MP for Plymouth, wrote a letter to Edward Thomason in Birmingham.[69] Thomason was not only one of the town's leading toy manufacturers but was also vice-consul for Austria (and seven other countries besides); and Congreve's letter concerned the forthcoming visit of Archduke Maximilian of Austria to Birmingham. The letter entreated Thomason to show the Archduke everything in his own 'admirable manufactory' as well as 'whatever else may be curious at Birmingham, particularly the nail manufactory, the japan ware, *papier machée*, the whip manufactory' among others.[70]

The significant point here is Congreve's use of the definite article when referring to 'the nail manufactory'. Although Congreve did not refer to the Britannia by name, the Britannia Nail Works

[67] Drake, pp. 107-108. In the second edition of the book, Drake criticised the practice of 'hermetically sealing' some of the town's most interesting manufactures as 'churlish', 'absurd', 'unfair' and 'impolitic'. See Drake, *The Picture of Birmingham,* 2nd edn (Birmingham: Drake, 1831), pp. 21-22.
[68] *Osborne's London and Birmingham Railway Guide* (Birmingham: E. C. & W. Osborne, 1840), p. 228.
[69] History of Parliament. Congreve, William (1772-1828), of Walton, Staffs, www.historyofparliamentonline.org/volume/1790-1820/member/congreve-william-1772-1828 [accessed 17 February 2015].
[70] Sir Edward Thomason, *Memoirs During Half a Century, Volume 1 of 2* (London: Longman, 1845), p. 163.

was henceforth invariably included in the itineraries of eminent visitors to Birmingham. When Princess Victoria and her mother, the Duchess of Kent, visited the town in August 1830, newspaper reports mentioned the Britannia nail manufactory by name.[71] During the twenty years that followed, the Britannia was visited by a range of dignitaries: the French ambassador (1838), the King of Saxony (1844), Prince Ibrahim Pascha of Egypt (1846), and the Turkish ambassador, whose visit coincided with the 1849 Exhibition of Manufactures and Art in Birmingham.[72] Having inspected a japanware or *papier machée* manufacturer, visitors would then be taken to the Britannia. There, as the *Mechanics Magazine* (1838) reported:

> The transition from the delicate and ornamental, to the powerful, ponderous, and useful appeared to gratify them very much. The machinery, worked by steam, which keeps employed some hundred hands, making above a thousand nails a minute, of all sizes, from the small boot tack to the ten-penny nail (five inches in length) was, as might be expected, the amazement of the foreigners […].[73]

A select number of Birmingham manufacturers, therefore, were included in what became a standard itinerary for the great and the good visiting Birmingham. Its impressive architecture, its size and the novelty of the production process distinguished the Britannia from its competitors and thus earned its inclusion in places to visit, as well as some free and valuable publicity.

4.6. Summary

At one level this chapter has been an analysis of how a Birmingham 'ale manufactory' was converted into a 'nale manufactory'. At another level, however, it has been about how Joseph Dyer, a young American immigrant, laid the foundations of an industry which, as the following chapters show, was to become a significant one for both the local and national economies throughout much of the nineteenth century. Although not recognised as such by historians, there seems little doubt that Dyer can take his place among the second tier of entrepreneurial innovators. He may not be as

[71] See, for example, *Leicester Journal*, 13 Aug 1830.
[72] *Morning Post*, 26 Jul 1838; *ABG*, 01 Jul 1844; *Bristol Mercury*, 20 Jul 1846; *London Standard*, 12 Sep 1849; *ABG*, 17 Sep 1849.
[73] *The Mechanic's Magazine,* (782), 4 Aug 1838, pp. 301-302.

famous as men such as Matthew Boulton, George Stephenson and Isambard Kingdom Brunel but, since the history of nail- making has attracted little interest in the past, this is hardly surprising.[74] He was, however, an 'heroic' and radical entrepreneur in the Schumpeter mould, and one who looms large in the annals of British nail-making history. Dyer's vision of the future of nail manufacture was one of mechanised, factory-based production and, despite the failure of the early models, the lack of interest in the innovative process, the wartime economic depression, and the dense cloud of uncertainty that enveloped the whole project, he persevered in the achievement of his goal. Then, having attained it, he promptly headed north, leaving the scene of his success behind him.

In the same way that inventors lacking business acumen leave the commercialisation of their invention to others, so entrepreneurs lacking the skills or, more likely, the motivation to manage a business that they have created, leave the operational control to others. Dyer's move to Manchester was an example of this. He set up an engineering works in the town and founded another business in France, and yet he never held a management position in either of these or any other of the many business enterprises in which he was involved.

The Dyer era was one of 'high-level' entrepreneurship. The period from 1827, when his third patent expired, to the Great Exhibition of 1851 was, as the next chapter shows, very different. It was, on the one hand, a period of rapid expansion for the Birmingham and district cut-nail trade. On the other hand, the growth was led, not by radical innovators in the Dyer mould, but by 'low-level' entrepreneurs prepared to take risks in exploiting the opportunities that nail-making machinery presented, particularly when linked to the expansion of steam power that took hold in the 1830s.

[74] See Hugh Bodey, *Nailmaking* (Botley: Shire, 2008), p. 7.

CHAPTER 5

THE EMERGENCE AND GROWTH OF THE BIRMINGHAM AND DISTRICT CUT-NAIL TRADE, 1827-1853

5.1. Introduction

A disturbing report of an attack by a rabid wolf on people gathered in a crowded market place in western Anatolia appeared on page three of *The Times* on 16 August 1852.[1] The account sat inappropriately and rather uncomfortably on a page otherwise devoted entirely to the activity of different English markets: an unusually-busy cotton market in Liverpool and, conversely, a dull hosiery and lace market in Nottingham. These reports, together with those from Leeds, Manchester, and other major commercial centres, were clustered under the heading of 'State of Trade', a regular feature of the newspaper. The report from Birmingham gave the disappointing news that exports of hardware from the town had fallen by 20 per cent between June 1851 and June 1852. On the other hand, there was nothing but good news for the Birmingham cut-nail trade, the newspaper's correspondent stating that

> Cut nails have taken almost complete possession of the market. The immense powers of production now existing in Birmingham – for cut-nail manufactories are springing up in every direction – the excellent quality of the articles produced, and the low price at which they are sold, have combinedly annihilated (except some particular descriptions) the wrought nail trade.[2]

Brief and rather overblown as this account of the Birmingham cut-nail trade may be, its wording is highly significant. Phrases such as 'have taken […] possession', 'immense powers […] now existing' and 'springing up' are all strongly suggestive of a dynamic, energetic and vigorous industry. Nevertheless, bearing in mind the trade's slow and uncertain beginning explained in the previous chapter, the contrast between the trade in 1827, when Joseph Dyer's patent expired, and

[1] *The Times*, 16 Aug 1852.
[2] Ibid.

its apparent condition some twenty-five years later is remarkable: so remarkable, in fact, that it needs to be challenged on several fronts. The report raises several questions, not the least being: who was the correspondent, and did he have a vested interest in talking up the trade? Since the report omits a by-line, however, it is unlikely that this question will ever be answered. Evidence is more readily available to answer other questions. How had the cut-nail trade risen to such a position of dominance within the regional nail trade, and what human activity had enabled this to occur? Similarly, what technological developments had occurred to facilitate the 'immense powers of production' which had enabled nails that were cheap yet of high quality to be made? What is the evidence to support the statement that 'cut-nail manufactories [were] springing up in every direction'; and, if they were, what was meant by 'every direction'?

All these questions are about 'growth' – a deceptively simple word that conceals several different meanings. Growth can mean expansion, development, evolution or progress; and each of these four descriptors has relevance when analysing the 'growth' of the Birmingham and district cut-nail trade. Furthermore, even the word 'expansion' needs to be qualified, for it can refer to both numerical expansion and spatial expansion. Whilst 'expansion' has quantitative implications, 'development', 'evolution' and 'progress' have qualitative undertones; and both the quantitative and qualitative aspects of the growth of the cut-nail trade need to be considered.

In *Lever of Riches* (1990), Joel Mokyr questioned the value of a schematic life-cycle of technological creativity theory, arguing that the predictive powers of such a model were very limited.[3] Nevertheless, he went on to write: 'Like most theoretical models, it suggests to the empirical economist and economic historian where to look for specific evidence.'[4] With this in mind, the chapter begins with a brief examination of the third stage of the product life-cycle, the 'growth' stage. Chapter 3 dealt with the 'development' stage (conducted almost exclusively in the United States between 1790 and 1810), whilst Chapter 4 examined the 'introduction' stage, which began with the arrival in England of Joseph Dyer and concluded with the expiry of his patents in

[3] Joel Mokyr, *Lever of Riches* (Oxford; Oxford University Press [hereafter OUP], 1990), p. 262.
[4] Ibid.

1827.[5] This chapter is concerned with the third stage of the life-cycle model – the 'growth' stage – and will argue that this stage lasted from around 1827 until the immediate aftermath of the Great Exhibition of 1851. The chapter begins with a brief description of the theoretical elements of the growth stage, together with comment on the strengths and weaknesses of using the model in its current context. Since a major aspect of growth stage theory concerns expansion, the second part of the chapter examines the numerical and spatial growth of cut-nail production units in Birmingham and its locality. The third and fourth sections deal with qualitative features of growth, namely the technological developments that occurred during the period from 1827 to 1853, and the entrepreneurial activity that characterised the evolution of the cut-nail trade through the period.

5.2. Product Life-Cycle: The 'Growth' Stage

'Growth' stage theory rests upon an assumption of a growing market awareness and acceptance of the new product. A resulting increase in sales, the theory explains, enables further investment to be made in machinery and permits an increased utilisation of capital.[6] Greater utilisation creates economies of scale which, in turn, lead to a reduction in unit costs. Increasing sales and lower costs generate growing profits, and an awareness of these attracts new competition. Prospective competitors who have been waiting in the wings whilst monitoring the take-up of the new product then enter the market and are able to take advantage of the development activities undertaken by the originator. This requires producers to increase their investment in promoting their product and differentiate it from those of their competitors. Advertising is an obvious method of product promotion; another is by increasing the number of distribution outlets, whilst a third is for manufacturers to signal to the market their constant quest for quality through improvement.[7]

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[5] Confirmation of the expiry of Dyer's 1814 patent is given in Luke Herbert, *The Register of Arts and Journal of Patent Invention,* vol. 2 (London: Steill, 1828), p. 128.

[6] It will be recalled from the previous chapter that, in the early years of the Britannia Nail Works, under-utilised parts of the premises were rented out to other businesses run primarily by American merchants and inventors.

[7] William M. Pride, Robert J. Hughes and Jack R. Kapoor (eds), *Business*, 11th edn (Nashville TE: South-Western, 2012), pp. 367 and 368; Donald. R. Lehman and Russell. S. Winer, *Product Management*, 2nd edn (New York: McGraw Hill, 1997), p. 75; and http://productlifecyclestages.com (accessed 2 June 2013).

Although, as Mokyr suggested, the various elements of growth-stage theory indicate where to look for specific evidence of the expanding cut-nail trade, such a search is limited by the paucity of existing records, particularly those of individual businesses. In 2009, John Orbell noted that 'the majority of businesses […] make no formal provision for the care and administration of their archives'.[8] Whereas some major Birmingham and district businesses – Cadbury's, GKN, and Kynoch's, for example – clearly considered posterity by securing their archives, most small and medium-sized businesses did – and do – not.[9] This was certainly true for small and medium-sized enterprises in the first half of the nineteenth century. Without business records it is difficult to provide evidence of sales, the downward movement of unit costs, or the extent to which profits were generated. On the other hand, sources such as contemporary trade directories, newspapers, magazines, encyclopaedias and maps do make it possible to create a picture of the numerical and spatial expansion of the trade during the 'growth' period. They also enable an analysis of the extent to which businesses recognised the need to promote their products in the face of increasing competition either through advertising or through qualitative improvements.

Marketing activity coupled with product development is essential if those firms that enter the market in the early part of the 'growth' stage are to survive. While they may accrue an advantage by being in at the beginning – when competitors are relatively few – the overall success of the industry will attract newcomers to the market, thus increasing competition and threatening the position of the older-established businesses. 'Cut-nail manufactories are springing up in every direction' observed *The Times*, suggesting that historical fact accorded with modern theory. However, the product life-cycle model states that such a situation tends to occur near the end of the 'growth' stage. It is necessary, therefore, to establish the start and end points of the stage.

The extent of the various stages of the life-cycle model is always subject to debate and establishing the transitional point between stages is never exact. Rather than moving from one stage to the next

[8] John Orbell, A *Guide to Tracing the History of a Business* (Chichester: Phillimore, 2009), p.14.
[9] The Cadbury archive is held in the Cadbury Research Library, University of Birmingham; GKN records are be found at Wolverhampton Archives; and the Kynoch Company records are deposited at, among other places, the Library of Birmingham and the Walsall Local History Centre.

at a specific time, the process often gradually metamorphoses over several years. Nevertheless, despite this *caveat*, the beginning of the 'growth' stage of the Birmingham cut-nail trade is easier to fix than its end. As the previous chapter explained, Joseph Dyer's patents effectively prohibited the development of powered nail-cutting machinery beyond the walls of the Britannia Building. The expiry of the patents in 1827 released the brake on such development and, from that point on, the trade began to expand, albeit at a very slow pace initially. When the Duchess of Kent and her daughter Princess Victoria visited (and, according to a press report, 'minutely inspected') the Britannia Nail Works in August 1830 they probably did so because the Blews Street business was not only still seen as 'revolutionary' in its means of production but also because it was the only such manufactory of its kind in existence.[10] Developments had, however, begun to occur in 1827 and it is therefore not unreasonable to take this year as the start of the 'growth' stage.

The transitional point at which an industry moves from 'growth' into 'maturity' is equally imprecise. One way of fixing such a point is to identify roughly when the industry begins to rationalise. The process of rationalisation is often marked by the departure of smaller and weaker businesses, either because they find that they cannot compete and cease trading or because they become targets for merger and acquisition. A high point for the West Midlands cut-nail trade seems to have occurred around 1853. As this chapter shows, the greatest number of cut-nail manufacturers existing at any one time were in business during the years immediately following the Great Exhibition. After that, the number began to decline, even if the strength of the industry did not. Thus, 1853 will be taken as the transitional point from growth to maturity.

5.3. The Expansion of the Birmingham and District Cut-nail Trade

The quarter century that followed the conclusion of the Britannia's monopoly of machine-made nails coincided with a time of rapid demographic and economic change in Birmingham and its district. In 1801, the population of the original ancient parish of Birmingham was 60,822. By 1831, the population had expanded by a further 50,000 and by the time of the Great Exhibition of

[10] The visit occurred on 05 August 1830. See *Aris's Birmingham Gazette* [hereafter *ABG*] 09 Aug 1830.

1851 it stood at 140,190.[11] Economic change was associated with a range of new products and processes – brass bedsteads and electro-plating, steel pens and plate glass – although not with any noticeable transformation in industrial organisation. There was no precipitous transition from small- to large-scale industrial units, and production methods were not accompanied by the general introduction of machinery.[12] When the Factory Commissioners visited Birmingham in 1833, they reported that 'a very large proportion of the work of Birmingham is paid by the piece and is given out to be executed at the houses of the work-people'.[13]

Similar product changes were occurring in the Black Country. At Wednesbury, for instance, a falling demand for gun barrels after the Napoleonic Wars was compensated by the production of welded tubes for water and gas supply; and in Wolverhampton, locksmiths extended their product range to include wrought-iron safes.[14] Of particular significance was the gradual change in the industrial base of the Dudley and Tipton district, so long associated with the production of hand-wrought nails, as the manufacture of chains, cables and anchors began slowly to transform the local industrial scene. In September 1818, the *Morning Chronicle* reported that 'at Dudley and Stourbridge, the nail trade was never known so brisk'.[15] Twelve years later, the hand-wrought nail trade reached its zenith with an estimated 50,000 people employed.[16]

From 1830 onwards, the hand-made trade began a protracted decline, responsibility for which was placed firmly at the feet of the machine-cut nail trade.[17] Before examining the growth of the cut-

[11] C. R. Elrington and P. M. Tillott, 'The city of Birmingham: the growth of the city' in W. B. Stephens (ed.), *A History of the County of Warwick, vol.VII, The City of Birmingham*, (London: OUP,1964) [hereafter *VCH Warwicks VII*], pp. 4-25 at pp. 9 and 14.
[12] See Eric Hopkins, *The Rise of the Manufacturing Town: Birmingham and the Industrial Revolution* (Stroud: Sutton, 1998), pp. 26 and 35.
[13] Parliamentary Papers [hereafter PP] 1833 (450) Royal Commission on the Employment of Children in Factories. First Report. Minutes of Evidence [hereafter1833 CEC (1)], p. 900.
[14] G. C. Allen, *The Industrial Development of Birmingham and the Black Country 1860-1927* (London: Allen & Unwin, 1929; repr. Cass, 1966), p.37.
[15] *Morning Chronicle*, 12 Sep 1818.
[16] Ephraim Ball, 'The hand-made nail trade', in Samuel Timmins (ed.), *The Resources, Products and Industrial History of Birmingham and the West Midland Hardware Districts* (London: Hardwicke, 1866), pp. 110-116 at p. 111. But see Allen, who noted that 'in view of the size of the total population of the district, this is obviously an exaggerated estimate'. Allen, p.39.
[17] Ball, p. 111; and see Samuel Salt, *Second lecture on the nail forgers' general strike and the evils of the truck system* (Halesowen: self-published, 1862), no pp, in which two lines of his versified 'lecture' read: 'And what these evils are that ruins trade, /It's through trucks, cut and press'd nails being made.'

nail trade in detail, however, it is necessary to introduce a *caveat* about the nature of cut nails. The previous chapter stressed the fact that the Britannia Nail Works was the first producer of machine-cut nails in Britain when it began trading in 1815. Therefore, a document in the Birmingham Archives dated 1807 referring to 'Birmingham manufacturers' price lists for cut nails' presents something of a conundrum.[18] When the Dyer-established firm of Williams, Jones & Co was first recorded in a trade directory it was listed simply as a 'nail manufacturer', with no allusion to the nature of the product.[19] On the other hand, among the fifteen other nail manufacturers listed in the directory, three are shown as producing cut nails: Samuel Armfield, a snuffer and shell toy-maker; Bragg, Sprigg & Feidler, locksmiths; and William Clarke, a pressed hinge maker. Chapter 2 examined the emergence in the late eighteenth century of technological alternatives to the hand-wrought production of nails, one of which was the Willmore-Tonks hand-operated nail-cutting fly press.[20] Each of the cut-nail makers listed in Wrightson's 1815 directory would have used a fly-press in their primary businesses, and it is therefore reasonable to assume that the same equipment would have also been used to produce nails.

5.3.1. Numerical Expansion

Allen argued that there were four principal influences on the industrial growth of Birmingham and its district: the 'enormous' increase in the population; an increased demand for iron; the construction of the railways; and the general introduction of steam power.[21] The expanding cut-nail trade was a contributor to the increasing demand for iron, an 1841 edition of *The Penny Magazine* noting that 'nails furnish one among the many instances afforded in our manufactures of the enormous extent to which an apparently trifling article influences the consumption of raw material'.[22] Increased construction led to the emergence of many small-scale building firms, all of

[18] Library of Birmingham [hereafter LoB]. Birmingham History, K/1. 324164, 'Birmingham manufacturers' price lists for cut nails. 1807'.
[19] Wrightson's *New Triennial Directory of Birmingham* (Birmingham, 1815), p. 160.
[20] Joseph Willmore and John Tonks (1808), Methods and processes in the manufacture of nails. Patent No. 3137. Page 4 of the specification explains that 'the operation of pressing is performed by the action of the hand only'.
[21] Allen, p. 32.
[22] *The Penny Magazine*, 11 Sep 1841, p. 360.

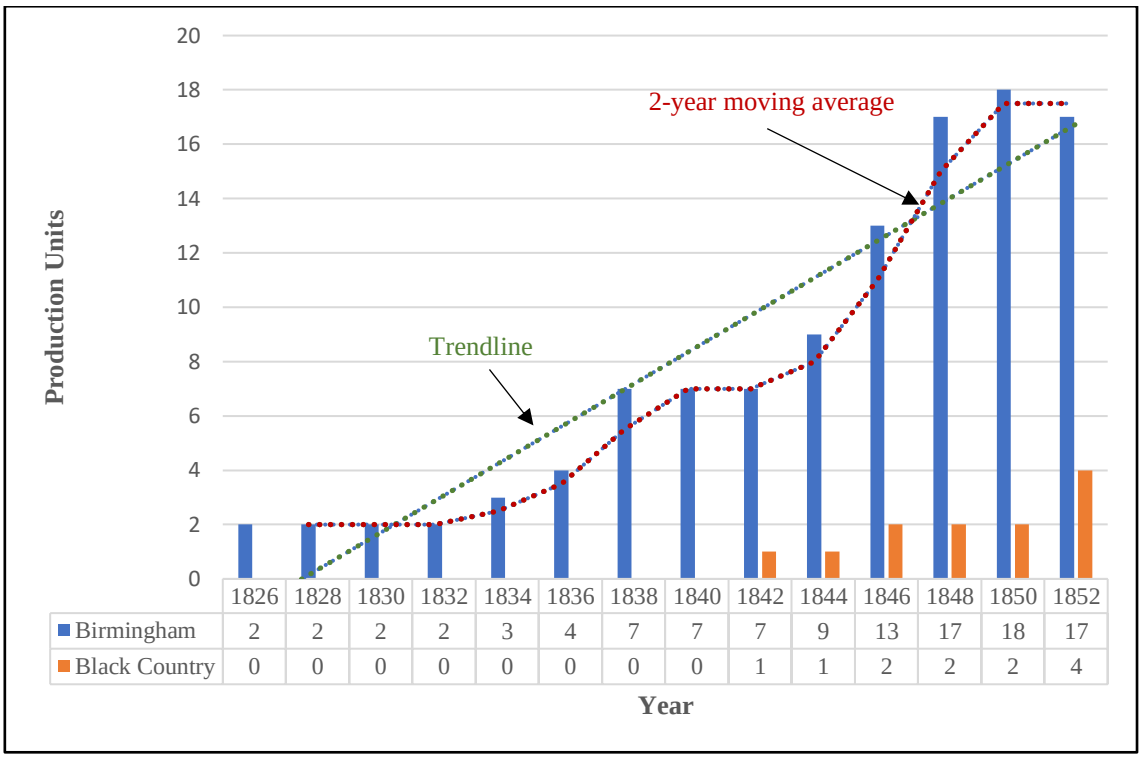
which would require large supplies of nails. The growing rail network, too, was an insatiable consumer of nails: small nails for the construction of rolling stock and large dog spikes to secure rails to sleepers. It was the application of steam power, however, that was critical to the expansion of the cut-nail trade.

Before 1830, steam power was little used in Birmingham and, when it was applied, it was to be found only in the primary metal industries for the processes of hammering or rolling. There were several reasons for this limited use. The organisational structure of Birmingham industry – reliant as it was on stamps, presses, lathes and draw-benches – obviated in large part the need for steam power. At the level of the firm, the high cost of Boulton & Watt engines, coupled with falling hardware prices (and thus, declining profits) between 1818 and 1832, deterred manufacturers from investing in steam-powered machinery.[23] Nevertheless, there were signs that the 'power of steam' was starting to make itself felt. In giving evidence to the Royal Commission on the Employment of Children in 1833, John Lewis, a former employee at Phipson's pin factory, was asked why he had left the firm after twenty-nine years' employment. His answer was: 'Because my work was done by steam-power, which before was done by manual labour'.[24] The increasing employment of steam power during the 1830s adds weight to Lewis's testimony. Between 1822 and 1830, the average annual increase in the number of steam engines in Birmingham was 5.4; between 1831 and 1838, it was 16.8.[25] To what extent was this upsurge in steam power reflected in the growth of the cut-nail trade?

The chart in Figure 5.1 illustrates the pattern of biennial growth of cut-nail production units between 1826 and 1845. There are three clear phases of growth: 1826-1835, 1836-1844 and 1845-1852. By the mid-1830s, little of note had occurred in the cut-nail trade to threaten the power of the hand-wrought nail trade. The trade depression that hit the town between 1826 and 1833

[23] Clive Behagg, *Politics and Production in the Early Nineteenth Century* (London: Routledge, 1990), p.43; Hopkins, p. 34; Jennifer Tann, *The Development of the Factory* (London: Cornmarket, 1970), p. 85.
[24] 1833 CEC (1). p. 903.
[25] W. H. B. Court, *The Rise of the Midland Industries, 1600-1838* (London: OUP, 1953), p. 257; Behagg, p. 43.

deterred prospective investors from risking their money in what was still an unproven industry; and, after all, the hand-wrought nail trade was still in a dominant position.[26] In 1829, Daniel Ledsam, one of only two cut-nail manufacturers in business at the time, was taken to court by his



	1826	1828	1830	1832	1834	1836	1838	1840	1842	1844	1846	1848	1850	1852
Birmingham	2	2	2	2	3	4	7	7	7	9	13	17	18	17
Black Country	0	0	0	0	0	0	0	0	1	1	2	2	2	4

Figure 5.1. Numerical increase in cut-nail production units, 1826-1852

Sources: Derived from data at Appendix 4 and trade directories listed in the bibliography

neighbour, Thomas Freeman, who ran a public house in the adjoining premises. Freeman complained that the vibration caused by Ledsam's steam-powered machinery meant that 'the ale barrels rattled like rocking-horses […] and were in a state of perpetual agitation', the upshot of which was that the beer was rendered undrinkable. When defence witnesses were called, they all 'cried out against the sacrilege of stopping the march of steam'.[27] In truth, however, the application of steam power to nail-making machinery before 1835 resembled more a laboured shuffle than a determined march.

[26] Hopkins, pp. 76-77.
[27] *Leamington Spa Courier*, 22 Aug 1829; and see Guy Sjögren, ''A mighty iron missionary of civilisation and progress': the power of steam in the West Midlands', *History West Midlands*, vol. 3 (3), Winter 2015, pp. 17-21.

The trendline in Fig. 5.1 clearly shows the upward 'march of steam' in the cut-nail trade; and the two-year moving average indicates that growth was not only consistent but also that it quickened its step, particularly during the 1840s. Behagg noted that the years 1837 to 1842 were ones of depression for the Birmingham economy although, given the disparate nature of the town's myriad trades, such generalisations are not particularly helpful.[28] During this second phase, the number of steam-powered cut-nail businesses increased four-fold, reflecting the overall spread of steam rather than the economic situation. When, in 1852, *The Times* reported that cut-nail manufactories were 'springing up in every direction', that certainly must have seemed to be the case: the number of businesses had more than doubled during the preceding decade. Numerically, therefore, the period from the expiry of Dyer's patent to the time immediately after the Great Exhibition was one of considerable growth for the cut-nail trade: but where is the evidence for this expansion?

In his guide to tracing the history of a business, John Orbell noted that the accuracy, completeness and currency of trade directories has been the subject of much debate; yet he concluded that they do provide a *fairly* accurate picture of the number of traders and manufacturers operating in business at a specific time. [29] In considering the reliability of directories as source material, Jane Norton has urged caution, stressing that they should be used in conjunction with other available evidence.[30] Without using trade directories, any attempt at establishing the expansion of the cut-nail trade would be virtually impossible; directories formed the basis upon which the data in Appendix 4 was compiled, with additional evidence gleaned from other sources such as parliamentary papers, newspapers and advertisements. Such evidence can be regarded as 'hard' evidence, although there are also 'softer', more conjectural and inferred forms of evidence. What follows draws on both 'hard' and 'soft' evidence.

A problem throughout much of the period was distinguishing between those cut-nail manufacturers who used hand-operated fly-presses to cut nails and those who employed steam power to drive

[28] Behagg, p. 108.
[29] Orbell, p. 128.
[30] Jane E. Norton, *Guide to the National and Provincial Directories of England and Wales, excluding London, Published before 1856* (London: Royal Historical Society, 1984), p. 24.

machinery in the way that the Britannia Nail Works had done since its inception. Directories did not differentiate between the two methods. From 1828 until 1834, however, there were only two steam-powered cut-nail manufactories. Both were in Birmingham. One was the Britannia, the other was Daniel Ledsam's manufactory at 26 Edmund Street, near the town centre. Although Ledsam's nail-cutting business is not mentioned in Pigot's *New Commercial Directory for 1828-9*, the press report of the court case mentioned earlier confirms both its existence and its source of power.[31] The *Leamington Spa Courier* told its readers that Ledsam was 'one of the great manufacturers with which Birmingham abounds' and that he had 'thought it proper to erect a steam engine on premises adjoining the public house, and a mill for cutting nails, to which steam was applied'.[32] The point here is not that 'malt prevailed over steam', though it clearly did, but that the historical evidence for Daniel Ledsam's steam-powered manufactory comes from a newspaper rather than a directory.

When Pigot published the 1835 edition of his directory, he listed forty-seven Birmingham nail manufacturers. Of these, five were shown as makers of cut nails and two as makers of 'patent' nails. One cut-nail maker, John J. Dearman, must be disregarded at this stage: he neither appears in a directory before 1835 nor after, and no alternative evidence, such as the decennial census, has come to light to explain the nature of his business. In 1867, *Aris's Birmingham Gazette* reported the death in London of a John J. Dearman, 'formerly of this town'.[33] If this is the same man, his departure to London may explain the lack of information about his business in Birmingham. The other four cut-nail makers produced goods other than nails. William Clarke, John Law, Charles Shaw and James Thornton were all producers of items such as pressed hinges, padlocks and washers. Just as they would have used a press to form the shapes of hinges and locks, so they would cut small, headless nails from strips of metal. All had been in business well before the

[31] See Pigot's *New Commercial Directory for 1828-9,* p. 799; *Leamington Spa Courier*, 22 Aug 1829.
[32] *Leamington Spa Courier*, 22 Aug 1829.
[33] *Aris's Birmingham Gazette* [hereafter *ABG*], 1 Jun 1867.

expiry of the Dyer patent.[34] For both reasons, these four manufacturers are unlikely to have been users of steam-powered machinery.

Two producers were referred to in Pigot's 1835 *National Commercial Directory* as manufacturers of 'patent' nails:[35] One was the partnership of Winkfield, Church & Blyth, current owners of the Britannia; the second was the firm of Abraham and Jacob Salt. Abraham Salt had formerly been a partner of William Clarke until the partnership had been dissolved in 1827.[36] When Abraham and Jacob Salt were listed in Pigot's 1835 directory, the business was shown as operating at 'The Phoenix Patent Nail Warehouse' at 49 Dudley Street. The words 'Phoenix' and 'Patent' are interesting. Firstly, this was the earliest time that the Dudley Street premises had been referred to in this way. Secondly, was the word 'Phoenix' a reference to a new beginning for the business? Thirdly, when the only other cut-nail manufacturer mentioned as producing 'patent' nails was the Britannia, did this mean that by 1835 the Salts were using steam-powered machinery? They must have converted to steam power at some stage. In 1862, the firm was acquired by a major competitor, John Reynolds; and there can have been no good reason for Reynolds to buy an ailing business equipped with hand-operated presses.[37]

Hard evidence can be acquired from several different sources. As the data in Fig. 5.1 show, there were far fewer cut-nail manufacturers in Black Country towns than there were in Birmingham. Two of the four Wolverhampton firms trading during the 'growth' phase were Thomas Hemingsley & Co. and John Neve & Co. Both were described as 'cut-nail manufacturers', although the method of production used by each was unclear. The second report of the 1843 Children's Employment Commission clarified the situation. The commissioners visited the premises of both firms and noted that, at Neve's establishment, 'the machines are put in action by the hand instead of by steam'.[38] Evidence of how Hemingsley powered his machines is also made

[34] See Wrightson's *New Triennial Directory of Birmingham, 1818*, p. 162.
[35] Pigot's *National Commercial Directory,1835*, p. 561.
[36] *ABG*, 22 Jan 1827.
[37] *ABG*, 11 Jan 1862.
[38] PP. 1843 (430, 431, 432) Royal Commission on Children's Employment in Mines and Manufactories. Second Report (Manufactures) [hereafter 1843 CEC (2) Manufacs], p. 91.

clear from the report: 'Not any of the machinery is boxed off or guarded in any way. It is a frightful place, turn which way you will. There is a constant hammering roar of wheels, so that you could not possibly hear any warning voice.'[39] There would be no reason why a fly-press would be 'boxed off'; and the 'hammering roar of wheels' indicates steam-powered machinery with constantly moving parts, driven by a series of shafts and exposed belts.

Trade directories give valuable clues as to what power sources were being used. Eight of the twenty-six cut-nail manufacturers trading at some stage between 1840 and 1852 (30.7 per cent) were based at one or other of the eight steam-mills that existed in Birmingham. 'Steam-power is an article produced in great quantities for sale' in Birmingham, *The Penny Cyclopaedia* informed its readers in 1835.[40] Small cut-nail manufacturers – those starting out or those with little capital – took advantage of 'power to let'. When large factories were built, manufacturers, realising that they were unlikely to fill the entire building with machinery for some years to come, rented out both space and power. By doing so, factory owners were able to cover the interest due on the capital cost of the buildings with the rent received from their tenants.[41] Both John Reynolds and Samuel Webb started their long-lasting businesses in this way, both trading into the twentieth century. On the other hand, W. P. Flanagan, and George and Elizabeth Newton were unable to develop their businesses. Along with Benjamin Pearce, they never rose above rented space.

One of the features of the 'growth' stage of the product life-cycle is that a greater number of competitors tend to enter the market at the latter end of stage rather than earlier. Having waited in the wings whilst monitoring the growth of steam-powered manufacture, new cut-nail businesses began trading. Of the nineteen manufacturers operating in the district in 1852, fourteen – 73.7 per cent – had begun doing so as recently as 1846. Entering the market at such a late stage, they were able to take advantage of the development activities undertaken by the early entrants.[42] One such

[39] 1843 CEC (2) Manufacs, p. 90.
[40] *The Penny Cyclopaedia*, vol. IV, 1835, pp. 446.
[41] Tann, pp. 77-78. See also William Hawkes Smith, *Birmingham and its Vicinity as a Manufacturing and Commercial District* (London: Tilt, 1836), Part iii, pp. 8-9.; Maxine Berg, *The Age of Manufactures, 1700–1820. Industry, Innovation and Work in Britain*, 2nd edn (London: Routledge, 1994), p. 279.
[42] Lehman and Winer, p. 75.

manufacturer was Francis Agard, who established a cut-nail works in Heneage Street. Agard first appeared in a trade directory in 1852, where he was listed simply as a nail manufacturer. Despite this lack of detail, however, he clearly used steam power to drive his machines as, in October 1854, he bought a 30hp Taylor & Challen steam engine for his Heneage Street works, and for which he was charged £580 for its manufacture and installation.[43] A few years earlier, another Heneage Street cut-nail maker, Thomas Pearson, appeared in a trade directory. He too was listed merely as a 'nail manufacturer'; although, as this chapter has shown, even being referred to as a cut-nail manufacturer was no guarantee of a mechanised production process. In this instance, however, a notice in a newspaper makes it possible to establish Pearson as a user of steam power. When the threat of bankruptcy forced him to sell his 'stock in trade and valuable machinery', among the items in the inventory were forty-eight nail-cutting machines 'in beautiful working order', a 15 hp steam engine and 158 cwt of sheet iron'.[44] Prosser added further information, noting that Pearson 'had been connected to the Blews Street Works'.[45] In other words, Pearson had acquired his knowledge of mechanised nail production while employed at the prestigious Britannia Nail Works.

Establishing the numerical expansion of the Birmingham and district cut-nail trade has been complicated by the ambiguous, dual meaning of the term 'cut-nail manufacture'. This was alluded to earlier in this chapter, with confusion arising from a lack of clear distinction between manufacturers using a hand-operated fly-press and others producing cut- nails with steam-powered machinery – the focus of this study. Trade directories have provided the material upon which the data illustrating the expansion of the trade between 1827 and 1852 is based; and, whenever possible, additional source material has been used to 'prove' the data. Figure 5.1 showed how the numerical expansion of the trade reflected the spread of steam power, especially in Birmingham. George Barnsby has argued that 'it was in the 1830s that the Industrial Revolution caught up with

[43] LoB. MS 1350 A/2. Memorandum of agreement being a contract for the construction of a condensing beam steam engine. 18 October 1854.
[44] *ABG*, 30 Aug 1847. Although the bankruptcy was annulled, the business was acquired by Richard Oldacre. See *London Gazette,* 22 Oct 1847 and White's *Directory of Birmingham 1855*, p.383.
[45] Prosser, p. 74.

nail-making', although the reverse is probably more accurate.[46] Slow to get going, the wider application of steam power during the 1830s certainly stimulated the growth of the mechanised nail trade. Whilst technological innovation was to have a noticeable impact on the Birmingham nail trade, it made little impression on nail-making in south Staffordshire and north-east Worcestershire. There were never more than three cut-nail manufacturers in business in the Black Country at any one time during the 'growth' period, whereas Birmingham experienced an eight-fold increase. As the number of businesses grew, so cut-nail manufacture began to cluster in two specific districts in the town.

5.3.2. Spatial Expansion

The reasons why the hand-wrought nail trade came to be located so successfully in south Staffordshire and north-east Worcestershire were examined in Chapter 2; but what factors determined the location of the machine-cut nail trade in Birmingham? When *The Times* reported that cut-nail manufactories were 'springing up in every direction' in Birmingham, it omitted to explain exactly where they were doing so and why. There are three levels of decision to be made in siting a manufactory.[47] The first is the 'macro' decision, a decision about in which town to locate and why. In the case of the cut-nail trade, Chapter 4 argued that such decisions rested on tangible and intangible factors. Tangible factors included the proximity of the factory to a source of raw materials; the existence of appropriate transport facilities; and an adequate supply of skilled and unskilled labour. Intangible factors included an all-pervading atmosphere of entrepreneurial drive and the presence of vibrant business networks. The second level of decision-making is the 'meso' level decision: decisions to determine where in the chosen town would be an appropriate site to locate a factory. Ready access to both suppliers and distributors via an established transport system was a significant consideration for cut-nail manufacturers. A similarly important matter was the availability of vacant land, if a new build were envisaged, or, if not, a suitable building for

[46] George J. Barnsby, *Socialism in Birmingham and the Black Country 1850-1939* (Wolverhampton: Integrated Publishing Services, 1998), p.35.
[47] H. A. Eiselt and Carl-Louis Sandblom, *Decision Analysis, Location Models and Scheduling Problems* (Berlin: Springer, 2004), p. 155; John Bale, *The Location of Manufacturing Industry: An Introductory Approach*, 2nd edn (Edinburgh: Oliver & Boyd, 1981), pp. 22 and 27.

conversion. In each case, a further issue was the potential offered by the site if the business needed to expand. The final level of decision-making is the 'micro' level, which concerned decisions about the layout of the building.

At a macro level, the choice of town was not difficult. Writing in 1913, W. J. Audley explained that Birmingham's specialisation was 'the production of finished articles, and not of the crude metal from which they are made', and that Birmingham was 'the home of metal users rather than metal makers'.[48] The meso decisions rested on a more complex range of factors, one of which affected all cut-nail manufacturers, whatever their size, namely the availability of a suitable labour force. At the time that the cut-nail trade was growing, so was the population of Birmingham. There was thus an increasingly sizeable pool of labour from which to recruit: an adaptable labour force experienced in many forms of metal manufacture. Even as early as 1837, one manufacturer, Richard Goose, felt sufficiently confident to advertise for 'a good workman in the cut-nail trade', stating that 'no one need apply who has not had experience in the trade'.[49] Critical, however, was access to a canal, and Birmingham's cut-nail district developed around the junction of four canals that stretched to all four points of the compass (Figure 5.2).

The method used to determine the pattern of spatial growth of cut-nail manufacture in Birmingham began by dividing the town into four quadrants, with the intersection of the east-west and north-south axes at St Philip's Church, approximately at the centre of the town (see Figure 5.2).[50] Such a method may seem arbitrary, although it has proved to be a useful way of facilitating analysis of the spatial development of cut-nail manufacture in Birmingham. Growth was especially marked in the north-east and south-west quadrants, whilst the south-east and north-west quadrants appear to have held little appeal. The reasons why two quadrants thrived in relation to the other two will be examined shortly.

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[48] W. J. Audley, 'Birmingham Industry and Commerce' in G. A. Auden (ed.), *A Handbook for Birmingham and the Neighbourhood* (Birmingham: Cornish Brothers, 1913), pp. 353-64 at pp. 359 and 408.
[49] *ABG*, 13 Nov 1837.
[50] St Martin's Church, adjacent to the Bull Ring, was traditionally taken to be the central point of Birmingham, but as the town spread, especially northwards, so too the notional 'town centre' moved north. See *VCH, Warwicks, VII*, p.10.

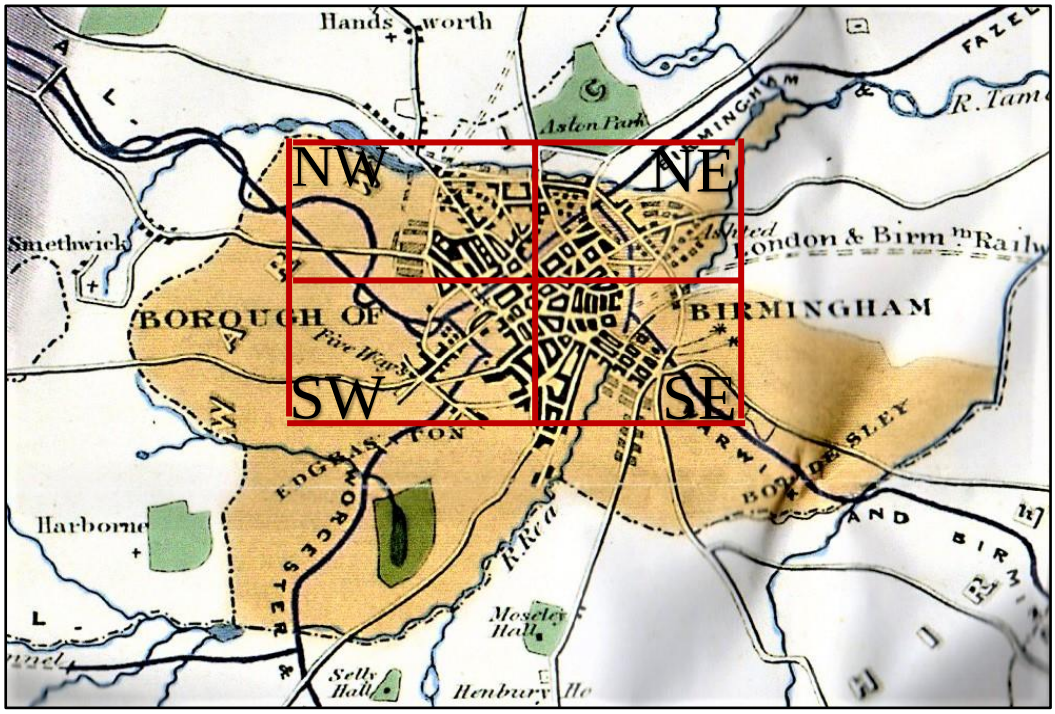


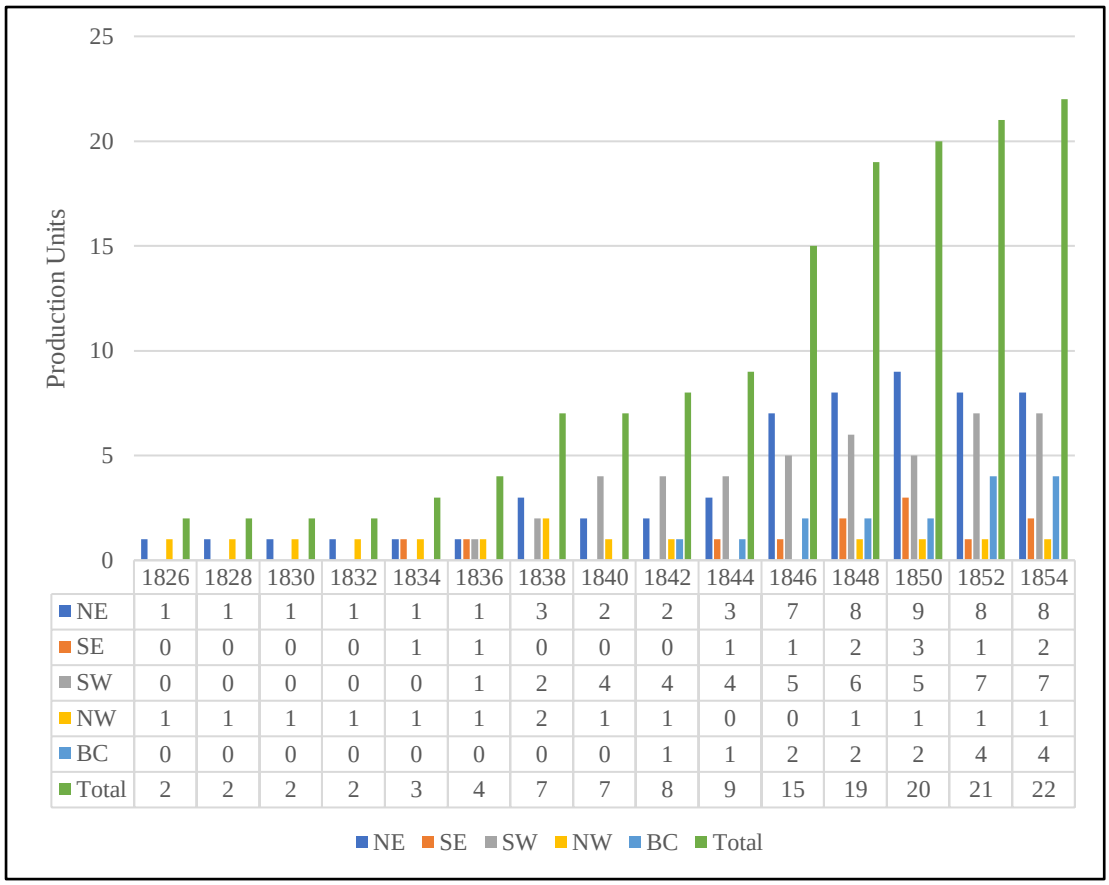
Figure 5.2. The four quadrants of the Birmingham cut-nail manufacturing district in relation to the canal system (shown in black) c.1845

Source: Adapted by the author from Radclyffe & Co.'s Map of the Mining and Manufacturing Districts 1836. Staffordshire and Worcestershire (repr. Walsall: Mapseeker Publishing, 2013)

Growth within the four quadrants between 1826 and 1854 is illustrated by means of a bar chart (Figure 5.3). As with the numerical analysis above, trade directories provided the main source of data, supported by contemporary maps and newspaper reports. Manufacturers' locations were identified, and their positions plotted on quadrant maps. That said, the exercise in manufactory location was not without its difficulties. Some directories simply gave the street in which the manufactory was located, such as 'Pearson, Thomas, Heneage Street'.[51] On this evidence alone, it was not possible to pin-point the exact location of the business. When the directory gave two streets as an address – for example, 'Pearce, Benjamin, Bridge Street, Broad Street' – this indicated that a factory was located at the junction of the two streets named.[52] In such cases, it was possible to identify the precise location. Obviously, the same was true when an entry gave the street number

[51] Pigot's *Directory of Birmingham, 1842*, p. 101.
[52] White's *History, Geography, and Directory of Warwickshire 1850*, p. 364.

of the building; 'Salt, Abraham and Jacob, 49 Dudley Street' is an example.[53] From 1845 onwards, Post Office directories not only gave street numbers but also gave an indication of where on the street a property lay. For instance, The Birmingham Cut Nail Company lay at the junction of Bishop Street and Moseley Street.[54] Such was the redevelopment of Birmingham in the 1960s,



	1826	1828	1830	1832	1834	1836	1838	1840	1842	1844	1846	1848	1850	1852	1854
NE	1	1	1	1	1	1	3	2	2	3	7	8	9	8	8
SE	0	0	0	0	1	1	0	0	0	1	1	2	3	1	2
SW	0	0	0	0	0	1	2	4	4	4	5	6	5	7	7
NW	1	1	1	1	1	1	2	1	1	0	0	1	1	1	1
BC	0	0	0	0	0	0	0	0	1	1	2	2	2	4	4
Total	2	2	2	2	3	4	7	7	8	9	15	19	20	21	22

Figure 5.3. Biennial changes in the number of cut-nail production units trading in the four Birmingham quadrants and the Black Country (BC), 1826-1854

Sources: Derived from data at Appendix 4 and trade directories listed in the Bibliography

however, that many nineteenth-century streets and buildings no longer exist, and thus thwart a physical check. A systematic, physical search of cut-nail factory locations revealed only one building still in existence, namely the Hadley factory in Eyre Street.

[53] White's *History, Geography, and Directory of Warwickshire 1850*, p. 364.
[54] Post Office *Directory of Birmingham, Staffordshire & Worcestershire, 1850*, p. 24.

5.3.2.1. The North-East Quadrant

At the start of the period, the sole manufactory in the north-east quadrant was the Britannia Nail Works. During the 'growth' stage, a further fourteen businesses were established, more than in any of the other three quadrants. Two specific phenomena dictated the siting of these businesses. The first was concerned with the expansion of the town. As the population of Birmingham grew, so the edge of the built environment was extended. In 1838, when Birmingham became incorporated into a borough, much of the eastern part of the original parish had been fully developed.[55] In their quest for land, industrialists began to exploit the north-eastern edges of the town, followed in due course by the north-west. This was especially true of cut-nail manufacturers after the mid-1840s, for whom the district held a two-fold attraction. The first was that land lying outside the built environment was both relatively cheap and amply available. Even allowing for a degree of artistic licence, Henry Ackerman's panorama, published in 1847 (Figure 5.4) shows that the Britannia Nail Works (A) remained on the edge of the borough and that land was readily available in area C. Four years after the publication of the panorama, at least three cut-nail manufacturers had established factories in Heneage Street and Lord Street, both of which had been laid out in area C.

The second significant factor was the importance of being sited near a canal. The Britannia Brewery had been chosen partly for its proximity to the Birmingham & Fazeley Canal, and as Figure 5.5 shows, most manufactories established during the 'growth' phase lay adjacent to or within two hundred metres of either the Birmingham & Fazeley Canal or of the Digbeth Branch Canal, which provided a link to the Warwick & Birmingham Canal. Proximity to a canal was apparently of greater significance than to the railway. The London & Birmingham Railway's terminus lay, 'somewhat inconveniently', just to the south of the north-east quadrant in Curzon Street, and yet it appears that the canals were the magnet that attracted cut-nail makers to the

[55] *VCH Warwicks VII*, p. 10.

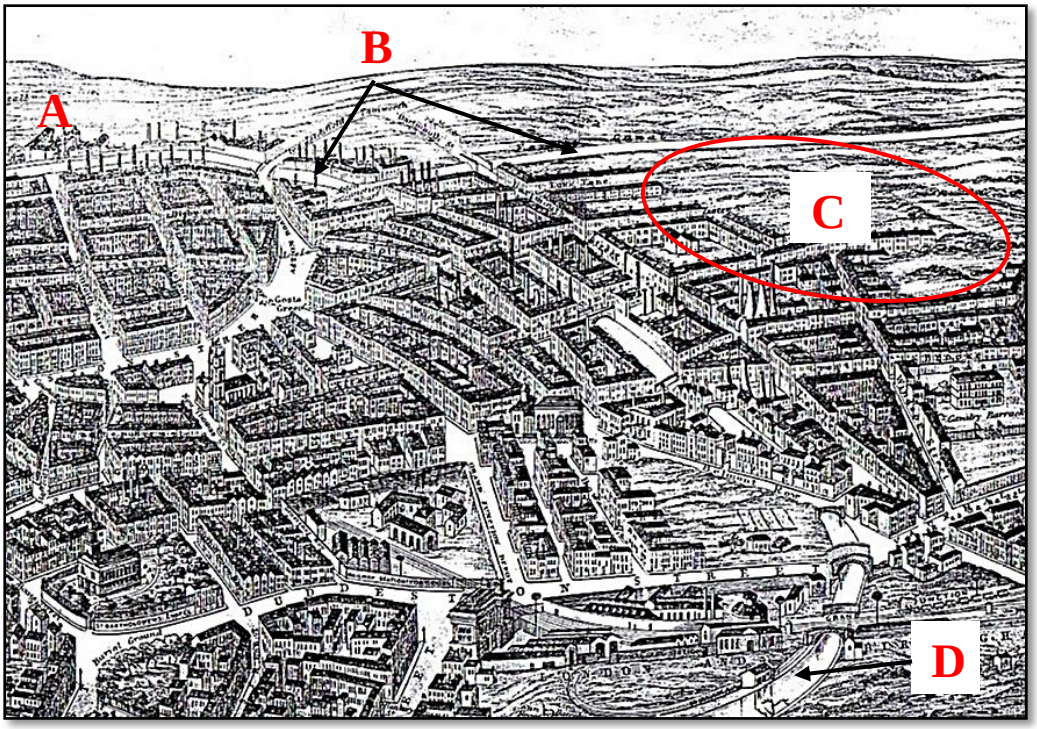


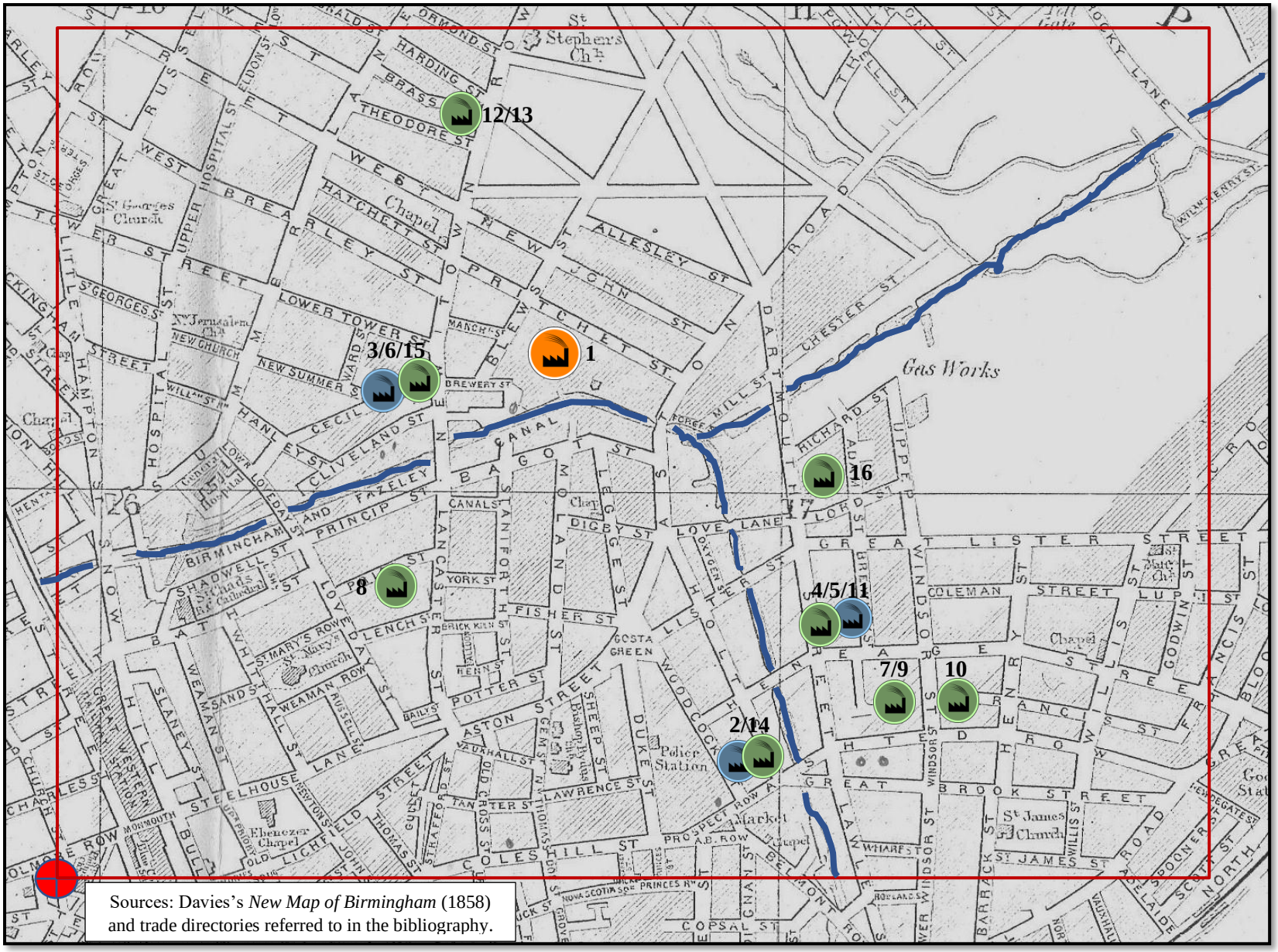
Figure 5.4. Panoramic view of the north-east quadrant

A. Britannia Nail Works
B. Birmingham & Fazeley Canal
C. Approximate area of new street construction after 1847
D. Digbeth Branch Canal.

Source: Adapted by the author from Library of Birmingham L/./85/1; 295795. Panoramic view of Birmingham (Ackerman and Co.) 1847.

quadrant rather than the railway.[56] In the railway's 1830 prospectus, the canals were described as 'those old and unimprovable modes of transport'. However, a second prospectus, published two years later, was rather more pragmatic when it stated that 'the railway will probably not be used to convey coal, limes and other cheap and heavy articles, which compose the chief traffic of the

[56] See G. H. Wright, *Chronicles of the Birmingham Chamber of Commerce 1813-1913* (Birmingham: Chamber of Commerce, 1913), p. 219; *VCH Warwicks VII*, p.10.



Formed before 1836

1. Britannia Nail Works

Formed 1836-1844

2. Jones, William & Co.
3. Newton, George
4. Pearson, Thomas (from New Canal Street, SE Quadrant 1838)

Formed 1845-1854

5. Agard, F. H. & Co.
6. Asbury, George
7. Cartwright, Francis
8. Farmer, William
9. Flanagan, W. P.
10. Jenkins, L. C.
11. Oldacre, Richard & Co.
12. Pumphrey, Josiah & Son
13. Reynolds, John (from Attwood's Mill, Easy Row 1849)
14. Robinson, John
15. Webb, Samuel (until 1850)
16. Webb, Samuel (after 1850)

St Philip's Church

Canal

Figure 5.5. Spatial expansion in the north-east quadrant of Birmingham by 1854

canals'.[57] It is notable that two Birmingham directors of the London & Birmingham Railway were Daniel Ledsam and Charles Shaw, both of whom were also owners of Birmingham cut-nail businesses, and thus producers of 'cheap and heavy articles'.[58] Whether Ledsam – that 'great manufacturer' – or the shrewd, 'generally disliked and somewhat dreaded […] 'Charley' Shaw' had a hand in preparing the second prospectus is an appealing thought but one unsupported by the evidence.[59] By 1850, canals still had an important part to play, and much of the town's factory traffic continued to be water-borne.[60]

Writing on the cut-nail trade before 1865, R. F. Martineau explained that: 'The manufacturer's success depends almost entirely on the perfection of his machinery; and while some masters have done well, there is scarcely another trade in Birmingham in which the proportion of failures has been so large.'[61] If this were true of the Birmingham trade as a whole, there were certainly signs of business failure in the north-east quadrant. At one end of the scale was the Britannia which, despite changing hands on four occasions during the 'growth' phase, retained its pre-eminent position in the trade. At the other end, five of the quadrant's fifteen firms were small concerns conducting their business in steam mills, renting space and power from the mill owner. George Newton and his wife produced cut nails at Bullock's Mill in Cliveland Street, but their business survived only four years; W. P. Flanagan lasted the same short spell in the appalling conditions of Wallis's Mill in Dartmouth Street; whilst John Robinson traded for six years from Brueton Mill on Prospect Row.[62] Not all steam mills were as dilapidated as Wallis's Mill, and existing mills offered start-up businesses the chance to enter the market with reduced overheads and establish themselves before relocating to their own premises.

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[57] LoB, Archives/117408, Collection of Prospectuses: Prospectus of the London & Birmingham Railway 1830 and 1832.
[58] *ABG*, 29 Nov 1830.
[59] *Leamington Spa Courier*, 22 Aug 1829; Ellezer Edwards, *Personal Recollections of Birmingham and Birmingham Men* (Birmingham: Midland Educational Trading Co., 1877), p.109.
[60] Victor Skipp, *The Making of Victorian Birmingham* (Birmingham: Skipp, 1983), p. 35.
[61] R. F. Martineau, 'Cut nails', in Timmins, pp. 613-616 at p. 613.
[62] Children's Employment Commissioner R. D. Grainger reported on his visit to Wallis's Mill in 1841, stating that he had 'never seen a shop in a more filthy and wretched condition', adding that Mr Wallis would not allow him to interview the children in the counting house as 'they would make the place stink, so that the customers would not stay in it'. PP. 1843 CEC (2) Manufacs, p. 158.

Like the railway, 'power to let' was an essentially democratic innovation. As William Hawkes Smith explained:

> The mere working man, who has saved a trifling sum, is enabled, by renting a share of room and power, in some extensive rolling-mill or other considerable establishment, to pursue on a small scale, an occupation, which would otherwise be out of his reach.[63]

Two major cut-nail producers started in such a way. Thirty-year-old John Reynolds set up his Crown Nail business in 1847 at Attwood's Mill, an 'extensive' copper-rolling mill in Baskerville Place. There he learned his trade, working alongside a producer of japan ware, three glass cutters and a steel-toy polisher. Reynolds was clearly a quick learner and keen to expand. On 7 February 1849, a 'spacious, well-arranged manufactory, warehouse and premises' on Newtown Row belonging to hook-and-eye manufacturer Josiah Pumphrey & Son was auctioned. Reynolds was the buyer, and his cut-nail business remained at 209 Newtown Row until 1959.[64] Like Reynolds, Samuel Webb began trading in 1847, employing two men and 'one other labourer' at Bullock's Mill in Cliveland Street, close to the Britannia Nail Works.[65] By 1852, he too had moved his business from the mill to new premises. Webb established a newly-built nail works at 15, Lord Street, itself a newly-laid street providing a north-westerly extension to Love Lane into previously unbuilt land (Area 'C' in Figure 5.4; location 16 in Figure 5.5). Webb was still trading there fifty years later.

5.3.2.2. The South-East Quadrant

The south-east quadrant is something of an anomaly. By the mid-1830s, Thomas Pearson, formerly of the Britannia Nail Works, was the sole cut-nail manufacturer in the quadrant. Pearson's business was based in New Canal Street and is first recorded there in 1835. As the street name suggests, this would seem to have been an ideal location. The street ran adjacent to the canal basin on an extension of the

[63] Smith. p. 9.
[64] *ABG*, 22 Jan 1849; Library of Birmingham MS 2013, Pumphrey and Palmer Family Letters and Papers, 1759-1852; Slater's *Directory of Important Towns, 1847*, p. 26. The evidence contradicts that of Reynolds' grandson who, in a letter to his niece dated 2 Apr 1957, wrote that John Reynolds 'was living in a house with a large garden in New Town Row, and built the first part of the factory in this garden at the side of the house'. (Letter in the author's private collection.).
[65] Census of Population in England and Wales, 1851.

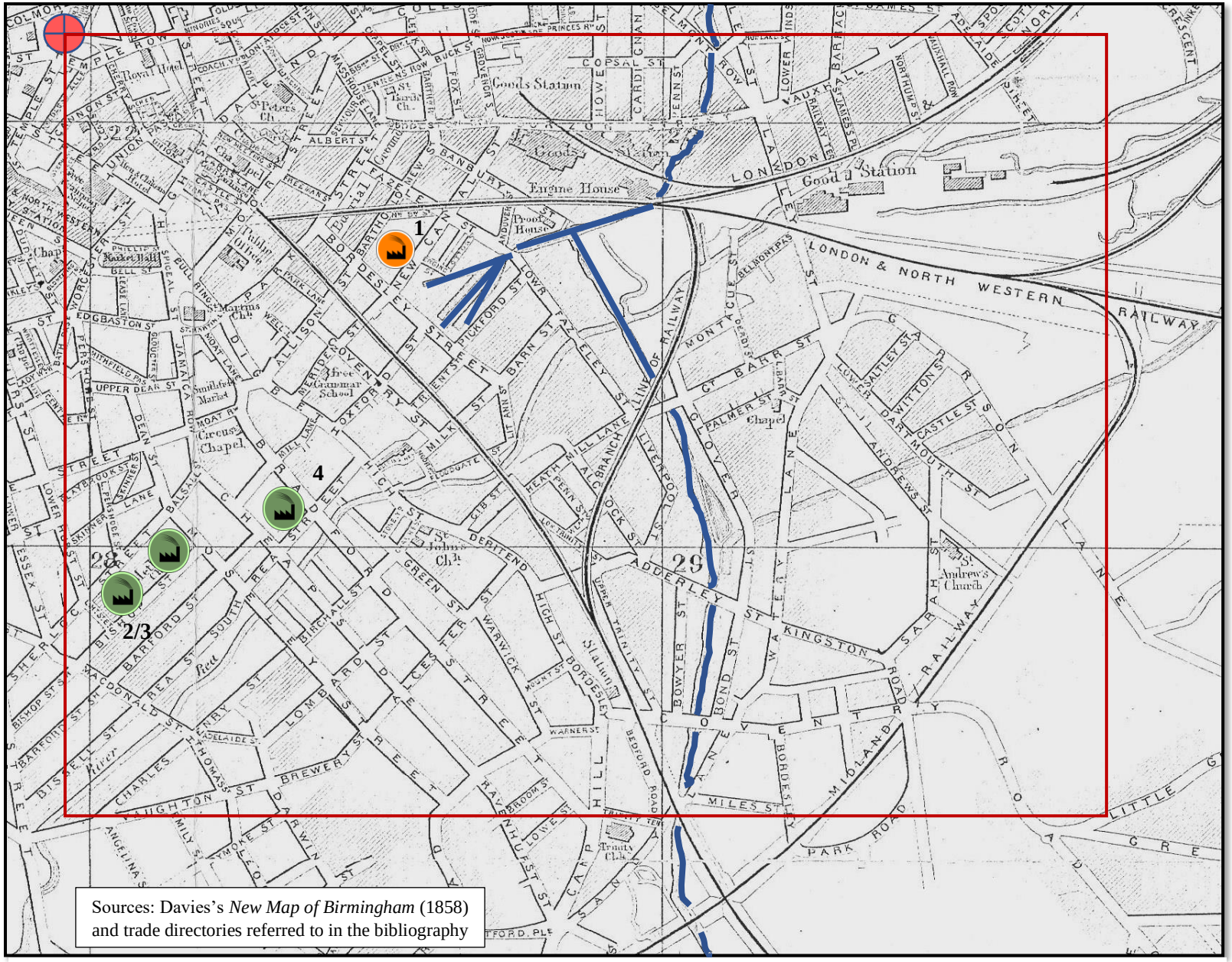


Figure 5.6. Spatial expansion in the south-east quadrant of Birmingham by 1854

Digbeth Branch Canal, and at its northern end ran into the Curzon Street rail freight terminus. Despite these apparent advantages, Pearson's stay in the quadrant was short-lived and by 1839 he had moved half a mile north to new premises in Heneage Street. From 1838 onwards – and thus quite early in the 'growth' period – Birmingham was connected by rail links to both London and Liverpool, a rail system that had been created to meet the demand from Birmingham manufacturers for faster and cheaper connections with the markets for their goods.[66] Yet the potential advantages offered by both these transport facilities appear to have made no impact on the cut-nail trade.

A short and limited burst of growth occurred during the 1840s in the Cheapside and Bordesley Street area. Three cut-nail businesses were established in the quadrant (Figure 5.6) although their reasons for selecting this area of Birmingham are unclear. None was situated close to either a canal wharf or a railway, and two of the four manufacturers eventually moved into the expanding northern parts of the town: areas that were much closer to a canal. Pearson had moved by 1839 and when, a decade later, the partnership of James Taylor and William Farmer was dissolved, Farmer relocated to 24 Lancaster Street in the north-east quadrant.

5.3.2.3. The South-West Quadrant

Abraham and Jacob Salt had originally set up their enterprise at 49 Dudley Street in the centre of Birmingham, two hundred metres west of the Bull Ring. Such town-centre locations, however, were not ideally suited to cut-nail manufacturers, relying as they did on supplies of heavy raw materials from the Black Country. Nevertheless, although they briefly established a second manufactory at 13 Broad Street in the late 1830s, the Salts continued to trade from Dudley Street until the business was acquired by John Reynolds in 1861. By remaining in the town centre, the Salts were very much in the minority.

Just as the Birmingham & Fazeley Canal and the Digbeth Branch Canal had acted as a magnet for cut-nail manufacturers in the north-east quadrant, so too did canals in the south-west quadrant. As Figure 5.7 illustrates, most of the cut-nail manufacturers in this quadrant were to be found in the area around

[66] *VCH Warwicks VII,* p. 38.

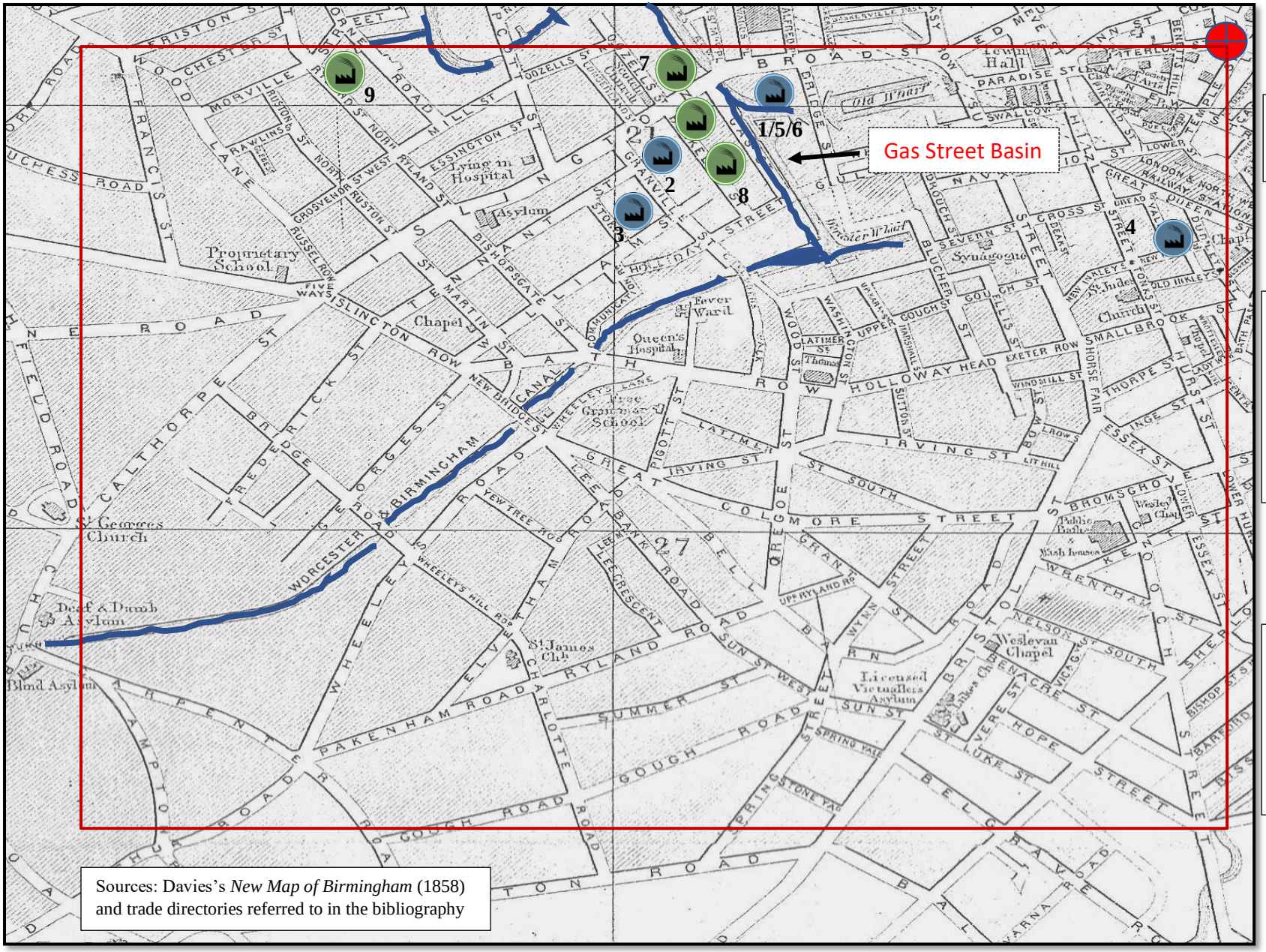


Figure 5.7. Spatial expansion in the south-west quadrant of Birmingham by 1854

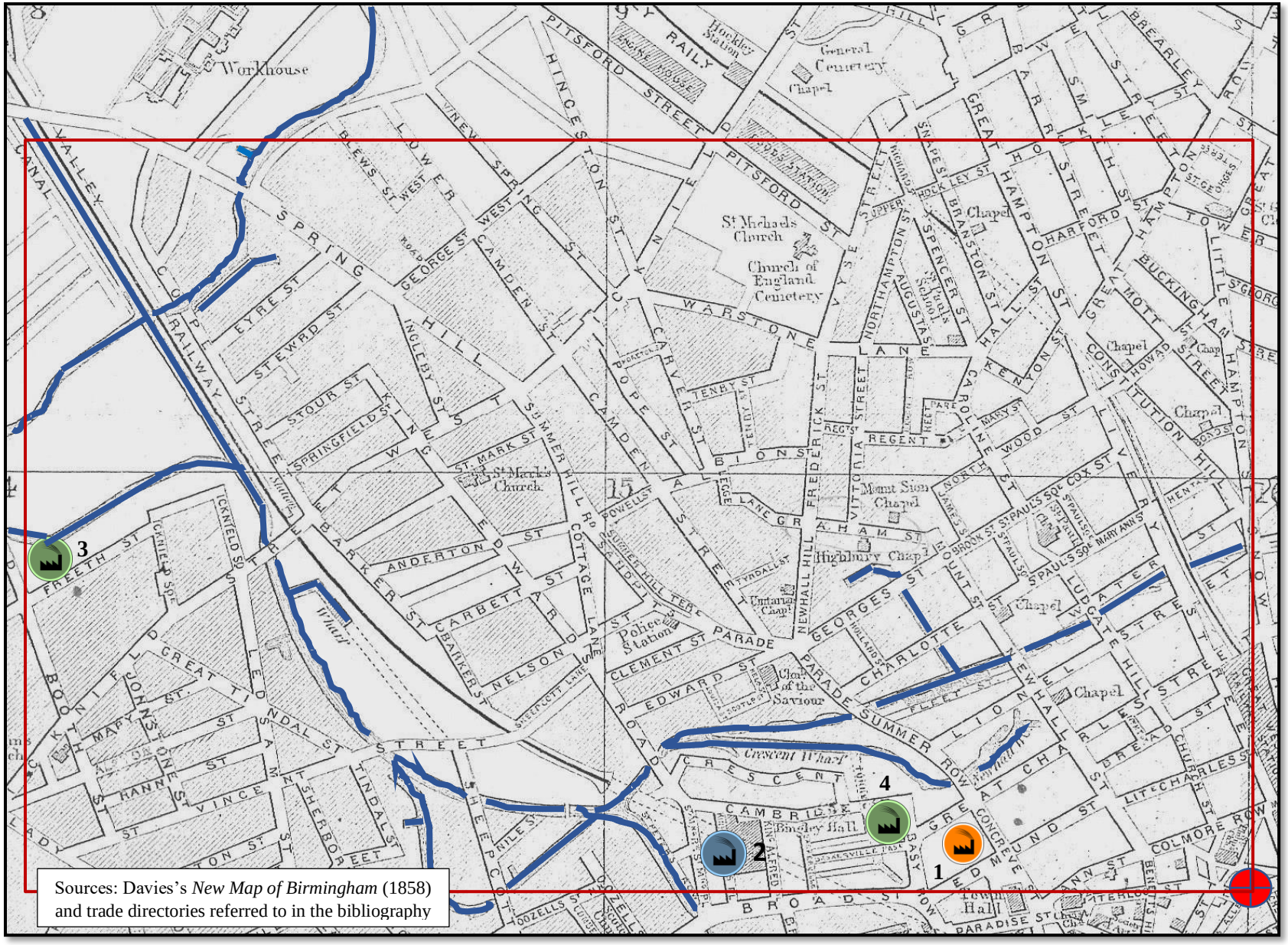
the wharves of the Gas Street basin, which were situated at the junction of three canals. Although there were fewer cut-nail manufactories in the south-west quadrant than there were in the north-east, Figure 5.8 shows very clearly how those in the south-west were tightly clustered in the streets around the Gas Street basin, whereas the manufacturers in the north-east tended to be more spread out along the canals. The significance of the basin was that it was the hub of the Birmingham Canal Navigation (BCN) system and that the BCN had become the hub of the national canal system.[67]

Whilst Eric Hopkins has counselled against over-exaggerating the importance of canal building, arguing that canals had accelerated rather than created industrial growth in the Birmingham area, there seems little doubt that the waterways were a major factor in the growth of the Birmingham cut-nail trade, especially in the south-west quadrant.[68] At the same time as the Gas Street basin provided a magnetic attraction to cut-nail factories, the development of Edgbaston as a building estate prevented their expansion to the south and west of the basin. When Lord Calthorpe began the systematic development of Edgbaston after 1810, the guiding principles included the exclusion of industry, manufactures and trades (although Birmingham's industrial elite and other people of 'the right sort' were welcomed). As Figure 5.7 shows, the Birmingham & Worcester Canal cut through the estate, and clauses in the Act prohibited the construction of factories and warehouses.[69]

5.3.2.4. The North-West Quadrant

The map in Figure 5.8, adapted from Davies's 1858 map of Birmingham, gives a slightly misleading impression of what the north-west quadrant would have looked like during the 'growth' period of 1827-1854. The map shows a series of streets lying to the south-west of Spring Hill and Summer Hill. Up until the early 1850s, however, this area was largely undeveloped agricultural land. Even though the Wolverhampton & Birmingham Canal and the Stour Valley railway passed through it, the area

[67] M. J. Wise and B. L. C. Johnson, 'The changing regional pattern during the eighteenth century', in M. J. Wise (ed.), *Birmingham and its Regional Setting* (Birmingham: British Association for the Advancement of Science, 1950), pp. 169-192 at p. 186.
[68] Hopkins, pp 30-31.
[69] Gordon E. Cherry, *Birmingham: a study in geography, history and planning* (Chichester: Wiley, 1994), p. 48; Terry Slater, *Edgbaston. A History* (Chichester: Phillimore, 2002), p. 25.



Formed before 1836

1. Ledsam, Daniel & Mill Co.

Formed 1836-1844

2. Goose, Richard (until 1840, then to Berkley Street, SW Quadrant)

Formed 1845-1854

3. Gorse, William
4. Reynolds, John (until 1849; then to Newtown Row, NE Quadrant)

St Philip's Church

Canal

Figure 5.8. Spatial expansion in the north-west quadrant of Birmingham by 1854

lacked the necessary infrastructure to entice would-be cut-nail businesses to site a manufactory there. In fact, three of the five businesses that were to establish themselves in the north-west quadrant did so in town-centre locations. When John Reynolds appeared in a trade directory for the first time, his business address was Attwood's Mill, adjacent to the Union Rolling Mill.[70] Strictly speaking, Reynolds' business was in the north-west quadrant. He was, however, more likely to have been attracted by the facilities existing in the immediate vicinity of the Gas Street basin than by any the north-west quadrant had to offer. Indeed, the north-west quadrant was the last to fully develop. Apart from William Gorse's factory on Freeth Street, it was not until the late 1850s that cut-nail factories began to appear in places such as Icknield Port Road and Eyre Street.

5.4. Technological Developments and Entrepreneurship

A former Harvard Business School academic, Abraham Zalesnik, once said: 'if we want to understand the entrepreneur, we should look at the juvenile delinquent' since both are opportunists and sometimes ruthless to a fault.[71] Certainly, as Chapter 1 explained, an ability to perceive and identify business opportunities lies at the heart of entrepreneurship theory. It was argued earlier that the creation of the Britannia Nail Works resulted from Joseph Dyer's perception of just such an opportunity, and that this was an example of 'high level' entrepreneurship. As Donald Coleman argued, however, just as there is a high level of entrepreneurship, there is also a lower level: one that involves 'the continuous adaptation of the technical and/or organisational structure of an existing business to minor changes in the market both for factors and for final products'.[72] As far as the Birmingham cut-nail trade was concerned, this was certainly true. After the expiry of Dyer's patent in 1827, the Britannia continued to develop during the 'growth' phase by adapting to technological and market changes; but so too did the industry change. By 1852, the state of the cut-nail trade was very different from what it had been in 1827 in that the competitive structure of the trade had changed.

[70] White's *History & Directory of Birmingham 1849*, p. 364.
[71] *The Economist*, 27 Apr 2009 at https://www.economist.com/news/2009/04/27/entrepreneurship (accessed 5 Jul 2018).
[72] D. C. Coleman, 'Gentlemen and players', *Economic History Review*, vol. 26 (1), 1973, pp. 92-116 at p. 112.

The fundamental business unit throughout much of the nineteenth century was the individual proprietorship or the small partnership. While most of the Birmingham cut-nail business fitted this particular mould, the Britannia did not. Between its formation in 1815 and 1836, the owning partnership changed five times, each partnership having at least one American among its number.[73] 'The main constraint on entrepreneurship has traditionally been a shortage of capital and not ideas', observed *The Economist* in 2009.[74] Again, this was not the case at the Britannia. When, in September 1832, the owners wanted to buy the freehold, the premises were mortgaged to Viscount St. Vincent to secure an advance of three thousand pounds.[75] As Susan Darby has shown, the 1830s were turbulent years for the Britannia and, in 1835, Thomas Morton Jones, an American partner, 'was suing everyone' involved in the business.[76] After the rapids of the 1830s, calmer waters were reached when ownership of the Chunk Nail Company, as it was then known, passed to Joshua Scholefield in 1838.[77] As well as being one of Birmingham's first MPs, Scholefield was an iron manufacturer, merchant, and banker; and thus a wealthy and influential individual with ready access to capital funds.[78] In 1842, a new partnership was formed consisting of Scholefield, his son John and a nail manufacturer named Francis Clark.[79] The partnership document contains a simple balance sheet dated 1 July 1842, which shows that the Scholefields had put almost five thousand pounds into the business, in addition to a loan from the Midland Bank for £4,520 – 9s – 3d. Access to funds was not a problem for the company.

The organisational tumult at the Britannia does not appear to have had an adverse effect on production. Following a visit by its representatives to various factories in Birmingham, the December

[73] See Susan Darby, *Prosser the Engineer: the Forgotten Birmingham Genius* (2017), an account of the battle for control of the Britannia at https://prossertheengineer.com and https://www.gracesguide.co.uk/Britannia_Nail_Works.
[74] *The Economist*, 27 Apr 2009. See https://www.economist.com/news/2009/04/27/entrepreneurship (accessed 5 July 2018)
[75] SCRO D4452/5/9/1/5. Deeds relating to property in Blews Street, Aston, Birmingham. 29 September 1832
[76] Darby, p. 117.
[77] The Chunk Nail Company is a strange title and its origins unclear. It may reflect the American ownership: Mauch Chunk are native American words meaning Bear Mountain. See https://www.google.co.uk/?gws_rd=ssl (accessed 20 July 2017).
[78] R. W. Davis, Scholefield, Joshua (1774/5-1844), politician and businessman. *Oxford Dictionary of National Biography* http://www.oxforddnb.com/view/10.1093/ref:odnb/9780198614128.001.0001/odnb-9780198614128-e-24814 (accessed 12 July 2018).
[79] LoB. MS 3 Box 3 Bundle 38, Partnership Agreement Establishing the Cut Nail Company, 31 August 1842.

1844 edition of *The Penny Magazine* carried a supplement reporting on the manufacture of screws and swords, pins, pens and papier-mâché trays. A further report covered a visit to the Britannia, where 'stories or ranges of rooms, one over another, are filled with nail-making machines, nearly a hundred in number, all of complicated construction, and all set in motion by one steam-engine'.[80] The machinery had been developed by an American inventor, Dr William Church, who had been resident at the Britannia since 1822. Like Jacob Perkins, Church was a professional inventor and was granted eighteen patents for inventions ranging from knife sharpeners to machines for printing railway tickets.[81] When he was invited to join the partnership of the Britannia in 1831, however, the invitation could not have been because of his business acumen or the prospect of a financial input into the company. Like many an inventor, he lacked the former and was usually impecunious. He can only have been wanted for his known expertise as an engineer, and particularly for his knowledge of nail machines. Another benefit, of course, would be the control that the partnership would have over the two nail-machine patents he was granted between July 1831 and February 1832. Access to capital, technical know-how and an undoubted reputation – the factory was visited by the future Queen Victoria in 1830 – all placed the Britannia in a pre-eminent position in the cut-nail market. So strong was the business that by 1840 its markets extended as far as New Zealand. In September of that year, the *Birmingham Journal* carried a report that John Pierce's 'Britannia Hotel and Stores' was selling, 'amongst other items, nails direct from the Britannia Works'.[82]

In his study of 'the city of a thousand trades', Malcolm Dick noted that, during the eighteenth century, 'opportunities for success within a booming economy [had] attracted potential or actual entrepreneurs'.[83] Throughout the 'growth' phase of the cut-nail trade, however, it was not the economy that influenced prospective entrepreneurs but rather the spread of steam power, the continuing success of the Britannia and the seemingly limitless demand for nails. After all, the

[80] Anon, 'A second day at the Birmingham factories', Supplement to *The Penny Magazine*, vol. XIII, December 1844, pp. 501-508 at pp. 504-505.
[81] Prosser, pp. 205 and 209.
[82] Nigel Isaacs, 'Nails in New Zealand, 1770-1910', *Construction History*, vol. 24, 2009, pp. 83-102 at p. 84; and see *Birmingham Journal*, 12 Sep 1840.
[83] Malcolm Dick, 'The City of a Thousand Trades, 1700-1945' in Carl Chinn and Malcolm Dick (eds), *Birmingham, The Workshop of the World* (Liverpool: Liverpool University Press, 2016), pp.125-157 at p. 131.

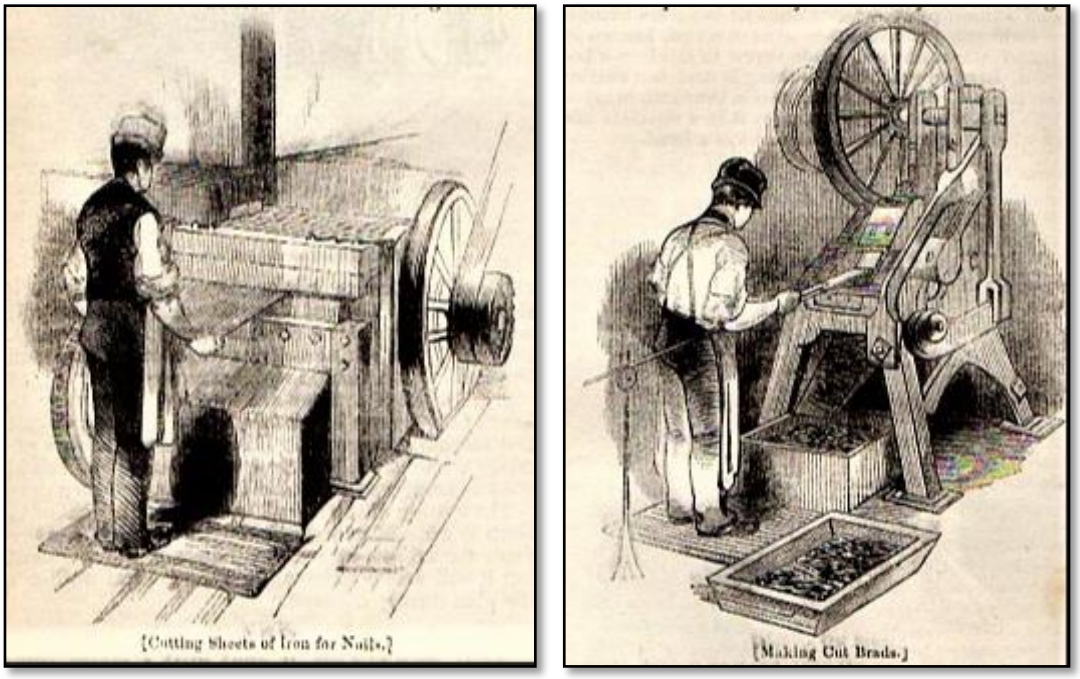


Figure 5.9. Machinery at the Britannia Nail Works for cutting nail sheets into strips (left) and for producing cut nails (right)

Source. Supplement to *The Penny Magazine*, vol. XIII, December 1844, p. 505.

number of cut-nail manufacturers doubled in Birmingham during the years of economic depression from 1837 to 1842. Whilst those who entered the cut-nail market at this time can be seen as entrepreneurs – people who saw an opportunity and risked their money, or somebody else's – they fell into two categories: those who wished to develop and expand their businesses, and those who apparently had no ambition to do so or simply wished to remain self-employed.

Among the latter category are the five manufacturers who established their businesses in steam mills and remained there throughout the life of the enterprise. The average life of such businesses was 5.2 years. George Asbury's traded for eight years from Bullock's Mill but eventually went into voluntary liquidation in 1855. Francis Cartwright and J. P. Flanagan were both lured to the squalor of Wallis's Mill during the trade's bonanza years from 1848 to 1852. Neither business survived for more than four years. Were they what Robert Owen damningly referred to as 'plodding men of business, with

little knowledge and limited ideas', or were they simply unable to compete with the Britannia and other producers whose trajectory was upwardly inclined rather than flat?[84]

John Reynolds and Samuel Webb were mentioned earlier in this chapter as men who started their businesses in steam mills but who went on to build large and long-lasting enterprises. The 1841 census gave Webb's occupation as a 'nail-maker journeyman'; ten years later, the census simply described him as a 'nail-maker'. John Reynolds had an equally undistinguished beginning. When he was married in 1838, the marriage certificate shows that his father was a gun-lock maker; by 1839 John Reynolds was a tack maker; and, in the 1841 census he is shown as a 'nail-maker'.[85] When he set himself up at Attwood's Mill on Birmingham's Easy Row in 1847, it was, as his son Alfred confirmed many years later, 'in a small way'.[86] This raises the question: how was John Reynolds able to raise sufficient capital to buy the Pumphrey premises on Newtown Row in 1849? The sale announcement in the *Birmingham Gazette* explained that, in addition to the manufactory, there was a 'convenient dwelling house and large garden': yet, when Reynolds' grandson wrote to his niece in 1957, he explained that Reynolds had 'built the first part of the factory [...] at the side of the house, and this was equipped with the new type of nail machines driven by a steam engine and boiler house with a tall chimney stack'.[87] This suggests that Reynolds was building on a 'greenfield' site: the newspaper notice suggests otherwise. The latter is the more convincing, especially, as within two years of moving to Newtown Row, Reynolds was able to produce cut nails of such quality as to win a prize medal at the Great Exhibition of 1851. Reynolds cannot be placed in the same category as Joseph Dyer as an entrepreneur: he faced similar risks, of course, but there was far less uncertainty involved. Nevertheless, Reynolds' role was far more than a managerial one. The 'traits' approach to entrepreneurship has largely been devalued as an analytical tool, and yet personal attributes can often distinguish entrepreneurial functions from the purely managerial. The entrepreneur 'must lead, perhaps even inspire', wrote William Baumol; 'he cannot allow things to get into a rut, and for him

[84] Quoted in François Crouzet, *The First Industrialists; the Problems of Origins* (Cambridge: CUP, 1985). p. 13.
[85] Robert Colquhoun, *Reynolds of Birmingham*, (Unpublished typescript, 1999), p. 28. (Author's private collection).
[86] Ibid.
[87] Correspondence from Ernest Reynolds to Ann Hines, 4 Feb 1957. (Author's private collection).

today's practice is never good enough for tomorrow'.[88] Reynolds must surely have demonstrated such behaviours in transforming a small business in rented accommodation into a modern, prize-winning enterprise.

5.5. Summary

This chapter opened with a brief extract from *The Times* claiming that cut nails had taken almost complete possession of the market, and that cut-nail manufactories were 'springing up in every direction'. Low-priced cut nails, the report noted, had annihilated the wrought-nail trade. This chapter has shown the report to be partly true and partly exaggerated.

By dividing Birmingham into four quadrants or zones and analysing the available data, it became clear that the industry was localised in two of these quadrants: the north-east and the south-west. In *Principles of Economics,* Alfred Marshall argued that physical conditions were among the most significant factors causing the localisation of industry; and, among these conditions, Marshall cited a proximity to mines and quarries together with ease of access by land and water as crucial.[89] In themselves, cut nails are small, and yet not only did their manufacture require the input of bulky and heavy materials but the sacks and kegs of finished nails were also weighty items. The advent of the railway in 1837 failed to have an early impact on the movement of heavy goods, and the canals retained their attraction. In the north-eastern quadrant, cut-nail factories were spread along the Birmingham & Fazeley and Digbeth Branch canals. Even so, the fifteen producers who set up in business during the 'growth' phase were clustered in an area of about one square mile. In the south-west there were fewer firms and the concentration around the Gas Street basin was even more marked. Not only did Marshall expound on the causes of localisation but he also explained its advantages. These included networking between firms in a localised industry, leading to 'prompt discussion of inventions, improvements in machinery, in processes and business organisation'.[90] An absence of

[88] William J. Baumol, 'Entrepreneurship in Economic Theory', *American Economic Review*, vol. 58 (2), Papers and Proceedings of the Eightieth Annual Meeting of the American Economic Association. May 1968, pp. 64-71 at pp. 64-65.
[89] Alfred Marshall, *Principles of Economics*. 8th edn (London: Macmillan, 1920), p. 268.
[90] Marshall, p. 271.

empirical data, however, makes such an analysis impossible. At the same time, it offers an opportunity for further research.

The article in *The Times* claimed that cut-nail factories were 'springing up in every direction'. Clearly, they were not 'springing up' in either the south-east or the north-west of the town. 'Springing up' implied new construction and, as this chapter has shown, this too was untrue. Just as Dyer's company was established in a former brewery, other new cut-nail businesses were set up in existing buildings. John Reynolds, for example, occupied a former hook-and-eye factory; and William Farmer converted residential premises in Lancaster Street. The advantages of occupying existing premises were, firstly, that they offered the opportunity of immediate occupancy and, secondly, that building conversion was often far less costly than building from scratch. As David Smith put it: 'Old premises serve the function of industrial nurseries.'[91] Nine businesses had begun (and most of these remained) in steam mills and, bearing in mind the condition of Wallis's Mill, the phrase 'springing up' seems singularly inappropriate.

There can be no doubt that the period between 1827 and 1852 was one of considerable expansion for the cut-nail trade. Until the mid-1830s, growth was minimal. Once the application of steam power became more common-place, however, and once the success of early-established producers became apparent, so an increasing number of entrepreneurs entered the market. Some made informed judgemental decisions and survived; others were under-capitalised and were unable to compete. Nail-making technology matured and was to change little during the second half of the century. Entrepreneurs, on the other hand, faced new challenges.

[91] David M. Smith, *Industrial Location.* 2nd edn (New York: Wiley, 1981), pp. 38-39.

CHAPTER 6

SUCCESS AND FAILURE: STRATEGIC ENTREPRENEURSHIP, 1854 to 1871

6.1. Introduction

Of the 608 Swedish exhibits displayed at the 1862 London International Exhibition, one in particular caught the attention of the British press.[1] 'Considerable interest has been excited in the Birmingham district', reported *The Ironmonger,* 'by the alleged extraordinary capabilities of a nail-making machine [….] This wonderful machine for making nails is due to the ingenuity of Mr C Gustafson, a Swede'.[2] The machine was said to produce 15,000 three-inch nails per day. The report drew an immediate and dismissive response from James Cocking, the chief engineer at William Campbell & Co, cut-nail manufacturer in Birmingham's Selly Oak district. Cocking explained that Campbell's machines produced 100,000 nails in a 10-hour day: 'Thus, you see, I make nails nearly seven times as fast as your "wonderful" machine; and I was not aware, until reading your article, that I had anything *wonderful*.'[3] At first glance, Cocking's letter was merely a statement of fact: that the output of Campbell's existing machines was superior to the 'extraordinary capabilities' of the Scandinavian machine. Yet it was more than that. The disparaging tone of the letter exuded confidence not only in Campbell's machinery but also in the firm's operational capacity. The letter was published in November 1862 and coincided with press reports explaining that the cut-nail trade was 'keeping brisk'.[4]

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[1] *International Exhibition 1862. Official Catalogue. Industrial Department*, 3rd edn (London: Truscott, Son, & Simmons, 1862), p. 411.
[2] The first report appeared in the *London Evening Standard*, 11 Oct 1862. It then appeared verbatim in the *Birmingham Daily Post* [hereafter *BDP*],13 Oct 1862 and the *Birmingham Journa*l [hereafter *BJ*], 18 Oct 1862. Embellished with a reference to the excitement caused in the Birmingham district, the report eventually appeared in the *Ironmonger and Metal Trades Advertiser* [hereafter *I&MTA*], 31 Oct 1862.
[3] *I&MTA*, 7 Nov 1862. Original italics.
[4] *The Staffordshire Advertiser*, 15 Nov 1862.

The article in *The Times* of August 1852, referred to in the previous chapter, had proclaimed the quantitative and qualitative success of the Birmingham and district cut-nail trade, and Cocking's letter a decade later implied a smooth continuation of progress.[5] Yet the fact was that the trade was experiencing a period of change that lasted from around 1853 until the early 1870s. It was marked by a fall in the number of West Midlands manufacturers from twenty-one in 1854 to twelve in 1872 (Appendix 5). This reduction, however, was not an indication of a trade in decline but rather a reflection of how businesses and industries change when they move from the 'growth' phase of the life-cycle to the 'maturity' phase. The 'maturity' phase of the Midlands cut-nail trade proved to be the shortest of its five stages and lasted for little over two decades. The period was marked not by technological change, although improvements to machinery were constantly being made, but by entrepreneurial activity. The objectives of this chapter are twofold. The first is to analyse the interplay of entrepreneurship and technological change within the context of the 'maturity' phase of the trade's life-cycle. The second objective is to examine how entrepreneurs organised and operated their businesses. To establish a contextual backdrop, the chapter begins with a brief analysis of the district's macro-economic environment during the period of the so-called 'Great Victorian Boom'. The theoretical elements of the 'maturity' phase of the product life-cycle are then introduced to provide a framework for the analysis of entrepreneurial behaviour that forms the bulk of the chapter.

6.2. The 'Great Victorian Boom' and the Hardware Trades

The classic view of the mid-Victorian period was that its climate was one of economic optimism: a period when prices, profits and wages rose, when the growth of the national product quickened, and when the mass of the population began at last to enjoy the benefits of industrialisation.[6] Alternative analyses of the period have, however, toned down such a positive view. Instead of being a period of overall growth, Roy Church argued that the period 1850-1873 exhibited no unity regarding prices, economic growth and investment. Rather, he identified a series of mini-booms occurring from

[5] *The Times*, 16 Aug 1852.
[6] François Crouzet, *The Victorian Economy* (London: Routledge, 1990), p. 47.

1852-1853, 1863-1865, and 1871-1873, each separated by a stable plateau.[7] François Crouzet noted that slumps had occurred in 1857, 1862 and again in 1868, concluding that a slow-down of British industrial growth began in the 1860s rather than a decade later; even more pointedly, Theodore Hoppen argued that growth rates of industrial output had followed a downward trend between 1837 and 1874.[8] Church also emphasised that different sectors had experienced differing pricing trends, and that investment and technological change had led to industrial relocation and intersectional decline in certain industries and regions. To understand the period more clearly, he urged historians to concentrate less on national macro-economic aggregates and more on micro-economic regional developments.[9]

'Birmingham! The very name has a metallic ring!' exclaimed an imaginative sketch writer in 1863.[10] Birmingham was 'the city of a thousand trades', and many of those trades were concerned with the manufacture of metal products: products that ranged from bedsteads to bayonets, from pen nibs to police whistles; from candelabra to cut nails. Given the extensive range of Birmingham's manufactures and their equally wide-ranging markets, it makes little sense to label a twenty-year period as a 'boom' period. Individual trades experienced different trading conditions at different times. For example, early in the period, the state of trade in Birmingham was reported as follows:

> The general manufactures of Birmingham continue languid, but fortunately, owing to their diversity, some branches are well employed [….] The japannery business is far from active and the pearl button trade is much depressed [….] Nail manufacture is unusually dull. The cut nail branch is described as never worse [….] There is, however, considerable demand for edged tools as well as for steel toys [….] The manufacture of Government small arms proceeds briskly.[11]

[7] Roy Church, *The Great Victorian Boom, 1850-1873* (London: Macmillan, 1975), p. 76.
[8] Crouzet, pp. 50 and 55; K. Theodore Hoppen, *The Mid-Victorian Generation: England 1846-1886* (Oxford: Clarendon Press, 1998), p. 279.
[9] Church, *Boom*, pp. 77-78.
[10] *Birmingham Daily Gazette* [hereafter *BDG*], 19 Nov 1863.
[11] *The Times*, 22 Jan 1855.

In 1855, therefore, there was no common industrial experience within the town, nor was there ever likely to be one.

In the Black Country, the industrial scene was changing, with individual trades being affected by different trading conditions. With the wider application of steam power from the 1830s onwards, together with an increase in local demand for coal and iron, production of both materials rose. New and deeper pits were opened, whilst the production of pig iron soared from 50,000 tons in 1807 to 777,000 tons in 1857, made possible by an increase in the number of local blast furnaces.[12] In the 1860s, however, the tide began to turn for the primary industries of coal and iron. The hand-made nail trade, in decline since the 1830s, not only continued to contract but also found its hub shifting to the southern reaches of the Black Country around Brierley Hill, Netherton and Stourbridge, and beyond the Black Country to Bromsgrove and its neighbouring villages. In contrast, towns fringing the coalfield – such as Wolverhampton, Walsall and West Bromwich – continued to develop steadily after 1850.[13]

Other Black Country metal trades also experienced different trading conditions. In 1853, whilst the small metal manufacturers in Walsall, Willenhall and Darlaston were suffering from the high price of iron, in Smethwick, a few miles to the east, the works of Messrs Fox & Henderson were 'in employ night and day' producing 'numerous ponderous structures' for the new Crystal Palace at Sydenham.[14] In a qualified summary of the Birmingham and district's industrial experience between 1851 and 1873, Eric Hopkins explained that '*in very general terms*, it participated in the continued national expansion of industry and of trade during the period' and that 'British industry *as a whole* experienced two decades of considerable prosperity in the 1850s and 1860s'.[15] Thus, applying the blanket term the 'Great Victorian Boom' to the Birmingham and district hardware trade is both ill-advised and inappropriate.

[12] B. I. C. Johnson and M. J. Wise, 'The Black Country 1800-1950' in M. J. Wise (ed.), *Birmingham and its Regional Setting. A Scientific Survey* (Birmingham: British Association, 1950), pp. 229-248 at p. 234.
[13] Ibid, p. 243.
[14] *Morning Chronicle*, 17 Jan 1853.
[15] Eric Hopkins, *Birmingham. The Making of the Second City, 1850-1939* (Stroud: Tempus, 2001), p. 33. My italics.

No business or trade can remain immune from the many and various forces that buffet it. The Birmingham and district cut-nail trade was affected by forces common to all iron-manufacturing businesses, the most common being the fluctuations in the price of iron. Sometimes, the high price of iron dampened orders for cut nails. Conversely, when there was a building boom, as there was in 1852, the high price that manufacturers had to pay for nail sheets had no adverse effect on demand.[16] The degree of competition in domestic and foreign markets, however, clearly had an impact on the local trade. Although the Black Country hand-made nail trade was in decline, it nevertheless provided competition for the machine-based trade. Writing in 1865, Halesowen nail-master Ephraim Ball noted that 'however good the quality of [making nails by machine] may be, it never produces nails which are so firm in texture and so ductile as those which are hammered out […] by hand'.[17]

Cut-nail manufacturers in other parts of England also provided competition for the Birmingham and Wolverhampton makers, even if by comparison they lacked the numbers and the power of the Midlands firms. The southernmost manufacturer of cut nails was Bristol's William Sherring although, as Sherring's manager explained in 1862, cut-nail making was 'quite an exceptional trade in Bristol', adding that 'this is the only instance in this part of England'.[18] Cut-nail manufacturers were more plentiful in the northern half of the country, although the number of northern makers could not match their Midlands rivals. During the 1860s there were fewer than ten in Manchester, Sheffield, Newcastle and Gateshead combined.

In the north-Cheshire industrial town of Dukinfield, John Summers had established a clog-making business in the 1840s.[19] When his supplier of nails and clog irons went out of business, Summers

[16] *The Times*, 13 Dec 1852.
[17] Ephraim Ball, 'The hand-made nail trade' in Samuel Timmins (ed.), *The Resources, Products and Industrial History of Birmingham and the Midland Hardware District* (London: Hardwicke, 1866), pp. 110-116 at fn p. 115; and see *The English Mechanic and Mirror of Science and Art*, vol. IX, 14 May 1869, p. 170.
[18] Sherring had acquired the Bristol Cut Nail Co. when its former owner had been declared bankrupt in 1853. See *Perry's Bankrupt Gazette*, 30 Apr 1853; *Bristol Mercury*, 20 May 1854. Parliamentary Papers [hereafter PP] 1866 (3678) Children's Employment Commission (1862). Fifth Report of the Commissioners [hereafter CEC 1862 (5)], p.90.
[19] Brian Redhead and Sheila Gooddie, *The Summers of Shotton* (London: Hodder & Stoughton, 1987), p. 14.

began to make his own. Following a visit to the Great Exhibition he invested in a nail-making machine and subsequently established a cut-nail-making operation at the newly-acquired Sandy Bank Forge in Stalybridge. Production of cut nails increased considerably and within a year Summers was delivering throughout North Wales, Lancashire and Yorkshire. In 1869, he moved to the purpose-built Globe Iron Works nearby – a business that continued to produce cut nails until its closure in July 1969.[20] Another late-comer to the trade was the firm of Jones Brothers who, in 1872, 'inaugurated a new branch of industry in Middlesbrough' when they set up a cut-nail factory with thirty nail-making machines.[21] Neither of these businesses threatened the supremacy of the Birmingham and Wolverhampton manufacturers although, if there was a domestic threat, it came from Leeds. Whilst the number of cut-nail manufacturers in other towns numbered no more than four in each, there were no fewer than ten in Leeds.[22] Throughout the 1850s and 1860s, the fortunes of the cut-nail trade in Leeds and Birmingham featured as key industrial indicators in 'state of trade' reports carried by both the national and trade press.[23] And, as Chapter 8 explains, it was the Leeds and Midlands manufacturers who formed the nucleus of the United Cut Nail Trade Association (UCNTA) between 1868 and 1882.

Competition from overseas and in overseas markets came in a variety of forms. In 1850 Britain exported 9,267 tons of nails to forty-nine different countries.[24] Among these were: 2,016 tons to Britain's North American colonies; 882 tons to South America; and 121 tons to the Hanseatic towns, such as Hannover, Hamburg and Bremen. In comparison, a minuscule amount was exported to Belgium – only 9 cwt – and for very good reason. The nail manufacturers of Liège and Namur had long been major competitors of the British nail trade – both wrought and machine-made – constantly under-cutting British manufacturers on price, if not on quality. In 1863, *The Ironmonger*

[20] Redhead and Gooddie, pp. 16, 23 and 154. Summers' first machine cost him forty pounds, 'which was every penny he had'.
[21] *Daily Gazette for Middlesbrough*, 17 Jul 1872.
[22] See White's *Directory of Leeds, Bradford, Huddersfield..., 1866*, p. 188.
[23] See, for example, *The Times*, 8 Dec and 15 Dec 1856 and *I&MTA*, 30 Jun and 03 Aug 1868.
[24] PP. 1852 (1466-1) Tables of the Revenue, Population, Commerce, etc. of the United Kingdom, and its Dependencies. Part XX, pp. 92-3. This figure covers all types of nail. Official figures rarely distinguished between hand-wrought and machine-cut nails. 1850 exports represented a fifty-six per cent increase on the 1835 figure. See Andrew Ure, *A Dictionary of Arts, Manufactures and Mines* (London: Longman, 1839), p. 877.

noted that 'competition is immense [...] from Belgium in particular' and carried an advertisement placed by Morgan Brothers, the Birmingham agents for Belgian wire-nail manufacturer Bernard, Roland & Co.[25] In 1865, while reflecting on Belgian competition, Ephraim Ball noted that the low price at which Belgian manufacturers had been able to offer their product 'could not be believed at the time [1837]; and to this day the English nail workman will not believe that the English nail-master has such competition'.[26] Although Ball believed that the Belgian nail was inferior to its English equivalent, the Belgian makers continued to thrive. A decade later the competitive threat was unabated and, in an attempt to end underselling by the Belgian manufacturers, a meeting of UCNTA in December 1872 resolved that the Association's secretary, William Hartle, should write to the Belgians urging them to join the Association.[27] He did so, but 'they courteously declined, saying that they were getting much better prices than the English makers'.[28]



Figure 6.1. Wrought forms of Ewbank nails, 1836 – 1881

Source: Christopher How, 'Revisiting Ewbank nails as aids to dating construction elements' (http://www.aicomos.com/wp-content/uploads/Revisiting-Ewbank-Nails-full-paper.pdf, p. 9. Accessed 15 Apr 2017))

Although Britain had exported some 1,537 tons of nails to Australia in 1850 and continued to view the colony as a highly significant market throughout the rest of the century, the Midland-based cut-

[25] *I&MTA*, 30 Jun 1863.
[26] Ball, p. 112.
[27] United Cut Nail Trade Association [hereafter UCNTA] Minutes of the Executive Committee [hereafter UCNTA-MEC], 19 Dec1872.
[28] UCNTA Annual Report [hereafter UNCTA-AR] 1873, 9 Feb 1874.

nail manufacturers did not have it all their own way. Whilst cut nails were suitable for softwood fittings, it was the machine-wrought, flat-tipped 'Ewbank' nail, made by J. J. Cordes & Co at their Dos Works in Newport, Monmouthshire, that was most widely used in hardwood construction in Australia, as well as in China, India and South America (Figure 6.1).[29] A further obstacle facing the Midlands cut-nail exporters was the imposition by the United States of protectionist tariffs on goods imported from Britain. In 1869, Birmingham gun-makers faced a tariff of 5s 3d on a 15s product. But that was nothing in comparison with the import duty on nails and brads. The tariff placed on a hundredweight of cut nails priced at 9s 9d per cwt was 7s 4d, whilst a prohibitive duty of 127 per cent was placed on imported brads.[30]

6.3. Entrepreneurship: Success and Failure

In 1826, there were two cut-nail manufacturers operating in Birmingham and its hinterland; by 1852, there were twenty-one. Proven steam-powered machinery and a growing acceptance of cut nails had attracted an increasing number of entrepreneurs into the market. This accorded with product life-cycle theory during the 'growth' phase. When an industry moves into the 'maturity' phase, however, the growing number of firms producing goods for a finite market eventually causes the industry to reach saturation point. When this point is reached, firms begin to reduce their prices to attract customers and, if they are unable to reduce production costs at the same time, margins are squeezed, and profits begin to fall. Depending on the financial strength of the firm, the weaker ones will be forced to leave the market, thus triggering a period of industry rationalisation. For the remainder, future survival depends on gaining competitive advantage and this is achieved by entrepreneurial engagement through an unending search for opportunities to differentiate products from those of competitors.[31]

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[29] Chris How and Miles Lewis, 'The Ewbank nail', *The Proceedings of the Third International Congress on Construction History*, vol. 2, May 2009, pp. 829-836 at pp. 829 and 833. See also How, 'Revisiting Ewbank nails as aids to dating construction elements', a paper delivered at the 2015 Australia ICOMOS Conference at http://www.aicomos.com/wp-content/uploads/Revisiting-Ewbank-Nails-full-paper.pdf (accessed 15 Apr 2017).

[30] *The Times*, 10 Nov 1869.

[31] Martin Carter, 'Entrepreneurship and marketing' in Mark Casson, Bernard Yeung, Anuradha Basu and Nigel Wadeson (eds), *The Oxford Handbook of Entrepreneurship* (Oxford: Oxford University Press [hereafter OUP], 2006), pp. 114-137 at p. 117.

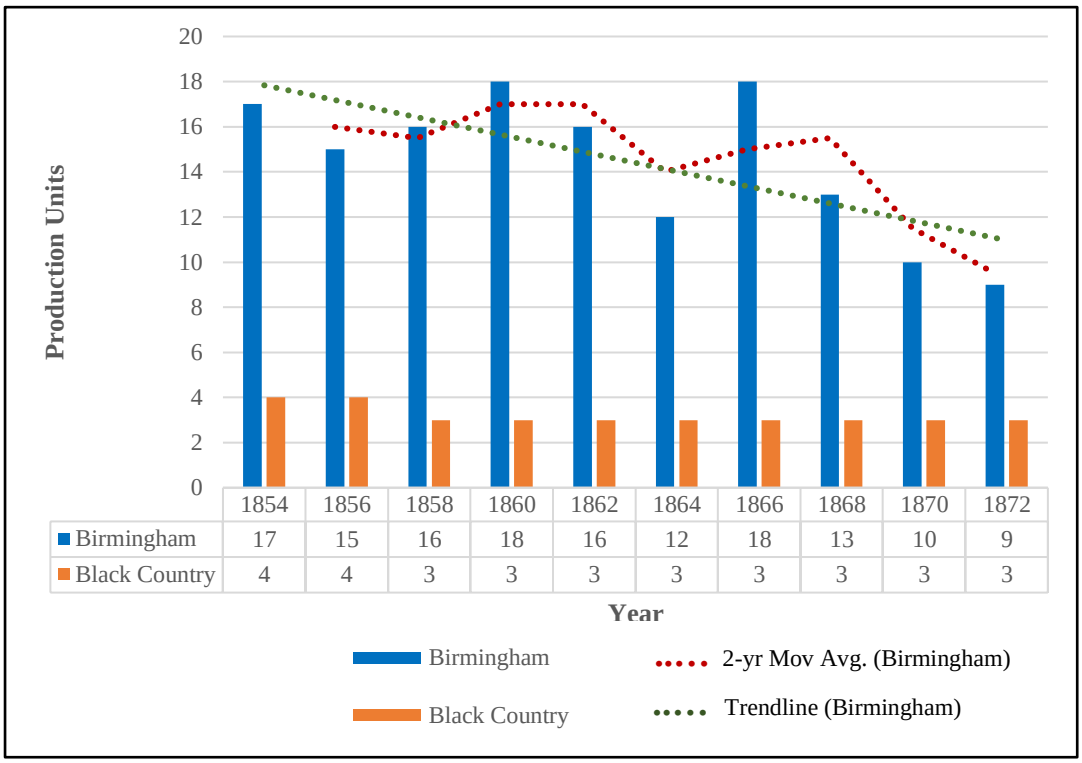


Figure 6.2. Birmingham and district cut-nail manufacturers, 1854 -1872

Sources: Trade directories and newspapers referred to in the Bibliography; Census of Population, 1851-1871.

Whilst the cut-nail trade may have benefited from the general economic prosperity of the period, there seems little doubt that the effects of an industry experiencing the dynamics of its 'maturity' phase had an overriding impact on the trade. Figure 6.2 charts the numerical evolution of the Birmingham and district cut-nail trade between 1854 and 1872. The two-year moving average, marked in red, reflects a rise in the number of production units during and immediately after the mini-booms of 1852-1853 and 1863-1865, and similarly a decline following the recessions of 1857, 1862 and 1868. The chart also shows that the number of cut-nail manufacturers never rose above the 1854 high-water mark of twenty-one. The trendline, marked in green, indicates either decline or rationalisation of the local industry. Given that the press reported in the spring of 1872 that the trade was busy, rationalisation was the more likely reason.[32]

[32] *BDP*, 17 Apr and 29 May 1872.

Rationalisation resulted in casualties. A report in the trade journal *The Engineer* in August 1856 noted: 'The nail trade is not so brisk as it was [….] The frequent recurrence of bankruptcies in this trade is driving the business into fewer hands.'[33] The report failed to distinguish between the hand-wrought and cut-nail branches of the trade. Nevertheless, it is more likely to have been referring to the declining Black Country trade rather than the maturing machine-based trade in Birmingham and Wolverhampton. In fact, there is little evidence to suggest that bankruptcy was a 'frequent' occurrence in the cut-nail trade. Of the forty-three cut-nail manufacturers in business at one time or another between 1854 and 1873, research has shown that only six were called before the bankruptcy court (see Appendix 5).

For the Victorians, few things were as important as 'character' and 'respectability', along with their associated virtues of thrift, self-help and individual effort.[34] As Lester Markham noted: 'For an individual to fail financially was to show dishonesty and thus weakness of character.'[35] In such a climate, it is hardly surprising that businessmen who found themselves in debt tried desperately to avoid bankruptcy. Although the 1849 Consolidation Act favoured the creditor, the legislation nevertheless recognised three levels of bankruptcy.[36]

The first category was the 'virtuous' bankrupt, whose bankruptcy arose from unavoidable losses and misfortunes. Birmingham cut-nail manufacturer William Farmer fell into this category, his bankruptcy in 1855 caused by the failure of a key supplier. In his submission to the bankruptcy court, Farmer's solicitor explained that his client's bankruptcy had been 'occasioned by the recent failures in the iron trade and that, finding he could not sell any goods, he came and placed his affairs before the court'.[37] The second category was the 'unfortunate' bankrupt whose losses had arisen

[33] *The Engineer*, 1 Aug 1856, p. 414.
[34] Lester V. Markham, *Victorian Insolvency: Bankruptcy, Imprisonment for Debt, and Company Winding-up in Nineteenth-century England* (Oxford: Clarendon Press, 1995), p. 68.
[35] Ibid, p. 67.
[36] The categories of 'virtuous', 'unfortunate' and 'reckless' or 'fraudulent' debtor were commonly used. See, for instance, Edward Wise, *The Bankruptcy Law Consolidation Act 1849: with Introduction, Explanatory Notes, Forms and a very Copious Index* (London: Crockford, 1849), p. 206; William Downes Griffith, *The Law and Practice of Bankruptcy* vol. II (London: Sweet, 1869), p. 956.
[37] *BJ*, 10 Nov 1855.

not wholly but in part from unavoidable losses and misfortunes. Joseph Reynolds, the nephew of his more successful uncle, John Reynolds, set himself up in 1865 at the age of twenty-eight with a loan of £360 from his father.[38] By the spring of 1872 the debts of Reynolds' Diamond Cut Nail Works had reached £772. When Reynolds' solicitor met his young client's creditors, he explained that 'Mr. Reynolds' present position arose from his undertaking contracts without calculating advances in the price of iron'.[39] The third category accounted for the bankrupt who had incurred debts through reckless or fraudulent behaviour.[40] John Poultney, a long-established and well-respected Birmingham cut-nail producer, may not have acted fraudulently but his bankruptcy in 1871 was caused by ill-advised if not reckless behaviour. Then seventy years old, he suffered the ignominy of being the subject of newspaper headlines announcing a 'Failure in the Cut Nail Trade'.[41] At a meeting of his creditors held at the Queen's Hotel, Birmingham on 8 September 1871, Poultney's solicitor explained how such misfortune had arisen:

> Nine years ago, he might have retired with a competency; but, unfortunately, he commenced to buy shares and became managing director in concerns which did not prove successful. This occupied a good deal of his time. He was robbed by servants and, being away from his business, it did not go so well.[42]

The unsuccessful concerns in which Poultney had become involved were two slate quarrying companies in Wales: the St Bride's United Slate and Slab Company in Pembrokeshire, and the Heddol Slate and Slab Company near Dolgellau. Both businesses were set up in 1865 and both were short-lived, the St Bride's company closing in October 1869 and the Heddol in April 1871.[43] In view of the difficult conditions faced by the cut-nail trade in the late 1860s, this was not an appropriate time for distractions, especially unfamiliar ones such as being a director of a joint-stock

[38] *BDP*, 5 Apr 1872.
[39] Ibid.
[40] George Moffatt, *On the Bankruptcy Law of England* (London: Ridgway, 1865), p. 14.
[41] *BDP*, 25 Aug 1871.
[42] Ibid, 8 Sep 1871.
[43] Ibid, 22 Jul and 11 Dec 1865; *London Daily News*, 6 Oct 1869; *Aris's Birmingham Gazette* [hereafter *ABG*], 27 May 1871.

company. The result was that Poultney faced debts of £7,238 balanced by assets amounting to only £2,626. He also faced the liquidation of his estate.[44]

Filing a bankruptcy petition against an insolvent debtor was often seen as a last resort since the process was both costly and time-consuming. Creditors frequently preferred to work out an arrangement with an insolvent debtor to avoid bankruptcy. In such cases, if a debtor and his creditors agreed, a debtor's estate might be liquidated privately, each creditor receiving a *pro rata* share of the assets. Alternatively, creditors permitted the debtor to continue trading, within strict limits set by them, in an attempt to recoup their potential losses over time.[45] This was the route taken by the creditors of Cornelius Terry, George Trinfield and Sarah Farmer & Sons. Both Terry and Trinfield had been employed by major cut-nail manufacturers before setting out on their own: Terry with the Chunk Nail Company, and Trinfield as a clerk for seven years with John Reynolds.[46]

Cornelius Terry first appeared in a trade directory in 1852.[47] He was twenty-seven years old. While he may have had experience of working in the cut-nail trade, this did not necessarily prepare him for managing his own business. On 8 July 1854 a notice in *The Times* stated that Terry had assigned 'all his estate and effects' by indenture to three trustees acting on behalf of his creditors.[48] Ten days later, a deed of assignment drawn up by the creditors forced him to sell his sixteen nail-making machines, his stock-in-trade and other effects.[49] His Brass House Yard business was at an end. This, however, did not mark his demise as a cut-nail manufacturer. By 1858, Terry had begun trading again, this time at premises in Coventry Street.[50] The business survived until the economic downturn of the late 1860s when, early in 1867, he was forced to suspend payments again, his

[44] *BDP*, 8 and 11 Sep 1871. The latter reported that a meeting of Poultney's creditors had agreed to liquidation by arrangement rather than by bankruptcy.
[45] Markham, p. 78.
[46] Slater's *Directory of Birmingham, 1852*, Advertisements, p.41; *BDP*, 22 Feb 1859. Little is known about George Trinfield other than that he was declared bankrupt in 1864.
[47] Slater, ibid, p. 128.
[48] *The Times*, 8 Jul 1854.
[49] *ABG*, 10 Jul 1854.
[50] Dix's *General and Commercial Directory of Birmingham, 1858*, p. 446.

solicitor noting that Terry's assets would realise no more than eight shillings in the pound.[51] The business was subsequently acquired by John Reynolds the following year.[52]

William Farmer had been in the cut-nail trade in Birmingham since the early 1840s and by 1851 owned a medium-sized business in Lancaster Street. When, in 1857, he died prematurely aged forty-nine, he willed that the business be carried on by his wife Sarah and their sons.[53] This they did, although by 1862 the business was clearly facing difficulties and, on 11 April, a meeting of their creditors was held to consider the best course of action 'for the benefit of the whole body'.[54] The firm clearly managed to satisfy its creditors and, for the next three years at least, showed all the outward signs of success: entertaining its workforce to dinner to celebrate the marriage of the Prince of Wales; continuing to hire workers; and being the subject of a fulsome two-page article in *The Ironmonger*.[55] All this proved illusory, however, because in September 1865 the business was shown in *Perry's Bankrupt Gazette* as having to pay its creditors five shillings in the pound over a fourteen-month period.[56] This was not enough to satisfy the creditors and, on 26 September 1866, what remained of the company's stock, fixtures and fittings came under the auctioneer's hammer.[57]

The 'maturity' phase of the cut-nail trade was a more turbulent one than the preceding 'growth' phase. As Figure 6.2 shows, the numerical contraction was erratic rather than gradual. Twenty-one new cut-nail businesses entered the market during the period and seventeen left before 1873. Twelve firms, no doubt attracted by the success of the trade, appear to have misread the situation and traded for no more than four years. Whether by choice or by necessity, others, such as George Asbury, failed to develop their businesses and, faced with increasing competition, were simply unable to survive. Asbury was forced into voluntary liquidation in 1857.[58] In 1855, after five years

[51] *I&MTA*, 31 Jan 1867.
[52] *BDP*, 16 Jul 1868.
[53] National Archives, PROB 11/2256/47, The Will of William Farmer, Cut-nail Manufacturer of Aston, Warwickshire.
[54] *BDP*, 9 Apr 1862.
[55] *BDP*, 12 Mar 1863; *ABG*, 10 Sep 1864; *I&MTA*, 30 Sep 1864.
[56] *ABG*, 2 Sep 1865.
[57] *BJ*, 22 Sep 1866.
[58] *Morning Advertiser*, 10 Jun 1857.

in the trade, Francis Agard sold his Heneage Street business to Fletcher Brothers and retired to run the *Noah's Ark* public house in Lichfield Street.[59] In the Black Country, the collapse of Thomas Hemingsley's business in 1855 left cut-nail production in the hands of three large businesses.

Entrepreneurship is about recognising and exploiting opportunities. While competition forced some manufacturers to leave the market, others reacted by changing the direction of their businesses. L. C. Jenkins had made cut nails since the mid-1840s. His last directory entry as a manufacturer was in White's 1855 *Directory of Birmingham*, after which he changed course to become a factor, concentrating on the distribution of nails rather than on their production.[60] William Gorse established a cut-nail factory in Freeth Street in 1851 before relocating to Minworth, a village to the north-east of Birmingham. In 1862, he was granted a patent for a brad-making machine, the commercialisation of which was clearly successful as, two years later, he announced that he had 'declined the manufacturing of cut nails' in favour of producing nail-making machinery.[61] This was an astute move. Competition in the market for cut nails was growing, not just locally but in the northern industrial districts as well. This had a dual effect: on the one hand, nails were harder to sell but, on the other, there was an increasing demand for nail-cutting machines. In a cleverly-constructed advertisement, Gorse announced that not only was he prepared to grant licences for his new machine but that he had already 'distributed his patent and other machines' to several stalwarts of the trade, including John Poultney and Hadley Brothers in Birmingham; Danks, Walker & Co. in Wolverhampton; and John Summers in Stalybridge.[62]

Donald Coleman has argued that entrepreneurship involves both the exploitation of innovations – technical and organisational – and a continuous adaptation to minor changes in the market both for factors and for final products.[63] Whilst there were very few major changes in the design and operation of cut-nail machines after 1850, innovation was characterised by improvements to

[59] *BDP*, 15 Jan 1861.
[60] White's *Directory of Birmingham 1855*, p. 382.
[61] *BDP*, 27 Sep 1864; William Gorse (1862), Machinery employed in the manufacture of cut brads. Patent No. 106.
[62] *BDP*, 27 Sep 1864.
[63] D. C. Coleman, 'Gentlemen and players', *Economic History Review*, vol. 26 (1), February 1973, pp. 92-116, at p. 112.

existing machinery. Some of these improvements were the subject of patents. It has been said before in this study that patents are not necessarily an indicator of inventive activity, nor do they reflect the quality of inventive output. Yet, as Harry Dutton pointed out, they remain the only index of historical inventive activity available 'and thus should not be abandoned because they are imperfect'.[64]

Sixty-two nail-related patents were granted in England between 1852 and 1866. Twenty-three such patents (37.1 per cent) were awarded to people involved in the Birmingham and Wolverhampton cut-nail trade; and, of these, almost half (47.0 per cent) can be identified as patents for the improvement of machinery (Appendix 6). Such was the mechanical culture and the quest for competitive advantage through technical improvement that nineteen of these patents were granted to cut-nail manufacturers (eight), their engineers and machinists (eleven). The motives of these 'tweakers' and 'implementers', as Meisenzahl and Mokyr referred to them, was protection of their intellectual property.[65] In addition to that, however, there were other incentives for the innovating entrepreneur. A patent was a signal of competence, and professional competence helped to bolster a firm's reputation; and, in the cauldron of Birmingham metal manufacture, high standing amongst one's peers was of considerable importance.

The middle-class entrepreneur gained respectability and a positive reputation through the pursuit of wealth. It gave him social status not merely for himself but for his family and this, in turn, reinforced his role as a patriarchal figure both at home and in the factory. Respectability, personal reputation and recognition were indicators of business success; and these would be manifested in where and how the individual entrepreneur lived, his altruism, and his involvement in social and civic affairs. John Poultney had been a town councillor from 1856 to 1861 and was a churchwarden at St James's in Edgbaston. John Reynolds, giving evidence to the Children's Employment

[64] H. I. Dutton, *The Patent System and Inventive Activity During the Industrial Revolution, 1750-1852* (Manchester: Manchester University Press, 1984), pp. 6-7.
[65] National Bureau of Economic Research Working Paper 16993. Ralph Meisenzahl and Joel Mokyr, 'The rate and direction of invention in the British industrial revolution: incentives and institutions' in Josh Lerner and Scott Stern (eds), *The Rate and Direction of Inventive Activity Revisited* (Chicago: University of Chicago Press, 2012), pp. 443-479 at p. 449.

Commission (CEC) in 1862, explained that he was the largest employer in Birmingham's cut-nail trade. Within six years of his appearance before the commission, Reynolds had further cemented his position within Birmingham's manufacturing hierarchy by acquiring three of his competitors' businesses, the most notable of which was the Chunk Nail Company, heir and successor to Joseph Dyer's business at the Britannia. The other two firms were those of the Salt brothers' Phoenix Nail Company, established in 1825, and the failing business of Cornelius Terry. Reynolds had closed all three businesses by 1869, concentrating production at his Crown Nail Works in Newtown Row. It was a shrewd move. His acquisitions removed three competitors from the market; he was able to bask in the reflected glory of two former prestigious cut-nail businesses; and he doubtless acquired the extensive customer lists of all three.

Felix and Thomas Hadley proved to be equally astute. The 1861 census shows 33-year-old Felix Hadley as an 'iron and steel merchant', whilst his younger brother Thomas owned a small cut-nail factory in Bishop Street. By 1864, the brothers had joined forces and established a new cut-nail business at a purpose-built factory in Eyre Street, in the Spring Hill district of Birmingham – the Mitre Cut Nail Works (Figure 6.3).[66] The factory was strategically situated next to the Glyndon & Shorthouse metal-rolling mill, on a branch of the Wolverhampton Canal, and close to both the London and North Western and the Great Western Railway lines. The factory housed 150 nail-cutting machines, which, by 1874, had been replaced by faster, American-made, self-feeding machines.[67] Like Reynolds, Hadley Bothers appreciated the value of marketing, and the Mitre Cut Nail Works brass band that participated in the parade to mark the opening of the Queen's Hospital extension was just as much a statement about the position of the business in the commercial life of Birmingham as it was about the band's musical talents.[68]

[66] The Mitre was the brand name of the Hadley business. Its origins were to be found in Bishop Street, where Thomas Hadley established his cut-nail factory close to the Mitre Inn. Ray Shill, *Workshop of the World: Birmingham's Industrial Legacy* (Stroud: Sutton, 2006), p. 18.
[67] *Engineering*, 21 Aug 1874.
[68] *Birmingham Mail*, 4 Dec 1871.

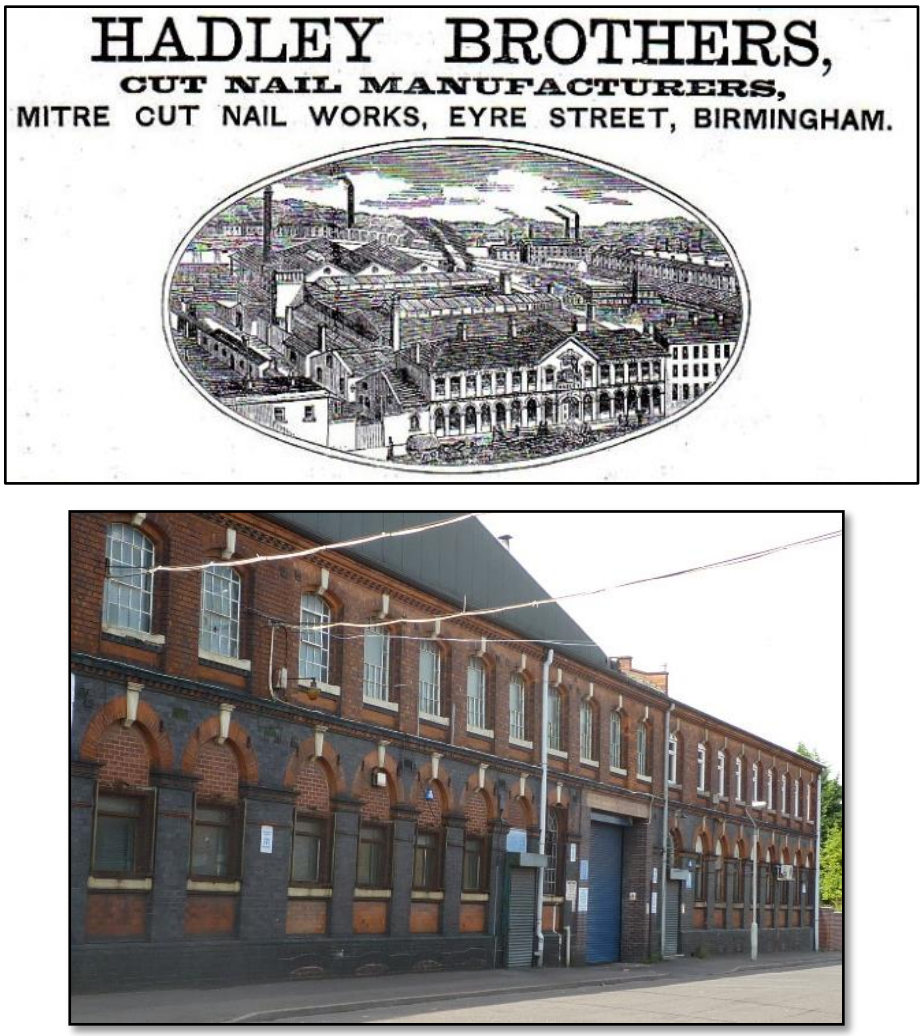


Figure 6.3. Two views of the Hadley factory, Eyre Street, Birmingham

Top: As portrayed in an advertisement in Martineau and Smith's *Monthly Trade Circular*, 31 August 1876
Bottom: The same building in 2018 (Photograph by the author.)

6.4. Organisational Structures: Factories

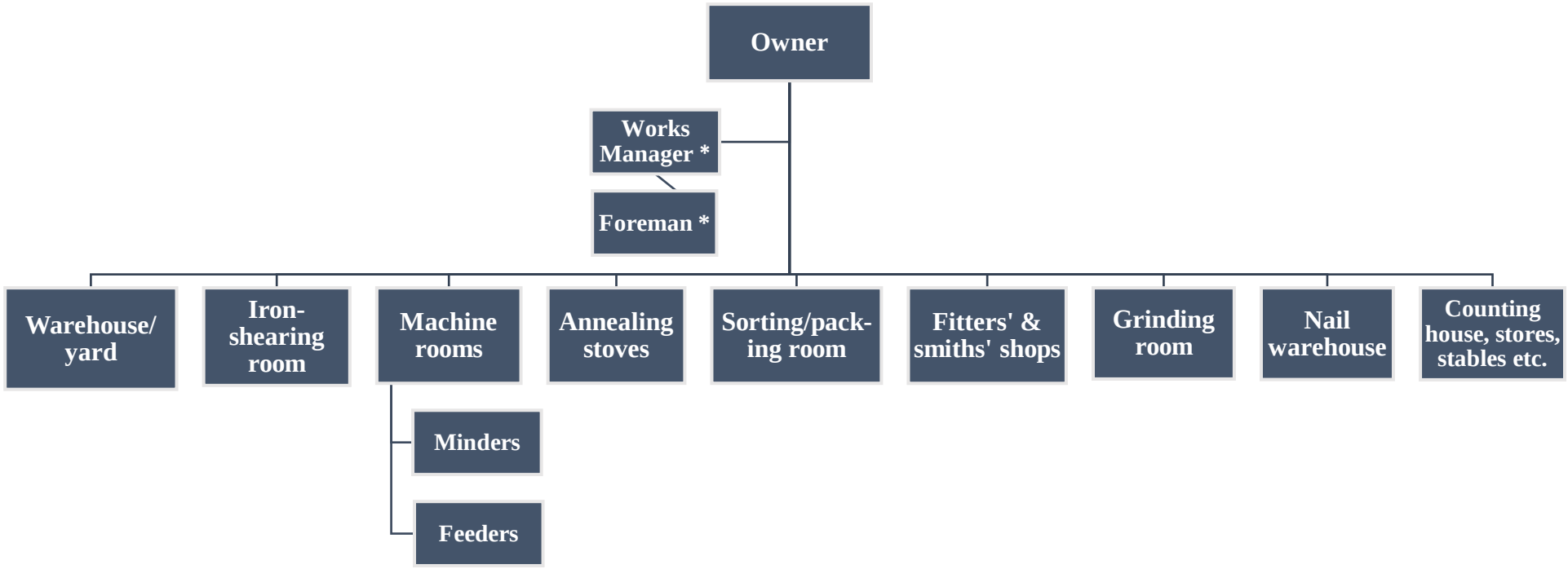
A process of rationalisation – a key feature of 'maturity' phase theory – characterised the evolution of the Birmingham cut-nail trade. The small Black Country cohort lost the Hemingsley business, but Birmingham's fell from seventeen at the start of the period to nine by the end. The rationalisation of the midland cut-nail trade between 1854 and 1873 resulted in a leaner yet more efficient and well-equipped industry – one operating in modern factory buildings. Gone by the mid-1850s were the small businesses making nails in 'power to let' premises; and rapidly disappearing was the manufacturer who, as Samuel Timmins reminded his readers, had 'used his house as a

workshop, annexed another, [and] had built upon the garden or the yard'.[69] At the same time, it would be wrong to liken factories in Birmingham with the multi-storey buildings that typified the Lancashire cotton mills. Mid-Victorian cut-nail factories were modest in size, as the images of the Hadley Brothers' Eyre Street factory show. Timmins also noted: 'Whenever the business has overgrown its early home, and it is necessary to remove or rebuild, a better class of building is invariably adopted.'[70] Hadley's purpose-built factory was an example of this 'better class of building'. Even if not all cut-nail factories fitted the Eyre Street mould, mechanisation and the use of steam power largely dictated the layout of the mid-Victorian cut-nail factory. Apart from the detailed plans and elevations of the Britannia Nail Works produced by the Boulton & Watt Company in 1814, no similar evidence of cut-nail factory layouts has come to light.[71] Nevertheless, using press reports and business sale notices, it has been possible to build a picture of the constituent parts of a cut-nail factory (Figure 6.4).

Chapter 5 noted how many cut-nail factories were located close, if not adjacent, to a canal. Nail sheets were delivered. Some like the Hadley factory and the Crown Nail Works in Wolverhampton had their own wharves to which metal sheets were delivered. When John Poultney was forced to sell his Rotary Nail Works in William Street, the sale notice specified that the premises had 'an arm of the canal, by which iron and coal can be delivered direct'.[72] The sale notices also listed a warehouse where the sheets would be stored. The sheets were then hauled, often by boys as young as ten,[73] to the shearing room where they were cut into strips, their width determined by the type of

[69] Samuel Timmins, 'The industrial history of Birmingham' in Samuel Timmins (ed.), *The Resources, Products and Industrial History of Birmingham and the Midland Hardware District* (London: Hardwicke, 1866), pp. 207-224 at p. 223. Such was the case of Sarah Farmer & Sons who, by 1861, occupied numbers 35, 36 and 37 Lower Hospital Street. See Cornish's *Corporation, General and Trades Directory of Birmingham, 1861*, p. 496.
[70] Timmins, p. 223.
[71] Library of Birmingham [hereafter LoB]. MS 3147/5/807. Williams, Jones & Co. Gas lighting apparatus. August-November 1814. Reproduced in Chapter 4.
[72] *BDP*, 21 Oct 1871.
[73] When interviewed, William Richardson (aged 10) stated that he carried iron 'about two hundred (weight) when in the truck, and half a hundred when on my shoulders'. 1864 [3414-1] Children's Employment Commission 1862. Third Report of the Commissioner [hereafter 1864 CEC (3)], p. 115.

Figure 6.4. Typical cut-nail factory organisation



* The presence of a works manager and a foreman would depend on the size of the firm. In smaller factories, the owner would fulfil these roles.

nail to be made. The strips were then carried to the machine rooms – Poultney's works had two – where they were fed into the nail-making machines. The next stage was the annealing process. As *The Ironmonger* noted: 'cutting and compressing nails has a tendency to destroy the fibrous character of the iron'. Annealing the nails by 'heating them to a dull redness in a furnace and then throwing them into water' overcame this problem.[74] The finished nails were then dried, examined, weighed, and packed ready for despatch.[75] When Cornelius Terry's sale inventory was drawn up in 1854, it included 16,000 tack labels together with a quantity of string and brown paper.[76] Larger nails were packed in coarse canvas bags made of a material known as 'Dudley muslin'. The hub of the factory was the machine room, although there were other sections that were vital to the operation of the factory: fitters repaired machinery and smiths made spare parts and tools; grinders had to sharpen the cutting blades every hour, and the administrators in the counting house maintained the books.

The size of cut-nail businesses can be measured in several ways. The acreage covered by the factory site might be one. The original Britannia Nail Works, for example, occupied two acres of canal-side land, whereas the extent of the Hadley Brothers' site was exactly half that.[77] Further indicators of size might be the number of nail machines installed (the Birmingham Cut Nail Company had seventy; Cornelius Terry had sixteen);[78] the quantity of metal used (Hadley Brothers used between 120 and 140 tons per week); or a firm's weekly output (an unnamed Birmingham factory visited by Harriet Martineau in 1851 produced twenty tons of nails per week, whilst in 1861 Sarah Farmer was turning out up to sixty tons).[79] Yet another gauge was the size of a firm's labour force. Allen used employee numbers to distinguish roughly between the types of workplace

[74] *I&MTA*, 30 Sep 1864, p. 164.
[75] See *I&MTA*, 30 Sep 1864, p. 164; *ABG*, 7 Oct 1854; *I&MTA*, 30 Sep 1864; BDG, 6 Oct 1870; *BDP*, 28 Aug, 8 Oct and 21 Oct 1871.
[76] *ABG*, 10 Jul 1854.
[77] SCRO. D4452/5/9/1/1/15 Appointment of a piece of land adjoining the Britannia Brewery Buildings in Birmingham, John Patteson to Messrs Farley, Wakeman, Wheeley and Hanson, plan incorporated 25 March 1814; *BDP*, 28 Aug 1871.
[78] *ABG*, 10 Jul 1854 and 27 Sep 1867.
[79] Harriet Martineau, 'The wonders of nails and screws' in Charles Dickens (ed.), *Household Words*, vol. IV (84), 1 November 1851, pp 138-142 at pp. 138-139; *I&MTA*, 30 Sep 1864.

existing in the Birmingham district in 1860.[80] According to Allen, the large factory employed more than 150 people and made extensive use of power machinery. The small factory had a workforce ranging from 30 to 150, again with power-driven plant. The third establishment was the workshop, employing up to 30 or 40 people. Using these criteria, only Danks, Walker & Co. of Wolverhampton could be called a large enterprise, employing as it did a workforce of 215 people (Table 6.1). A. & F. Parkes and John Poultney – employing 138 and 101 people respectively – were therefore 'small' enterprises, whilst John Reynolds' businesses fell into the 'workshop' category. This, however, gives a highly misleading view of the cut-nail factory of the time. The cut-nail trade was one of the most highly mechanised trades in the district and a high degree of mechanisation meant fewer employees.[81] Thus, while businesses such as that of John Reynolds, at whose factory in 1858 'machinery of the most approved kind [was] employed, and the subdivision of labour [was] carried to its utmost limit', employed a relatively small workforce, they were technologically on a par with major employers such as Joseph Gillott's pen factory and William Aston's button factory.[82] When members of the Iron and Steel Institute visited Birmingham in August 1871, the inclusion of Hadley Brothers' factory in the itinerary of visits alongside such notable manufacturers as Gillott's, Nettlefold & Chamberlain (screws), and Hardman & Co. (church furniture) was telling.

6.5. Organisational Structures: Employment

Mid-Victorian census returns provide valuable information concerning employment, some evaluators being more diligent than others. John Danks of Wolverhampton, for example, was recorded in 1861 as being a 'cut-nail manufacturer employing 82 men, 59 boys and 74 girls', whereas Joseph Reynolds, owner of the Diamond Cut Nail Company in Birmingham's New John

[80] G. C. Allen, *The Industrial Development of Birmingham and the Black Country 1860-1927* (London: Allen & Unwin, 1929; repr. Cass, 1966), pp. 114-115 and 342.
[81] *VCH, Warwicks, VII*, p. 126.
[82] The 1861 census recorded John Reynolds as employing thirty people, However, as was noted in Chapter 1, Reynolds had told the 1862 Children's Employment Commission that he was 'the largest employer [in Birmingham] in this branch of the trade'. Therefore, either the size of his workforce was greatly understated in the census or the business was in the process of rapid expansion. Both are possible. The census was taken in 1861 whereas, less than a year later, Reynolds had acquired the Chunk Nail Company together, no doubt, with its entire workforce.

Street, was listed simply as an 'iron nail-cutter', the census return providing no indication of the size of Reynolds' concern. Nevertheless, those returns which did provide employment details

Year	Business	Location	Town	Employing	Total
1851	Asbury, George	21 Cliveland Street	Birmingham	15 pairs of hands	15
	Danks, John	North Street	Wolverhampton	140 men	140
	Dawes, Henry	73, Edmund Street	Birmingham	6 men, 6 boys and 8 girls	20
	Farmer, William	24, Lancaster Street	Birmingham	40 males and 9 females	49
	Neve, John & Co	Junction Works	Wolverhampton	80 men and boys	80
	Poultney, John	99, Granville Street	Birmingham	32 persons	32
	John Reynolds	209, Newtown Row	Birmingham	16 men	16
	Terry, Henry	13, King Alfred's Place	Birmingham	8 pairs of hands	8
	Webb, Samuel	21 Cliveland Street	Birmingham	3 persons	3
1861	Danks, Walker & Co	North Street	Wolverhampton	82 men, 59 boys and 74 girls	215
	Farmer, Sarah & Son	35-37, Lower Hospital Street	Birmingham	10 men and 30 boys and girls	40
	Gorse, William	Freeth Street	Birmingham	5 men, 6 boys and 3 girls	14
	Hadley, Thomas	Bishop Street	Birmingham	5 men, 12 boys and 10 girls	27
	A & F Parkes	Dartmouth Street	Birmingham	65 men, 69 boys, 4 women	138
	Poultney, John	99, Granville Street	Birmingham	101 persons	101
	John Reynolds	209, Newtown Row	Birmingham	28 men and 2 boys	30
1871	Bell, Henry	397, New John Street West	Birmingham	11 men, 22 girls and 12 boys	45
	Danks, Walker & Co	North Street	Wolverhampton	250 men	250
	Hadley Brothers	Eyre Street, Spring Hill	Birmingham	300 workpeople	300
	Neve, John & Co	Horseley Fields	Wolverhampton	120 persons	120
	Poultney, John	99, Granville Street	Birmingham	100 people	100
	Walker, Robert	Stafford Street	Wolverhampton	100 men, 25 boys and 20 girls	145
	Webb, Samuel	15, Lord Street	Birmingham	83 persons	83

Table 6.1. Birmingham and district cut-nail trade employment, 1851-1871

Sources: Census of Population for England and Wales, 1851-1871; 1864 (3414-1) Children's Employment Commission 1862. Second Report of the Commissioners (various pages); *Birmingham Daily Post*, 28 Aug 1871

offer three valuable insights into the nature of a company's labour force. First, as with Danks, they gave its overall size. Thus, using available figures from the census, it is possible to make the general observation that the Wolverhampton businesses tended to be much larger organisations than their Birmingham counterparts. Between 1851 and 1871, the average size of a Wolverhampton workforce was 158.3, whereas in Birmingham it was only 64.8. Second, the census figures indicate the expansion or contraction of a business over time. When the 1851 census was taken, Samuel

Webb was still in a 'power to let' unit at Bullock's Mill where he employed just three people. Shortly afterwards, he relocated to his own premises in Lord Street, and by 1871 his workforce had grown to eighty-three. Poultney employed thirty-two men in 1851; twenty years later, his workforce had risen to 100. Thirdly, census data offer a picture not only of the split between adults and young people but also the gender mix of different age groups.



Figure 6.5. The shearing shop at the Crown Nail Works, Wolverhampton, recorded by Arthur Lockwood shortly before the factory closed in 2004. The steel sheets (to the right of the scrap bin) were sliced into strips. In the foreground are kegs containing strips ready for delivery to the nail-cutting machines. Although this machine was powered by electricity, remnants of the old shaft and belt system can be seen in the top-right corner of the picture.

© Arthur Lockwood. By kind permission of the artist.

Before considering the composition of the labour force in detail, a word needs to be said about nail-making occupations. An analysis of such occupations recorded in the censuses between 1851 and 1871 revealed thirty nail-making-related occupations (Appendix 7). Some clearly did not belong to the cut-nail trade – 'nail caster' and 'nail forger' are examples – whilst others clearly did. A 'nail-

strip cutter' referred to the operator of a machine that slit the metal sheets into narrow strips (Figure 6.5), and the job of 'engine-driver at nail works' speaks for itself. Other job titles were rather more vague: 'nail worker' and 'nail maker', for instance, offer no clue as to which branch of the nail trade the worker belonged. The most common occupation in the cut-nail trade was 'nail-cutter', but even this was not entirely clear. Was the job title a generic one, describing anyone who worked in a cut-nail factory? Or was it more specific, referring to the employees who operated the nail-cutting machines? If the latter, what was the difference between a 'nail-cutter' and a 'nail-cutter machine feeder'? Answers to these questions remain unclear.[83] Thus, in the absence of substantive evidence, the analysis that follows subsumes these two roles under the generic heading of 'nail cutter'.

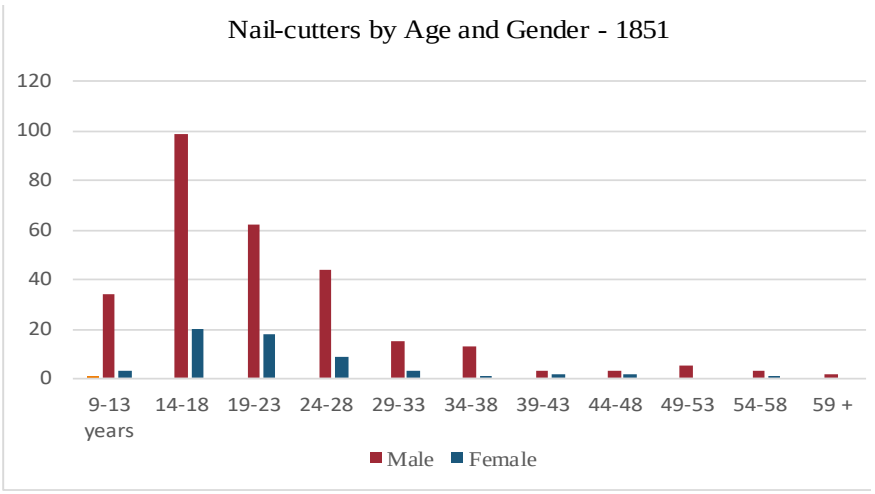
Figure 6.6 shows a numerical breakdown of Birmingham nail-cutters by quinquennial age groups and by gender. At the outset, it is important to remember that this data represents merely a snapshot of the situation that pertained on just three days of a twenty-year period. Nevertheless, it enables several comparative observations to be made: firstly, on the employment of children, young people and women in the cut-nail trade; and, secondly, the shift in the age balance of employment between 1851 and 1871. These observations can then be set in the context of the working conditions in which these people operated.

The first point to note is that, between 1851 and 1871, the number of feeders increased by 52.9 per cent. This growth occurred at a time when the number of cut-nail businesses was falling and the efficiency of nail machines was improving, the implication being that the number of machines per unit of production was rising. Whilst the proportion of adult male cutters increased by only 1.8 per cent, there was significant movement in the proportion of women, children (boys and girls aged between nine and thirteen) and young people (those aged between fourteen and eighteen) employed as a nail-cutter during the 'maturity' period.[84] The proportion of children fell by 9.1 per cent and

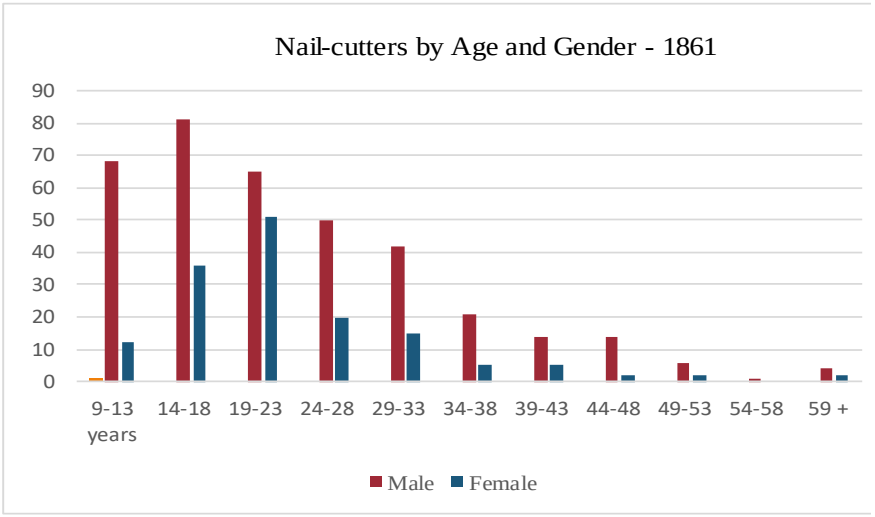
[83] But see 1864 (3414, 3414-I) Children's Employment Commission 1862. Second Report of the Commissioners [hereafter 1864 CEC (2)], p. 371, para. 92 where, in his evidence, Abraham Williams (14) used the terms 'nail cutter' and 'feeders' synonymously

[84] See Peter Kirby, *Child Labour in Britain, 1750-1870* (Basingstoke: Palgrave, 2003), p. 54.

Age	Male	Female
9-13 years	34	3
14-18	99	20
19-23	62	18
24-28	44	9
29-33	15	3
34-38	13	1
39-43	3	2
44-48	3	2
49-53	5	0
54-58	3	1
59 +	2	0
Sub totals	**283**	**59**
Total	**342**	



Age	Male	Female
9-13 years	68	12
14-18	81	36
19-23	65	51
24-28	50	20
29-33	42	15
34-38	21	5
39-43	14	5
44-48	14	2
49-53	6	2
54-58	1	0
59 +	4	2
Sub totals	**366**	**150**
Total	**516**	



Age	Male	Female
9-13 years	11	11
14-18	73	110
19-23	88	87
24-28	73	45
29-33	51	24
34-38	38	20
39-43	26	12
44-48	23	6
49-53	7	6
54-58	7	2
59 +	3	1
Sub totals	**400**	**324**
Total	**724**	

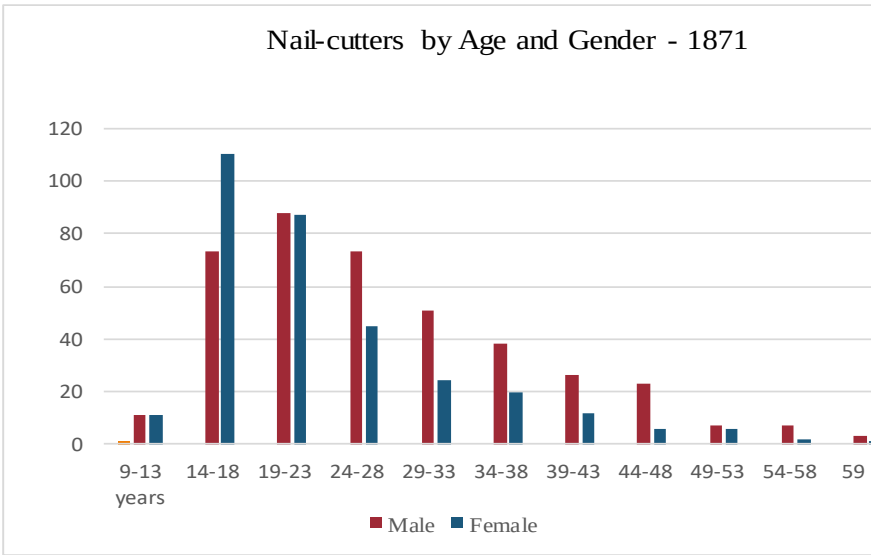


Figure 6.6. Nail-cutters by age and gender in Birmingham, 1851-1871

Source: Census of Population in England and Wales, 1851-1871

that of young people by 9.6 per cent, almost matched by an increase in adult women of 18.6 per cent. The 1851 census revealed that domestic service accounted for 10 per cent of the entire labour force and almost 40 per cent of the female labour force.[85] According to Carl Chinn, however, domestic service did not appeal to young women of the lower working class, who preferred to find work in factories.[86] Such women were forced into the least-skilled and worst-paid work, which partly explains why the falling proportion of juvenile nail-cutters was offset by a corresponding increase in the employment of unskilled women.

By the early 1860s, Birmingham had as high a proportion of juvenile labour as any in the country and that being in work at the age of nine or ten was the norm.[87] In 1861, 15.5 per cent of nail-cutters were aged thirteen or under, the figure for nail-cutters below the age of twenty accounting for 38.2 per cent of all cutters in the town. This contradicts Clark Nardinelli's assertions that, firstly, children were not important in non-textile factories and, secondly, that industrialisation did not attract an increasing number of children into factories.[88] Juvenile labour was extensive in cut-nail factories, encouraged by the method of production and the system of employment. Peter Kirby has argued that a shift to mechanised production reduced, and sometimes removed, the differential in strength between adults and children in rendering factory work more amenable to child labour.[89] This appears to have been the case with the cut-nail trade.

Apart from sorting and packing, most young people worked as feeders. In an 1864 report on Wolverhampton industries, the author described the feeder's role as 'pushing strips of iron into the machines and turning it quickly round as the machine acts upon it [….] The feeders can either sit or

[85] Eric J. Evans, *The Forging of the Modern State: Early Industrial Britain, 1783-1870*, 3rd edn, (Harlow: Pearson, 2001), p. 154.
[86] Carl Chinn, *They Worked All Their Lives: Women of the Urban Poor, 1880-1939* (Lancaster: Carnegie Publishing, 2006), p. 79.
[87] Allen, p. 168.
[88] Clark Nardinelli, 'Child Labour and the Factory Acts', *Journal of Economic History*, vol. 40 (4), December 1980, pp. 739-755 at pp. 753-754; and see Hoppen, p. 330. Hoppen claimed that 'by mid-century, few children worked […] long and regular hours of paid employment'. This was not the case in the cut-nail trade.
[89] Kirby, p. 72.

stand as they work. Their labour, although very monotonous, is not laborious'.[90] As feeding required neither strength nor particular skill, it was a suitable occupation for a juvenile worker. The same report noted how, 'in many of the nail [,,,] factories, the masters contract with one or two men for the performance of the work'.[91] These subcontractors were known as 'minders', and it was their job to hire the factory hands, superintend the work, and manage and clean the machinery.[92] Since the common method of payment was piece-rate, the minders therefore had every incentive to obtain the cheapest labour possible, namely children and adolescents. As the data in Table 6.1 illustrate, nail cutting was predominantly a young person's occupation and, during the 1860s, was largely performed by boys and young men under thirty. By 1871, this situation had changed and a marked shift away from younger cutters had occurred. The reason for the change will be examined shortly.

The appetite for children's labour in the mid-Victorian industrial economy in general and in the cut-nail trade in particular arose for two reasons. The first was that there were jobs that children could carry out and which were recognised as 'children's work'. Such jobs were distinct from those performed by adults although they often required autonomous action and imposed heavy responsibility.[93] Nail cutting was one such job and, as Jane Humphries has noted, so was the vital role of moving raw materials and work-in-progress around the workplace.[94] Carrying the iron sheets from the warehouse to the shearing shop; taking the strips from the shearing shop to the machine rooms; operating cutting machines; bagging and labelling nails all came under the heading of 'children's work'.

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[90] 1864 CEC (2), p. 357. Also see Allen, p. 169.
[91] 1864 CEC (2), p. 339; 1864 CEC (3), p. 113.
[92] In their evidence to the Children's Employment Commission, most cut-nail manufacturer witnesses explained that feeders were hired and paid by the minders (1864 CEC (3), pp. 23, 113 and 114). This system continued well into the second half of the twentieth century (pers. comm. Dennis Stamps). Somewhat confusingly, however, the manager of the Crown Nail Company in Wolverhampton told the Commission that the feeders were 'hired and paid by the fitter' (1864 CEC (3), p. 24). Subcontractors went by a series of different titles depending on the industry. 'Overhands', 'buttes' and 'piece-masters' were others. See Allen, p. 160.
[93] Jane Humphries, *Childhood and Child Labour in the British Industrial Revolution* (Cambridge: CUP, 2010), p. 8.
[94] Ibid.

The second reason was to be found in the domestic life of these children. Whilst the idea persisted that children should be useful as soon as they were able and that work was better than idleness, it was domestic necessity that frequently led children to the cut-nail factories. 'The lowest class of the young are probably employed in mills for rolling etc., nail cutting and places where steam power is let', observed one sub-commissioner.[95] When visiting Charles Shaw's nail works in Birmingham's Morville Street, he noted the presence of 'men, women and children of rough appearance', many of whom were 'ill-clothed, dirty and in a state of extreme ignorance'.[96] Many young nail-cutters lived in dire poverty, amid families that were in chronic need. Sampling the census returns for child nail-cutters illustrates the point. After the 1841 census, the enumerators' books followed a set pattern. It is therefore possible to make comparisons between the data sets contained in the Birmingham censuses for 1851, 1861 and 1871.

The samples in Table 6.2 were extracted from facsimile copies of the enumerators' books available online at both the *Ancestry* and *Genealogist* websites. To ensure a random sample, the table shows the first two child nail-cutters recorded on the *Genealogist* website for each age between nine and fourteen years. The data for these children were then checked against the data held on the *Ancestry* website to ensure validity.

The purpose of Table 6.2 is to show the family situations of the selected children: the occupations of their parents; the number of older and younger siblings; and those siblings also occupied as nail-cutters. Before examining the data, however, something needs to be said briefly about the fact that only a third of the mothers listed in the table appear to have been in paid work. The first point to note is that, in families headed by working men and in families without adult male heads, the dominant family strategy was to employ children rather than or in addition to mothers.[97] Secondly, as Edward Higgs has indicated, women often worked for pay on a casual or part-time basis, and

[95] 1864 CEC (3), p. 132.
[96] Ibid, p. 114.
[97] Humphries, p. 369.

Year	Age	Name	Father's occupation	Mother's occupation	Older siblings	Younger siblings	All children in family
1851	14	William Day	Smith and fitter	Not stated (N/S)	0	4	5
		William Hanton	Deceased	Charwoman	0	1	2
	13	William Jones	Refiner	N/S	0	0	1
		John Pearcy	Machinist	N/S	1 (NC)	6	8
	12	Edwin Bostock	Sawyer	N/S	2 (1 x NC)	2	5
		John Morris	Silver plater journeyman	N/S	2 (1 x NC)	3 (1 x NC)	6
	11	Andrew Rogers	Labourer	N/S	1	0	2
		Charles Williams	Tool maker	N/S	2	0	3
	10	James Desmond	Stone Mason	N/S	3	2	6
		William Bennett	Boot and shoe maker	Boot and shoe maker	2	0	3
	9	Charles Danby	Warehouseman	N/S	2 (1 x NC)	2	5
		William Marshall	Porter in screw works	Wood screw maker	1	3	5
1861	14	Henry Chell	Lamp maker	N/S	3(1 x NC)	6 (1 x NC)	10
		William Wigley	Wire drawer	N/S	2	2	5
	13	Henry Oliver	Blacksmith	N/S	1	3	5
		Louisa Fletcher	Shearer	Charwoman	1 (NC)	2	4
	12	Charles Sewell	Nail-cutter	N/S	0	4	5
		Thomas Morriss	Labourer	N/S	3	1	5
	11	Edwin Hinks	Nail-cutter	N/S	0	0	1
		Susannah Day	Deceased	Washhouse woman	2 (2 x NC)	1	4
	10	Joseph Crook	Deceased	Charwoman	1 (NC)	2	4
		Edward Rourke	Nail-cutter	N/S	3	0	4
	9	Thomas Goddard	Stove grate fitter	Bone button driller	2 (2 x NC)	3	6
		Samuel Bottnell	Coach spring fitter	N/S	0	5	5
1871	14	Selina Green	Deceased	N/S	3 (2 x NC)	2	6
		Richard Clarke	Carter	N/S	0	2	3
	13	Ann Phillips	Powder flask worker	Bridle stitcher	3	2	6
		Anne Scrivens	Pearl button cutter	Pearl button polisher	1	1	3
	12	Sarah Midgeley	Nail-cutter	N/S	3 (2 x NC)	5	9
		Emma Latham	Nail-cutter	Nail-cutter	2 (1 x NC)	1	4
	11	John Bates	Bricklayer	N/S	3(1 x NC)	2	6
		John Kelly	Deceased	Charwoman	2	4	7
	10	Clara Jones	Boatman	N/S	2	1	4
		Nil					
	9	Nil					
		Total					157
		Average per family					4.7

Key:
NC = Nail-cutter
N/S = No occupation shown on return

Table 6.2. Family circumstances of child nail-cutters in Birmingham, 1851-171: a sample

Source: Census of Population in England and Wales, 1851-1871

such labour was often not recorded in the returns as an 'occupation'. Only specified paid occupations were recorded. Where a mother's occupation was not shown, therefore, this did not necessarily mean that she made no contribution to the family income.

Given the apparent absence of direct evidence for parental motivation in sending children to work, it is necessary to make reasonable and informed conjectures. With anything up to ten children in residence (see, for example, the families of John Pearcy, Henry Chell and Sarah Midgeley), one reason for children to be sent out to work as soon as possible may simply have been to relieve the cramped accommodation. Given that cut-nail workers usually worked an eleven- or twelve-hour day, that objective was probably achieved.[98] Another likely reason underlying child employment was the opportunity costs of children *not* working. Several children interviewed by the CEC inspectors had been to school in their early years but were working as feeders by the age of eleven. One boy employed by John Reynolds said that he had not been in school since he was five. Another said that, although he had previously attended school, his parents could no longer afford the 2d or 3d per week that it cost to send a child to school. By far the most common explanation for both leaving and not attending school was a family's need for children's wages.[99] Table 6.2 suggests that this was the case of Susannah Day. Her widowed mother was a 'washhouse woman' with four children of whom the eldest three contributed to the family purse by working in a cut-nail factory

Reynolds also told the commissioner that 'some of the men […] bring their wives and young children to work, the former preferring work to staying at home, and the latter to going to school'.[100] It was not uncommon for fathers working as sub-contracting 'minders' to employ family

[98] These hours were in line with those set by the Factory Act of 1853, albeit that the Act did not cover metal trades such as nail-making. Nail-cutters at William Campbell's Selly Oak factory worked from 7.00 am until 7.00 pm, whilst those employed by Alexander Parkes, John Reynolds and Charles Shaw worked an eleven-hour day from 8.00 am until 7.00 pm. 1864 CEC (3), pp. 113-115.
[99] 1864 CEC (2), p. 461; Humphries, p. 318.
[100] 1864 CEC (2), p. 462.

members.[101] In the 1871 census, twelve-year old Emma Latham was shown as a nail-cutter as were both her parents and an older sibling (Table 6.2).[102] Children's wages in cut-nail factories appear to have been better than in some other manufacturing establishments. For example, it was common for twelve-year-old feeders to earn between four and five shillings a week: Frederick Tregan (thirteen), a feeder at the Shaw's Morville Street works, was paid four shillings, whilst Harriett Evans (twelve), a feeder with John Neve in Wolverhampton, took home four shillings and ten pence a week.[103] On the other hand, a thirteen-year-old working at Aston's button factory earned no more than three shillings and sixpence a week, and Dean's japanning and galvanising business in Bilston paid their twelve-year-old tray decorators just three shillings. Nevertheless, the children working as feeders were still impoverished. One CEC inspector recorded that, on leaving Shaw's factory, a boy, 'very ragged, followed me away to beg that I would get him some boots'.[104]

6.6. Working Conditions

In the 1840s, the working conditions in some cut-nail factories were very poor. A CEC inspector described Thomas Hemingsley's Wolverhampton factory as 'a frightful place'. [105] John Neve's was hardly an improvement, with its almost-vertical, unprotected ladders and broken floor-boards. Twenty years later, working conditions had improved, although cut-nail factories were still considered dangerous places of employment, especially for young people. As one report of 1865 noted:

> The machinery worked by steam-power in some of these shops is of a very dangerous character. The legs and arms of the workers are always in proximity to wheels and straps revolving with great rapidity. Although the large fly-wheels and a few other dangerous parts are guarded, the safety of the workers is for the most part dependent on great caution on their part, and on the employers

[101] This was common practice in the cut-nail trade (see *BDP*, 5 Jan 1865), and still operated at John Reynolds & Sons (Birmingham) Ltd during the second half of the twentieth century. Pers. comm. Dennis Stamps, 15 Jan 2014.
[102] Emma Latham also had two other siblings, one older and one younger. With rest of the family at work, this may have been a case of an older child remaining at home to care for the younger. See *BDP*, 26 Jan 1865, which again records this as common practice among the labouring poor.
[103] 1864 CEC (2), p. 461.
[104] 1864 CEC (2), p. 462.
[105] 1864 CEC (2**),** p. 90. Not for nothing was Hemingsley's factory in Horseley Fields called the Old Factory. White's 1834 *History, Gazetteer, and Directory of Staffordshire* recorded the address as such, suggesting that the buildings were old even then.

> taking great care not to put young or careless children to any part of these machines.[106]

Despite the inherent dangers in cut-nail factories, the evidence suggests that accidents were few and far between. As one might expect, in giving evidence to the CEC, employers did not emphasise the dangers. 'Accidents very seldom occur', said John Reynolds, whilst Robert Walker. admitted that 'we have accidents sometimes from the machinery, but very few'.[107] Perhaps influenced by the adults, none of the children questioned by the sub-commissioners told of serious accidents. 'The feeders very seldom get their fingers hurt', said Abraham Williams, a 14-year-old nail-cutter.[108] Similarly, there were very few reports of serious accidents in the local press. Accidents that did occur often did so in factories described by the commissioners as being 'very old and dilapidated, and crowded with machinery'.[109] The more modern factories were reported as having 'ample space and air' (Campbell's), being 'spacious and airy' (Reynolds') and having a machine shop 'of good height and large dimensions, with plenty of light and air' (Hadley's).[110]

Even so, factories were dangerous places. The image in Figure 6.7 not only illustrates the way in which nail machines were closely packed together but it also gives an alarming impression of just how accidents might occur.[111] Girls were especially vulnerable as their skirts could easily be caught in rotating machinery as they passed among the closely-packed nail machines. Such was the case of a young woman who caught her crinoline in a machine 'causing her to be drawn round and round, her head apparently striking the floor'.[112] On another occasion, two boys ran into John Horton's Scotland Street factory 'to see the process'. On being ordered off the premises, they ran

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[106] 1864 (3548) Children's Employment Commission 1862. Fourth report of the commissioners [hereafter 1865 CEC (4)], p. 60.
[107] 1864 CEC (2), p. 371.
[108] Ibid, p. 371
[109] 1864 CEC (3) p. 357.
[110] Ibid, pp. 113-114; *BDP*, 28 Aug 1871.
[111] The website in which this photograph appeared is titled 'Factory children c.1860'. It is indisputably the interior of a cut-tack factory. The metal strips ready to be fed into the machines can be seen in the bins adjacent to each machine; and note the similarity with Figure 6.5. A request for permission to use the image above met with no response.
[112] *BDP*, 2 Sep 1865.

into the machine room by mistake. There 'they got entangled, were drawn round the shaft, and so dreadfully injured that death speedily resulted'.[113]

If accidents were relatively uncommon, so too were illnesses caused by cut-nail manufacture. William Dunn, a Wolverhampton surgeon, considered the employments of enamelling, galvanising,

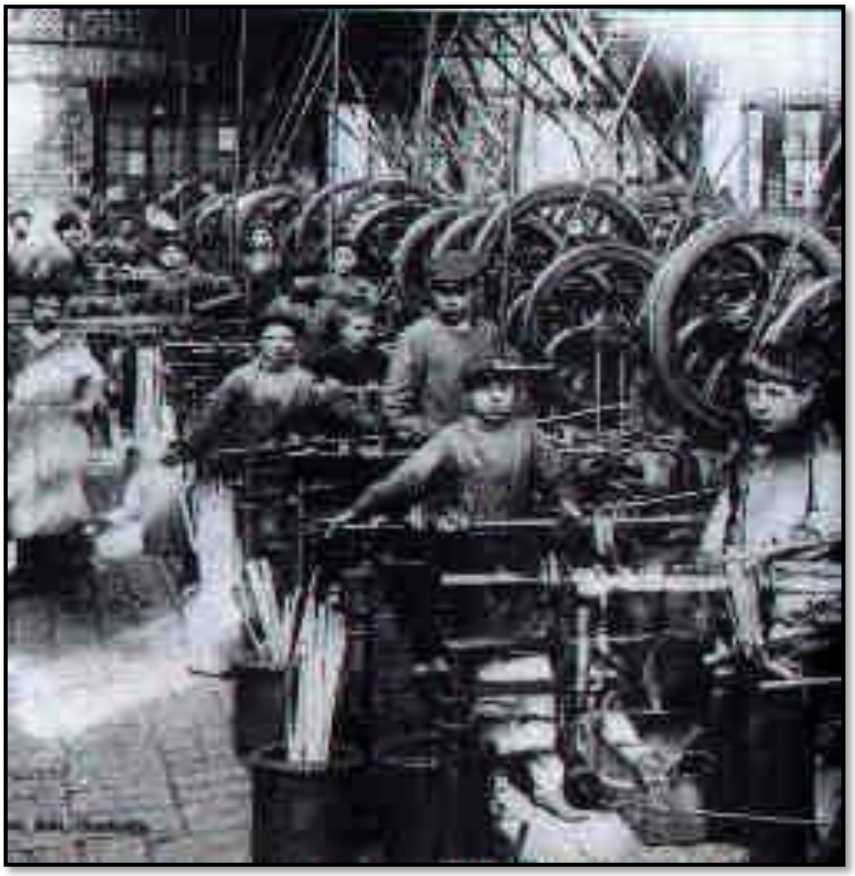


Figure 6.7. Juvenile nail-cutters operating cut-tack machines, c.1860 (location unknown)

Source: https://richardjohnbr.wordpress.com/2010/12/28/reforming-factories/ (accessed 15 Mar 2019)

Japanning and brass-casting to be the unhealthiest. On the other hand, he considered the cut-nail trade to be 'not unhealthy, unless the rooms are too crowded'.[114] An investigation into the distribution of disease throughout England found that 'the coarser kinds of metal manufacture, such as iron-founding, nail-making etc., seem to be much less injurious to health than the manufacture of cutlery […] and needle making', where fine dust produced by grinding was a major cause of

[113] *Birmingham Advertiser*, 5 Nov 1870.
[114] *BDP*, 16 Jan 1865.

pulmonary disease.[115] An analysis of in-patient admissions to the Birmingham General Hospital between 1862 and 1875 supported this overall picture of nail-cutters' health. During six of the thirteen years, no nail-cutters were recorded as being admitted to the hospital. During the remaining seven years, a total of twelve nail-cutters aged between fourteen and thirty-seven were admitted. Recorded illnesses included scarlet fever, pneumonia and pleurisy, although no two patients were recorded as suffering from the same illness.[116] There was, however, one notable risk to a nail-cutter's health: noise.

In the opening pages of Stendhal's novel, *Le Rouge et le Noir* (*The Red and the Black*) (1830), the narrator describes his encounter with a nail factory on his arrival in the town of Verrières: 'a fine nail factory which deafens everybody who goes up the Grande Rue'.[117] Sixty years later, the din inside a nail factory persisted. Felix Hadley spent thirty years in the cut-nail trade and this took its toll on his hearing. When the proceedings of the 1895 annual general meeting of the Hadley shareholders were published, it was noted that Felix Hadley had been unable to take the chair because of his deafness.[118] In the mid-1960s, Dennis Stamps, then managing director of John Reynolds & Sons (Birmingham) Ltd, decided to test the level of noise at his West Bromwich cut-nail works. It measured 144 decibels, nearly 50 decibels higher than the legally accepted level of unprotected noise to which workers should be exposed in 2018.[119] At the time that Stamps measured the noise, his workers would have worn ear-defenders; but, when sixteen-year-old Mary Cope was interviewed by the employment commissioners in 1862, no hearing protection was available. Mary Cope was a worker in a match factory and, in her evidence to the sub-

[115] General Board of Health, *Papers Relating to the Sanitary State of the People of England* (London: Eyre and Spottiswoode, 1858), p. 72. Even so, 47-year-old Thomas Whitehouse, one of John Poultney's employees, died of congestion of the lungs. *BDP*, 25 Mar 1869.
[116] LoB. HC/GH/4/2/17. Medical In-Patients Admitted by Ticket and as Urgent Cases. 1862-1875.
[117] Stendhal, *The Red and the Black: A Chronicle of 1830* (Paris: Levasseur, 1830: trl. Roger Gard, London: Penguin Books, 2002), pp. 12-13.
[118] LoB. Birmingham History, D/26/502188. Felix Hadley & Co. Ltd., Proceedings at the Annual General Meeting of Shareholders held at the Grand Hotel, Birmingham, 22 February 1895, p.3.
[119] Pers. comm. Dennis Stamps, 11 Oct 2011; and see 'Noise at Work Regulations' at www.hse.gov.uk/noise/regulations.htm (accessed 6 September 2018).

commissioner, she explained that she had been employed 'at nail-cutting', adding that she preferred her current employment: 'the other was too noisy, and she always had a headache'.[120]

Many visitors to cut-nail factories complained of the noise. When *The Ironmonger* reported on a visit to Sarah Farmer & Sons' nail works in Lower Hospital Street, the author described his experience on entering the machine room. 'We find ourselves', he wrote, 'in the midst of a number of the noisiest machines that ever deafened our ears or rendered our power of speech useless.'[121] At the Shaws' works, the noise was 'very great, so as to make it impossible to hear the voice'.[122] Sub-commissioner J. F. White summed up the situation:

> The noisiest employment of all is perhaps the nail-cutting, owing to the number of machines used together, the nature of the work and material, and the rapidity of the strokes [….] While I was in one of the nail-cutting factories the pace of the machinery from some cause or other was increased to such a degree as to become positively painful [….] The floors and benches also sometimes vibrate from the force and the pace of the machinery.[123]

The Factory Acts passed before 1864 dealt mainly with the textile and mining industries and thus had no relevance to the cut-nail trade. Following the CEC's reports, the trade was eventually brought within the scope of the legislation when the 1867 Factory Acts Extension Act and the Workshop Regulation Act were passed. The Extension Act covered all places where fifty or more people were employed and stipulated that children between the ages of eight and thirteen should be given fifteen hours of schooling a week, and that their weekly hours of work should not exceed thirty hours.

Following the legislation, nail-cutting became an occupation employing rather older people: 47.9 per cent were aged between twenty-one and fifty-nine in 1851; by 1871 the figure had risen to 66.4 per cent. The obvious question is: what caused this reduction in juvenile labour? As Anna Davin

[120] 1863 (3170) CEC (1), p. 54.
[121] *I&MTA*, 30 Sep 1864.
[122] 1864 CEC (3), p. 114.
[123] Ibid, p. 55.

argued, there is no single answer to the question, and this appears to be the consensus.[124] Pamela Horn noted that factory and workshop legislation was patchy both in its scope and effectiveness, and thus the legislation cannot be cited as the main factor. Peter Kirby went further, dismissing state regulation and schooling as 'irrelevant'.[125] Michael Lavalette named family strategy, whilst Alannah Tomkins attributed the decline in child labour to rising male wages and an increasing propensity on the part of fathers to sustain and extend the longevity of their breadwinner role.[126] According to Jane Humphries the answer can be found in the hands of 'the usual suspects'**:** shifts in technology, the Factory Acts, and compulsory schooling.[127]

The two decades following the Great Exhibition saw many small improvements in the design and manufacture of machine tools, making them more powerful, more rapid, more precise and capable of carrying out more complex tasks.[128] This was true of cut-nail machinery. Between 1852 and 1866, no fewer than twenty-three patents were taken out either for new machines or, more commonly, for improvements to existing machinery.[129] Among the patentees were leading West Midlands cut-nail manufacturers such as John Danks (Wolverhampton), Alexander Parkes (Smethwick), William Gorse and Samuel Webb (both of Birmingham). One such improvement was the development of self-feeding nail machines; another was the introduction in the mid-1860s of a machine capable of cutting four nails from an iron strip at each operation, whereas previously only one had been cut.[130] Therefore, in theory at least, productivity was improved fourfold, requiring three fewer nail cutters for the same unit output.

The passing of the Factory Acts Extension Act and the Workshops Regulation Act in 1867 was an

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[124] Anna Davin, 'Child labour: the working-class family and domestic ideology in nineteenth-century Britain', *Development and Change*, vol. 13, 1982, pp. 633 -652 at p. 650.
[125] Pamela Horn, *Children's Work and Welfare, 1780-1880s* (Basingstoke: Macmillan, 1994), p. 61; Kirby, pp. 110-112.
[126] Michael Lavalette (ed.), *Thing of the Past? Child Labour in Britain 1800 to the Present* (Liverpool: Liverpool University Press, 1999), p. 71; Alannah Tomkins, book review of Humphries in *English Historical Review*, vol. 126, May 2011, pp. 966-967.
[127] Humphries, p. 5.
[128] Crouzet, p. 248.
[129] Commissioner of Patents, *Patents for Inventions,* pp. 103-400. See also *BJ,* 3 Mar 1866 announcing the arrival from America of a 'new and useful improvement in nail machines, and in feeding mechanisms'.
[130] Allen, p. 183.

additional factor leading to an older nail-cutter work force. As children's working hours were reduced, the proportion of nail cutters aged between twenty and forty-nine rose accordingly, although surprisingly that of the fifteen to nineteen age group did not. The fall in the number of boy nail-cutters reflected the decline in other metal trades. For example, the number of boys employed in ironmaking fell from 2,686 in 1867 to 62 by the time of the 1871 census. During the same period, boys employed in foundries fell from 1,014 to 137.[131] With children working only half time, minders found that the continuity of feeding the machines was disrupted, making the hiring of adult cutters a better option. Between the passing of the 1867 Acts and of the Education Act in 1870 there was a brief 'interregnum'. Some parents considered the earnings of half-timers as inadequate and kept their children at home rather than having to pay for schooling; others thought that schooling should be provided only for the youngest children.[132] The result, Alderman Sadler told Birmingham Town Council in April 1869, was that children who had been discharged from the town's manufactories as a result of the legislation were receiving their education 'in the streets'. This, he argued, had accounted for the increasing number of juveniles who had come before the magistrates between 1867 and 1868, citing a 22 per cent rise in felony charges, a 100 per cent increase in charges of misdemeanour, and an 89 per cent upsurge in those of vagrancy.[133] Whatever the validity of Alderman Sadler's arguments, there can be little doubt that the profile of employment in cut-nail factories was changing by 1871.

6.7. Summary

The 'maturity' phase of the Birmingham and district cut-nail trade lasted from 1854 to 1871 and was the shortest of its five life-cycle stages. Brief though it was, it was also the most dynamic. After a period of frenetic growth during the late 1830s and 1840s, the market for cut nails became saturated. Rather than enjoying the overall prosperity that characterised British industry during the 1850s and 60s, the local cut-nail trade went through a period of rationalisation. The number of

[131] Horn, p. 61.
[132] Kirby, p. 112.
[133] *BDP*, 7 Apr 1869.

businesses fell, particularly in Birmingham. Some manufacturers were unable to compete for a place in the market and were forced to leave, either of their own volition or by their creditors. The businesses that remained were, for the most part, those that had come late to the market and which had been able to benefit from the technological advances that had been made earlier. These businesses had also been established by astute entrepreneurs who had recognised and pursued the opportunities that a rationalising marketplace offered. The Hadley brothers had used their combined experience of the trade to establish a 'state-of-the-art' factory with immediate access to the canal and rail systems. Reynolds had reduced the competition by acquiring three rival businesses, and William Gorse had switched production from nails to nail-making machinery. New machinery and new forms of factory organisation had led to an overall increase in employment. The 'maturity' phase was a period of rationalisation and modernisation and had provided manufacturers with a bumpy ride. Those who survived into the 1870s were to enjoy the benefits of the boom that lasted from 1871 to 1873. This, however, proved to be a false dawn, after which the trade began a long decline into the twentieth century.

CHAPTER 7

STRIVING FOR COMPETITIVE ADVANTAGE: MARKETING THE CUT-NAIL TRADE, 1815-1913

7.1. Introduction

The editorial notes in the February 1872 edition of *The Ironmonger and Metal Trades Advertiser* began with the following versified warning:

> Who in business most would thrive
> To each detail must be alive
> And nine in ten, though e'er so wise,
> Will fail unless they advertise! [1]

Advertising played a significant role in marketing the Birmingham and district cut-nail trade, and yet the scope of marketing activity extended – and, indeed, extends – beyond the confines of advertising. As with any product, manufacturers of cut nails needed to promote their products with a view to increasing sales and generating profit. The purpose of this chapter, therefore, is to examine why and how such product promotion occurred. The analysis will be set within the context of two of the central themes of this study: entrepreneurship and the product life-cycle. It also takes account of changes that occurred in the marketing process during the nineteenth century.

Any attempt to define what is meant by 'marketing' is a decidedly fraught exercise, with one American website collecting no fewer than seventy-two separate definitions.[2] Conversely, when discussing the development of marketing in the nineteenth century, economic historians appear to have manoeuvred around the problem either by failing to attempt a definition or by simply assuming that no such explanation is required.[3] Neither approach is helpful. One school of thought

[1] *The Ironmonger and Metal Trades Advertiser* [hereafter *I&MTA*], 29 February 1872, p. 137.
[2] See Heidi Cohen, 'Marketing definitions', http:/www.heidicohen.com/marketing-definition [accessed 20 November 2015].
[3] See, for example, Stanley D. Chapman, 'British marketing enterprise: the changing role of merchants, manufacturers, and financiers, 1700-1860', *Business History Review*, vol. 53 (2), Summer 1979, pp. 205-234; Stephen J. Nicholas, 'The overseas marketing performance of British industry, 1760-1914', *Economic History Review*, vol. 37 (4), November 1984, pp. 489-506.

currently gaining ground is 'entrepreneurial marketing' (EM).[4] At first glance, EM would appear to have direct relevance to this study, although for two reasons this may not be so. Firstly, research on marketing in the entrepreneurial firm is comparatively new and no strong consensus has yet emerged.[5] The second reason lies within the definition of EM. In 2010, Gerald Hills defined EM as:

> […] a spirit, an orientation as well as a process of passionately pursuing opportunities and launching and growing ventures that create perceived customer value through relationships by employing innovativeness, creativity, selling, market immersion, networking and flexibility.[6]

Although this lengthy description couples entrepreneurship – innovation and a pursuit of opportunities – with the marketing process, it emphasises approaches to marketing that were rare throughout much of the nineteenth century. 'Relationship marketing', for instance, focuses on customer retention through a combination of product quality and customer service; [7] and yet, up to about 1870, attention to customer needs appears to have been of little significance to producers. Relationships between manufacturers and their markets operated through intermediaries, a process known as 'merchanting' and, as far as the cut-nail trade was concerned, this form of marketing continued throughout the nineteenth century. The Birmingham and district trade was well-served: in 1835, Pigot's directory recorded 171 factors and merchants operating in the town.[8]

One of the earliest and most widely-cited attempts to account for the evolution of marketing was Robert Keith's 1960 article entitled 'The Marketing Revolution', in which he identified three 'eras'

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[4] See, for example, Rosalind Jones and Jennifer Rowley, 'Entrepreneurial marketing in small businesses: a conceptual exploration', *International Small Business Journal*, vol. 29 (1), February 2011, pp. 25–36; Edwin J. Nijssen, *Entrepreneurial Marketing: An Effectual Approach* (Abingdon: Routledge, 2017).
[5] Martin Carter, 'Entrepreneurship and marketing' in Mark Casson *et al* (eds), *The Oxford Handbook of Entrepreneurship* (Oxford: Oxford University Press [hereafter OUP], 2006), pp. 114-137 at p. 128.
[6] Gerald E. Hills, 'History, theory and evidence of entrepreneurial marketing: an overview', *International Journal of Entrepreneurship and Innovation Management*, vol. 11 (1), 2010, pp. 3-18 at p. 6.
[7] Martin Christopher, *Relationship Marketing* (Oxford: Butterworth-Heinemann, 2002), pp. 4 and 9.
[8] Pigot's *Directory of Birmingham 1835*, pp. 547, 548 and 560. In 1842, the Chunk Nail Company employed home-based agents in London, Manchester and Liverpool. In 1887, Felix Hadley was represented at the Adelaide Jubilee International Exhibition by his agent H. B. Hardt. *Adelaide Jubilee International Exhibition, Official Catalogue of Exhibits*, p. 176.

through which the marketing process had passed.[9] The Production Era, Keith argued, had extended from the 1860s into the 1930s, and was characterised by management emphasis on production rather than distribution; when manufacturers aimed to sell what they produced rather than what the market wanted. This was followed by the Sales Era: a period of high-energy personal selling, spurred on initially by the economic depression of the 1930s. This era, he said, ended in the 1950s, when the Sales Era gave way to the Marketing Era: a period when the marketing process was characterised by what Ronald Fullerton later described as a 'sophisticated market orientation'.[10]

Fullerton criticised Keith's analysis of the Production Era claiming it ignored well-established historical facts about business, that it took no account of the 'varied and vigorous marketing efforts' made by numerous manufacturers and producers, and that it ignored the growth of new marketing institutions outside the manufacturing firm.[11] Fullerton concluded his criticism of Keith's three eras by replacing them with four new eras of his own. Whilst the first and fourth of these are not relevant to this chapter, since they deal with the period from about 1500 to 1750 and from the 1930s to the late twentieth century respectively, the second and third are.[12] Fullerton called his second era 'The Era of Origins – modern marketing begins'. This, he argued, began around 1750 with the onset of the Industrial Revolution. It was characterised by improvements in production and transportation, which, when coupled with migration from the countryside to urban areas, provided the potential for large-scale markets. The realisation of this potential was brought about by businessmen who 'promoted vigorously, targeted promising groups for special attention, and designed products primarily to appeal to potential buyers'.[13] Fullerton's Era of Origins came to an end by 1850 and was followed by The Era of Institutional Development, which lasted until the onset of the Great Depression in 1929. Mass production required mass stimulation of demand, Fullerton argued, and

[9] Robert J. Keith, 'The marketing revolution', *Journal of Marketing*, vol. 24 (1), January 1960, pp. 35-38.
[10] Ronald A. Fullerton, 'How modern is modern marketing? Marketing's evolution and the myth of the 'production era'', *Journal of Marketing*, vol. 52 (1), January 1988, pp. 108-125 at p. 109.
[11] Fullerton, p. 111.
[12] Fullerton called his first era 'The Era of Antecedents', during which the development of commerce was accompanied by 'persistent methods of demand determination and stimulation […] the direct antecedents of modern marketing'. The fourth era he referred to as the Era of Refinement and Formalization. Ibid, pp. 121-123.
[13] Ibid, p. 122.

the increasing physical separation between producer and buyer necessitated institutions through which the producer could effectively understand and communicate with large numbers of distant, prospective customers.

Whereas there is an ever-burgeoning body of conceptual literature on the marketing process, empirical studies of marketing in the nineteenth century are in short supply. In reviews of Richard Davenport-Hines's study of the history of British marketing and industrial performance between 1830 and 1939, *Markets and Bagmen* (1986), A. J. Marrison referred to the 'slender literature on British marketing', and Ian Keil regretted the 'relatively little attention' devoted to this important aspect of British economic activity.[14] More recently (2006), John Wilson and Andrew Thomson commented in a similar vein, explaining that British marketing history has not been well treated by historians or marketing academics. Significantly for this thesis, Roy Church noted (1999) that research into British marketing has largely focused on the retail sector, Wilson and Thomson adding that 'little has been written about marketing at all outside the consumer-oriented industries'.[15]

Markets and Bagmen is a collection of six essays concerning the marketing of British manufactures, ranging from cocoa to armaments. One essay, concerning British marketing techniques, has the title 'English versus American hardware', and yet the focus is on the Sheffield cutlery and edge tool trade – a fact only revealed in a footnote.[16] Similarly, a promising article in the journal *Business History* by S. R. H. Jones on the marketing and distribution of 'Birmingham hardware' between 1750 and 1810 is, in fact, devoted to one particular West Midland hardware manufacturer, J. English & Sons, a firm of Worcestershire needle-makers.[17] Just as Amos Loveday's book on the

[14] A. J. Marrison's review of Davenport-Hines in *Victorian Studies*, vol. 32 (2), Winter 1989, p. 268; Ian Keil's review of Davenport-Hines in *The Business History Review*, vol. 63 (1), Spring, 1989, pp. 221-223.
[15] John F. Wilson and Andrew Thomson, *The Making of Modern Management: British Management in Historical Perspective* (Oxford: OUP, 2006), p. 246; Roy Church, 'New perspectives on the history of products, firms, marketing, and consumers in Britain and the United States since the mid-nineteenth century', *Economic History Review*, vol 52 (3), August 1999, pp. 405-435 at p. 406.
[16] Geoffrey Tweedale, 'English versus American hardware: British marketing techniques and business performance in the USA in the nineteenth and early-twentieth centuries' in Davenport-Hines, (ed.), pp. 57-81 at fn 1, p. 74.
[17] S. R. H. Jones, 'The country trade and the marketing and distribution of Birmingham hardware, 1750–1810', *Business History*, vol. 26 (1), March 1984, pp. 24-42.

'American' cut-nail trade is, in reality, an account of the industry limited to the district around Wheeling, West Virginia, the titles of these articles promise more than they deliver, to say nothing of using the questionable technique of generalising from a solitary case study.

This examination of the Birmingham and district cut-nail trade overlaps Fullerton's second and third eras. The remainder of the chapter, therefore, examines the extent to which and the means by which the trade promoted itself and targeted Fullerton's 'promising groups' both before and after 1850. Product life-cycle theory states that the objectives of product promotion are, initially, to create consumer and brand awareness in the first half of the cycle and then to ensure product differentiation and the retention of customer loyalty in the second half.[18] Whilst the theory explains *why* promotional activity takes place, it does not, understandably, describe *how* such promotion should be carried out. Therefore, if the product life-cycle is to be used as an analytical model, it is necessary to identify the range of promotional activities available to cut-nail manufacturers at each stage of the cycle, before examining the extent to which individual manufacturers took the opportunity actively

Product Life-Cycle Stage	**Marketing Objective**	**Media Used**
Introduction 1815-1827	Announcement	Trade cards Travellers Trade directories
Growth 1827-1854	Announcement Persuasion	Travellers Trade directories Exhibitions
Maturity 1854-1873	Persuasion Differentiation	Travellers Trade directories Trade journals Newspapers Exhibitions
Decline 1873-1913	Announcement Persuasion Differentiation	Travellers Trade directories Trade journals Newspapers Exhibitions

Table 7.1. Marketing objectives and media used by cut-nail manufacturers at each stage of the product life-cycle

[18] See, for example, William Pride, Robert Hughes & Jack Kapoor, *Business* (11th edn, Mason OH: South-Western, 2012), pp. 366-367.

to promote their products. Figure 7.1 shows the marketing objectives of cut-nail manufacturers at each stage of the product life-cycle and the media they used to achieve these objectives. These will be referred to throughout the chapter.

7.2. Promotional Activity

When Dr Samuel Johnson wrote in 1760 that 'the trade of advertising is now so near to perfection that it is not easy to propose any improvements', he could not possibly have foreseen the changes in the methods, media and direction that advertising and marketing would take.[19] Even during the first half of the nineteenth century, the range of marketing tools available to manufacturers was growing. Several had originated in the previous century: trade cards, posters, commercial travellers, newspapers. Others were very much nineteenth-century developments: trade directories, trade exhibitions, trade journals and the adoption of trade-marks. It is true that there was nothing new about the use of directories and trade-marks; both were in evidence in the West Midlands from the mid-eighteenth century onwards. Sketchley's *Directory of Birmingham* had been published in 1767, and the use of trade-marks and 'branding' was well known to Josiah Wedgwood, although, as the nineteenth century progressed, increasing use was made of these and other specifically trade-related promotional tools.[20]



Figure 7.1. Trade card. Abraham and Jacob Salt (late 1820s)

Source: LoB. Birmingham Trade Card Collection, Item 1104.

[19] This quotation is taken from *The Idler*, 20 Jul 1760 and was quoted in John Egan, *Marketing Communications* (London: Thomson, 2007), p. 5.
[20] P. L. Payne, *British Entrepreneurship in the Nineteenth Century* (Basingstoke: Macmillan, 1988), p. 40.

Some of these marketing methods can be disregarded at the outset. Judging by archival evidence, cut-nail manufacturers do not appear to have used trade cards to any great extent; or, if they did, very few have survived. An online search of trade-card collections held at the British Museum, the Victoria and Albert Museum, the Fitzwilliam Museum, the Bodleian Library and at Waddesdon Manor, and a physical search of the archives at the Library of Birmingham, revealed just a single example, namely a card for Abraham and Jacob Salt of Dudley Street, Birmingham (Figure 7.1).

The use of posters as a form of marketing was introduced in the eighteenth century and became increasingly popular in the nineteenth. In the second half of the nineteenth century, as Hamish Frazer explained, 'every surface exposed to the public gaze was hastily covered with posters extolling the virtues of some product or service'.[21] Early nineteenth-century poster campaigns were conducted by firms such as Schweppes, Lea & Perrins, and Crosse & Blackwell; and, in his book on printing in England, Michael Twyman reproduced three illustrations of poster-clad walls promoting everything from concerts to cough mixture, from table salt to sherry, and from shoes to safes.[22] Posters reflected the growth of consumerism. They targeted the consumer and were therefore an inappropriate advertising medium for the basic forms of hardware such as cut-nails. Nail manufacturers were not concerned with selling direct to the consumer; their target was the wholesale market. Thus, they probably regarded their customers as 'users' and not as 'consumers'. This distinction, made by Raymond Williams in 1980, is a crucial one in the context of marketing the cut-nail trade.[23]

A third marketing tool available to the cut-nail maker was the employment of travelling representatives. Evidence that West Midlands manufacturers used these 'knights of the road' is to be found in notices appearing in the regional press.[24] Notices were placed by people seeking employment as travellers or by employers looking for such people to represent them. For instance,

[21] W. Hamish Frazer, *The Coming of the Mass Market, 1850-1914* (London: Macmillan, 1981), p. 135.
[22] Egan, p. 5; Michael Twyman, *Printing, 1770-1970: An Illustrated History of its Developments and Uses in England* (London: British Library, 1988), p 11.
[23] Raymond Williams, *Culture and Materialism: Selected Essays* (London: Verso, 1980), p. 187.
[24] See, for example, *Aris's Birmingham Gazette* (hereafter *ABG*), 22 Dec 1834; and *Birmingham Daily Post* (hereafter *BDP*), 9 Feb 1865.

one firm wanted as a traveller a 'steady, active young man, who understands the nail trade and Birmingham factoring', whilst William Blews & Sons advertised for 'a gentleman who thoroughly understands the cut nail trade to represent a house in the Midland district and Glasgow'.[25]

It would, of course, add to our understanding of the marketing methods employed by cut-nail manufacturers if records existed accounting for the activities of these travellers. This is not the case. Not only do accounts of travellers in the cut-nail trade not exist but one historian, Oliver Westall, referring to travellers in general, has bemoaned the fact that this 'humble hero of marketing has scarcely received adequate attention from economic historians'.[26] It should be noted, however, that whilst travellers were clearly employed by cut-nail manufacturers, their use should not be exaggerated. In a report in the *Daily News* in October 1851, the author explained that 'the [hardware] manufacturers, themselves not sending out travellers, with few exceptions their custom was to supply the merchants and the factors with their patterns'.[27] The traders were then remunerated by commission on their sales. Nevertheless, until more research is carried out into the activities and experience of the 'commercial' traveller, all one can do is to acknowledge their role and significance in the sale and marketing of cut nails.

7.2.1. Newspapers

One can be forgiven for thinking that the burgeoning growth of newspaper titles during the nineteenth century – 258 in 1800; more than 3,000 a century later[28] – and the resulting widespread dissemination of information would have led to an accompanying expansion of advertising. However, although contemporary newspapers have proved to be an invaluable source in piecing together this picture of the cut-nail trade, they were clearly not used for marketing purposes. There were financial, cultural and editorial reasons why this was so.

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[25] *ABG*, 22 Dec 1834.
[26] Oliver M. Westall, 'The competitive environment of British business, 1850-1914' in Maurice W. Kirby and Mary B. Rose, (eds), *Business Enterprise in Modern Britain from the Eighteenth to the Twentieth Century* (London: Routledge, 1994), pp. 207-235 at p. 222.
[27] *Daily News*, 6 Oct 1851.
[28] T. R. Nevett, *Advertising in Britain*: *A History* (London: Heinemann, 1982), p. 17; E. S. Turner, *The Shocking History of Advertising* (Harmondsworth: Penguin, 1965), p.78.

When Leigh and John Hunt founded *The Examiner* (a weekly intellectual newspaper) in 1808, their prospectus announced that 'no advertisements will be admitted'.[29] The proprietors of the political weekly *The National Register* were of the same mind, ruling that 'advertisements, which encumber so large a space of other newspapers, will be entirely excluded'.[30] But it was not just a question of the space that advertisements occupied; there was also the matter of aesthetics to consider. Rather than showing awareness of the opportunities that advertising offered a newspaper, editors seemed more concerned with its appearance, so that no advertisement should be allowed to break the regularity of its columns.[31]

In a lecture at the London School of Economics in 1919, Thomas Russell, a former advertising manager with *The Times*, argued that advertising in the early nineteenth century had become synonymous with 'claptrap and misrepresentation and was viewed with contempt'.[32] Many people had reservations about the respectability of advertising. One view was that manufacturers resorted to advertising for the purpose of introducing inferior goods into the market, while Thomas Carlyle argued that 'there is not a man or hat-maker born into the world but feels, or has felt, that he is degrading himself if he speaks of his excellence and prowesses, and supremacy in his crafts'.[33] Ernest Turner has argued that even manufacturers were reluctant to advertise, fearing that advertising would be perceived as a flag of distress – 'the bigger the flag, the graver the distress'.[34]

If such a range of attitudes was not enough to discourage manufacturers from advertising in the press, there were other more pragmatic, cost-related reasons for not doing so. In 1815, a fourpenny stamp duty was placed on newspapers and a tax of 3s 6d imposed on each advertisement. At the halfway point in the century, however, the Great Exhibition of 1851 changed everything. From then on, as Thomas Richards put it, 'the commodity became […] the one subject of mass culture, the centrepiece of everyday life [….] Even the smallest and most unalluring objects displayed […]

[29] Blanche B. Elliott, *A History of English Advertising* (London: Batsford, 1962), p155.
[30] Ibid, p. 156.
[31] Frazer, p. 138.
[32] Thomas Russell, *Commercial Advertising* (G. P. Putnam's Sons, 1919; Abingdon: Routledge, 2013), p. 2.
[33] Thomas Carlyle, *Collected Works. vol. XIII. Past and Present* (London: Chapman and Hall, 1870), p. 177.
[34] Turner, p.132.

benefited from the Crystal Palace's greenhouse effect'.[35] The transcendence of the commodity was coupled with a campaign against the continuance of the duty on advertising: a campaign fuelled by anomalies that were becoming apparent. For instance, advertisements in the Great Exhibition's official catalogue were placed free of tax. Posters and advertisements in railway carriages were also exempt. In 1853, Gladstone's 'great budget' abolished the duty on advertisements and, two years later, the stamp duty on newspapers was also repealed.[36]

What difference did this new freedom to advertise in newspapers have on cut-nail manufacturers? The answer is almost nothing. None of the major Birmingham manufacturers began suddenly to advertise in either the local or national press. None, that is, except for John Reynolds; and, when he did, it was not until 1868. Following a search of the British Library's online British Newspaper Archive for the twelve months of 1868, it is estimated that Reynolds placed a total of three hundred and forty advertisements in thirty-seven different newspapers.[37] Thirty of these were English newspapers – spread between Devon in the south-west to Newcastle in the north-east – and seven were Irish titles, with publication ranging between Antrim in the north and Cork in the south (see Appendix 8). Just why these specific newspapers were chosen is not clear. The fact that twenty-seven of them (67 per cent) had a Liberal political affiliation is interesting but nothing more. On the face of it, a concentration on Dublin among the Irish press may seem understandable. Yet, with the population of Ireland in a state of permanent decline after the famine of the 1840s until independence in 1921, it is hardly as if industrialisation or a construction boom underpinned Reynold's advertising campaign on the island.[38] Even in the more prosperous north, investment in the linen trade was beginning to decline by the late 1860s.[39] Forty-six advertisements were placed in Yorkshire newspapers although, curiously, all but three of these appeared in textile towns, such

[35] Thomas Richards, *The Commodity Culture of Victorian England: Advertising and Spectacle, 1851-1914* (Stanford CA: Stanford University Press, 1991), pp. 1 and 4.
[36] Frazer, p. 137. Gladstone believed that any lost revenue would be recouped by increased trade. He also believed that the Post Office would benefit from posted responses to advertisements.
[37] www.britishnewspaperarchive.co.uk (accessed 7 Aug 2018).
[38] See Franz Rothenbacher, *The Societies of Europe: The European Population, 1840-1945* (Basingstoke: Palgrave Macmillan, 2002), pp. 398-399.
[39] Andy Bielenberg, *Ireland and the Industrial Revolution: the Impact of the Industrial Revolution on Irish Industry, 1801-1922* (London: Routledge, 2009), p. 33.

as Halifax and Huddersfield. None was published in Leeds; and whilst Leeds too was a textile town, it was also the centre of cut-nail manufacture in the north of England. As Chapter 8 explains, it was the Leeds manufacturers who, among others, eventually toppled the Birmingham and district cut-nail makers from their perch. The ten advertisements placed in the *Worcester Journal* may have been intended to help seal the fate of the dying hand-wrought nail trade which, by the late 1860s, had its centre in the Bromsgrove area. While this explanation is the stuff of reasonable conjecture, it is very difficult to understand why single advertisements were placed in the *Brighton Guardian*, the *Liverpool Mercury* and the *Cambridge Chronicle*.

One plausible reason is that Reynolds had placed his advertising in the hands of an advertising agency. Very few advertising agencies existed in the first half of the nineteenth century and, even when the Reynolds advertisements were placed, agencies merely acted as intermediaries between the client and the newspaper, doing little more than buying space.[40] After that, agencies acquired a role of helping their clients to find new markets and to develop existing ones.[41] Reynolds' 1868 campaign may well have been an early attempt to do that. The year was a significant one for Reynolds and his business. On 30 July, Reynolds had been installed as chairman of the newly-formed United Cut Nail Trade Association (UCNTA).[42] This national trade association had been established in the face of increasing competition, falling prices, and a 'flat' and 'dull' market that had lasted for more than two years.[43] Reynolds' business was not immune to these economic difficulties. Nevertheless, two weeks before UCNTA's formation, he consolidated his position as the pre-eminent player in the market by adding the business of Cornelius Terry to his portfolio of acquisitions.[44] Faced with both a difficult market and increasingly stiff competition, it may well be

[40] Diana and Geoffrey Hindley, *Advertising in Victorian England, 1837-1901* (London: Wayland, 1972), p. 20; Roy Church, 'Advertising consumer goods in nineteenth-century Britain: reinterpretations', *Economic History Review*, vol. 53 (4), November 2000, pp. 621-645 at p. 634.
[41] Frazer, p. 138.
[42] Minutes of UCNTA's General Meetings (hereafter UCNTA-GM), p. 6. Minutes of the preliminary meeting of UCNTA, 30 Jul 1868.
[43] See *I&MTA* 31 Dec 1867, p. 190; and 30 Jun 1868, p. 64.
[44] *BDP* 16 Jul 1868. In his evidence to the Children's Employment Commission in 1863, John Reynolds confidently asserted that he was then 'the largest employer here [i.e. Birmingham] in the trade'. PP. 1864 (3414, 3414-1) Children's Employment Commission 1862. Second Report of the Commissioners p. 372.

the case that the expanded business of John Reynolds & Son not only felt able but also felt the need to seek new markets as well as penetrating their rivals' territory. If this were so, it can be argued that the advertising campaign of 1868 did not achieve its aim. No other cut-nail manufacturer followed Reynolds' example, and Reynolds himself never repeated the exercise. On the other hand, as no other cut-nail manufacturer followed suit, it was the name of John Reynolds & Son alone that was displayed before a wide readership throughout large areas of England and Ireland.

Even though the evidence indicates that cut-nail manufacturers rarely advertised in newspapers, there were occasional opportunities for some free indirect publicity, particularly for the larger manufacturers. As was noted in Chapter 4, the Britannia Nail Works was visited by several foreign dignitaries during the 1830s and 1840s, each visit to this major manufactory being reported in the press. By the 1860s, other major cut-nail works were competing with the Britannia in Birmingham, and they too attracted visitors. In September 1864, a representative from *The Ironmonger* visited the works of Messrs Farmer & Sons in Lower Hospital Street. The report that followed was then published as part of the journal's 'Our Workshops' series. It noted that several kinds of machine were at work – cut-nail machines made by Farmer's themselves – 'all apparently producing an equally good result', and that 'an endless variety of nails for foreign consumption' were produced: different nails to suit the different woods to be found in countries such as Canada, Peru and Brazil.[45] The hidden message, of course, was that Farmer's operated a modern, mechanised factory capable of meeting its customers' needs at home and abroad. Similarly, positive words were used in the report of a visit by a delegation from the Iron and Steel Institute in 1871 to Hadley Brothers' Eyre Street works in Birmingham.[46] The report referred to the 'well-known Mitre nails', which were made in a factory 'replete with all mechanical appliances necessary for carrying on a very extensive trade'. Such apparently objective appraisal was always going to be seen in a more favourable light than was any self-generated, self-congratulatory 'puffery'.

[45] *I&MTA*, 30 Sep 1864; Morris's *Business Directory of Birmingham, 1862*, advertisements, p. 227.
[46] *BDP*, 28 Aug 1871.

7.2.2. Trade Publications

The perennial problem with product promotion in general, and advertising in particular, is knowing where, when and how to carry out such promotion. In his *History of Advertising* published in 1874, Henry Sampson counselled prospective advertisers, explaining that 'it must be always borne in mind that the essence of advertising is to place your statement where it is most likely to be seen by those most interested in it'.[47] A self-serving editorial in the weekly *Export Mercantile Advertiser* echoed Sampson's sentiments, stating that: '[I]f a man has anything that is worth selling, he must advertise it, and that in the most suitable medium'.[48] As Reynolds found out in 1868, 'those most interested' in cut nails were not the readers of regional newspapers; and, even at a time when attitudes to advertising were slowly beginning to change, newspapers were not 'the most suitable medium'. Rather, prospective buyers of cut nails were to be found reading a range of trade publications that became available as the century progressed.

In his article about the advertising of consumer goods in nineteenth-century Britain, Roy Church commented that, in comparison with the growing literature dealing with the history of American advertising, 'the history of advertising in Britain remains largely unresearched'.[49] In view of the significance and subsequent longevity of the trade press, it is also surprising that greater scholarly interest has not been shown in marketing through this medium. Church cites the contributions made by T. R. Nevett, Blanche Elliott, E. S. Turner and others to the study of the history of advertising in Britain. However, like other historians, he does not distinguish between advertising in different media. Whilst 'the first scholarly history of advertising' may have been written by Nevett,[50] it is surprising that he devoted only one short paragraph to the subject of advertising in the trade press.[51] Turner also ignored the trade press. Only Blanche Elliott, writing in 1962, has seen fit to assign a complete chapter to the subject. She justified her decision by saying that 'to assess the progress of advertising in the nineteenth century solely by the ballyhoo in the public press over such domestic

[47] Henry Sampson, *A History of Advertising from the Earliest Times* (London: Ballantyne, 1874), p. 7.
[48] *The Export Mercantile Advertiser & British Prices Current*, 18 Jun 1881.
[49] Church, p. 621.
[50] Ibid, p. 626.
[51] See Nevett, p. 43.

articles as pills, soap, hair oils etc. […] is to present an incomplete picture, for this would indicate that our more important trades were voiceless'.[52] How, then, did the cut-nail trade make its voice heard through the trade press, and what were its objectives in doing so?

When the Britannia Nail Works began trading in 1815, the main publication available to a new company was the trade directory. From the outset, the firm of Williams, Jones & Co. was included among the nail manufacturers listed in Wrightson's *New Triennial Directory of Birmingham* published in that year. The entry is remarkably subdued. It simply reads 'Williams, Jones & Co., nail manufacturers, Britannia Building'.[53] There was no attempt to distinguish it from the cast-nail, brass-nail and saddle-nail makers or, indeed, from the four fly-press-using makers of cut nails then in business. There was nothing remotely to resemble Thomas Carlyle's 'all-deafening blast of puffery' that so characterised consumer advertising at the time.[54] As Thomas Russell told his audience at the London School of Economics in 1919, the more honourable manufacturers 'rejected with disdain the thought of saying things about their wares that were not true'.[55] They would announce their goods but say nothing about them at all. Their name, and name alone, would be sufficient. As E. S. Turner put it: 'proclamation rather than persuasion'.[56] This neatly summarises the distinction between advertisements appearing before the 1850s and those produced after. This was certainly the opinion of Thomas Richards, who saw the Great Exhibition as the point of origin of modern advertising, and of Lori Anne Loeb who, in her book *Advertising and Victorian Women* (1994), declared that 'before the mid-century advertisements were […] almost always simple announcements that relied on repetition, bold headlines, and small logos'.[57] The convenient dividing line provided by the Great Exhibition is, however, not universally accepted. John Strachan, for example, subsequently argued that both authors had ignored the 'often remarkable,

[52] Elliott, p. 179.
[53] Wrightson's *New Triennial Directory of Birmingham* (1815), p. 160.
[54] Carlyle, p. 177.
[55] Russell, p. 2.
[56] Turner, p. 79.
[57] Lori Anne Loeb, *Consuming Angels: Advertising and Victorian Women* (Oxford: OUP, 1994), p. 7.

sophisticated and socially suggestive' advertising of the late Georgian period, viewing the Great Exhibition as a 'point of arrival rather than a point of origin'.[58]

'User' advertising in the first half of the nineteenth century was anything but remarkable and sophisticated. The Great Exhibition, however, marked the start of a very gradual transition in advertising from the straightforward announcement to an increasingly persuasive style. This was certainly true of cut-nail advertisements and was a function of both increased competition within the trade – and the consequent need for product differentiation – and of the changing nature of advertising. As the previous chapter explained, the number of Birmingham and district cut-nail manufacturers grew from the mid-1830s onwards, and this was reflected in directory entries. Pigot's 1828 directory listed twenty-eight nail manufacturers, of which two were cut-nail producers: by 1855, the figures had risen to seventy and fifteen respectively.[59] For the most part, however, manufacturers remained content merely to have their names, addresses and products listed.

As directories became more sophisticated, they included an increasing number of advertisements. Slater's 1852 *Directory of Birmingham* carried no fewer than 224, although the number of advertisements placed by cut-nail makers failed to match this overall expansion. Only thirteen were placed between 1839 and 1852 – and six of these were placed by one manufacturer, James Thornton & Son. Nevertheless, the advantage of trade directories was that they had staying power: they remained in shops and offices for at least a year and, most likely, for longer. Therefore, those who placed advertisements in directories knew that their name would have a lengthy exposure. Even so, the nature of advertisements changed little between 1815 and the early 1850s.

As the advertisement placed by L. C. Jenkins in Wrightson's 1847 *Directory of Birmingham* illustrates (Figure 7.2), the emphasis was still on 'proclamation' rather than 'persuasion': an announcement that gave details of producer, product and place of production. In 1887, the

[58] John Strachan, *Advertising and Satirical Culture in the Romantic Period* (Cambridge: Cambridge University Press [hereafter CUP], 2007), p. 25.
[59] Pigot's *Commercial Directory for 1828-1829* (p. 799) and *Commercial Directory of Derby, Heref, Leics…1835* (pp. 561-562).

Advertiser's Guide to Publicity informed prospective advertisers that the value of their efforts depended upon 'the number of people who can be *persuaded* to desire and use' their products.[60] When the Jenkins advertisement appeared in 1847, however, it was *The Handbook for Advertisers*, published (tellingly) under the authorship of 'An Old Advertiser', that was the influential text. In a chapter headed 'How to write advertisements', tradesmen were advised that it was 'rarely necessary to set out more than a list of the principal articles for sale'.[61] The Jenkins advertisement did just that, although it also exemplified certain typographical developments that had occurred by the mid-nineteenth century. By using an eclectic combination of type styles and sizes, the advertisement typified such mid-nineteenth century announcements by reflecting the availability of a growing range of new typefaces as well as the typographic novelty demanded by a comparatively new genre of advertising.

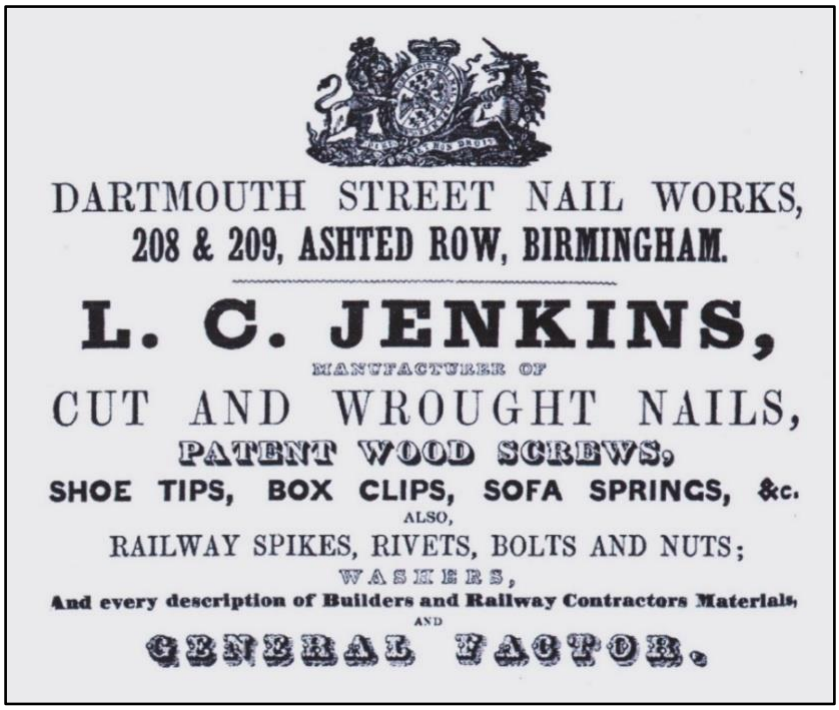


Figure 7.2. Advertisement for L. C. Jenkins, 1847

Source: Wrightson's *Directory of Birmingham*, 1847, p. 126.

[60] Quoted in Hindley, p. 28. My italics.
[61] Anon, *A Handbook for Advertisers and Guide to Advertising*, 6th edn (London: Effingham Wilson, 1854), p. 28.

In 1847, there was no such thing as a 'professional designer', the design of 'user' advertisements, being left largely in the hands of the printers. As Caroline Archer-Parré has argued, 'a considered typographic language that would help the reader navigate the text or understand what was of primary importance on the page had not yet evolved'.[62] This may account for the typographic cacophony revealed in the Jenkins advertisement, with typefaces ranging from bold slab serif (line 3), which gave particular emphasis to the name of the business, to the decorated, outlined slab serif with dropped shadow in the final line. Jenkins' products appear to be displayed in order of importance or popularity, signified by the decreasing size of type between one line and the next. The '&c.' at the end of line 7 was a common feature of nineteenth century cut-nail advertisements and used either as a space-saving device or as suggesting an even more extensive catalogue than that shown. Finally, the royal coat-of-arms surmounting the advertisement presents something of a conundrum. Did it proclaim a royal warrant of appointment or was it used simply to inspire confidence and to infer quality and value? Research for this study suggests the latter. Specifically, L. C. Jenkins was a small and unexceptional business whilst, on a broader front, none of the cut-nail advertisements found makes any mention of a royal appointment. It is perhaps significant that the Trademark Registration Act 1875 prohibited the use of a crown and royal symbols to denote quality.[63]

It would be reasonable to expect that typographical developments, the impact of the Great Exhibition, the abolition of the duty on newspapers and advertisements, and the growing competition facing cut-nail manufacturers might have brought about a change in attitude towards advertising. Few manufacturers, however, appear to have appreciated the opportunities that advertising offered. In a crowded market and with a seemingly homogeneous product to sell, cut-nail makers needed not only to differentiate their product from those of their competitors but also to persuade the customer of its superiority. If the advertisements that continued to appear in directories

[62] I am indebted to Caroline Archer-Parré, Professor of Typology at Birmingham City University, for sharing her extensive knowledge of the printing and design of nineteenth-century advertisements.
[63] *I&MTA*, 1 Aug 1876.

are an indication, however, most manufacturers failed to make this connection and their advertisements remained unchanged.

In Birmingham, metal engraving was commonly used by jewellers and gun-makers. It was, however, an expensive process and was rarely used in the production of cut-nail advertisements, although the two advertisements in Figure 7.3 were produced using the engraving process. A comparison of these advertisements reveals the use of stock blocks by the publisher. The Museum of English Rural Life's website includes a page on the use of printing blocks.[64] With the introduction of new types of agricultural machinery in the early nineteenth century, manufacturers wanted catalogues and advertising material that were illustrated. Wood-engraving provided a

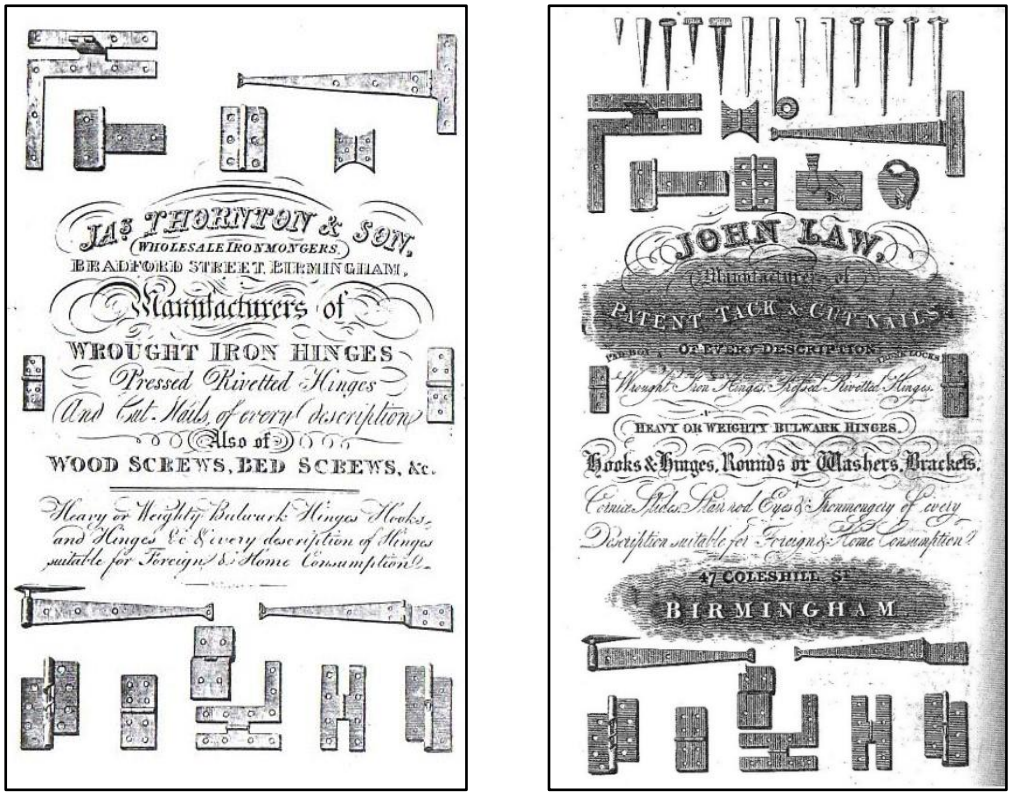


Figure 7.3. Cut-nail advertisements showing the use of engraved stock blocks

Source: Wrightson's *Directory of Birmingham* 1839 (p. 276) and 1843 (p. 111)

[64] Museum of English Rural Life (MERL), 'Printing block collection' at www.reading.ac.uk/merl/collections/merl-printingblocks.aspx (accessed 25 July 2018).

method of reproducing illustrations that could be printed alongside metal type.[65] Cut-nail advertisements, however, rarely carried illustrations before the 1870s, although the full-page depiction of the Britannia in Figure 7.4 is an early example of where a wood-block illustration and metal type were used together.

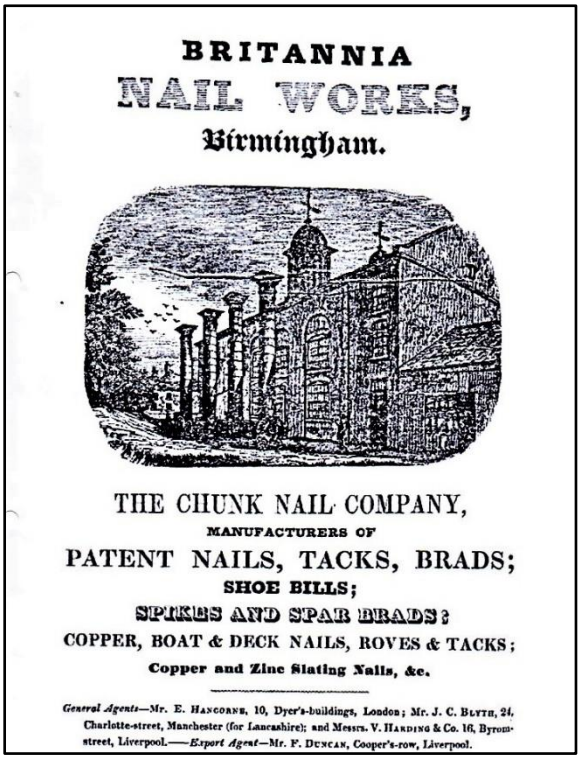


Figure 7.4. Advertisement for the Britannia Nail Works using the wood-block technique, 1842

Source: Pigot's *Royal National and Commercial Directory and Topography*, 1842, p. 1012.

'An important distinction in mid-Victorian Britain', wrote Eric Evans, 'was between respectability and non-respectability'.[66] Evans was writing in the context of personal morality and behaviour, and yet respectability was as important in characterising the honest and trustworthy business as it was an individual or a family. Adding the royal coat-of-arms to the text of an advertisement, as Jenkins did, was a common way of representing qualities of authority and quality. John Reynolds went a

[65] MERL, 'Printing block collection'; and see Maurice Rickards, *The Encyclopaedia of Ephemera* (London: British Library, 2000), p. 313.
[66] Eric J. Evans, *The Forging of the Modern State: Early Industrial Britain, 1783-1870*, 3rd edn (Harlow: Pearson, 2001), p. 352.

step further. He had exhibited at the Great Exhibition and had been awarded a Prize Medal. This award – the only one for cut nails – was significant in itself and Reynolds would exploit the medal in his advertisements throughout the following three decades (Figure 7.5). Images of the medal flanked the royal coat-of-arms, while the statement at the top of the advertisement instantly differentiated the Reynolds product from those of his competitors. In subsequent advertisements, he conveniently omitted to state at which particular exhibition he had won the medal. When placing an advertisement in the 1867 Post Office *Directory of Birmingham* he still declared that he had won 'the only prize medal for cut nails', thus ignoring the fact that five international exhibitions had been held since he had received the award.[67]

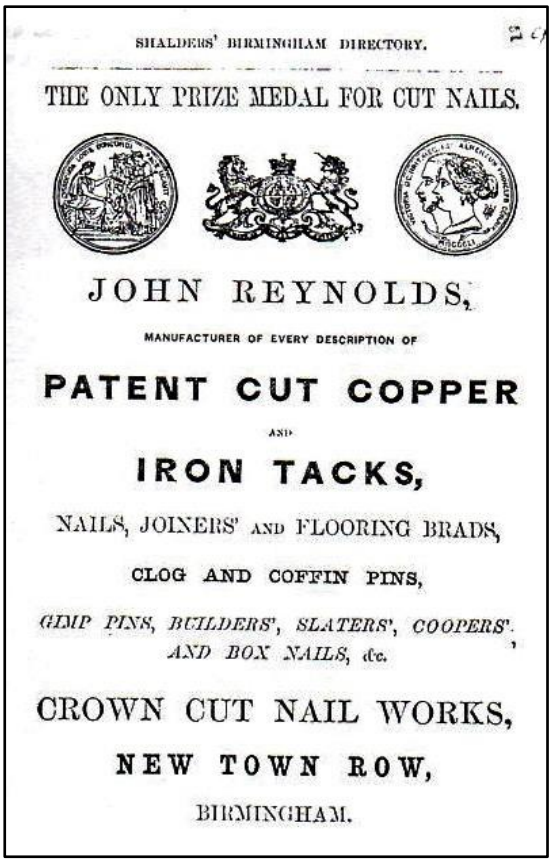


Figure 7.5. Advertisement for John Reynolds, 1854

Source: Shalders' *Directory of Birmingham,* 1854, p. 299.

[67] Post Office *Directory of Birmingham, 1847,* p. 471. The exhibitions were held at Cork (1852), New York (1853-54), Dublin (1853), Paris (1855) and London (1862).

Reynolds' 1868 newspaper advertisement also included a line in bold text confidently announcing that 'the best cut nails made' were available from his Newtown Row works. Reynolds' advertisements, and indeed advertisements in general, were undergoing change; sometimes subtle, sometimes blatant. No longer were they simple proclamations of producer, place and product but, in a crowded market, they sought to differentiate one product from another. In Reynolds' case, it was by creating an impression of distinction and superiority over his competitors.

Another development in the trade press, one that followed hard on the heels of the Great Exhibition and the repeal of the taxes on newspapers and advertisements, was the rapid growth of trade journals. The leading trade journal for the cut-nail trade was undoubtedly *The Ironmonger and Metal Trades Advertiser*. There were others, such as *Martineau and Smith's Monthly Trade Circular*, although, in business historian Geoffrey Tweedale's opinion, *The Ironmonger* was the 'king of the hardware journals'.[68] *The Ironmonger* was founded in May 1859 with an initial circulation of under a thousand; by the end of the year, this had risen to around ten thousand. By 1865, each monthly edition contained sixteen pages of news, trade reports from the major hardware districts, exhibition reports, and product information, together with forty pages of advertisements.[69] The journal itself was in no doubt as to its own significance. In April 1878, after twenty years as a monthly publication, the journal became a weekly. Urging hardware manufacturers to advertise in the journal, the editor of that first weekly edition set out the advantages of doing so: '*The Ironmonger* is kept and constantly referred to, whereas the calling of a traveller is a matter of minutes and is at once forgotten in the hurry and press of business.'[70] Despite these exhortations, cut-nail manufacturers did not rush either to advertise in *The Ironmonger* or to gain inclusion in the journal's directory section. In 1875, Henry Sampson had counselled prospective advertisers – with an obvious point, perhaps – that 'the essence of advertising is to place your statement where it is

[68]Geoffrey Tweedale, '*The Ironmonger*. King of the Hardware Journals'. PDF dated 27 Jul 2014 at http://www.wkfinetools.com/contrib2/TweedaleG/theIronmonger/theIronmonger-01.asp (Accessed 4 January 2015).
[69] Ibid.
[70] *I&MTA*, 1 Apr 1878, p. 149.

most likely to be seen by those most interested in it'.[71] Whilst a dedicated hardware journal such as *The Ironmonger* might seem to be such a place, Sampson's later comment may have discouraged the smaller cut-nail maker from advertising. 'Advertising', he wrote, 'is a most expensive luxury if not properly regulated and a most valuable adjunct when coolness and calculation are brought to bear upon it as accessories.'[72]

Only the major cut-nail manufacturers chose to, or could afford to, advertise in the trade journals. Reynolds was selective in deciding in which issues to place his advertisements. For example, it is significant that he advertised in *The Ironmonger* between February and October 1868, thus coinciding with his newspaper campaign and his election as chairman of UCNTA. Again, in 1884, after an absence of several years, he placed advertisements to coincide with his winning a medal at the Calcutta International Exhibition. Other manufacturers would test the water over a brief period, John Neve of Wolverhampton inserting a small (one sixth size) advertisement in only the January 1862 issue. But it was Hadley Brothers who exploited to the full the promotional opportunities offered by trade journals.

Hadley Brothers advertisements were notable for several reasons, not least for the frequency with which they were inserted. The business began advertising regularly in *The Ironmonger* in September 1868 and was still doing so by the mid-1880s. Hadley also placed advertisements in *Martineau and Smith's Monthly Trade Circular.* In both journals, the advertisements were large – never smaller than half-page and, from 1870 onwards, invariably full-page. Their design, particularly through the use of graphics, was more striking than those of their competitors, and the message they carried was often changed to suit current circumstances. They were, above all, persuasive. Hadley Brothers did not simply list the types of nail produced, but rather focused on the benefits of their product. In their advertisement in *The Ironmonger*, placed to coincide with the Calcutta exhibition, Hadley proclaimed that their steel nails were '*lighter* than hand-wrought iron nails', that customers would get 'a *greater* number of nails to the hundredweight', and that they

[71] Sampson, p. 7.
[72] Ibid, p. 8.

were also '*lower in price* than any other wrought nails'.[73] In an earlier advertisement, the Crown Nail Company of Wolverhampton had adopted a similarly persuasive approach, claiming that its cut tacks were 'the *cheapest* and [packaged] in the *most convenient* form ever put before the public'.[74] Whereas pre-1850s advertisements had emphasised the importance of producer and product, these later examples show that 'user' advertising had 'reached a stage of persuasion as distinct from proclamation'.[75]

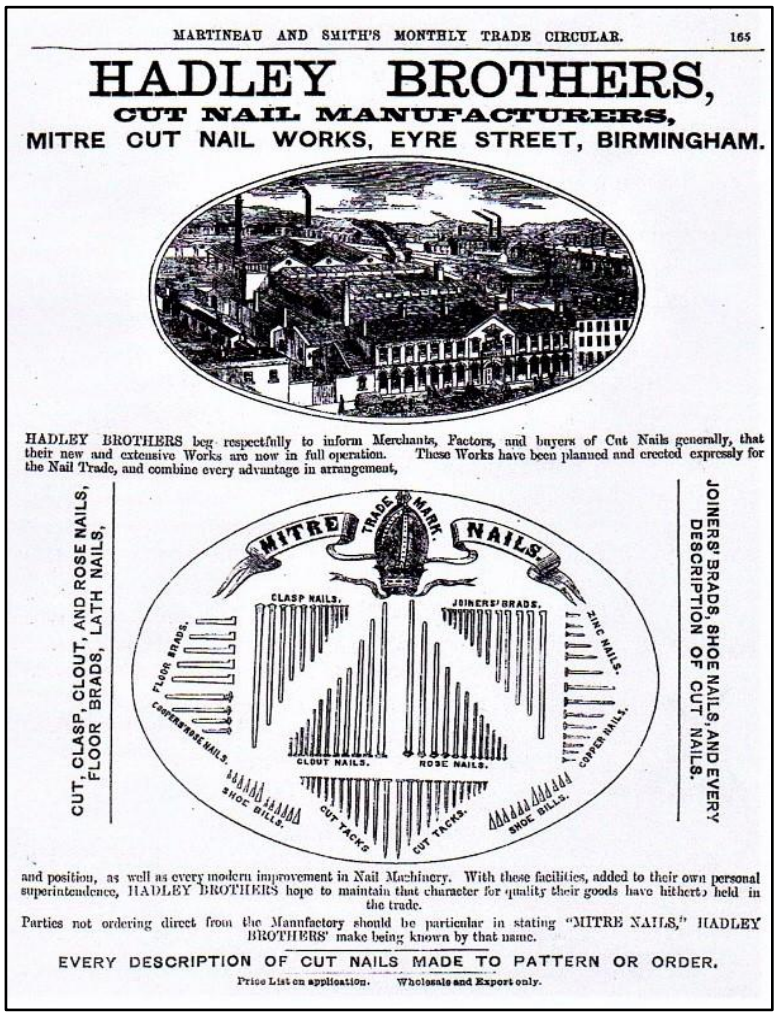


Figure 7.6. Hadley Brothers advertisement, 1876

Source: *Martineau and Smith's Monthly Trade Circular*, (32), 31 August 1876, p. 165.

[73] *I&MTA Supplement*, 5 Jul 1884. Author's italics.
[74] *I&MTA*, 1 Dec 1875, p. 1572.
[75] Gillian Dyer, *Advertising as Communication* (London: Routledge, 1982), p. 41.

7.2.3. Trademarks

Hadley's advertisements displayed the company's Mitre trademark from its formation and, from the late 1860s onwards, this practice was adopted by all cut-nail manufacturers. Although trademarks had been used since the eighteenth century, they were increasingly adopted from the mid-nineteenth century.[76] Faced with increasing competition from the 1850s onwards, Birmingham and district cut-nail producers sought to consolidate their position in the market. Product differentiation was therefore of prime importance. One way of achieving differentiation was through branding, of which the trademark was a visible sign. As now, trademarks provided the exclusive right to a distinctive name, word, sign, symbol or town. Not only did they work as a guarantee of origin, but they were also protected by law. A brand is a much broader concept than a trademark, for it is the brand, rather than simply the trademark, that a firm uses to identify and differentiate its product from the competition.[77]

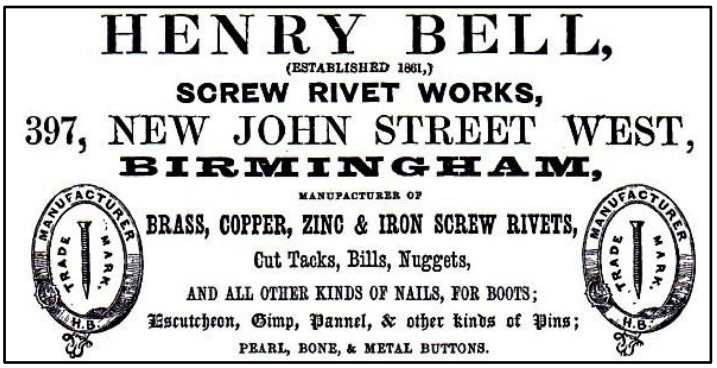


Figure 7.7. Advertisement for Henry Bell, 1867

Source: Post Office *Directory of Birmingham*, 1867, p. 449

Trademarks became a feature of cut-nail makers' advertisements from the late 1860s, as cut-tack maker Henry Bell's 1867 advertisement illustrates (Figure 7.7). However, whilst the use of the trademark attracted the reader's eye, Bell had not created a brand. Some Birmingham cut-nail makers had attempted to do so. Thomas Pritchard, whose business was located at the Globe Cut Nail Works in Cuckoo Road, Nechells, registered two appropriate trademarks, a globe and a

[76] Payne, p. 40.
[77] Teresa de Silva Lopes and Paulo Guimaraes, 'Trademarks and British dominance in consumer goods, 1876-1914', *Economic History Review*, vol. 67 (3), 2014, pp. 793-817 at p.795.

cuckoo. Hadley Brothers and John Reynolds & Sons, however, were alone in creating a brand. Both linked the name of their works, their trademark and the name by which their nails were known. Thus, Hadley's 'Mitre' nails were produced at the Mitre Cut Nail Works along with the distinctive bishop's mitre trademark. Reynolds' nails were known as Crown nails, produced at the Crown Nail Works at 209, Newtown Row in Aston. The firm's trademark consisted of three crowns and the name of the town where the business was located.[78]

As the need for differentiation was so important, manufacturers were constantly on their guard against the fraudulent misuse of trademarks.[79] Both Reynolds and Hadley faced this problem. In July 1864, Reynolds' solicitor was obliged to place a notice in the *Birmingham Gazette*. Headed 'Caution', the notice stated that Messrs Reynolds had, 'at various times heretofore, discovered that certain persons were in the habit of infringing upon and counterfeiting their trademarks, labels and tallies, which are their exclusive property' and that future 'misdemeanours' would result in legal proceedings'.[80] A similar infringement caused Hadley Brothers to demand an apology from Messrs D. and W. Popplewell, cut-nail manufacturers in Brass House Passage.[81] The apology was subsequently carried in the *Birmingham Gazette,* the Popplewells acknowledging that they had 'fraudulently imitated [Hadley's] 'Mitre' trade mark upon labels for cut tacks and joiners' brads sold by us'.[82] The deception was an act of desperation. The Popplewells appear to have been a small and not particularly successful business. The firm was not mentioned in any trade directory before 1869 and, two years after fraudulently misrepresenting themselves, the business folded.[83]

7.2.4. International Trade Exhibitions: 'Advertising and Spectacle'

The April 1876 edition of *The Ironmonger* informed its readers that the first Finnish trade exhibition was to be held in Helsinki later that year, remarking that 'it appears that the fever for exhibitions is

[78] The Trademark Registration Act 1875 prohibited the use of a crown, a royal symbol, the name of a town, or the word 'best' to denote quality in any newly-registered trademark. See *I&MTA,* 1 Aug 1876.
[79] Westall, p. 220.
[80] *ABG*, 2 Jul 1864.
[81] *I&MTA*, 31 Jul 1869, p. 621.
[82] *ABG,* 3 Jul 1869.
[83] Post Office *Directory of Birmingham* 1869, p. 400; *ABG*, 8 Jul 1871.

approaching the frigid zone of the North'.[84] The point to note is not so much the location of the exhibition but the phrase 'the fever for exhibitions'. Although by no means the first exhibition, this infection had taken hold in London with the Great Exhibition of 1851: 'the first world's fair, the first department store, the first shopping mall', as Thomas Richards described it.[85] The contagion then spread geographically, to Paris (1855) and Vienna (1873); New York (1853) and Philadelphia (1876); Sydney (1879), Melbourne (1880) and Calcutta (1883). By the mid-1870s, opinions were being expressed that the novelty of great exhibitions had worn off, and that manufacturers 'unanimously vote [them] a bore'.[86] Hardly 'unanimous': not only did the number of exhibitions increase but their size and duration grew. Visitor numbers rocketed. The Great Exhibition was attended by 6,039,195 fee-paying visitors whilst, nearly forty years later, such was the popularity of the Exposition Universelle in Paris in 1889 that it attracted more than thirty million people.[87]

In a study of the Great Exhibition (2001), Louise Purbrick considered the exposition from several different perspectives.[88] On the one hand, she argued, it could be seen as illustrating the achievement of industrial technology without reference to the condition of industrial labour. On the other hand, it could be seen as a statement of imperial power through industrialisation rather than military conquest. A further 'imperialist' perception, popular since the 1990s, has focused on how the exhibition was a showcase for manufactures produced by the industrial nations but derived from the raw materials of their colonies. Richards argued that, vast as it was in execution, the Exhibition had its root in a single conception: 'that all human life and cultural endeavour could be fully represented by exhibiting manufactured articles'. These *post hoc* interpretations aside, perhaps the judgement of one famous visitor summed up the reason why British hardware manufacturers were motivated to send their exhibits to London. The Crystal Palace, observed the Russian novelist

[84] *I&MTA*, 1 Apr 1876 p. 107
[85] Richards, p. 17.
[86] See *Journal of the Society of Arts,* 24 Apr 1874, p. 514.
[87] C. R. Fay, *Palace of Industry, 1851* (Cambridge: CUP, 1951), p. 75; 'The Expositions Universelles in Nineteenth Century Paris' at https://library.brown.edu/cds/paris/worldfairs.html (accessed 30 December 2015).
[88] Louise Purbrick (ed.), *The Great Exhibition of 1851: New Disciplinary Essays* (Manchester: Manchester University Press, 2001), pp. 2-9.

Fyodor Dostoevsky, simply 'stands for modernity'.[89] When, in August 1852, *The Times* reported that 'cut nails have taken almost complete possession of the market', the implication (and, indeed, the fact) was that this emerging industry was a thoroughly modern one.[90] And if the Great Exhibition stood for 'modernity', as Dostoevsky had said it did, then surely cut-nail manufacturers would be keen to be involved in the marketing spectacle that was 'The Great Exhibition of the Industry of all the Nations'. This, however, was not the case.

Of the 586 British hardware exhibitors, 151 had their premises in Birmingham and its hardware district; and of these, six were nail manufacturers.[91] In addition to the West Midlands nail exhibitors, there were five from other parts of Great Britain and twenty-three from seven colonial and foreign territories.[92] There was therefore a total of thirty-four nail exhibits scattered throughout the Crystal Palace. A visitor intent on viewing an exhibit of cut nails, however, would have had difficulty in tracking one down. Out of the million or so exhibits on display, there were only two of cut nails: one by the Canadian firm of Holland & Dunn, the other by John Reynolds of Birmingham.[93]

In *The Commodity Culture of Victorian England* (1991), Richards explained that, when the exhibition opened on 1 May 1851, advertising was in a 'primitive state'.[94] The Great Exhibition, he argued in rather over-blown language, marked a sea-change and demonstrated 'how a small group of advertisers saw what was happening, placed themselves at the juncture of commerce and culture, and so became the minstrels of capitalism'.[95] Advertising became inextricably linked with spectacle, and the Crystal Palace and its contents were the very embodiment of this: 'Captions were kept to a minimum; things now spoke for themselves using […] a language of their own.'[96] In advertising the commodity, images had been taken over by the real thing. There was another, more

[89] Purbrick, p. 2.
[90] *The Times*, 16 Aug 1852.
[91] *Official Catalogue of the Great Exhibition of the Works of Industry of All Nations, 1851*, pp. 110-123.
[92] Ibid., pp. 168, 170-71, 189, 191, 200-06, 211-13, 239, 268 and 275.
[93] *Official Catalogue of the Great Exhibition of the Works of Industry of All Nations, 1851*, pp. 116 and 170.
[94] Richards, p. 6.
[95] Ibid, p. 1.
[96] Ibid., p. 4.

prosaic reason why manufacturers chose exhibitions as marketing tools. Trade fairs offered exhibitors a way to advertise without disclosing the secrets of their innovations. Rather than exhibiting a new piece of machinery, or describing a new process, exhibitors often chose to display samples of their final output.[97]

Those Birmingham and district cut-nail makers who perceived the benefits of this very contemporary form of marketing proved to be a very small band indeed. For the smaller manufacturers, who limited their promotion activity to seeking an entry in a trade directory, the cost of exhibiting outweighed the perceived benefits of doing so. For the larger, wealthier businesses, however, the self-serving words of *The Ironmonger* clearly resonated. 'As with all modes of advertising', the journal proclaimed, 'it is those who spend money the most lavishly, and who are best able to support their effort, who reap the handsomest rewards.'[98] Table 7.2 shows which of the Birmingham and Wolverhampton cut-nail manufacturers decided, during the second half of the nineteenth century, that such rewards would indeed be likely to flow. It also shows the exhibitions they attended and their degree of success. It is evident that participation at international trade exhibitions was limited to the major West Midland players, particularly Hadley, Reynolds and Parkes. What motivated them to spend time and money doing so can be easily explained. Each was an exporter of cut nails, particularly to imperial markets. The Chunk Nail Company at the Britannia Nail Works, acquired by Reynolds in 1862, had been exporting nails to New Zealand since the early 1840s.[99] Hadley did likewise. Details of exports listed in *The Ironmonger* in the spring of 1878 showed that Hadley's agents, Messrs Brooker, Dore & Co, had exported twenty pounds' worth of nails to Tasmania and sixteen pounds' worth to Canterbury, New Zealand.[100]

A second explanation for the 'big three's' involvement at exhibitions is simply that they could afford to do so. Exhibiting was a costly business. To begin with, each exhibitor had to produce an

[97] Petra Moser, 'How do patent laws influence innovation? Evidence from nineteenth-century world's fairs', *American Economic Review*, vol. 95 (4), September 2005, pp. 1214-1236 at p. 1219.
[98] *I&MTA*, 1 Apr 1878, p. 173.
[99] *BJ*, 12 Sep 1840.
[100] *I&MTA*, 1 Mar and 1 Apr 1878.

Year	Exhibition	Birmingham & Wolverhampton Cut-nail Exhibitors	Awards
1851	Great Exhibition, London	John Reynolds, Birmingham	Prize Medal[101]
1855	Exposition Universelle, Paris	John Neve & Co, Wolverhampton[102]	
1862	International Exhibition, London	John Reynolds, Birmingham John Neve & Co, Wolverhampton[103]	
1867	Exposition Universelle, Paris	Hadley Brothers, Birmingham John Israel Parkes, Smethwick[104]	Honourable Mention[105]
1879	Sydney International Exhibition	Henry Bell, Birmingham John Israel Parkes, Smethwick John Reynolds & Sons, Birmingham[106]	Commended[107] Third Class Award[108] Second Class Award[109]
1880	Melbourne International Exhibition	John Israel Parkes, Smethwick[110]	Second Order of Merit (Certificate) [111]
1883	Calcutta International Exhibition	Felix Hadley, Birmingham John Reynolds & Sons, Birmingham[112]	Silver Medal[113] Bronze Medal[114]
1887	Adelaide International Jubilee Exhibition	Felix Hadley, Birmingham John Reynolds & Sons, Birmingham[115]	First Order of Merit[116] Second Order of Merit
1888	Melbourne Centennial International Exhibition	Felix Hadley, Birmingham[117]	
1889	Exposition Universelle, Paris	Felix Hadley, Birmingham	Bronze Medal[118]

Table 7.2. Cut-nail manufacturers' attendance at international exhibitions, 1851-1889

[101] *Official Catalogue of the Great Exhibition…1851* (London: 1851), p. 113; *Morning Post*, 16 Oct 1851.
[102] *Paris Universal Exhibition, 1855. Catalogue of Works Exhibited in the British Section…* (London: 1855), p. 42.
[103] *International Exhibition, 1862. Official Catalogue of the Industrial Department* 3rd edn (London: 1862), p. 94.
[104] *Catalogue Général : Exposition Universelle de 1867 à Paris.* vol. 1 (Paris :1867), pp. 298 and 299.
[105] *Birmingham Daily Gazette*, 10 Jul 1867.
[106] State Library of New South Wales [hereafter SLNSW]. 607.34944/3. *Sydney International Exhibition, 1879: Official Catalogue of the British Section* (London: 1879), pp. 181, 187 and 189.
[107] SLNSW. DSM/606/S. *Official Record of the Sydney International Exhibition, 1879* (Sydney, 1881), p. 333.
[108] Ibid. 'A good exhibit of useful, well-made articles'.
[109] Ibid. p. 336. 'A small but good exhibit of nails from tacks to the length of 8 inches'.
[110] *Sydney Morning Herald*, 2 Nov 1880.
[111] *Official Record of the Melbourne International Exhibition 1880-1881* (Melbourne, 1882), p. 329.
[112] *Official Catalogue of the Calcutta International Exhibition, 1883-1884*, 3rd edn (London, 1883), pp. 164 & 180.
[113] *I&MTA*, 5 Jul 1884.
[114] *I&MTA*, 9 Mar 1884.
[115] SLNSW. DSM/606/A. *Official Catalogue…Adelaide International Exhibition, 1887* (Adelaide: 1887), p. 45.
[116] *BDP*, 25 Oct 1887.
[117] *Official Catalogue, Melbourne Centennial International Exhibition, 1888-1889* (Melbourne, 1888), p. 66.
[118] *The Times* 28 Sep 1889.

impressive, eye-catching display. Prior to the Sydney Exhibition (1879), the *Birmingham Daily Post* carried two short articles describing both the Parkes and Reynolds exhibits. The Parkes display was described rather unflatteringly as being 'effective'.[119] The report on the Reynolds exhibit, on the other hand, was more effusive. The company had apparently gone to 'considerable trouble in fitting up an elaborate showcase with specimens of the cut nails made by them'. The case was made of ebony, picked out in gold and surmounted by the trademark crown. 'A special feature of the case', the report noted, 'is the chain surrounding the various samples, composed solely of cut nails clenched when cold'.[120] If the exhibit's construction was costly, its transport to the exhibition added further expense: agents' fees and shipping costs had to be paid. Insurance, too, would have been a sensible outlay; most of the American exhibits destined for the Melbourne Exhibition of 1880 were reported to have been lost at sea.[121]

A third reason for deciding either to have a presence at an exhibition or not would have depended on the firm's attitude to the whole question of advertising. William Campbell & Co of Selly Oak had clearly been in the cut-nail trade since the early 1860s, and yet had not felt it necessary to be included in a trade directory until 1869.[122] They were not alone. As Turner pointed out, even by the mid-1850s, 'all but a few manufacturers had yet to be convinced that advertising was necessary'.[123] For the majority, the traditional way of doing business by creating a circle of customers and cultivating personal relations with them was sufficient. Added to this, some manufacturers may well have been deterred by the bad publicity that tended to haunt the management and administration of exhibitions. The Centennial Exhibition in Philadelphia (1876) was criticised for the 'harassing regulations and irritating espionage to which foreign exhibitors, especially British exhibitors, were subjected'.[124] At the Paris Exhibition of 1878, the press reported that 'accusations of bribery against the juries are openly and passionately made' while, at Calcutta (1873), the first

[119] *BDP*, 21 Apr 1879.
[120] *BDP*, 11 Apr 1879. The significance of this was to demonstrate the malleability of the nails.
[121] *BDP*, 16 Nov 1880. The report prompted the comment that 'somehow or other, America is rarely successful at exhibitions'.
[122] See *I&MTA*, 7 Nov 1862; Post Office *Directory of Birmingham, 1869*, p. 351.
[123] Turner, p. 78.
[124] *I&MTA*, 1 Nov 1876, p. 411.

two editions of the official catalogue were pronounced 'entirely unreliable and incomplete'.[125] Despite these instances of inefficiency, Hadley, Reynolds, Parkes – and a few others, such as John Neve of Wolverhampton – clearly perceived that there were benefits to be had from marketing in as many ways as possible. Trade journals were a modern means of doing so; exhibitions were another.



Figure 7.8. Prize medal (Second Class) awarded to
John Reynolds & Sons at the Sydney International Exhibition, 1879

Bronze. Diameter: 760 mm. Weight: 223 g.

The obverse (left) illustrates the exhibition building in the background and, in the foreground, the figure of New South Wales surrounded by symbols of industry and the arts. The reverse (right) shows the Waratah flower and other vegetation common in New South Wales.

Source: Author's private collection. Photograph by the author

A fourth benefit to participating at exhibitions lay in the opportunities that stemmed from winning prizes. Just as free indirect publicity was derived from pre-exhibition press reports, so prestigious exposure was to be gained from a mention in the list of awards made by the juries. If press announcements were transient, reference to an award certainly was not. Even in 1883, John Reynolds reminded his prospective customers in India that he had been awarded 'the only prize

[125] *Worcester Chronicle*, 14 Sep 1878; *I&MTA* ,9 Feb 1884, p. 184.

medal for cut nails' at the Great Exhibition and another award at the 1879 Sydney Exhibition.[126] As well as illustrating an advertisement with an image of the medal, medals were important for what they represented. At the Great Exhibition they were awarded 'whenever a certain standard of excellence in production or workmanship had been attained [in terms of] utility, beauty, cheapness or adaptation to particular markets'.[127] Although nails are utilitarian objects and have no intrinsic beauty, cut nails had other advantages.[128] Not only were they renowned for their holding power but they were also considerably cheaper than their hand-made counterparts; and different cut nails were produced to suit the different hardness of wood throughout the world. Medals signified distinction, not just in terms of the award but also in the superiority of both product and producer (Figure 7.8).

7.3. Summary

This chapter has been concerned with the ways in which cut-nail manufacturers promoted their goods throughout most of the nineteenth century. It has also considered their underlying motivation. In the 'emergence and growth' stages of the cut-nail product life-cycle – essentially, from the formation of the Britannia Nail Works in 1815 to the years immediately following the Great Exhibition – promotional activity appears to have been largely undynamic. Aside from the employment of commercial travellers (evidenced by the 'wanted' advertisements in local newspapers), factors and merchants, the most common way in which manufacturers 'announced' themselves was through a listing in trade directories. Many cut-nail makers did so, although not all; William Campbell of Selly Oak was an example of the latter. Of those who sought entry in a trade directory, a few went a step further and placed actual advertisements. Some did so regularly; others dipped their toe into this pond only once. Francis Agard, for instance, placed a half-page advertisement in White's 1855 *Directory of Birmingham* but never repeated the exercise. James Thornton of Bradford Street, on the other hand, placed advertisements – some full-page, others half-

[126] *Catalogue of the Calcutta Exhibition, 1883-1884,* p. 180.
[127] *The Exhibitors' Almanac for 1852: and Alphabetical List of All the Prizeholders of the Great Exhibition of the Industries of All the Nations* (London, 1852). The pages are unnumbered.
[128] Nevertheless, when Hadley Bothers exhibited at the Building and Manufacturing Exhibition in Birmingham in 1882, their exhibit of cut nails was reported as having 'beautiful finish as regards the cutting'. *BDP*, 18 Apr 1882.

page – in six different directories between 1839 and 1847. In their design, advertisements tended to be more verbal than visual; they tended to be announcements of what products were produced by which manufacturer at which address. As competition increased, as attitudes towards advertising began to become more accepting, and as mere announcement gave way to a more persuasive message aimed at product differentiation, so pictorial images began to assume greater importance.[129] At the same time, there appears to have been no appetite for advertising in newspapers apart, that is, from John Reynolds' campaign in 1868. This is hardly surprising since the target readership was inappropriate. All the same, the free publicity that accompanied factory visits and exhibiting at trade exhibitions never did any harm.

There seems little doubt that the Great Exhibition of 1851 marked a sea-change in the way that 'user' businesses promoted themselves. Jealously-guarded trademarks began to be widely used as a means of differentiating one product from another: a crucial tool in an industry whose products were largely homogeneous. The development of trade journals such as *The Ironmonger* offered manufacturers a much more relevant and targeted readership than newspapers ever did; and some producers caught the 'fever for exhibitions'. However, what this study has shown is that only a small number of cut-nail manufacturers took advantage of the increasing range of promotional media. There was a clear divide between those who took every chance to promote their activities and those who did not. The majority were content to have their businesses listed in a trade directory, but a few fervently embraced the new advertising opportunities. None exemplified the latter more than Hadley Brothers. Their factory attracted visitors and press reports; they promoted their distinctive 'Mitre' brand; they placed eye-catching and persuasive advertisements in a range of trade publications; they exhibited at international trade fairs and won prizes. Reynolds and Parkes were similarly catholic in their promotional activity. These three businesses, more than any others, became the leading cut-nail manufacturers in Birmingham and the hardware district; but whether their success was a function of their promotional endeavours or whether their extensive marketing activity was made possible by their business success remains an open question.

[129] Twyman, p. 104.

CHAPTER 8

RENAISSANCE OR DECLINE? MANAGING TECHNOLOGICAL CHANGE IN THE CUT-NAIL TRADE, 1872-1913

8.1. Introduction

When the United Cut Nail Trade Association (UCNTA) met in Wolverhampton in February 1874, its secretary, William Hartle, recorded with 'much pleasure' that the previous year had 'not been otherwise than prosperous' for all its members.[1] Five months later, a report on the Birmingham economy in *The Ironmonger* made more sobering reading. Looking back to the previous summer, the article mused that 'everything was *couleur de rose* and traders acted as if they believed the millennium of prosperity had arrived and would remain with them, if not for ever, at least for years to follow'.[2] The report continued: '[W]hat change has come over everything!' Although 1874 was a prosperous year for the Birmingham and district cut-nail trade, Hartle's reports from 1875 onwards became increasingly gloomy. There was a brief respite in 1881 and 1882 but, when the shareholders of Felix Hadley & Co. met in 1895, the chairman explained: 'Year by year since 1890 trade has been gradually getting worse and worse [with] 1894 considerably worse than its predecessor.'[3]

Several questions arise from this apparent change in fortunes for the cut-nail trade, the first and most obvious being: to what extent was the trade in decline? Secondly, if the evidence suggests that it was in decline, what were the underlying causes? Thirdly, what steps were taken to reverse it and to what effect? Before seeking answers to these questions, the chapter begins with an examination of UCNTA. There are two reasons for doing so. Firstly, the life of the association

[1] United Cut Nail Trade Association Annual Report [hereafter UCNTA-AR] for 1873, 9 Feb 1874, p. 1.
[2] *Ironmonger and Metal Trades Advertiser* [hereafter *I&MTA*], 1 Jul 1874.
[3] UCNTA-AR for 1874, 8 Feb 1875, p. 1; Library of Birmingham [hereafter LoB]. Birmingham History, D/26/502188. 'Felix Hadley & Co. Ltd., Proceedings at the Annual General Meeting of Shareholders held at the Grand Hotel, Birmingham, 22 February 1895' [hereafter Hadley AGM 1895], p.3.

from 1868 to 1882 acted as a bridge between the 'maturity' and 'decline' phases of the regional cut-nail trade; and secondly, UCNTA's activities, gleaned largely from surviving records of this short-lived association, provide an insight into the opportunities and threats facing cut-nail manufacturers during the 'long' 1870s. Guided by the characteristics of the 'decline' phase of the product life-cycle, the second part of the chapter analyses the trajectory of the trade to 1913 with a view to determining the nature and extent of its decline. Here, it is necessary to introduce a sixth phase to the life-cycle: the 'renaissance' stage.[4] Whilst the 'decline' stage assumes a degree of finality for the product and/or the industry, the 'renaissance' stage emphasises the emergence and growth of new industries to take the place of the declining industry. This chapter therefore analyses the relevance of this additional stage to the cut-nail trade. The third part of the chapter identifies the underlying causes of decline; and, in the final part, attention turns to the strategies adopted by the West Midlands cut-nail manufacturers to meet the existential challenges they faced, finishing with an assessment of how successful they were.

8.2. Co-operation: The United Cut Nail Trade Association

In his essay on the competitive environment of British business during the second half of the nineteenth century, Oliver Westall referred to the 'three usual strategic options' open to businessmen: competition, integration and collusion.[5] Competition on price, he explained, was not a realistic choice for businesses that remained small in relation to markets and where products were relatively standardised. Both criteria applied to the cut-nail trade. Westall also argued that, for businesses with high overhead costs, involvement in a price war could lead to a narrowing of margins and a consequent reduction in profitability. Again, this was the case with cut-nail manufacture. Of course, firms compete in ways other than on price: through advertising, product differentiation and new product innovation. Apart from advertising and using trademarks, however, it was difficult for manufacturers to differentiate between such simple and standardised

[4] See Andrew Popp and John Wilson, 'Life cycles, contingency, and agency: growth, development, and change in English industrial districts and clusters', *Environment and Planning A*, vol. 39, 2007, pp. 2975-2992, at p. 2978.
[5] Oliver M. Westall, 'The competitive environment of British business, 1850-1914', in Maurice W. Kirby and Mary B. Rose, *British Enterprise in Modern Britain* (London: Routledge, 1994), pp. 207-235 at p. 207.

products as nails; and, until the introduction of wire nails in the 1880s, there was little innovation other than in improved nail machinery – which, in any case, merely increased output rather than extending the product range.

From the mid-1860s onwards, the fastener trades – nuts and bolts, screws, locks – witnessed several flurries of integration. The Patent Nut and Bolt Co. of Smethwick resulted from the combination of several manufacturers, whilst acquisitions made by Nettlefolds, Britain's chief screw manufacturer, eventually led to the formation of Guest, Keen & Nettlefold in 1902.[6] Between John Reynolds' acquisition of Cornelius Terry's tack-making business in 1868 and the amalgamation of Felix Hadley & Co. with the metal-rolling firm of Glydon & Shorthouse in 1899, however, no combination of midland cut-nail manufacturers occurred; nor is there any available evidence to suggest that one was considered. Apart from reducing competition, integration offered a degree of increased security. It therefore seems strange that the cut-nail trade eschewed the potential benefits that combination offered. An enthusiasm for price stability coupled with an apparent lack of appetite for integration left collusion – or, if not collusion, co-operation – among competing firms as the preferred way forward for the cut-nail trade.

The recession of 1867-1869 signalled the start of forty years of uneven decline for the midland cut-nail trade. It also led directly to a period of co-operation, heralded by the formation of UCNTA in 1868; and, for the next fourteen years, it was UCNTA that fought to keep the trade afloat. The preface to UCNTA's minute book explained how 'keen competition, miserably low and partly ruinous prices at which cut nails have been sold for a long time past' coupled with the aim of achieving 'a more remunerative and better regulated list of prices' in the future, had led to the formation of the association.[7]

[6] W. B. Stephens (ed.), *A History of the County of Warwick. Vol. VII, The City of Birmingham* [hereafter *VCH, Warwicks VII*] (London: Oxford University Press [hereafter OUP], 1964), p. 155.
[7] UCNTA Minute Book [hereafter UCNTA-MB], Preface, p. 4. (Author's private collection).

Trade associations develop for a variety of reasons but, as the preface to its minute book makes clear, UCNTA was a price-fixing association.[8] With its membership drawn from manufacturers in the same trade, it was a 'typical' trade association, reflecting many of the organisational characteristics of such horizontal combinations. It was also a 'closed' organisation, in that it made no use of publicity or advertising. Indeed, not only were there no references in the trade press to the formation of UCNTA but there was also scant mention of the association in the wider press.[9] In his oft-cited 1907 study of the trust movement in British industry, H. W. Macrosty referred to this lack of publicity as a common feature of trade associations.[10] He also referred to the rules often established by trade associations, although UCNTA appears not to have set any such rules.[11] Rather, it worked on the principle of 'gentlemen's agreements', whereby decisions taken by the association relied simply on the honour of the membership for their implementation. In retrospect, this was unwise. Without a set of rules backed by punitive sanctions, the achievement of UCNTA's objectives was always going to be difficult.

Although the association was formed at the suggestion of Birmingham cut-nail-maker Charles Shaw, and although membership was heavily weighted in favour of the midland producers, UCNTA was a national organisation with affiliated members spread between Bristol and Newcastle upon Tyne.[12] A preliminary meeting, held in Birmingham on 30 July 1868, was attended by ten midland makers along with Josiah Grimshaw, representing the Leeds makers, and John Ellison from Manchester. An executive committee was formed: John Reynolds was elected chairman and Hartle appointed as the association's secretary.[13] Members were invited to submit copies of their

[8] See H. W. Macrosty, 'Business aspects of British trusts', *Economic Journal*, vol. 12, (47), September 1902, pp. 347-366; UCNTA-MB, p. 4.
[9] The only exception that has come to light was a letter from William Hartle, UCNTA's secretary, to the editor of the *Birmingham Daily Post* complaining about a report the newspaper had published, which the association considered 'misleading and most injurious to the trade at large'. See *BDP*, 23 Jun 1873. The editor rejected Hartle's complaint.
[10] H. W. Macrosty, *The Trust Movement in British Industry* (London: Longman, Green & Co., 1907). See references to Macrosty in, for example, Allen, p. 465; Westall, 'Competitive environment', pp. 224-227; John F. Wilson, *British Business History, 1720-1994* (Manchester: Manchester University Press [hereafter MUP], 1995), p. 257.
[11] Ibid, pp. 3 and 7.
[12] See Appendix 9 for details of UCNTA membership.
[13] William Hartle (1803-1893) was described as a 'cashier in a nail works' in the 1881 census. And see *BDP*, 28 Aug 1893.

firm's price list so that an association-wide list could be prepared.[14] The executive met again ten days later, the minutes recording how the discussion had 'opened-up many conflicting issues'.[15] One instance of disharmony occurred within ten days of UCNTA's formation, resulting in a deputation being sent to Wolverhampton 'to wait upon Messrs Danks & Walker urging their consent and co-operation in adopting the [association's] list […] prepared for the guidance and benefit of the whole trade'.[16]

Throughout its life, the association was blighted by instances of underselling, with some makers putting self-interest before that of the common good – the very purpose of UCNTA's creation. The minutes frequently recorded occasions when representatives had to be despatched to aberrant manufacturers with the aim of bringing them into line; the Wolverhampton makers appeared to be less compliant than their neighbours in Birmingham.[17] Internecine squabbles about underselling also constantly threatened the unity of the association. In his annual report for 1872, Hartle had attributed the success of the previous year to 'the watchful care and unceasing attention' of the chairman and the executive committee. He also paid tribute to the cohesion of the association, although this emphasis on unity may well have been aimed at steadying the ship.[18] Further chinks in the association's armour had begun to appear in 1872 when Jones Brothers of Middlesbrough sent a letter alleging underselling by John Summers at Stalybridge, and by the Birmingham and Wolverhampton manufacturers. The executive utterly repudiated the charge against the midland makers although, significantly, there was no mention of Summers. [19] Six weeks later, Summers wrote a letter announcing that he had unilaterally reduced his prices by £2 per ton. Such behaviour clearly alarmed the executive, and Hartle was instructed to reply 'in the strongest terms condemning the extraordinary course he had pursued'.[20] But the damage had been done. The

[14] UCNTA Minutes of General Meetings [hereafter UCNTA-MGM], 30 Jul 1868.
[15] UCNTA Minutes of Executive Committee Meetings [hereafter UCNTA-MEC], 10 Aug 1868.
[16] UCNTA-MEC, 10 Aug 1868. The deputation comprised John Poultney, Felix Hadley and John Neve.
[17] See, for example, UCNTA-MEC, 14 Jan 1870 and 7 Dec 1874.
[18] UCNTA-AR 1872, p. 1.
[19] UCNTA-MEC, 29 Aug 1872.
[20] UCNTA-MEC, 14 Oct 1872.

Leeds makers followed suit, thus leaving the executive no alternative but to announce a price reduction to 15s. 0d. per cwt.[21] The leader was becoming a follower.

Underselling became increasingly widespread between September 1874 and the autumn of 1879. Marked by a clear sense of frustration, each of Hartle's annual reports commented upon the vexed matter of underselling. Reviewing the association's activity throughout 1875, he noted that 'many members have been underselling, [although] it has not been rendered needful by the want of a fair and steady demand'.[22] The following year, Hartle drew attention to 'lamentable underselling' and, in 1877, referred to the 'many members' who were still engaging in the practice.[23] By the time the association met in Derby in April 1879, his patience was clearly wearing thin. He began his annual report in an unusually downbeat manner stating that he had 'but little to record, and still less to congratulate the members upon'.[24] A year later, Hartle's mood was unchanged, even if his choice of words was a little more imaginative. Opening his report, the secretary regretted that 'he [had] but a poor trumpet to blow and but little applause to anticipate', the exasperated Hartle complaining that underselling was jeopardising the best interests of the association.[25]

In addition to this endemic, trust-sapping problem, the executive faced other challenges. There were occasional rifts between the midland and northern makers. When UCNTA tried to arrange a common list of workmen's wages, the Leeds and Middlesbrough members rejected it and sent a terse letter to the executive stating, in Hartle's words, that 'if not at once settled, the northern makers will make their own terms and leave us [the midland makers] to fight our own battle'.[26] A further sign of disquiet occurred in October 1880 when, five days after the executive had announced a reduction in price to the dangerously low figure of 8s. 6d., the three leading Wolverhampton

[21] UCNTA MEC, 21 Oct and 11 Nov 1872.
[22] UCNTA-AR 1875, p. 1.
[23] UCNTA-AR 1876, p. 1.
[24] UCNTA-AR 1878, p. 1. The annual meeting was held on 28 Apr 1879. The meeting had been deferred from its usual January date. In early 1879, the executive was occupied with a potentially serious split between the midland members and those in Leeds after the latter had unilaterally reduced their prices at the end of 1878. See UCNTA-MB, 30 Dec 1878 for minutes of a meeting of the midland makers.
[25] UCNTA-AR 1879, p. 1. The deferred annual meeting was held on 31 May 1880, although the minutes offer no explanation for the postponement.
[26] UCNTA-MEC, 9 Jul 1878.

makers resigned from the association *en masse*. In the event, the resignation was short-lived, and the manufacturers returned to the fold, although the episode did nothing for the stability of either the trade or the association.[27] Yet another unsettling occurrence was the attendance at a general meeting in July 1881 of 'Mr Chamberlain'.[28] This was undoubtedly Arthur Chamberlain (1842-1913). A younger brother of the more famous Joseph, Arthur was a rising star in the firmament of Birmingham industry.[29] No explanation was offered for his attendance at this meeting and he is not recorded as attending any other meeting, either before or after. Taking the long view, however, his appearance was significant, for Chamberlain was instrumental in ousting Felix Hadley from the Hadley board in 1895 before taking control of the company.[30]

When the final report of the Royal Commission on the Depression in Trade and Industry was published in 1886, it noted that the depression dated from about 1875 and that, except for a short period of prosperity from 1880 to 1883, 'had proceeded with tolerable uniformity'.[31] As the analysis of price movements will show, the fortunes of the cut-nail trade largely reflected the general downward slide of British trade and industry as a whole. It also shows that UCNTA was largely powerless to control prices, its original objective. The price of iron dictated the price of cut nails.[32] An absence of rules and penalties meant that there were no sanctions for underselling. Gentlemen's agreements were inadequate in the face of an individual manufacturer's self-interest; and, as the power of the northern makers grew in relation to that of their midland counterparts,

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[27] See UCNTA-MB, p. 171. On 29 September 1881, Hartle issued a notice concerning a price increase 'after Mr A. J. R. [Alfred Reynolds, eldest son of John Reynolds and vice-chairman of UCNTA following his father's retirement in 1876] and Mr. Hadley had seen and gained the consent of the Wolverhampton makers'. Charles Neve and Henry Bate (of the Crown Nail Company) were subsequently recorded as being present at a meeting of the executive committee on 12 January 1882.
[28] UCNTA-MGM, 15 Jul 1880.
[29] In 1883, Arthur Chamberlain became a managing partner in Chamberlain & Hookham (electrical fittings) and, in 1889, he was appointed chairman of percussion cap makers, Kynoch Ltd. See Barbara Smith, 'Chamberlain, Arthur (1842-1913) industrialist', *Oxford Dictionary of National Biography*. See: www.oxforddnb.com/view/10.1093/ref.odnb/9780198614128.001.0001/odnb9780198614128-e-46812 (accessed 20 Sep 2018).
[30] Library of Birmingham [hereafter LoB]. Birmingham History/D/26.502188. Felix Hadley & Co. Minutes of Annual Meeting of Shareholders, 22 Feb 1895 [hereafter Hadley AGM, 1895], p. 34.
[31] PP. 1886 (C4893) Royal Commission to inquire into the depression of Trade and Industry. Final Report, Minutes of Evidence, Appendix [hereafter *Depression*], p. x.
[32] See, for example, UCNTA-MEC, 11 Apr 1872, where the minutes recorded that 'in consequence of the extraordinary upward tendency of the iron market, the managing committee have this day decided to advance cut nails [by 1s per cwt]'.

divisions began to appear between the two regions. In the absence of any corroborative evidence, the abrupt cessation of UCNTA's minutes must imply the winding-up of the association.[33] If this is so, it was not alone. As Barbara Smith observed: 'A great many such associations […] were tried and usually they failed after a short period.'[34]

8.3. Indicators of Decline

A dwindling number of competing firms clearly suggests a declining product or industry. Product life-cycle theory identifies other indicators: a shrinkage in the size of the overall labour force; falling prices; a reduction in sales volumes and profits; and a perceived switch in customer preference to competing products.[35] Changes in a firm's spending on product promotion can also indicate decline: an increase in marketing activity can suggest a firm trying to maintain its profile, whilst a decrease may signal a need to cut costs.

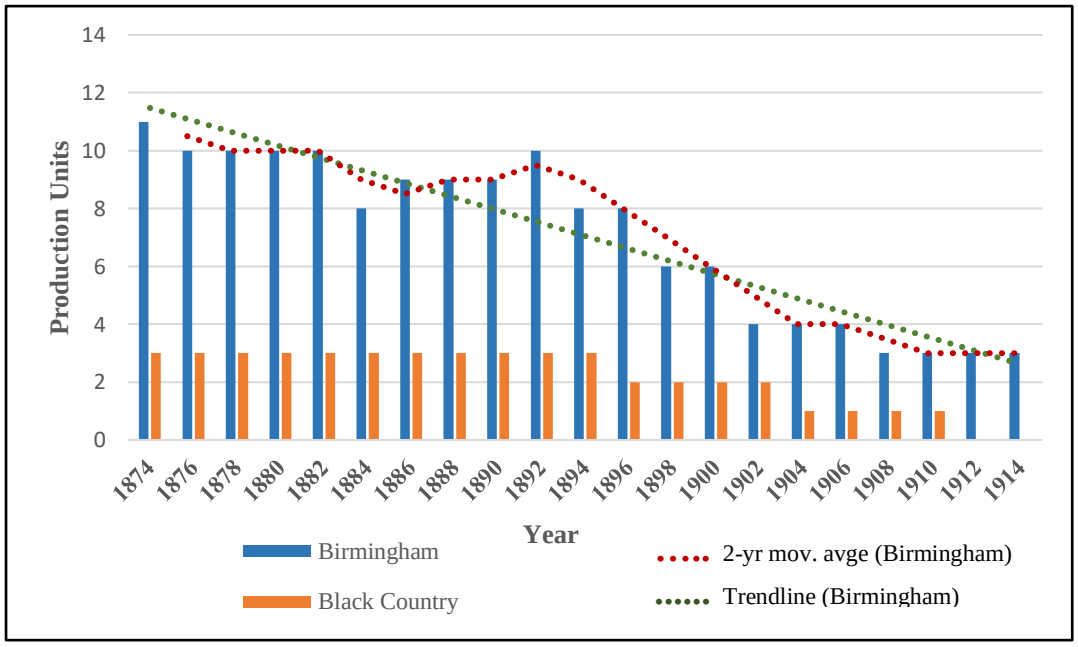


Figure 8.1. Cut-nail manufacturers trading in Birmingham and District, 1874-1914

Source: Data at Appendix 10

[33] The last set of minutes recorded the business of a meeting held at the Midland Hotel, Birmingham on 12 January1882. They were written on a loose piece of paper, although six blank pages remained in the minute book.
[34] *VCH, Warwicks VII*, p. 163.
[35] See, for example, William M. Pride, Robert J. Hughes and Jack R. Kapoor (eds), *Business*, 11th edn (Nashville TE; South-Western 2012), pp. 367-368.

As Figure 8.1 shows, the number of Birmingham and district cut-nail manufacturers fell markedly if not continuously throughout the period, from fourteen in 1874 to three in 1913 – a reduction of 85.7 per cent. Although the three Wolverhampton manufacturers remained in business until 1893, the deteriorating trade conditions of the early 1890s took their toll. Having traded for more than fifty years, John Neve & Co. was forced to close in 1894. The remaining two Wolverhampton makers survived into the twentieth century, though both had ceased trading by 1911. Of course, the overall reduction in the number of firms might have resulted from mergers within the trade, thus creating fewer but more efficient businesses but, as was noted earlier in this chapter, that was not the case. On numerical evidence alone the Birmingham and district cut-nail trade contracted after 1872.

Falling prices in themselves are not necessarily damaging so long as demand for the product increases or production costs fall. When prices and demand fall concurrently, however, there comes a time when no further profit can be made. UCNTA's records have proved to be a rare and valuable source of information about price movements between 1868 and 1882. Thereafter, tracking their progress becomes more difficult. Newspaper reports frequently referred to price movements in general rather than specific terms: for instance, 'the prices of cut nails have been maintained very well' and 'the prices of cut nails and tacks are strengthening'.[36] Only occasionally was the actual price mentioned. One such example occurred in 1882 when, stressing the superiority of Irish nails over English ones, the secretary of the Irish National Nailmakers' Union reported that 'the lowest priced English cut nails [are] 9s. 6d. per cwt'.[37]

The graph in Figure 8.2 shows the movement of prices for 3-inch nails 'at the works' from 1868 to 1882.[38] Two points are worth noting before the graph is analysed. Firstly, although the price lists

[36] *Leeds Mercury*, 07 Apr 1887; *BDP*, 06 Sep 1890.
[37] *Irish Times*, 13 Jun 1882.
[38] See Appendix 11 for monthly price data, July 1868 to June 1882. The price of nails 'at the works' referred to the standard price charged before either a surcharge was made for deliveries to London (usually a shilling per cwt) or an agreed percentage discount was allowed. From 1879 onwards, UCNTA quoted two prices for London: one for delivery by rail and another for delivery by water.

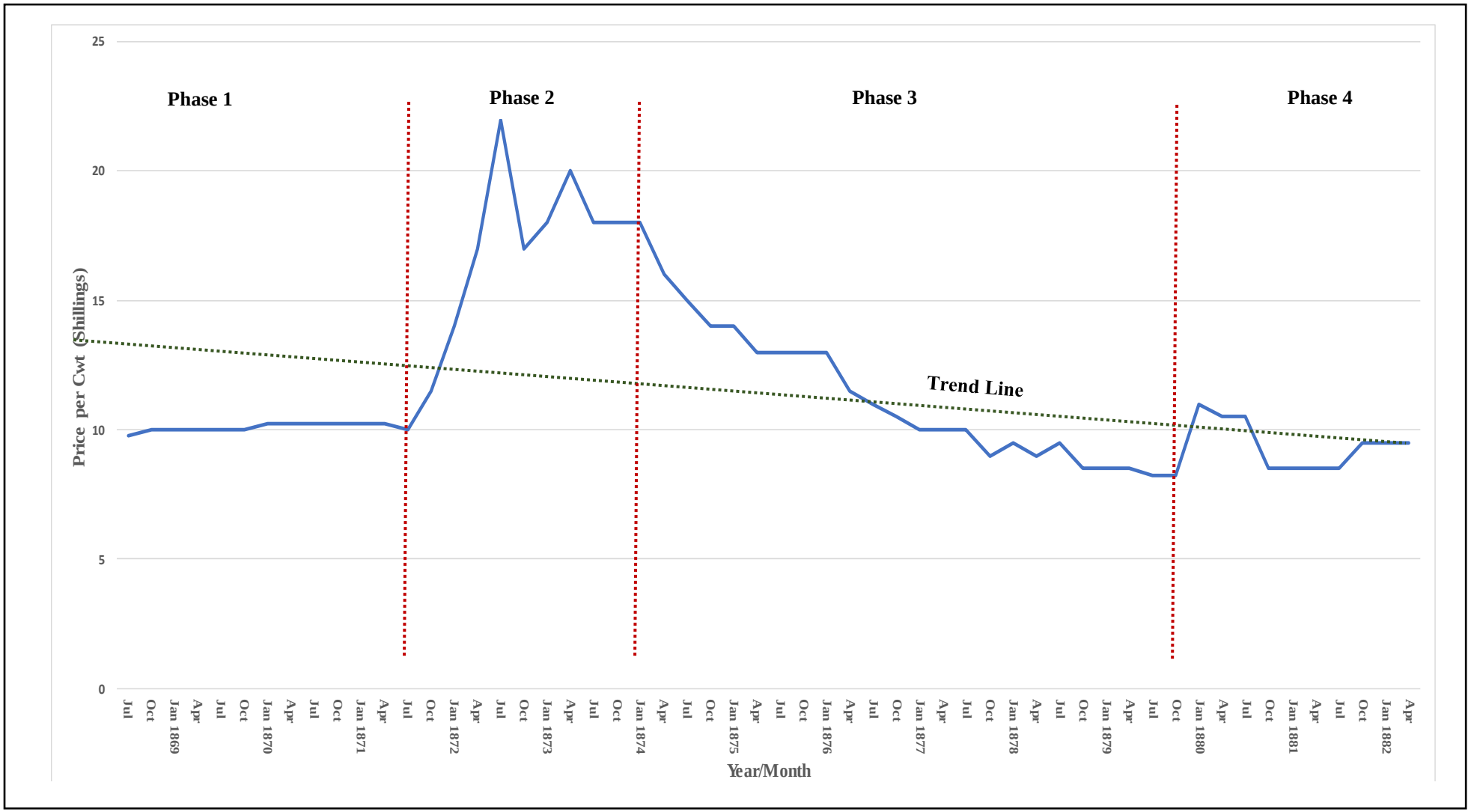


Figure 8.2. Price of 3-inch nails at the works, July 1868-April 1882

Source: Graph derived from data at Appendix 11

prepared by UCNTA included twenty-nine varieties of nail, in sizes ranging from 6-inch to ¼-inch, the 3-inch nail became the benchmark against which all other nails were priced. Secondly, when price changes were recorded in the minutes, two separate prices were given: one for nails delivered at the works and another, at an additional shilling per cwt, for delivery in London.

The trend line indicates that the price of cut nails followed a downward path during the thirteen years of UCNTA's existence. A more detailed analysis, however, shows that the period can be split into four distinct phases of unequal length. The first phase lasted from August 1868 to July 1871 and was characterised by almost three years of flatline prices. The second phase, from August 1871 until January 1874, was the exact opposite: a period during which prices doubled. The third phase lasted from 1874 to 1879, during which the price of cut nails fell relentlessly. During the fourth phase, from December 1879 until mid-summer 1882, prices remained generally low, averaging just 9s. 6d. per cwt.

The spike in prices between July 1871 and January 1874 was caused by rapid and sustained increases in the price of iron nail-sheets. By June 1871, the price of 3-inch nails was 10s. 3d. per cwt, having risen by just 3d. during the preceding three years. In November, the same nails were being sold for 12s. per cwt, a 20 per cent increase in five months. According to *The Times,* the demand for nail-sheets was so great that makers were reported to be 'indifferent about new business'.[39] On the other hand, cut-nail manufacturers, 'though well-supplied with orders, are prevented by the scarcity of iron from keeping their works going more than two or three days a week'. At the conclusion of a meeting of UCNTA's executive committee on 27 June 1872, the price of 3-inch nails had reached 22s.0d. per cwt, representing an increase of 120 per cent in twelve months. As the price of iron eased so the price of cut-nails fell steadily until the end of the year, but this was nothing exceptional and simply reflected the state of the district's hardware trade in general. Allen referred to it as 'a slight set-back'; but, when describing 1872 as a whole, he quoted

[39] *The Times*, 17 Nov 1871.

an unnamed 'authority' who claimed that the year had been 'rarely equalled and never surpassed for its great and general prosperity'.[40]

This downward movement was reversed in January 1873 when the price of iron began to rise. At a meeting of the iron trade in Birmingham Town Hall on 10 January, an attempt to restrict the price of iron failed. The market was to be allowed to dictate the price and, with iron sheets 'in great request', their price rose and with it the price of cut nails.[41] However, this was not necessarily to the advantage of the makers. While prices had climbed back to 20s. 0d. by the summer, the press reported that higher prices were restricting sales and, at an extraordinary meeting held on 22 May, members of UCNTA were 'urgently requested to work short time as much as possible'.[42] The problems facing manufacturers were further compounded by the unilateral decision of The Patent Tip and Cut Nail Co. of Wolverhampton to reduce the price of cut nails by £2 per ton – an action that forced other makers in the district to make a similar reduction.[43]

The price of 3-inch cut nails at the works fell almost continually over five years; from 15s. 0d. per cwt in August 1874 to 8s. 3d. in May 1879, where it stayed throughout the summer. In May 1880, Hartle recorded that 'demand [had] somewhat increased', and prices rose accordingly.[44] The advance, however, was short lived. Prices had sat at 11s. 0d. from January to March but, by December, had retreated to 8s. 6d. UCNTA's executive held seven meetings during 1880, the minutes of which provide further evidence of inter-regional underselling. On 18 September, *The Ironmonger* reported that Leeds manufacturers were selling 3-inch nails at 9s. 0d., forcing Hartle to write to the midland makers recommending that they follow suit.[45]

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[40] G. C. Allen, *The Industrial Development of Birmingham and the Black Country 1860-1927* (London: Allen & Unwin, 1929; repr. Cass, 1966), p. 199.
[41] *BDP*, 10 Jan 1873.
[42] UCNTA-MGM, 22 May 1873.
[43] UCNTA-MB, p. 140; *BDP*, 14 Jun 1873. The Patent Tip and Cut Nail Co. had rejected invitations to join UCNTA.
[44] UCNTA-MB, p. 140.
[45] A transcript of the letter was recorded in the UCNTA Minute Book, p. 170.

At the meeting of Hadley shareholders in February 1895, the chairman noted that trading conditions had deteriorated in the preceding five years. 'Most of us believed, or hoped, that the climax had been reached at the end of 1893', he said.[46] However, a combination of 'faith' and 'hope' proved to be an inadequate base from which to operate and by the end of 1896 trade was so bad that prices had fallen to 7s. 6d. per cwt. When they rose in January 1897, it was only by 6d. a hundredweight.[47] Prices in early 1897 were thus 63.9 per cent lower than they had been in July 1872 and, during the same period, the number of competing firms in the district's cut-nail trade had fallen (coincidentally) by the same percentage. The combined evidence of falling prices and the declining number of competing firms indicate that the cut-nail trade in Birmingham and Wolverhampton was clearly on a downward path.

Other indicators of decline are less precise. The occupational statistics contained within the decennial censuses recorded all types of employment in the nail trade under the single heading of 'nail manufacture'. It is therefore impossible to separate employment figures in the cut-nail trade from those in other forms of nail production. In 1881, there were 14,718 people occupied in nail manufacture in Staffordshire, Warwickshire and Worcestershire; by 1911 the figure had fallen to 3,163.[48] The regional nail industry was in decline. As for the impact of falling sales and profits, one can only make assumptions. The cut-nail trade was highly mechanised and therefore its fixed costs were high. As both prices and demand fell, profit margins undoubtedly narrowed: and eventually the negative cost-revenue ratio would mean that it was impossible to continue trading. The closure of the Dudley Road Cut Nail Co. exemplifies this. A press report noted how the works had been erected 'at great cost […] with the most modern machinery' but that, in the face of the low prices offered by their competitors, 'the proprietors say they cannot carry on at a profit, and have decided to close their establishment'.[49] This example also adds weight to Allen's argument

[46] Hadley AGM 1895, p. 3.
[47] *Glasgow Herald,* 14 Jan 1897.
[48] Allen, p. 274.
[49] *Staffordshire Sentinel*, 25 Sep 1877.

that the Birmingham and Wolverhampton cut-nail trade had begun to 'lose ground' well before 1886.[50] But what did he mean by 'losing ground'? In favour of whom and why?

8.4. The Causes of Decline

Newspaper articles about the state of the iron trade frequently reported on the disequilibrium between the demand for iron and its supply. In 1872, *The Times* reported that Wolverhampton ironmasters were rejecting all offers from buyers below the asking price.[51] The day before, the *Birmingham Daily Post* had reported how cut-nail makers were experiencing difficulty in obtaining adequate supplies of sheets.[52] Demand exceeded supply, and this accounted for the price increase of 1s. 0d. per cwt. announced on 23 May, a similar increase following a fortnight later. Thus, the fortunes of the regional cut-nail trade were inextricably linked to and largely determined by Black Country iron production. When local resources of iron ore became exhausted from around 1870 onwards, cut-nail makers had to source their materials from outside the district, causing an increase in costs and a reduction of profit margins. When the Dudley Road Cut Nail Co. ceased trading in 1877, blame was laid at the feet of the Belgian and Leeds makers. Therefore, it was not just the rising cost of raw materials but also domestic and foreign competition that threatened the primacy of the midland manufacturers. Ever since Joseph Dyer established the Britannia Nail Works in 1814, the midland trade had experienced change; however, never had such existential challenges emanated from outside the district and never had they been concentrated within such a brief period.

From the 1860s onwards, primary industries in the Black Country began to decline. Of the 400 collieries in operation in 1860, more than 120 had closed by the end of the century; and between 1871 and 1886, iron ore output fell from 710,000 tons to 120,000 tons, a reduction of 83.1 per cent.[53] At the same time as local production of these staples was in decline, technological and

[50] Allen, p.273.
[51] *The Times*, 30 May 1872.
[52] *BDP*, 29 May 1872; and see UCNTA-MEC, 23 May and 7 Jun 1872.
[53] B. L. C. Johnson and M. J. Wise, 'The Black Country 1800-1950' in M. J. Wise (ed.), *Birmingham and its Regional Setting: A Scientific Survey* (Birmingham: British Association, 1950), pp. 229-248 at pp. 241-242; Allen, p.243. And see Janet Sullivan, 'Paying the Price for Industrialisation: the Experience of a Black Country Town, Oldbury, in the Eighteenth and Nineteenth Centuries' (Unpublished PhD Thesis: University of Birmingham, 2014), p. 332.

material innovations were taking place in other parts of the country. Gale argued that, as far as the Black Country was concerned, the most important development during the nineteenth century was the introduction of cheap mild steel.[54] Robert Friedel agreed but went a step further, claiming that the introduction of cheap steel was 'the most important single event in the great transformation of the nineteenth-century material world'.[55] The 'onslaught' of mild steel, as Gale regarded it, began with Henry Bessemer's experiments with steel in the production of ordnance during the Crimean War (1854). However, Bessemer's process was far harder to exploit than had originally been imagined. The main problem – one faced by Black Country producers in particular – was that mild steel required phosphorus-free haematite ore, and this was not obtainable in the Midlands.[56]

The Birmingham firm of A. & F. Parkes was producing steel nails by 1867 although, at the time, steel was not seen as a serious competitor to wrought iron.[57] By the 1870s, however, steelmakers had Bessemer and Siemens open-hearth processes at their disposal, both being capable of large-scale operation. Because haematite ore is relatively scarce in Britain, supplies had to be imported from Sweden and Spain. This created a 'push-pull' effect. Obsolescent plant, exhausted sources of iron ore, and aged coal mines in the Black Country resulted in a migration of puddlers and skilled ironworkers north to the flourishing metallurgical centres in Middlesbrough and Cumberland.[58] At the same time, steel manufacturers were attracted to coastal locations, which offered both ease of access to imported ore and the benefit of cheaper sea transport.

When mild steel began to displace wrought iron during the 1880s, the Birmingham and Wolverhampton manufacturers lost their advantage of being close to the chief source of supply of their materials. Nevertheless, a few of the larger midland manufacturers began to cut nails from

[54] W. K. V. Gale, 'The development of industrial technology in the Black Country, 1700-1900' in Wise, pp. 193-210 at p. 208.
[55] Robert Friedel, *A Culture of Improvement: Technology and the Western Millennium* (Cambridge MA: MIT Press, 2007), p. 355.
[56] Allen, p. 196; Gale, *Iron and Steel* (London: Longman, 1969), p. 73; Barrie Trinder, *Britain's Industrial Revolution: The Making of a Manufacturing People, 1700-1870* (Lancaster: Carnegie, 2013), p. 300.
[57] *Birmingham Daily Gazette* [hereafter *BDG*], 18 Sep 1867.
[58] See Allen, p.233-235; Trinder, p. 300; Mark Bowden (ed.), *Furness Iron* (English Heritage, 2000), pp. 46-47.

steel sheets. In 1879, Parkes exhibited steel nails at the Sydney International Exhibition. In 1881 John Reynolds & Sons promoted themselves as 'makers of the best steel nails to supersede patent and other wrought nails'; while Hadley Brothers placed an advertisement in *The Ironmonger* announcing their award of a silver medal at the Calcutta Exhibition, emphasising the superior strength-to-weight ratio and the relatively low price of their steel nails (Figure 8.3).[59] As Allen noted, however, steel was still regarded with suspicion and its use was limited, these misgivings being reflected in the minuscule production of steel ingots in the Black Country: 12,300 tons in 1882 or 0.7 per cent of the total British output.[60]

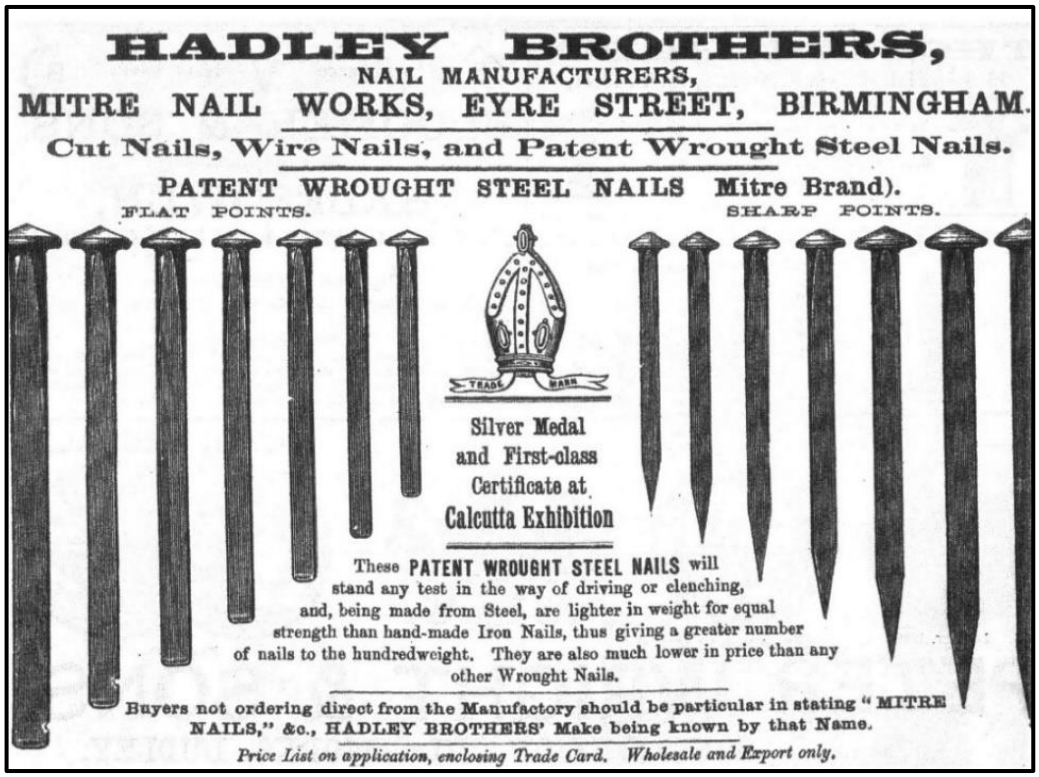


Figure 8.3. Hadley Brothers advertisement for steel nails, 1884

Source: *I&MTA*, 5 Jul 1884, Supplement, p. 60.

[59] *Lloyd's List*, 20 Oct 1881, p. 17; Hulley's *Directory for the Hardware District 1884*, advertisement section, p. 32; *I&MTA*, 5 Jul 1884, supplement, p. 60. The partnership between Thomas and Felix Hadley was dissolved in January 1876, although the business retained the title of Hadley Brothers until 1 January 1888. It then became a limited company operating under the title of Felix Hadley & Co. Ltd. *BDP*, 2 January 1888.
[60] Allen, p. 239 and fn 1, p. 240.

It would be wrong to consider the reluctance to switch to steel as a purely local issue. In West Virginia, the large cut-nail producers in the Wheeling district had considered converting to steel. Many attempts had been made to introduce steel as a material for making nails, a report in the American trade journal *The Iron Age* explained, but all had failed 'for various reasons'.[61] One reason was that cutting nails from steel required new and expensive machinery, with all but the more heavily capitalised Wheeling and Birmingham producers unable to risk the necessary investment. Whilst some Birmingham makers were able to switch from iron to steel, the 'new' material posed a threat to the midland trade.[62] A press report in 1893 commented on the severe competition that the midland makers were facing from the steel cut-nail manufacturers in Cleveland and on the Clyde: a threat exacerbated by the northern makers' ability to get to the London market 'by water at greatly under Staffordshire and Midland prices'.[63]

Year	Cut Nails*	Wire Nails*
1886	8.161	0.6
1892	4.508	4.72
1899	1.904	7.618

* Millions of 100 lb kegs per year

Table 8.1. US nail production, 1886-1899

Source: Naomi R. Lamoreaux, The Great Merger Movement in American Business, 1895-1904 (Cambridge: Cambridge University Press, 1985), p. 64.

Already under threat from both steel and the northern manufacturers, a seemingly innocuous innovation presented a far greater danger to the Birmingham and Wolverhampton makers: the wire nail. Loveday explained how the Wheeling cut-nail makers were caught completely unawares by

[61] Amos J. Loveday Jnr, *The Rise and Decline of the American Cut Nail Industry* (Westport CT: Greenwood, 1983), p. 114.
[62] Albert Cook, Felix Hadley, A. & F. Parkes and John Reynolds & Sons were four such Birmingham firms. In addition, at least one other Birmingham manufacturer of steel products, the Marriott Cycle Co., entered the market, producing steel cut nails as a secondary product.
[63] *Yorkshire Post and Leeds Intelligencer*, 28 Feb 1893. London, the report noted was 'the great market for these goods'.

the new product and how they were at a loss to know how to cope with it.[64] As Table 8.1 shows, the battle between cut and wire nails was an unequal struggle.[65]

At the Great Exhibition of 1851, Birmingham wire manufacturer John Cornforth exhibited 'wire nails of various sizes and forms'.[66] During the two decades that followed, however, little was heard of them, Timmins making no mention of them in his 1865 survey of the midland hardware manufactures. In 1872, however, a letter addressed to the editor of *The Ironmonger,* headed 'A Question for Birmingham and Wolverhampton Men', asked why it was that, with 'such an immense demand for wire nails', some English firm did not make them.[67] Did such an 'immense demand for wire nails' really exist? Birmingham industrialist W. C. Aitken doubted it: 'the quantity of wire nails made is not great for they are but little used in England'.[68] In 1875, a contradictory article appeared in the trade journal *Hardware, Metals and Machinery,* informing its readers of the great impetus that the wire-nail trade had given to wire manufacture in Birmingham.[69] Wire nails, it asserted, were the latest phase of nail-making. By 1886, the wire-nail trade was technologically and organisationally a modern industry: not only were its machines simpler to operate than their nail-cutting equivalents but they also required fewer operatives and less maintenance.[70] Unlike the cut-nail trade, vertically-integrated firms were beginning to be established in the wire nail trade: firms such as Nettlefold's Imperial Wire Company, which not only made wire nails at its mill in Smethwick but also produced the wire at its own ironworks at Wellington, Shropshire.[71] That said, wire-nail manufacture never became firmly rooted in

[64] Loveday, pp. 129 and 135.
[65] William H. Adams, 'Cut nails and wire nails', *Historical Archaeology,* 36 (4), 2002, pp. 66-88 at p. 73; and see Naomi R. Lamoreaux, *The Great Merger Movement in American Business, 1895-1904* (Cambridge: Cambridge University Press [hereafter CUP], 1985), p. 64.
[66] *Official Catalogue of the Great Exhibition of the Works of Industry of All Nations*, 1851, p. 115.
[67] *I&MTA*, 29 Feb 1872.
[68] W. C. Aitken, 'Nails' in G. P. Bevan, *British Manufacturing Industries*, 2nd edn. (London: Stamford, 1878), pp. 30-46 at pp. 44 and 46.
[69] *Hardware, Metals and Machinery*, 25 Sep 1875.
[70] R. F. Martineau, 'Nails (cut)' in British Association, *Handbook of Birmingham* (Birmingham: Hall & English, 1886), pp.199-200 at p. 199.
[71] Ibid, p. 200.

Birmingham. Rather, as with steel production, the focal point of the nail trade shifted north; in the case of the wire-nail trade to the Cheshire needle-making district of Warrington.

Not only were the new nail technologies developing in the northern industrial districts rather than in Birmingham and Wolverhampton, but the competitive advantage experienced by the northern nail-makers was also having a negative impact on the midland manufacturers. In its report on the depression in industry, the Royal Commission noted that a 'short period of prosperity [had been] enjoyed by certain branches of trade in the years 1880 to 1883'.[72] The midland makers were not one of those branches. Whilst they were complaining about the 'unremunerative prices' charged by the Leeds and Glasgow manufacturers, the *Birmingham Daily Post* believed the problem lay in over-production.[73] The power of the midland manufacturers was clearly waning: a fact emphasised by the changing composition of UCNTA's executive committee. When the executive committee was formed in 1868, the ratio of midland to northern members was seven to two; by 1880, the balance had swung in favour of the northern makers in the proportion of four to five.[74]

At the Hadley meeting in February 1895, the chairman observed that 'four competing companies [had recently] closed their works owing to their inability to cope with the present competition'. Such competition emanated not only from the northern cut-nail makers and the competing technology of the Warrington wire-nail manufacturers but also increasingly from overseas manufacturers. So intense was the Belgian competition that in 1872 Hartle had written to the Belgian manufacturers urging them to join UCNTA, but 'they courteously declined, saying that they were getting much better prices than the English makers'.[75] Not just the Belgians: German and American manufacturers as well. 'Foreign competition is keen', reported *The Ironmonger* in 1876, adding that 'it is a cause for regret that US manufacturers cannot be kept where we now find

[72] *Depression*, p. x.
[73] *BDP*, 29 Jan 1881.
[74] UCNTA-MGM, 30 Jul 1868; UCNTA-AR 1879. The 1868 members of the executive committee were: John Reynolds (Chairman), Felix Hadley and John Poultney (Birmingham); Titus Neve and William Bate (Wolverhampton); Josiah Grimshaw (Leeds); and John Ellison (Manchester). In 1880, the committee comprised: Felix Hadley (Chairman) and Alfred Reynolds (Birmingham); Titus Neve and Robert Walker (Wolverhampton); Jonathan Grimshaw, Charles Roberts and J. Ingham (Leeds); William Ellison (Manchester) and William Fallows (Newcastle-upon-Tyne).
[75] UCNTA-AR 1873, 9 Feb 1874.

them'.[76] A brief respite followed. In 1879, the *Hardware Trade Journal* reported that 'some of the Birmingham cut-nail manufacturers [had] regained command of some of the South American markets, from which they had been temporarily ousted by the competition of the US houses'.[77] Hopes of a recovery, however, were tempered by a concluding sentence: 'These orders have come, it is true, at prices which show very little profit.'

Published in 1886, the *Handbook of Birmingham* noted that competition from Belgian and French cut-nail manufacturers had largely disappeared.[78] Whilst this may have been so, cut nails were being replaced by an increasing flow of Belgian wire nails into British markets.[79] In the colonial export markets, ones that the midland cut-nail makers might have hitherto considered theirs by right, foreign competition was also being keenly felt.[80] Writing in 1893, Australian journalist Louis Anson stressed that British exporters needed to be aware that the United States and Germany showed signs of 'a firm determination to contest the ground in Australasia inch-by-inch with Britain as regards trade competition'.[81] To add weight to his argument, Anson compared German exports to New South Wales during the 1880s with those from Britain: an increase of 346.1 per cent from Germany, but only 32.1 per cent from Britain.[82]

Anson's report was followed in 1897 by a report on British and foreign trade sent from Adelaide to the Colonial Office, suggesting reasons for the disparity. Foreign competitors were 'almost feverish in their desire to acquire new markets', the report noted, whilst British merchants were 'too often content to rest upon past laurels'.[83] Noting that foreign firms frequently had resident representatives, Anson urged British manufacturers to engage directly with Australian customers rather than through agents. Agents often worked for numerous competing firms, thus diluting their

[76] *I&MTA*, 1 Apr and 1 Jun 1876.
[77] Martineau & Smith's *Hardware Trade Journal*, 31 Jul 1879, pp. 11-12.
[78] British Association, *Birmingham*, p. 199.
[79] Allen, p. 273.
[80] G. R. Searle, *A New England? Peace and War 1886-1918* (Oxford: Clarendon Press, 2004), p. 183.
[81] State Library of New South Wales [hereafter SLNSW]. DSM/339.09/A. Louis Anson, English Manufactures and Australasian Trade: with Four Chapters on Direct Trade and how to Promote it (1893), p. 15.
[82] Ibid.
[83] SLNSW, Q338.093/S. British and Foreign Trade: Report Prepared in Compliance with Colonial Office Despatch, (Adelaide, 1897), p. 13.

loyalty to, and sales effort for, specific clients.[84] At the Adelaide International Exhibition (1887), for example, Felix Hadley and two other Birmingham competitors were represented by the same agent, H. W. Hardt.[85] When British firms did send representatives, Anson observed that they tended to behave like tourists, 'going after kangaroos instead of after orders'.[86] Finally, there was 'a pronounced desire on the part of continental manufacturers to meet the wishes of their clients'; this was 'not so marked in the case of British manufacturers'. Americans, for example, were 'especially enterprising in regard to catalogues and price lists', and were competitive in their packaging, which was 'smaller and handier' (Figure 8.5).[87]

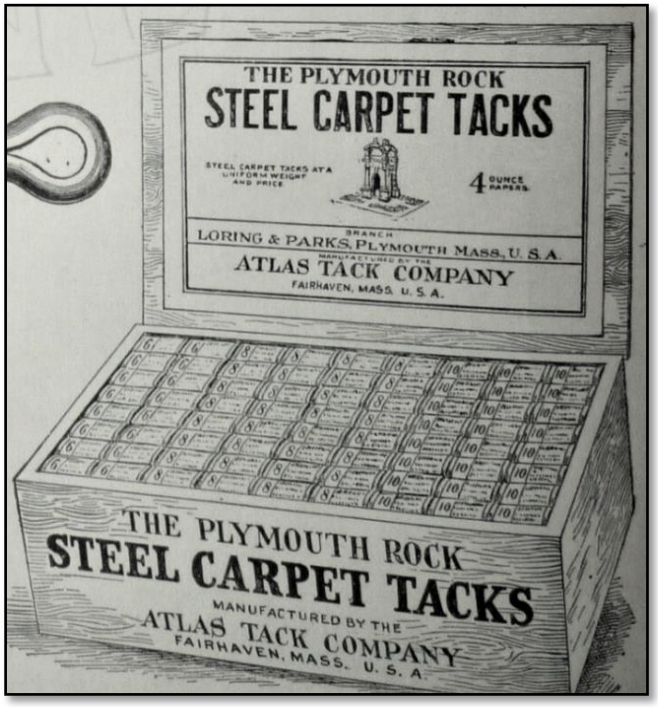


Figure 8.5. Sydney ironmonger W. S. Friend & Co.'s 1905 catalogue (detail)

Source: State Library of New South Wales, Q683.02994/2, Catalogue, 1905/W. S. Friend, p.8.

A 1907 Board of Trade report showed that little had changed. On the one hand, American packaging methods 'have met with great success' whilst, on the other, British tack manufacturers –

[84] Anson, pp. 51-52.
[85] Adelaide Jubilee International Exhibition 1887, *Official Catalogue of Exhibits*, p. 176.
[86] Anson, p. 66.
[87] *British and Foreign Trade*, pp. 13, 18 and 19.

such as Thomas Pritchard and Samuel Webb – were being ousted from the market by the superior quality and packaging of American products.[88] 'English makers', the report noted, 'never trouble to quote, therefore they have lost all the trade.'[89] The report acknowledged the inevitable reduction of Britain's slice of the Australian trade once Germany and the United States entered the market, but criticised British manufacturers for showing indifference towards the Australian market, for failing to monitor its development, and for failing 'to adapt their goods and methods to Australian conditions and desires'.[90]

As one of Birmingham's most technically-modern trades, cut-nail manufacture relied on innovation for its continual development. 'An immense amount of skill and capital has been expended to bring up cut-nail machines to their present rate of production', explained the trade journal *Engineering* in 1874. Hadley Brothers acquired labour-saving, self-feeding machines, newly invented in Philadelphia and, even when the trade began to decline after 1873, the *London Gazette* was still recording patents for improvements in cut-nail manufacture, although none was recorded after 1877.[91] While some manufacturers tried to increase productivity through the development of more efficient machinery, they found themselves, however, constantly swimming against the tide of change. Urban expansion and the newly-developing industries of the late nineteenth and early twentieth centuries affected the Birmingham and district 'fastener' trades in different ways. Just as cut-nails were rapidly being replaced by wire nails, so the demand for padlocks, cabinet and trunk locks was in decline; door locks, however, were being made in ever-increasing quantities.[92] Major developments occurred in the Smethwick and Birmingham screw trade, as well as in the Darlaston, Wednesbury and Wolverhampton nut-and-bolt trade. The wood-screw trade was stimulated by the domestic building trade, whilst the nascent cycle and motor trades led to the development of threaded screws. Likewise, the nut-and-bolt trade was stimulated

[88] PP. 1907 (Cd 3639), Board of Trade, Report upon the Conditions and Prospects of British Trade in Australia by the Advisory Committee on Commercial Intelligence, p. 26.
[89] Ibid.
[90] British Trade in Australia, p.36.
[91] *Engineering*, 21 Apr 1874.
[92] J. C. Tildesley, 'Locks and Lock Making' in British Association, *Birmingham*, p. 193.

by the colonial railways, electrical engineering and machine-tool trades.[93] While the midland nail trade declined, the strength of the other fastener trades grew (Table 8.2).

Year	Nails	Other Fasteners
1881	14,718	5887
1901	4174	8134
1911	3163	12633

Table 8.2. Employment in the nail and other fastener trades in Staffordshire, Worcestershire and Warwickshire, 1881-1911

Source: Census of England and Wales 1881, 1901 and 1911

Yet another problem facing the midland cut-nail producers was exorbitantly high railway rates. Complaints about the seemingly arbitrary and partial behaviour of the railway companies had been increasing throughout the 1870s and resulted in the establishment of the Parliamentary Select Committee on Railways (Rates and Fares) in 1882. The committee considered seven major complaints against the railway companies. Although no cut-nail manufacturers were called to give evidence, of particular interest to the midland manufacturers were issues such as the charging of different rates over the same line for some goods as compared to others, and the charging of lower rates for imported goods than home-produced goods.[94] At a meeting of Birmingham merchants and manufacturers held in January 1884, the mayor, Albert Cook – himself a cut-nail manufacturer – criticised the disparity between the railway companies' charges for the carriage of nails. According to Cook, nails could be sent for 2d. per mile from Birmingham to London and Glasgow but, to send the same quantity to Wolverhampton and Walsall, manufacturers were charged 8½d. and 11½d. per mile respectively.[95]

[93] Allen, pp. 252-254.
[94] PP. 1882 (317) Report from the Select Committee on Railways (Rates and Fares), Together with the Proceedings of the Committee, Minutes of Evidence, Appendix, p. xvi.
[95] *BDP*, 25 Jan 1884.

The fact that 18,936 tons of nails left Birmingham by rail in 1885 indicates that the district's nail trade was by no means finished.[96] Even so, a press report noted ominously that 'the centre of gravity of the cut-nail trade has shifted from Birmingham to Leeds', the report emphasising the competitive advantage afforded to the Leeds manufacturers by its lying 'within cheap and easy reach of water transport'.[97] Transport by sea also benefited the Middlesbrough makers: they could deliver cut nails to London by sea for 6s. 0d. per ton, whereas their midland counterparts had to pay 14s. 2d. per ton by rail.[98] The 'railway rates question' rumbled on into the 1890s.[99] Although the 'exorbitant' rates did not in themselves deliver a fatal blow to the Birmingham and district cut-nail trade, they added yet another dimension to the 'death by a thousand cuts' it experienced in the final quarter of the nineteenth century.

Another possible factor contributing to the demise of the Birmingham and district cut-nail trade might be found in aggressive trade unionism. When the Cut Nail Makers Society (CNMS) was formed in 1851, there was no widespread trade union movement in Birmingham and the Black Country.[100] For the first twenty years or so of the CNMS's existence, press reports of the society's activities were limited to accounts of its annual dinners, although there was a brief exchange of correspondence between the CNMS and cut-tack manufacturer John Horton in September 1869 editions of the *Birmingham Daily Gazette*.[101] The letters concerned the alleged assault by CNMS men on a non-union man at Horton's Scotland Street works. A similar 'outrage' occurred at the Crown Nail Works, Wolverhampton in 1871.[102] However, neither incident came to much and

[96] British Association, *Birmingham*, p. 151.
[97] *BDP*, 27 Jun 1884.
[98] *BDP*, 18 Jan 1884.
[99] *BDP*, 27 Feb 1893. The Wolverhampton Chamber of Commerce wrote to the Board of Trade complaining of yet another increase in railway rates.
[100] See Eric Taylor, 'The Midland Counties Trades Federation, 1886-1914', *Midland History*, vol. 1 (3), Spring 1972, pp. 26-40 at p. 26; Clive Behagg, 'Custom, class and change: the trade societies of Birmingham', *Social History*, vol. 4 (3), October 1979, pp. 455-480 at p. 458, fn. 13; Eric Hopkins, *Birmingham: The Making of the Second City, 1850-1939* (Stroud: Tempus, 2001), p. 77. See also Humphrey Southall, 'Unionization' in John Langton and R. J. Morris (eds), *Atlas of Industrializing Britain, 1780-1914* (London: Methuen, 1986), pp 189-193 at p.193.
[101] See, for example, *BDP* 25 Feb 1858 and *BJ*, 29 Mar 1862. The dinners were held at held at the Railway Tavern at the junction of Blews Street and Manchester Street, adjacent to the site of the Britannia Nail Works.
[102] *BDG*, 21,22 and 23 Sep 1869.

press interest was short-lived. Rather than through strikes and scuffles, disputes tended to be settled through conciliation and arbitration. Joseph Chamberlain was a supporter of such processes and they tended to characterise conflict resolution throughout Birmingham industry.[103] In 1878, when the price of cut nails was at its lowest point, workers had accepted a reduction in wages on the condition that this would be reviewed when trade improved. Twelve years elapsed before the workers again pressed their claim for an increase and, when they did, it was for an increase of 15 per cent. The demand was backed by a rare four-week strike, although the dispute was eventually settled at a meeting of manufacturers and operatives. [104] At the meeting, Felix Hadley explained to the workers' delegates that it would be unfair to expect the midland manufacturers to grant an increase of 15 per cent when the northern makers had agreed on 7.5 per cent. The midland operatives duly accepted the lower figure.

8.5. Entrepreneurship and Organisation

The quality of entrepreneurship and the behaviour of businessmen during the final quarter of the nineteenth century has been at the heart of 'lively, not to say combative debates' concerning the alleged decline of the British economy.[105] While this is not the place for a detailed exposition of those debates, the conduct of the midland cut-nail manufacturers during the most difficult stage of the trade's life-cycle cannot be ignored. So far, the substance of this chapter has indicated that external factors played a major part in causing the decline of the Birmingham and district cut-nail trade. Was poor entrepreneurship also responsible?

In a 1934 study of the British iron and steel industry between 1870 and 1930, T. H. Burnham and G. O. Hoskins concluded that 'if a business deteriorates it is of no use blaming anyone else except those at the top'.[106] Thirty years later, D. H. Aldcroft expressed a similar view, arguing that Britain's relatively poor economic performance between 1870 and 1914 was largely attributable to

[103] Hopkins, *Second City*, pp. 86-87.
[104] *BDP*, 13 Feb and 14 Mar 1890; *Morning Post*, 20 Mar 1890.
[105] K. Theodore Hoppen, *The Mid-Victorian Generation: England 1846-1886* (Oxford: Clarendon Press, 1998), p. 310.
[106] Quoted in Donald N. McCloskey and Lars G. Sandberg, 'From damnation to redemption: judgements on the late-Victorian entrepreneur', *Economic History*, Fall 1971, 9.1, pp. 89-108 at fn. 4 p. 91.

the failure of British entrepreneurship to respond to the challenge of changed conditions.[107] The assault on the record of British entrepreneurship came from two directions.[108] The first was an institutional approach, which claimed that new industrialising nations displaced British pre-eminence by performing better in such fields as labour relations, education, industrial organisation and corporate finance. Proponents of the second approach have favoured a cultural explanation, believing that 'a rigid social structure and the persistence of gentlemanly capital eroded the industrial spirit'.[109] Whilst entrepreneurs were required to behave rationally in an economic environment that was beyond their control, that behaviour was influenced by the culture of late-Victorian business.

It was against this cultural backdrop of organisational conservatism that blame has been laid at the feet of the entrepreneur. Late-Victorian entrepreneurs, it was argued, had failed to adopt the best available techniques of production; had underestimated the growing importance of science; were poor salesmen, particularly abroad; and were insufficiently aggressive in organising cartels. Critics blamed the public-school system, which provided an education unsuited to business management. Businessmen's real interests, they claimed, lay in following the pursuits of the gentry to provide them with social status – pursuits that served only to distract attention from their core role.[110] Elbaum and Lazonick, however, dismissed references to cultural conservatism, convinced that the roots of Britain's alleged entrepreneurial failure lay in its rigid institutional structure: one characterised by single-plant firms run by owner-proprietors or close family associates specialising in a particular line of manufacture.[111]

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[107] D. H. Aldcroft, 'The entrepreneur and the British economy, 1870-1914', *Economic History Review*, vol. 17 (1), 1964, pp. 113-134 at p. 113.
[108] See, for example, Martin J. Weiner, *English Culture and the Decline of the Industrial Spirit, 1850-1980*, 2nd edn (Cambridge: CUP, 2010).
[109] Tom Nicholas, 'Enterprise and management' in Roderick Floud and Paul Johnson (eds), *The Cambridge Economic History of Modern Britain. vol. 2. Economic Maturity, 1860-1939* (Cambridge: CUP, 2004), pp. 227-252 at pp. 227-228.
[110] See, for example, François Crouzet, *The Victorian Economy* (London: Routledge, 1990), p. 407.
[111] Bernard Elbaum and William Lazonick, 'An institutional perspective on British decline' in Bernard Elbaum and William Lazonick, *The Decline of the British Economy* (Oxford: Clarendon Press, 1986), pp. 1-17 at pp. 2-3.

In 1888, not only was the high-flying Arthur Chamberlain recruited by the Kynoch Company to save the ailing cartridge business, but he also became a major shareholder in the newly-reorganised Hadley enterprise. Having showed 'his restructuring genius' at Kynoch, he turned his attention to Hadley's.[112] In May 1894, Chamberlain visited the Eyre Street works and, after a visit lasting no more than an hour, concluded that the rent for the premises was too high, recent extensions to the premises were unnecessarily extravagant, and the machinery was old-fashioned.[113] By the time he attended the shareholders meeting the following February he was in no mood for compromise. When Hadley's directors explained that falling profits were 'entirely beyond [their] control due solely to the depression in trade', Chamberlain retorted: 'I know there is bad trade, but I am acquainted with businesses in these bad times that don't fall off.'[114] He then asked the directors what new markets the company was targeting; what new products and processes were being introduced; and whether the company should consider amalgamating with some of its competitors. These were tough questions for the board to answer, and the meeting concluded with the resignation of Felix Hadley and his fellow directors, and the appointment of a new board with Chamberlain at the helm.[115] Four years later, he organised the amalgamation of Hadley's with the Glydon & Shorthouse rolling-mill, before absorbing the new company into the Kynoch empire two years later.[116] Chamberlain took hold of the new company by the scruff of the neck and reorganised it, announcing in June 1900 that he was planning to relocate the nail machinery to new accommodation built on spare land on the Shorthouse estate and to sell the old Hadley premises,

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[112] Smith, Barbara M. D. 2013 'Chamberlain, Arthur (1842-1813), industrialist.' *Oxford Dictionary of National Biography* at http://www.oxforddnb.com/view/10.1093/ref.odnb/9780198614128.001/odnb-9780198614128-e-46812 (accessed 18 Nov. 2016). See also Peter. T. Marsh, *Joseph Chamberlain: Entrepreneur in Politics* (London: Yale University Press, 1994), p. 503.

[113] Hadley AGM 1895, p. 5.

[114] Hadley AGM 1895, p. 24.

[115] Ibid, pp. 26 and 34. Such was the animosity between the old and the new board that, when it was suggested that the three former executive directors might like to work alongside the new board, Leonard Brierley, one of Hadley's highly experienced directors, replied unequivocally: 'I, for one, decline entirely and absolutely' (p. 26).

[116] LoB. MS 1422/23/1/6/1/1. Agreement for Reconstruction between Messrs Felix Hadley & Co Ltd and Messrs Glydon & Shorthouse Ltd, 12 January1899; MS 1422/34/1/7/8. Extracts from the Kynoch Board Minutes. 03 June 1901, p. 51. Like Hadley's Mitre Works, those of Glydon & Shorthouse were situated in Eyre Street.

[116] Eric Hopkins, 'Industrial change and life at work in Birmingham, 1850-1914', *Midland History*, vol. 27 (1), 2002, pp 112-129 at p. 119.

thus saving £1,000 in rent per annum.[117] Chamberlain's modernising zeal was, however, unique in the cut-nail trade.

The second half of the nineteenth century saw a national growth of combination among firms, both horizontal and vertical, although the degree of vertical integration in Birmingham remained strictly limited.[118] In the cut-nail trade, Reynolds' three acquisitions in the 1860s remained the sole example of horizontal integration, whilst the Hadley-Glydon & Shorthouse merger was the only instance of vertical combination. Such amalgamations were therefore isolated exceptions rather than the rule, and the organisation of the midland cut-nail trade remained a cluster of single-plant firms run by owner-proprietors or close family associates. The only firms that ever operated on more than one site were Reynolds in the late 1860s and C. & J. Shaw, which had factories in Newhall Street, Morville Street and at 226 Aston Road. Soon after Reynolds had made his third acquisition, he consolidated his expanded business at his Newtown Row premises; and by 1875 the Shaws had sold their Morville Street and Aston Road sites.[119]

Ownership, too, remained firmly in the hands of the wider family. The Shaws sold their Aston Road works to their former manager, S. H. Wood; and when Samuel Webb died in 1884, he bequeathed the Lord Street business to his son. When John Reynolds retired in 1876, the ownership of his business passed to his four sons. The two youngest sons left the partnership in 1881 and, when a third died in 1884, the business was left in the sole hands of the eldest son, Alfred.[120] As Crouzet observed: 'nearly all firms, even when dressed up as public companies, were in fact family businesses'.[121] Such was the case with John Reynolds & Sons. When the firm

[117] *BDP*, 14 Jun 1900.
[118] Hopkins, *Second City*, p. 41.
[119] *The Merchant Shippers of London, Liverpool, Manchester, Birmingham, Bristol and Hull* (London: Straker & Sons, 1868), p. 304; BDP, 2 Aug 1872 and 27 Mar 1875.
[120] LoB. BCC/1/AM/D/1/31/12130-12136. 178 Newtown Row and 35 Brass Street; *London Gazette*, 30 Jun 1876, Issue 24341, p. 3745.
[121] Crouzet, p. 406.

became a public company in April 1899, Alfred Reynolds' second son, John Henry, took over as managing director and remained so until his death in 1949.[122]

In his review of Loveday's book on the American cut-nail industry, Jeremy Atack remarked: 'Why these firms failed to seek external financing is the great unanswered question of this book.'[123] The same could be said about the Midland cut-nail enterprises. Felix Hadley was the first to hand his business over to shareholders and, by 1900, three more had followed suit: Reynolds, the Smethwick firm of John Parkes, and the Marriott Cycle Company.[124] The problem was, as Chamberlain warned his shareholders in 1900, 'unfortunately, there are rather more people in the cut-nail business than there is room for'.[125] Whilst the Hadley & Shorthouse business had been busy during the preceding year, its competitors 'had not been so fortunate'. By 1913, the impact of over-supply, external competition and narrowing margins had reduced the Midland cut-nail trade to three producers.[126]

How applicable are the cultural criticisms of historians such as Crouzet and Martin Wiener to cut-nail entrepreneurs?[127] The main line of attack appears to be that British entrepreneurs were distracted from running their businesses effectively through a range of diversions, the main one being the pursuit of a gentrified lifestyle reflecting the values of the landed aristocracy.[128] Such attacks lay at the heart of Hoppen's fierce counter-criticism. In his opinion, 'lurid pictures of third-generation businessmen emerging entrepreneurially castrated from effete public schools, buying large country estates, and devoting little of their fading industrial energies to managing cotton

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[122] LoB. MS TC 12132. Articles of Association. John Reynolds & Sons Ltd. On John Henry Reynolds' death, the family retained a major presence on the board. His brother Ernest was Chairman; and his son Edward was Commercial Director until his own death in 1956. See Robert Colquhoun, *Reynolds of Birmingham*, Unpublished manuscript (1999), p. 13.
[123] See Jeremy Atack's review of Loveday in *The Journal of Economic History*, vol. 44 (4), December 1984, pp. 1118-1119 at p. 1119.
[124] Peck's *Trades Directory of Birmingham 1896-97*, p. 193; *BDP*, 5 Apr 1892. The Marriott Cycle Company Ltd was formed in 1892 by an amalgamation of the Marriott Cycle Company and cut-tack maker J. Marriott.
[125] *BDP*, 14 Jun 1900.
[126] Kelly's *Directory of Birmingham 1913* (p. 1039) listed thirty nail-makers of which only four are shown as cut-nail manufacturers and, of these, three are listed as public companies.
[127] Crouzet, pp. 406-407.
[128] Mary B. Rose, 'The family firm in British business, 1780-1914', in Kirby and Rose, pp. 61-87 at p. 77.

mills, iron works, and coal mines' were nothing short of 'ludicrous'.[129] As far as the Birmingham and district cut-nail makers were concerned, the evidence supports such a view.

Even the leading Birmingham cut-nail manufacturers had been educated locally rather than at a public school. The 1841 census shows that the 14-year-old Felix Hadley was then attending Old Swinford Hospital School.[130] Alfred Reynolds attended William Howell's school in Birmingham's Easy Row before joining his father's firm 'at an early age' where he worked initially as a warehouse assistant.[131] Reynolds had four sons, two of whom followed their father into the family's cut-nail business. All four were educated at King Edward's School in Birmingham, an institution for local boys and not an elite public school.[132] While these few examples do not provide overwhelming evidence, they do indicate that the future leaders of the Birmingham cut-nail trade enjoyed a sound local schooling rather than an especially privileged education.

Private residences varied considerably in size. John Adams began manufacturing cut nails in the Spring Hill district of Birmingham in 1891, funding his business with loans from family members. When he was declared bankrupt in 1900, he was living in a small terraced house in Smethwick.[133] John Reynolds initially occupied a house adjacent to his Newtown Row works in Aston. When the business became well established, he moved to Carpenter Road in Edgbaston and subsequently to a large regency residence in nearby Wellington Road. Edgbaston was, as William White had described it in 1860, 'the Bayswater of Birmingham' and, as Eric Hopkins noted, 'the most favoured middle-class residential area' in Birmingham.[134] At various times between 1871 and 1911, it attracted several of the more prosperous nail-makers such as John Poultney and Samuel Webb. Other Birmingham cut-nail manufacturers of similar standing chose leafy suburbs and

[129] Hoppen, p. 311.
[130] NA. HO 107/1198/9. Census of England and Wales, 1841. Old Swinford Hospital School. The school was founded in 1667 by Thomas Foley to provide education for underprivileged boys. It is now one of 36 state boarding schools in England.
[131] *BDP*, 10 Nov 1905.
[132] *BDP*, 10 Nov 1908; *BP*, 22 Jan and 23 Nov 1949, 19 Jun 1958.
[133] *BDP*, 12 Apr 1900.
[134] Walter White, *All Around the Wrekin* (London: Chapman and Hall, 1860), p. 176; Hopkins, *Second City*, p. 29.

villages such as Handsworth, Harborne and Erdington, while the Wolverhampton makers favoured Tettenhall. Some of the residences were clearly extensive. When, in the autumn of 1888, Felix Hadley sold Hamstead Hill House in Handsworth before moving to North Wales, the sale notice referred to a house 'with charming grounds and luxuriant gardens […] with an approach by a long drive through a magnificent avenue of trees'.[135] However, whilst some properties were clearly substantial, no cut-nail manufacturer's residence equated to a country estate.

A small number of leading manufacturers had interests beyond the manufacture of cut-nails but, apart from John Poultney's unwise venture into the slate-quarrying enterprise, none were detrimental to the efficient running of their businesses. When Poultney had earlier served as a town councillor (1857-1859), his William Street business was unaffected.[136] From the mid-1860s onwards local political power lay increasingly in the hands of councillors drawn largely from what Linda Jones referred to as Birmingham's 'businessmen of substance'.[137] Jones argued that, not only were their entrepreneurial skills seen as the skills most suitable for local government but also that the Birmingham Civic Gospel, upon which the new politics were based, was at its root an entrepreneurial gospel. The principle of the Civic Gospel was underpinned both by nonconformist religious beliefs and political Liberalism; and it asserted that a town council's responsibility was to ensure the welfare of all within and subject to its authority, accepting that this necessitated prudent expenditure.[138]

Both Felix Hadley and Alfred Reynolds held office as Birmingham councillors. Hadley was a nonconformist and a Liberal, standing for election in the Rotton Park ward in 1874. In an open letter to the burgesses of the ward, Hadley clearly demonstrated his espousal of the Civic Gospel. 'During my thirty years in Birmingham', he wrote, 'I have […] given my hearty support to the

[135] *BDP*, 6 Oct 1888.
[136] See Roger Ward, 'Birmingham: a political profile, 1700-1940' in Carl Chinn and Malcolm Dick (eds), *Birmingham: The Workshop of the World* (Liverpool: Liverpool University Press, 2016), pp. 159-191 at p. 168.
[137] Linda J. Jones, 'Public pursuit of private profit? Liberal businessmen and municipal politics in Birmingham, 1865-1900', *Business History*, vol. 25 (3), November 1983, pp. 241-259 at p. 241.
[138] Hopkins, *Second City*, p. 53.

measures I considered most likely to promote the welfare of the Town. I have no motive or interest whatever in consenting to become a candidate other than to work for the good of all my fellow citizens.'[139] Alfred Reynolds was neither a nonconformist nor a Liberal, but rather an Anglican and a Conservative. As an obituarist recorded, 'he [had] always been identified with the social and philanthropic enterprises of the neighbourhood in which he resided, and the district in which his works were situated' – the former Birchfield and the latter Aston.[140] When a vacancy

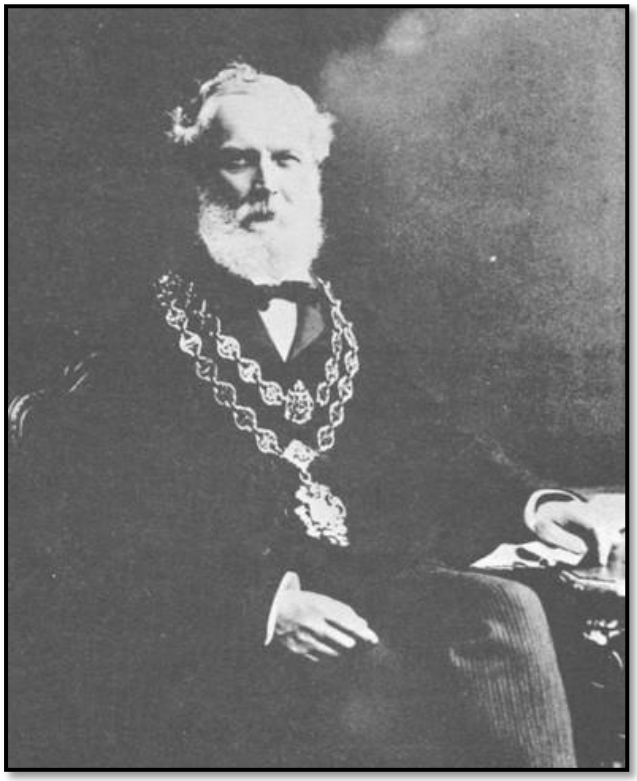


Figure 8.6. Alfred J. Reynolds, Managing Director, John Reynolds & Sons 1876-1908; Lord Mayor of Birmingham, November 1905 – November 1906

Source: Author's private collection.

appeared in Aston's St Stephen's ward, he was encouraged to seek election. He did so and was elected unopposed. Even though he was a Conservative, his 'personal worth as a citizen' was attested by the fact that his nomination papers were signed by Liberals and Liberal Unionists

[139] *BDP*, 5 Oct 1874.
[140] *BDP*, 10 Nov 1908.

alike.[141] Like Hadley, Alfred Reynolds was committed to the development of free libraries and sat on the Free Libraries Committee from 1893-1905. In November 1905, his direct involvement with the committee ended when he was elected Birmingham's Lord Mayor (Figure 8.6.).[142]

The link between business acumen and public service was referred to at Reynolds' mayoral inauguration Although perhaps not in the same league as other entrepreneurs who had worn the mayoral chain – men such as Thomas Avery and Joseph Chamberlain – his proposer, W. L. Barber, noted how Reynolds had from an early age 'found out that success in life was not to be gained by snoring', but through hard work and concern for the welfare of others.[143] Echoes of the Civic Gospel. Significantly, Barber also pointed out that Reynolds did not fish or shoot – pastimes of the gentry – but that his main recreation was music.[144] Reynolds' son John Henry (Figure 8.7) was

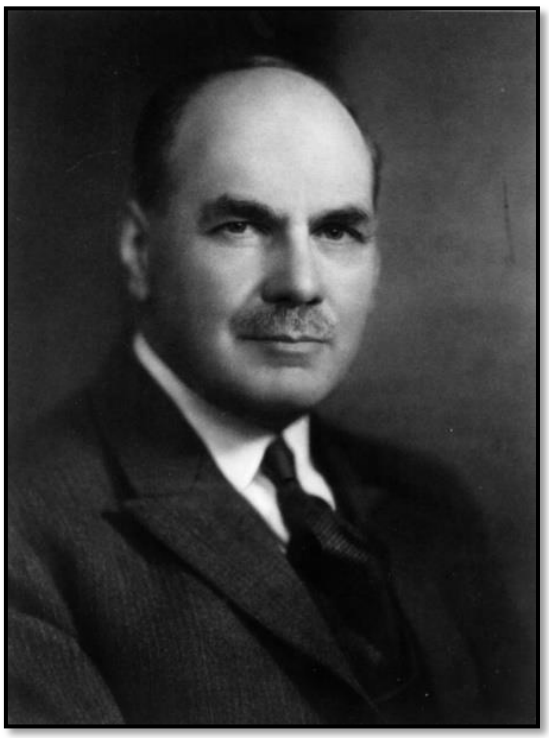


Figure 8.7. John H. Reynolds, Managing Director, John Reynolds & Sons 1908-1949

Source: Author's private collection

[141] *BDP*, 10 Nov 1908.
[142] Colquhoun, p. 30; *BDP*, 10 Nov 1905.
[143] *BDP*, 10 Nov 1905.
[144] Alfred Reynolds was an accomplished organist and frequently played at St Stephen's Church, which stood a short distance from his works.

not only musically talented but he was also a keen amateur astronomer. In 1899, at the age of 25, he was elected Fellow of the Royal Astronomical Society (RAS) and, in 1935, became President of the Society. One obituarist described Reynolds as 'the best-known English amateur astronomer'; another explained tellingly that, while he was able to meet his external commitments, he was still able to deal with all 'the routine and anxieties of a large-scale enterprise in the Birmingham metal industries'.[145]

UCNTA distinguished between the 'smaller makers' – producers of cut tacks, sprigs and shoe nails – and those manufacturers who made the larger cut nails and spikes. It was from the latter group that Jones' 'businessmen of substance' emanated. While they were undoubtedly men of ambition and entrepreneurial talent, there is no evidence that they were products of the public school system, that they aspired to become landed gentry, or were distracted by outside interests from their core objective of running a successful business. [146] Therefore, critics taking a cultural approach to alleged entrepreneurial failure would find it difficult to use the evidence of midland cut-nail manufacturers to support their argument; those taking an institutional approach would find it easier.

At the fateful Hadley shareholder meeting in February 1895, Arthur Chamberlain had asked if new markets might be found, new products introduced, and whether opportunities existed for a merger with one or more competitors. The astute Chamberlain must have realised, however, that the scope for radical change was limited. The advertisement in Figure 8.8 illustrates that Hadley was already producing an extensive variety of nails; and, anyway, Chamberlain was fully aware that 'the largeness and generalness of demand', as he put it, was counterbalanced by oversupply and low prices.[147] While this suggests that the time was right for amalgamation, there were very few

[145] *BDP*, 23 Nov 1949; *Monthly Notices of the Royal Astronomical Society*, vol. 110, 1950, pp. 131-133; Ron Maddison, 'The telescopes of J. H. Reynolds, Birmingham, England', *Journal of the Antique Telescope Society*, vol. 8, Summer 1995, pp. 12-16. Reynolds was also a former secretary of the Birmingham and Midland Institute and a life governor of the University of Birmingham.
[146] The exception was John Poultney. As was explained in Chapter 7, Poultney allowed himself to be distracted from his core business by his involvement in two short-lived Welsh slate-quarry businesses.
[147] *BDP*, 14 Jun 1900.

remaining competitors with whom to merge.[148] On top of that, *The Ironmonger* was reporting that 'vast quantities of bright wire nails' were being imported into the Midlands from Germany 'at a price which the cut-nail manufacturers cannot even approach'.[149] The time for radical change had passed, even if opportunities to counteract the threats had existed.



Figure 8.8. Product range, Felix Hadley & Co. Ltd, 1895

Source: *The Hardware Trade Journal*, 30 Sep 1895, p. xv.

[148] Hadley & Shorthouse Ltd. was eventually sold to John Reynolds & Sons Ltd. for £10,000 in 1928. See LoB MS 1422/34/1/7/8, Extracts from Kynoch Board Minutes, 31 January 1928, p. 82. See also *VCH Warwicks VII*, p. 158, which states that the firm was 'absorbed by Tube Investments (TI), as part of John Reynolds & Sons'. This is incorrect. It was the Patent Butted Tube Company, renamed the Reynolds Tube Co. Ltd. in 1923, that became part of TI.

[149] *I&MTA*, 30 Mar 1895, p. 87.

The formation of UCNTA on the initiative of the Birmingham manufacturers was aimed at bolstering the trade at a time of recession. When the cut-nail trade again began to falter early in the new century, a new Cut Nails Association (CNA) was formed in 1904. It covered thirty firms in England, Wales and Scotland, accounted for ninety-nine per cent of the national trade, and was of a very different nature from UCNTA. Unlike its predecessor, the CNA was structured on a 'pool' basis, whereby members' profits were paid into a central fund and then shared out on an agreed scale.[150] It also seems to have maintained a much firmer grip on its members, *The Times* noting that: 'A revised list of prices will be issued; in the case of any breach of the price regulations severe penalties will be imposed.'[151] When W. & J. Ellison's Church Iron Works Co. in Wigan undercut CNA prices and refused to join the association, the CNA solved the problem by buying the business.[152]

By the time that the CNA was formed, two of the three major cut-nail manufacturers in Wolverhampton had ceased trading. After more than forty years in the trade, John Neve & Co. closed its doors in 1894.[153] Danks, Walker & Co. soldiered on until April 1903, when a sale notice announced that the owners were 'retiring from business'.[154] This left the Crown Nail Company as the sole cut-nail manufacturer in Wolverhampton although, in 1910, faced with a saturated market, the company was forced to stop making cut nails.[155] In Birmingham, four manufacturers survived long enough to become members of the CNA, although Hadley was not one of them. Hadley had done almost everything in his power to move with the times and thus stave off the forces that threatened cut-nail manufacturers. By 1875, he had adopted advanced self-feeding machinery and, in the following twenty years, constantly sought further improvement. As Leonard Brierley reminded the Hadley shareholders: 'If there is one thing more than another

[150] Macrosty, *Trust Movement*, p. 79; *VCH, Warwicks VII*, p. 164.
[151] *The Times*, 10 Dec 1904.
[152] LoB. MS 1422/34/1/7/8. Extracts from Kynoch Board Minutes, p. 62. 23 Aug 1909.
[153] The Crown Nail Company at http://www.historywebsite.co.uk/Museum/Engineering/CrownNailCo (accessed 17 Mar 2017); *London Gazette*, 14 Nov 1884, Issue 25414, p. 4917.
[154] *Staffordshire Advertiser*, 25 Apr 1903.
[155] The Crown Nail Company continued producing tacks. Nail manufacture was resurrected in 1986 but was finally abandoned in 2004 when the firm decided to concentrate on distribution rather than manufacture. This too was the fate of John Reynolds & Sons (Birmingham) Ltd in the decade or so before its closure in 2014, during which time it imported and distributed nails made in China.

that Mr H has been keen upon, it is the pursuit of the best machinery, for which purpose he has visited Vienna and other continental cities.'[156] Despite falling revenues, Hadley continued to invest in promotional activities to maintain his public profile; and in 1888, the year in which he exhibited at the Calcutta International Exhibition, he took the company into public ownership. However, none of these major business decisions was enough to prevent the company from being taken over by the modernising Arthur Chamberlain.[157]

Two other long-established Birmingham firms – Samuel Webb and Thomas Pritchard – had survived into the twentieth century, but by only a few years. Having traded since the late-1840s, Samuel Webb was bankrupted in 1907, able to pay only a meagre 'first and final dividend' of just 4s. 0d. in the pound.[158] The following year, Thomas Pritchard's Globe Works closed when the firm went into voluntary liquidation.[159] Their closure meant that, apart from Hadley, just three Birmingham and Wolverhampton firms remained in business by 1913. After 1910, the Crown Nail Co. in Wolverhampton restricted its production to cut tacks, whilst the remaining two firms survived by diversifying. The Smethwick firm of John Israel Parkes had always had a broad base. A press report published shortly before the 1879 Sydney International Exhibition gave an indication as to the nature of Parkes' business. Although much of the report was devoted to his 'effective display of cut nails', the report informed readers that the firm would also be exhibiting a broad range of 'tinned and galvanised culinary utensils'.[160] Reynolds, on the other hand, diversified only when competition became severe. In an editorial published in an 1895 edition, *The Ironmonger* had urged British manufacturers to 'shake off our lethargy and show whether we are still possessed of the old conquering, persevering, and irresistible British spirit'.[161] Reynolds did just that.

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[156] Hadley AGM 1895, p. 6. Brierley was a Hadley board member and deputised as chairman for deaf Felix Hadley at the meeting.
[157] LoB. MS 1422/34/1/7/8. Extracts from Kynoch Board Minutes, p. 51. Felix Hadley had gone deaf by 1895. He died aged of seventy-three at his home in Conway on 16 March 1901.
[158] *London Gazette*, 17 Mar 1908, Issue 28120, p. 2131.
[159] Ibid, 15 Sep 1908, Issue 28177, p. 6723.
[160] See *BDG*, 10 Jul 1867 announcing that Parkes had been awarded an 'honourable mention' for his display of 'cut nails, frying pans, etc.'.
[161] *I&MTA*, 2 Feb 1895.

Eric Tyler's *Reynolds in Retrospect* (1948) explained in a rather understated way that the firm of John Reynolds had become firmly established in the cut-nail trade by 1895 and 'so the Reynolds family began to turn their thoughts to the possibility of another line of business which could be undertaken in their premises side-by-side with the existing production'.[162] Ignoring the fact that Reynolds had become 'firmly established' by 1847, Tyler singularly failed to take account of the parlous state of the Birmingham and district cut-nail trade in the 1890s. As the Hadley shareholders were only too aware, acute domestic and foreign competition had led to the collapse of several cut-nail businesses in the years before the First World War. Therefore, it was not a case of Reynolds merely 'turning their thoughts' to another line of business; rather it was an essential step if the business was to survive. In October 1897, Alfred Reynolds' son Freddie and his foreman, John Hewitt, were granted a patent for the manufacture of 'butted' tubes.[163] Butted tubes gave cycle frames much-needed extra strength at the joints and eliminated the need to insert a liner into each end of the tube. The timing of the patent was impeccable, coinciding as it did with a cycle boom that had begun in 1895: in the first three months of 1896, 613 patents were applied for, covering everything from tyres to chains, saddles to bells; and by the end of 1897, there were 309 cycle manufacturers in Birmingham alone.[164]

The Patent Butted Tube Company was registered on 20 December 1898 and the new company held its first meeting on 27 March 1899. The chairman was Alfred Reynolds, with Freddie the only other director. The minutes of a meeting held three weeks later recorded that part of the Newtown Row nail works – along with a steam engine, boiler, fixed shafting and gearing – was to be rented from John Reynolds & Sons for seventy-five pounds per annum. Whilst this is not the place for a detailed account of the new company, suffice to note that, despite 'the general state of trade and

[162] Eric Tyler, *Reynolds in Retrospect* (Unpublished manuscript in possession of Reynolds Technology Ltd, Birmingham), p. 4. This 53-page document was written in 1948 by Eric Tyler, a former Company Secretary of Reynolds Tube Ltd. Reynolds Technology Ltd. is the successor to Reynolds Tube, itself successor to the original Patent Butted Tube Co. founded in 1898. Reynolds Technology still produces high-grade bicycle tubing at its factory in the Hall Green district of Birmingham.

[163] Alfred M. Reynolds and John T. Hewitt (1897) Improvements relating to the manufacture of tubes. Patent No. 24,931. The process enabled the thickness of the tube wall to be increased solely at the ends and without increasing the external diameter.

[164] David Rubinstein, 'Cycling in the 1890s', *Victorian Studies*, vol. 21 (1), Autumn 1977, pp. 47-71 at p. 53.

reckless competition', the business grew steadily.[165] The plant was extended and, in 1907, the company was financially strong enough to acquire the Champion Weldless Tube Company in Smethwick. Trade, which had been difficult during the first decade of the new century, began to improve in 1910 and, by 1912, both the Newtown Row and Smethwick works were employed twenty-four hours a day.[166] The success of the Patent Butted Tube Company, the fact that John Reynolds & Sons was a shareholder in its sister company, and the reduced competition in the local cut-nail trade all ensured the survival of the Aston-based nail-maker until 1959.[167] As the twentieth century got under way, however, it was the Patent Butted Tube Company rather than its elder sibling that would become a player in Birmingham and district's industrial renaissance.

8.6. Summary

In his analysis of the British economy from 1870 to 1914, Sydney Pollard concluded that there seemed to be no single characteristic or feature within British industry that could be made responsible for such weaknesses that appeared.[168] Much the same could be said of the Birmingham and district cut-nail trade. Key performance indicators point to an industry indisputably in decline. Although prices fell unevenly, the downward trend resulted in an overall fall of 63.9 per cent between 1872 and 1897. Narrowing profit margins in this highly-mechanised industry proved unsustainable and eventually caused a sizeable proportion of competing firms to close. The fourteen firms that operated in Birmingham and Wolverhampton in 1874 were reduced to eight by the turn of the century and to just four in 1913. These statistics, however, conceal both the causes of the decline and the efforts that were made to try to prevent it.

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[165] Reynolds Technology Ltd collection. Patent Butted Tube Company. Minutes of Directors' Meeting, 11 Oct 1900.
[166] Tyler, p. 9.
[167] Author's private collection. Letter from John Reynolds & Sons' solicitors (Ryland, Martineau & Co.) to shareholders dated 29 May 1959. The letter explained that, as the Crown Nail Works was situated in one of Birmingham's redevelopment areas, the company 'could be turned out at comparatively short notice'. It went on to say that 'Messrs Hall & Wright' had offered to buy the company 'on very satisfactory terms'. The buyer's name stated in the letter was incorrect. It should have read Hall & Rice Ltd, a firm of iron-founders with works in Old Meeting Street, West Bromwich. After the sale, the Reynolds business relocated to West Bromwich and traded under the name of John Reynolds & Sons (Birmingham) Ltd. The company was finally wound up in July 2014. See *London Gazette*, 28 Jul 2014, Issue 60944, p. 14722.
[168] Sydney Pollard, *Britain's Prime and Britain's Decline: The British Economy 1870-1914* (London: Arnold, 1989), p. 54.

Most of the causes of decline lay outside the control of the manufacturers. The decline of the Black Country iron and coal industries, coupled with disadvantageous transport costs, meant that the cost of raw materials rose whilst sales revenue fell. The northern makers, on the other hand, were able to take advantage of ready access to supplies of iron, steel and coal, the availability of sea transport, and, of course, the difficulties faced by their midland competitors. Throughout the period, northern and midland manufacturers alike faced increasing competition from foreign producers, in both the domestic market and in overseas markets where they had once had a monopoly. British manufacturers have been criticised for their poor marketing behaviour, and yet those midland manufacturers who could afford to advertise and participate in trade exhibitions did so. They also expanded their product range in an attempt to meet demand. However, neither marketing nor costly investment in product development were options for the smaller makers, and many of the midland makers were very small. Co-operation through the formation of UCNTA was potentially of benefit to both small and large producers, although, throughout its life, self-interest and underselling undermined the effectiveness of the association.

If co-operation failed and the ability to compete slowly withered, might integration have saved the trade? When Arthur Chamberlain asked this question, the opportunity for amalgamation had gone. That is not to say that such opportunities had not occurred. The prospect of reduced competition, economies of scale, and a more efficient industry existed but were never adopted. The joint-stock form of organisation – with its board of directors, professional managers and accountants – came late both to Britain and to the midland cut-nail trade. The trade comprised family firms and small partnerships, and owners were reluctant to hand over control that both forms of integration threatened to remove. In the end, as Pollard suggested, it was simply a case of the trade reaching the limits of its technical capabilities and its expansionary potential.[169]

[169] Pollard, p. 50.

CHAPTER 9

CONCLUSION

9.1. Introduction

The purpose behind *The Making of the English Working Class*, E. P. Thompson explained, was to 'rescue the poor stockinger, the Luddite cropper' and others from the 'enormous condescension of posterity'.[1] The purpose of this thesis has been to rescue the cut-nail trade from the condescension of obscurity by providing the first analysis of what was a regionally-, nationally- and internationally-significant, yet largely-ignored West Midlands manufacturing industry. Few academic studies of the regional nail trade have been made to date and, of those that have, most were produced before 1950 and all were focused on the Black Country hand-made nail trade. Unlike the United States, where cut nails offer an important and oft-used source for dating old buildings, interest in the British cut-nail trade has been minimal.[2] 'The nail is blue collar; the screw white collar', wrote the American novelist John Vernon, thus demoting nails to a lowly position in the hierarchy of hardware.[3] Yet, in the 1860s, a Parliamentary Commission listed cut nails among the twelve 'most important manufactures of [Birmingham] and district'.[4] Edmund Burke allegedly referred to Birmingham as 'the city of a thousand trades'.[5] Even if he was exaggerating by a considerable margin, for the cut-nail trade to be considered among the top twelve of these trades was no mean feat, especially since its origins lay in the nineteenth century, unlike similarly 'important' trades – such as guns and glass, brass and buttons – the roots of which were to be found in earlier periods.

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[1]E. P. Thompson, *The Making of the English Working Class* (New York: Pantheon, 1964), p. 12.
[2] See Ronald L. Michael, 'Cut nail manufacture: southwestern Pennsylvania', *Bulletin of the Association for Preservation Technology*, vol. 6 (1), 1974, pp. 99-108 at p. 99.
[3] John Vernon, *The Book of Reasons* (Boston MA: Houghton Mifflin, 1996), p. 48.
[4] Parliamentary Papers [hereafter PP]. 1864 (3414-1) Children's Employment Commission 1862. Third Report of the Commissioners. With Appendix. [hereafter 1864 CEC (3)], p. 328.
[5] Malcolm Dick, 'The City of a Thousand Trades, 1700-1945' in Carl Chinn and Malcolm Dick (eds), *Birmingham, The Workshop of the World* (Liverpool: Liverpool University Press, 2016), pp. 125-158 at p. 125.

This concluding chapter brings together in summary the main themes of the study: the Birmingham and district cut-nail trade, and the influence of technological change and entrepreneurship on its development. In doing so, Section 9.2. addresses the research questions set out in Section 1.1. of Chapter 1. With neither a substantial business archive nor adequate secondary sources to provide guidance and direction to the research, it was necessary to start with some fundamental questions and then to adopt a forensic approach in following the leads that the answers provided. What were cut nails? How and why did the trade develop in the West Midlands? How extensive was the trade? Where was it located? How was it organised? Why, when the trade was considered 'important' by nineteenth-century observers, has it been subsequently ignored by historians?

During the research, it became clear that what had begun life as a work of economic and business history was crossing the boundaries of regional, urban, social and cultural history as well. As a result, this thesis has relevance for research that extends beyond the narrow confines of cut-nail manufacture. These are discussed in Section 9.3. The overall framework for the study stemmed from a decision to use the classic product life-cycle model as a methodological tool with which to analyse the cut-nail trade. This ensured that the thesis developed along largely chronological lines. Nevertheless, except for Chapter 7, which was devoted to the ways in which cut-nail manufacturers marketed their products, Chapters 3 to 8 were also thematic in that they each analysed the cut-nail trade in the light of the specific characteristics relating to the discrete stage of the life-cycle under discussion. Just how successful the decision was to use a predictive tool as an analytical tool is discussed in Section 9.4. Finally, Section 9.5. looks ahead to opportunities for further research arising from this thesis.

9.2. Findings

The aim of the thesis was to analyse the evolution of the cut-nail trade during the nineteenth and early twentieth centuries. Throughout, the analysis of the trade's chronology has been shaped by two main themes, namely technological change and entrepreneurship. These themes, in turn, informed the setting of two objectives. The first was to determine the extent to which

technological change influenced the development of nail manufacture in Birmingham and the neighbouring hardware district during the century before the First World War. The second objective was to establish how and with what degree of success entrepreneurship was influential in the evolution of the cut-nail trade. Instead of revisiting the conclusions of individual chapters chronologically, this conclusion considers how the chapters throw light on these two core themes.

9.2.1. Technological Change

According to Barbara Hahn, there are two fundamental approaches to an understanding of technology: 'internalist' and 'contextualist'.[6] Internalist analysis focuses on the artefact itself rather than on how the artefact relates to its external context. This was the predominant approach before the 1970s and was characterised by the publication of multi-volume histories of technology such as Maurice Dumas' three-volume *History of Technology and Invention* (1962-1968), which, he said, provided 'the technical information necessary for understanding step-by-step the nature of various perfections and inventions'.[7] Whilst internalist analysis answers questions such as 'what does this machine do?' and 'what did people want this machine to do?', the contextualist approach poses the question '*why* did they want that?'. In asking this last question, enquiry is immediately taken beyond the machine itself and into considerations of the economic, social and cultural contexts underlying the invention and development of a specific artefact. Whilst the main thrust of this thesis has developed along contextualist lines, a study of technological change in nail manufacture cannot, and should not, avoid internalist analysis.

As Chapter 2 explained, three sixteenth-century technological developments – the blast furnace, the tilt hammer and the slitting mill – enabled nail production to expand by permitting a greater volume of iron and a greater variety of nail-rod gauges to be produced. Whilst these innovations facilitated the expansion of nail production, they did nothing to change the traditional method of

[6] Barbara Hahn, 'Causes and effects: the relationship between social and technological change' in Chris Wrigley (ed.), *Industrialisation and Society in Britain: Cromford and Beyond in the Era of the Industrial Revolution* (Cromford: The Arkwright Society, 2016), pp. 68-86 at pp. 69-70; and see John M. Staudenmaier, *Technology's Storytellers: Reweaving the Human Fabric* (Cambridge MA: MIT Press, 1985), pp. 9-12.
[7] Maurice Dumas (ed.), *A History of Technology and Invention*, vol. 1, *First Stages of Mechanization, 1450-1725* trl. by Eileen B. Hennessy (London: John Murray, 1980), p. 7.

making nails by hand. The seeds of change were eventually sown in the second half of the eighteenth century. In 1769, Birmingham iron-founder Joseph Ashton began to make coffin nails and tack-nails by casting, but they proved to be too brittle for widespread use.[8] Twenty years later, William Finch of Wombourne, Worcestershire patented a method of producing nails 'by means of certain machinery […] instead of making them by hand', although R. B. Prosser claimed that the process 'consisted in little more than the use of hammers worked by power instead of by hand' with a nail passing through 'three hands before being completed'.[9] Other innovations included Willmore and Tonks' nail-making fly-press and Thomas Clifford's rolling process. Thus, whilst there was evidence of some movement away from the traditional method of nail-making, these innovations still involved human intervention at one stage or another of the production process, and therefore remained in the field of hand-tool technology.[10]

'Dynamic, exciting and innovative' was Carl Chinn's description of early twenty-first-century Birmingham, although such a depiction of the town and its district could equally have been applied two centuries earlier.[11] From a contextualist perspective, there is little doubt that conditions in the West Midlands in the early nineteenth century were conducive to technological change in nail production. The cultural, organisational and technical aspects of Arnold Pacey's model of 'technology practice' (Chapter 1) were all in evidence in Birmingham. Renowned, as one correspondent to *The Birmingham Magazine* put it in 1827, 'for the ingenuity of its numerous artisans, and their admirable improvements in articles of utility and ornament', [12] Birmingham's historical reputation has not diminished with time. For Maxine Berg it was a 'creative and

[8] Ashton, Joseph (1769), Making and casting coffin nails and tacks out of cast-iron. Patent No. 938; Luke Herbert, *The Engineers and Mechanics Encyclopaedia*, vol. 2 (London: Thomas Kelly, 1836), p. 184.
[9] William Finch, (1790), Machinery for making nails and spikes of iron etc. Patent No. 1768; R. B. Prosser, *Birmingham Inventors and Inventions: being a contribution to the industrial history of Birmingham* (Birmingham, 1881; repr. Wakefield: S. R. Publishers, 1970), p. 72.
[10] Akos Paulinyi, 'Revolution and technology' in Roy Porter and Mikuláš Teich (eds), *Revolution in History* (Cambridge: Cambridge University Press, 1986), pp. 261-289 at pp. 266-267.
[11] Carl Chinn, 'Birmingham: forward into the future' in Chinn and Dick, pp. 297-313 at p. 297.
[12] *The Birmingham Magazine*, vol. 1 (2), December 1827, p. 47.

inventive city': the place for a man to make a fortune and one, as Jenny Uglow noted, where 'Vulcan – not St Philip – was its patron'.[13]

Despite this positive cultural environment, two linked contextualist requirements remained to be satisfied. Firstly, the conditions necessary to make the transition from hand-tool to working-machine technology had to exist: manual intervention had to be replaced by a mechanism specifically designed to fulfil the form-changing movement before a device could be referred to as working-machine technology.[14] Even then the use of machines – in this case, nail-making machines – would be possible only when other technological sub-systems were in place. In the case of cut-nail production, there needed to be a regular supply of iron sheets; and this supply, in turn, relied on the mass production of iron, using coal for the material conversion and an appropriate energy supply to power the machines. These essential pre-conditions existed by the early years of the nineteenth century. Black Country and imported iron was available in abundance, with pig iron output more than doubling between 1785 and 1805, and steam engines were available to compensate for the lack of adequate sources of water power.[15]

The second condition was 'need'. As Chapter 2 demonstrated, there was simply no pressing requirement to mechanise nail production in Britain. By 1800, the West Midlands proto-nail industry, characterised by a plentiful supply of cheap labour operating within a putting-out system, had worked effectively for almost two centuries. An increasing demand for nails had been met by a corresponding expansion of the labour force, rising from about 10,000 in 1770 to around 30,000 in 1812.[16] There was no incentive either for investors to risk their capital in the seemingly unnecessary development of nail-making machinery or for the commercially-minded inventor to devote time and energy in conceiving a machine that no one wanted. Furthermore, there was a

[13] Maxine Berg, 'The genesis of 'useful knowledge'', *History of Science*, vol. 45 (2), June 2007, pp. 123-133 at p. 130; Jenny Uglow, *The Lunar Men: The Friends who made the Future, 1730-1810* (London: Faber and Faber, 2002), pp. 17 and 21.
[14] See Paulinyi, p. 267.
[15] Chris Evans and Göran Rydén, *The Industrial Revolution in Iron* (London: Routledge, 2017), p. 2.
[16] Maxine Berg, *The Age of Manufactures, 1700–1820. Industry, Innovation and Work in Britain*, 2nd edn (London: Routledge, 1994), p. 268; PP. 1812 (210) Minutes of Evidence taken before the Committee of the whole House of Commons relating to the Orders in Council, p. 2.

prevailing sentiment in some sectors that alternative, labour-saving means of production would lead to unemployment and a waste of human resources.

The eventual introduction of working-machine technology to the Birmingham and district nail trade was largely, but not entirely, serendipitous, for its roots lay not in the English West Midlands but in the American state of Massachusetts (Chapter 3). The heavy reliance of America on wood, coupled with a rapidly escalating demand for nails to secure ubiquitous timber structures, caused intense competition among inventors to design a reliable nail-making machine with the potential to increase productivity. Between 1790 and 1810, thirty-one patents were granted for nail-cutting machinery: an indication of inventive activity if not of commercial innovation.[17] That invention and innovation are complementary was the underlying premise of Joel Mokyr's *Lever of Riches* (1990) – the inventor and innovator being dependent on each other.[18] Jacob Perkins – a professional inventor but poor businessman – and his entrepreneurial agent Joseph Dyer created just such a partnership.[19] With the Non-Intercourse Act (1809) threatening his commercial interests in England, Dyer was persuaded to leave Boston and permanently establish himself in England in 1811. The previous year, Dyer had been granted an English patent for Perkins' third nail-machine invention in his own name.[20] Two patented improvements followed in 1812 and 1814, suggesting a very serious commitment to bringing the machine into commercial use. The Britannia Nail Works began its operations by 1815.

The century that followed can be divided into three phases. The first, from 1815 to the mid-1830s, was a period of slow technological improvement rather than instant commercial success: a period that might well be called the 'American period' (Chapter 4). The firm of Williams, Jones and Co. was founded by a Bostonian and financed by fellow-Bostonian Samuel Williams, a London-based

[17] United States Patent Office, *List of Patents for Inventions and Designs, Issued by the United States from 1790 to 1847* (Washington: Gideon, 1847), pp. 51-53.
[18] Joel Mokyr, *The Lever of Riches* (Oxford: Oxford University Press [hereafter OUP], 1990), pp. 10-11.
[19] See Charles Dickens, *Little Dorrit* (London: Bradbury and Evans, 1857; Oxford: OUP, 1999), pp. 161 and 168-169. Such was the basis of the partnership between the inventor Daniel Doyce and the entrepreneurial Arthur Clennam. Doyce claimed that 'No inventor can be a man of business, you know'.
[20] Joseph Dyer, (1812) Machinery for cutting and heading nails. Patent No 3543.

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merchant banker. The machinery installed at the Britannia was of American origin; and technical improvements made during the 1820s and early 1830s were the work of the Vermont-born inventor William Church and the young American engineer Sewell Barker. The Boulton and Watt plans for the Britannia provide an idealistic image of the fully-equipped factory.[21] In reality, as Jennifer Tann argued, the object was 'to provide adequate space to accommodate the machinery which would be *gradually* installed'.[22] Although nail machines occupied the greater part of the Britannia premises, the factory operated well below full capacity for the first ten years, with parts of the building let to various American 'mechanical experimentalists': members of the American community that had developed in Birmingham after 1814 and which had played 'a not unimportant part in the more limited and exclusive society of that period'.[23]

Technological change extended beyond the nail-making machinery itself. As Chapter 4 explained, eminent visitors and foreign industrialists alike were drawn to the Britannia during this early period. The attraction was not its commercial success but rather the grandeur of the premises, the novelty of the production process and its contrast with much of Birmingham's workshop-based industry and the Black Country hand-made nail trade. By centralising production in a factory setting and by the relatively rare use of steam power to drive a system of shafts and belts, the Britannia was placed in the vanguard of technological change in Birmingham: change that would not be fully realised until the latter half of the nineteenth century. Thus, it was not only sophisticated new machinery that was being introduced but an entire system of production. Nevertheless, when Dyer's patent expired in 1827, there was no rush to emulate his business model.

The second phase of the cut-nail trade's development lasted from the mid-1830s to the early 1870s (Chapter 5) and was characterised by fifteen years or so of steady growth followed by two decades

[21] Library of Birmingham. Boulton and Watt Collection. MS 3147/5/807. Gas Lighting Apparatus for Williams, Jones & Co. August-November 1814.
[22] Jennifer Tann, *The Development of the Factory* (London: Cornmarket Press, 1970), p. 149. The italics are mine.
[23] James Drake, *The Picture of Birmingham* (Birmingham: Drake, 1825), p. 64; *Birmingham Daily Post* [hereafter *BDP*], 27 Jul 1886.

of relative stability (Chapter 6). The initial period was characterised not so much by the refinement of the machinery, but rather by the wider application of steam power that began to take off in Birmingham and district during the 1830s. The system of 'power to let' enabled small cut-nail and tack manufacturers to enter the market, as well as offering the more ambitious producer a stepping-stone to independence. Between 1836 and 1850, the number of production units increased from four to eighteen. Refinements to nail-making machinery, however, were less noticeable. Writing in 1880, R. B. Prosser noted that major improvements to the machines initiated at the Britannia in the 1820s and early 1830s 'created what is, to all intents and purposes, the machine now in use'.[24] The inference is clear. From the 1830s onwards, with the increasing application of steam power acting as the catalyst for an expanding industry, technological change in the industry was characterised not by radically new machinery but by a series of improvements, such as the introduction of the self-feeding mechanism, introduced by a medley of 'tweakers and implementers': manufacturers, engineers and machinists.[25]

The third phase was one of contraction and decline. It lasted from 1873 until 1913 when, as Chapter 8 demonstrated, the cut-nail trade was adversely affected by the protracted period of poor trading conditions of the so-called 'Great Depression'. The operating difficulties faced by manufacturers were compounded by the introduction of new technology in the form of the cheaper and easier-to-produce wire nail. The larger manufacturers of cut nails added wire nails to their inventories although, without direct evidence, it remains unclear as to why the smaller producers did not make the switch.[26]

From an internalist perspective, the development of nail machines before 1830 was critical in establishing the base for the growth of a commercially viable cut-nail trade. A contextualist

[24] Prosser, p. 74.
[25] National Bureau of Economic Research Working Paper 16993. Ralph Meisenzahl and Joel Mokyr, 'The rate and direction of invention in the British industrial revolution: incentives and institutions' in Josh Lerner and Scott Stern (eds), *The Rate and Direction of Inventive Activity Revisited* (Chicago: University of Chicago Press, 2012), pp. 443-479 at p. 446.
[26] The *London Gazette* recorded seventeen patents for 'improvements in machinery for cutting nails and tacks' awarded to Birmingham and Wolverhampton patentees between 1871 and 1878.

approach to the evolution of the Birmingham and district cut-nail trade begins with a conundrum: why establish a business in the absence of a market? Dyer saw the future direction of nail-making as a technological one. He also recognised the opportunities that Birmingham offered. Not only was it culturally suited to innovation, but it was geographically well-placed: close enough to supplies of iron and coal from the Black Country without being dependent on their immediate proximity, but greatly facilitated by being at the hub of the regional canal system. Birmingham was also well-suited to a factory-based business, with its localised supply of labour experienced in the many forms of metal manufacture the town supported. The district was also an important trading centre, well serviced by both British and foreign merchants, which were to prove vital when the domestic and overseas markets began to develop.

There were, of course, social costs associated with the rise of the cut-nail trade. In Chapter 5, attention was drawn to an article in *The Times* published in August 1852 explaining how the power of the Birmingham and district machine-cut nail trade had virtually 'annihilated' the hand-wrought trade.[27] This was only partly true. Rather than replacing the traditional nail trade, the advent and growth of the machine-based trade created a two-tier industry, the former in the Black Country and the latter based largely in Birmingham. That is not to say that the hand-made trade continued as before. Contemporary commentators blamed the cut-nail trade for the gradual and painful decline of its hand-made counterpart although, in truth, the changing nature of Black Country industry towards heavy engineering played its part. Even within the cut-nail trade itself, mechanisation did not always equate with progress. As Chapter 7 showed, a high proportion of nail-machine feeders were young people aged between nine and nineteen, who worked a 12-hour day and who were at risk from closely-packed, unprotected machines and from deafness caused by the extreme noise of the machines.

[27] *The Times*, 16 Aug 1852.

9.2.2. Entrepreneurship

Just as invention and innovation are concerned with the creation and useful implementation of something new, so too is entrepreneurship. Albert Link and Donald Siegel emphasised the role of opportunity in entrepreneurship, defining it as 'the perception of opportunity and the ability to act upon that perception'.[28] This definition is highly appropriate when considering entrepreneurship in the cut-nail trade. Research into the trade revealed two forms of entrepreneur. The first was a 'high-level', Schumpeterian 'heroic' entrepreneur in the form of Joseph Dyer. The second was the 'low-level' entrepreneur: people who, though they may not have realised it at the time, acted entrepreneurially by exploiting technological or organisational opportunities as they arose, often doing so in circumstances of considerable uncertainty and risk.

According to Fritz Redlich, 'the entrepreneur pure and simple is very rare in economic life', and yet Dyer sat comfortably in this category (Chapter 4).[29] He was a man of vision who recognised not only that the future of nail production lay in mechanisation but also that the economic and cultural conditions of early nineteenth-century Birmingham provided him with the opportunity to put his vision into practice. He therefore fitted American historian Albro Martin's description of an entrepreneur as an innovator in the sense not of creating an idea but of recognising one and exploiting it.[30] Although Dyer went on to exploit many other ideas and opportunities during his life, the Britannia project demanded the greatest courage. His vision of mechanised nail manufacture was, not surprisingly, rejected by the Black Country nail-masters. In the face of well-organised and long-standing competition, without an identifiable market, with unproven machinery and an equally untested labour force and, in 1816, threatened with violence, the uncertainty surrounding Dyer's venture was considerable. He was not just putting the physical elements of the

[28] Albert N. Link and Donald S. Siegel, *Innovation, Entrepreneurship and Technological Change* (Oxford: OUP, 2007), p. 3.
[29] Fritz Redlich, 'The business leader in theory and reality', *American Journal of Economics and Sociology*, vol. 8 (3), April 1949, pp. 223-237 at p. 226.
[30] Albro Martin, 'Additional aspects of entrepreneurial history' in Calvin A. Kent, Donald L. Sexton and Karl H. Vesper (eds), *Encyclopedia of Entrepreneurship* (Englewood Cliffs, NJ: Prentice-Hall, 1982), pp. 15-18 at p. 16.

project in Birmingham at risk but also the capital provided by his underwriter, the American merchant banker, Samuel Williams.

Bygrave and Hofer asserted that an entrepreneur is 'someone who perceives an opportunity and creates an organization to pursue it'. [31] Dyer had done just that, and the British cut-nail trade was not to see his like again. That is not to say, however, that entrepreneurial activity ceased with Dyer's departure for Manchester. The eventual expiry of his patents in 1827, the wider application of steam power after 1830, and the apparent success of the Britannia Nail Works all contributed to a six-fold increase in the number of cut-nail businesses between 1834 and 1850.[32]

As Chapters 5 and 6 showed, the businesses that were formed and grew were established by those people who perceived opportunities and acted upon them. Some remained small manufacturers, especially those who never wanted – or were unable – to rise above rented space in a steam mill. Others, such as Richard Goose and Samuel Webb, set themselves up in a small way but then took the opportunity to move into larger premises within one of the two emerging cut-nail clusters. Men like William Gorse who started as cut-nail manufacturers but who, as the industry expanded, recognised increasing competition on the one hand, but also a growing demand for nail-machines on the other, and grasped the opportunity to switch from an over-crowded market to an under-served one. Wealthy merchants trading in hardware products, such as Charles Shaw, witnessed the growing demand for cut nails and established factories of their own. Thomas and Felix Hadley and the investors in Wolverhampton's Crown Nail Company took the calculated risk of establishing their own purpose-built factories. John Reynolds took the opportunity to reduce the competition by acquiring the businesses of three of his competitors and of advertising widely to secure and strengthen his place in the trade (Chapter 7). All these are examples of 'low-level'

[31] William D. Bygrave and Charles W. Hofer, 'Theorizing about entrepreneurship', *Entrepreneurship Theory and Practice*, Winter 1991, pp. 13-22 at p. 14.
[32] In the absence of production figures, 'success' here is measured in terms of the number of dignitaries who continued to visit the Britannia: the future Queen Victoria in 1830; royalty from Saxony and Egypt and members of the British Association for the Advancement of Science in the 1840s; and the Spanish ambassador in 1857.

entrepreneurship – all the result of decisions to introduce change in an environment of uncertainty and risk.

9.3. Wider Significance

The subject of this thesis has been the evolution of the Birmingham and district cut-nail trade from its origins to its eventual decline, as seen through the lenses of technological change and entrepreneurship. This multi-disciplinary examination has resulted in the first serious study of the West Midlands nail trade since the 1930s: previous studies focused almost entirely on the Black Country hand-made trade. Up to the 1860s, Birmingham industry was largely workshop-based, although this thesis has shown how the factory-based cut-nail trade was distinctive. Whilst Chapter 4 examined the layout of the Britannia Nail Works based on the Boulton and Watt Company plans, Chapter 6 took a bottom-up approach to explore features of the mid-nineteenth-century factory: aspects such as its organisation, the employment of children, and the impact of factory life on the health and safety of its workforce. In examining the cut-nail factory, this thesis has revealed another side to the nail trade, one that has been largely ignored by historians. It also has wider connotations in that research into the cut-nail trade has provided an added insight into other, seemingly unconnected, areas of research.

The thesis has implications for wider research at three levels. At a thematic level, it adds to the historiography of both industrial clusters and marketing. The work of historians Andrew Popp and John Wilson indicates that an analysis of industrial clusters remains a current research topic,[33] and Chapter 5 adds to the knowledge of clusters by explaining the dynamics underpinning the creation of two cut-nail clusters in Birmingham – one in the north-east of the town and another centred on the Gas Street basin in the south-west. Another current field of enquiry in business management studies is marketing (Chapter 7). To date, the limited historiography of marketing has focused on

[33] See, for example, John F. Wilson and Andrew Popp (eds), *Industrial Clusters and Regional Business Networks in England, 1750-1970* (Aldershot: Gower, 2003); Andrew Popp and John Wilson, 'Life cycles, contingency, and agency: growth, development, and change in English industrial districts and clusters', *Environment and Planning A*, vol. 39, 2007

the promotion of consumer goods and services to the exclusion of 'user' goods, such as builders' hardware. This study has revealed how and why, in the face of mounting competition, the style and tone of such advertising changed gradually from being proclamatory to persuasive. It also adds to an understanding of what marketing opportunities were available to hardware manufacturers during the nineteenth century, the extent to which these opportunities were pursued by cut-nail makers, and the value that manufacturers placed on tacit marketing tools such as prizes, medals and advertorials.

Another under-researched area of business history is that of trade associations. Drawing on previously undiscovered primary source material held hitherto in a private collection, the account of the United Cut Nail Trade Association (UCNTA, 1868-1882) in Chapter 8 not only examined the nature of this particular trade association – its objectives, membership, organisation and conduct – but also compared it with other such alliances and their effectiveness. There is scope not only for a comparative analysis of UCNTA and its successor the Cut Nails Association, formed in 1904, but also a similar analysis of the efficacy of British nail-related trade associations and their American counterparts.

9.4. Methodology

Amos Loveday introduced his 1983 study of the American cut-nail trade by explaining that his sources consisted mainly of a series of records preserved in the vaults of an 'important' American corporation, Wheeling Steel: these were records of enterprises comprising 'the ancestors of that company'.[34] Later in his introduction he explained that except for one cut-nail producer on the Hudson River, the Tremont Nail Works in Massachusetts and several related manufacturers, 'the firms of the Middle Atlantic and New England states left few records'.[35] Cut-nail manufacturers in the West Midlands resembled their New England counterparts rather than the Wheeling firms. In the apparent absence of any distinctive business archive, this study of the Birmingham and district

[34] Amos J. Loveday, Jnr, *The Rise and Decline of the American Cut Nail Industry: a Study of the Interrelationships of Technology, Business Organization, and Management Techniques* (Westport CT: Greenwood Press, 1983), p. xiii.
[35] Ibid, p. xix.

cut-nail trade has relied upon the analysis of a wide and scattered range of sources – from documents in the Boulton and Watt collection to often-neglected marketing material, and from maps and newspapers to patent records and relevant Parliamentary papers. A forensic approach was adopted in analysing the source material – an approach based upon the classic product life-cycle model. This approach indicates the potential for investigating a subject where a discrete business archive fails to survive.

Methodologically, the product life-cycle model has widespread uses. For example, it is used as a predictive tool in product management and marketing, and as a method of forecasting the path of technological evolution.[36] A novel feature of this thesis has been to use a five-stage product life-cycle model not merely as a structural framework on which to base the preceding chapters but, more significantly, as an analytical rather than a predictive tool. Each stage of the product life-cycle has its own set of characteristics and, when examining the passage of the cut-nail trade through the five stages, the characteristics of the stage formed the criteria against which the trade was analysed. In the absence of sufficient data, however, not every characteristic could be used to direct the narrative. For instance, one characteristic of the 'maturity' stage is that weaker competitors leave the market; and enough historical evidence was available to assess the extent to which cut-nail businesses left the saturated market of the 1860s. On the other hand, an absence of data meant that certain characteristics could not be examined. A characteristic of the 'decline' stage, for example, is that businesses experience falling profits and weaker cash flows. Without extensive financial records, it proved impossible to test the validity of this characteristic as it applied to the cut-nail trade.

This apparent weakness might lead one to question the validity of using the 'modern' product life-cycle model as an analytical tool to examine an historical industry. In response, it can be argued that even the simplest version of a life-cycle model helps to structure such an historical approach. Mokyr's three-stage model for analysing technological progress – 'the vigour of youth, followed

[36] See, for example, Michael E. Porter, C*ompetitive Advantage: Creating and Sustaining Superior Performance* (New York: The Free Press, 1998), p. 194.

by the caution of maturity and finally the feebleness of old age' – provided the beginnings of an analytical framework; an extension from three to five stages added structural clarity.[37] Most useful of all, however, were the characteristics, which provided context for the interrogation of the scattered evidence. It is contended that the historical evolution of other manufacturing trades exhibiting an identifiable and discrete life-cycle could be analysed by using the life-cycle model to examine the influence of technological change and entrepreneurship in determining the duration of the stages and the characteristics.

The approaches used to examine the cut-nail trade could well be used to examine the development of other West Midland metal trades, whether they be the screw trade, the pen trade or the manufacture of brassware. The West Midlands metal trades certainly await such investigation. A more specific variation on this theme would be to compare the evolution of the cut-nail trade with that of other trades such as screws, nuts and bolts, locks, hinges and needles. Another valuable area for future research would be to extend this largely regional study of the cut-nail trade to other English districts in which cut-nails were produced – Bristol, Leeds, Stalybridge and Newcastle – and to compare the Birmingham and district experience with those districts: was cut-nail manufacture as 'important' a trade in these districts as it was in the West Midlands? Was there a transfer of nail-machine technology between Birmingham and other districts? If so, how and when did this occur? If not, how and why did cut-nail manufacture become established in these districts? A search of the archival repositories in the above districts indicated a similar absence of primary source material compared to those in the West Midlands, suggesting that a research approach similar to the one adopted to produce this thesis would be appropriate. At another level still, and as an aspect of research into Britain's alleged industrial decline in the final quarter of the nineteenth century, historians could study how foreign cut-nail manufacturers were able to penetrate traditional British colonial markets and with what effects. Finally, whilst there are few analytical studies of individual Birmingham metal trades, the broad development of the town's industrial and economic growth is well served. The same cannot be said about the historiography of the Black

[37] Mokyr, *Lever*, p. 261.

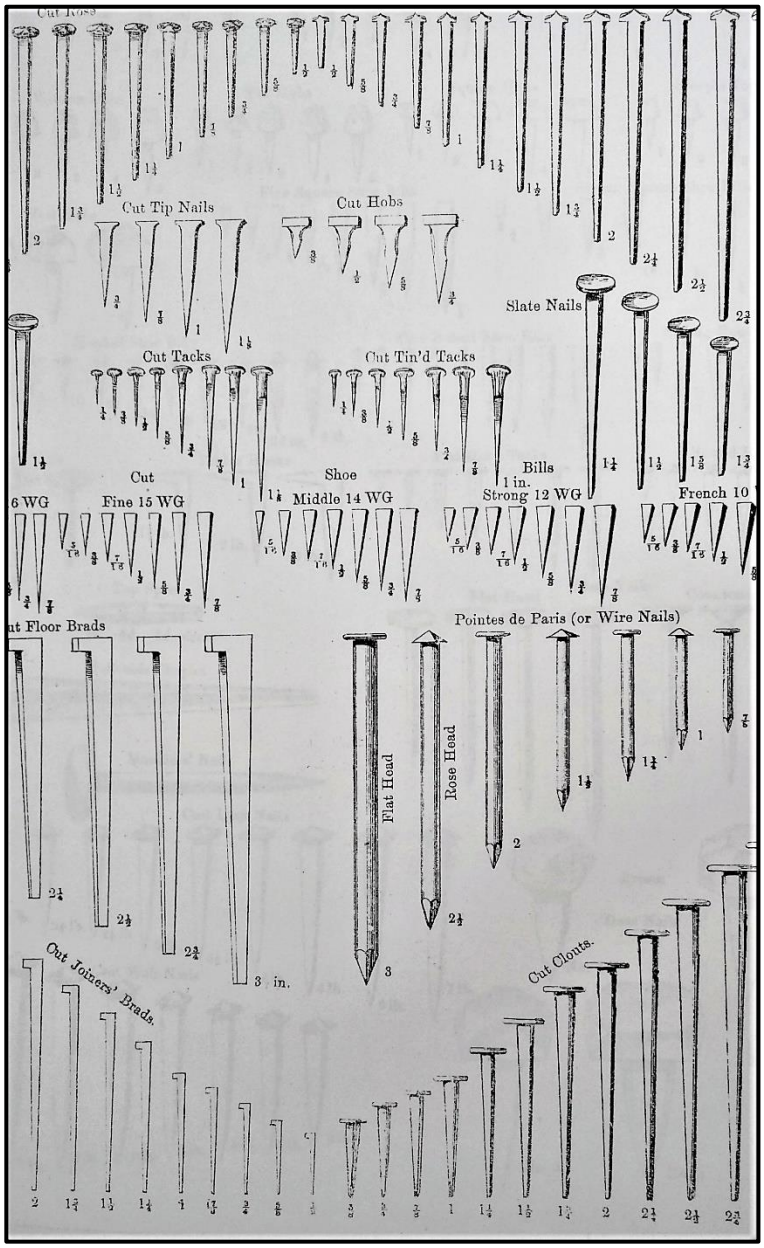
Country economy and its industry, and there is a pressing need for the work of G. C. Allen (1929), M. J. Wise (1950) and W. H. B. Court (1953) to be revisited and extended.

The Birmingham and district cut-nail trade was a child of the first Industrial Revolution and went into decline during the early years of the second, its maturity in the 1850s and 1860s straddling the two. It had its origins in America and the process of technology transfer – through American inventions, patents and entrepreneurship – brought it fortuitously to the ideally-suited manufacturing district of the West Midlands. There, in Birmingham particularly, it was developed by an expanding American mercantile and manufacturing community. As the industry expanded, and as the Birmingham and district manufacturers came to dominate the British cut-nail trade, so local entrepreneurs assumed control. This dominance, however, proved to be short-lived. In the last quarter of the nineteenth century, the global nail market – once the preserve of West Midlands manufacturers – fell victim to wire-nail technology and, paradoxically, to the more efficient and effective competition from America. Looking back over the evolution of the regional cut-nail trade during the century between 1811 and 1913, one counterfactual historical question is left hanging in the air: for how long would the Birmingham and district nail trade have remained reliant on hand-tool technology had the US Congress not passed the Non-Intercourse Act in 1809?

Appendices

Appendix 1

Cut and Wire Nails: Common Types and Uses

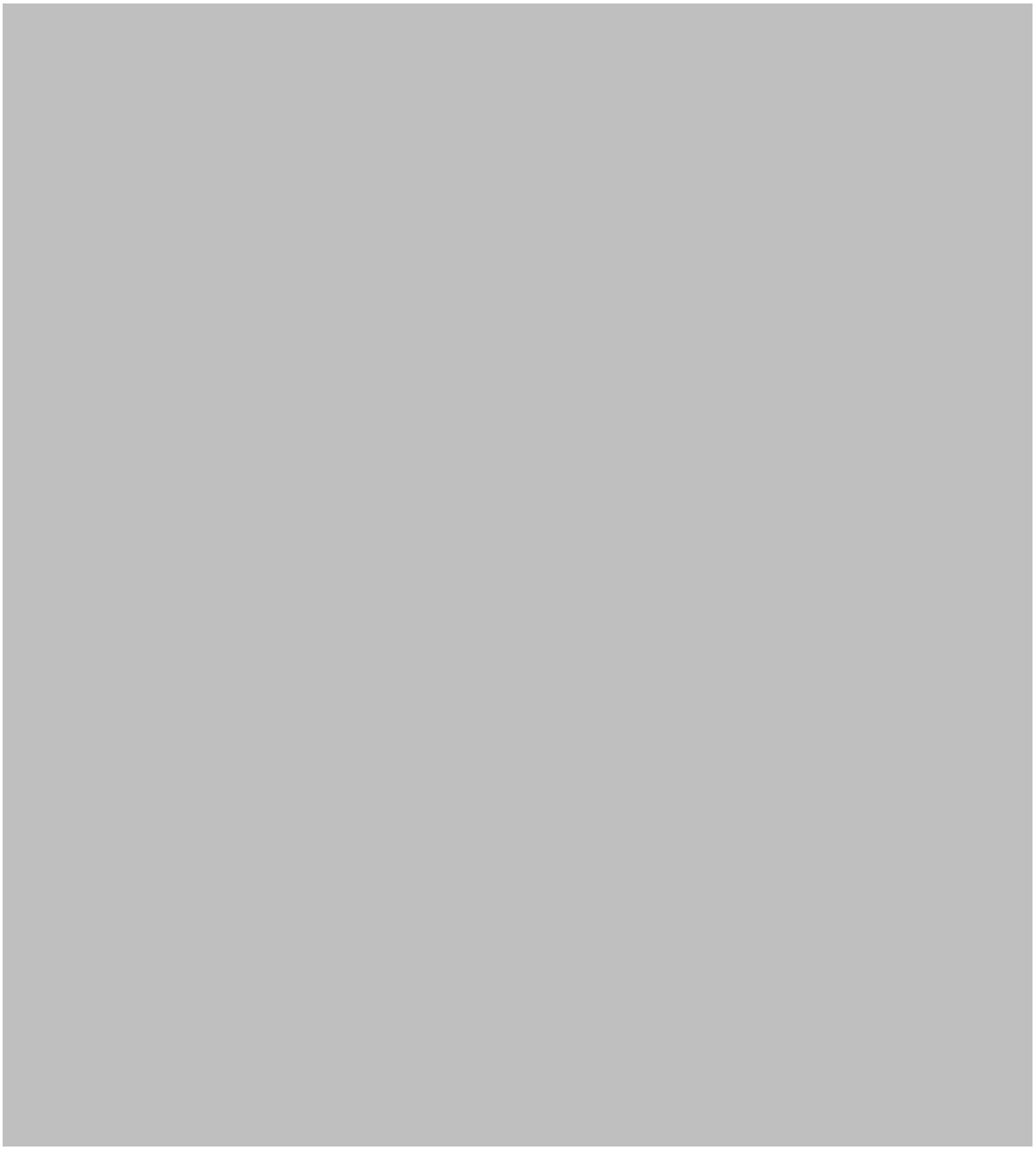


A	Cut rose head nails	Laying floors; making doors and furniture
B	Cut tips and hobs	Cobblers' nails used to increase durability of boot soles
C	Cut tacks	Fixing carpets to floorboards; stretching fabric onto wood
D	Cut shoe bills	Cobblers' nails used to secure shoe upper to the sole
E	Cut floor brads	Used for nailing floorboards to joists
F	Cut joiners' brads	Small, thin nails used in cabinet making
G	Cut clasp nails	Flooring, and when holding power important
H	Cut slate nails	Roofing
I	Wire nails	General usage. Unlike cut nails, have a round shank
J	Cut clout nails	General usage; construction and roofing

Appendix 2

Copy of a Letter (part) from William Matthews of Rowley, Worcestershire to Viscount Sidmouth, Home Secretary. 3 August 1816.

Source: National Archives. HO 42/152/132



Transcript of a Letter from William Matthews of Rowley, Worcestershire to Viscount Sidmouth, Home Secretary. 3 August 1816.

Source: National Archives. HO 42/152/132

May it Please your Lordship

In consequence of the nail ironmongers again reducing their workmen's wages, and so many being wholly out of employ, a plot is forming among them of a dangerous tendency to disturb the peace in this country, as the nailers look upon the newly invented machinery to press nails to be the principal cause of the trade being so bad. One of the principal of these manufactories is in the outskirts of Birmingham and known by the name of the Britannia Brewery and another about a mile out of Birmingham called Bromford Mill, [Wm Finch] these are the most extensive works.

Their plan is for about 50 from each parish that are stout and able to keep the secret about the next change of the moon to set out in small bodies from their homes after dark, half of them to one manufactory and half to the other and meet there at one o'clock in the morning. And what firearms they are able to collect to be in the hands of those that are disciplined to lie in ambush, while the others either demolish the machinery or, if that cannot be done, to set the building on fire. And if the soldiers from the barracks should come on them before they have completed their work for the ambush to fire on them, which at least would throw the soldiers in such confusion as to allow the rest to escape and, if they can complete it before the soldiers come, to disperse and return home in the same manner as they went.

This I thought it proper to inform your Lordship of. And when the night is fixed, or may further proceedings take place, if you wish it and are pleased to give me a line, I will wait on all their proceedings.

I remain, with the greatest deference, your most obedient and humble servant.

[Signed] William Matthews, Rowley near Dudley, Worcestershire

PS Before I took this letter to the post I heard that there was to be a meeting on Sunday afternoon at a wood near Dudley. I went with 2 more neighbours about 2 o'clock where we found about 20 met who soon increased to about 50 from all the different parishes. Nothing afresh from what I have named before was brought forward, except the return of the number of fire arms that they have at present informed of, which amounts to 79, and another meeting was to be held at the same place on Wednesday next, when one from each parish is to be selected to choose the fittest men in his parish as are disciplined, and to consult whether it would be proper to have any of the colliers with them.

William Finch's Patent. No. 1768 granted 26 August 1790 (page 2 of 3).

Finch's Method of Making Nails and Spikes of Iron, Copper, and other Metals.

methods of making nails and spikes of iron, copper, and other metals, by means of certain machinery put in motion by the force of animals, water, wind, or steam, instead of making them by hand labour, is described in manner following, that is to say:—

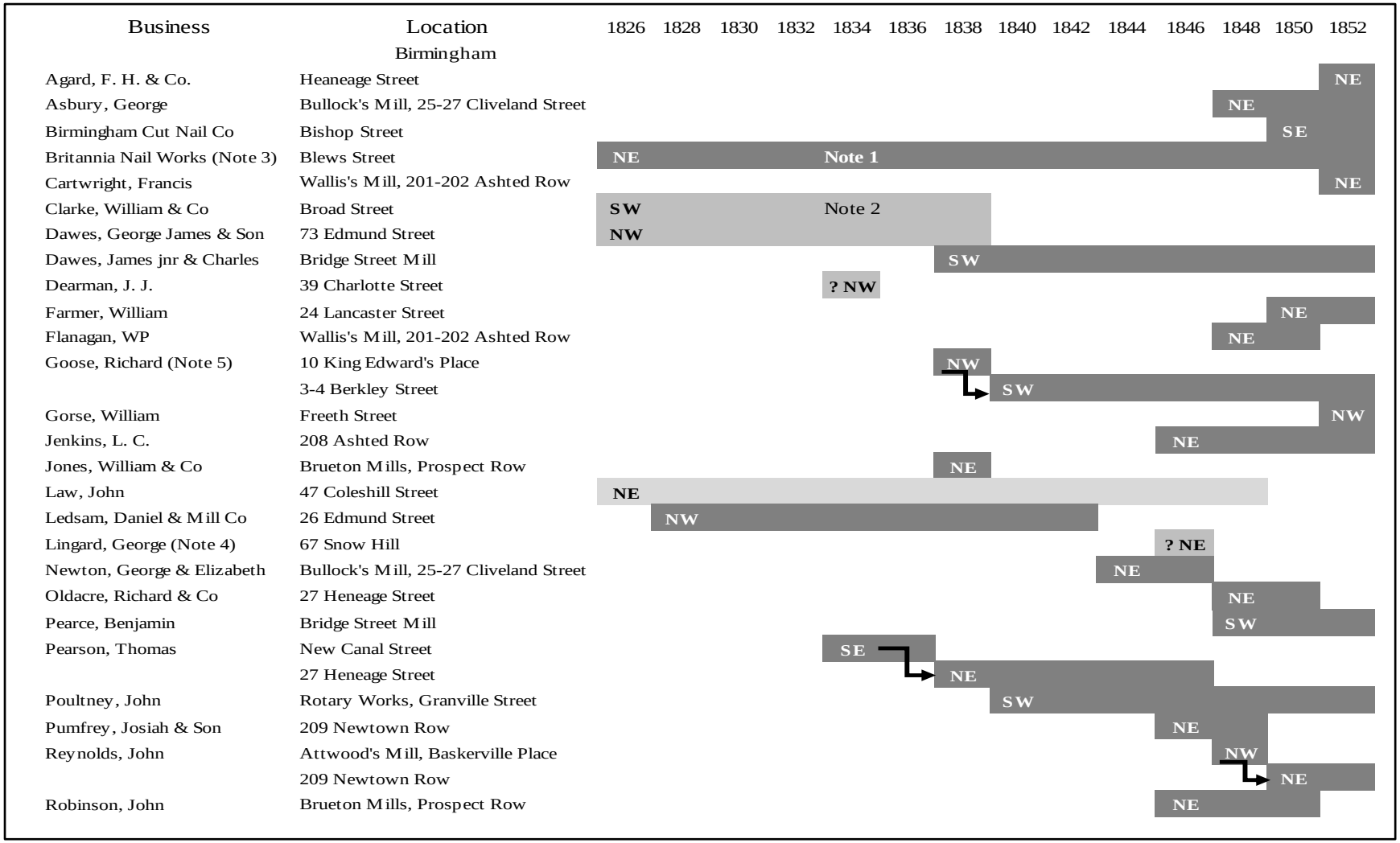
My machinery for working the hammers, by which all manual labour will be saved, consists of one main shaft, cause to turn round in either a horizontal or perpendicular direction by means of a water wheel, or the effects of fire by a steam engine; such main or principal shaft will put in motion, by means of cog and round or tooth and pinion wheels, other counter shafts or barrels, whereon is fixed coggs, tappets, or arms, which coggs, tappets, or arms, striking upon the helves or shafts whereon the hammers are fixed, work the same in either a lift or tilt manner. Also, to make three divisions of hands in the manufacturing of headed nails, namely, one man, woman, or child to carry the heated rod to the man, woman, or child stationed before the hammer, which man, woman, or child, by mere activity, will with one hand not only form the largest size nail, but a far greater number in the same given time; when the third man, woman, or child will, with the same kind of hammer, head and finish a number of the said shanks together, leaving them truer made and better for use than the present mode. Also, by a division of hands, will make such nails as require no tool or frame to be headed in; namely, the one, as heretofore mentioned, to carry the iron from the fire, and the other, as stationed before the hammer, to finish them. Also, by heating many rods in one fire there will be a saving of coal. Also, by the more speedy motion of the machine hammers, several nails will be made at once heating of the rod, whereas by the old method only one is made, consequently there will be a great saving of yield. Also, the motion being regular, independent of strength, a child will be able to make the largest nail or spike. And a further and considerable benefit will arise to the manufacturer by this mode, namely, that he will have his business done at one place or under one roof, whereas by the old method the workmen live many miles asunder, and cannot be overlooked; likewise, by this method the limbs of those employed in the manufactory will be preserved to the end of life, whereas in the old method of working, men are frequently lamed in seven or ten years, and obliged to be maintained by the parish.

In witness whereof, I, the said William Finch, have hereunto set my hand and seal; this Twenty-sixth day of August, One thousand seven hundred and ninety.

WILL^M FINCH. (L.S.).

Appendix 4

Birmingham and District Cut-nail Manufacturers, 1826-1852



Business	Location	1826	1828	1830	1832	1834	1836	1838	1840	1842	1844	1846	1848	1850	1852
	Birmingham (cont'd)														
Salt, Abraham and Jacob	49 Dudley Street						SW								
Sharp, George	Bridge Street														
Shaw, James and Charles	99 Great Charles Street	NW													
	Berkley Street											SW			
	Morville Street														
Taylor & Farmer	264 Bishop Street										SE				
Terry, Henry & Cornelius	Brass House Yard														SW
Thornton, James & Son	154 Bradford Street			SE											
Webb, Samuel	Bullock's Mill, 25-27 Cliveland Street										NE				
	Lord Street Nail Works, 15 Lord Street														NE
Wootton, Charles	62 Rea Street												SE		
	West Bromwich														
Bullock, Ephraim	Spon Lane														
	Willenhall														
Hemingsley, Thomas	Tame Mill									8	9	15	19	20	21
	Wolverhampton														
Crown Nail and Stamping Co.	Union Mill Street														
Dunning & Hemingsley	The Old Factory, Horseley Fields														
Hudson & Higgs	Union Mill							?							
Neve, John & Co	Union Nail Works, Horseley Fields														
Walker, Joseph	Junction Works														
Total steam-powered production units in operation:		**1**		**2**	**2**	**2**	**3**	**4**	**7**	**7**					

Notes

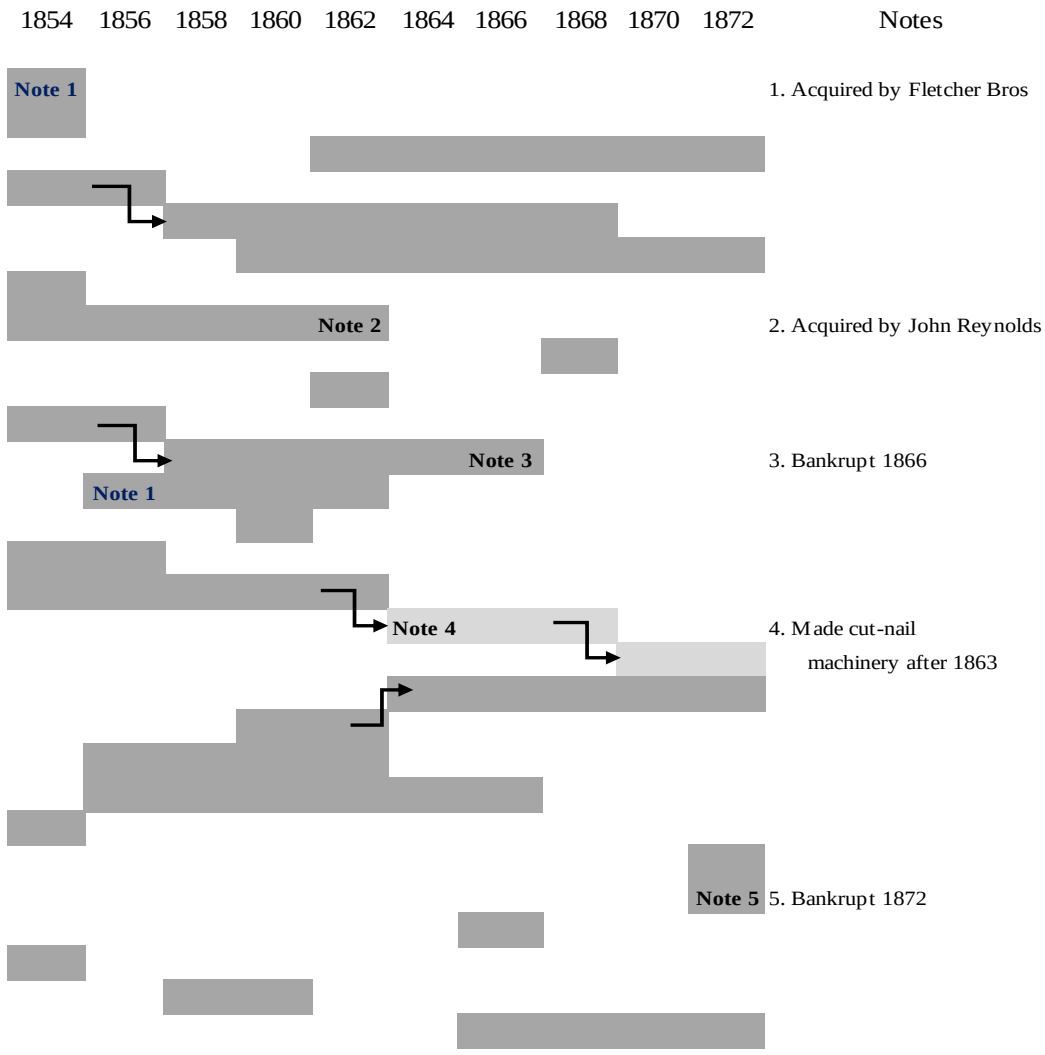
1 Steam-powered machinery / Quadrant
2 Cutting by fly-press / Quadrant
3 Between 1826 and 1854, the Britannia Nail Works was operated by five different partnerships. Here they are shown under the generic heading of the Britannia Nail Works to illustrate continuous production throughout the period.
4. ? = Unknown production technology.
5. Arrow indicates business relocation

Sources: Trade directories, trade journals and newspapers referred to in the Bibliography.

Appendix 5

Birmingham and District Cut-nail Manufacturers, 1854-1872

Business	Location	Notes
	Birmingham	
Agard, Francis H. & Co.	Star Nail Works, 27 Heneage Street	1. Acquired by Fletcher Bros
Asbury, George	Bullock's Mill, 25-27 Cliveland Street	
Bell, Henry	397 New John Street West	
Birmingham Cut Nail Co.	266, Bishop Street	
	Wiggin Street, Icknield Port Road	
Campbell, William & Co.	Selly Oak	
Cartwright, Francis	37 Ashted Row	
Chunk Nail Co.	Britannia Nail Works, Blews Street	2. Acquired by John Reynolds
Cluff, John	23 Princip Street	
Collins, J.	174 Newtown Row	
Farmer, William	24 Lancaster Street	
Farmer, Sarah & Sons	35-37 Lower Hospital Street	3. Bankrupt 1866
Fletcher Brothers	Star Works, 27 Heneage Street	
Ford, Reuben	5 Heneage Street	
Goose, Richard	3-4, Berkley Street	
Gorse, William	Freeth Street	
	Eagle Works, Minworth	4. Made cut-nail
	93, Lichfield Street	machinery after 1863
Hadley Brothers	Mitre Cut Nail Works, Eyre Street	
Hadley, Thomas	Bishop Street	
Heeley, James & Sons	73 Graham Street	
Heeley, Samuel	19 Wrottesley Street	
Hemmings, Thomas	Cliveland Street	
Horton, John	Scotland Street	
Ibbotson Brothers & Co.	35 Lower Hospital Street	5. Bankrupt 1872
Lloyd, J. & H. & Co.	Eagle Works, Handsworth	
Jenkins L. C.	208 Ashted Row	
Norris, Samuel	Icknield Port Road	
Parkes, A. and F & Co.	Coldfield Works, Dartmouth Street	



Business	Location	1854	1856	1858	1860	1862	1864	1866	1868	1870	1872	
	Birmingham (cont'd)											
Parkes, John Israel	Eagle Works, Rolfe Street, Smethwick											
Pearce, Benjamin	Attwood's Mill, Baskerville Place											
	30 Swallow Street											
Pearson, Thomas	Davis's Mill, Lichfield Street											
Popplewell, David & Co.	Star Nail Works, 27 Heneage Street											
Poultney, John	Rotary Cut Nail Works, Granville Street								Note 6			6. Bankrupt 1871
Pritchard, Thomas	Globe Cut Nail Works, 78 Cecil Street											
Reynolds, John	Crown Nail Works, 209 Newtown Row											
Reynolds, John & Son	Crown Nail Works, 209 Newtown Row											
Reynolds, John & Sons	Crown Nail Works, 209 Newtown Row											
Rerynolds, Joseph J.	400 New John Street West										Note 7	7. Bankrupt 1871
Salt, Abraham & Jacob	Phoenix Cut Nail Works, Dudley Street				Note 8							8. Acquired by John Reynolds
Sharp, George	Bridge Street											
Shaw, C. J. & Co.	Morville Street and Berkeley Street											
Terry, Cornelius	Brass House Yard, Broad Street	Note 9										9. Bankrupt 1854
	Coventry Street		?					Note 10				10. Acquired by John Reynolds
Trinfield & Nock	44 Old Bartholomew Street											
Webb, Samuel	8 Lord Street											
Sub Total (Birmingham)		**17**	**15**	**16**	**18**	**16**	**12**	**18**	**13**	**10**	**9**	
	Willenhall											
Hemingsley, Thomas	Tame Mill	Note 11										11. Bankrupt 1855
	Wolverhampton											
Crown Nail Co.	Commercial Road											
Danks, Walker & Co.	Junction Works, Stafford Street											
Neve, John & Co.	Union Works, Horsely Fields											
Sub Total (Black Country)		**4**	**4**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	
Total		**21**	**19**	**19**	**21**	**19**	**15**	**21**	**16**	**13**	**12**	

Sources: Trade directories, trade journals and newspapers referred to in the Bibliography. Also see UCNTA Minute Book, pp. 30 and 155.

Appendix 6

Machine-made Nail Patents, 1854-1866: Birmingham and District

Date	Patent	Patentee	Nature of Patent	Imp (*)	Occupation of Patentee
06 May 1853	1,116	John Danks	Cutting and heading	✓	Wolverhamton cut-nail manufacturer
		& Bernard Walker			Wolverhamton cut-nail manufacturer
06 Nov 1855	2490	Richard Goose	Cutting	✓	Birmingham cut-nail manufacturer
05 Jun 1856	1339	John Norris jnr	Cutting (heated plate)	✓	American agent resident in Birmingham
13 Sep 1856	2143	William Whittle	Machine-wrought nails		Mechanical engineer
16 Feb 1857	453	Alexander Parkes	Cutting/heading		Birmingham cut-nail manufacturer
23 Mar 1857	1453	William Carron	Rolling and cutting	✓	Machinist
22 Jun 1857	1741	John Norris jnr	Cutting and heading	✓	Both were New Yorkers living in Birmingham.
		& George Worstenholm			Norris's son Samuel was a B'ham cut-nail mfr.
09 Nov 1857	2832	Alexander Parkes	Cutting and heading		Birmingham cut-nail manufacturer
17 Apr 1858	840	William Carron	Casting nails	✓	Machinist
05 Nov 1858	2471	Thomas Till	Nail-heading machinery	✓	Engineer/machinist
01 Aug 1859	1774	William Campbell	Cutting and heading	✓	Birmingham cut-nail manufacturer
		& George Worstenholm			See above
18 Oct 1859	2377	Joseph Reynolds	Cutting and heading	✓	Birmingham cut-nail manufacturer
21 Nov 1859	2631	William Whittle	Machine-wrought nails		Mechanical engineer
03 Nov 1860	2695	Samuel Webb	Machine-wrought nails	✓	Birmingham cut-nail manufacturer
		& Thomas Timmins			Former printer (?)
04 Feb 1861	289	John Abraham	Casting brass nails		Metal dealer and machinist
05 Apr 1861	839	David Brown,	Cutting and heading	✓	Iron manufacturer
		Noah Fellows et al			Iron manufacturers
14 Jan 1862	106	William Gorse	Cut brads		Manufacturer of cut-nail machinery
20 Aug 1862	2327	William Whittle	Nail cutting		Mechanical engineer
05 Mar 1863	615	William Whittle	Nail cutting machinery		Mechanical engineer
11 Dec 1863	3118	Edmund Darwen	Copper wire nails		Merchant
		& John Haddon			Machinist
24 Sep 1864	2351	William Whittle	Nail cutting machinery	✓	Mechanical engineer
21 Mar 1865	785	Charles Farmer	Wire nail machinery		Button shank manufacturer
		& Thomas Turner			Gun manufacturer
30 Oct 1865	2789	William Whittle	Nail cutting machinery		Mechanical engineer

***** Imp = Patent for improvement to existing technology.

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Appendix 7

Nail-making Occupations Recorded in Census Returns, 1851-1871

(Occupations marked with an asterisk * are cut-nail-related occupations)

Apprentice nail-cutter *
Cut nail finisher *
Cut nail maker *
Cut nail maker master *
Cut nail manufacturer *
Engine driver at nail works *
Manager cut nail works *
Nail annealer *
Nail-bag maker
Nail burnisher
Nail caster
Nail-cutter *
Nail-cutter and tool grinder *
Nail feeder / nail machine feeder / nail cutter machine feeder / nail cutting machine feeder *
Nail forger
Nail machine fitter *
Nail machinist *
Nail maker
Nail-cutter mechanic *
Nail packer *
Nail plater
Nail pointer
Nail sorter *
Nail stamper
Nail strip cutter *
Nail trimmer
Nail turner
Nail worker
Nail wrapper up *
Nailer.

John Reynolds & Sons. Newspaper Advertisements Placed in 1868

Newspaper	1868 - Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
England													
Bedfordshire Mercury					5	4	4						**13**
Boston Guardian										3	2		**5**
Brighton Guardian									1				**1**
Bristol Daily Post			1	4									**5**
Bristol Mercury									3	3	2		**8**
Cambridge Chronicle										1			**1**
Cambridge Independent Press					1	3	2						**6**
Chester Chronicle					1	2	1						**4**
Devizes and Witshire Gazette								1	2	4			**7**
Halifax Courier								2	3	3			**8**
Hampshire Advertiser								3	4	5			**12**
Huddersfield Chronicle								2	2	4	2		**10**
Hull Packet	1	1	1	1									**4**
Leeds Mercury					1	2							**3**
Leicester Chronicle								4	4	5			**13**
Liverpool Mercury									1				**1**
Newcastle Chronicle	1	2	2	2									**7**
North Devon Journal							1	2	3	3	3		**12**
Northampton Mercury					4	4	2						**10**
Northwich Guardian								2					**2**
Oxford Chronicle					2	3	4	1					**10**
Portsmouth Times								1	2	3			**6**
Preston Chronicle		4	2	1									**7**
Shrewsbury Chronicle								1	2	4			**7**
Stroud Journal								3	3	4			**10**
Swindon Advertiser					3	4	4	3	1				**15**
Western Times								3	4				**7**
Worcester Journal					3	4	3						**10**
York Herald								4	4	5			**13**
Yorkshire Post									3	3	2		**8**
Sub Totals: England	**2**	**7**	**6**	**8**	**20**	**26**	**21**	**32**	**42**	**50**	**11**		**225**
Ireland													
Dublin Evening Post									7	11	13	10	**41**
Limerick Reporter	3		4	1									**8**
Northern Whig (Co, Antrim)			4	2	2								**8**
Southern Reporter									7	3	6	6	**22**
Tipperary Vindicator	3	5	5	1									**14**
Waterford News		4	4	3	3								**14**
Weekly Freeman's Journal		1	2	3	2								**8**
Sub Totals: Ireland	**6**	**10**	**19**	**10**	**7**				**14**	**14**	**19**	**16**	**115**
Sub Totals: England	**2**	**7**	**6**	**8**	**20**	**26**	**21**	**32**	**42**	**50**	**11**	**0**	**225**
Totals: England and Ireland	**8**	**17**	**25**	**18**	**27**	**26**	**21**	**32**	**56**	**64**	**30**	**16**	**340**

Source: British Newspaper Archive at https://www.britishnewspaperarchive.co.uk (Accessed 02 Dec 2017)

Appendix 9

The United Cut Nail Trade Association, 1868-1882

1. Attendance at Preliminary Meeting, 30 July 1868

Birmingham		
Felix Hadley	Hadley Brothers	Executive Committee member (Deputy Chairman 1872-1876; Chairman 1876-1882).
John Poultney	John Poultney	Deputy Chairman (until bankruptcy Aug 1871)
Mr Hayward	Messrs Taunton & Hayward	
John Reynolds	John Reynolds & Son	Chairman (1868 to retirement in 1876)
Alfred J. Reynolds	John Reynolds & Son	(Deputy Chairman after 1876)
Samuel Webb	Samuel Webb	
William Hartle		Secretary
Smethwick		
John I. Parkes	J. I. Parkes	
Wolverhampton		
William Bate	The Crown Nail Co.	Executive Committee member
John Danks	Danks, Walker & Co.	
Titus Neve	John Neve & Co.	Executive Committee member
Leeds		
Josiah Grimshaw (Representing the Leeds makers)	Grimshaw & Burniston	Executive Committee member (died 1871)
Manchester		
John Ellison	J. & W. Ellison	Executive Committee member

2. Members

Birmingham	
John Cluff	(Maker of cut tacks only)
Cox & Son	(Maker of cut tacks only)
Hadley Brothers	
John Horton	(Maker of cut tacks only)
Morewood & Co.	
D. Popplewell	(Maker of cut tacks only)
John Poultney	
Thomas Pritchard	
J. J. Reynolds	(Maker of cut tacks only)
John Reynolds & Son	
C. J. Shaw & Co.	Resigned from UCNTA June 1869
W. J. Sheldon	
Taunton & Hayward	(Maker of cut tacks only)
Samuel Webb	
Bristol	
Bristol Cut Nail Co.	

The United Cut Nail Trade Association, 1868-1882 (continued)

Leeds
Josiah Grimshaw
J. J. Ingham & Co.
John P. Mountain & Son
John Roberts & Son

Manchester
J. & W. Ellison

Middlesbrough
Jones Brothers & Co.

Smethwick
J. I. Parkes

Newcastle upon Tyne
William Galloway & Co.

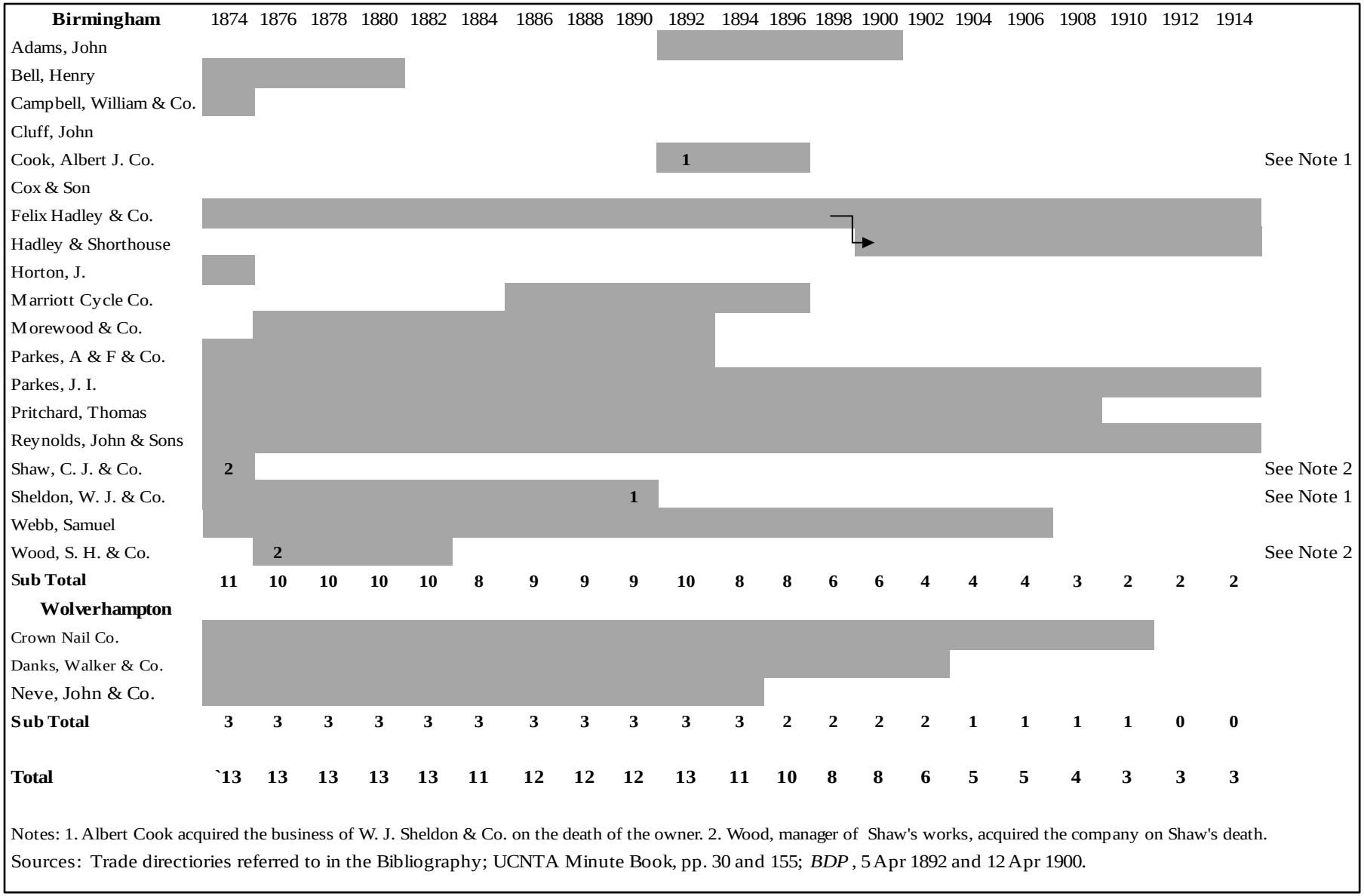
Stalybridge
John Summers

Wolverhampton
Crown Nail Co**.**
Danks, Walker & Co.
John Neve & Co.

Source: UCNTA-MB, 1868-1882; UCNTA-AR for 1876 dated 23 Jan 1877.

Appendix 10

Birmingham and Wolverhampton Cut-Nail Manufacturers, 1874-1914



Birmingham	1874	1876	1878	1880	1882	1884	1886	1888	1890	1892	1894	1896	1898	1900	1902	1904	1906	1908	1910	1912	1914	
Adams, John																						
Bell, Henry																						
Campbell, William & Co.																						
Cluff, John																						
Cook, Albert J. Co.										1												See Note 1
Cox & Son																						
Felix Hadley & Co.																						
Hadley & Shorthouse																						
Horton, J.																						
Marriott Cycle Co.																						
Morewood & Co.																						
Parkes, A & F & Co.																						
Parkes, J. I.																						
Pritchard, Thomas																						
Reynolds, John & Sons																						
Shaw, C. J. & Co.	2																					See Note 2
Sheldon, W. J. & Co.									1													See Note 1
Webb, Samuel																						
Wood, S. H. & Co.		2																				See Note 2
Sub Total	**11**	**10**	**10**	**10**	**10**	**8**	**9**	**9**	**9**	**10**	**8**	**8**	**6**	**6**	**4**	**4**	**4**	**3**	**2**	**2**	**2**	
Wolverhampton																						
Crown Nail Co.																						
Danks, Walker & Co.																						
Neve, John & Co.																						
Sub Total	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**0**	**0**	
Total	**`13**	**13**	**13**	**13**	**13**	**11**	**12**	**12**	**12**	**13**	**11**	**10**	**8**	**8**	**6**	**5**	**5**	**4**	**3**	**3**	**3**	

Notes: 1. Albert Cook acquired the business of W. J. Sheldon & Co. on the death of the owner. 2. Wood, manager of Shaw's works, acquired the company on Shaw's death.

Sources: Trade directiories referred to in the Bibliography; UCNTA Minute Book, pp. 30 and 155; *BDP*, 5 Apr 1892 and 12 Apr 1900.

Appendix 11

Price (per cwt) of 3-inch Cut Nails at the Works, July 1868 -June 1882

Month	Year							
	1868	**1869**	**1870**	**1871**	**1872**	**1873**	**1874**	**1875**
Jan		10s. 0d.	10s. 3d.	10s. 3d.	14s. 0d.	18s. 0d.	18s. 0d.	14s. 0d.
Feb		10s. 0d.	10s. 3d.	10s. 3d.	15s. 0d.	19s. 0d.	17s. 0d.	14s. 0d.
Mar		10s. 0d.	10s. 3d.	10s. 3d.	16s. 0d.	20s. 0d.	17s. 0d.	13s. 6d.
Apr		10s. 0d.	10s. 3d.	10s. 3d.	17s. 0d.	20s. 0d.	16s. 0d.	13s. 0d.
May		10s. 0d.	10s. 3d.	10s. 3d.	18s. 0d.	20s. 0d.	15s. 0d.	13s. 0d.
Jun		10s. 0d.	10s. 3d.	10s. 3d.	20s. 0d.	18s. 0d.	15s. 0d.	13s. 0d.
Jul	9s. 9d.	10s. 0d.	10s. 3d.	10s. 0d.	22s. 0d.	18s. 0d.	15s. 0d.	13s. 0d.
Aug	10s. 0d.	10s. 0d.	10s. 3d.	10s. 6d.	21s. 0d.	18s. 0d.	15s. 0d.	13s. 0d.
Sep	10s. 0d.	10s. 0d.	10s. 3d.	11s. 0d.	19s. 0d.	18s. 0d.	14s. 0d.	13s. 0d.
Oct	10s. 0d.	10s. 0d.	10s. 3d.	11s. 6d.	17s. 0d.	18s. 0d.	14s. 0d.	13s. 0d.
Nov	10s. 0d.	10s. 0d.	10s. 3d.	12s. 0d.	15s. 0d.	18s. 0d.	14s. 0d.	13s. 0d.
Dec	10s. 0d.	10s. 0d.	10s. 3d.	13s. 0d.	16s. 0d.	18s. 0d.	14s. 0d.	13s. 0d.

	1876	**1877**	**1878**	**1879**	**1880**	**1881**	**1882**
Jan	13s. 0d.	10s. 0d.	9s. 6d.	8s. 6d.	11s. 0d.	8s. 6d.	9s. 6d.
Feb	13s. 0d.	10s. 0d.	9s. 6d.	8s. 6d.	11s. 0d.	8s. 6d.	9s. 6d.
Mar	13s. 0d.	10s. 0d.	9s. 0d.	8s. 6d.	11s. 0d.	8s. 6d.	9s. 6d.
Apr	11s. 6d.	10s. 0d.	9s. 0d.	8s. 6d.	10s. 6d.	8s. 6d.	9s. 6d.
May	11s. 6d.	10s. 0d.	9s. 0d.	8s. 3d.	10s. 6d.	8s. 6d.	9s. 6d.
Jun	11s. 6d.	10s. 0d.	9s. 0d.	8s. 3d.	10s. 6d.	8s. 6d.	9s. 6d. *
Jul	11s. 0d.	10s. 0d.	9s. 6d.	8s. 3d.	10s. 6d.	8s. 6d.	
Aug	11s. 0d.	10s. 0d.	9s. 6d.	8s. 3d.	10s. 6d.	8s. 6d.	
Sep	10s. 6d.	9s. 0d.	9s. 6d.	8s. 3d.	9s. 0d.	8s. 6d.	
Oct	10s. 6d.	9s. 0d.	8s. 6d.	8s. 3d.	8s. 6d.	9s. 6d.	
Nov	10s. 6d.	9s. 0d.	8s. 6d.	9s. 6d.	8s. 6d.	9s. 6d.	
Dec	10s. 6d.	9s. 0d.	8s. 6d.	10s. 6d.	8s. 6d.	9s. 6d.	

Sources: UCNTA Minute Book, July 1868-January 1882, pp. 16-170; * *Freeman's Journal* , 16 Jun 1882.

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D4452/5/9/1/1/16 Lease of the Britannia Brewery Buildings and land in Birmingham for 62 years, Proprietors of the Britannia Brewery Buildings to Samuel Williams, plan incorporated 2 April 1814

D4452/5/9/1/4/2 Deed of Covenant to produce title deeds relating to the Britannia Brewery land and premises in Birmingham, 1 September 1819

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MS 1422/23/1/6/1/1. Agreement for reconstruction between Messrs Felix Hadley & Co Ltd and Messrs Glydon & Shorthouse Ltd, 12 Jan 1899

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