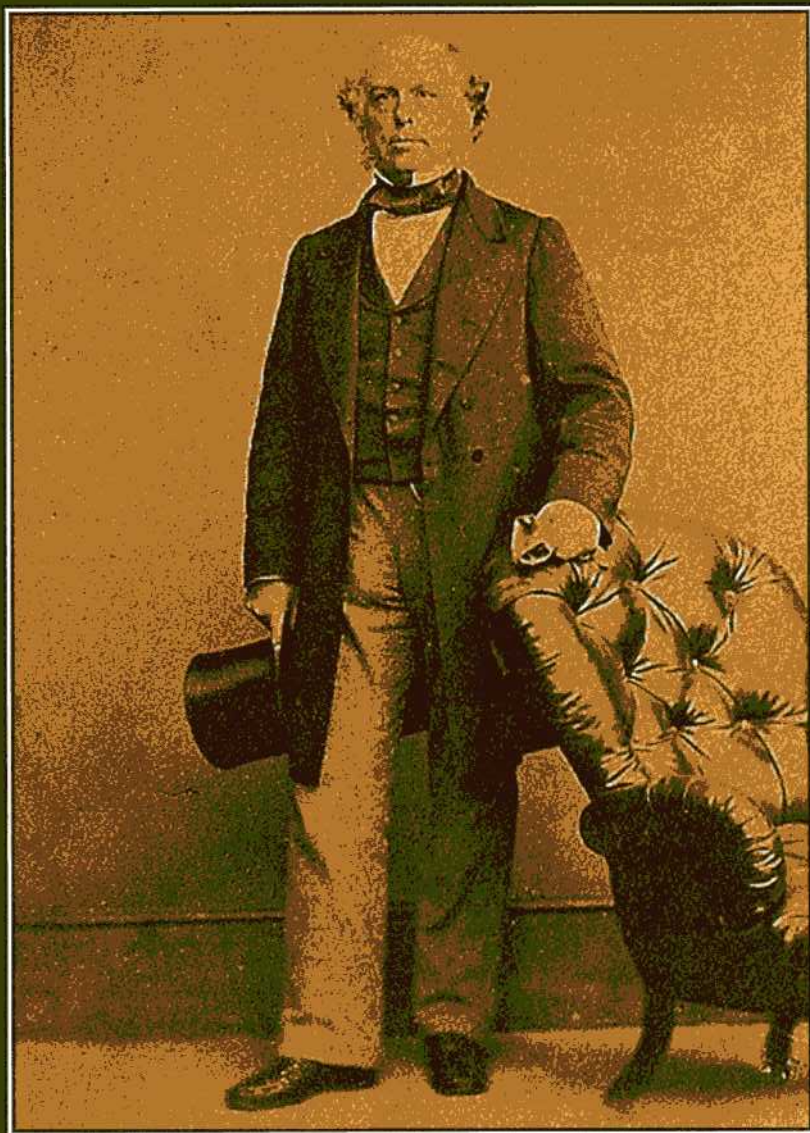




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Front : George Giles in 1850, the year he first left Lincoln to go to France. Photograph taken in London by H Lenthall, Regent St. (By courtesy of Edward Giles) (see pp 538–550).

Back : The aqueduct at Maintenon, southwest of Paris, built between 1685 and 1695 but never completed (see pp 590–1). © W P Featherstone

George Giles, MICE, 1810–1877 : the biography of a civil engineer

Dennis R Mills

George Giles was not of the front rank of engineers along with names such as Bazalgette, Brunel, Peto, Rennie and Stephenson, but the evidence suggests that he was nevertheless a very competent and successful engineer. His career exemplifies four general points, the first being the early nineteenth-century overlap between the surveying and engineering professions; the second the considerable importance of family connections; the third Giles' fulfilment of different roles; and fourthly the fact that many British engineers worked abroad for long periods, this being the age when Britain led the world in such matters.

Giles' parents were Peter and Elizabeth (née Hone) and he was born at Hersham Farm in Walton-on-Thames parish, Surrey, in 1810 (Table 1). His father's occupation is problematical as the sources are rather discordant, but the address Hersham Farm suggests that Peter Giles was a farmer, as well as being parish clerk of Walton-on-Thames, the description 'clerk' occurring in several documents including George's marriage certificate.¹

Netlam Giles, an older brother of Peter, appears to have been the first member of the family to engage in surveying or engineering work, having been a pupil of the well-known John Rennie senior (1761–1821). By the late eighteenth century Netlam had started his own firm and in 1803 his brother Francis John became his pupil, and it was Francis who in 1816 took over the leadership of the firm on Netlam's early death. In turn, Francis John trained his nephews, the brothers George (our man) and Francis, as engineers, and also his own sons, Francis George and Alfred, the latter becoming President of the Institution of Civil Engineers in 1895. In addition, Francis John was involved in the training of William Lindley and the future Sir John Rennie (son of John Rennie). The firm specialised in civil engineering surveying, and carried out a great deal of canal, river and harbour work in the early years of the nineteenth century, including work for Rennie senior at Boston in 1811 and 1822, followed by railway projects from 1828. In the latter context especially, the firm crossed the vague boundary between surveying and engineering. There were six surveyors and engineers

in the Giles family in George's generation or earlier (Tables 1 and 2).

Early work in England

After his training George worked as an engineering surveyor on the route of the London & Southampton Railway, the Act for which was obtained in 1834. When the works began, he carried out most of the design and construction of the Winchester–Southampton section as resident engineer. He was then employed by the contractors McIntosh and Betts to build the viaduct carrying the Midland Counties Railway over the River Avon at Rugby and four miles of track, where the work was probably completed in 1839. Giles married Elizabeth Betts, the daughter of William Betts, whose son Edward went into partnership with Peto (see below).

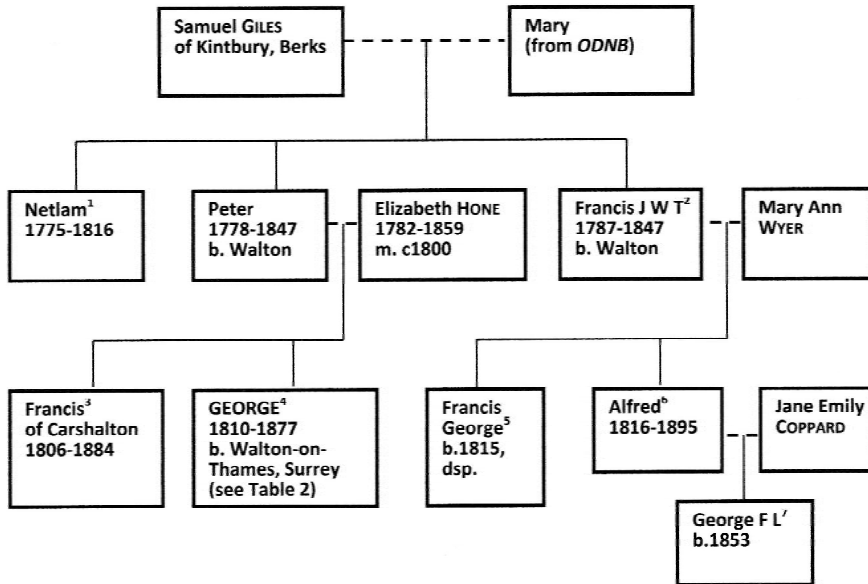
Hamburg

In 1831 the Lübeck merchant, Emil Müller, proposed a railway from that city to Hamburg. He travelled to London in 1833 to recruit investors and engineers, including Francis John Giles, George's uncle, who was appointed senior engineer. However, the survey prepared by Giles would have required the line to cross Danish territory and the king of Denmark withheld consent. The Lübeck proposal was therefore dropped and replaced with a railway from Hamburg to Berlin. William Lindley, who was already in post as the city-state's consulting engineer, was appointed to survey the line. He had been trained by Francis Giles and had worked on the London & Southampton Railway with George Giles. Lindley started work on his survey in 1838 and in 1839 George Giles became resident engineer in Hamburg under him. The railway was opened as far as Bergedorf in 1842.²

As Martin Kinzinger has noted, Lindley and Giles carried out several important contracts in Hamburg:

They designed not only the sewers of the new town centre in Hamburg and the first railway [to Bergedorf, about 9 miles, Figs 1, 2], but also drained the Hammerbrook, low marshes east of the town centre which were used for the first large scale planning scheme in Hamburg, a commercial/

Table 1. George Giles' birth family (simplified)



Notes

1. Netlam trained his brother, Francis John William Thomas
2. Francis John W T trained his sons Francis George and Alfred, and his nephews Francis of Carshalton and **George**. His *ODNB* entry includes Netlam.
3. *Aeg* gives him as MICE and posts including with Peto. Trained by his uncle Francis.
4. **George Giles**, trained by his uncle Francis.
5. Francis George (*ODNB*). Trained by his father, Francis J W T.
6. *Aeg.* records him as resident engineer, Southampton docks for 54 years and President of the ICE, 1892-93. Trained by his father, Francis J W T.
7. *Aeg.* records him as MICE and FGS, chief engineer, Belfast harbour.

Sources

ODNB. Oxford Dictionary of National Biography

Aeg. Aegidiana; or, Gleanings among Gilesees at Home and Abroad (priv. print., 1910). (By courtesy of Edward Giles)

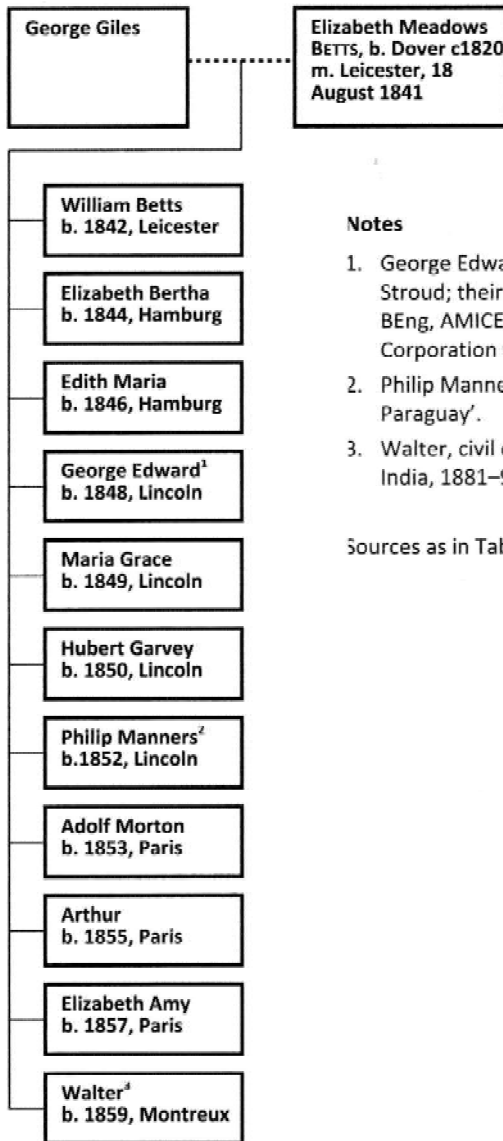
P S M Cross-Rudkin et al. (eds), *Biographical Dictionary of Civil Engineers in Great Britain, vol. 2, 1830-1890* (Thomas Telford, 2008) (article on the Giles family by Mike Chrimes)

industrial area near the harbour ... For a while Giles (as well as Lindley) had his own contract with the Hamburg authorities. He detailed the plans and supervised their execution whilst Lindley was away in England. At the symposium in October 2008 we discussed how the relationship of Lindley and Giles with the authorities could be described. Was it a traditional

scheme of individual engineers or was it an early engineering company? Giles switched between the roles of resident engineer and contractor, as the junior partner to Lindley in the first instance, and possibly also in the second.³

Just as the Hamburg to Bergedorf line was finished in 1842, the great fire of Hamburg destroyed a large

Table 2. George Giles' conjugal family (simplified)



Notes

1. George Edward, a solicitor at Nuneaton, m. Emily Stroud; their son, Humphrey Noel, b. 1880, was BSc, BEng, AMICE, resident engineer, Liverpool Corporation waterworks, d. 1963.
2. Philip Manners was 'employed in making a railway in Paraguay'.
3. Walter, civil engineer, Public Works Department, India, 1881–96

Sources as in Table 1.

part of the city and Giles' railway was first used to carry into the country hundreds of poor families left shelterless. Lindley and Giles volunteered to stop the progress of the fire by blowing up houses across its track. They nearly lost their lives from the 'fury of the mob', which at first misunderstood

their tactics. Lindley and Giles each received a vote of thanks from the Senate, with an order and a medal, the latter cast from the metal of bells from the four churches destroyed in the fire.

Giles's departure from Hamburg in December 1846 was reported in a Hamburg newspaper. A translation



Fig 1. Artist's impression of the Hamburg train shed opened 1842, from a contemporary montage. (Hermann Wilhelm Soltau, Lindley Album, 1852 (Frankfurt a M, 1900). (By courtesy of Martin Kinzinger)

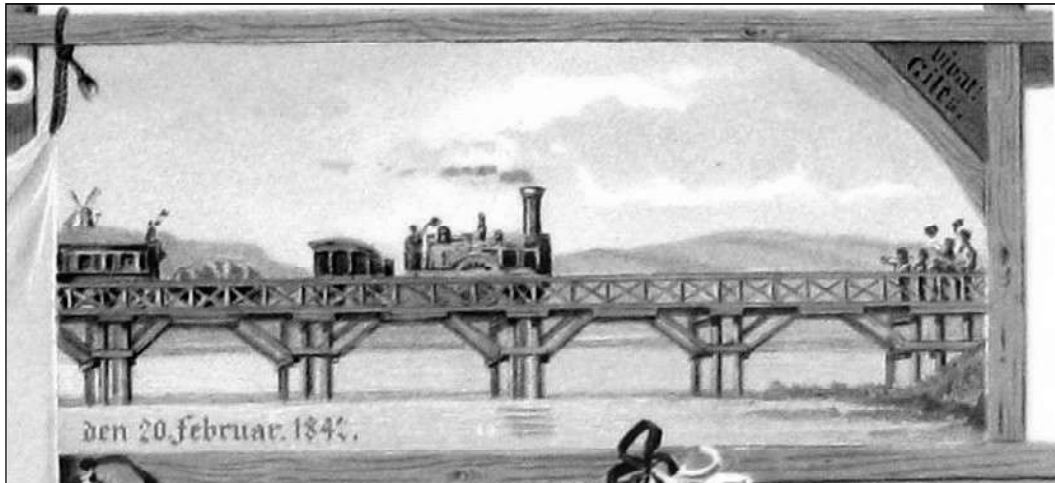


Fig 2. Impression of the first train journey in Hamburg, 20 February 1842. In the right-hand top corner are the words 'Vivat Giles' ['Long live Giles'] (Hermann Wilhelm Soltau, Lindley Album, 1852 (Frankfurt a M, 1900). (By courtesy of Martin Kinzinger)

appeared in the *Civil Engineer and Architect's Journal* the following year. He had been

... actively engaged in constructing the Hamburg–Bergedorf railway, the new sewage and water works, the navigation locks, canals, bridges, etc... On the 14 December a large meeting of senators, members of the board of works and board of exchequer, the directors of the Hamburg–Bergedorf railway (etc.) invited Mr Giles to a grand dinner at Streit's Hotel, on which occasion they presented him with a handsome piece of plate, and an address testifying their 'high appreciation of his professional and private worth, expressing at the

same time their deep regret at his retirement from them'.⁴

His return to England was for personal reasons, perhaps owing to illnesses suffered by his father, Peter Giles, and his uncle Francis John, who both died in 1847.

Lincoln

The writer's interest in Giles' work arose out of finding in Lincoln Central Library a copy of his printed report to the city council in 1849 on the subject of

sanitary improvements. Bound with the report is his manuscript plan on a scale of 20 inches to the mile (1:3,168) showing his proposal for a complete system of underground sewerage (samples in Fig 8).⁵

Giles' original reason for being in Lincoln was the construction of the Great Northern Railway (GNR) 'Loop Line' from Peterborough to Gainsborough via Boston and Lincoln. The earliest record of him in the city is in March 1847 when he was listed in the St Martin's parish rate book as the occupant of Hilton House, a distinguished Georgian building. At this time he was working on a railway bridge on the Midland Railway near Stamford some distance away to the south. Hilton House is associated with the well-known artists Peter De Wint and his brother-in-law William Hilton, RA, De Wint having been the occupier immediately ahead of Giles. Although the latter did not own this very substantial house, occupying it put him socially on a par with the most successful businessmen in Lincoln.⁶

In 1841 Giles had returned to England to marry Elizabeth Meadows Betts. The ceremony took place at Leicester on 18 August. She was the daughter of William Betts, the public works contractor (of the McIntosh and Betts partnership, which had employed Giles in the 1830s). This family connection became important in 1847, as Elizabeth's brother, Edward

Ladd Betts, had established a partnership with (Sir) Samuel Morton Peto, whose sister Ann had married Betts in 1843 (Table 3). The firm of Peto and Betts had the contract for the whole of the GNR 'Loop Line'. Giles worked as contractor's agent, therefore, for his brother-in-law Betts, whilst the latter was in partnership with his other brother-in-law Peto! The line was opened between Peterborough and Lincoln in October 1848, and a single track between Lincoln and Gainsborough in April 1849.

It has not been possible to pin down exactly the geographical extent of Giles' responsibilities, but it seems likely that they were not as extensive as could be implied from his obituary, which states: 'In 1847 he had charge of the execution of works on the Great Northern Railway between Gainsborough and Peterborough'. The distance between these towns down the track was 78 miles, with about 48 miles of this between Gainsborough and Boston, the section for which it seems likely that Giles was responsible. Lincoln is much nearer to Gainsborough (18 miles) than to Boston (30 miles), but the Lincoln-Boston stretch contained no town, only villages, mostly small ones. Lincoln, then a city of about 17,000 people, was a good location for Giles' base. Especially in the early period before his temporary way was available to travel on, Giles could have moved up and down

the Lincoln-Boston stretch by the packet boats plying along the River Witham, on whose bank for the most part the line was constructed.

Some of the difficulties faced by Giles in his railway work can be illustrated by the Durham Ox crossing in Lincoln, where the turnpike, new in 1843, crossed not only his line but also the Manchester Sheffield & Lincolnshire line on its way to Market Rasen and Grimsby (Fig 4). This crossing was to cause immeasurable congestion and annoyance as the traffic built up and the turnpike (now the A15) became lined by foundries and

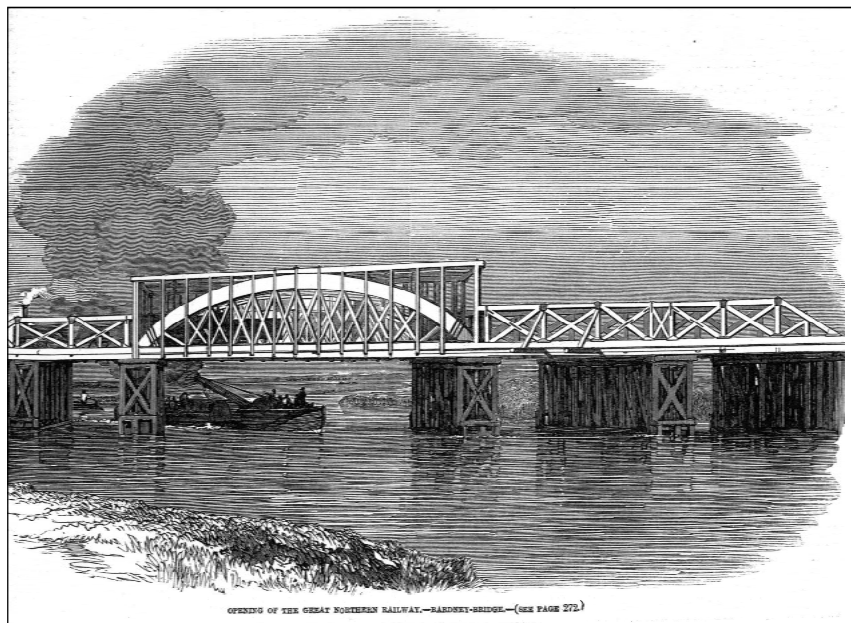
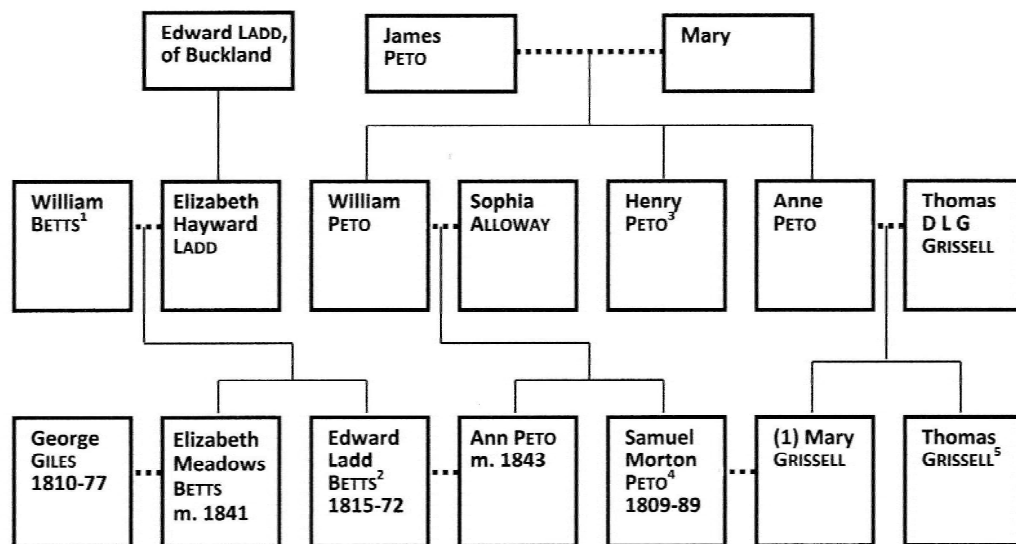


Fig 3. Bardney Bridge carrying the GNR over the River Witham at the junction of the new and old rivers, about 10 miles southeast of Lincoln (Illustrated London News, 28 October 1848)

Table 3. George Giles' significant marriage connections (simplified)



Notes

1. William Betts, contractor or contractor's agent
2. Edward Ladd Betts, railway contractor but apprenticed to a builder in Lincoln called Richardson.
3. Henry Peto, builder and contractor, unmarried, left his business to Samuel Morton Peto and Thomas Grissell.
4. (Sir) Samuel Morton Peto, civil engineer and railway contractor, rebuilt Houses of Parliament.
5. Thomas Grissell, in partnership with S M Peto and E L Betts

Sources

ODNB. *Oxford Dictionary of National Biography* sub Edward Ladd Betts, Henry Peto, Samuel Morton Peto

streets of workpeople's houses. Foreseeing some such possibility, Giles attempted to ameliorate the situation created by the designers of the Loop Line and those drafting the enabling Act. There was nothing he could do about the intersection of the lines or the need to shunt trains over the crossing, first west-east from the GNR station, with trains then returning to another platform.

However, he proposed a better fit with smaller gates which could be opened and closed more quickly by reducing the distance between the highway boundaries, but leaving the paved road as it was. He suggested this to the turnpike trust, no doubt through the medium of the their surveyor, J S Padley, whose plans had formed the basis of Giles' surveying work. However, the vestry of St Mark's parish, in whose territory the crossing was situated, got wind of this and put a stop to the matter. They

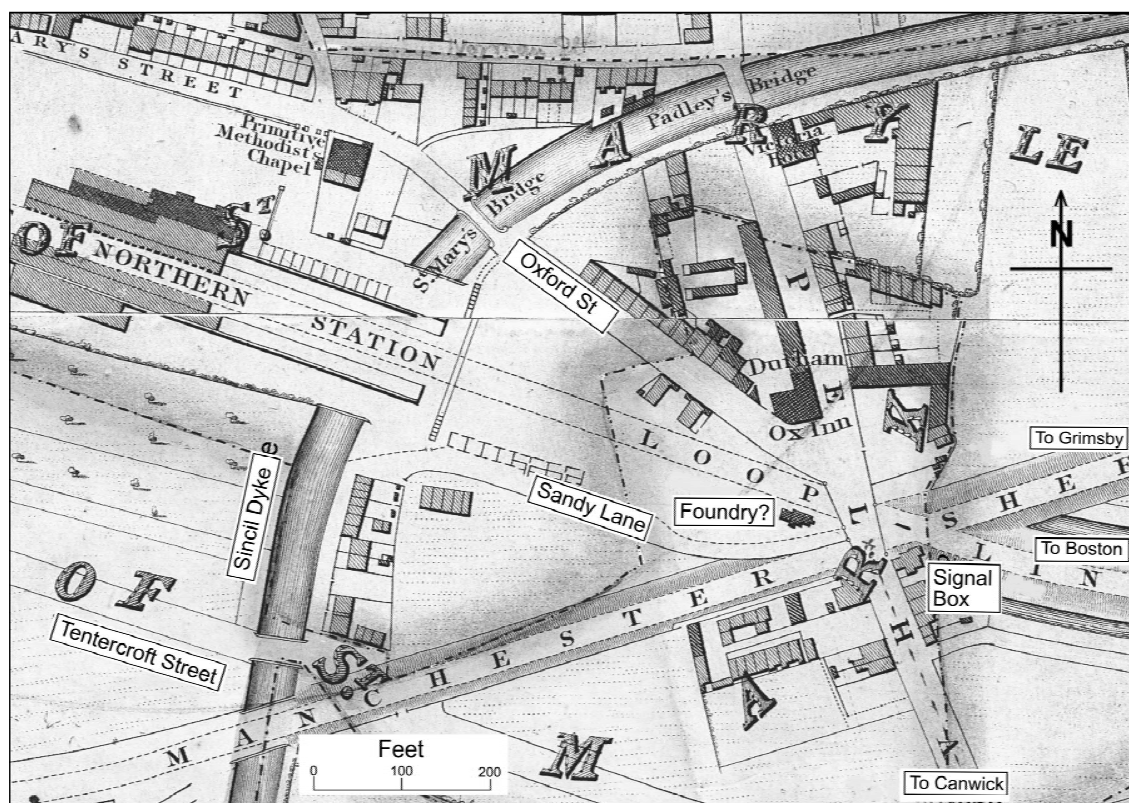


Fig 4. The new turnpike road of which Pelham Street was part was opened in 1843. William Fisher built the Durham Ox Inn the following year at the junction of the turnpike and Oxford Street, connecting it with the city centre. Opposite the inn Giles constructed the Loop Line in 1847–48, also building a foundry in the vicinity for the production of metal parts for the permanent way, which may have been located as indicated. This building is not shown on Padley’s 1842 plan and had disappeared before his 1883 edition. Not to scale. (James Sandby Padley, 20 inch to the mile plan of Lincoln (1851)). See also D R Mills and R C Wheeler (eds.), *Historic Town Plans of Lincoln, 1610–1920* (Lincoln: Lincoln Record Society, 2004)

had residents in Sandy Lane who were partially cut off from the city centre by the Loop Line. The vestry resisted the closing of the lane by two western crossing gates that actually met in the middle of it when trains were passing. Instead, the exit from Sandy Lane was left unprotected. Lincoln was saddled with this problem until 1958 – the eastern gates overlapped when open to road traffic but the reverse applied to the western gates, both features making them cumbersome and the employment of three or four gatekeepers necessary.⁷ In 1958 the Pelham (Street) Bridge over the crossing was opened, but it was many years later, when new signalling was installed, that the shunting points were moved to a position inside the station.

With his railway work running down, Giles was able to work on the Lincoln West Drainage in the early part of 1849, a system established about 50 years before to drain a large area of low-lying agricultural land west of the city (Fig 5). A report on its state and what should be done about it was commissioned from Giles by the trustees on 17 January 1849. He produced a longitudinal profile from the start of the West Drainage North District Main Drain in North Carlton Lowfields on the northwest side of the city, thence along the Foss Dyke (canal) to Lincoln. It carried on through the city eastwards down the South Delph (a drain supplementing the lower Witham) to Horsley Deepes near Bardney. Altogether this is was a distance of 1,170 chains or 14.625 miles, with transverse sections

every quarter mile. It must have been a tedious job, but in this area it was important to establish gradients with considerable accuracy.⁸

Giles' report suggested enlarging the tunnel where most of the West Drainage water went *under* the upper Witham to enter water-courses by-passing the city centre. Alternatively Giles suggested that a steam engine could be used. Objections came to both alternatives from the Witham Drainage Commissioners and from the landowners above Lincoln acting through the Lincoln Court of Sewers, so nothing was done apart from cleaning out the existing drains. As this decision was taken on 16 February 1849, the outcome would have enabled Giles to give most of his time in the summer of 1849 to the sewerage report which he submitted to the city sanitary committee in September. Neither of these large pieces of work is mentioned in Giles' 'official' obituary, presumably because they did not lead to actual engineering projects.

Nevertheless, the sewerage report was a very important piece of work in the context of Lincoln's struggle to improve its sanitary condition and it is possible to learn from it a great deal about sewerage engineering at this date.

Lincoln sewerage report

In December 1848 Giles received a commission from the city sanitary committee to be their consulting engineer 'to examine the existing state of drainage in the City of Lincoln; also to report on, and estimate the

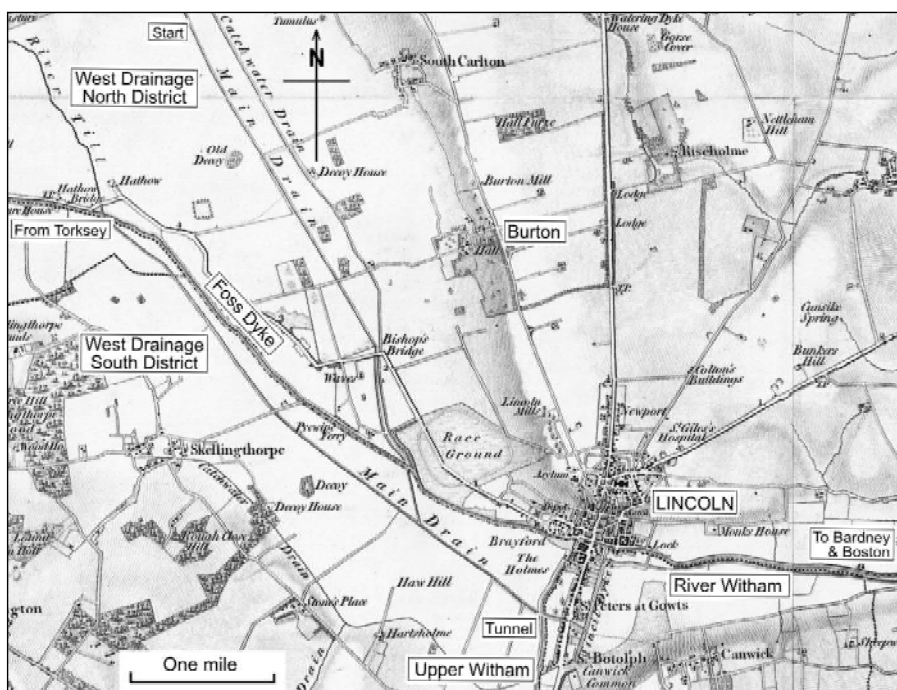


Fig 5. Lincoln area showing the West Drainage (from OS 1 inch Old Series, 1820 survey). Distance on Foss Dyke from Lincoln to the Trent at Torksey approximately 11 miles; to Bardney on the River Witham approximately 9 miles; to Boston approximately 30 miles. 'Start' in NW corner of map indicates the start of Giles' longitudinal profile on the Main Drain of the North district. 'Tunnel' on the Main Drain SSW of Lincoln marks the tunnel under the Upper Witham. Not to scale. The map shows part of the course of the Witham from Lincoln to Boston and part of the Foss Dyke towards Gainsborough, both of which were followed by Giles' stretch of the GNR.

cost of, carrying out a system of underground sewerage thereat', as he wrote at the head of his report. The first part amounted to 9,000 words, describing the physical geography of the city and the surface and house drainage in considerable detail. A large proportion of the surface drains proceeded down the streets on the scarp slope below the cathedral towards the River Witham and the Brayford Pool. Most of them passed into covered drains for the last 100–200 yards to reach their outfalls through densely built-up areas. A certain amount of slops and household waste was directly deposited to join the rain water, and more 'nuisances' were caused by foul water seeping into the open channels. This was usually derived from overflowing cesspits, or from those in the limestone which leaked 'secretly' downwards, the foul water emerging when the clay horizon was reached. Giles then moved on to the details of house drainage,

street by street, also mentioning many of the closed courts, over 100 in number, with their attendant pigsties, manure heaps, wells and dust holes (ash pits).

The second part of the report contained Giles' proposals and was relatively short at 3,000 words, but was, in effect, an explanation of his two plans, one at 40 inches to the mile, the other at 20 inches, both of which survive (Figs 6 and 7). His proposals were much influenced by Lindley's methods in Hamburg. Giles boldly suggested a comprehensive system of underground drainage, maximising the momentum created by routes down the steep slopes, in order to reach a sewage depot at the lowest part of the city with the minimum of pumping. He proposed to keep the drainage of foul water separate from that of rain water, regarding the existing system adequate for the latter. The latest innovations would have included: firstly, much deeper sewers than was traditional but with the smaller dimensions made possible by egg-shaped cross sections (Fig 8);

secondly, the use of pipes rather than brick for sewers of the smallest dimensions; and thirdly, curving, rather than right-angled corners, with tangential junctions. There would have been about 50 flushing stations, taking water from the natural watercourses, and from the recently installed pipes of the Lincoln Water Company. He did not mention manholes and these did not appear elsewhere for a few more years.

This would have been a state-of-the-art system, but correspondingly expensive at an estimated £30,000. The city council probably contained a clear majority of members in favour of adoption, provided they could carry the public with them, but the small ratepayers were immediately hostile in the face of such an immense expense, despite the city being able to sell off property and to raise a Treasury loan that could have been paid off over 30 years. There were two riotous public meetings in the Corn Exchange in January and May 1850 and despite several later initiatives it was not until 1881 that the eventually adopted scheme was completed for a much bigger

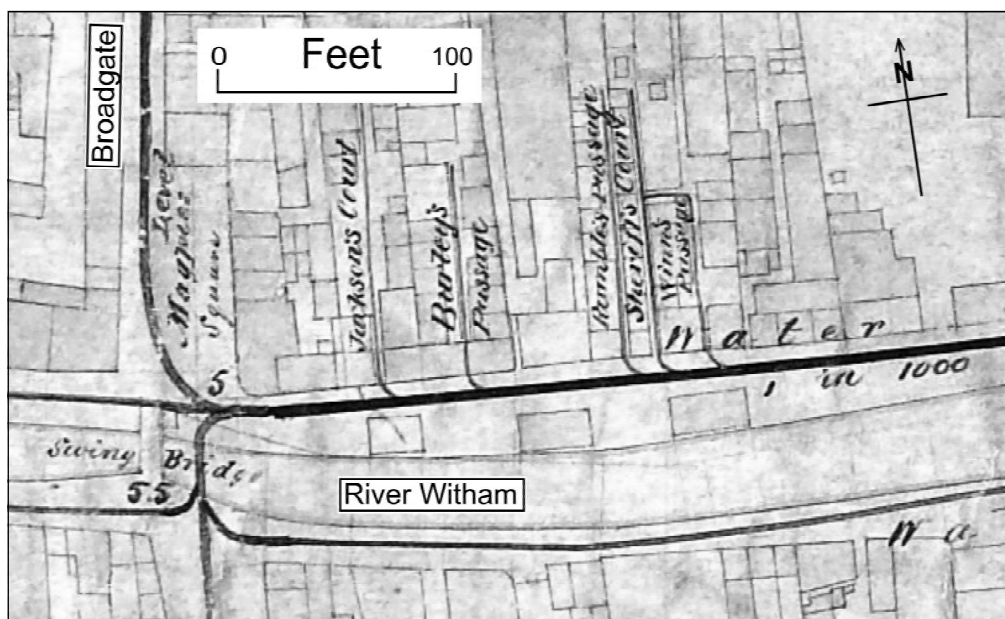


Fig 6. Part of Giles' 40 inch plan of his proposed complete underground sewerage system which he signed on 22 September 1849 as he presented it to the City Council. This extract shows the main sewer on the north bank of the river, effluent to flow eastwards to the planned sewage depot at Stamp End. The sewage from south of the river was to pass under it near the Swing Bridge. The figures 5 and 5.5 represent heights in feet of the sewer above the datum level at Stamp End. Giles named many of the unhealthy courtyard developments on this large scale plan, making it Lincoln's best Victorian source for this kind of information. Not to scale. Also available online at <www.thesurveyoflincoln.co.uk/1849plan>. (Original in the Lincolnshire Archives, reproduced by courtesy of the City of Lincoln Council)

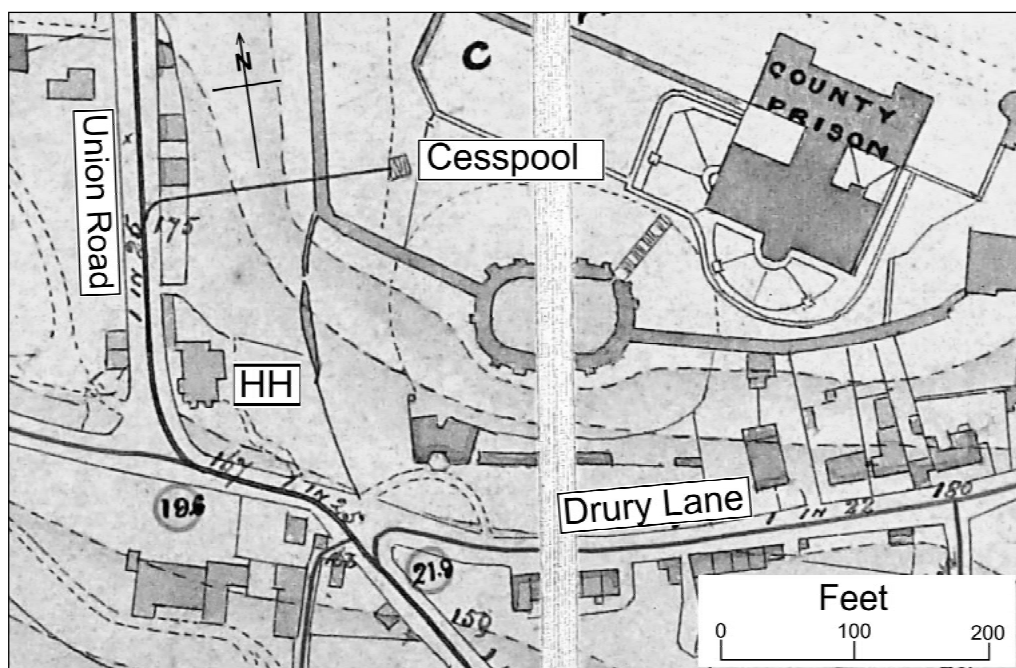


Fig 7. Lincoln Castle. Part of Giles' 20 inch plan which carried more sewerage detail than the 40 inch plan, including contours. Sewers are shown by lines of differing colouring and thickness for different sizes. The large numbers in circles are depths of trenches. The small numbers are inverts – the heights of the bottom of the sewer trench above the datum. These show a steep fall southwards in Union Road and westwards along Drury Lane. Both sewers were then to pass effluent even more quickly south-eastwards; it would have reached the proposed sewage depot without the need for pumping. HH = Hilton House, in which Giles resided, to the southwest of the Castle. Not to scale. (Original in the Local Studies Collection, Lincoln Central Library, reproduced by courtesy of Lincolnshire County Council)

population.⁹ However it was probably the expert influence of Giles that led to the installation of egg-shaped sewers for the new prison built inside the castle grounds in 1847. These were described in 1851 by a government inspector and an archaeological dig during 2011–12 revealed them (Fig 8).¹⁰

Giles' obituary states that he visited France in 1850 (see below), but he was also engaged on some other jobs in Britain but away from Lincoln in 1850–52 both before and after the final decision had been taken in Lincoln not to proceed with his plan. In January 1850 he was appointed to make a report on drainage and sewerage at Bridgnorth (Shropshire) and this report was published in the press the following August. In September 1851 he was reported as George Giles, C E, of Lincoln, arriving at Bangor, north Wales, although no purpose was given. Finally he had quite a large responsibility at Holyhead in March 1852, when he oversaw the auction of almost a

'mountain' of civil engineering equipment on behalf of Peto and Betts, who had been working on the Chester to Holyhead line.¹¹

Giles may have gone back and forth to France more than once, as there is a note in the correspondence with Lord Monson's agent in which Giles said 'I have been away on the continent some time for my health'. There are also scattered references to him working on small commissions for Monson at Burton just north of Lincoln during 1850–51. For example, on 13 August 1850, with the Hon Mr Monson, Giles met the Christ's Hospital Committee, which was responsible for an estate in the South District, to discuss how the Monson land in the North District could be given equal priority in drainage terms with the land in the South District.¹²

Giles was in Lincoln in the spring of 1851, as he appears in the 1851 census enumerator's book for St Martin's parish. The household included eleven

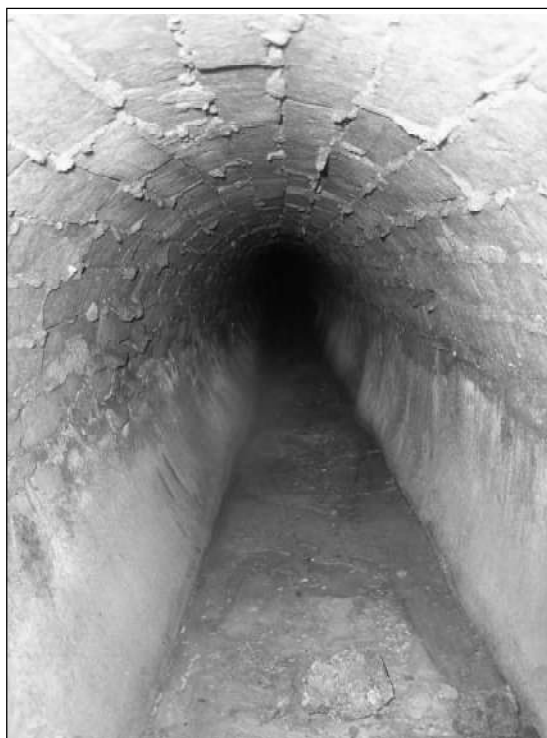


Fig 8. Sewer of egg-shaped cross section discovered near the County Prison building of 1847 within Lincoln Castle. External diameter approximately 28 and 18 inches. The lower part had been covered in concrete to prevent downward seepage. (FAS-Heritage, courtesy of Dr Nicola Toop)

people, George and Elizabeth, four children, four servants and Elizabeth's unmarried sister, Maria Betts. It is possible that Mrs Giles was very attached to Hilton House, where four of their eleven children were born, and this could be why the family stayed there for so long after the collapse of the sewerage project.¹³ However, probably the end of their association with Lincoln came on 15–16 May 1852 when a vast amount of furniture was auctioned on Giles' behalf at Hilton House. The list of items on offer for this two-day event demonstrates the superior style of living he had achieved. The advertisement highlighted 'elegant marqueterie and rosewood furniture', a 'carved rosewood cabinet piano-forte by the King of Prussia's maker (six-and-a-half octaves, with improved pedals)', 'handsome Spanish mahogany plate-glass bookcases', 'handsome dinner, dessert and tea services', etc, etc. Other notable items included Brussels carpets, many

French items, a superior self-acting shower bath (!) and outside a 'moveable double-room boarded office', the latter doubtless connected with Giles's professional work up and down railway lines.¹⁴

Railway projects on the continent

In 1850 Giles went to France for Peto and Betts for the first time, working as their agent on railway projects until 1856, including the section of the Paris–Marseilles line between St Rambert and Montelimar (south of Lyon and north of Avignon).¹⁵ After 1856 he was working in Austria on the Kaiserin Elisabeth Railway, responsible as agent for Brassey, Peto and Betts for the 49 miles from Linz to Vienna. In 1862 he returned to England, probably with retirement in mind, but even after that date he was involved in railway schemes in Egypt, Croatia, Turkey and Mesopotamia. These included the Alexandra–Rosetta line in Egypt and in Croatia the line from Fiume (Rijeka) to Semlin (Zemun, near Belgrade).

Giles died at Bonchurch, Isle of Wight, on 9 April 1877, aged 67. He had an address there by 1865, as he appears in Harrod's *Directory of Hampshire* for that year at a very substantial house called Westfield, at Bonchurch, Ventnor, which survives. His 1871 census entry records a household of nine, his wife, two unmarried daughters and five servants. Giles described himself as 'landowner and late C. E.' (civil engineer), another demonstration of his success. Two of his sons, one of his grandsons and one of the sons of his cousin Alfred were also engineers. His obituary closes with the following assessment: 'Mr. Giles was noted for the thoroughness of his knowledge in the details of his profession, and his energy and perseverance in working them out practically'.

The Giles family kept their links with friends in Hamburg, as Edith Maria, one of two Giles daughters born in the city, married Dr Otto Prausnitz, MD, an army physician from Hamburg. In 2008 the people of Hamburg celebrated the bicentenary of Lindley's birth, not just for his 1842 initiative, but also to mark his great influence on city planning in Hamburg and elsewhere in Germany. Members of both the Lindley and Giles families attended the functions.

Giles' career took in work on water supply, sewerage systems, and land drainage, in addition to his main interest in railway building. Such a variety of work may have been typical of the 1830s and 1840s, also the varying roles of surveyor, agent, contractor, consulting engineer and resident

engineer. Railway building offered more opportunities in his professional life time than did sewerage systems which came to the fore later. Moreover, as Peto and Betts moved their operations overseas, the whole of Europe was potentially an area of employment for Giles. The general trend in the economy and his family connections coincided in their influence on his career.

Acknowledgments

Help has come from many directions, but I am especially grateful to Edward Giles and Martin Kinzinger; also to the late Fay Brown, Mike Chrimes, Dr Bernard Eccleston, Tony Keyworth, Stewart Squires, Dr Nicola Toop and Dr Rob Wheeler. Carla Hughes and Dr Paul Dryburgh provided translations of some German sources.

Notes and references

1. Except where otherwise indicated, biographical data have come from: P S M Cross-Rudkin et al, (eds), *Biographical Dictionary of Civil Engineers in Great Britain and Ireland, Vol 2, 1830–1890*, pp 335–7 (the Giles family entry) and pp 480–2 (William Lindley's entry), both entries written by Mike Chrimes; 'Obituary of George Giles' in *Minutes of the Proceedings of the Institution of Civil Engineers*, 50 (4) (1876–77), pp 177–8; entries in the Staatarchiv Hamburg, courtesy of Martin Kinzinger, at the Denkmalschutzamt (Department for Heritage Conservation); information from the Giles pedigree, courtesy of Edward Giles, great-great-grandson; census and directory entries; *Oxford Dictionary of National Biography (ODNB)* sub Edward Ladd Betts, Francis John Giles, William Lindley and Sir Samuel Morton Peto; R C Wheeler (ed.), *Maps of the Witham Fens from the Thirteenth to the Nineteenth Century* (Lincoln Record Society, 2008, pp 45, 50–51 and D Mills, 'George Giles, civil engineer, and the Great Northern Loop Line: Peterborough–Spalding–Boston–Lincoln–Gainsborough', *Great Northern News*, no 170 (March/April 2010), pp 8, 11.
2. Information on the Hamburg–Lübeck scheme and the Hamburg–Bergedorf railway derives from Wikipedia entries <https://en.wikipedia.org/wiki/Lübeck-Büchen_Railway_Company> and <https://en.wikipedia.org/wiki/Hamburg-Bergedorf_Railway_Company> [both accessed 31 May 2016]
3. Information from Martin Kinzinger (letter dated 21 May 2009). The contracts with Lindley and Giles were renewed annually by the Hamburg Senate (email dated 15 December 2008). The 2008 symposium held in Hamburg, to which Kinzinger refers, was concerned with a wide range of topics related to town planning, civil engineering, public health, etc.
4. *Civil Engineer and Architect's Journal*, vol. 10 (1847), pp 94–5 (courtesy of Martin Kinzinger). Also available online at <<https://babel.hathitrust.org/cgi/pt?id=nyp.33433062756097;view=1up;seq=130>> [accessed 6 June 2016]. In 1846 Giles had become a Member of the Institution of Civil Engineers.
5. 'Report made to the Sanitary Committee of the Corporation of Lincoln on a general underground sewerage of the city, and an estimate of the probable cost of effecting the same, by George Giles, Esq., M Inst C E, to which is appended a report of the Sanitary Committee made thereon to the Council of the Corporation' (Lincoln: printed by William Bellatti, High Street, 1849) (Lincoln Central Library (LCL), L.LINC.628.2, Glass Cabinet)
6. Giles continued to pay the rates until March 1852 (D Mills, 'Where were George Giles and Motherby Hill, Lincoln', *The Lincoln Enquirer*, no 19 (November 2010), p 5. The Stamford information comes from the *Lincoln, Rutland and Stamford Mercury (LRSM)*, 26 March 1847, p 6, col 2.
7. *LRSM*, 9 June 1848, p 2, col 3. See also J G Ruddock and R E Pearson, *The Railway History of Lincoln* (Lincoln: Ruddock, 2nd ed, 1985), p 114 and chapter 11, 'The Level Crossings'.
8. Lincolnshire Archives (LA), TLE 37; for the discussions of the Trustees of the Lincoln West Drainage see LA, MON 7/27a. Courts of Sewers were old established institutions regulating the drainage of mainly agricultural land, the word 'sewer' indicating surface drainage at the time when the courts were set up. (Lincoln West Drainage information thanks to Dr Rob Wheeler.)
9. Dennis R Mills, *Effluence and Influence: public health, sewers and politics in Lincoln, 1848–50* (Lincoln: Society for Lincolnshire History and Archaeology, 2015). This book contains the whole of Giles' report of 1849 and his 20 inch plan appears in sections over 17 pages.
10. LA, CoC 5/6/74, pp 4, 8–9, Report of R D Grainger on the state of the New County Gaol, 3 November 1851; FAS-Heritage, Report to Lincolnshire County Council, 'Archaeological Watching Brief, Heritage Skills Centre, Lincoln Castle, Lincoln' (July 2013), report author, Dr Nicola Toop, especially, pp 23, 24, 34. My thanks to Dr Toop also for the reference to Grainger's report.
11. *Birmingham Journal*, 26 January 1850, p 6, col 5; *Hereford Times*, 24 August 1850, p 7, col 6; *North Wales Chronicle*, 4 September 1851, p 3, col 3; *Liverpool Mercury*, 13 March 1852, p 5, col 3. I am grateful to Chris Page for retrieving these references from '19th Century British Newspapers' <www.britishnewspaperarchive.co.uk>.
12. LA, Mon 25/13/10/2–3; and LA, LD 71/25

13. It is remarkable that the births of three of George and Elizabeth's children were reported as far afield as Lincoln (both newspapers), Sheffield, Nottingham, and in the London newspapers, the *Morning Chronicle* and the *Evening Standard*. The third of these births had taken place in the Rue Balzac in Paris after the Giles family had left Lincoln for good. My thanks to Chris Page for these further references.
14. *LRSM*, 14 May 1852. My thanks to John Herridge for a copy of this report.
15. Peto and Betts joined with Thomas Brassey in connection with the Lyon–Avignon Railway in 1852 (*ODNB*, p 898) and also in connection with projects in Austria and Hungary (personal note from Martin Kinzinger).

George Stephenson – the railway surveys

Part 1 : 1819–1832

Robert F Hartley

George Stephenson was the subject of one of the earliest popular biographies. Samuel Smiles published his *Life of George Stephenson* in 1857. Variations on this text appeared in numerous later editions over half a century and have been used as a source by other, more recent authors. Smiles's biography is excellent: well organised, fluent and in the main factually accurate. He corresponded with Robert Stephenson about it and visited old friends of George Stephenson in Killingworth, Chesterfield and elsewhere. However he tended to exaggerate some of Stephenson's achievements and he only provided a limited number of references to back up his text.

Recently I have been tracking down information on the railway surveys signed by or on behalf of George Stephenson to see what additional light they shed on his activities and to check the accuracy of the story as told by Smiles. I have seen more than 70 in the Record Office collections for Cumbria, Durham, North Yorkshire, West Yorkshire, Cheshire, Stockport, Staffordshire, Derbyshire, Lancashire and Leicestershire. More surveys no doubt exist and I should be interested to hear of any that may be known to readers of this paper.

Stephenson presumably supervised surveys for converting the eastern end of the Killingworth Railway to cable operation, and for the Killingworth–Burradon branch which opened in 1820,¹ but no plans appear to have survived. In 1821 he submitted estimates for the Hetton Colliery Railway.² Presumably there must have been plans as well, but again I am not aware of any which survive. With Nicholas Wood he had carried out numerous experiments on the working of locomotives and

inclines, giving them a very clear understanding of how future railways should be laid out.

Stockton & Darlington Railway

When Stephenson and Wood travelled to Darlington on 19 April 1821 they were presumably hoping to supply one or more locomotives and their expertise in railway operation. The Stockton & Darlington Railway had already obtained its Act of Parliament that day, using plans based on George Overton's 1818 survey. The Killingworth men may have been surprised that Edward Pease agreed to let George carry out a new survey of the line and suggest improvements. With John Dixon appointed to accompany him, Stephenson seems to have begun work at the beginning of October and presented his plans to the S&DR Board on 18 January 1822. The survey was deposited with the Clerk of the Peace for County Durham on 28 September.³ It is signed by George Stephenson himself, and viewing the original in the Durham Record Office one can sense something of his pride in it. The plan is hand drawn and lettered (presumably by a local cartographer, but possibly by someone in London) and has hachuring to indicate hill slopes. The areas of the exposed coalfield and the limestone beds are coloured in, perhaps reflecting Stephenson's lifelong interest in exploiting mineral resources.

The plan also shows the route of the earlier survey by Overton and has comparative cross-sections as well. Both routes link the same places – Witton Park and Black Boy Collieries in the west with Stockton Quay in the east. Both have branches into the northern outskirts of Darlington. Overton has in

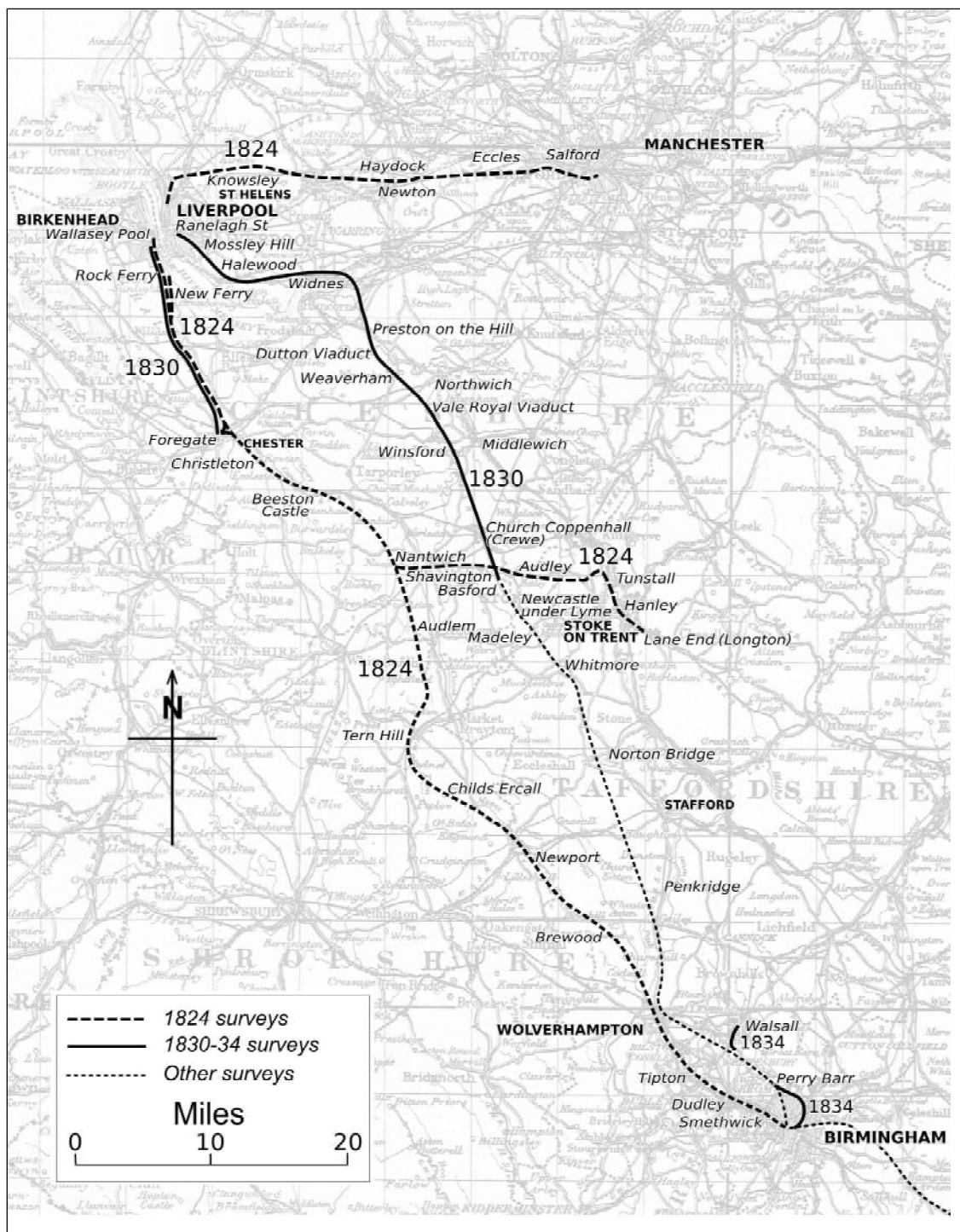


Fig 1. Railway surveys by George Stephenson in 1824, and from Liverpool in 1830 including the Walsall Branch and revised approach to Birmingham of 1834

addition a branch to Yarm whilst Stephenson has one, marked as 'additional' to Croft Bridge on the Tees. The main differences between the two routes were created because Stephenson chose to use pairs of inclined planes to cross the Brusselton, Etherley and Old Shildon ridges whereas Overton's route was more sinuous in following the contours around these areas of higher ground.

A slightly revised plan, signed by Robert Stephenson (Engineer) and John Dixon (Surveyor), was deposited a year later, on 22 September 1823. This includes the Yarm branch and Haggerleases branch and shows the line very much as built.⁴

Liverpool and Manchester, and Bolton

In March 1822 William James, a Warwickshire land agent and solicitor, was planning the Liverpool & Manchester Railway. He had been impressed by Stephenson's Killingworth locomotives and invited the 20-year-old Robert Stephenson to join his surveying team, which he did until September. A draft plan for the line was apparently completed the following month, although no copy appears to survive. The Lancashire Record Office has a copy of the section and a list of landowners,⁵ both signed by William James, which indicate a route via Everton, Clubmoor, Rainhill, Newton-le-Willows and Chat Moss. Although it has horizontal and vertical scales, the distances are difficult to reconcile with the modern Ordnance Survey maps, suggesting that it is a sketch done after a quick reconnaissance of the topography. Unfortunately by this date the once wealthy James was in serious financial trouble, dodging his creditors and refusing to face reality. In November he was committed to the Kings Bench Prison in Southwark, London. He was to spend much of the next year in jail, until October 1823, and even when he was at liberty he was often attending to work in other parts of the country. Despite this he was just about keeping the Liverpool promoters happy and the railway project continued to go forward.

At the beginning of 1824 George Stephenson seemed in a fortunate position. He was modestly well-off, the Stockton & Darlington line was progressing well and he was a partner in a new engine-building company, Robert Stephenson & Company. Since 1821 he had also been in partnership, regarding future sales of his locomotives, with William James.⁶ In due course he could look to make some return on ten years of research and development by supplying the locomotive system he had patented

to these new railways and to others which would probably follow.

Two unforeseen events in early summer threatened to spoil this prospect. Firstly, Robert Stephenson insisted on setting off on a very risky expedition to develop mines in South America, depriving George of his closest assistant. Secondly, William James was jailed again on 14 May 1824.⁷ A week or so later the L&MR committee decided they could wait no longer. George Stephenson was approached and appointed as the company's engineer. He had to act decisively and moved to Liverpool in June 1824. He was immediately at work on the survey, having recruited Paul Padley and others of William James's team. Finished plans were deposited on 20 November 1824, signed by George Stephenson (Engineer) and T O Blackett (Surveyor).⁸

In terms of economic geography, Stephenson's route seems more decisive and coherent than William James's. Stephenson was clearly focussing on goods traffic and the western end of his line swept around the north side of the Liverpool ridge to take command of the waterfront where most of the newest and largest docks were being created. Henry Booth, the L&MR Secretary, later said that Stephenson's was a better route than the one which opened in 1830.

Another of William James's schemes had been the Bolton & Leigh Railway, whose promoters also called in Stephenson to complete the plans. These were deposited on 30 November 1824, signed by Stephenson and by Hugh Steel,⁹ and show the line very much as it was built, with cable-worked inclines at Daubhill and Chequerbent to surmount the ridge at Over Hulton.

Birmingham and Birkenhead (the Birmingham & Liverpool Railway)

A less well-known aspect of Stephenson's career is that in July, August and October 1824 he also surveyed the route of a far larger railway project, 'from Birmingham to the South Bank of the Mersey, opposite Liverpool' with a branch to the Potteries. The promoters of this line had visited him in Newcastle in May and June (after the imprisonment of William James, who may just previously have been asked to do the survey) and he felt obliged to take the job on. He started work on 8 July, working at great speed ranging rapidly across country.

One of the promoters, James Foster,¹⁰ accompanied Stephenson on this survey, and Stephenson observed in a letter:

... he will not forget it as long as he lives – some days fourteen hours without either bread or water rising at half past three and working ‘til nine, ten or even twelve before we got to our quarters.¹¹

This gives us a rare glimpse of Stephenson at work in his prime, a man of prodigious energy and determination. In another letter, dated 11 July 1824 he records how on one long journey from the Birmingham line back to Liverpool his horse collapsed with fatigue and severely injured its knees.¹² In the same letter he recorded that he had four sets of surveyors at work.

The plans were completed and deposited at the end of November, signed by George Stephenson (Engineer), Paul Padley and George Hamilton (Surveyors).¹³ The line extended from Sheepcote Lane bridge near the Gas Street canal basin in Birmingham, via Tipton, Wolverhampton, Newport, Audlem, Beeston Castle and Chester to Wallasey Pool, with a branch to Rock Ferry. The Chester station site was at Egerton St/Brook St, on a short branch accessed via a triangular junction. The main line had mostly easy gradients with three low summits at Sutton, at Beeston Castle and at the crossing of the Watling Street (present A5) near Brewood.

At Wolverhampton the line had an inclined plane to rise to the level of the highly industrialised coalfield area around Bilston, Coseley, Tipton and Oldbury. The Potteries were reached by a long branch from Ravensmoor (near Nantwich) to Stoke-on-Trent and Lane End (a point close to the present Longton station). This branch had an incline descending from Chesterton eastwards into the Trent valley near Tunstall.

The railway as a whole was clearly laid out mainly as a route to export the minerals and manufactures of the Black Country and the Potteries. Heading for Birkenhead instead of Liverpool made it shorter and cheaper and avoided the congestion and expense of going through the Liverpool docks. Had this line been taken forward it could have been the first steam-operated trunk line. It would have been a project three times the size of the Liverpool & Manchester and the long distances would have required a massive leap in locomotive capabilities. It gives a new insight into the promoters’ belief in their potential.

George Stephenson & Son

Between November 1824 and February 1825 some 60 joint-stock railway companies were proposed, in the first Railway Mania.¹⁴ There was clearly a lot of potential profit in this business, but in letters at the

time Stephenson lamented the endless amount of work that was coming in and worried about the collapse of this investment bubble. He must already have become aware of the problems of producing accurate plans and estimates within the very short timescales demanded by the promoters. The solution he came up with, presumably in consultation with Edward Pease and Michael Longridge, was to form a new company (with the same shareholders as Robert Stephenson & Co) which could employ staff who could help him.

On the last day of 1824 the firm of George Stephenson & Son was established in Newcastle to survey and construct railway lines. The eighteen names on the company prospectus include Joseph Locke, John C Birkenshaw, John Dixon, Thomas L Gooch, William Allcard, Elijah Galloway and Thomas Storey as well as Paul Padley and George Hamilton who had formerly worked with William James. The more experienced men were to be paid handsomely for their work whilst the youngest were unpaid apprentices gaining experience for their future careers.

In his biography of the Stephensons,¹⁵ L T C Rolt described the establishment of George Stephenson & Son as an attempt to create a monopoly of railway construction. He also considered it to have been ‘disastrous’ in its effects as George Stephenson recruited inexperienced young assistants and exploited them to carry out his ambitions. Study of the surveys and the chronology of events suggests the possibility of a different interpretation. The mistakes on the Liverpool & Manchester survey were made before George Stephenson & Son was created and presumably the company was intended to improve his ability to manage future projects. In addition, many of the young engineers the firm recruited quickly proved themselves to be more than up to the challenge and rose to become eminent in their profession.

The plans for this fledgling company were ambitious. They were to take on the Liverpool & Manchester and the Liverpool & Birmingham (presumably the line surveyed by Stephenson the previous summer) as well as a London & South Wales Railway and a London Northern Railway. The London Northern appointed Stephenson as their consulting engineer in January 1825 and planned to build a route from London to Manchester via Cambridge, Peterborough, Loughborough and Cromford, incorporating the Cromford & High Peak Railway line from Cromford to Whaley Bridge.¹⁶ In

the event, Stephenson's fears about the first 'Railway Mania' were realised. The value of shares in the London Northern and many other companies rose quickly and then collapsed. Apart from the Liverpool & Manchester, which had wealthy backers and a genuinely good potential for traffic, it would be another five or ten years before railway building on a large scale would be commenced.

Ridicule and defeat

The Liverpool & Manchester Bill came before Parliament in May 1825 and fared miserably. When Stephenson was called to give evidence he was subjected to sustained cross-examination in which the surveyed levels of the proposed line were shown to be considerably in error. Having exposed these faults, the counsel for the opponents of the bill succeeded in casting doubt on the viability of the entire project. Perhaps Stephenson's earlier successes had made him slightly over-confident. He knew the line could be built much as planned, but had failed to ensure that this was absolutely demonstrated by the survey and that the thousand and one details were all accurate. In addition it was probably the first time a railway project had come up against wealthy and entrenched opposition represented by a first-rate legal counsel.¹⁷

The Birmingham & Liverpool line fared even worse; having failed to comply with some of the standing orders it was withdrawn on 15 March. Both schemes appear to have been done with too much haste to meet the Parliamentary deadlines for the year. The formation of George Stephenson & Son in the

interim would mean that in future the work could be more suitably delegated and such gaffes could be avoided but this must have been a bruising time for Stephenson, whose reputation was in danger of being destroyed. He was at least able to return to Darlington in the autumn to preside over the successful opening of the Stockton & Darlington. In the meantime the Birmingham & Liverpool commissioned a new survey from two more established engineers – George Rennie and Josias Jessop.

The following year Parliament approved an altered route for the Liverpool & Manchester, planned by Charles Vignoles under the supervision of George & John Rennie. This was more direct but required the construction of a large viaduct across the Sankey valley. By heading straight into Liverpool it needed inclined tunnels to penetrate the built-up area. A short one led to Crown Street passenger terminus, which was remote from the town centre, and a long one led to a goods depot at Wapping near the docks on the waterfront.

Stephenson's 1824 route would have been two or three miles longer, but from a commercial point of view seems to have had several advantages. It would have avoided the restriction caused by the cable-worked tunnels to Crown Street and Wapping; the terminus would have been close to the site of the later Exchange Station of the Lancashire & Yorkshire Railway, and it would have taken control of the Liverpool waterfront in a way that the Vignoles route never did. There would have been no need for the Sankey viaduct, and the line would have served more collieries and industrial sites en route.

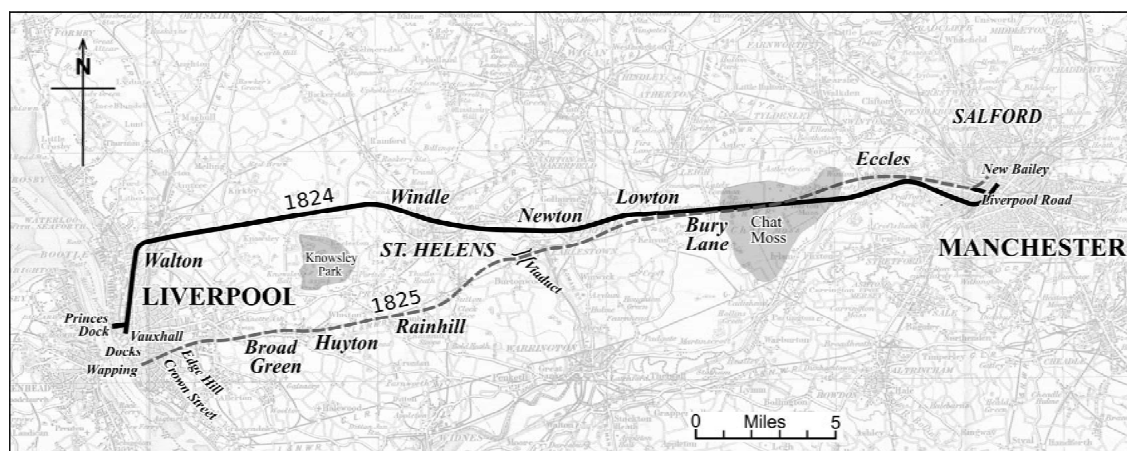


Fig 2. Liverpool & Manchester Railway surveys. George Stephenson's 1824 line, and John & George Rennie's 1825 route with Stephenson's Liverpool Road extension in Manchester

Instead of being the celebrated engineer of this new railway, George Stephenson in the summer of 1825 was in danger of being seen as a figure of ridicule who had planned to build an impossible railway across the bottomless swamp of Chat Moss. He had been publicly humiliated and denounced virtually as a fraud, whilst his one-time partner, William James, was bankrupt and imprisoned. The two greatest engineering projects of the day had been snatched away and given to his rivals. True, the Bolton & Leigh had gained its Act, but it initially struggled to obtain sufficient finance for work to be started. Few would have predicted at the time that Stephenson was destined to reverse these defeats and go on to plan yet greater railways in the years to come.

The Liverpool & Manchester, and other lines

After the rejection of his survey for the Liverpool & Manchester, George Stephenson was dismissed as the company's engineer, while the new survey went ahead.¹⁸ The short-lived Railway Mania of 1825 had passed and few projects were under way. It was a critical time, not just for Stephenson's career but for the two companies in Newcastle which he had recently been involved in setting up. Without income from at least one railway project they would be unable to keep together a core of specialist staff.

Although the Rennies were successful in obtaining an Act for the Liverpool & Manchester line in 1826, several members of the company's board clearly still hoped to appoint George Stephenson. He seems to have been supported, especially by Henry Booth and Joseph Sandars.¹⁹ Letters in his support were sent by Edward Pease and Michael Longridge – hardly surprising as they were the major shareholders in both George Stephenson & Son and Robert Stephenson & Co!

On 3 July 1826, just a year after his failure to get his own plans approved, Stephenson was reappointed as Principal Engineer to the Liverpool & Manchester Railway. He quickly brought in Joseph Locke, William Allcard and John Dixon as his assistants,²⁰ and although all three were young (Allcard just 17!) three better choices could hardly have been made. In October T L Gooch rejoined him after a spell at Edinburgh University and became his personal secretary and draughtsman.²¹ Stephenson's immediate task was to build the railway as planned by Vignoles, but he introduced two major alterations before the route was completed.

On 30 November 1827 Stephenson deposited plans for an altered alignment of the railway from Kendrick's Cross (Rainhill) to Hurst Hall (near Bury Lane).²² This made the course less sinuous over a distance of 11 miles, although the position of the Sankey viaduct, near the centre of this distance, was not changed. In November 1828 he signed off plans for changing the Manchester end of the line.²³

Probably in the interest of reducing opposition to the railway, Vignoles had planned a terminus in Salford (on the site later used by the Manchester & Bolton Railway).²⁴ Following a site visit with two of the directors, Stephenson revived the plan from his 1824 survey to cross the Irwell to a station built on Liverpool Road in Manchester.²⁵

Stephenson's contract required him not to take on work for other companies; nevertheless he was still being approached to do such work and in due course would solve the problem by sending his brother Robert Stephenson senior or deputies from George Stephenson & Son to do work on the Bolton & Leigh, Leigh & Kenyon Junction, and Canterbury & Whitstable Railways. Robert Stephenson junior returned from his expedition to South America in November 1827 to help on these projects and more importantly on the Warrington & Newton Railway.

George Stephenson was invited down to Leicester in 1828 to give his opinion on the Leicester & Swannington. He was again obliged to decline becoming their engineer but recommended his son Robert, who was duly appointed and surveyed the route. In July 1830 George Stephenson & Son were appointed to construct of the line, with Robert continuing as Engineer. This connection with Leicestershire would be important in the years to come.

As the Liverpool & Manchester approached completion a degree of confidence re-emerged in railway promotion and new schemes were launched. One of these was the Stockport Junction Railway, 'intended to connect the Liverpool and Manchester Railway with the Cromford & High Peak Railway'.²⁶ The plans for this were signed by George Stephenson (Engineer) and Paul Padley (Surveyor). They show a route from a junction with the L&MR at Oldfield Road, just outside the Liverpool Road terminus, to Stockport via Didsbury and then up the Goyt valley to Marple and Whaley Bridge where it joined the C&HPR. There was also a branch line, with two inclined planes, from Whaley Bridge to the limestone quarries at Peak Forest. This would have been in

direct competition almost with the existing Peak Forest Tramway. The Stockport Junction line did not go forward, but the route from Manchester to Bugsworth was followed quite closely by the Salford & Sheffield proposal the following year.

The Liverpool & Manchester was completed in September 1830, 50 months from Stephenson's appointment. Considering the innovative nature of so many aspects of the project, this does not seem unduly slow. His management was criticised by Telford and others, but when the Board carried out an investigation in May 1827 they decided to increase his salary!

The 1830 Surveys

The year 1830 saw a flurry of new proposals for railways, the most important of which was the London & Birmingham. George Stephenson & Son were appointed to survey this line in September and Robert Stephenson took charge. This was to be the greatest civil engineering project of the 1830s and would dominate the firm's priorities until 1837.

At least four surveys by George Stephenson were deposited in November 1830 and they vary considerably in character. The Chester & Liverpool extended from Chester (Foregate) to the Birkenhead Ferry on a similar course to the 1824 Birmingham and Birkenhead and very much on the route of the line as eventually constructed.²⁷

The Sheffield & Manchester (or Salford & Sheffield) in contrast was a direct extension from the L&MR, diverging from it by a junction at Ordsall Lane. The route across the Peak District was interesting, to say the least, as we shall see below.

The 1830 Manchester & Leeds proposal also envisaged a link from the L&MR at Salford, curving around the south of Manchester before heading northwards past Newton Heath and Rochdale.²⁸

The Liverpool & Birmingham (northern section) followed a course from Ranelagh Street in Liverpool across the Mersey at Cuerdley (near Widnes) to Nantwich. George Stephenson is described as the Engineer and Paul Padley as the Surveyor. From Preston Brook southwards to Basford Hall near Crewe the route surveyed is precisely that later followed by the Grand Junction Railway. As yet the author has not seen plans for the southern section but they too are likely to correspond with the line as built, except for the final approach to Birmingham. It is interesting to observe that Stephenson's Ranelagh Street terminus would have occupied precisely the same

triangle of land as was later used by the Cheshire Lines Committee to build their Liverpool Central Station.

Manchester to Sheffield and beyond

The only one of these four schemes to gain Parliamentary sanction was the Sheffield & Manchester. George Stephenson & Son were appointed as engineers to this project in May 1830. It was in many ways the least practical and the least forward looking, but it had the advantage of facing no concerted opposition from the canals or existing railways. The scheme developed out of the Stockport Junction line and followed the Goyt valley through Marple and New Mills to Bugsworth before turning east towards Sheffield. There were two tunnels containing steep, cable-worked inclines to surmount Rushup Edge and a longer tunnel, on a gradient of 1 in 185, under Burbage Moor.

The scheme seems totally impractical and dangerous if it was intended to carry passengers. George Dow considered that Stephenson might merely have lent his name to the project.²⁹ In fact he and Robert had a substantial shareholding in it. When we remember that the nearest neighbour to this railway was the soon to be completed Cromford & High Peak, the use of cable-worked inclines becomes less surprising. The line would have had an easily graded route with plentiful traffic as far as Chapel-en-le-Frith, and the nearby Peak Forest quarries could easily have been reached to tap a flow of traffic which still forms an important business for the railways nearly two centuries later. In the event the promoters did not go ahead with the scheme.

On 29 November 1830 (one day before the Manchester & Sheffield) plans were also deposited for a Sheffield to Goole Railway, surveyed by Joseph Burke,³⁰ who later collaborated with Stephenson on the North Lancashire Junction line. The original prospectus for this line gave George Stephenson & Son as the Engineers, but it is not known to this author if they prepared a survey, or if Burke was at that time associated with them. If these projected routes had come to fruition the L&MR could have been linked to Leeds and to the Humber estuary by the mid-1830s.

Manchester & Leeds

George Stephenson and James Walker were both individually instructed to prepare surveys for this project on 18 October 1830.³¹ Stephenson began

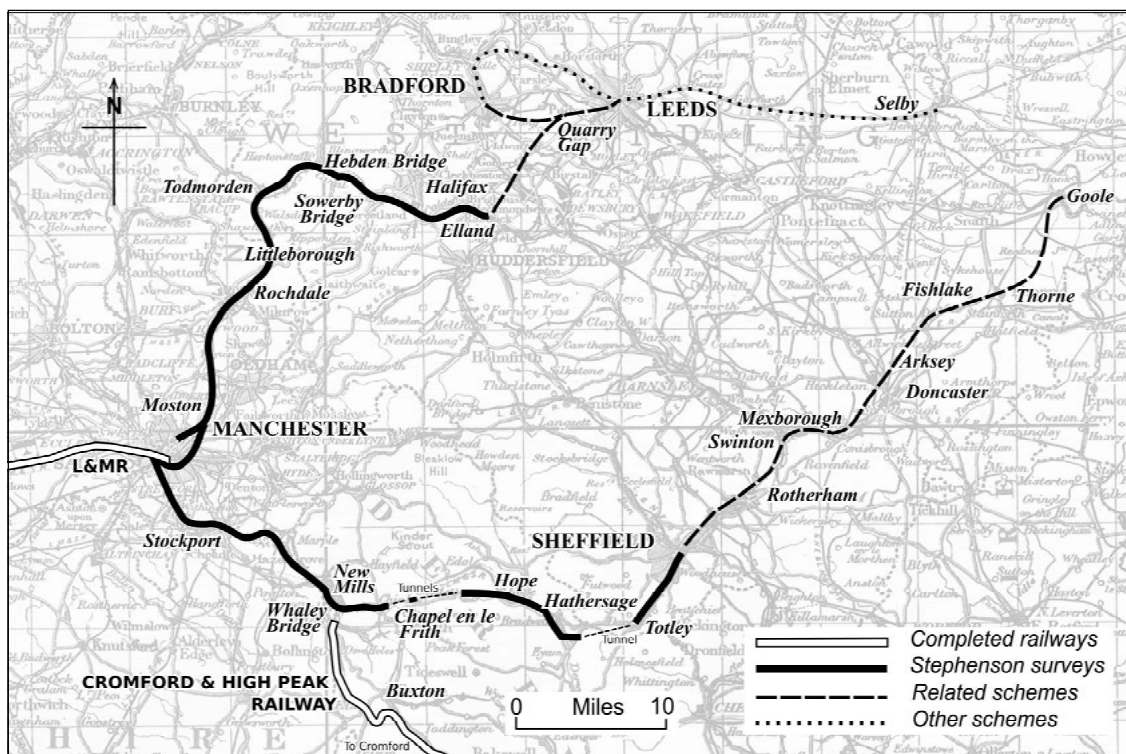


Fig 3. Stephenson's trans-Pennine schemes of 1830 from Manchester to Leeds, Sheffield and beyond

work on the Calder valley route, obliging Walker to look at an alternative via Ashton-under-Lyne, Delph and Huddersfield.³² A plan exists in the Lancashire Record Office³³ but it is unfortunately completely unattributed. From a junction with the L&MR at Oldfield Road, Salford, it shows a line curving around the south side of Manchester before heading northwards past Rochdale and Todmorden to Sowerby Bridge and Elland. There was also a branch to a terminus near Oldham Road in Manchester, and another from Salterhebble to Halifax.

Apart from the line around the south of Manchester, this was very much the route eventually built in the late 1830s. However, east of Elland the line is shown turning north-east and beginning to climb, passing Low Moor ironworks and continuing to Pudsey, where it would have joined the proposed Leeds & Bradford Railway at a point called Quarry Gap.

The section is curious in that the route is very level from Manchester to Elland where it begins a steady climb on a gradient of about 1 in 75. The lettering on the section also changes for this section.

It seems possible that the plan is a composite, using Stephenson's proposals from Manchester to Elland and Walker's from Elland to Quarry Gap.³⁴ This awkward compromise of a route was not destined to go ahead.

A central station for Liverpool

In August and September 1831 Stephenson studied the course of a new line from Edge Hill to a central passenger terminus at Liverpool Lime Street for the L&MR. The survey, done by William Allcard under Stephenson's direction, was deposited on 30 November 1831.³⁵ The route was almost entirely in a tunnel, 2,230 yards long and on a gradient of 1 in 88 worked by cable from two stationary steam engines. The line opened in August 1836, with Lime Street Station given a pioneering over-all roof. A handsome architectural frontage, in the Classical style, was designed by the city surveyor, John Foster junior to form a frontage onto an impressive new square. This was the first station in Britain to be incorporated into a major civic centre and it would be interesting to know more about the extent of Stephenson's involvement in its planning.

Liverpool to the south

In 1831 the plans for the Warrington to Birmingham route were deposited.³⁶ This line had the backing of the shareholders of the L&MR and it was later modified to become the Grand Junction Railway. Stephenson shared the survey work with Joseph Locke and the usual version of the story is that Locke proved so much more capable and efficient that Stephenson was sidelined by the company. My own reading of events suggests that George Stephenson & Son fell victim to the vagaries of the British political system. The Grand Junction plans were submitted in 1831 but failed to be passed before Parliament was dissolved. In the interim George Stephenson was invited to Whitby and in June and July 1832 prospected a route to Pickering, the plans of which were later also submitted to Parliament. Eventually, and perhaps somewhat to their surprise, on 6 May 1833 George Stephenson & Son found that three of their projects had been approved – the Grand Junction, the London & Birmingham and the Whitby & Pickering. These stretched their resources of skilled draughtsmen and engineers.

The London & Birmingham clearly had the highest profile and the Chief Engineer, Robert Stephenson,

swiftly appointed his team, including Birkenshaw and Gooch, George Buck, John Brunton, Frank Forster, Edward Dixon and Paul Padley. John Dixon might have joined them too if the L&MR had not insisted on retaining his services.

This seems to have left George Stephenson and Frederick Swanwick on the Whitby & Pickering, and George Stephenson and Joseph Locke on the Grand Junction. Locke was no longer an apprentice: he was ambitious and highly competent. With most of its best staff deployed to London, George Stephenson & Son was probably no longer providing him with any particular support or other advantages. Gradually he secured the support of the company directors as his work on the northern half of the route progressed more quickly and efficiently than the southern half which Stephenson was supervising. Locke proved himself a superior organiser of resources, perhaps in part because he was focused solely on this line, whereas Stephenson had other projects in progress. However George remained contracted to the Grand Junction for some time longer, and signed off the sections for the modified approach from Perry Barr through Aston to Birmingham Vauxhall, and the Walsall branch, in 1834.

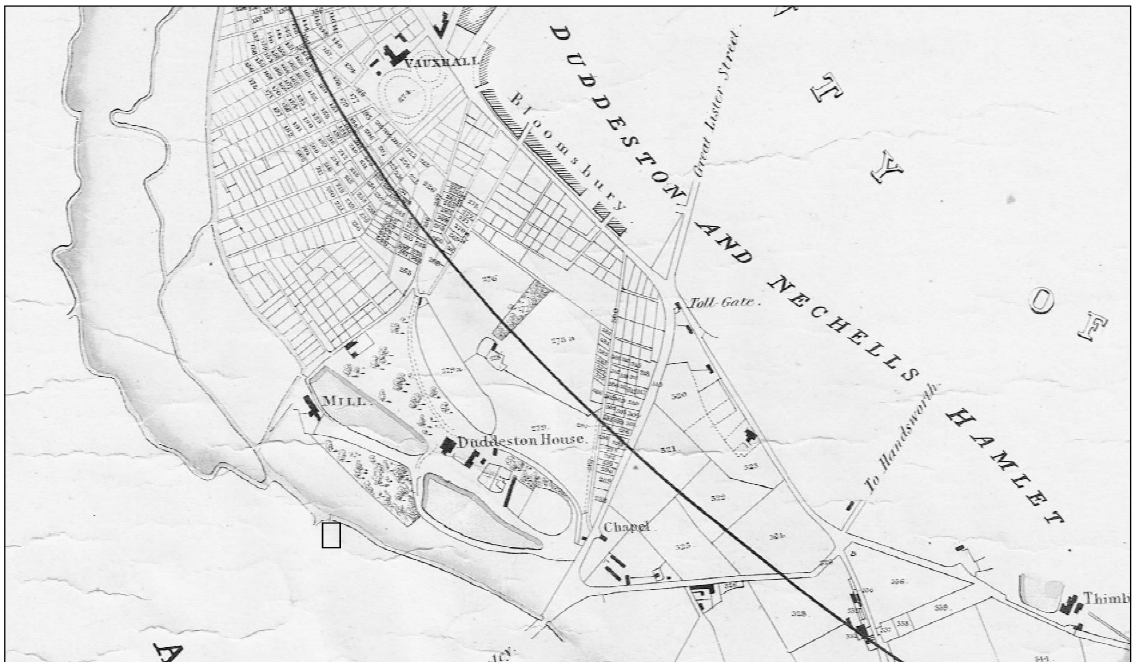


Fig 4. Extract from the Stephenson/Locke survey of 1834 for the Grand Junction Railway's altered route into Birmingham (Richard Dean)

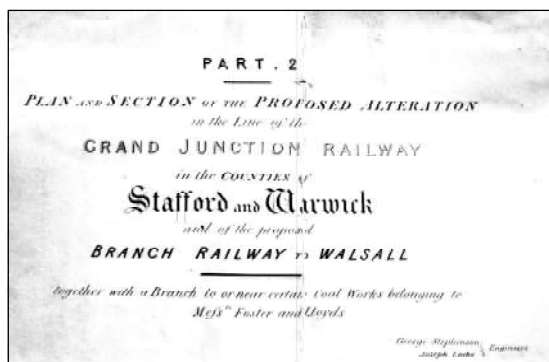


Fig 5. Caption to deposited plans of 1834 for the Grand Junction Railway, now in Stafford Record Office (Q/RUM/81) showing the joint involvement at this date of both Stephenson and Locke

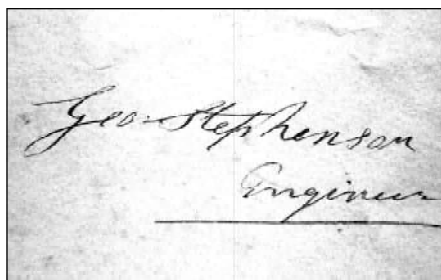


Fig 6. George Stephenson's signature on the 1834 plans for the Grand Junction Railway

George Stephenson was said to have been bitter about the way Locke replaced him on the Grand Junction, but in July 1834 he met the rising star of railway promotion, George Hudson, in Whitby and new prospects unfolded. On 27 July he was appointed to make a survey of the North Midland Railway, which in his mind was probably more than a sufficient replacement for the Grand Junction, for he formally resigned from that concern a few days later.

Whitby and Pickering, and a move to Leicestershire

In 1832 George Stephenson and Frederick Swanwick had deposited their survey for the Whitby & Pickering Railway.³⁷ This line was quite conservative, constrained by the topography and the relatively modest prospects for traffic. Operation of most of the route was by horses and by a long cable-worked incline at Beckhole. It was built almost exactly in accordance with the plans and completed in 1836.

Up to 1832 Stephenson's achievements, in terms of completed railways, had been modest. Only two of the nine public railways he had surveyed had been built (the Stockton & Darlington and the Bolton & Leigh), although the Grand Junction, Whitby & Pickering, and the Lime Street Station line were under way. His most famous railway, the L&MR, had been largely planned by Vignoles, although he had supervised its construction and to some extent remodelled it to fit more closely with his original ideas. The various projected routes across the Pennines had stalled and despite all his work on Liverpool to Birmingham schemes he was being supplanted by Locke on the Grand Junction.

In the summer of 1832 Stephenson left his house in Liverpool³⁸ and moved to Leicestershire. His relationship with the 'Liverpool Party' of investors had never been entirely comfortable, although two of them, Joseph Sandars and Joshua Walmsley, remained friends and business partners for life. His relocation, like everything else he did, was instinctively strategic. He would be in place and ready for a new flurry of projects which would extend the railway network into the north Midlands and Yorkshire.

Notes and references

1. R F Hartley, 'Killingworth 200 – the Killingworth Rail Road and Stephenson's early locomotives', *North Eastern Express*, vol 54, February 2015, pp 4–12
2. C E Mountford, 'The Hetton Railway – Stephenson's original design and its evolution', *Early Railways* 3 (Sudbury : Six Martlets, 2006), pp 76–95
3. Durham County Record Office (DCRO), Q/DP/8
4. DCRO, Q/DP/8
5. Lancashire Record Office (LRO), PDR/97, PDR/98
6. Miles Macnair, *William James (1771–1837): the man who discovered George Stephenson* (Oxford : Railway & Canal Historical Society, 2007), pp 60–64
7. Successive authors have portrayed this as some sort of plot on Stephenson's behalf, but it was James's own family, employees and business associates who took action in an attempt to retrieve money they were owed.
8. LRO, PDR/132. Another version is believed now to be in Manchester Central Library, but cannot currently be located.
9. LRO, PDR/131
10. Foster was the partner of J U Rastrick in the

- Stourbridge foundry where several early locomotives were built.
11. W O Skeat, *George Stephenson: the engineer and his letters* (London : Institution of Mechanical Engineers, 1973), p 71
 12. Skeat (1973), p 72
 13. Staffordshire Record Office (SRO), (Q) RUM (53); another copy in Cheshire Record Office (CRO), Q/DP/60. Hamilton had also been a member of William James's L&MR survey team.
 14. Paul Reynolds, 'The Railway Mania of 1824/5: a re-examination', *Journal of the Railway & Canal Historical Society*, no 207 (March 2010), pp 2–19
 15. L T C Rolt, *George and Robert Stephenson: the railway revolution* (London : Longman, 1960), pp 11–12
 16. Paul Reynolds, 'The Birmingham & Liverpool Railway 1823–1831', *Railway & Canal Historical Society*, Early Railway Group Occasional Paper 220 (2012)
 17. Rolt (1960), pp 108–114
 18. Hugh Steel, one of the surveyors, is said to have taken the setback so much to heart that he committed suicide in Stephenson's office in Newcastle.
 19. R E Carlson, *The Liverpool & Manchester Railway Project 1821–1831* (Newton Abbot : David & Charles, 1969), pp 184–6
 20. Carlson (1969), p 186
 21. R S Fitzgerald, *Liverpool Road Station, Manchester* (Manchester University Press, 1980), p 16
 22. LRO, PDR/164
 23. LRO, PDR/172a, 29 November 1828
 24. Now Salford Central station
 25. Fitzgerald (1980) covers this in detail.
 26. LRO, PDR/180; copy in Stockport Library, L/1282, L/1283
 27. CRO, QDP/98
 28. Jeffrey Wells, *The Eleven Towns Railway* (Keighley : Railway & Canal Historical Society, 2000), p 10
 29. George Dow, *Great Central*, Vol. 1 (London : Locomotive Publishing Co, 1959), pp 6–16
 30. West Yorkshire Archive Service, Wakefield, QE20/1/1830/3
 31. Wells (2000), p 11
 32. A Holt, *A Pennine Pioneer : the history of Summit railway tunnel* (Littleborough : George Kelsall, 1999), p 2
 33. LRO, PDR/190
 35. See plan in Holt (1999), p 1
 35. LRO, PDR/209
 36. SRO, Q/RUM/73
 37. North Yorkshire Record Office, QDP/(M)/19
 38. On Upper Parliament St where it still stands

MANCHESTER, 14th JUNE, 1830

At a special meeting of the Directors of the Liverpool and Manchester Railway, held here, on their arrival this day, by the Arrow, locomotive engine, from Liverpool,

Resolved, – That the Directors cannot allow this opportunity to pass , without expressing their strong sense of the great skill and unwearied energy displayed by their Engineer, Mr. George Stephenson, which have so far brought this great national work to a successful termination, and which promise to be followed by results so beneficial to the country at large , and to the Proprietors of this concern.

(Signed) CHARLES LAWRENCE, Chairman

[*Newcastle Courant*, 19 June 1830]

Thomas Gilbert's proposal : alternative ways of financing the Trent & Mersey Canal

Peter Brown

The Trent & Mersey Canal, then known as the Grand Trunk Canal, was a joint-stock company, the money being raised by the sale of shares. The shareholders owned the company, took all the risk, and benefited from all the profits.

But it need not have been this way. For example, another possible model was that of the turnpike trusts, organisations financed by borrowing rather than by the issuing of shares, and administered by commissioners.

Jean Lindsay's *The Trent & Mersey Canal* says:

[Wedgwood] wrote to Thomas Bentley, ... on 2 January 1765, to tell him that he had defeated a plan put forward by Thomas Gilbert MP, the land agent of Earl Gower and legal agent of the Duke of Bridgewater, and by Samuel Garbett, a rich industrialist in Birmingham, to have commissioners control the canal instead of a company of proprietors. Wedgwood had appealed to Earl Gower's 'candour and humanity', and had thus won him over to his side.

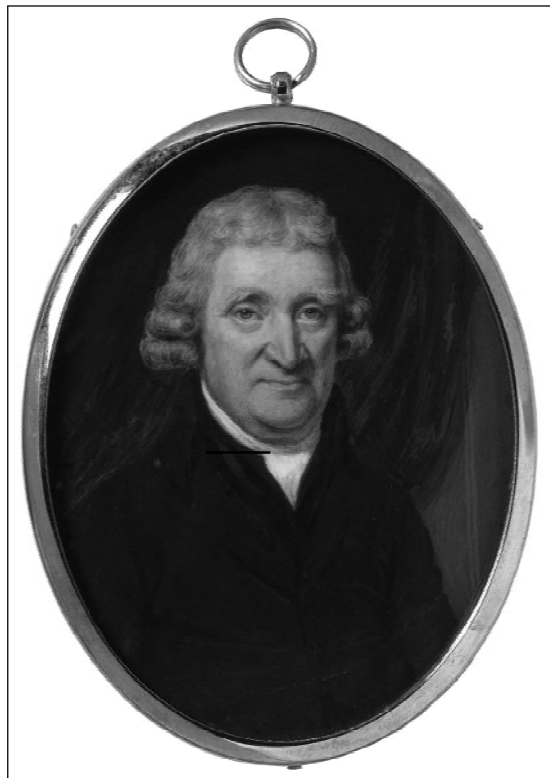
The source is given as a letter from Wedgwood to Thomas Bentley dated 2 January 1765.¹

In his biography of Thomas and John Gilbert, *Agents of Revolution*, Peter Lead says:

[Josiah Wedgwood] succeeded in protecting the yet unborn canal from the monopolistic Gower–Bridgewater interest represented by the Gilbert brothers. On his return from Liverpool in December 1764, Wedgwood was presented with a copy of a pamphlet written by Thomas Gilbert which argued that the projected Trent and Mersey Canal should be controlled by a group of proprietors. Such an arrangement would have provided both the Duke of Bridgewater and Earl Gower with extensive powers and a disproportionate financial return on their investment.

He goes on to say how Wedgwood won the argument, Earl Gower giving way. In the notes to this chapter, the author states that he had been unable to trace a copy of this pamphlet and it did not appear amongst the list of Thomas Gilbert's pamphlets held by the British Library.²

Victoria Owens, in her recent work, *James Brindley*



Thomas Gilbert by unknown artist, watercolour and bodycolour on ivory, 1780s. © National Portrait Gallery, London

and the Duke of Bridgewater, describes the controversy thus:

Returning home ... Wedgwood found a pamphlet outlining proposals which, to his mind, were 'dark, mysterious, and ungenerous'. The work of Thomas Gilbert, it advocated that the new canal be administered by commissioners – that is to say, by officials drawn, roughly speaking, from the same moneyed stratum of society as jurors and magistrates. ... To Wedgwood the idea was anathema. While adopting the commissioner scheme might enable Gilbert himself and his well-to-do commissioner-friends to draw a profit from

the canal tolls while satisfying their consciences with occasional repairs to its fabric, it would bring no benefit whatever to the small tradesman-investor.

She continues by describing how Wedgwood persuaded Gower of the wrongness of the proposal.³ However, like Lead, she had been unable to locate a copy of the pamphlet and is relying on Wedgwood's comments on it, particularly as set out in the letter to Bentley referred to above and in a letter to Erasmus Darwin dated 5 June 1765.⁴

The elusive pamphlet found?

Whilst researching other matters in the Sutherland papers held by the Staffordshire Record Office, I came across an undated and unsigned but professionally printed three-page document titled *Considerations on the proposal for making a communication between the ports of Liverpool and Hull*.⁵ Earl Gower's son was the first Duke of Sutherland, so this was a reasonable place to find a surviving copy of Gilbert's pamphlet. It does not mention 'commissioners' but its contents seem consistent with what were said to be Gilbert's views.

The first two pages extol the virtues of canals compared with river and road transport; specifically they endorse the proposal for a canal joining the rivers Mersey and Trent. The concluding five paragraphs are concerned with its financing and management. They are written in such a way as to appear to be the official statement of the promoters – an impression to which Josiah Wedgwood justifiably took great exception.

The first of these five paragraphs set out the author's fundamental principles: he wanted to avoid 'the least local or personal prejudice or partiality', desiring a scheme which 'may prevent any undue preference, and exorbitant advantage'.

The final four paragraphs discuss how the money needed could be raised and the implications of the various methods: by borrowing at a fixed interest rate on the security of the tolls; by shares in a joint-stock company; and by a compromise proposal, later referred to by Wedgwood as the 'medium scheme'.

The full text of Wedgwood's letter to Bentley states explicitly that the 'dark, mysterious, and ungenerous' part of Gilbert's pamphlet was 'the four last paragraphs'.⁶ This reference makes me certain that this is indeed the elusive pamphlet. For the rest of this article I shall assume that Thomas Gilbert was indeed its author.

Financing by borrowing

Gilbert considered that to raise the money by borrowing 'at bare interest on the credit of the tolls' would be difficult because of the size of the amount needed. By 'bare interest' he presumably meant limited to 5% by the usury laws then in force. Also, he thought, it would not be easy to find enough gentlemen resident locally willing to attend the meetings 'when they are not united in one common interest, by respectively risking their property'.

At that time carrying out public works by means of trusts was a familiar concept: the years following 1750 had seen many turnpike trusts created in most parts of the country. Locally it would even have been familiar in the context of navigable waterways. Following its managerial and financial reconstruction under an Act of 1760, the Weaver Navigation was managed by commissioners, with surplus profits going to the relief of the ratepayers of Cheshire, which did happen in various years from the 1770s. In 1763, the year prior to the implicit date of the pamphlet, the Louth Navigation's Act prescribed this method – Thomas Gilbert, as an MP, would probably have known this. Later examples were the Driffeld Navigation (1767) and the Bure Navigation (1773).

The positive wish to act in 'the common good' certainly had an influence on people's willingness to undertake voluntary roles such as justices of the peace and turnpike trustees, though a more passive feeling of 'duty' or even a desire to exercise power could also be the motivator. However, it is probable that 'the common good' would be a more effective motivator when the activity was purely local. For an undertaking covering such a large area as the Trent & Mersey Canal it was much less likely to be effective – each end being 45 miles from the offices at Stone, making it impossible for some people to get to a meeting and then return within the same day.

Turnpike trusts had an excessive number of trustees for effective management. For example, the Trust for the road only 14 miles long from Newcastle-under-Lyme to Market Drayton had over 350 trustees – perhaps most men living reasonably locally who fulfilled the criteria of receiving rents of at least £50 a year or having a personal estate with the value of at least £1,000 – yet the quorum was only five.⁷

Gilbert was aware of these problems, referring to 'the experience of many inconveniences, which have attended navigations framed on this plan of execution'.

In his letter to Erasmus Darwin dated 5 June 1765, Josiah Wedgwood was very critical of the 'trust' method of management, although he was himself a turnpike trustee – or perhaps because of his experiences as one. He wrote:

Most sensible people ... believe it will be a difficult matter to find a sufficient number of commissioners, who will bestow so much of their time & attention *pro bono publico*, as the carrying into execution & conducting this design will require, the most probable consequence of which will be that the management of it will by degrees drop into the hands of a few, who may squander away the money in serving themselves, and making jobs for their dependents & friends, instead of lowering the tonnage ...

In this letter Wedgwood accepted the need for an independent committee 'to see that the landowners and the country in general have justice done to them', in other words, a committee of commissioners to deal with appeals about the valuation of land compulsorily purchased and compensation to be paid, as was normal in navigation Acts.

Financing by share capital

Gilbert foresaw that a joint-stock company was likely to breach the fundamental principles he had set out. He wrote:

It is to be feared lest [the shareholders'] principal view should be to gain unreasonable profits to themselves: ... it will be difficult to ascertain such a rate of tonnage, as will answer the ends proposed, and at the same time prevent the future inconvenience of exorbitant gain.

He felt that the latter issue would be a particular problem when the canal was extended or joined by branches.

At that time a joint-stock company was a relatively unfamiliar concept except for overseas trading organisations such as the British East India Company. The Sankey Brook Navigation, authorised in 1755, was an early use of this form of financing and management for an inland waterway.

But were Gilbert's criticisms of this method of financing justified? Through the 1780s the Trent & Mersey Canal typically paid dividends of 5%, which nobody could describe as excessive. The big increases came after the deaths of Wedgwood (1795) and Gilbert (1798). By 1806 the dividend was 40% and it reached 75% in 1822.⁸ Shareholders interests seemed to have become paramount, as Gilbert had feared. No doubt the traders and their customers would have preferred lower tonnage tolls.

Gilbert was particularly concerned about the directors of a joint-stock company using their power to favour themselves and their friends. Josiah Wedgwood was later himself accused of this, probably unjustly, concerning the siting of his new pottery at Etruria.⁹

A more suspect example from the adjacent county concerns the construction sequence in the 1790s of the Ellesmere Canal, which was meant to go from Shrewsbury through the industrial area of Ruabon and Wrexham to Chester and on to what became Ellesmere Port. By 1798 the canal completed or contracted for included less than half of the main line but several of the branches; nevertheless it enabled five of the six most influential committee members to be provided with limestone from Llanymynech to improve their estates' lands.¹⁰

Wedgwood thought that the landed interests would be dominant unless the joint-stock system was used. However, only a relatively small proportion of the Trent & Mersey shares were held by tradesmen-investors; the landed interests were in fact dominant. An analysis of its £300,000 share capital as at 1782 shows by value: one peer (Earl Gower) 7%; landed gentry 39%; capitalists (mainly Liverpool and London) 16%; manufacturers 9%; tradesmen 9%; professional 7%; clergy 4%; women 9%.¹¹ With the exception of the capitalists, this was probably not dissimilar to the profile of lenders to a typical turnpike trust.

The 'medium scheme'

As a compromise Gilbert submitted:

... whether it might not be advisable to distribute the whole sum to be subscribed for, into shares of a certain value each, with a restriction that no subscriber shall have above a certain number of shares: and that out of the proprietors of such shares, an annual election be made of directors to superintend the management of the works.

Thus far, it might sound like an ordinary joint-stock company, but in the final paragraph he attempted to clarify it by proposing:

after the completion of [the works], to give [subscribers] an extraordinary annual allowance, not exceeding [left blank] per cent, over and above the said five per cent as a compensation for their assistance in promoting and conducting such a laudable and useful undertaking; until the principal shall be paid off out of the surplus profits.

He thought that many people owning estates close to the canal, as well as many traders, 'will be desirous

of becoming proprietors, in order to assist in the direction and management of it for the common good', adding 'they will consequently be content with a moderate profit'.

This explanation of his concept is remarkably unclear. For example, he did not explain how the undertaking would be managed once the debt was paid off.

Josiah Wedgwood's archive adds little additional practical detail. In his letter to Bentley dated 2 January 1765 Wedgwood refers to the 'chimerical plan of a medium betwixt proprietors and commissioners', that is, between a joint-stock company owned by its shareholders and a trust managed by commissioners. He said he tried to discuss the details of the 'weak or tyrannical' proposals with Thomas Gilbert but the latter did not answer his questions and referred him to another proponent of the concept, Samuel Garbett, a Birmingham industrialist.¹² Garbett was more forthcoming, but '[i]n ten minutes time he found his *baseless fabrick* tumbling down to the ground, and deserted it immediately'. Wedgwood was not of course unbiased, as he admits: 'I am not reasoning now, I am only huzzaing and singing I o' after a conquest ...'¹³

It is difficult to see the substance of some of Wedgwood's objections as set out in the books quoted earlier. In particular, it is not obvious how Gilbert's proposals would make it any more likely that the project would have given the Duke of Bridgewater and Earl Gower any greater extensive powers that they would possess as principal shareholders in a joint-stock company (or as principal lenders to a trust). When the canal company was formed, the landed interest had considerable influence, and the man who first chaired its committee was indeed Thomas Gilbert.¹⁴ Wedgwood and his allies also had considerable influence, and Wedgwood's solicitor, John Sparrow, was the canal company's Clerk. Nor is it evident how such an arrangement would have given people such as the Duke of Bridgewater and Earl Gower a disproportionate return on their investment, as all investors would have received the same rate of interest and the amount of any one person's investment could be limited.

One element of the proposal which is not mentioned in the pamphlet but which is hinted at in Wedgwood's letter to Bentley is the creation of 'a new set of masters ... raised up to controul [sic] both

[the proprietors] and their works'.¹⁵ It was normal for navigation Acts to set up committees of 'commissioners' to deal with appeals concerning valuation matters, but, as noted above, Wedgwood found this acceptable. Perhaps Gilbert had suggested that the commissioners should have a wider role, ensuring that the canal company did not exceed its powers and monitoring its charges and dividends – an eighteenth-century equivalent of the Office of Gas and Electricity Markets (Ofgem) and the Office of Rail and Road (ORR).

Conclusions

I have no doubt that the newly found pamphlet is indeed the one written by Thomas Gilbert. The views expressed coincide with those Wedgwood attributed to him and Wedgwood's reference to 'the four last paragraphs' seems too much for coincidence.

Wedgwood claimed to have won the argument in early January 1765, so it is surprising that the matter was still being discussed in June.

Neither the pamphlet nor Wedgwood mentioned the main weakness of debt-financed organisations: the difficulty of coping with reductions in income, whether caused by a temporary down-turn in the national or local economy or a longer-term problem caused by the pressure of competition.

I am sure that Wedgwood was right in asserting that the trust model would not have worked for such a large scheme, nor could it have survived the need for extra capital when it was found that the cost had been underestimated. A list of Trent & Mersey shareholders as at 1770 shows that only 434½ of the 505 £200 shares were taken up in the original flotation.¹⁶ In the absence of government funding it needed the lure of potential profit to raise the necessary capital. That argument trumps all.

Nevertheless, I have much sympathy with Gilbert's warnings about joint-stock companies and find some of Wedgwood's arguments in defence of them implausible. Indeed, Wedgwood seems to have made no attempt to address the substance of the criticisms of joint-stock companies. In particular, he asserted that a joint-stock company would reduce tolls but a trust would not, which seems counter-intuitive.

A simpler way to have achieved Gilbert's objectives would seem to have been a clause limiting the dividend. It is possible that this is what he in fact wanted but I think this unlikely. Surely an experienced lawyer, land-agent and reforming MP would not have

used such convoluted wording for such a simple concept?

The Forth & Clyde Canal's Act of 1768 limited dividends to 10%, the only one of the 'first generation' of canals having such a restriction. It was more common during the 'Canal Mania': the Montgomeryshire's Act limited dividends to 10% and the Acts of the Derby, Grantham, Sleaford, Horncastle, Chelmer & Blackwater and Glamorganshire Canals imposed a limit of 8%, for example. Ironically, in 1767 Josiah Wedgwood wrote that Samuel Garbett had wanted the Trent & Mersey Canal's dividends limited to 10%, though he was then asking Parliament *not* to limit Forth & Clyde Canal's dividends.¹⁷

Notes

My thanks to Paul Sillitoe, Victoria Owens and Peter Cross-Rudkin for giving me much to think about when preparing this article.

1. Jean Lindsay, *The Trent & Mersey Canal* (Newton Abbot: David & Charles, 1979), p 20; the letter is quoted at length in Eliza Meteyard, *Life of Josiah Wedgwood*, vol 1 (London : Hurst and Blackett, 1865), pp 347–351
2. Peter Lead, *Agents of Revolution: John and Thomas Gilbert – entrepreneurs* (Keele : Centre for Local History, University of Keele, 1989), pp 72–3, 163
3. Victoria Owens, *James Brindley and the Duke of Bridgewater: canal visionaries* (Stroud : Amberley, 2015), p 51
4. Katherine Eufemia Farrer (editor), *Correspondence of Josiah Wedgwood* (London : 1903; repr Cambridge University Press, 2011), vol 3, p 251
5. *Considerations on the proposal for making a communication between the ports of Liverpool and Hull*, undated: Staffordshire Record Office, D593/V/3/7
6. Letter from Josiah Wedgwood to Thomas Bentley, 2 January 1765: Meteyard (1865), p 348
7. Turnpike Act, 1810: Staffordshire Record Office, D593/V/3/64
8. Lindsay (1979), p 94
9. Christine Richardson, *James Brindley: canal pioneer* (Burton-on-Trent : Waterways World, 2004), p 78
10. The six most influential committee members were the three who between them chaired three-quarters of the meetings (Kynaston, Hill and Hunt) and the other three who attended most of the meetings (Lloyd, Owen and Rowland). The first five were Shropshire land-owners; Rowland, the only one who received no benefit from the partly-completed canal, was a Ruabon industrialist.
11. J.R Ward, *The Finance of Canal Building in Eighteenth-Century England* (Oxford University Press, 1974), pp 28–9
12. Samuel Garbett (1717–1803) manufactured buttons and hardware; with his partner John Roebuck he was a pioneer in industrial chemistry and founder of the Carron ironworks in Scotland. With Erasmus Darwin and two other partners, in the early 1760s Garbett established an ironworks and slitting mill at Wychnor, north-east of Lichfield, on the line proposed for the Trent & Mersey Canal. (Jenny Uglow, *The Lunar Men* (London : Faber, 2002), pp 22, 109).
13. Letter from Josiah Wedgwood to Thomas Bentley, 2 January 1765: Meteyard (1865), p 349
14. Lindsay (1979), p 57
15. Letter from Josiah Wedgwood to Thomas Bentley, 2 January 1765: Meteyard (1865), p 350
16. List of proprietors of the Trent & Mersey Canal, 9 March 1770: Staffordshire Record Office, D593/T/1/35
17. Ward (1974), pp 132–3, 137, quoting Farrer (1903), pp 134–5

The Lincoln Navigation : Fossdike in the Ellison era

Pat Jones

The Fossdike is an ancient canal that links Brayford Pool, in the heart of the city of Lincoln, to the tidal river Trent at Torksey. Previous papers by the writer have shown there is reason to believe it was the first of three canals cut soon after AD 71 to support the 9th Legion's advance from Lincoln to York.¹ At that time the minor river Till flowed into Brayford Pool from the west, the river Witham entered it from the south, and they exited eastward through a gap in the limestone ridge. The water level was held up by Brayford Head, a 'natural staunch' of yellow sand in the mouth of the gap, which was crossed by a paved

ford. Dave Watt's interpretation of sectional sketches in Michael Drury's 1887-8 notebooks (Fig 1) show the sand at Brayford Head to be 2.0m above OD.² The depth of water on the ford would normally have been around 0.3m, rising above 0.5m in high-flow conditions, when it became impassable.

For twenty years the writer edited Ripon Motor Boat Club's *Guide to the North East Waterways*, with the help of British Waterways and the other Navigation Authorities, which may explain his interest in the levels of navigable waterways and their structures. In 1994 inattention by one of the

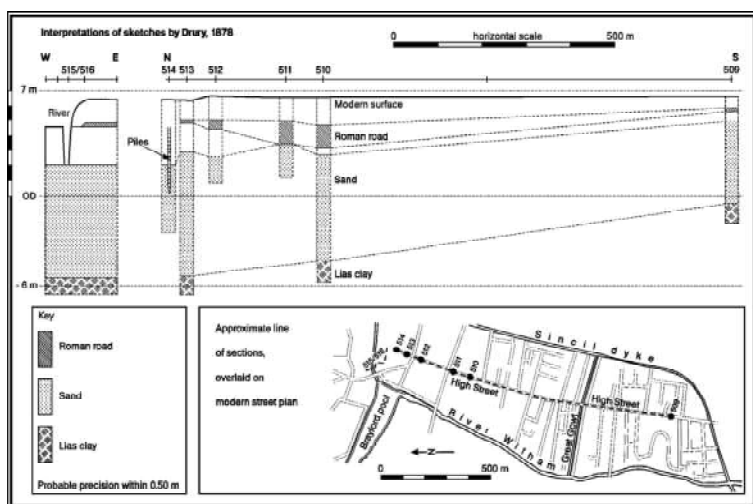


Fig 1. Interpretations of sketches by Drury (Dave Watt, E.H.) from *The City by the Pool* (fig 6.14). We are grateful to Jarvis Gurr, Historic England's Archive Licensing Officer, for permission to copy and reproduce this drawing. © Historic England

Michael Drury (born c.1832) was a Lincoln architect who became the City's Surveyor. In 1878 he was responsible for a new drainage and sewerage scheme for Lincoln, and kept extensive notes on the many Roman discoveries that were made. These included sectional sketches of eight separate sites; two of which were at Brayford Head, and six on the Roman road beneath the High Street at Wigford. Levels originally related to Ordnance Datum Liverpool were presumably corrected with a notional subtraction of 8 inches for OD Newlyn, and then converted to metric units. The probable precision was considered to be within 0.5m, but the stratum measurements were taken to the unit inch (25.4mm), which encourages confidence in their accuracy.

Stations 514 to 516 revealed the level of the sand forming the 'Natural Stanch' of Brayford Head, and the addition of a scale between the 'OD' and '7m' lines show it to be 2.0 metres above Ordnance Datum.

Club's members resulted in the grounding of his boat on what appears to be the earliest of two paved Roman fords across the Trent at Littleborough. The dredged channel is on the Lincolnshire side; the quite substantial remains of the ford were on the Nottinghamshire side of the river. Its survival 'ankle-deep' at low tide suggests the natural bed level, gradient, and course of the river have all remained virtually constant thereabouts since Roman times.

British Waterways Newark Engineer had provided detailed information regarding Torksey Lock, which included the figure 1.054m above OD for its bottom cill. This is significantly higher than the bed of the dredged channel below the lock, suggesting that the cill still occupies the level of an earlier structure. It would have been absolutely necessary for the bottom cill of Ellison's lock to correspond to river bed level, and the discovery of a second-century votive offering during the course of his restoration work,³ missed during previous restoration attempts, strongly suggests that the Roman canal had been at the same level, had occupied the same outfall, and therefore that it probably followed the same course all the way to Lincoln.

The Fossdike joined the tidal river Trent on the outside of a bend at Torksey, (Fig 2) where there was deep water beside the riverbank, and it is safe to assume the riverbed was c 1.1m above OD, which would have become the canal's bed level. Evidently a depth of c 1.2m could be retained at Torksey; the Roman canal had probably been held up by a guillotine gate, raised for navigation when the tide made a level.

Floodwater-borne silt caused navigation to cease on the Fossdike during the latter part of the 2nd century. The silt was evidently cleaned out in 1121; a literal translation of Symeon of Durham's contemporary account of the event in his *Historia Regum* claims: 'in 1121 King Henry made a long ditch (*fossato*) in the soil from Torksey as far as Lincoln, as a course for ships, by turning the river Trent'. This suggests the canal was tidal; in all probability the rising tide usually increased the depth of water by 'backing-up' water flowing down the Fossdike from Brayford Pool. The Trent's flood tides carry a great deal of silt (locally termed *warp*) in suspension, which would have been deposited as its rate of flow decreased, thereby reducing the canal's navigable depth. When spring tides coincided with low-flow conditions in the Witham, the Trent's waters may have flowed into Brayford Pool.

(Siltation was also experienced on the nearby Bycarrsdike (lower River Idle); a decision to assist the upstream passage of craft by leaving the gates of Misterton Soss open to the flood tide, had to be reversed two years later:

Court of Sewers at Thorne, September 12th 1728:

Whereas by reason of setting open the Soss gates, the river called Bycarsdike is much warped up to the prejudice of ... landowners adjoining. Now this Court doth order that in time to come the said gates shall only be sett open for the necessary passing and repassing of boats and keels, and at other times be kept shut.⁴)

The Act 22 & 23 Chas II c.25 that empowered the Mayor and Corporation of Lincoln to undertake the improvement of navigation on the Fossdike and Witham, and to levy specified tolls upon these waterways, had received the Royal Assent in 1671. The preamble to the Act reads as follows:

Whereas there hath been for some hundred of years a good navigation betwixt the borough of Boston and the river of Trent by and through the city of Lincoln, and thereby a great trade managed to the benefit of those parts of Lincolnshire, and some parts of Nottinghamshire and Yorkshire, which afforded an honest employment and livelihood to great numbers of people. But at present the said navigation is much obstructed and in great decay by reason that the rivers or ancient channels of Witham and Fossdike, which run betwixt Boston and Trent are much silted and landed up and thereby not passable with boats and lighters as formerly, to the great decay of the trade and intercourse of the said city and all market and other towns near any of the said rivers, which hath produced in them much poverty and depopulation. For remedy whereof and for improvement of the said navigation, may it please your most excellent Majesty that it may be enacted ... etc

The Act required the undertakers to maintain Saxilby Bridge, and confirmed an ancient public right to cross the Fossdike by fords in six specified places, implying the depth of water had to be limited, although the maximum was not specified. There was a requirement to provide sufficient depth for the passage in summer of boats of five tons burthen, which would have a draught of about 18 inches (0.5m), a figure that was also mentioned elsewhere.

The Corporation appear to have confined their activities to the Fossdike; they entered into an Agreement with Samuel Fortrey, who was '...well versed and expert in matters of inland navigation' and between 1672 and 1675 some work was done

on the Fossdike under his direction, in return for a one third share of the tolls in perpetuity. This included replacement of the pre-existing sluice situated some 600 metres east of Torksey Bridge, by a pound lock west of the bridge, to which flood-gates were attached. This work seems to have been intended to minimize the deposition of silt from the Trent's flood tide; a lesson the management of the Bycarrsdike had still to learn.

But tide-borne silt was not the Fossdike's only problem; in above moderate flow conditions part of the Witham's stream was diverted into the Sincil Dike, which discharged back into the Witham at Stamp End. Moreover, the six fords that crossed the canal limited the depth of water, thereby restricting the load boats could carry. When in moderately high-flow conditions navigation should have been possible, it had become the practice to cast gravel upon the fords to reduce the depth of water over them. Consequently the revenue from tolls was greatly exceeded by the cost of maintenance, and navigation had ceased by 1737, when it was said that 'locks and other works upon the said channel are in so ruinous and bad condition, and the channel so warped and silted up, that the navigation is in great measure rendered useless'. Lincoln Corporation was evidently unwilling or unable to find the estimated £3,000 cost of repair, and so they resolved to seek a private undertaker to make the canal navigable, and, because of his experience, Richard Ellison was one of those approached.

Richard Ellison

Richard Ellison was a timber merchant of Thorne in south Yorkshire, who had considerable and profitable experience with various enterprises in that county. He had given evidence for the Don Bill of 1727, and served on the Don Navigation committee 1731-37. In 1735 he had carried out a survey of the Ouse and Swale on behalf of the Don Navigation with William Palmer.⁵ Ellison personally promoted a scheme to make the Ouse navigable above St Marygate York to Boroughbridge, and the Swale from its junction with the Ouse to Langton, but it encountered much opposition from milling interests, local landowners, and York Corporation. He was accused of furthering his own interests; evidently Ellison owned a large quantity of timber standing beside the Swale, which could be extracted, shipped downstream, and sold very profitably. On 4 February 1736 a House of Commons Committee

considered the Bill for making the Swale navigable, but it was dropped after its first reading. A paper dated 22 December 1737 prepared for the Duke of Somerset,⁶ shows that Ellison had apparently taken no action to put a Bill to Parliament during that year, but intended to do so in 1738.

His involvement with the Fossdike dates from 1737, when he established that the height difference between the riverbed, and the surface of the water impounded by Torksey Lock, would make it possible to improve the channel to carry craft drawing 3ft 6ins, as had already been achieved on the Don. That would depend, however, upon the City being able to end the public's right to use the six fords. In 1672 the City had sold a third share of the tolls of the Fossdike to Samuel Fortrey, which by 1731 was held by Robert Peart, who had mortgaged his right to James Humberston for £750. By September 1740 they had struck a bargain with Richard Ellison, (whom they termed a merchant), and leased the navigation's tolls to him for 999 years from 1 January 1741 at an annual rental of £50 to Lincoln and £25 to Humberston. The toll rates were to remain those set by the 1671 Act. There was no mention of the fords; he was to deepen the channel so that boats may at all times pass drawing 3ft 6ins, keep up Saxilby Bridge and the bridge carrying the towing path over the river Till, and indemnify the City against any claims arising from alterations to Torksey bridge.

Late in 1742 Richard Ellison again proposed a Bill for the improvement of the river Swale. As a result, the matter was again considered by York Corporation as recorded by a minute of their meeting held on 6 December 1742, which reads:

Mr Tolford, having acquainted these prospects that he has heard Mr Ellison intends to attempt a Bill in this session of Parliament for making the River Swale navigable. My Lord Mayor is desired to write to our Representatives in Parliament to have a watchful eye in that respect to give all the opposition in their power to the Bill and to be sent a copy of it as soon as they can that this City may send a petition against it.⁷

Once more opposition to Ellison's proposals seems to have won the day; nothing further is heard about this scheme. By 1743 he is likely to have been fully occupied with the Fossdike, which had already cost £3,000 and the work was far from finished. It is possible that his health was failing; he died on 20 December 1743 but the work continued under the direction of his son, Richard II (born 1721) and the canal reopened in 1744. Only work that was absolutely necessary had been undertaken; the lock

built in the 1720s on the Trent side of Torksey Bridge would have been rebuilt to accept the coal-carrying craft then operating out of the Don, which were 54ft long by 14ft 4ins beam, and the canal's channel was cleaned-out to enable them to reach wharves beside Brayford Pool.

The Fossdyke proved to be difficult to maintain; silt was carried in from land-drains and on the flood tide, and the banks which were of sand and stood 10-14ft (3-4m) above the water, were constantly falling in. It seems likely that within a few years of the reopening it had become apparent that raising its surface level would mitigate some of the problems inherent in a canal cut down to a tidal river's bed level. A map of Torksey dated 1757 in Lincoln Archive Office shows the lock to be on the Trent side of the bridge; raising the canal level would have reduced the less than generous headroom beneath it. It would be necessary to build a new lock on the other side of the bridge, or raise the bridge. In a deposition pertaining to a Chancery case of the late 1830s,⁸ it was claimed by the family that Richard Ellison II, who carried the reopening work to a successful conclusion, was nearly ruined by the actual costs, which by 1761 amounted to £14,000. It seems likely that this figure included the cost of building a new lock; it certainly existed in 1782, when Jessop's *Survey of the river Trent* showed Torksey Lock to be on the eastern side of the bridge (Fig 2).

In order to raise the canal's surface level it would have been necessary to raise the cill at the head of Sincil Dike, and to raise the crest of Stamp End Weir. Richard Ellison's authority did not extend to the Witham, and the proposed alterations would have been subject to negotiation. The narrow river through the city that is spanned by High Bridge was too shallow for navigation, and a ford between Brayford's North and East wharves was in regular use by horse-drawn carts – it was replaced by a swing-bridge 1795-7 – and a significant increase in the depth of water would have been unacceptable. It seems likely that Sincil Dike was modified under a 1762 Act,⁹ and that any change to the crest of Stamp End Weir was limited to whatever was necessary to maintain a level of c. 2.5m upstream in normal conditions.¹⁰ This created a depth of c. 0.5m (18ins) over the timber floor of High Bridge, which enabled traders who had warehouses between High Bridge and Stamp End to trans-ship their goods from craft moored at Brayford's wharves into 'small boats or lighters drawing only a foot of water'. In the event Stamp End weir could not 'make any water over

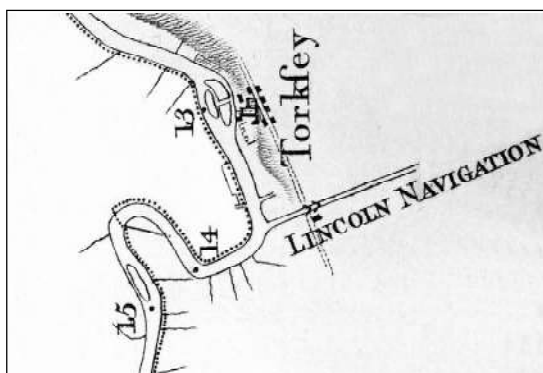


Fig 2. An extract from Wm Jessop's 1782 Survey of the river Trent; the numerals record the mileage above Gainsborough. Jessop termed the Fossdike the 'Lincoln Navigation'; the suffix denoting a waterway previously navigable in part or in favourable conditions by small craft, improved to accept the larger craft trading on contiguous waters. Hence 'Don Navigation' etc. The deep-water channel is to be found around the outside of a river's bend; evidently someone who understood rivers took the decision as to precisely where the Fossdike should join the Trent.

Brayford Head in the summer season', and raising the Fossdike's surface level became an outcome of 1791 proposals to extend navigation on the rivers Bain and Sleaf to Horncastle and Sleaford respectively.

The viability of the Horncastle and Sleaford projects depended upon them having direct access to the markets and sources of coal that the Fossdike enabled the citizens of Lincoln to enjoy. This required the creation of a navigable link between Stamp End and Brayford Pool. On 17 November Lincoln Corporation agreed to the timber floor beneath the arch of High Bridge being lowered to allow craft drawing 3ft 6ins to pass. It could only be lowered to a limited extent to avoid undermining the abutments of the bridge, so that in addition, 'the water level at Brayford Head would need to be raised about a foot'.¹¹

Jessop's February 1792 *Estimate of the Expense of improving the present Navigable Communication between the Fossdike and Witham Navigation through the High Bridge at Lincoln* comprised:

- £80. For 'making alterations to the staunch at Stamp End'
- £200. For 'making a New Cut for Sincil Dike to discharge below the Staunch'

- £460. For 'taking down and rebuilding the Wall through the Town'
- £40. For 'lowering the floor of the High Bridge'
- £120. For 'widening and deepening the river'
- £300. For 'purchase of land'
- £120. For 'contingencies at 10 per cent'
- Total: £1,320.¹²

Detailed reports and estimates for the work at Lincoln totalling £3,497 were produced by Michael Pilley (resident engineer for the Witham Commissioners) and John Tompson (the Don Navigation's engineer) and presented to the Commissioners on 3 October 1794. The work started in the spring of 1795; it had been completed by April 1797, and the final cost had exceeded the estimate by £1,164. All costs incurred west of the High Bridge were borne by the Ellison family.¹³ However, Jessop's proposal to deepen the river and lower the floor beneath High Bridge was not adopted; the sectional sketches from Michael Drury's notebooks (Fig 1) show the natural bed of the river at Brayford Head at the same level in the narrow section west of the bridge. Figures given by Wheeler,¹⁴ imply that the work raised the river above Stamp End, Brayford Pool,

and the canal, to their present-day level, which would have required Stamp End Lock and Weir, and Torksey Lock, to be raised or rebuilt:

In October 1802 with 8ft 6ins on the sill of Grand Sluice, the surface level at High Bridge was 9ft 5½ins above that at Grand Sluice (p.160-1).

Grand Sluice sill 3.2ft below OD (Liverpool) (p 167).

Therefore the surface level at Grand Sluice was 5 feet 3½ inches above OD (L); at High Bridge 14 feet 9 inches above OD (L), or 14 feet 1 inch. (4.3m) above OD (Newlyn). Present day levels are normally: 1.4m above OD(N) above Grand Sluice; 2.8m above OD(N) above Bardney Lock; 4.4m above OD (N) above Stamp End Lock, and 4.3m above OD(N) at Torksey.¹⁵ Presumably the 0.1m difference is caused by losses due to lockage, leakage, and evaporation.

Between Lincoln and Saxilby, on both sides of the Fossdike, nearly 4,000 acres of low-lying fenland drained by gravity into either the eastern end of the Fossdike, or the river Witham upstream of Lincoln. The outfall of the arterial drains was impeded by the retention of water in the canal and river, so that by the middle of the eighteenth century landowners were seeking means to drain it more effectively. Drainage



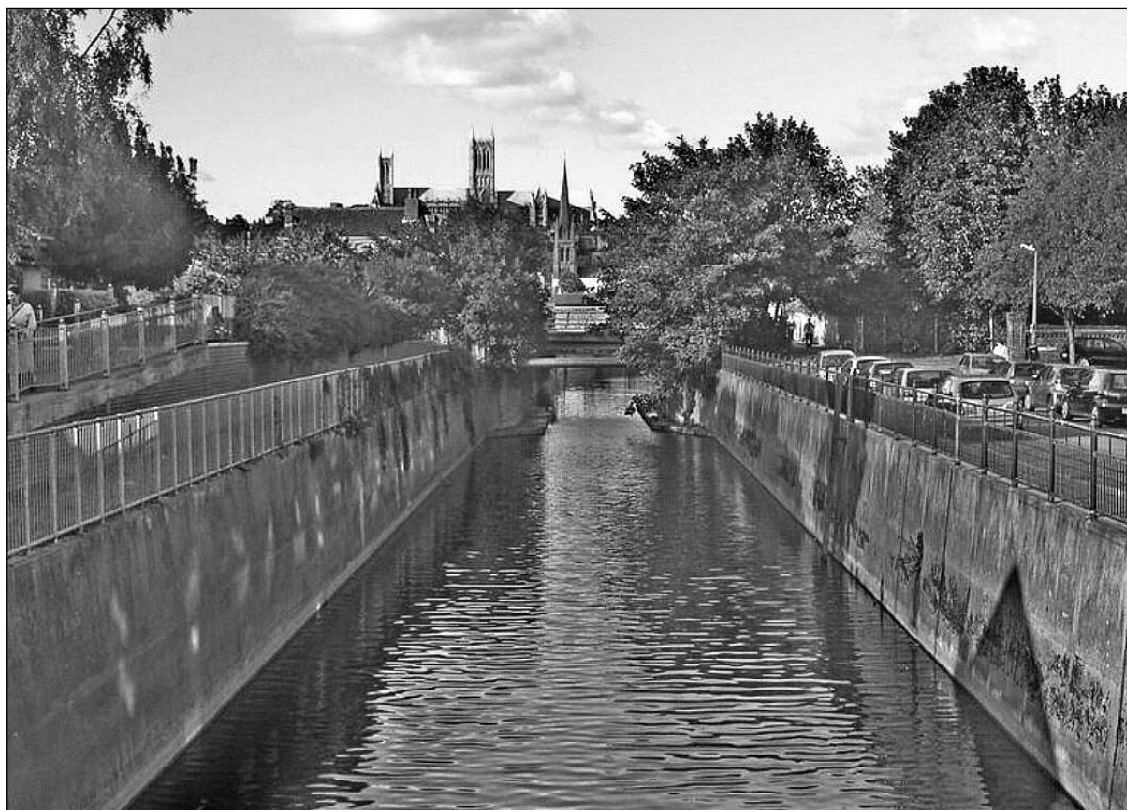
Fig 3. An enlarged extract from 1930 6 inch OS map, showing where Great Gowts Tunnel passes under the upper river Witham and the road, between Coulson Road to the west, and Boultham Avenue to the east. It was part of a scheme to separate upland from lowland waters, and carried lowland drainage into the Sincil Dike, which was extended to discharge via the South Delph into the Witham below Bardney Lock.



Skellingthorpe Main (Boultham) Drain beside Coulson Road. East of the Witham at Great Gowts it becomes Great Gowts Drain. (From Google Earth, photo: rendezvous (2009))



Great Gowts Drain outfall into Sincil Dike. (From Google Earth, photo: redimp 99 (2009))



Sincil Dike (From Google Earth, photo: redimp 99 (2009))

districts were established for both sides of the Fossdike, and a report by John Smeaton and John Grundy was submitted to their commissioners in 1762, but no action was taken. Twenty years later Smeaton was again commissioned to investigate, and ten years later one of his proposals was included in the Horncastle Canal Act of 1792, which authorized the Witham drainage commissioners to construct a culvert or tunnel of 4.9m clear waterway beneath the Witham. ‘Great Gowts Tunnel’ (Fig 3) appears to have been built shortly afterwards, and it would have gone a considerable way to resolving the drainage problem in the low lands south of the canal. However, the increased impediment to the free-flow of drainage water caused by raising the level retained in canal and river, exacerbated the problem in the low lands north of the canal.

What followed was described by Barry M J Barton: ‘John Rennie and the drainage of the Witham Fens, Lincolnshire, UK’ (ICE Proceedings *Engineering History and Heritage*, vol 164, Issue EH3 (2011) p191):

In 1802 John Rennie, in his report on the Witham drainage, endorsed Smeaton’s proposals, and in 1804 the drainage commissioners west of Lincoln obtained an Act of Parliament with powers to undertake works ‘not very different from what was proposed by my late able and judicious friend, Mr Smeaton’. The Smeaton/Rennie solution (HEW 1833) involved the use of catchwater drains to separate upland and lowland waters; the 7.4 km Boultham Catchwater Drain along the southern edge of the low lands discharging to the Witham and, north of the canal, the 6.1 km Burton Catchwater Drain along the foot of the scarp slope of the Lincoln Edge and discharging into the canal itself. Within the low lands, drainage was by means of new arterial drains; the 8.0 km Burton Main Drain in the Northern drainage district and the 6.0 km Skellingthorpe Main Drain in the Southern district. Rennie linked the former to the latter by a sunken cast iron tunnel under the canal at Pyewipe, which exists to this day as a key component of the arterial land drainage network. (The Act authorised two such tunnels but only one was built.) Rennie’s cast iron tunnel under the Fossdyke was to be a single elliptical pipe approximately 37 m long and with an area of 1.5 m². Work commenced in 1805

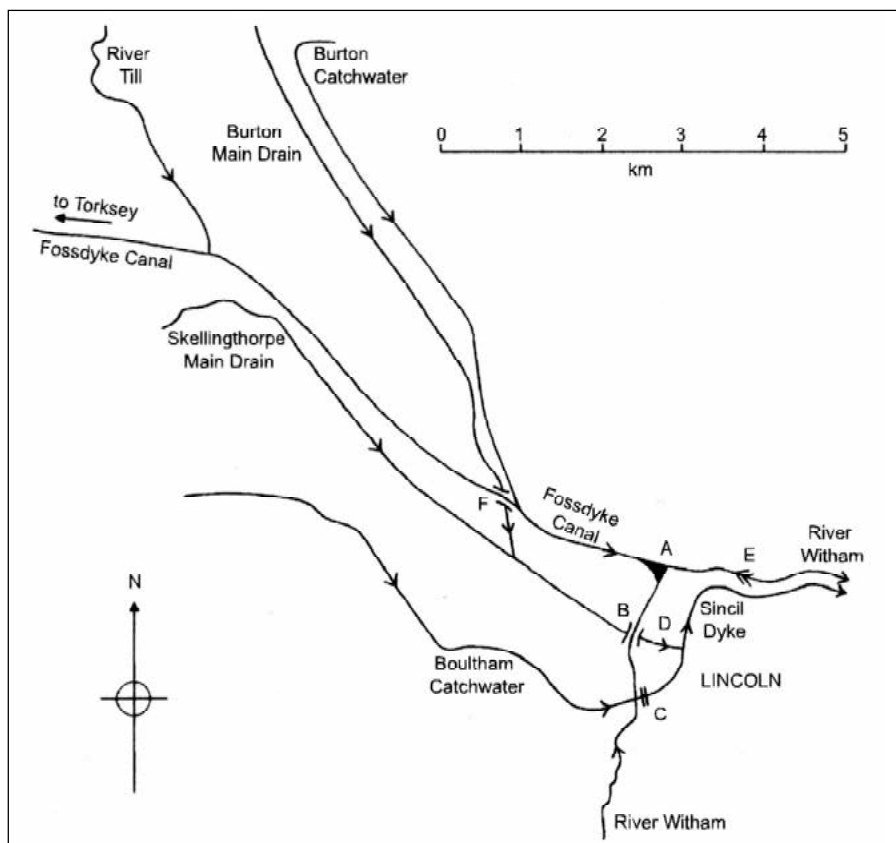


Fig 4. Sketch map of the drainage in the Lincoln area (Barton fig 4, cropped PEJ)

A = Brayford Pool B = Great Gowts Tunnel, [1795–8] C = Bargate Sluice
D = Great Gowts Drain E = Stamp End Lock F = Pyewipe Tunnel [1805–16]

Sources:

B M J Barton, Lincoln ‘Western Area Drainage. Supplementary report to HEW 1833 record form’ (ICE Archives, London)

J S Padley, Fens and Floods of Mid Lincolnshire (Lincoln : C Akrell, 1882)

W H Wheeler, A History of the Fens of South Lincolnshire (2nd ed, Boston : J N Newcomb ; London : Simpkins, Marshall, 1896)

R C Wheeler (ed), Maps of the Witham Fens from the Thirteenth to the Nineteenth Century (Woodbridge : Boydell Press for the Lincoln Record Society, 2008)

and had been largely completed by 1808, but the ‘award’ certifying completion of the scheme was not issued until 1816. We know that problems were encountered with running sand during construction, and in 1809 the south bank of the canal collapsed at the site of the tunnel excavation.

The influence of the Witham commissioners on the 1804 Act can also be detected in the inclusion in that Act of a flood spillway weir, Bargate Weir, from the Witham to the head of Sincil Dyke, although there

may already have been some sort of structure there. By extending the Sincil Dyke to Horsley Deeps in the Witham scheme, Rennie had ensured a significant head differential for the drainage of the low lands west of Lincoln.

The Notice announcing the opening of the Horncastle Canal dated 5 November 1802 included the words; ‘Coals very much wanted’.¹⁶ One of the first vessels to pass through Lincoln and reach Horncastle from Wakefield on 3 June 1803, was John Wilson & Benjamin Gilyard’s 42 ton sloop *Margaret*.¹⁷

William Jessop’s 1808 Report on suggested improvements to the Witham Navigation is appended.

Peter Fairweather describes some nineteenth-century events in *The Ellison family of*

Sudbroke Holme and Boultham. <<http://homepage.ntlworld.com/peter.fairweather/docs/Ellison.htm>> [accessed 9 June 2015].

As a part of the Lincoln West Drainage Scheme bridges were built over the Great and Little Gowts drains in the High Street; the West Drainage embankment was constructed in 1805, when Ellison III emptied the Fossdyke for a mile and a quarter from Lincoln and deepened it, but for nearly 15 years after that nothing more was done.

Complaints became numerous, and in 1819 traders said that the channel was so silted up that they could not pass up and down even with empty vessels drawing only 2 feet of water. In 1826 an exceptional drought brought complaints to a head, and Ellison spent £6,000 in deepening the Fossdyke.

Continuing improvements to the river Trent above Gainsborough authorized by an Act of 1783 had by the 1820s resulted in a significant increase in its channel's navigable depth. At that time much of Lincoln's trade was trans-shipped at Gainsborough into or out of Upper Trent Boats, which carried a single square sail, were up to 74ft long, a little over 14ft beam, lightly built and undecked. They could not operate in the potentially rough waters below Keadby, but could carry loads of 50 tons on a draught of 3ft 6ins.

Following the improvements to the Trent, pressure began to be exerted on the Ellisons to increase the *Fossdyke's* depth, and the width of Torksey Lock, so that the heavier and relatively seaworthy Yorkshire Keels (which were trading to and from Hull) could reach Lincoln. When Richard Ellison III died in 1827 the canal's management was handed to a relative by

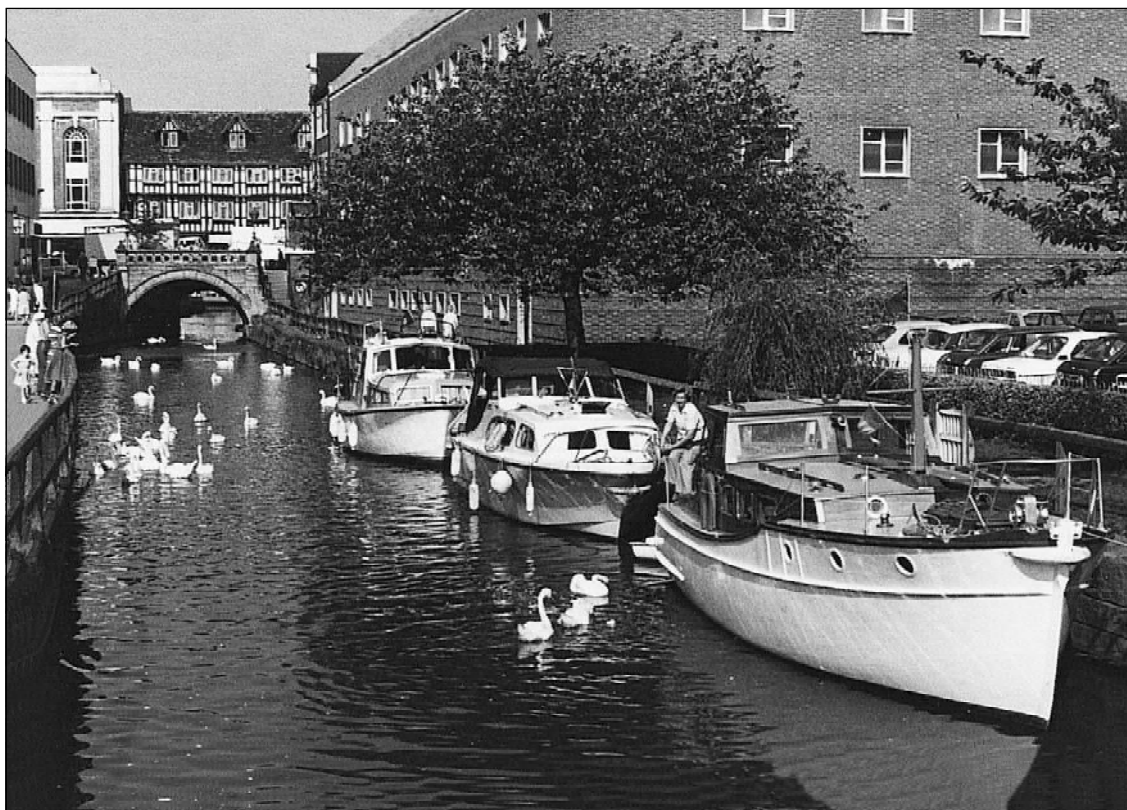
marriage, Humphrey Sibthorp, the MP for Lincoln, who was already a proprietor of the Witham. An arch opponent of free trade, railways, or anything else which might threaten to disturb his status quo, he once said 'I would rather meet a highwayman, or see a burglar on my premises than an engineer'. His invitation in the spring of 1833 to the engineer Isambard Kingdom Brunel (1806-1859) to survey and report the condition of the *Fossdyke* is therefore quite remarkable. At that time Brunel was engaged in surveying a route for the Great Western Railway, and his acceptance and prompt attention is perhaps even more remarkable. His soundings and cross-sections of the channel showed the extent to which improvement would be necessary.¹⁸ Despite the distractions of a lengthy lawsuit – which the Ellison family eventually won – the Fossdyke was deepened to give it a navigable depth of five feet.

Fairweather continued:

For some time before the death of Richard III, opposition to the way that the Ellisons were carrying out their responsibilities concerning the Fossdyke had been growing, and a 'careless and ineffectual cleansing' of 1827 did not appease the public. A Commission of inquiry in the Court of



Bargate Sluice. From Google Earth, photo: Husssydogg (2009))



The river Witham and 'High Bridge' or 'Glory Hole', with the writer's cruiser in the foreground. The arch is 20ft (6.1m) wide, and the 'air draught' beneath its centre is 9ft 6ins (2.9m). Photo: PEJ (1987).

Chancery was instigated by the merchants and traders and dragged on for years. By 1837 both Richard and [brother] Henry were dead and the heat had gone out of the battle, which ended in 1839 in Ellison's favour. Henry had died in 1836 and was succeeded by his only son Richard IV, who, as soon as the litigation ended, offered to sell the lease, but the city council felt that the price was too high. *The Stamford Mercury* said that a railway to Gainsborough could be built for less, and a few years later this became a reality when it was proposed to build just such a line. This would have captured the Fossdyke grain trade and had an adverse effect on Ellison income, so he sold his lease to the railway company. Thus ended the Ellison connection with the Fossdyke after a little more than 100 years.

The problems with the section of the river Witham spanned by Lincoln's High Bridge were also described by A J Ludlam in *The Lincolnshire Loop Line (GNR) and the river Witham* (Oakwood Press, 1995), p 5:

High Bridge, in Lincoln, continued to cause problems for navigation; a petition, presented to

the House of Lords by the Mayor, Aldermen and Burgesses of the City, in 1846, described the problem: 'The ordinary depth of water under High Bridge when it stands at the height of the datum line drawn from the weir of Stamp End lock to a mark on the bridge is three feet eight inches at most, while the depth of water in the Fossdyke, immediately above, is five feet, and in the Witham, immediately below, six feet'. The result was that vessels often had to lighten their load in order to be able to pass under the bridge.

Floodwaters presented a different problem. The increase in the depth of water and the resulting decrease in headway beneath the arch of the bridge, meant that vessels sometimes had to lie up in the river below the bridge for several days. On some occasions boatmen would allow water into the holds of their vessels in order to sit them low enough in the water to avoid the arch.

The 1846 petition was also concerned with the proposals of the London and York Railway Company, at that time before Parliament. Included in this legislation were provisions for the company to take a 999year lease on the Witham, and about

990 [890] years on the Fossdyke. The petitioners were anxious to protect the interests of the navigation and ensure its continued maintenance.

Raising the surface level in Lincoln of the river Witham and Fossdike by 6ft (1.8m) was seemingly intended to directly benefit navigation (and land drainage indirectly): firstly, to stop the ingress of tide-borne silt by raising the surface level of the canal above all but the highest tides. And secondly, to stop the deposit of drainage-borne silt, by creating space for culverts through which drainage water could flow beneath the canal into the river Witham below Lincoln, *via* the Sincil Dike. Unfortunately only half the number of culverts planned were actually built.

The Great Northern Railway's 'Loop Line' was built on the south banks of the *Fossdike* and river Witham from Saxilby through Lincoln to Bardney, where it crossed to the opposite bank, crossing the river again at Boston. Under the terms of the GNR's 1846 Act, on 22 January 1850 they leased the Witham Navigation from its proprietors for 999 years commencing 1 July 1846 at £10,545 per annum, plus interest on mortgages totalling £24,692. (The GNR had redeemed the mortgages by 1857.) They sub-leased the Fossdike from the Ellison family for 894 years (the un-expired part of their 999 year lease) at £9,570 per annum. These figures were the average of the net profits for the previous three years (during which the navigations benefited from the carriage of the railway's construction material) plus 5%. They almost completely rebuilt Torksey Lock in 1846;¹⁹ the line opened to Lincoln on 18 October 1848, and to Gainsborough on 9 April 1849.

Acknowledgements

This paper is intended to add detail to the account by former RCHS member the late John Boyes 'The South Lincolnshire Navigations: The Fossdyke and Witham' in Chapter X, *The Canals of Eastern England*, by John Boyes and Ronald Russell (Newton Abbot: David & Charles, 1977).

An early version was circulated to members of the RCHS Waterway History Research Group as Occasional Paper 126. I am grateful to Barry Barton, who very helpfully commented upon and contributed to its draft. I am also grateful to Raymond Carey, who sent me a copy of his painstakingly researched (but regrettably unfinished) history of the Fossdike. And also to Stephen Hague, who sent me a copy of Barbara Muirhead's transcription by former RCHS

member, the late Alan Voce, of material (in North Yorkshire Record Office, Northallerton) that describe Richard Ellison's unsuccessful attempt to make the river Swale navigable.

Notes

1. Pat Jones 'Two Early Roman Canals? The origins of the Turnbridgedike and Bycarrsdike', *RCHS Journal* no 162, November 1995, pp 522–31. Also, Pat Jones 'The inception and demise of the Roman Fossdike', *RCHS Journal* no 219, March 2014, pp 26–31
2. M J Jones (ed) *The City by the Pool* (Oxbow, 2003), p 52
3. Pat Jones 'The discovery of a statuette of Mars in the Fossdike at Torksey in the 18th century', *RCHS Journal* no 224, November 2015, pp 390–4
4. Pat Jones 'The effect of land-drainage works upon navigation on the river Idle', *RCHS Journal*, no 172, March 1999, pp 8–26 (particularly pages 13–16)
5. Richard Ellison & William Palmer *A Survey of the Rivers Swale & Ouse from Richmond to York* (1735) (Doncaster Central Library Ref: L386 SWA)
6. West Sussex Record Office, Petworth House Archives D26/10. The Duke of Somerset owned Topcliffe Manor which included a mill, and land on both banks of a six-mile length of the river Swale.
7. York Corporation Record Book no 43 (1742) p 87
8. Lincoln Archive Office, Chancery case of 1838–9, at LAO BS 12/2/1/3
9. 2 Geo III c.32, RA 2 June 1762
10. W H Wheeler, *A History of the Fens of South Lincolnshire* (2nd ed, Boston: JN Newcomb; London: Simpkins Marshall, 1896). 'Sincil Dike – probably work of Romans – bottom several inches higher than natural staunch between Mere and High Bridge called Brayford Head' (p 138). [In 1762] 'the staunch at Lincoln Lock below Stamp End higher than natural staunch at Brayford Head' (p 159).
11. W M Hunt, 'The Lincoln High Bridge Scheme' *RCHS Journal* no 149, November 1991, p 274.
12. Hunt (1991), p 277
13. Hunt (1991), p 278
14. Wheeler (1896) pp 160–1. Data presumably derived from John Rennie's survey on 5–7 October 1802 in John Rennie, *Letter Books*, vol 2, f428 (ICE Library).
15. The 'present-day' levels for the Witham and Fossdike are those observed by the writer, during a number of visits during the last four decades of the 20th century.

Barry Barton comments:

Within the 0.1m limit, the water levels under normal conditions above Stamp End and above Torksey lock should be essentially the same. If anything, the level at Torksey should be slightly higher than that at Stamp End due to the river Till inflow flowing east from Saxilby, although losses to tide through Torksey lock may mean that the Torksey level is marginally lower than that at Saxilby i.e. water flowing both ways from the 'peak' at Saxilby (the Till confluence) but more to the east than to the west.

16. J N Clarke, *The Horncastle and Tattershall Canal* (Oakwood Press, 1990), p 37
17. Clarke (1990), p 35
18. L T C Rolt, *Isambard Kingdom Brunel* (London : Longman, 1957), p 49
19. Personal communication from Raymond Carey. Rebuilding work had also been undertaken in 1836.

The existing (1846) lock at Torksey has four pairs of mitred gates, permitting pleasure craft to use the lock in either direction at most states of the tide in the Trent. The western-most pair were also intended to serve as flood gates, to protect the canal and its riparian lands against flood waters from the Trent. These gates are operated by balance-beams, the other gates are operated by 'capstans'. Each consists of a

pedestal holding bearings for a vertical shaft, which has a hand-wheel at the top, a pinion at the bottom, and drives a toothed quadrant attached to the gate. All components are of cast iron, and typical of mid-19th century technology. In 1997 British Waterways built a short chamber on the tidal side of Torksey Bridge, fitted with an additional pair of floodgates to give an enhanced level of flood protection.

Appendix

Witham Navigation Improvement

To the worshipful the Mayor and Corporation of the City of Lincoln.

GENTLEMEN,

As the City of Lincoln must be very materially interested in the important propositions for Improving the Drainage of the Country bordering on the River Witham and its collateral Branches, and the Navigation of the said River, but most particularly in the latter, and as you have done me the honour of asking my Opinion as to the proportionate degree of benefit which may be derived to the City of Lincoln and to the adjoining Country interested in the improvement of that Navigation, if carried into effect

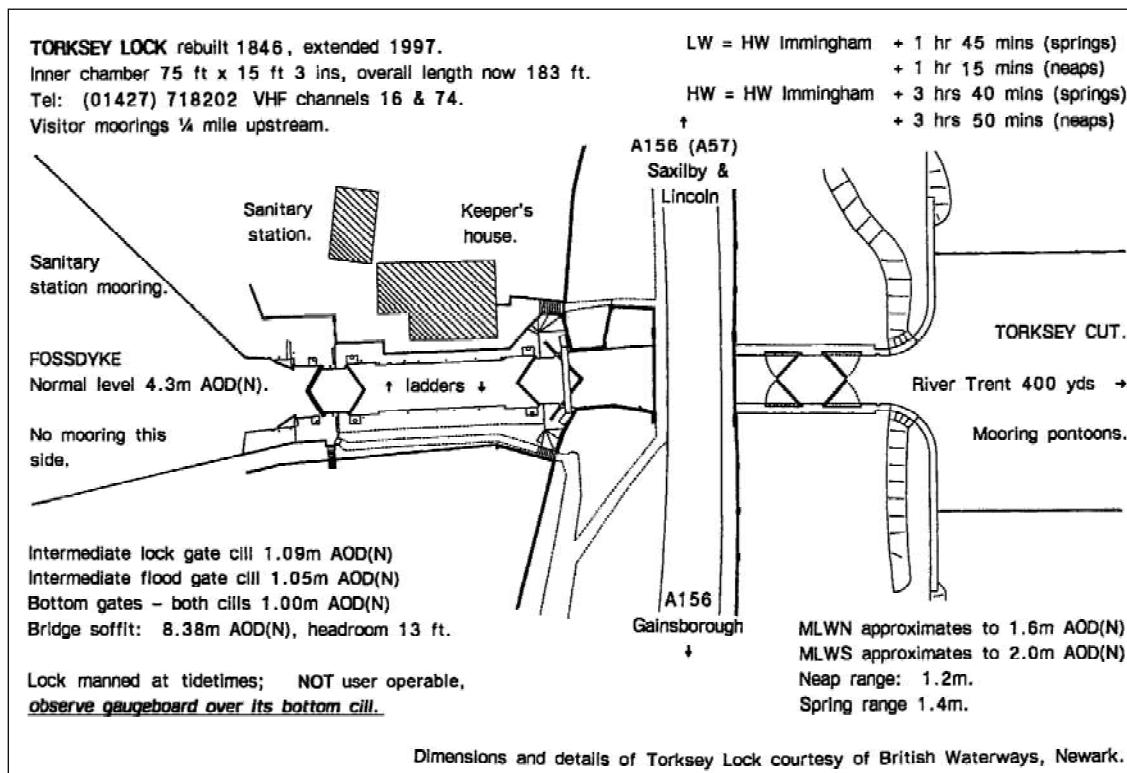


Fig 5. Torksey Lock diagram

as proposed by the Bill now before Parliament, I shall endeavour to submit my Opinion with strict impartiality.

In the first place it appears to me that the Scheme proposed by Mr. Rennie is likely to effect the purpose of Complete Drainage, but as it is understood that half of the Expence is to be provided for by an Augmentation of the Tolls on the Navigation, I think the improvement of the Navigation, as proposed by the Bill in its present form, falls considerably short of what might be reasonably expected by those more interested in the Navigation than in the Drainage.

As it appears to be essentially necessary for the Drainage, it is already proposed by Mr. Rennie that from Boston to next Stixwould Ferry, a length of about eighteen Miles, the depth of the River shall be nine feet under the surface of the Water as kept up by the Gage at the Great Sluice at Boston, and that the bottom Width shall be from 50 feet to 33 Feet 6 Inches, which is amply sufficient for Sea Vessels of Eighty Tons burthen; but from this point upwards to Stamp End Lock, which is 14 Miles further, or nearly 32 Miles from Boston, the bottom width will decrease from 33 Feet 6 Inches to 28 Feet. An Increase in the width of this latter 14 miles to 33 Feet 6 Inches, so as to make it sufficient for such Vessels to Stamp End Lock, which is within 3½ Furlongs of the High Bridge at Lincoln, would cost about £5000.

As it is obvious that such a Navigation would be highly beneficial to the Country at large and particularly to the Capital of the County, it can hardly be supposed that so small an Addition of Expence, to what would without it be necessary for the purposes of Drainage, would for a Moment be objected to. But as the Title of the Bill has naturally led to the Expectation that the restoring and improving the Navigation shall extend between the High Bridge at Lincoln and the Sea, the mode of effecting this, or something adequate to this intention, demands a more serious consideration.

Between Stamp End Lock and the High Bridge (at Lincoln), the river is very narrow and shallow, and is confined within walls, with buildings on the banks nearly the whole length of it, and so near to the river that the widening and deepening of it might probably endanger the foundations of those buildings, as at the necessary depth the soil appears to be a running sand.

The probable expense of the extension or enlargement from Stamp End Lock to High Bridge would be not less than £14,000, exclusive of the hazard

of damage to the adjoining buildings. But if, instead of this extension to the High Bridge in the present course, an adequate extension were to be made from Stamp End Lock, cutting off an angle of the Sincil Dyke and terminating at the High St., at a point about 180 yards to the south of the Cornhill, or any other convenient point, this might be effected for £5,500, and for something less than this sum the Corporation might afterwards extend it to the bason in Brayford Meer.

Though present navigation of barges between Stamp End Lock and the High Bridge would remain as it is, it might at very small expence in deepening be much improved. Yet it is fair to presume that the proprietors of warehouses on its banks would have a right to expect some compensation for a relative depreciation of the value of their property, but this I cannot attempt to estimate.

As the completion of the improvement of the navigation will essentially depend on the mode of the communication with the tideway through Boston, I thought it necessary to enquire into the present state of the harbour, and I was informed that there is throughout the year a stagnation of the shipping trade during the neap tides, but that in summer, so great is the deposit of mud in the haven, it would be almost impossible to make and maintain a 9' depth of water to and through the Grand Sluice, even at Spring Tides, putting the obstruction of the Bridge out of the question. If the bridge was the only obstruction, this might be remedied in a great measure by raising the arch about 3' and by causing vessels that would be required to pass under it to be constructed with masts that might be lowered, but, taking the whole together, I cannot [but] consider the proposal of a communication by this way as totally inadmissible. I therefore can see no alternative to making a communication with the tideway by such a cut as was proposed by Mr. Rennie in his report of 1803. The length of this cut from above the Grand Sluice to the river below, near the Red Gowt and a little above the Black Sluice, would be something less than a mile, and it might cost, including the lock and necessary bridges and the purchase of the land, about £10,500, but, deducting for what it might otherwise cost to take down and rebuild the present lock at the Grand Sluice, and for raising of the iron bridge and deepening the haven, which would probably amount to £5,000, it would leave £5,500 to be added on this account to the general estimate. I cannot help considering this cut so peculiarly essential to the improvement of the navigation that if any difficulty

should arise from the want of funds for effecting it in the manner proposed, I should submit to the Corporation that they had better relinquish some part of what they might fairly expect to be done at Lincoln, rather than lose the whole navigation for sea vessels for want of a practicable connection with the tide way.

As an entrance near the Black Sluice would admit of such communication seven days a fortnight on the spring tides, while the present entrance through the Grand Sluice, even if it could be kept free from obstruction, would not admit of a communication more than five days in a fortnight; if, instead of the proposed cut, a cut of 3½ miles in length, crossing the Forty Foot Drain, were to be made, to drop into the river at Wyberton Roads (a scheme which has often been proposed), there would be no stoppage of the intercourse at any time of the year, and as such last-mentioned cut would serve as a floating dock for the town of Boston, such an improvement of the port, joined to the increased facility of internal

communication, would amply repay any expence that it would cost, but this is at present a digression.

Upon the whole, as it does not appear that, over and above what would be necessary to be done for the improvement of the drainage alone, the amount of such further sums as would be required towards the improvement of the navigation, in the manner herein proposed, would exceed £25,000, while it is intended that the interest of, £60,000 should be discharged by the tolls of the navigation, I humbly submit what is proposed on behalf of the Corporation of Lincoln, and of others interested in the improvement of the navigation, cannot be deemed unreasonable by gentlemen who may be exclusively interested in the improvement of the drainage.

LINCOLN, April 26, 1808
(signed) W. Jessop

[Italicised sections in the above report are by the present author.]

Divine intervention? Thomas Cooper and the Nuneaton accident, 1858

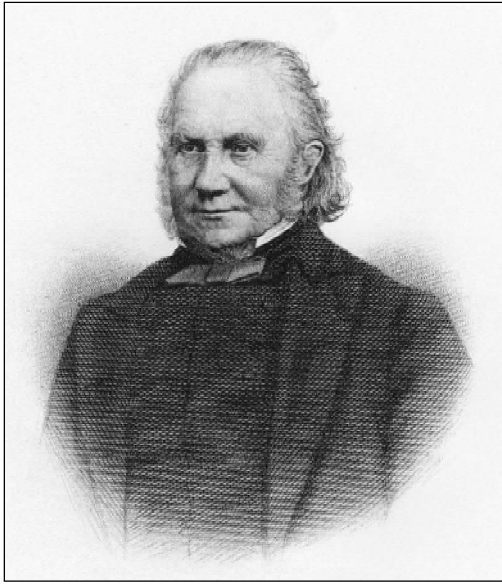
Adrian Gray

Thomas Cooper is one of the most interesting radical figures of the nineteenth century. Born in Leicester in 1805, he grew up in humble circumstances in Gainsborough where he educated himself quite prodigiously. He was an ardent Methodist as a youth, but became disillusioned with the comfortable lifestyle of leading local Methodists. He then began a radical journey as a journalist in Lincoln, Stamford and Leicester, eventually becoming a key figure in the Chartist movement in the 1840s.

Cooper used railways a great deal and, famously, the authorities used railways to manage the Chartist 'problem'. Cooper was arrested at Newcastle-under-Lyme in 1842 and taken to the nearest station – Whitmore – under the guard of cavalry with drawn swords; there he was handcuffed to a constable and taken by train to Stafford gaol.

Cooper abandoned his Christian faith but also lost interest in Chartism after 1848. For a time he spoke often at atheistic public lectures, but in 1855 announced that he had converted back to Christianity. He struggled to make a living as a journalist and writer until his life was changed by the way in which he survived a fatal railway disaster.

We have Cooper's personal account of this accident as it forms a pivotal moment in his autobiography, *The Life of Thomas Cooper, Written by Himself*, published in 1872. This book was dedicated to the Rev Dr Frederick James Jobson, a fellow survivor of the accident. Jobson was of a similar age to Cooper, but was also interested in architecture and an accomplished artist whose sketches in Australia are of genuine merit. A few



Thomas Cooper

years earlier he had written an influential book on chapel architecture and he had just published another on Methodism in America. Both men had lived in Lincoln when young.

In 1858 Cooper had stepped away from his radical past to the extent of having something of an establishment job in the Board of Health, but still did regular lecturing. He had arranged to do some lecturing in Yorkshire with his friend Dr Jobson and that they would travel up together from Euston on 10 May. Cooper got to Euston first and walked up to the front of the train, opening a door into the second carriage:

I was about to step into it when a porter, who was an utter stranger to me, took hold of my portmanteau and said, "Don't go in there, sir, go a little lower down." I yielded to the man but felt a little surprised at his motion.

Cooper was just stowing his luggage in the fifth carriage, first class, when he saw Jobson walk past towards the very carriage he had just left. Cooper shouted to him, and his friend joined him in the compartment. 'He expressed his surprise when I told him how the porter had particularly led me to enter it.' Soon they were joined by four barristers on their way to the assizes in Liverpool. However, one of them got out to join another who was still on the platform, then both got into the second carriage. Of those two, one died and the other broke a leg, according to Cooper.



Frederick James Jobson

In Cooper's account the journey went well until they were near Nuneaton. The express was rounding a bend where the view forward was obscured when it ran into a cow despite the efforts of a man in a field waving a red rag. 'The guard put on the drag, which was afterwards said to be an error, for that the express train unchecked would have crushed the cow to death and passed on without the human passengers suffering any harm.' The collision caused the coupling to break behind the tender and the first carriage careered down the embankment into a field. Cooper's carriage derailed onto the other track, 'as if supernatural beings had lifted it up and placed it down again'.

Cooper and Jobson escaped injury. 'The glass was broken in our carriage, but not a hair of the head of any person in it was injured.' Only when they got out did they find that three had been killed, their bodies covered over in the field. A large crowd had already gathered by this time.

Cooper described his response in his autobiography. 'I and my friend might have been two of these three; but Thou, Lord God, hast preserved us. Oh, take my life which Thou hast graciously kept, and let it be devoted to Thee.' As a result he gave up his job at the Board of Health by the end of the same month and decided to commit his life to preaching – starting in Sheffield at the beginning of June. Following a conversation in Barnsley, Cooper became a Baptist and was baptised

in Leicester in June 1859. From then on he travelled thousands of miles across the nation, preaching and lecturing; there is no record of him ever having involvement in another accident. In his ‘Christian phase’ alone he delivered 4,292 lectures and 2,568 sermons in 545 different places – counting the whole of London as one place. He also wrote voluminously, both prose and poetry, and his life is the subject of Charles Kingsley’s novel *Alton Locke*.

How accurate was Cooper’s account of this accident? Lt Col Yolland reported on it for the Board of Trade, so comparisons are simple.¹ The train was the 9.00am ‘Scotch Express’ and its formation was set out in the report:

1	Brake van	
2	1st class	Glasgow
3	1st class	Edinburgh
4	2nd class	Edinburgh
5	Composite	Manchester
6	Composite	Manchester
7	Composite	Huddersfield
8	Brake van	

The accident occurred near Attleborough, 1½ miles south of Nuneaton. Yolland’s account as to how the cow got onto the line is close to Cooper’s. Both mention that the cow was distressed after having its calf taken away, both mention the attempts of a man with a flag to wave the train down (identified by Yolland as the crossing keeper from Attleborough crossing) but neither seems to have known how the cow actually got onto the line.

It is clear from Yolland’s report that it was the Glasgow carriage that included all the fatalities. The report explains that this left the track, vaulted the hedge, and landed in the field on its roof with all three dead by the time they were removed from the wreckage. This was undoubtedly therefore the carriage that Cooper had been directed away from, but it is less clear which carriage he got into. He refers to being in one of three compartments in the fifth carriage, and that it diverted onto the other track – ‘the whole carriage was removed from one line of rails to the other’; however Yolland says that the fifth carriage diverted – along with all the first four – to the left, and only the second Manchester carriage went to the right across the up line.

Cooper also refers to the couplings breaking between his carriage and the others; perhaps he was travelling in the fifth *passenger* carriage, which was the sixth vehicle.

Cooper also refers the guard as having put on ‘the drag’. Yolland reports the driving seeing the cow walking down the line towards him and then asking the fireman to put on the tender break.

Cooper appears to have been less accurate in his beliefs about who was in the fatal carriage. There are no references to barristers going to Liverpool in accounts in *The Times*, though two barristers were involved. One of these was William Morgan, aged 28, who was going to visit Shrewsbury and was killed. Another barrister, Henry Ince, was injured, but according to *The Guardian* on 12 May he was travelling to court in Manchester. However on 13 May *The Guardian* contradicted itself – Morgan and Ince were friends, Morgan had just been called to the Bar, and both were travelling to Shrewsbury to celebrate. It seems likely that these were the two that Cooper had seen at Euston.

The other two fatalities were Jeremiah Richmond, who was travelling to Maryport with his daughter, and the Rev Thomas Miller, a Belfast Presbyterian.

Thomas Miller attracted some interest as it was reported his last words were ‘I’m insured’ but no insurance ticket had been found. On the other hand, another witness reported his final words as ‘I’m so faint’. Perhaps Miller was making a theological point about his personal salvation rather than about the monetary protection for his family. Cooper did not speculate why his own life had been spared yet Miller’s lost, nor did he comment on the case of the guard Wyatt who was travelling in the first brake van; this crashed into the field and the Glasgow carriage landed on top of it – yet Wyatt emerged from the wreckage unscathed.

Thomas Cooper died on 15 July 1892 at his home, 13 St Mary Street, Lincoln – directly opposite the Central station – having lived in the city since he retired from lecturing. His grave, in Washingborough Road cemetery, Lincoln, was restored in 1993.

Reference

1. Available via the Railways Archive website < <http://www.railwaysarchive.co.uk> >; perhaps continuing on the theme of divine intervention, when I checked the website for this report it was top of the ‘latest documents’ list on the home page, having been uploaded only the day before!

Labour markets, enlistment and demobilisation in World War One : the case of the Irish railway companies

Peter Rigney

It has been remarked that the outbreak of war in August 1914 saved Britain from civil war on the issue of Irish Home Rule. Redmond and Carson, the leaders of unionism and constitutional nationalism respectively, urged their followers to enlist – and many did. Both sides fought a statistics war on the numbers enlisting from each community in order to claim territory – real or political – in the negotiations which would take place at the war's end. This political background to recruitment was therefore much different in Ireland to that prevailing in Britain. The other difference was that conscription was never imposed in Ireland – and an attempt to do so in March 1918 proved a political disaster for the government. What this paper seeks to do is to examine enlistment patterns in two railway companies – the Great Southern & Western (GSWR) which served the nationalist south and west and the Great Northern (GNR) whose headquarters were in Dublin but which was the largest company in Ulster. The archival sources for the paper are held in the Archives of the Irish Railway Record Society in Heuston Station, Dublin.

The paper will have three parts:

1. The attitude of the railway companies to recruitment in the early years of the war
2. Company policy towards the re-employment of their demobilised staff
3. Company policy towards the employment of other ex-soldiers

In the first weeks of the war, the GNR decided to treat men enlisting and reservists called up in the same manner as was applied during the Boer War. The GSWR established a package of supports for employees who joined up. In this early period of the war many railwaymen joining the colours would be doing so as reservists – a point made by the printing format of the GNR index card (Fig 1).

In the first weeks of the war the British railway companies got a commitment from government that no railwayman would be accepted into the forces except with the permission of his employer. The

EUROPEAN WAR.			
Name <u>M. Copeland.</u>		(Reservist) (Volunteer)	
Occupation <u>Porter.</u>			
Station <u>Henry, Edmund Street, Goods.</u>			
Rate of Wages	Allowance from Co.	Contribution to Pension Fd.	TOTAL
per week.	per week.	per week.	per week.
<u>15/-</u>	<u>4/-</u>	<u>2/-</u>	<u>21/-</u>
W.E. <u>8th August 1914.</u>			
to W.E.			
Week of <u>24th July 1914</u>			

**Fig 1. Specimen GNR (I) staff record card.
The original is on red card.**

railways therefore contrasted with industries like building or distilling. In early 1915 the painting trade press reported that in Ireland '[... the painting] trade has yielded a fair quota to both Irish and other regiments ... the lack of employment induced large numbers to join the services'.¹

The GSWR staff records survive for the traffic and the civil engineer's departments but do not survive for the locomotive department which yielded the most recruits. However, files survive on recruitment and on the reemployment of demobilised men which includes the locomotive department. The GNR staff records are card index based, covering all departments. The drawback is that they include only people who had left before 1958 when that company was divided between the two state-owned transport companies

The early campaigning of August to October 1914 had decimated the original British Expeditionary Force. The War Office then started to raise two fresh armies – K1 and K2 named for Lord Kitchener. In Ireland implementing this campaign fell to the Viceroy, Lord Wimborne. In November 1915 he wrote to the railway companies asking for their help in getting recruits:

You will understand the situation better than the men themselves, and a few words from you will carry great weight. Will you speak to them ... and so help them to realise how vital it is that a far larger number of recruits should be forthcoming?²²

Sir William Goulding, chairman of the GSWR, replied on behalf of all the companies. He asked for the same assurance that the British companies got in 1914, that they would have a veto on the enlistment of their employees. The recruiting authorities gave

the assurance on condition that the companies would co-operate with recruitment efforts. At this time 623 of the GSWR's 9,010 employees, or 6.9 per cent had either enlisted or had been called up as reservists in August 1914. The handbill illustrated in Fig 2 details the supports available for employees serving. However, it is as revealing for the concerns written on the back in pencil by a senior member of GSWR management:

CIRCULAR.
P. 16050.

Great Southern and Western Railway.

GENERAL MANAGER'S OFFICE,
KINGSBRIDGE,
October 16th, 1914.

EUROPEAN WAR.

My previous Circulars P. 16050 of the 14th of August, 9th and 22nd of September, are hereby cancelled, and the following are the complete arrangements up to date which this Company have made with respect to allowances to their employees who have been called up for service, or who enlist for the present War, and to their dependents.

1. Reservists called up for duty in the Army or Navy.

To wife only	...	...	4/- a week.
To wife and children	...	...	5/- "
2. Men who enlist in the Army for the present War, and who were in the Company's service on the 1st August, 1914.

In the case of married men, whose salary or wages do not exceed £200 per annum, the Company will make the following allowances until such time as the men are discharged, or are in a position to claim their discharge from the Army.

To wife, wife and children, or (in the case of a widower) to children only, an amount will be paid which, when added to the man's Separation Allowance and the sum deducted by the Army Authorities from his pay in respect of his dependents, will make the total not less than four-fifths of his salary or wages at the time of enlistment.

Cases of single men or widowers without children, who have parents or other relatives dependent upon them, and who have contributed to their assistance, will receive an allowance depending on the conditions of each case.

All contributions to Superannuation Funds will be paid by the Company both in the case of married and single men until such time as each individual is discharged or in a position to claim his discharge from the Army.

Men, when discharged, or in a position to claim their discharge, from the Army, and desiring to re-enter the Company's Service, will, if physically fit, be found employment at the rate of wages or salary to which they would have been entitled had they not enlisted.

Single men who enlist for the War, and in whose case no other allowances have been made, will on their return to duty receive a Bonus of ten pounds for their outfit.

E. A. NEALE,
General Manager.

Fig 2. GSWR handbill detailing allowances to employees serving in the armed forces and to their dependents, October 1914

All right if we can get time can spare with difficulty a good many men

Must be allowed to break 8 hour rule with signalmen on branch lines

No active part on account of action by NUR

Khaki armlet

Can spare no man from Inchicore munitions and engines

Don't join a committee appoint a rly one.

Many of these concerns were rooted in industrial relations. The years before the outbreak of war were turbulent ones with union recognition forced on reluctant railway companies by the government in August 1911. In Ireland a second strike in September 1911 was comprehensively defeated and whilst the unions were much weakened, the wartime manpower shortages meant that employers had to make do with less and dearer labour. For example, on the Dublin & South Eastern Railway in 1915, platelayer Michael Kennedy '[r]esigned owing to low wages on the railway and stated he was taking up a position with Kynoch's' who were the Arklow explosives manufacturer.³ In October 1915 E A Watson, the Locomotive Engineer of the GSWR, approached the board with a proposal to increase the wages of locomotive cleaners by 2s per week as 'we are experiencing great difficulty in getting these lads'.

On 23 November 1915 a meeting of Dublin employers was held, following which a letter was sent to all permanent GSWR staff urging them to enlist and enclosing an enlistment form. The GNR board adopted a more supportive position in December 1915 when it urged heads of departments to allow 'every volunteer to go ... who could possibly be spared even at their own personal inconvenience and at the sacrifice of some degree of efficiency'.⁴ Nevertheless rising wartime traffic drove a requirement for extra staff and 114 locomotive cleaners were recruited by the GNR between August 1914 and November 1918.⁵

The recruitment campaign was not a success on the GSWR. In February 1916 Goulding wrote to Wimborne: 'I was greatly disappointed on hearing from captain Kelly of the poor response made by our railwaymen ... I shall make a strong appeal to them at our shareholders' meeting on 23rd'.

On 1 March 1916, the Department of Recruiting wrote to all employers in the Dublin area asking them for a list their employees in the 18 to 41 age category and requesting permission for military canvassers to approach such men in their workplace. After a meeting

between the company secretary and the General Manager it was decided to submit only clerical staff names to the recruiting authorities (Fig 3). The list of clerical staff was forwarded to the recruiting department with the proviso that the company 'could not allow the men to be interviewed during business hours, but it is open to the canvasser to see them

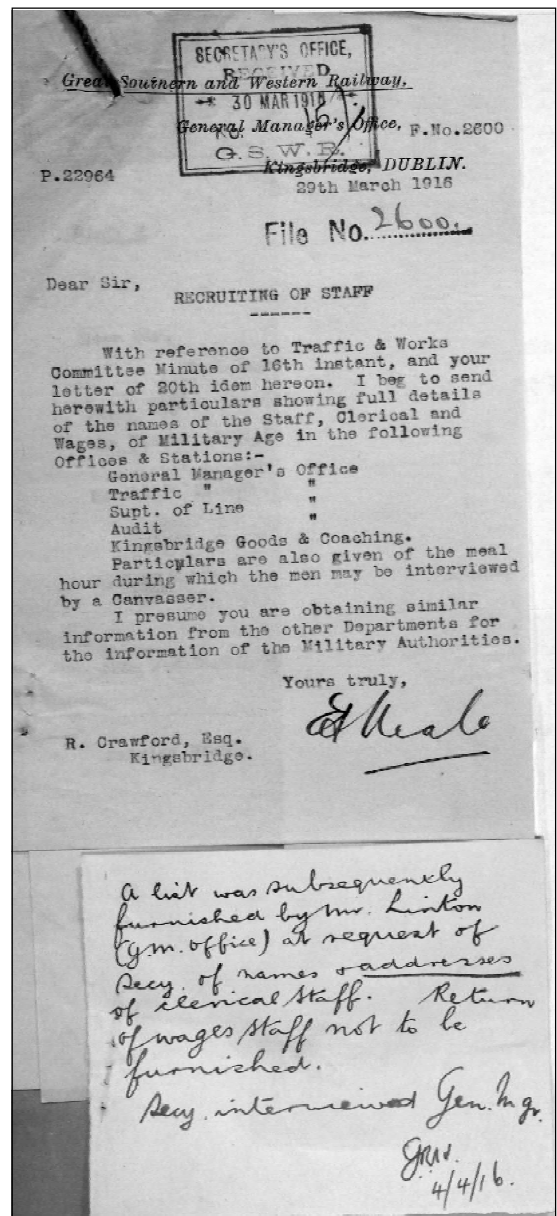


Fig. 3. Letter covering submission of clerical staff figures in General Manager's office and others, GSWR, March 1916

Table 1			
Category	Skilled (%)	Semi-skilled (%)	Unskilled (%)
Pension	36	36	28
Killed/died of wounds	19	49	32
Returners	16	49	35

during the time they are allowed for dinner'. This letter illustrates the bizarre spectacle of one of Ireland's largest employers obstructing recruitment efforts. It is inconceivable that this could have happened without the knowledge of Sir William Goulding, pillar of the southern Unionist establishment and later Irish privy council member.

The *Railway Gazette* carried league tables of the numbers enlisting from British companies. The Irish companies were omitted from most of these tables. In November 1915 enlistment rates of the British companies were running at between 12 and 20 per cent. The GSWR tally of 623 (6.9 per cent) was separately and discretely mentioned in a later issue. This was the last mention of Irish enlistment levels in the *Gazette* for the duration of the war although British league tables continued to be published until 1918.⁶

Enlistment – the evidence

The GSWR traffic department ledger contains about 4,500 names of men of military age of whom 175 or 3.8 per cent enlisted. Recruitment was an overwhelmingly urban experience with 53 per cent of those who served coming from Dublin, Cork, Limerick and Waterford.

The civil engineering department was organised in three divisions – northern centred on Dublin, southern centred on Cork and western centred on Limerick. The workforce was mainly unskilled and overwhelmingly rural. Most workers were ex-agricultural labourers and shared the lack of enthusiasm of that class for enlistment. Enlistment rates declined the further one got from Dublin. It was 5.9 per cent on the northern division, 2.5 per cent on the southern division and 2.1 per cent on the western division.

The majority of GSWR fatalities were from the Mechanical Engineer's department so we may safely assume that it produced the largest proportion of recruits. Wage ledgers do not survive for this department, but comprehensive lists do survive of

those returning to employment and of those who died. By using pension applications made between 1918 and 1921 as a proxy for the workforce as a whole we can compare the skill balance of the labour force with the skill balance of those who had enlisted as is shown in Table 1.

Skilled tradesmen were under represented but they were less likely to be released. Unskilled labourers were over represented but not as significantly as semi-skilled who were hugely over represented. There are two possible reasons for this. One was the tendency for companies to employ large numbers of ex-soldiers in this category. The minute book of the Inchicore branch of the United Machine Workers' Association, which catered for semi-skilled machinists, illustrates this point. As early as April 1914 head office was asked to help as 'Brother Coughlan is being instructed to teach ex-soldiers to work machines on labouring men's wages'. The result of Brother Coughlan's complaint is not recorded but it shows the policy of the railway company to recruit ex-soldiers into the semi-skilled grades, and union members' fear of them undercutting wages.

Another incentive for the semi-skilled to enlist was to gain a new skill in the army, as in civilian life they would have been excluded from promotion by craftsmen and their unions. Men who had learned a trade in the army had wider career choices if they returned. One shoemaker served in the Connaught Rangers and was trained as a car mechanic in the army and on his return to Ballinasloe instead of taking up his old trade he started a taxi service.⁷ In the *Dundalk Democrat* of August 2005 an article on a local bus firm stated that it 'was started by Joe Halpenny after he returned ... from fighting in the First World War' where he had served in a cavalry unit in the Middle East.⁸

Of the 665 GNR staff who served, 253 cards survive in the staff records. This company served an area where recruitment rates were particularly politically contentious and a geographic analysis is interesting. In contrast to the departmental analysis of the GSWR

Table 2			
Location	Soldiers (%)	Loco crew 1938(%)	Divergence
Belfast	30.8	26.0	+4.8
Dublin	13.4	11.5	+1.9
Dundalk	14.2	14.2	+0.0
Portadown/Lurgan	7.5	12.0	-4.5
Newry	5.1	4.0	+1.1
Enniskillen ⁹	3.5	6.0	-2.5
Derry	1.9	6.0	-4.1
Clones ¹⁰	3.0	6.6	-3.6

I have compared the pattern of enlistment in the company with the geographic pattern of employment using locomotive crew numbers as a proxy for total employment based (Table 2).

This covers 79.4% of soldiers and 86.3% of locomotive crew. The only major positive divergence is Belfast whilst willingness to volunteer declined as one went west.

The most likely GNR categories to enlist were porters, cleaners and clerks, who together constituted 56 per cent of the total. The most significant point is the wide divergence as regards clerks with many more enlisting than on the GSWR, where the best evidence is of a recruitment rate of about 3 per cent or about half the rate in the company as a whole. This would explain the wish of the GSWR to focus the attention of recruiters on their clerical workforce.

Post combat experience

There were three categories of returning veterans:

1. Wounded ex-railwaymen who began to return as early as 1914
2. Demobilised ex-railwaymen. Once these men passed a medical examination they were reinstated in their old jobs
3. Demobilised ex-soldiers with no previous railway connections seeking employment

The companies re-employed wounded ex-soldiers subject to a medical examination, finding light work for them if necessary. However, anyone presenting with TB was rejected. In August 1917 the GSWR stores superintendent requested permission from the board to re-employ 'one of my best men who returned

from war minus his arm, but otherwise healthy ... It is most desirable that I should have him back as soon as possible'. Further employment of wounded ex-soldiers was delayed by difficulties in the company insuring them under the workmen's compensation legislation. Once this was resolved by the Home Office the way was paved for the re-employment of the wounded. Fit railwaymen who passed the medical were reinstated and in some cases they were promoted to the grade they would have attained had they not joined up.

The employment of demobilised soldiers was coordinated by a number of committees, some geographic and some sectoral. The railway labour market was tightly and often informally regulated by institutions such as industrial relations and family linkages. Recruitment procedures into entry grades were extremely informal and decentralised with casual temporary men or boys providing a pool from which permanent recruits were drawn. Entry into this casual pool was often within the gift of a local manager or foreman. Altering these arrangements needed action at the highest level, and this occurred in December 1919 when the GSWR took a decision that in each case where an ex-soldier applied for a post and was declined the Chairman was to be informed. The Board decision was followed by departmental orders such as one issued in January 1920 that all vacancies for porters should be filled by ex-soldiers.

This caused tensions. Between June and November 1920 Irish railwaymen took part in a policy of refusing to work trains carrying armed troops or munitions. This was termed the 'munitions strike' and hundreds of men who refused to work trains

carrying armed troops and munitions were dismissed. This increased the political sensitivity surrounding the recruitment of new staff. In October 1920 the General Manager reported that: 'Ticket checker O'Connell asked me to give a few days work to a relative ... I took him on but he knocked off on the first day before his time was up ... O'Connell later informed me that he had been arraigned before the men's society for introducing a temporary man'.¹¹

Just as ex-soldiers began to arrive back in earnest in the spring of 1919 there was an unprecedented one-off demand for extra labour due to the granting of the eight hour day. This was negotiated for the British companies but extended at the stroke of a pen to Ireland – allegedly due to the influence of J H Thomas of the NUR. This caused employment levels on the railway to grow by roughly 10 per cent. However nearly 40 per cent of this increased employment was among locomotive crew, and the entry grade of cleaner was closed to ex-soldiers due to an upper age limit of 19. Similar restrictions applied to trade apprentices and in addition in April 1919 the Dublin railway companies had agreed that 'for each outside apprentice at least three sons will be taken on'.¹²

The best way of mapping the treatment of ex-soldiers is through records of the recruitment process. A ledger of applications for employment survives for the northern division of the GSWR Civil Engineer's department. Between September 1918 and September 1922, 303 ex-servicemen applied of whom 49.9 per cent received an offer of employment (some offers were declined). Of the total offers of employment made in this period, 62.5 per cent went to ex-servicemen. Ex-soldiers were refused employment for being too old, for having a bad previous work record or for various wound-related disabilities such as being unable to walk without a stick or unable to work with creosote.

The effectiveness of GSWR recruitment policies in favour of ex-soldiers is confirmed by the unlikeliest of sources – the intelligence department of the IRA's Cork 1 Brigade. A memo to IRA GHQ sent in June 1921 reads:

About the end of 1919 a circular was issued ... stating that only ex soldiers were to be taken on as temporary men. There were then some 30 ordinary temporary men working in Cork Goods store. In January 1920 an order was issued that only ex soldiers were to be appointed as porters. 23 ex soldiers were appointed that year. This year ... the traffic got light and all ... the temporary men were

dismissed. All the ex soldiers were safe as they were appointed porters. Traffic is now becoming normal again ... Ex soldiers will again get preference for employment. Those on whom we can depend will be kept out and the goods Dept turned into a soldiers' home.

Conclusion

Enlistment rates for the Irish companies hovered between 8 and 9 per cent with the 12 per cent rate of the GNR being exceptional. It is instructive to compare these rates with those for the British railway companies. When Sir Henry Wilson, Chief of the Imperial General Staff, was shot by the IRA in 1922 he was returning from the unveiling of the Great Eastern Railway war memorial in Liverpool Street Station which recorded 1,220 deaths. The GER had four times as many workers as the GSWR but had 16 times the casualties. The other GSWR, the Glasgow & South Western, almost identical size to the Irish GSWR, had 320 names on its plaque in Glasgow St Enoch Station commemorating those killed in the war compared to 97 names on the plaque in Kingsbridge (now Heuston) station, Dublin.

Comparing British and Irish enlistment rates in the same industries, the overwhelming fact is not how many Irishmen served, but how few. If Irish railwaymen were reluctant to enlist, some Irish companies became reluctant to make labour scarcer and dearer by encouraging recruitment. Ireland's railways differed from those of Britain, France, Germany and the United States where women entered the operating side of the railway labour force in large numbers. With the exception of eight female ticket checkers employed by the Cork, Blackrock & Passage Railway such developments were unknown in Ireland, though women entered the clerical labour force in Ireland in significant numbers and remained there – at least until marriage.

Whilst the railway companies kept faith with their employees by holding open jobs to 1921 and in some cases beyond, they were also sensitive to the labour market needs of ex-soldiers with no previous employment record. However, most soldiers tended to be less skilled and (with the exception of those who had learned mechanical skills) were at an inbuilt disadvantage in the post-war labour market. This is attested to by the experience in the civil service where the standard of exams had to be reduced for ex-soldiers. It is also seen in France, where in the great railway workshop of Oullins near Lyons the union committee asked for a relaxation in promotional exams

in 1920 because they were ‘trop difficile pour les poilus’.¹³

Ex-soldiers had to compete with three other groups for employment. One group was members of the network of existing employees and shareholders, a second one was occupants of the demographic bulge who would have emigrated in peacetime but who remained in the country during the war. After 1923 the third group emerged comprising ex-soldiers of the Irish Free State who were demobilised at the end of Ireland’s Civil War. The only way that ex-soldiers might have done better was if age and kinship restrictions for apprenticeships to occupations such as fitters and locomotive drivers had been relaxed. That would have been difficult in Britain and impossible in Ireland. Even in Great Britain there was evidence of ‘veteran fatigue’ setting in shortly after the end of the war. In the construction industry a proposal to train disabled ex-servicemen was accepted in a ballot vote by members of the Amalgamated Society of Woodworkers in March 1918. In 1919 the Government sought to extend the scheme to fit ex servicemen. The construction unions decided to cease cooperation with the scheme with effect from September 1920.¹⁴

Workplace records allow us to view the labour market transactions surrounding men’s move between civilian and military employment. Participation in the war has been dealt with in separate compartments. Men enlist, the war economy heats up, women are drawn into the labour force, there is labour militancy, and then in the final act veterans return seeking work. In fact, it is all one part of the same process. However I leave the last word on this matter to the Broadstone

ex-servicemen’s club which wrote in 1925 in a memorial to the company directors: ‘No ordinary person has any idea of the terrible experiences in France or other places during the late war’.

Notes and references

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2. GSWR file 2600 (recruitment appeal)
3. CIÉ Permanent way and signalling staff index card
4. GNR Locomotive Dept minute book, 6, 14 December 1915
5. GNR Locomotive Dept seniority list, 1928
6. *Railway Gazette* 1915, vol 2, pp 270, 375, 594
7. Máirín Nic Eoin, *Eoghan Ó Tuairisc : beatha agus saothar* (Dublin : An Clóchomhar, 1988), p 23
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12. MGWR Board minutes, CIÉ Archives, Heuston Station
13. Christian Chevandier, *Cheminots en usine : les ouvriers des ateliers d’Oullins au temps de la vapeur* (Lyon : Presses universitaires de Lyon, 1993), p 256
14. Samuel Higenbottam, *Our Society’s History* (Manchester : Amalgamated Society of Woodworkers, 1939) pp 230–2

Obituary

Edwin Course (1922–2016)

Edwin Alfred Course was born in Brixton in 1922, the son of Captain Alfred George Course, who had qualified as a Cape Horn by voyaging around Cape Horn under sail, but by 1924 he was a Port of London Authority dock master. From 1924 Edwin grew up living in a company house in Victoria Dock and then from 1926 in Tilbury Dock. But this was not the only early influence on his interest in transport; his paternal grandfather was a Metropolitan District Railway station master at Alperton and Park Royal.

From 1930 to 1939 he was educated at Palmer's School, Grays, and shortly afterwards he was called up for service in the Royal Navy for the duration of the war, serving as Petty Officer Radio Mechanic and Petty Officer Mechanic Instructor in RADAR. After demobilisation in 1946, he became a teacher with the London County Council, at the same time taking evening classes at the London School of Economics. He went on to become a full-time student and, by the time he joined the RCHS shortly after its formation in 1954 as member number 65, he was a PhD student in the Geography department at LSE, researching for his thesis on *'The evolution of the railway network of south east England'*. Anyone undertaking research in this field might find it useful to have a look at this prodigious work of 948 pages in three volumes.

'History and geography of London's railways' was the title of one of the London University extra-mural courses conducted by Edwin Course while at LSE. Two of his students were Desmond Croome and Alan A Jackson, authors of *Rails through the Clay: a history of London's tube railways* (1962), in which they acknowledged 'Edwin's enthusiasm and tuition that generated the original idea of the book, the first either of us had ever written'. Alan and Edwin remained close friends until Alan's death in 2009.

In 1956, now with a PhD, Edwin was appointed assistant lecturer, and later senior lecturer, in the

University of Southampton Extra-Mural Department, where he remained until retirement in 1988. Even after retirement he continued for another ten years as a part-time lecturer in the Civil Engineering Department.

His first published work was a paper on *The Bexleyheath Railway, 1883–1900* given to the Woolwich & District Antiquarian Society in 1954. At Southampton he started to adapt his thesis for publication. *London Railways*, which appeared in 1962, was one of the most significant railway books of its time and remains one of the best historical geographies of British railways. This was followed in 1973–6 by *The Railways of Southern England* in three volumes. All were distinguished by Edwin's easy style, with flashes of wit. Other works included *Portsmouth Railways* (1969), *The Southampton & Netley Railway* (1973), *The Itchen Navigation* (1983), and *Portsmouth Corporation Tramways 1896–1936* (1986).

The Society's AGM Weekend in 1993 was organised by Edwin, based in Southampton. On the coach tours, his running commentaries on the passing scene revealed his exhaustive knowledge of not only transport history, but also local, national, agricultural industrial, and cultural history. He was much involved in local preservation and restoration groups, including Twyford waterworks and Hockley viaduct, and was at various times president of the Hampshire Field Club, the Society for Nautical Research (South) and the Southampton University Industrial Archaeology Group (later the Hampshire IA Society). He was elected President of the RCHS in 1992–4. Sadly, the onset of dementia restricted his later years, but we remember his many decades of substantial contribution to our field of interest.

Edwin died in February at the age of 93. We offer our sincere condolences to his wife, Catherine.

GAB

Correspondence

Francis Egerton's visit to the Canal du Midi

(*RCHS Journal*, March 2016, pp 440–9)

Journal 225 (March 2016) contained a very interesting article making comparisons between French and English aqueduct building in the eighteenth century – ‘Francis Egerton's visit to the Canal du Midi in 1754 and its extraordinary aftermath’ by Nicholas Hammond. It may be helpful to query one small aspect of that article and then draw readers' attention to another, contemporary, French aqueduct which is of considerable interest.

On page 445 there is reference to the origin of the French soldier-navvy: ‘Planning and surveying the routes for the early French canals in the seventeenth century were often the peacetime occupation of several prominent military men such as Vauban. A parallel relationship developed at the other end of the social scale. When the navvies started encroaching on private land, and were privately repulsed, the king could order soldiers to be sent in; they were given picks and shovels and the navvies were given firearms. This is the origin of the French soldier-navvy.’

Although there may have been instances where troops became involved in civil engineering projects to protect the works and the workers, such civil disturbances were not the chief concern of the French monarchy which led to the deployment of troops in such projects. The continuous expansionist foreign policy of Louis XIV led to the creation of the largest standing army in Europe at that time. In war such quantities of troops were a necessity but in peace they were a burden on the economy not recompensed by any useful employment. Military strategy and tactics in the later eighteenth century revolved around fortifications and siege warfare resulting in armies having a higher proportion of engineers and skilled labourers than before or since. Thus, like Vauban and other senior military engineers, ordinary troops with experience of masonry, earth-moving and similar skills could be deployed in large numbers on civil engineering projects, which were often quasi-governmental in origin in any case.

A case in point is the Canal Louis XIV which was planned to run for 50 miles from Maintenon to Pontgouin to supply the vast amounts of water

needed for the spectacular water displays at Versailles. Although this was a water supply and not a transport canal, its dimensions were considerable (in the aqueduct discussed below the channel was just over 8 feet wide and 8 feet deep – 2.48m x 1.89m) and involved many embankments, tunnels and bridges on its route. What made this vast engineering project possible was the signing of the Treaty of Ratisbon in 1684 which promised a truce to European hostilities for the next twenty years. Work on the Canal Louis XIV started in the same year and it was planned to employ 30,000 workers in this vast project of which 20,000 were to be soldiers (obviously far too many for peace-keeping duties). In fact such numbers were never achieved even with recruiting taking place in Belgium, Germany and Switzerland. The maximum number at any one time was 17,000 of whom 12,000 were soldiers. It should be noted that work was a spring and summer occupation, and virtually ceased when the troops went into winter quarters each year (the canal obviously could be safely left unguarded over winter).

The use of troops in this project was clearly vital, and just as their availability in peacetime rendered it possible, the fact they were needed to fight a war brought it, unfinished, to an end. The formation of the League of Augsburg in 1688 saw the troops march away, and by 1692 the trickle of work that had carried on after their departure had totally ended. Not, however, before one of the greatest civil engineering projects of the seventeenth century was effectively completed (not including military civil engineering – some of Vauban's city defences were a vastly greater scale, despite Professor Skempton's comment on the Canal du Midi mentioned on page 440). This was the aqueduct of Maintenon, whose impressive remains are still well worth a pilgrimage. The 47 arches of the viaduct have a maximum height of just over 93 feet (28.5m) and achieve a total length of more than half a mile (2,833 feet).

The aqueduct as built pales into insignificance when set against the original proposals of the Academy of Sciences. It is perhaps unfair to accuse the French of an obsession with ‘grand works’, although there are clear parallels between the reign of Louis XIV and the last few decades of French history, in terms of such projects. France in the 1690s

was the dominant state of Europe, and it was felt that public works should be on a commensurate scale. So the Academy proposed taking the canal over the Rivers Eure and Larris, not by individual aqueducts but by a single monolithic aqueduct stretching for 10½ miles (17 kilometres). At its greatest depth a triple tier of arches would carry water for the fountains of Versailles over the Eure 239 feet above river level! It is doubtful if even the France of that time had the human and financial resources required to complete such a colossus but what a sight it would have been if they had done so!

The Histoire du Canal Louis XIV by Gabriel Despots and Jacques Galland (2006) is recommended reading for the French reader. It gives a full description of all the surviving structures of the canal, of which there are a considerable number despite its incomplete state. Other than articles and references in more general volumes this was the only publication devoted to the canal at the time of its publication. The Association pour l'étude et la Sauvegarde des Vestiges du Canal Louis XIV was formed in 1976.#

Bill Featherstone

[The correspondent's illustrations of the Maintenon aqueduct appear on the back cover. Ed.]

The single-sided Cambridge station

(*RCHS Journal*, July 2016, pp 498–509)

Could I correct a couple of details in Rob Shorland-Ball's article in *Journal* 226 on Cambridge station? He says (p. 507, 2nd para) that Cambridge power signal box was installed in 1983/84: in fact it was opened on 17 October 1982, taking over control of the Cambridge station area and replacing the former Cambridge North and South boxes at this time. Further expansion took place throughout 1983 and 1984 into outlying areas.

He is wrong in stating that the power signal box has been superseded by Romford Railway Operating Centre. At the time of writing (June 2016) Romford ROC has no operational signalling control functions at all; it is only being used to house control office staff and even when it does open in November of this year the first areas it will control are the LT&S lines currently controlled by Upminster IECC. Cambridge PSB is fully operational and will be so for some time to come.

Andrew Overton

The importance of fieldwork in researching railway history

(*RCHS Journal*, March 2016, p 457; July 2016, p 523)

Whilst it is true that HMS *Canopus* fired on the German warships at breakfast time when still in harbour I do not consider that two unanswered salvos, from a battleship that took no further part, constitute any significant part of the battle. The main engagement between the principal Royal Navy and German units did not commence until 12.47 and at least 45 miles from the Falklands. Had the entire population of Port Stanley formed a human pyramid they would still not have seen anything.

As regards the two prior engagements, volume 1 of the official history *Naval Operations* refers to 'The Battle Of Coronel' and that is good enough for me. The same volume refers with typical British understatement to 'The Action Off Heligoland'. The British forces consisted of 8 light cruisers, 33 destroyers, and 6 submarines with Admiral Beatty's 5 battlecruisers in support. They were in continuous action for some seven hours, sank four German ships and damaged several others. In my mind that constitutes a battle.

Robert Humm

An illegal Beeching-era closure in Dorset

(*RCHS Journal*, July 2016, pp 486–9)

Professor Divall is uncertain about the closure to freight of the Broadstone–Hamworthy Junction line (p 488).

Through freight services over the link ceased at the same time as the passenger service was withdrawn from 4 May 1964. Thereafter train activity on the line was limited to traffic between Broadstone and Doulton and Co's siding. The section thence to Hamworthy Junction (which had no service) was disconnected ('taken out of use') from 5 June 1966. Doulton's siding continued to be serviced via Broadstone until closed from 5 February 1973 (as later recorded in *Branch Line News*). This marked the demise of the final section of the line.

Richard Maund

Reviews

Early Main Line Railways: papers from the International Main Line Railways Conference — edited by Peter Cross-Rudkin

xii, 308pp, 106 figures (including maps and portraits), 21 tables, hardback, Six Martlets Publishing, 4 Market Hill, Clare, Sudbury CO10 8NN, <www.earlymainlinerailways.org.uk>, no ISBN, £55 (p&p £3 extra)

The Early Railways Conferences changed our perception of how the concept of the railway emerged from something of local significance into something greater; and the Liverpool & Manchester Railway has come to be accepted as the paradigm initial main line. Clearly it is much more difficult to establish a concluding point for this ‘early’, especially when considered on an international basis: ‘early’ in the Argentine was remarkably late.

Space limitations preclude a listing of all the authors, but the topics covered demonstrate the extent of coverage. Professor Casson examines railway promotion in Victorian Britain using a counterfactual approach: the discussion generated is surely a significant loss. Bailey’s analysis of engineering development and Boyes’ examination of progress towards common standards are pivotal papers. Similarly, the emergence of new professions and the adaption of existing ones to meet the new order; the development of drawing offices and steps towards electromagnetic traction all reflect a cultural shift. Contractors’ lines also fit within this new techno-economic landscape.

Carr Glyn’s approach to monopoly and compet-

ition; the construction of the Dublin–Galway main line; early main line railways in Egypt (a tainted gift); railway development in British India (two papers); the British railway monopoly in Colombia; the inter-colonial railway idea in British North America which led to the trans-continental line, Herb MacDonald’s final contribution to Canadian railway history before his death; the impact of main line railways on the iron and coking industries in northeast England; the Central Argentine Railway; the architecture associated with early British main lines and lengthmen’s cottages on the Semmering Railway complete the contents.

Some of the contributions are so excellent that their authors should consider whether they might form the basis for articles in more widely circulated journals, such as *BackTrack*.

The Early Railways Conference proceedings brought railway history up to the standards set for academic studies for most disciplines. These include clearly observable objectives and identification of original sources: these are clearly maintained in this volume and indicate many possible future avenues for research.

KEVIN JONES

The Leeds & Liverpool Canal — Mike Clarke

422pp, 265x190mm, many b&w and colour illustrations, 30 facsimile & many new maps and plans, multiple tables and graphs, 6 appendices, chronology, softback, Milepost Research, 8 Green Bank, Barnoldswick BB18 6HX, 2016, ISBN 0 9519236 8 4, £28 (p&p included from <www.mikeclarke.myzen.co.uk/>)

This is the second, and much expanded, edition of the history which the author (the Society’s President) has taken nearly fifty years to complete.

Concise summaries of Yorkshire and Lancashire transport history are followed by the story of the River Douglas navigation which subsequently was substantially incorporated into the canal. There are chronological chapters on the history to date, details of connections to the Rochdale and Lancaster Canals, and a history of the connecting Bradford Canal. The immensely complex history of proposals and counter-proposals, which is not always covered in such histories, is dealt with as clearly as could be expected. There are specific chapters on topics such as finances, engineering, water supply, personnel and

various traffics. This gets around the overloading of the historical narrative with perhaps more specialist information. Unlike some recent railway histories reviewed in the *Journal*, there are fewer extracts from company minutes, although for further research fully traceable footnotes are given to extensive primary and secondary sources.

Most places mentioned in the text are traceable on one of the maps. The old maps are sometimes too small, but the specially drawn ones are models of usefulness and clarity (although anyone colour-blind would struggle with some of them). The only real suggestion to be made for improvement of the book generally is that a list of maps could be included in the contents section.

DAVID PEDLEY

***South Wales Valleys: railways and industry in the Western Valley, Newport to Aberbeeg* — John Hodge**

254pp, 290x228mm, 390 photographs, 9 drawings, hardback, Pen & Sword Transport, 47 Church Street, Barnsley S70 2AS, 2016, ISBN 978 1 47383 8 079, £25

John Hodge worked as a British Railways manager and was instrumental in re-planning the Western Valleys operation in 1968 that led to the closure of Rogerstone down hump yard. Calling on his intimate experience of these matters, this book concentrates, location by location, on operating factors for moving coal and iron ore on the former Monmouthshire Railway & Canal Company's Western Valley line from Newport docks as far as Aberbeeg. (The lines onwards to Ebbw Vale and Brynmawr together with the historically separate Hall's Road must wait until a second volume: the Western Valley line to Nine Mile Point and the Sirhowy Valley are also not included.) Whilst stations and passenger trains are illustrated, they are here very much of secondary importance to freight movement. Through a good extensive selection of photographs to complement his own, Hodge describes changing track layouts, re-sitings of signal boxes and laying down of holding sidings from the GWR period through BR to the present day. These verbal and photographic descriptions are made with the help of R A Cooke's track layout publications but we are treated to no contemporary maps. Motive power depots at

Newport are described and decennial locomotive allocations from 1902 are analysed. A short history of the industries in the Pontymister area is drawn, uncredited, from Tony Jukes's work and colliery histories come from Ray Lawrence's monographs.

Hodge opts out of attempting a similar track analysis for the pre-GWR years but simply transparently re-words Aubrey Byles' 1982 history of the MRCC in a long unedited opening and somewhat irrelevant chapter. If only he had had the confidence to do some primary research on early maps and leases (which are readily accessible) we could have had a more complete picture of railway development at Newport from tramroad days. What becomes clear is that this valuable contribution on twentieth-century railway operation in the Ebbw Valley is embellished unnecessarily with too much material on earlier years repeated from already published sources to which no value has been added. A bibliography lists five publications and there are no references in the text. This book still leaves scope for a new history to be written of the MRCC (up to 1880) to succeed the works of Aubrey Byles and Charles Hadfield. STEPHEN ROWSON

***A–Z of the Birmingham Canal Navigations* — Edward Paget-Tomlinson with historical notes by Ray Shill**

180pp, 210x150 mm, 88 photographs (38 colour), 29 line drawings, 2 maps, softback, landscape, Birmingham Canal Navigations Society/Canal Book Shop, Audlem Mill Ltd, The Wharf, Shropshire St, Audlem, Crewe CW3 0DX, ISBN 978 0 9574037 8 9, £14.95

The late Edward Paget-Tomlinson provided a series of historical drawings for the BCN Society magazine *Boundary Post*, producing an 'A–Z' with historical essays by Ray Shill, RCHS member and historian. This booklet reproduces all 26 sets of drawings and articles, edited with the provision of historical photographs by BCN Society members. It is one of a growing number of new and reprinted publications by the Canal Book Shop, and hopefully more will follow.

The result of the collaboration is a well-produced set of observations that add to knowledge from other sources. Topics include places (Anglesey Basin), industries (blast furnaces), processes (indexing station), boats (*James Loader*), passenger-carrying

(packet boats), engineering features (Steward aqueduct), wharves (Valentia wharf), and on to products carried (zinc).

This is probably a book in which to dip rather than read from cover to cover. Some selections are idiosyncratic, but there are many fascinating details. To take a single example, the section on packet boats explains the background to Mr Paget-Tomlinson's imaginative reconstruction of Shipton's *Swift* packet boat at Galton Bridge in 1843. The same section records the last packet boat service, through the new Netherton Tunnel from 1858, and references to various earlier short-lived services, along with details of operations of more resilient services.

JOSEPH BOUGHEY

***Industrial Locomotives & Railways of Cumbria* — Gordon Edgar**

128pp, 168x242mm, 132 colour photographs, 34 b&w, map, softback, landscape, 2016, Amberley Publishing, The Hill, Stroud GL5 4EP, 2016, ISBN 978 1 4456 4833 0, £19.99

Whilst the Industrial Railway Society's locomotive lists have been available for many years, such railways have in general attracted little attention from railway historians and enthusiasts – perhaps because they rarely operated passenger services and had few large locomotives. What is now known as Cumbria had a variety of both standard and narrow-gauge industrial lines, most of which have now vanished – one as recently as 2014. Gordon Edgar grew up in the area and has long been a student of these operations; this volume gives short accounts of many of them in a pictorial format.

Intended as the first in a series, the book has 14 chapters, some devoted to particular locations such

as the Port of Workington and others surveying particular industries. Among the operations covered are Millom ironworks and the steeply-graded Lowca Light Railway. The colour images, many taken by the author in the 1970s, have reproduced well and convey particularly effectively the often grimy and neglected environments in which such railways operated (and, in a few cases, still do).

If the high standards of this volume are maintained, the later ones will be worth waiting for. A bibliography, inevitably rather short, is included, but there is no index.

GRAHAM BIRD

***Samuel Telford Dutton. Railway signal engineer of Worcester* — Edward Dorricott**

256pp, 215x273mm, 375 b&w & colour photographs, hardback, Signalling Record Society, 66a Lower Wyche Road, Malvern WR14 4ET, 2016, ISBN 978 1 873228 26 5, £30 (plus £4.25 p&p)

From 1860 rapid strides were made in train control through the introduction of centralising signal and point control in cabins. Combined with absolute block working and interlocking this materially improved railway safety but railway companies were slow to adopt it on cost grounds. Nevertheless signal engineering companies grew rapidly and vied to improve and patent systems.

One of the major emerging firms was McKenzie and Holland of Vulcan Ironworks, Worcester. Foremost of their engineers was Manchester-born Samuel Telford Dutton (1838–1919). Dutton had joined the company as a draughtsman in its formation year, 1861, and became an outstanding figure in the success of the signalling concern. With five patents to his name by the mid-1870s he had, by the 1880s, become a managing partner and a prominent civic leader in Worcester.

Dutton foresaw the explosion in demand that was to come following the Regulation of Railways Act 1889 which compelled railway companies to implement fully grudgingly adopted safety measures on a tight timescale. In 1888 he set up independently as Dutton & Co Ltd in recently vacated, and very grand, premises next door to his old company. He gained considerable work on the Cambrian, Highland, Great

Eastern and Great Northern Railways. However very soon signalling of the home railways with well engineered and long-lived equipment reached maturity. These installations were to endure for much of the next 70 years leaving only maintenance and limited new work to sustain independent businesses. After a flourishing and prosperous start the Dutton company therefore fell upon lean times and was wound up in November 1899, the assets eventually passing to McKenzie and Holland. Dutton retired, living in some style in Worcester till his death.

The comprehensive research behind this well produced book is fully set out in two parts. The shorter of the two sections is devoted to the life of Dutton, his various patent appliances and an outline of his business. This is followed by an examination, by railway company, of the known installations and their technical details. Although his company was short lived, these survived until swept away in the torrent of change of the last fifty years, though some still survive. This well researched and competently written book is a tribute to a lesser known engineer and his company and a very welcome addition to the somewhat sparse literature on this vital area of railway operation.

BRIAN JANES

***Caillet's Patent Mono-rail System* — John L Townsend**

42pp, 230x17.5mm, 46 illustrations, softback, The Narrow Gauge Railway Society, 115a Church Street, Ecclesfield, Sheffield S35 9WF, <www.ngrs.org>, 2016, £5.50 (plus £1.00 p&p)

Here is another in this society's excellent series of monographs which comprehensively covers this, the most widely used of all ground-laid mono-rail systems. It answered the question of how to improve the transportation of relatively light loads using manual or horse power for the minimum capital outlay. It took its inspiration from the coolie trotting along with baskets on the end of a shoulder pole and the donkey with panniers slung off its back. Achieving good balance via simple, lightweight engineering was at the heart of all Caillet's patents (from 1893 to 1903), though virtually nothing is known about the man himself. It has, naturally, many similarities to the out-rigger mono-rail systems of Thorold (1868).

The last 15 pages give details of examples built and proposed around the world and the range of trucks available for purchase. Apart from minerals etc passengers (up to about 16) were also catered for, one example being a 3 mile line on Canvey Island constructed in 1903. Caillet's last patent (FR 324729 – 1903) envisaged the horse being substituted by a vertical-boilered steam locomotive but no example was ever built. The success of Caillet's system lay in its modest simplicity and this would have taken it into realms already covered by Ewing (1894) and later by Stronach & Dutton (1918). Most mono-rail systems, however ingenious, failed to meet their inventors' aspirations. Caillet's was an exception, and the author of this small, very well illustrated monograph tells the story admirably.

MILES MACNAIR

***Motor Rail Ltd* — Alan M Keef**

x, 152pp, 282x224mm, 241 illustrations, hardback, Lightmoor Press, Unit 144B, Lydney Trading Estate, Harbour Road, Lydney GL15 5EJ, 2016, ISBN 978 1 911038 09 2, £22.50

2016 sees the centenary of The Motor Rail & Tramcar Co Ltd of Bedford building its first locomotives, in the shape of the petrol-engined 'Simplex' tractors which proved so successful on the Western Front and whose design was the basis of the company's production for most of the rest of its existence.

The author states that the text covering the period up to 1965 is largely based on the work of Frank Jux. Mr Keef is well placed to cover the more recent history, having acquired the railway business of Motor Rail, and the book is at its strongest here,

with insights into the company's commercial policies and attempted diversification.

The author also acknowledges that the present book should be read in conjunction with writings of W J K Davies for the earlier period and of Hall and Rowlands for the details of narrow-gauge model development. Taking this into account, we now have a comprehensive account of a once unsung company. A final chapter presents some sample locomotive histories, demonstrating what remarkable lives these apparently humble machines could lead.

MATTHEW SEARLE

***Regional Tramways: Yorkshire and north east of England* — Peter Waller**

176pp, 280x215mm, 215 photographs (13 colour), 11 maps, hardback, Pen & Sword Transport, 47 Church Street, Barnsley S70 2AS, 2016, ISBN 978 1 47382 3 846, £25

This is the first in a *Regional Tramways* series from this Barnsley firm, on home territory here. There are nine chapters, on Bradford, Gateshead, Hull, Rotherham, South Shields, Sunderland and (particularly) Leeds and Sheffield, all 'first generation' tramways which survived the Second World War, with brief notes on 'second generation' systems, South Yorkshire Supertram and Tyne & Wear Metro,

and a chapter on preservation. But there were many others and the introduction mentions these – earlier ones, several horse-drawn, many company rather than municipal, and others less long-lived, surrendering earlier to buses or trolleybuses: Huddersfield, Halifax, Keighley, Yorkshire Woollen, Dearne Valley, Barnsley, Doncaster, York, Scarborough, Middlesbrough and Stockton.

The book's principal value is the illustrations, mainly black and white photographs and at least decently reproduced. The longest lived of these systems were Leeds (last tram 1959) and Sheffield (last tram 1960). The latter stands out for several reasons: in the Second World War as many as fourteen trams were lost to enemy action in the blitz of 12 December 1940, gaps having to be filled from two other systems discussed here, Newcastle and Bradford; and whereas Leeds' first post-1945 trams were second-hand, Sheffield's last fifteen years

featured new and exciting developments – the reviewer recalls being excited by no 501 (1946), effectively the blueprint for the 35-strong Roberts cars, which seemed the last word in comfort, elegance and modernity. In retrospect, the end came quite quickly.

The maps of the post-1945 systems are diagrammatic; there is an error in that for Sheffield, showing routes converted to buses in the 1930s. Generally, the volume can be recommended.

PHILIP SCOWCROFT

***Thomas Telford through Time* — John Christopher**

96pp, 235 x 165mm, 188 illustrations (128 colour), 7 maps, softback, Amberley Publishing, The Hill, Merrywalks, Stroud GL5 4EP, 2016, ISBN 978 1 4456 5781 3, £14.99

Amberley Publishing's popular 'Through Time' series deals largely with places; on the evidence of this book, the anthology of images format lends itself to illustrating the historical legacy of individual engineers equally well. From line drawings, maps, postcards and photographs new and old, John Christopher compiles an impressive overview of the Telford heritage.

Divided into eight headings, the book offers a wide-ranging survey of Telford's early works – roads, canals, Scottish ventures, the Holyhead road, bridges, harbours and docks, and later works. Although concise, the captions offer a generous amount of informative detail about individual

structures. 'Scotland' – unsurprisingly, the longest section – offers a particularly rich record of the massive road and bridge building programme for which Telford was responsible in the Highlands. The only regret, which may be unreasonable, is that although the book refers to Telford's Göta canal in Sweden, it includes no pictures of it. By way of compensation, it illustrates such intriguing might-have-beens as the 600 foot single cast iron span that Telford designed as a new London Bridge in 1800 and his idiosyncratic Gothic suspension bridge intended for the Avon Gorge at Clifton.

VICTORIA OWENS

***Last Rites: from the track to the scrapyards* — John Evans**

128pp, 231x165mm, 187 photographs, softback, Amberley Publishing, The Hill, Stroud GL5 4EP, www.amberley-books.com, 2016, ISBN 978 1 4456 5498 0, £12.99 (also available as an e-book)

This collection of illustrated essays is based on the author's railway experiences in the 1960s. He was brought up in Northampton, where his first job was as a local newspaper reporter, and most of content relates to this locality and the wider East Midlands region, with some sorties further afield. The illustrations are mainly his own photographs and relate to the text, but their quality is variable and the reproduction often muddy.

Parts of this book comprise tales of train spotting and visits to sheds and scrapyards, with numerous pictures of withdrawn steam locomotives. However, there are also descriptions of travel on the Great

Central main line shortly before closure, of visits to local industrial railways, and of exploring closed lines. The latter include walks along most of the trackbed of the Stratford-upon-Avon & Midland Junction Railway in 1966 and travelling on a demolition train on the former Midland Railway Northampton branch in 1967. There are a few errors; for example, an industrial Sentinel steam locomotive is misidentified as a diesel.

This book is an enjoyable read, communicating well the atmosphere around the 'last rites' of the steam railway of the 1960s. Its main appeal is likely to be to a local readership.

TIM EDMONDS

***Tracking the Hooligans: the history of football violence on the UK rail network* — Michael Layton and Alan Pacey**

286pp, 234x156mm, 16 colour photographs, softback, Amberley Publishing, The Hill, Stroud GL5 4EP, 2016, ISBN 978 1 4456 5180 4, £16.99

The two authors of this book are retired British Transport Police officers and the most significant feature of this book is that it draws upon the personal recollections of colleagues since the 1970s. There is a well-trodden path in railway history of drawing upon the memories of railway servants and others and this book fits into that genre of writing.

The first part of its title perfectly summarises it – the second part is a little misleading. Almost all of the book deals with the 1970s onwards, whilst the chapter ‘The Early Years’ is barely nine pages and starts in 1951. Although the introduction does mention a couple of earlier incidents, the content implies there was little trouble before the 1970s.

Indeed the comment ‘specially chartered football specials were a feature of the seventies’ seems to ignore their existence many decades earlier.

If one sets that aside the book can be read for what it really is – a mostly lively retelling of what it was like on the football specials and at the station buffets as some of the nation’s less savoury characters travelled up and down seeking trouble under the pretence of attending football matches. Ultimately of course this killed off the ‘footex’ pretty well altogether until its modern renaissance in luxury mode, now even with steam haulage!

ADRIAN GRAY

***Roads of East Shropshire through time* — Neil Clarke**

96pp, 234x165mm, 164 illustrations (98 colour), 7 maps, softback, Amberley Publishing, The Hill, Merrywalks, Stroud GL5 4EP, 2016, ISBN 978 1 4456 5324 2, £14.99 (also available as an e-book)

For the last hundred years, roads and their vehicles have been the most important form of transport, yet they hardly ever feature in books written for the general reader. This volume is therefore particularly welcome.

‘East Shropshire’ here means principally what is now the town of Telford, plus a few images from a wider area bounded by Atcham, Newport, Shifnal, Bridgnorth and Much Wenlock. The local story is set squarely in a national context. After a short section on prehistoric, Roman and mediaeval roads, the longest section – half the book – is devoted to the turnpike era, illustrating the bridges, tollhouses, mileposts and coaching inns. The improvements to the Holyhead road made under the direction of

Thomas Telford in the 1820s and 1830s are discussed in detail. During the motor age, most of the images are concerned with the vehicles and their related infrastructure: cycles, cars, lorries and buses, together with their maintenance, garaging and fuelling. The concluding pictures concern the new roads within the town of Telford and the construction of the M54.

With its pleasing balance of old and new pictures and its authoritative text, this is a valuable addition to the local history of the area. The only significant omission is any mention of Telford’s great road glory: its fifty or so roundabouts – many with sculptures, others with floral displays.

PETER BROWN

***Isambard Kingdom Brunel: the life of an engineering genius* — Colin Maggs**

310pp, 234x156mm, 85 illustrations (14 colour), hardback, Amberley Publishing, The Hill, Merrywalks, Stroud GL5 4EP, 2016, ISBN 978 1 4456 4065 5, £20

A survey of Brunel biographies currently available points not only to a high level of interest in his life and work but also to an exchange about his character and merits. L T C Rolt (1957) wrote an uncritical account to which Adrian Vaughan (1991) took a revisionist scalpel by highlighting the engineer’s professional and moral flaws. Between their conflicting views Angus Buchanan (2002) sought to establish a measure of balance, particularly in respect

of Brunel’s relations with John Scott Russell, whilst Stephen Brindle (2005) presented his achievements as the triumph of the egotistical sublime in a timid age.

Rather than engage in this debate, Colin Maggs – a prolific railway writer and author of a 2013 history of the Great Western Railway – offers a robust cradle-to-grave life story. Taking a chronological approach to Brunel’s maritime, railway and civil engineering

work, Maggs seeks to demonstrate how his different ventures ‘inter-mingled’.

This strategy does not entirely pay off. Although Maggs lists Brunel’s activities with meticulous care, his all-embracing record presents the raw stuff of the engineer’s hectic existence in somewhat amorphous form. Frequent lengthy quotations from journals and correspondence of Brunel and his associates deflect the book’s narrative thrust and the text is apt to repeat itself; we learn, for instance, about Brunel’s unexpected advice to the Taff Vale Railway Company

to adopt standard rather than broad gauge three times over.

Whilst the absence of footnotes may please some readers, others will regret the lack of source-references. Nevertheless, Maggs provides six appendices, giving a time-line; a list of Brunel’s major works; dimensions of his ships; details of his Duke Street residence with its staff; and a selection of his letters. There is a brief bibliography and a useful index. The illustrations – some familiar images, some less well-known – are illuminating and of high quality.

VICTORIA OWENS

***The Royal Arsenal Railways: the rise and fall of a military railway network* — Mark Smithers**

x, 172pp, 290x225mm, 165 illustrations, 34 drawings, 3 maps, 10 tables, hardback, Pen & Sword Transport, 47 Church Street, Barnsley S70 2AS, 2016, ISBN 978 1 47384 400 1, £30

For obvious reasons, what went on beyond the gates of the Royal Arsenal at Woolwich remained somewhat mysterious during its working life, although it must have been a fascinating place particularly in its First World War heyday with 25 standard-gauge and 45 narrow-gauge locomotives going about their business.

Now its railway system has been thoroughly documented. The author has a special interest in 18-inch gauge steam locomotives, and these (particularly those built by Manning, Wardle) feature extensively, but the standard gauge and non-steam motive power are by no means neglected. The sources used are

indicated within the narrative text rather than being separately footnoted.

The major flaw of the book is that, although much care has clearly been taken in drawing the master site map (essential for understanding the text), it has been reproduced at far too small a scale to be legible without magnification. The illustrations, however, have exceptionally full captions. There is a brief index.

There is probably little more that could be said about this intriguing system, and this book generally does it justice.

MATTHEW SEARLE

***The Broad Gauge Railway at Watchet* — Chris Saunders**

64pp, 275x215mm, 102 illustrations, softback, Lightmoor Press, Unit 144B, Lydney Trading Estate, Harbour Road, Lydney GL15 5EJ, 2016, ISBN 9781911038 08 5, £9 (plus £2 p&p)

The broad-gauge West Somerset Railway was opened from Taunton to the port of Watchet in 1862. It was operated by the Bristol & Exeter Railway, as was the 1874 extension by the Minehead Railway, and all three were absorbed by the GWR in 1876. This book comprises captioned photographs from the second half of the nineteenth century, two thirds of them by local photographer James Date, plus some contemporary engravings and documents. Treatment is chronological, with chapters covering the railway construction period, early operations before the extension, activity from the opening of the extension until gauge conversion in 1882, and subsequent changes to 1900.

The author, who lives in Watchet, has compiled an impressive selection of images with analytical

captions. They include some well-known photographs, but there are many that have not previously been published and, although the quality of some is poor, their inclusion is justified by the rarity of the content. In many cases the railway is incidental to the main subject, which is most frequently the harbour and its surrounding area. There are many pictures taken from the same viewpoints and their significance is in the changing details of everyday life and economic activity – ships, cargoes, machinery, road transport, buildings and people. Whilst this book will have a particular appeal to broad-gauge specialists and a local readership, the depiction of activity at a small port is of considerable historic interest.

TIM EDMONDS

Brief notes

Britain's Canals: a handbook — Nick Corble
95pp, 234x165mm, 150 colour illustrations, softback, Amberley Publishing, The Hill, Merrywalks, Stroud GL5 4EP, 2016, ISBN 978 1 4456 4966 5, £15.99 (e-book also available)

Although not one for the transport historian, this is nevertheless a good introduction for anyone wanting a boating holiday or to walk or cycle the towpaths, and it has a useful bibliography inviting the reader to follow up their interest.

EMUs: a history — Hugh Llewelyn

128pp, 167x244mm, 166 colour photographs, 14 b&w, softback, landscape, Amberley Publishing, The Hill, Stroud GL5 4EP, 2016, ISBN 978 1 4456 4982 5, £19.99

This book is slightly mis-titled, covering as it does only electric multiple units built since 1947. Coverage is class-by-class and chronological, starting with the pre-nationalisation designs perpetuated by BR and those based on the Mark 1 body shell, the Mark 2-derived 310s and 312s, the prototype PEP of 1972 and its progeny, and then the Mark 3 designs of 1981–85. Subsequent sectorisation, followed (after something of a famine in rolling stock orders) by privatization has produced a surprisingly wide variety of designs: one of the virtues of the book is its analysis of these by 'families' (Hunslet, CAF, Alstom, Adtranz/Bombardier and Desiro): for those of a certain age who could easily tell a 305 from a 309 but are confused by the various classes of Electrostar the book will prove a godsend. For each class basic technical details and areas of operation (past and present) are given and the book is very well illustrated: nearly all the photographs are in colour and the author's own. There is the occasional mistake in captions, but overall the book can be recommended as a work of reference for anyone interested in the current railway scene.

Slate, Sail, Steam: a history of the industries of Porthmadog — John Idris Jones

96pp, 165x233mm, 33 illustrations (11 colour), map, paperback, Amberley Publishing, The Hill, Stroud GL5 4EP, 2016, ISBN 978 1 4456 5347 1, £14.99

The title of this book is something of a misnomer. Slate merely passed through Porthmadog and of the railways that served, and serve, it, only the Ffestiniog is mentioned in any detail and the Welsh Highland in

passing. The book would have benefitted from stronger editorial discipline to bring chapters on the same subject together. The short bibliography probably represents the author's sources. The selection of photographs taken in 2015 does not adequately represent their subjects and none of the illustrations is attributed. There is no index. The design is much improved on previous titles seen from this publisher.

Robert Hudson Ltd Leeds: light railway material (1915 edition)

92pp, 280x210mm, numerous illustrations, softback, Narrow Gauge Railway Society, 115a Church Street, Ecclesfield, Sheffield S35 9WF, <www.ngrs.org>, 2016, ISBN 978 0 9934386 2 2, £8.95 (plus £1 p&p)

This is a facsimile reprint of a catalogue from the publisher's archive, with a page of information about Robert Hudson Ltd added. It is packed with photographs, diagrams, dimensions and other information about the company's products which comprised a huge variety of light railway equipment, including track, wagons, locomotives, tools and ancillary items. It makes a fascinating browse and a valuable research tool, particularly for those interested in industrial railways and the export market. It is also of interest for the centenary of the Great War because Hudson played a key role in supplying military narrow-gauge railway track and rolling stock.

The Fairbourne Railway: a centenary of steam — Graham Billington

88pp, A4, 114 photographs (95 colour), softback, Mainline & Maritime Ltd, 3 Broadleaze, Upper Seagry, near Chippenham SN15 5EY, 2016, ISBN 978-1-900340-24-3, £14.95

This book concentrates on the post-1985 12¼-inch gauge period of the line's history, acknowledging that the earlier periods have been amply covered in John Milner's *Rails through the Sands* (1996) – although they are ably summarised here. The last quarter-century has been no less eventful than the preceding years, and the complexities – particularly the coming, going and transformation of rolling stock – are clearly distangled for the reader. This is the first in an intended series on Britain's miniature railways, and enthusiasts for the minimum gauge will be well served if it continues at this level of quality.

***Lost Lines of Wales* — Tom Ferris**

64pp, 150x200mm, about 30 photographs, maps, hardback, Graffeg Publishing, 24 Stradey Park Business Centre, Llangennech, Llanelli SA14 8YP, £6.99

***Ruabon to Barmouth* —**

ISBN 978 1 90982 317 4

***Brecon to Newport*—**

ISBN 978 1 90982 318 1

***Aberystwyth to Carmarthen* —**

ISBN 978 1 90982 319 8

***Cambrian Coast Line* —**

ISBN 978 1 90982 320 4

The author of these books is Tom Ferris who has previously written books on railways in Ireland but who now lives in Wales and has turned his attention to the railways of that nation. Graffeg are an established Welsh publisher but this seems to be their first excursion into the railway book market.

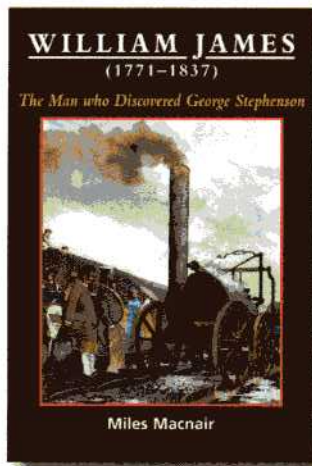
There is an introductory chapter in each book giving the history of the line and detailed captions to the photographs. The photographs, which come from a wide range of dates, have reproduced well and although a few are familiar most seem to be published for the first time. The books are a little let down by the maps which show only the line under consideration with no connecting lines or other geographic features and some of the intermediate stopping places are omitted. There are some errors such as Bala being shown as on the main line rather than on the Blaenau Ffestiniog branch. In some cases the captions have been printed across the images and some of the photographs have been printed across the page join. The other comment to be made is that the Cambrian Coast Line is hardly a 'lost line'. However, at only £6.99 each these books are well worth considering if you are interested in the lines described, particularly as they contain some unfamiliar photographs and in two of the books a few of the illustrations are in colour.



Llys halt opened in 1934 between Bala Junction and Dolgellau (from Tom Ferris, Ruabon to Barmouth described above)

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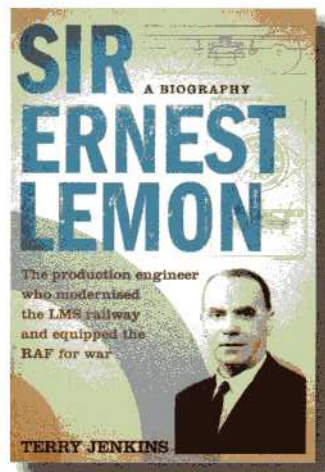
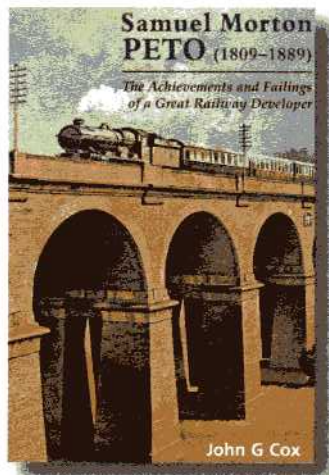


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