

PETER NIGHTINGALE, RICHARD ARKWRIGHT, AND THE DERWENT VALLEY COTTON MILLS, 1771-1818

By STANLEY CHAPMAN

The 1780s were a period of spectacular growth of the cotton industry in Britain. So much so, that many historians have identified this as the first decade of 'take-off' into our Industrial Revolution. A rash of mills suddenly appeared across the country, beginning in Nottingham and the Derwent Valley of Derbyshire, where Arkwright inaugurated his industrial empire, but soon dispersed to locations as far away as Aberdeen and Exeter. It was the great speculation of the age and all kinds of men of capital, keen to multiply their fortunes, crowded into it to pursue Arkwright's route to wealth and power. A much-quoted 'census' of the early cotton industry in 1788 counted 143 mills on the Arkwright plan, but recent research shows there were a lot more – at least 340 – many of them in Nottinghamshire and Derbyshire, where the leaders of the old-established hosiery industry (the merchant hosiers) were soon familiar with the new technology and had the capital and market connections to exploit the existing opportunity. A lot more mills mushroomed on the remote Pennine streams of Lancashire and Yorkshire where numerous little entrepreneurs were (they hoped) hidden from Arkwright's aggressive patent controls.¹

THE NIGHTINGALE DYNASTY

Peter Nightingale, a landowner and lead merchant whose family dynasty had been settled at Lea, near Cromford, was just one such entrepreneur. He had no knowledge or experience, so far as we know, of the textile industry, for the hosiery industry (framework knitting) had scarcely reached this isolated part of Derbyshire. His great initial advantage was that, by lucky chance, Arkwright chose to develop his first major cotton spinning interests close to the lead mining village of Cromford, just a couple of miles away from Lea. For a few, brief years, Cromford looked like the new centre of Industrial Britain and the local landowning class (most of whom were, like Nightingale, involved in the struggling lead mining industry) were not people to miss out on the opportunity. Several families (such as the Hurts, the Gells, the Evanses, the Milneses and the Simpsons) soon became involved with Arkwright at one level or another, particularly as partners, licencees, suppliers, or lessors of mill sites, even though the famous entrepreneur was not good at what is now called interpersonal skills, and business relationships were often volatile. John Gell of Hopton complained in 1789 that 'we made a friend of him but he held us all here as enemies.' But this cannot be the whole story, for Arkwright's daughter married Charles Hurt, and his son one of the Simpson sisters; it would have been fairer to say that Arkwright inserted himself into the ranks of Derbyshire gentry despite his rough manners and rapidly changing moods.²

By the standards of eighteenth century Derbyshire, the Nightingales were *nouveaux riches* rather than old landed gentry. The rise of the family only began at the beginning of the century when Thomas Nightingale, an illiterate 'yeoman' (tenant farmer with a few small plots of land) found his way into lead mining through his non-conformist religious connections.

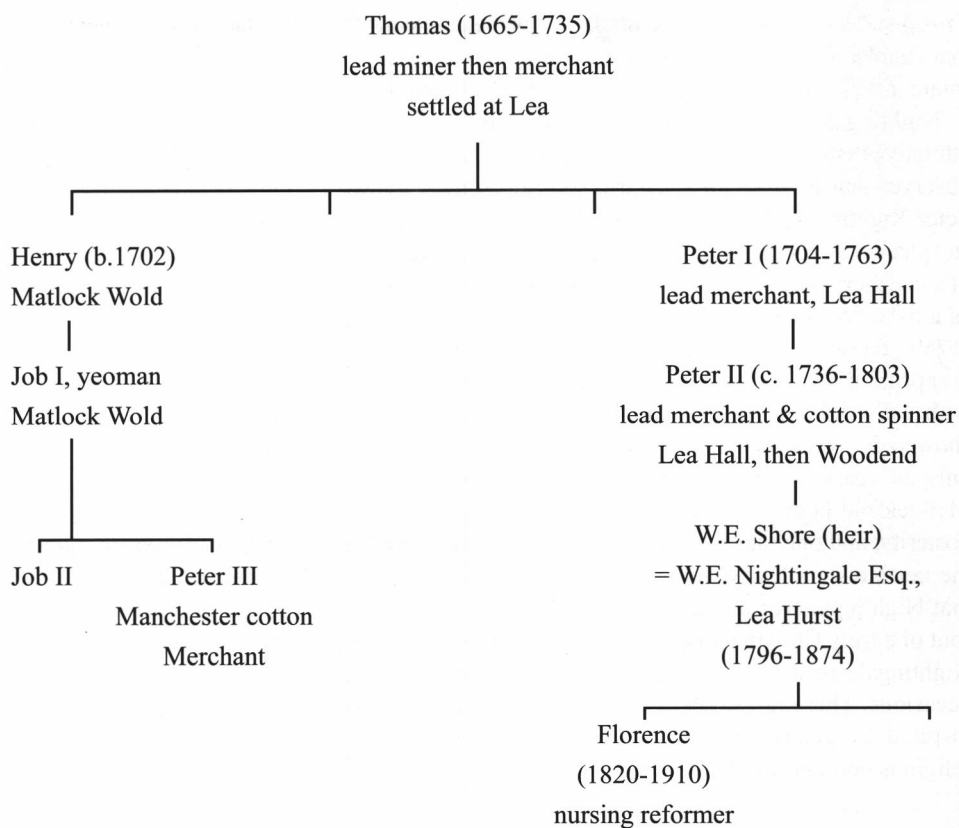
Already in 1714 he was describing himself as a 'lead merchant'. In the next generation, Peter Nightingale I was an innovating entrepreneur with the new kind of lead smelting furnaces (or cupolas) in which the furnace was charged with galena mixed with pit coal (carted from Clay Cross) and local limestone. No doubt it was the ample profits generated by his pioneer venture that enabled Peter Nightingale II (the subject of this article) to add 1,381 acres to his inherited estate in 1771, placing himself among the leading landowners in the county.³

Nightingale has been represented as a restless and culpable character, with no more attractive personality than Arkwright. The biographer of the Arkwrights quotes a contemporary observer that he was 'an eccentric sporting squire, known throughout the country as "mad Peter Nightingale" [who] had gained notoriety as a dare-devil horseman, a rider in midnight steeplechases and a layer of wagers, given to hard drinking and low company.'⁴ This picture of a decadent playboy must have been written by a youthful crony and cannot obtain credence as a balanced record. James Pilkington, the sober author of *The Present State of Derbyshire* (1789), recorded his appreciation of Nightingale as a minerologist, and in the pages that follow it appears that he was no less an authority on industrial finance. In the turbulent relationship with Arkwright, he appears the more restrained partner. Even as a young man, Nightingale showed far more social responsibility than the rake depicted above. In 1760 (when he was only 24 years old) he was at the head of a group that rebuilt the south aisle and gallery of Matlock old church, saving the rude painted ceiling and ancient garlands for an ungrateful posterity, and one may suspect he was the means of persuading Richard Arkwright to rebuild the north aisle a few years later, in 1783. From the reports in the *Derby Mercury*, we learn that Nightingale (or his father) provided corn and beef for the hungry in a period of distress 'out of a truly Christian disposition and compassion for the poor' (1757). In subsequent years, Nightingale paid for the inoculation of the children of Lea and Holloway on at least three occasions. These are surely the actions of an individual (or family) of uncommon humanity, inspired by genuine Christian commitment, very likely an inheritance from their earlier religious nonconformity.⁵

INDUSTRIAL ENTERPRISE

The most important feature of the Derbyshire trading gentry in the eighteenth century is the substantial capital they employed and their practice of working in capital-sharing partnerships. This was essentially because of the high cost and great risks of the lead mining industry, the more accessible seams having been worked out many years before. On Cromford Moor and the area for many miles around there were innumerable shafts of lead mines, some of which had been sunk to depths of more than 600 feet (about 200 metres). The vein-bearing strata needed to be drained by soughs (underground tunnels) that cost thousands of pounds to excavate. In the eighteenth century the most expensive drainage projects cost £30,000 to £50,000, ten times the cost of the early cotton mills built and furnished on Arkwright's plan. Mine drainage sometimes involved steam power and Newcomen pumping engines could cost up to £2,000. Such huge commitment of capital necessitated strings of partners, which brought the leading families together to share the risks and (hopefully) the riches. Clearly, they would not be daunted by the relatively low capital cost of a cotton mill in the early years of the industry.⁶

Perhaps the wealth and willingness to gamble for high stakes in lead mining exhibited by Arkwright's new gentry neighbours emboldened him to think big; more likely he had more than enough grand ambitions of his own, for his passion for wealth and status was legendary.



Sources: J. Hunter, *Familiae Minorum Gentium*, I (Harleian Society, 1894) pp.142-3; memorials in Ashover Church. Miriam Wood, 'Lead Smelting in Lea', *Derbys Miscellany* IX (5), Spring 1982, and the same author's 'Thomas Nightingale of Lea 1665-1735', *Derbys Miscellany* XIV, Autumn, 1987.

Fig. 1: Chart showing prominent members of Nightingale family.



Plate 1: A view of the principal elevation of Lea Hall, Nightingale's home. Originally a farmhouse, Peter Nightingale extended the building and added the impressive frontage in the mid-18th century. Clearly a man of substance and standing in the locality, Nightingale later removed to a house that he built near Cromford Bridge. [Photo: Jane Middleton-Smith]

Whatever the truth of this interpretation, he could scarcely wait to scramble up the social hierarchy to the ranks of the Derbyshire industrial gentry. It is reckoned that he made over £100,000 in the halcyon years of his patents (1777-1783) and 2-300 per cent on his capital the next few years, but in 1776, when he began to spend and invest lavishly, his means were still limited. Nevertheless, in that year he entered into a secret agreement with Richard Nall, the Chesterfield hosier and trustee for William Milnes and his wife, to buy the Manor of Cromford for £20,000. Arkwright's initial (1771) foothold in Cromford dated from a bargain made with Nall and the Milnes to build a cotton mill on the Bonsall Brook, and he was evidently anxious to secure both his economic and social foothold. But for the time being, he lacked adequate capital to strengthen his position and fulfil his strategy. The £20,000 payment was deferred for a year at 4 per cent, and then only £12,000 of the total to be paid; the new technology was finally perfected and the second Cromford mill was erected, but Arkwright needed to buy time.⁷

This chronology and interpretation serves to introduce Peter Nightingale to the Arkwright story, and place him in his proper context in the industrial history of the period. Though Fitton (Arkwright's biographer) made conjectures on Arkwright's financial problems, he could not trace the document regarding the secret agreement and, like a string of other researchers, puzzled over the exact course of events. It is now clear that the generous terms offered by the Milnes were still too steep for Arkwright, and he had to borrow £3,000 from Nightingale,

along with a minuted memorandum of the possibility of a further £750. This proved to be the first of a series of subventions that drew Nightingale into a closer and closer relationship with the famous entrepreneur. The subsequent financial links, and the documentary sources for them, are summarised in Table 1.⁸

date	sum (£)	properties	parties	PN's role
1776	£20,000	Manor of Cromford (part)	Richard Nall Wm & Mary Milnes (vendors)	£3,750 for Cromford Mill II and workers' housing, Rock House
1782	£14,864	Manor of Cromford and Willersley (part) and estate in Matlock	T.H. Hodges (vendor)	Further housing
1789	£30,000	Manor of Cromford	Rev'd. Thos. Manlove John Toplis	£10,000 loan

Sources

Arkwright Society archives, Articles of Agreement 3 April 1776.

British Library Add. Mss. 6687 p.112, 6689 p.378.

Derbyshire Records Office, Nightingale mss. D1575, box L.

For further details of Milnes and Hodges' estates see Willoughby Castle mss., leases of 1771 (Milnes) and (Hodges).

Fig. 2: Sir Richard Arkwright's major debts 1776-1789, showing the role of Peter Nightingale.

It appears that the £2,000 advance was directed to the second Arkwright mill at Cromford, which was being built at the time. The initial insured value of this mill, including the building, machinery, water power and transmission system, was £3,000, so it is fair to surmise that Nightingale owned two-thirds of the second enterprise. The 1777 mill represented the acme of the Arkwright production system, the prototype of the hundreds of mills that were to follow in its wake. Nightingale's major contribution to the capital cost was always kept secret – it was not even mentioned in the legally-binding insurance policy, for instance, though it was normal for the Sun, Royal Exchange, Phoenix, and other insurers of cotton mills to list all the partners in the policy document.⁹

The £1,000 advance was directed to the building of North Street on Cromford Hill, generally dated to 1777. Certainly this was the only extensive house building connected with Arkwright's enterprise at this early period. The housing was intended, as Arkwright advertised, for weavers with 'larger families', all of whose members (men, women and children) could find work; consequently it was not necessary to recruit pauper labour from workhouses or charities or to build and resource an apprentice house, as many pioneers of the factory system did. Again, the role of Nightingale can be seen as central: he not only provided most of the capital for the new mill, but also the capital necessary for securing the labour force. Arkwright perfected the technology while Nightingale turned it into economic reality.¹⁰

Another area in which Peter Nightingale powerfully assisted Arkwright to realise his dreams was the acquisition of Rock House, a lofty perch above the newly-built industrial complex and manager's house in Mill Lane, Cromford. The mansion enjoyed sweeping vistas

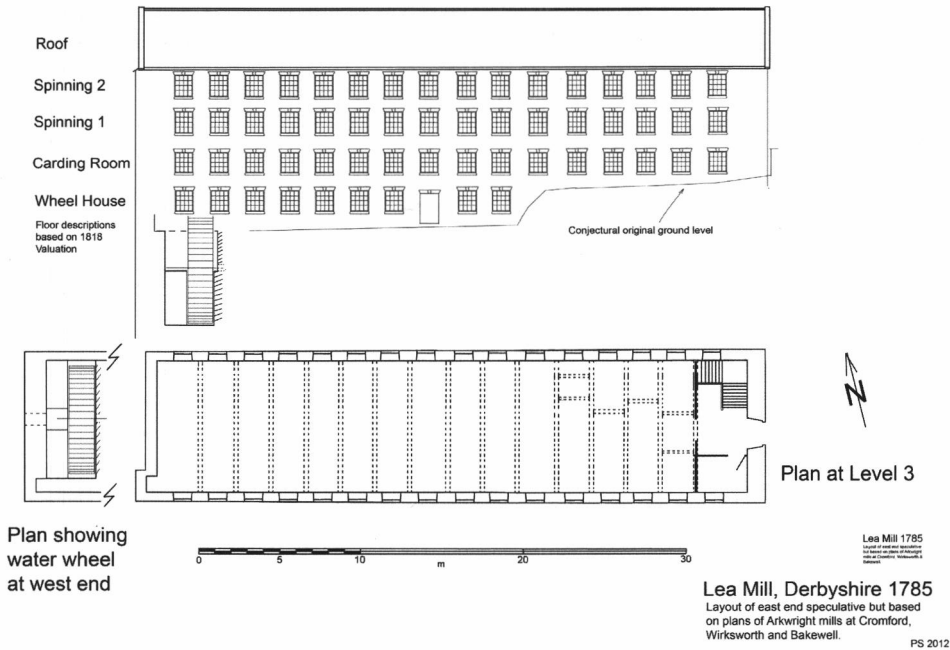


Fig. 3: Cross-section and floor plan of Nightingale's Cotton Mill at Lea Bridge, as it would have been c1785. [Courtesy of Dr Patrick Strange]

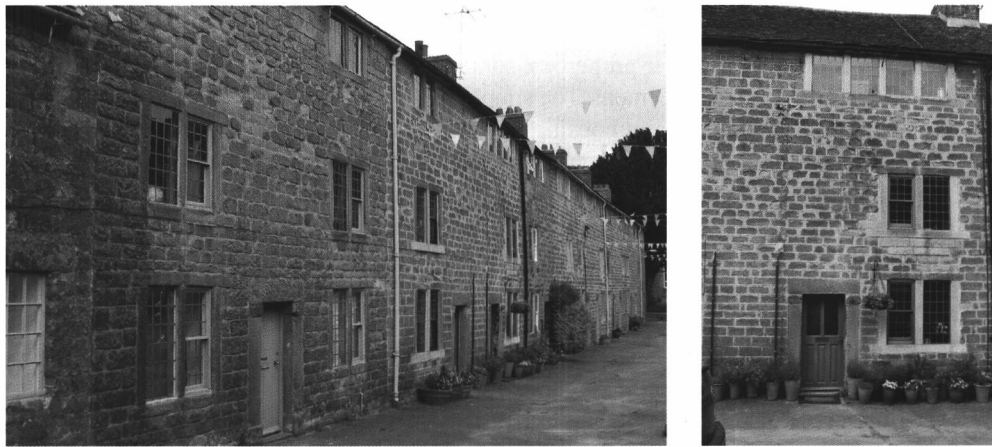


Plate 2: Views of cottages in North Street, Cromford. Built by Arkwright, but funded by Nightingale, North Street is generally recognised as the first of Arkwright's housing developments. The close-up shows one of the cottages with the workroom windows on the top floor. [Photo: Jane Middleton-Smith]

beyond the acres of mining dereliction to the Cromford Meadows and River Derwent in the middle distance, a gentleman's seat detached from the work-a-day world of textile production. Here again, it was the collaboration between Nightingale and the Milnes that proved effective. The Milnes were relative newcomers to the Derbyshire mining gentry, easier to accommodate than proud old families like the Gells of Hopton Hall and the Hurts of Alderwasley; indeed, for a period, Arkwright and his wife shared the property with the Milnes, according to one source. Nightingale raised the finance while Arkwright confirmed his newly-claimed social status by occupying his 'seat' in Cromford.

He lived at Rock House for the rest of his life (1776-1792), though latterly restive to proclaim his rank in society by building Willersley Castle on a virgin site, more romantically situated overlooking the Derwent and Scarthin Rock, and completely out of sight of his industrial plant. The 1776 agreement contained a provision for Nightingale to retain Rock House for his own use if he wished, allowing Arkwright up to £500 to build his own house, but the financier evidently decided against the idea, no doubt (in view of later developments) so he could concentrate on his own industrial interests at Lea Bridge. Admiring the handsome Greyhound Inn in Cromford Market Place, one cannot help musing that it could have been born in Arkwright's ambitions as his own residence, and subsequently evolved into a public building as the commercial potential of the site was recognised with the opening of the turnpike road. The inn was insured for the £500 allowed by Nightingale and Arkwright's target figure for his residence; the stables and chaisehouse (£200) were added to serve and augment the new coach service.¹¹

The 1776 agreement between Nightingale, Arkwright and the Milnes is an invaluable document for in effect it summarises the population structure of Cromford at the time. It is the missing link in the evidence that compelled Arkwright's biographer to speculate on the growth of the industrial settlement rather than determine the exact course of events. Some parts of the agreement are beyond the scope of the present study, but we would like to draw particular attention to the light it sheds on workers' housing in Arkwright's time. To clarify, we have presented the details in a second tabulation.

There were four or five better properties, some with land attached, that were reserved for individual treatment in the agreement. The simple calculation in the table serves to underline the superiority of the North Street housing which, the agreement is quite explicit, was built to Arkwright's plan. The two blind-back terraces were substantially built in local grit stone and consisted of three rooms each, one above the other, evidently planned for living, sleeping and working (i.e. loom shops). This was the familiar type of workers' housing at the time in Nottingham, yet from the level of rent was much superior to both the lead workers and village craftsmen's accommodation. The North Street housing was intended, as Arkwright advertised, for large families and so might have had as many as two adults and eight or ten children in each dwelling, which means the whole street must have contained something more than 28 x 10 people or 280+ in all, about the right number to supply labour for the standard Arkwright-type cotton mill.¹²

	rental p.a.	average rental per unit p.a.
Village housing		
48 cottages, some with workshops, warehouses, gardens, etc.	£116-3s-7d	£2.42
Mill Lane housing		
12 cottages and 'five old buildings' located for the calamine works	£19-1s-2d	£1.59
Wirksworth Hill (North Street) housing		
28 new houses for weavers/knitters and mill workers' families	£180-0s-0d	£2.40

Table. 1: Workers' housing in Cromford, 1776-7

The 1776 agreement included provision for demolition of the old calamine works' cottages to make room for Arkwright and Nightingale's new industrial plant in Mill Lane and used the materials for rebuilding – a characteristic Arkwright economy we may fairly infer. Arkwright's most able fellow worker in Nottingham (Coniah Wood, a man of undoubted mechanical genius) refused to follow him to Cromford, which was a major setback, and no doubt persuaded him to offer a more attractive home for migrants than the industrial dereliction of an isolated old mining settlement. Arkwright and Nightingale transformed this industrial wreck to a showpiece of the industrial revolution in the next few years.¹³

While on the subject of property values and village vistas, it should be added that Arkwright's other contribution to the status of the locality, the Greyhound Inn in Cromford Market Place, was insured for £500 in 1777, the equivalent of a £25 annual rental. Some have conjectured that the coaching inn was also financed by Nightingale, but it is not mentioned in the agreement. The calculated rental confirms that the inn was much the grandest property in Cromford at the time, apart from Rock House, and is a further measure of the two entrepreneurs' pride in their reborn industrial village.¹⁴

The financial developments listed in Table 1 look simple enough, but the ramifications were quite complex – so much so that a string of historians has failed to sort them out. The Manors of Willersley and Cromford were assembled during the eighteenth century as a result of enclosures, tithe awards, and consolidation of a patchwork of ownership. Thomas Hallet Hodges Esq. bought the Lascelles estates (260 acres in the vicinity of the Cromford mills) for £11,550, and land in Matlock and Matlock Bath (including the present Willersley Castle estate) from Edmund Hodgkinson (lead merchant) for £12,050. The negotiations were conducted by Hodges's brother-in-law, Major John Cartwright (known to history as 'the founder of English radicalism'), no doubt watched by his other brother-in-law, Revd Dr Edmund Cartwright, the celebrated inventor of the power loom and woolcombing machine. We can imagine the Cartwright brothers hoping to launch their pioneer factories in the Derwent Valley, but any such plan was thwarted for want of capital. Edmund's first factory was in fact opened in Doncaster in 1787 and John's in Retford in 1788.

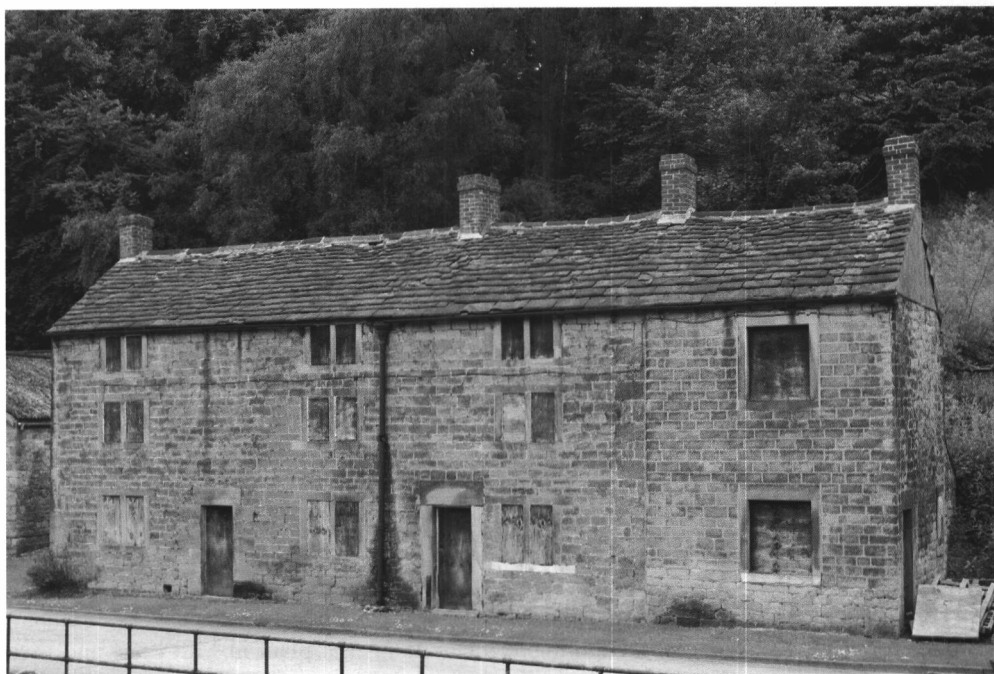


Plate 3: Three-storey cottages built by Peter Nightingale in December 1783 as part of the mill complex. At Lea Bridge the layout is typical of 18th century industrial accommodation, although the southernmost cottage has a front door to the side of the row. The northernmost cottage (to the right of the image) is a later addition. [Photo: Jane Middleton-Smith]

Arkwright seized the chance to acquire the Manors for £30,000 in 1782, heading off any possible competition from mill owners as well as satisfying his social ambitions. The earlier (1776) financial deal had allowed him to draw in Peter Nightingale (who borrowed £10,000 from Revd Thomas Manlove to maintain his credit) and another Cromford lead merchant, Charles Hurt. When Nightingale defaulted on his loan in 1789, John Topleys, the Wirksworth mercer and banker, took over. In a word, Nightingale was one of a string of local capitalists who struggled to accommodate Arkwright's ruthless borrowing, threatening their own solvency in the process.

There is ample evidence for Nightingale being caught in a financial crisis, or at any rate suffering serious cash-flow problems, from 1789 to the summer of 1792. He was constantly engaged in large financial transactions and evidently got his sums wrong. The economic solution to the 'land-locked' situation of Lea industrial estate was the opening of canal and turnpike links. Not surprisingly, the engineer of the Cromford Canal (Benjamin Outram) said Nightingale was 'very anxious for the success of the measure' (the private Act of Parliament), but for the time being he was unable to raise £1,000 to buy shares in the promising venture. In March 1792, a desperate Nightingale sold the paper and fulling mills at Alport (with potential for cotton mill development), his share in Hill Car Sough and its associated lead mines, and land at Darley Dale, all for £1,000, surely a bargain. But even this did not solve his predicament, for in May that year he was advertising a 21-years lease of the two cupolas, two

slag mills and lead rolling mill at Lea, together with the stock of lead slags (10 to 12.5% pure lead). In what must have looked like a last desperate throw of the dice, he offered to sell 'All the shares of mines belonging to Peter Nightingale of Lea'.¹⁵

The solution to this fraught period is, alas, not on record. We can only say that, by the period of the Nightingale letter book (1794-6), Nightingale's industrial interests had returned to what looks like normal. Two explanations can be offered. The obvious one is that the opening of the Cromford Canal in August 1794 generated unprecedented prosperity to the whole region, not least to that part focused on the new Lea Wharf. The other important clue in the letter book is that Nightingale maintained good relations with local bankers, Toplis of Wirksworth, Evans of Darley Abbey, Crompton of Derby, and his brother-in-law, William Shore of Sheffield. The Derbyshire industrial gentry were accustomed to working together, and by this means Nightingale's solvency was maintained. Shore's son was heir to Nightingale, so it is fair to assume that the father would not allow him to go bankrupt.

Nightingale's substantial investments in Arkwright's estate, mill and housing properties at a critical stage of development of his Cromford business must mark him out as the principal benefactor of the 'father of the factory system'. Certainly he played a much larger role, in financial terms, than Arkwright's earlier partners in the region, notably Need in Nottingham, Strutt in Derby, and Milnes in Cromford. This undeniable fact must lead us presently to reassess both the roles of Nightingale and Arkwright in the history of the early English cotton industry.¹⁶

Meanwhile, we should return to the main chronology. When Arkwright advertised for workers in the *Derby Mercury* in 1781 he offered employment to weavers *or* framework knitters, almost as though he had not yet made up his mind which specialism to pursue. Textile technologists are clear that his yarns were more suitable for knitting (hence his early connection with Need and Strutt, merchant hosiers), but he was a highly ambitious man and was no doubt keen to serve the Lancashire market and not lose ground to his closest rivals, Robert Peel and partners of Blackburn and Bolton. His initial advantage was in the hosiery market and his main focus on spinning technology, which is no doubt why he encouraged Nightingale to invest more capital in artisan settlement, £750 in a row of six cottages called Weavers Street on Wirksworth hill, just to the north of the Jug and Glass public house and round the corner from North Street. Behind the corner pub (dated 1782) are two weavers' workshops, easily identifiable from their characteristic long windows. This modest investment was probably the prelude to the building of Lea cotton mill cottages two or three years later.¹⁷

A NEW MILL AND PARTNERSHIP

We believe Peter Nightingale had no specific knowledge of the textile industry but, like many others in the 1780s, this did not deter him from embarking on a cotton mill enterprise. The financial partnership with Arkwright (1776) did not preclude him from entering the new industry, and he was given a prompt in 1782 when his brother-in-law's family, the Evans of Darley Abbey (Derby), briefly went into partnership with Arkwright to build a cotton mill further down the River Derwent.¹⁸ He simply recruited one of Arkwright's managers, Benjamin Pearson Junior, offering him a partnership, a loan of £500 (25% of the initial capital) and a salary of £50 a year until the machinery was working, and after that £100 p.a. if the profits reached 25% p.a., or £60 p.a. if less. It does not sound over-generous, as the most skilled framework knitters could earn as much as £1 to £2 per week without the trouble of

introducing and teaching new technology to a labour force unfamiliar with factory work and discipline. The likely explanation is that neither party expected the partnership contract to last long; it was a stepping stone for both of them. Pearson had worked for Arkwright for seven years (1776-82) and was evidently intent on working his way up the cotton industry ladder to independent ownership.¹⁹

We know little of Benjamin Pearson as such, but his family connections are very suggestive. Henry and John Pearson, Nottingham merchant hosiers, built the largest cotton mill in the town after Arkwright left for Cromford in 1771, and they moved ahead with the rapidly advancing new technology. Arkwright's major problem in Nottingham was power, for the necessary nine-horse capstan proved too expensive to drive the heavy machinery. His local builders, William Stretton & Co, complained that Arkwright 'could not be brought into a belief that a good thread could be spun by that means [steam power] till his own eyes convinced him,' and they never did, for he was no more successful with an experimental prototype steam mill at Wirksworth (1777-90). But the Pearsons persisted and had a small Boulton & Watt steam engine in their Nottingham mill at this period (1787). Meanwhile, Bernard Pearson had become the first landlord of Arkwright's Greyhound Inn, perhaps as a reward for him and Benjamin agreeing to move to Cromford. He was not only innkeeper, but also Arkwright's principal agent in promoting the adjacent market, and hence of boosting the morale of the cotton mills' labour force, surely a key position in the organisation. Peter Nightingale's future partner was reserved a house and land in Cromford called the Dale in the 1776 agreement and probably marked out for special recognition – most likely a confidential understanding between Arkwright and Nightingale that also reserved a partnership for him. Whatever the value of this speculation, there can be no doubt that Nightingale's partner came of a family at the cutting edge of cotton mill technology and organisation.²⁰

Agreement was reached between Nightingale and Pearson in March 1783 and a full contract signed in August. But before the project could get off the ground, Arkwright sued Nightingale for infringement of his patent and for seducing a workman from his Cromford mill. The details of the protracted patent trial were related at length in Fitton's study of *The Arkwrights* (1989) and lie beyond the realm of the present study. It is enough to record here that, although Arkwright was ultimately defeated by the combined interest of the cotton trade, the future viability of Nightingale's venture was in some doubt for a vital couple of years (August 1783 to November 1785). In March 1785, before the final court verdict was delivered, Nightingale and Pearson parted company. Pearson left with £710, enough to start a new partnership on more equal terms.²¹

Nightingale and Pearson's mill was built in 1783-4 at a cost of £800, with machinery and stock insured for a conventional £1,000. Like other Arkwright-type buildings, it was a simple, functional 'work box', 113ft x 26ft (55m x 8m) on three storeys with an overshot water wheel at one side surmounting the small but lively Lea Brook, as shown in Fig. 2. Like nearly all other cotton mills of the period, it was designed for a thousand spindles on the model of the Cromford prototypes. In a word, it was pretty much a standard product of the day as numerous entrepreneurs up and down the country imitated the successful Arkwright system. The only significant difference between the mill and numerous rivals, so far as we know, is that Nightingale managed to build at a cost of less than £2 a spindle, which was the lower end of a range varying from £2 to £4 per spindle. The mill was nearly twice as long as the earliest mills, which were more typically 70 x 30ft, suggesting that the partners were ambitious to double the size at an early date, as Arkwright was already doing for the second Cromford, Masson and Bakewell mills.²²

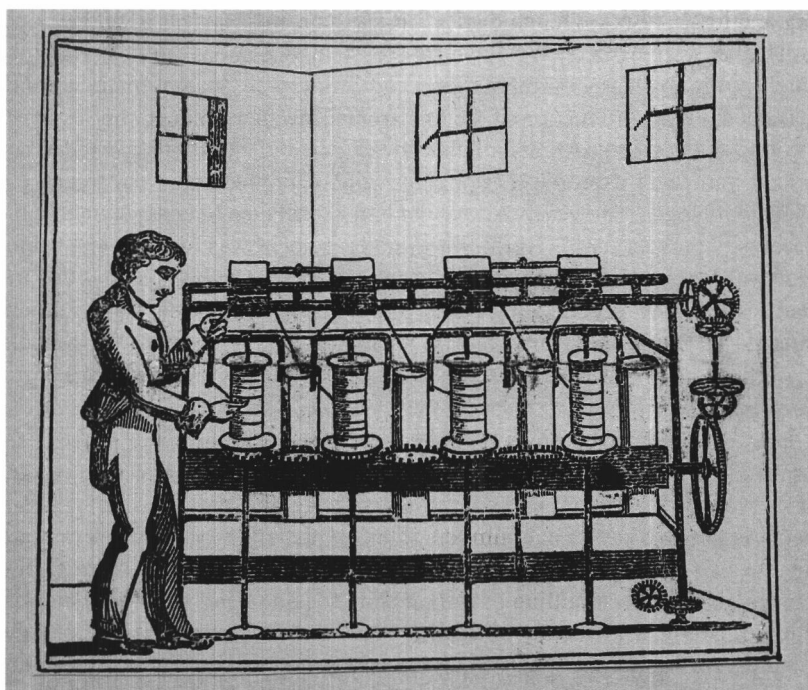


Plate 4: Naïve print, taken from a series showing the cotton industry from raw material to finished goods. The image depicts a man operating a small water frame such as would have been installed in Nightingale's mill building during the fitting out in late 1783, and early 1784. [Reproduced with the permission of the Harris Museum & Art Gallery, Preston]

Meanwhile Nightingale and Pearson built a weaving shop with eleven looms and started a bleaching croft next to their cotton mill, and in the summer of 1784 advertised that 'good callicoe weavers may be employed, and if they have large families, may be accommodated with large houses and have employment for their children' (*Derby Mercury*, 15 July 1784, and 14 Dec 1786). Remarkably, the row of cottages still survives and is shown in their attractive setting in Plate 3. 'Middle Row' is remarkably similar to the houses in North Street, Cromford, with store mullions and pairs of adjacent front doors, each with three rooms, one above the next; it looks as if a local builder was employed for both terraces. Arkwright had set the precedent as always, in this instance advertising for large families to occupy his terraces in North Street, Cromford. Most of the labour force in Arkwright-type mills was children, often carted from work-houses and charities in the south of England, but in this pioneer period of the industry, a cheaper and kinder way of recruiting juvenile labour was used. In November, Nightingale advertised that 'slag smelters wanted at Lea cotton mill'; as there were lead smelting mills all over the Peak District, it looks as if his prime intent was again looking for families to settle. He was still looking to take on 'a few families' in 1787, adding that 'coals and provisions' were 'reasonable' (*Derby Mercury*, 22 March 1787). Certainly there is no evidence to suggest that either Arkwright or Nightingale employed parish apprentices, preferring adult workers with large families.

The choice of calico weaving, as distinct to knitting, may appear a curious one, for the thread (known as warps) spun on Arkwright's system was more suitable for the stocking frame, which is why his early partners, Need and Strutt, were leading merchant hosiers. As Dr Ure explained, 'The introduction of the fine article [machine spun cotton] by Messrs Need & Strutt produced a vast improvement in the stocking manufacture; it superseded completely the hand spun yarn, and it produced stockings which supplemented the thread [i.e. linen] ones previously in vogue.' However, Arkwright himself seemed to be undecided which fabric making process to pursue, for his North Street advertisement was for weavers *or* knitters and the real need was for child labour. The easiest explanation that can be offered is that framework knitting had scarcely advanced beyond Derby in the 1780s and the few frames around Belper were connected to Derby merchant hosiers, notably the Strutt family. The Smedleys were hosiers at Wirksworth at this time but such evidence that we have suggests this was in a very small way of business.²³

In the later decades of the eighteenth century, there was an acute shortage of water-powered sites in all industrial parts of England, not least in Derbyshire. The result was that the best sites were at a premium and even sluggish streams were crowded with mills while their owners fought legal battles over limited water supply. The economic law of scarce means and alternative uses operated, with entrepreneurs switching from less to more profitable uses of water power, as from corn milling or fulling cloth to cotton and worsted spinning.

The little Lea Brook, the tributary of the Derwent that hurried through Nightingale's estate, was less than two miles long but served eight or more works before the end of the century. These included two adjacent corn mills with a wonderful fall of 34ft, making it a choice site. Much as Arkwright had done in Cromford, Nightingale demolished these two mills to commandeer their water for his new cotton mill, for which he excavated one (later two) new reservoirs. The corn mill was then rebuilt in 1794, no doubt on a safer plan. At the lower end of the Lea Brook, a short canal was cut and a wharf built to connect to the Cromford canal and hence to the national transport system. The spinning mill, weaving shed, bleach croft, lead works, corn mill and wharf together made up a major industrial and trading complex, with the adjacent factory colony.

Further evidence of Nightingale's unbounded ambitions at this period can be seen in the introduction of mule spinning at Lea Bridge. The mule (or muslin wheel) was a machine developed to spin finer yarns than could be produced on the basic Arkwright-type water frames; it began its long evolution at Bolton in 1780. James Pilkington noted the 'small manufacture of muslins' at Lea Bridge in his 1789 book when there were still only 27 houses in the small hamlet; it might well have been located in the L-shaped cottages adjacent to the cotton mill, said to have been built in 1783. This venture failed to prosper, most likely because Nightingale could not entice a knowledgeable mechanic from Lancashire to inject some expertise into the new development. In this respect, Arkwright does not appear to have been any more successful, and Richard Arkwright II only secured a place in the new specialism by acquiring a controlling interest in Samuel Oldknow's pioneer mill at Mellor. Yet more ambition is revealed in the building of a hat factory on Nightingale's estate in 1792. A hatter from Stockport (an eighteenth century centre of the industry) called James Daniel was induced to establish a branch enterprise close to the Cromford Canal. Daniel went bankrupt in 1796, but the factory was kept going by other producers for many years, no doubt offering a continuing outlet for the cotton mill close by. Not everything turned to gold by any means, but the overall results looked impressive indeed.²⁴

The corn mills and cotton mills of the eighteenth century were usually built on small lateral streams, for the Derwent, like so many other rivers, could be a raging torrent that was fully capable of sweeping away any property in its path. For this reason, Arkwright built his Cromford mills on the Bonsall Brook and Nightingale on the Lea Brook. There were, of course, textile mills on the Derwent, beginning with the famous Derby Silk Mill (1719-21) and later including Arkwright's Masson mills (1784), but they were rightly recognised as risky sites. Of course, the Derwent was able to generate more power to meet the needs of more ambitious enterprises.²⁵

Peter Nightingale's millwright was Joseph Wass of Mansfield who probably charged less than Arkwright's millwright, James Lowe of Nottingham. Lowe took most of the Midlands' cotton mill business of the period and so was probably able to impose premium charges, at any rate in the boom period in the mid-1780s, when he obtained three guineas (£3.30) a site visit. If the conjecture about Wass is true, he soon proved a false economy, for floods swept away part of Nightingale's new mill and machinery in September 1785 when the banks of his reservoir gave way. The renewed system, which involved two linked reservoirs and a second water wheel to power the extended mill, proved secure. But in 1792 the water supply was so inadequate that a corn mill was demolished and a further stream tapped. Water power technology was still in its infancy in this period and mistakes often made. There was no loss of life in 1786 but Nightingale was so depressed by the set-back that he advertised the whole concern – cotton mill weaving shop, bleaching croft and cottages – for sale, but apparently without success.²⁶

Peter Nightingale's confidence soon recovered from these setbacks, particularly as the first economic crisis in the cotton industry (1788-9) gave way to a renewed boom. In 1791 four cottages known as Middle Row were built; from their size they were probably intended to attract and retain supervisors (the loss of Pearson may have exposed weaknesses in the management hierarchy at the mill, not an unusual feature of the period). Remarkably, the cottages, with one addition, still survive. The next year, the restored mill was extended, supported by another dam and a second water wheel in the mill. Clustered round were cotton picking rooms, a warehouse, stables and a smithy. The total water power could have been as much as 20-30 h.p., implying a plan of up to 2,000 spindles, much like Arkwright's second mill at Cromford.²⁷

We do not know what Pearson was doing for the next four years or so, but in 1789 he reappears as one of a quartet owning a small cotton mill on the River Noe at Brough, near Castleton, in the remote High Peak district of Derbyshire. By this date, cotton mills were beginning to multiply their size, but this small affair was insured for only £1,500. Pearson was still involved in the concern over 50 years later (1841) and also in 1797 in a small mill run by a trio at Castleton. His partner in the second concern was William Newton, who had been a 'machinery carpenter' at Arkwright's Cressbrook mill, a similar background to Pearson's. It looks as if his early exit at Lea Bridge was to do with strategy or personality clash, certainly not with staying power as a mill owner.²⁸

RAPID PROGRESS OF THE EARLY COTTON INDUSTRY

While Nightingale's mill was economically strong enough to maintain its position for 50 years or more after its establishment, it was not in the same league as several early competitors in the Derwent Valley. In 1789, when Nightingale had more than £3,000 invested, Strutt had £26,247 in two large mills in Belper and £11,000 at Makeney and New Mills, making more

than £37,000 in all, a dozen times more than this Lea Bridge upstart. At this date the Evanses had £13,000 invested at Darley Abbey (Derby) while the old Derby Silk Mill, which had cost £29,000 early in the century, was valued at £6,000. Strutt employed 1,600 people while Nightingale would have been no more than 300, most of them, as in other mills, juveniles.²⁹

Strutt's investment advanced by leaps and bounds, from £3,000 for his first mill at Belper in 1779 to £37,000 a decade later. This astonishing rate of growth could take place because the profits of the leading cotton spinners were 200-300% annually for most of the 1780s. Meanwhile, Nightingale's old mill plodded from £2,000 in 1783 to £3,470 in 1835. Evidently, Lea Mills was a feasible investment, but it never came near to fulfilling the dreams of the founding partners. In fact, the mill was already on short time in 1798, and in the early decades of the nineteenth century competition between the innumerable mills was so intense that profits were no more than nominal.³⁰

The early cotton industry saw numerous bankruptcies and a high turnover of firms, even before the end of the eighteenth century, and the difficult trading conditions of the French Wars (1793-1815) made matters even worse. Fortunately for Nightingale, his established interest in lead and large investments sustained him during the long years of war. The opening of the Cromford Canal (1794), in which Nightingale belatedly became a shareholder, opened up land-locked Derbyshire to the growing national transport system. Both lead and cotton benefited, but lead acquired most advantage. Nightingale proudly referred to his own wharf when writing to customers. In a word, it was lead rather than cotton that secured the Nightingale family fortune once again.³¹

Arkwright and Nightingale were both prickly and inconsistent characters so that relations between them were sporadically turbulent. Nevertheless the tensions were nothing like so acrimonious as the February 1785 patent case must suggest. Nightingale was, as we have shown, Arkwright's foremost source of capital in the 1770s, and it seems highly unlikely that he would want to bite the hand that fed him at the critical juncture of development of his industrial empire. The case against Arkwright was scarcely presented, and the view in the Manchester trade was that the Court of Common Pleas action was in some way collusive. Arkwright acquired a great part of his fortune by selling licences to use his patented machines, and the principal aim must have been to persuade droves of illicit mill spinners to legalise their operations. Moreover, it is impossible to conceive that the owner of two-thirds of a cotton mill could be sued for stealing its secrets! In May 1784, Arkwright was awarded 20 guineas (£21) damages and costs against Nightingale for seducing a workman from his employ, but that was a mild rebuke in this period. In any event, Arkwright died in 1791 and his son, Richard II, was more accommodating, having married into the cousinhood of the Derbyshire trading gentry and wealth beyond the dreams of avarice. He sold off nearly all his cotton mills (Masson and Mellor were the outstanding exceptions) to live the life of a rich country gentleman, enjoying life at Willersley Castle out of sight of his industrial past.³²

If Peter Nightingale's financial accommodation of Arkwright was intended to create new harmony in Cromford, it did not succeed for long. Arkwright's single-minded determination over-rode all other considerations, including his relationships with his querulous neighbours. In 1785 it was acknowledged that 'divers disputes and controversies' had erupted when Arkwright had commandeered control of the Cromford Moor Sough by diverting the water from its mouth in Cromford to a new channel to maintain the reservoir that augmented the power of the Bonsall Brook. The additional flow of water was controlled by floodgates and protected by 200 yards of fencing and roofing. It might sound harmless enough, but the

floodgates raised the level of water in the sough, impeding the work (and perhaps threatening the lives) of lead miners at work there. The miners then took the law into their own hands, smashing down the floodgates to lower the water so the water wheels ground to a halt in 1780. Quite possibly it was this protracted quarrel and threat to the future of the Cromford mills that induced Arkwright to pick on Nightingale to sue for infringement of his patents.

The ten sough proprietors, among whom Peter Nightingale was the outstanding local figure, were furious at this threat to their expensive (£30,000) investment, and after long agitation forced Arkwright into arbitration. The adjudicator, John Balguy Esq of Swanwick Hall, decided in favour of the complainants on every point at issue. Arkwright was to pay £300 for repair of the sough immediately and £20pa 'for the privilege of raising the water in the said Sough,' as well as all the costs of the arbitration. The sough proprietors retained the right to remove Arkwright's floodgates. It was a humiliating public defeat for Arkwright, made all the worse by coinciding with the termination of his patent rights following an action brought by the Lancashire manufacturers. The consolation was that the newly-built and vastly more powerful Masson Mill diminished the importance of the two original Cromford cotton mills. And Arkwright was already so rich that the prescribed penalties were of little consequence to him.³³ Nightingale was being rapidly outpaced, for Arkwright was even more cunning as an entrepreneur than the boldest interpreters have discerned.

The evidence of the surviving Nightingale letter book is that business and social relationships gradually became closer in this period. Nightingale regularly refers to his following Arkwright's cotton price list, even though Richard II was no longer market leader in the way that his father had been in the pioneer years. He maintained an active account at Toplis & Co's bank at Wirksworth and kept a personal relationship with the managing partner, John Toplis. And we see him dining with Richard II and his brother-in-law, Samuel Simpson, who was emerging as a cotton mill owner on an unprecedented scale in Manchester. The whirlwind of the Arkwright boom years was drawing to a close and something of the old fraternal spirit of the cousinhood of the Derbyshire gentry was already re-establishing itself.³⁴

LATER FINANCIAL ASPECTS

The irony of Nightingale's textile business is that he must have made more money out of mortgages and loans to Arkwright than in spinning cotton and weaving calicoes. The land in and around Cromford was originally very cheap because of industrial dereliction left by many generations' exploitation of the land for lead mining. Consequently, when Arkwright moved from Nottingham to Cromford in 1771, he was able to take a 21-year lease of an old calamine works on the Bonsall Brook for a mere £11 p.a., which implies a capital value of £220 for the site. A map of the period labels much of the land between Cromford village and the Derwent Bridge as 'waste', and we know the hills around were littered with the debris of innumerable old mine workings and denuded of timber for fuel for smelting. When the Lascelles family of Harewood House (Yorkshire) sold the Willersley Estate in 1778, less than 4% (ten out of 260 acres) was cultivated land. The Derwent valley as we see it today is the result of Richard Arkwright II's planting of 30,000 trees which have reached splendid maturity, and not its mining dereliction.³⁵

Nightingale's appointment as High Sheriff of Derbyshire (1769-70) suggests that he was already recognised as a wealthy member of the gentry, for it required a substantial private income to support the office. Financial impregnability was also suggested by his close

connection with William Shore, the Sheffield banker whose son was his nominated heir. Nightingale's letter book (1794-6) discloses his involvement in some financial deals of his own, but this should be taken as a matter of opportunism, rather than necessity. Nightingale's financial standing was seldom in any doubt, but data is not available until after his death. In 1810, when his heir, W.E. Shore, reached his majority and was about to inherit, Nightingale's gross assets still exceeded well over £100,000. This sum comprised mortgages, bonds, bills and other securities almost £85,000, industrial interests (cotton mill, lead works, etc) over £15,000, and bank stock (safe investments) at a nominal £13,000 (in fact worth nearer £20,000). In other words, much the largest part of his wealth lay in his financial activities and only 10-15% in industrial property.³⁶

From Peter Nightingale's death in 1803 to the coming of age of his chosen heir, W.E. Shore in 1815, the whole of his assets, including the Lea Bridge cotton mill, were in the trusteeship of William Shore, the Sheffield banker. Evidently Shore senior was not comfortable with administering unfamiliar assets from a distance; he went into partnership with John Alsop, the Lea lead merchant, but admitted to him in 1814 that the whole of the business had 'been truly painful'. Two £10,000 loans were raised with Arkwright, Toplis & Co, the Wirksworth bankers, to bridge the gap between outgoings and delayed income; one was still outstanding in 1815 as young Shore prepared to assume control; meanwhile Shore senior refused to involve his own bank. Alsop's business experience was in lead and he could have had little notion of the quite different cotton trade, where prices were sliding as the Napoleonic War drew to a close. Nightingale had maintained that the mill generated over £300 p.a. profit (ten per cent or more on his investment) but by 1814 it had lost nearly £2,000. Disposal of this asset was urgent by the time the inexperienced Shore changed his name to W.E. Nightingale (Chart 2). There was some talk of acquiring the 'Bonsall manufactory' (presumably John Smedley's struggling knitting enterprise) but in the event the takeover roles were reversed when the next generation Smedley took over his family business and arrested its decline.³⁷

The final evidence of Nightingale's record as a textile entrepreneur is the inventory of cotton mill machinery bought by John Smedley in 1818. By this time there were almost 2,400 spindles in two rooms, which more than doubled the original capacity within 34 years. But the record is less than impressive, for Nightingale's former partner, Benjamin Pearson, had twice as much capital invested in machinery in his cotton mill at Brough; doubtless he had kept more up-to-date. The lease of the cotton mill stipulated that the existing machinery was to be retained after Nightingale's demise (1803). Further growth at Lea was probably limited by the water power available. The smallest spinning frames sold (six of 96 spindles each) probably belonged to the earliest years of Lea Mill, but there is no need to assume they were obsolescent by 1818. A pioneer textbook, James Montgomery's *Theory and Practice of Cotton Spinning* (Glasgow 1836), maintained that the machines 'that were constructed under the auspices of Arkwright himself were brought to a very high state of improvement, and those that have generally been used since his time are constructed upon the very same principle' (p.145).

Dr Andrew Ure's monumental study of *The Cotton Manufacture of Great Britain* (2 vols., 1836) maintains the same theme, calling attention to the fact that half a century after the earliest spinning frames were built at Cromford and Belper, several were still spinning good yarn. This could be taken to imply that the technology reached a high plateau about 1780 and no very significant improvements were made after that time, so that Nightingale's 1818 inventory was as good as it was when his plant was completed in 1785. Such an interpretation

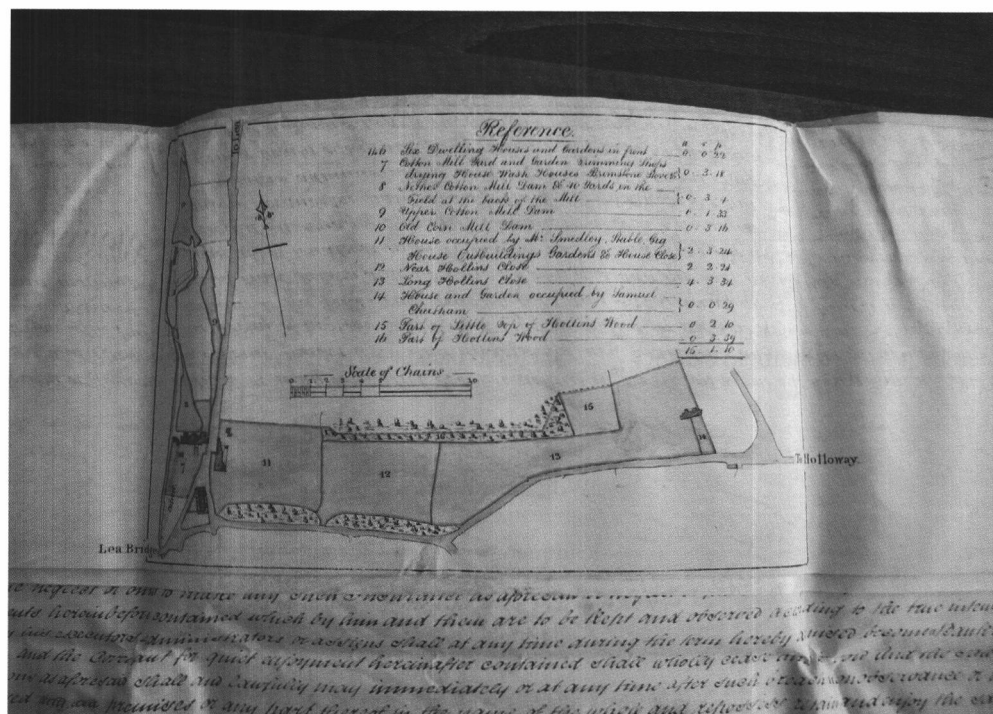


Plate 5: There are no known 18th century plans of the mill. Leased from the Nightingale estate in 1818 by John Smedley, a number of new buildings were added (and the Nether Mill Pond removed) as the century progressed. This plan is attached to a Lease dated 1842 and shows a layout broadly similar to the complex as it was at Nightingale's death in 1803. [Reproduced with the permission of the Derbyshire Record Office. D/1575/10/4]

is too simple. Arkwright's factory system challenged two generations of mechanics to make improvements, particularly in simplifying the movements, minimising friction, and reducing the power needed to drive these cumbrous mechanisms, as Ure conceded elsewhere in his book. Before the end of the eighteenth century, water frames were already two-and-a-half times as productive as when Arkwright 'perfected' them about 1780. Economy of power was not of critical concern to the few mills on major rivers (Derby, Darley Abbey, Milford, Masson, Bakewell, Calver etc.) that had almost unlimited supplies of power, but to the more numerous mills on lateral streams with limited power it could be a matter of life and death for the business. In the case of Lea Bridge, it appears that the 20-30h.p. generating only 2,000 to 3,000 spindles required improved technology for long-term survival. In other words, Nightingale's failure to keep pace with technical advances must have threatened the future of Lea Mill. No doubt this was the real reason why his successors wanted to sell it.³⁸

There were two or three ways in which a cotton mill owner might expand the scale of his business in Nightingale's time. One was to acquire more water power sites and replicate his first factory, as Arkwright had done. Another was to move into mule spinning, building a plant for the finest (and more remunerative) yarns, as Montgomery demonstrated in his book. In practice, mule spinning was a Lancashire technology based in Bolton, in which the

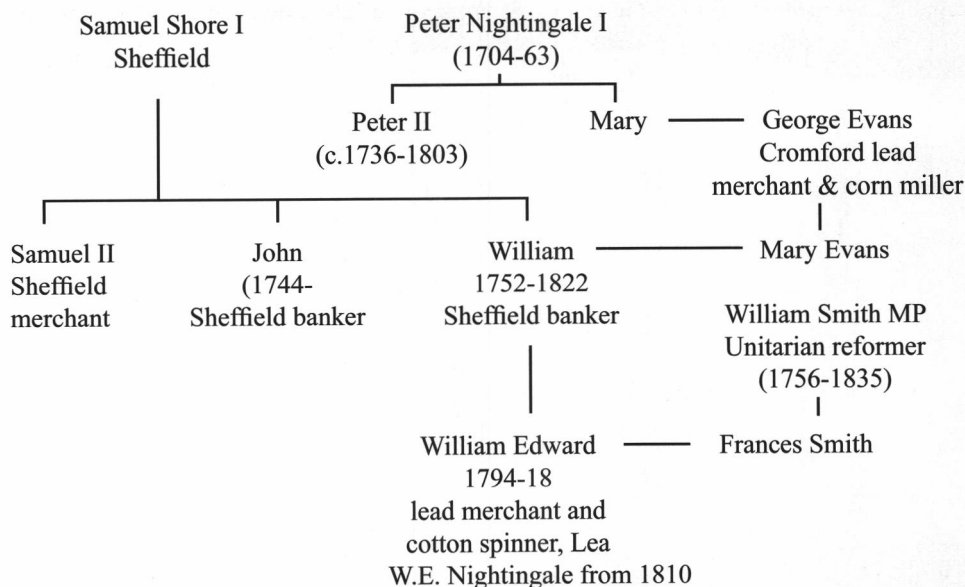


Fig. 4: Chart showing prominent members of the Shore family.

This chart follows on from Chart 1, above, featuring the Nightingale family. It shows how Peter Nightingale's fortune and estates came to be left to his niece Mary's young son, W.E. Shore.

Sources: Derbys R.O., Nightingale mss, D1575/36/66. Burke's *Gentry* (1900); P. Riden ed., *Derbyshire Directories 1781-1824* (2006); Willersley Castle mss (for Evans). *DNB* L111 for William Smith MP.

Derwent Valley entrepreneurs showed no sustained interest, preferring to exploit their copious water power sites to make cheap yarns. The third way was to use a superior water power site or steam power in large multi-storied mills to create economies of scale, as described in Andrew Ure's study. There were some impressive factories of this kind in the Derwent Valley, notably at Calver (Gardom, Pares & Co), Matlock Bath (Arkwright's Masson Mill), Belper (Strutt's mills) and Darley Abbey (Evans's mills) whose river situations gave them a competitive edge through the nineteenth century. But few Derwent Valley locations enjoyed this large capacity, so their growth was constricted. The Lea Bridge mill clearly fits into this bracket. Consequently Nightingale maintained his mill as a component of what we may call a cluster enterprise which included agriculture, corn milling, mining, transport (wharfage), and bleaching, as well as cotton spinning. The only problem was that the small cotton mill struggled to compete with the large multi-storey factories, which no doubt explains why it was the first component to be detached for sale. The role of the Smedleys of Wirksworth in resurrecting the languishing concern forms the subject matter of a forthcoming article.

This assessment might appear grudging, marking down Nightingale to be some sort of entrepreneurial mediocrity, until the context is taken more fully into account. Quite frankly, most of the cotton mill concerns of the age of Arkwright were failures one way or another. Many of the mills burned down (the Sun Fire Office, that insured the largest part of them, lost huge sums of money) or washed away in floods, while numerous partnerships went bankrupt or were simply given up as the investors went off to lament their losses. Even mills on prime sites lost money; in Derbyshire (just to take a local example) Samuel Oldknow's famous multi-storey mill at Mellor was only saved from financial disaster by the wealth of Richard Arkwright II.³⁹ It is difficult to identify any middle-ranking mill enterprises that lasted a generation, either in Derbyshire or beyond. In a word, Nightingale's mill was the great survivor; its owner's strategy may have appeared conventional, but it stayed the course while all around collapsed or simply disappeared. It may appear a dull legacy, but survival through testing times was (and remains) no mean achievement.

If Arkwright was the father of the factory system in textiles, Nightingale must be counted its midwife, delivering it to vigorous young life not so long after its conception. The roles of Arkwright's earlier partners, Smalley (the Preston publican), Wright (the Nottingham banker), Need and Strutt (the merchant hosiers) are well documented, so much so that the abundance of evidence has been allowed to bias the story. Their actual contributions were modest: Smalley lacked adequate capital to stay long with the project and meet Arkwright's aspirations, Wright was only accommodating for a few months, Need was sceptical and impatient, Strutt soon tired of Arkwright's warring behaviour and went his own way at Belper. The Scottish partners were bolder and more affluent, but by the time Arkwright moved north in 1785 his real problems were already over.⁴⁰ The drama of Arkwright's astonishing business career needs to be rewritten to place Nightingale, so long seen as a peripheral figure, where he belongs, that is at the very centre of the action. His own cotton mill may have been just one among many, but his financial role sets him apart as the key player.

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ILLUSTRATIONS

A view of the principal elevation of Lea Hall, Nightingale's home. Originally a farmhouse, Peter Nightingale extended the building and added the impressive frontage in the mid-18th century. Clearly a man of substance and standing in the locality, Nightingale later removed to a house that he built near Cromford Bridge. [Photo: Jane Middleton-Smith]

Cross-section and floor plan of Nightingale's Cotton Mill at Lea Bridge, as it would have been c1785. [Courtesy of Dr Patrick Strange]

Views of cottages in North Street, Cromford. Built by Arkwright, but funded by Nightingale, North Street is generally recognised as the first of Arkwright's housing developments. The close-up shows one of the cottages with the workroom windows on the top floor. [Photo: Jane Middleton-Smith]

Three-storey cottages built by Peter Nightingale in December 1783 as part of the mill complex. The layout is typical of 18th century industrial accommodation, although the southernmost cottage has a front door to the side of the row. The northernmost cottage (to the right of the image) is a later addition. [Photo: Jane Middleton-Smith]

Naïve print, taken from a series showing the cotton industry from raw material to finished goods. The image depicts a man operating a small water frame such as would have been installed in Nightingale's mill building during the fitting out in late 1783, early 1784. [Reproduced with the permission of the Harris Museum & Art Gallery, Preston]

There are no known 18th century plans of the mill. Leased from the Nightingale estate in 1818 by John Smedley, a number of new buildings were added [and the Nether Mill Pond removed] as the century progressed. This plan is attached to a Lease dated 1842 and shows a layout broadly similar to the complex as it was at Nightingale's death in 1803. [Reproduced with the permission of the Derbyshire Record Office. D/1575/10/4]