

The Railway Works at Swindon and Stratford in the 19th century: a comparison of their origins, activity and labour force and their social impact on their respective neighbourhoods.



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Abbreviations

C & GWUR – Cheltenham and Great Western Union Railway.

ECR- Eastern Counties Railway.

GER – Great Eastern Railway.

GWR – Great Western Railway.

HC – House of Commons.

ODNB – Oxford Dictionary of National Biography.

NALSC- Newham Archives and Local Studies Centre.

N &ER – Northern and Eastern Railway.

SCL – Swindon Central Library.

SHL – Senate House Library.

TNA – The National Archives.

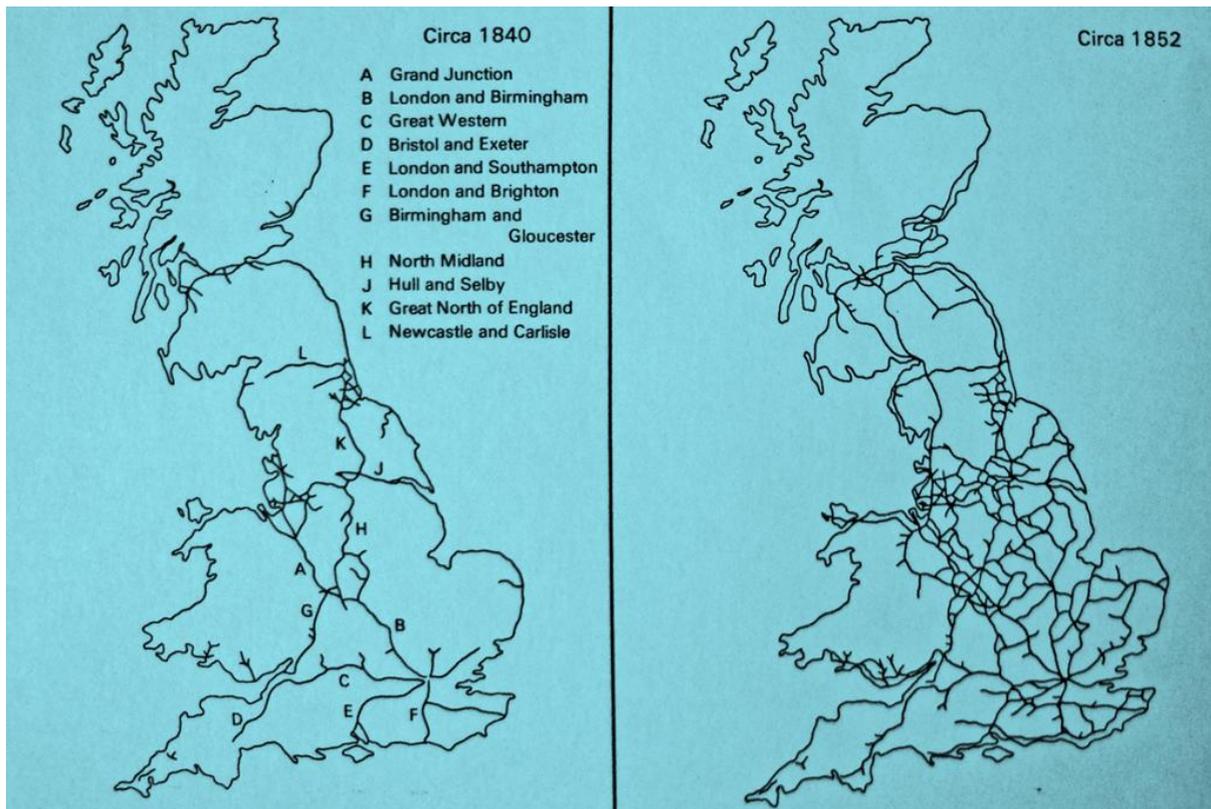
VCR – Victoria County History.

1. Introduction

The railway works of the GWR at Swindon, and that of the ECR at Stratford (Essex) – which through amalgamation with three other companies became the GER in 1862 - were significant establishments of their day, both to the companies that built and operated them and to their localities. Both works were established in the 1840s to maintain the locomotives operated by their respective companies, but increasingly, they began also to build locomotives instead of their companies purchasing them from third party locomotive engineers. This paper seeks to assess the reasons for and the extent of the similarities and differences between the two works in terms of their size, the work they undertook, their locality, the sources of their employees, as well as the support that each company provided to employees in terms of their housing, education and spiritual needs.

The archives visited to research this paper and the records examined are set out in appendix 1. In general more records have survived for GWR and the Swindon works than for ECR/GER and the Stratford works. Those of GWR are usually more expansive than for ECR/GER in recording explanations of events or decisions taken. Short biographies of the individuals mentioned in the text of this paper are in appendix 2.

Before we consider the two works we look briefly at the importance of the railways to Britain in the 19th century, the significance of railway works to the rail network, and in particular, those at Swindon and Stratford. Railways had been built , subject to the approval of Parliament , since 1801 and were found mainly in the coal fields of North East England,



Map 1. The railway network circa 1840 and in 1852.

the Midlands and South Wales.¹ The first public railways drawn by steam locomotives were the Stockton and Darlington Railway opened in 1825, and the Liverpool and Manchester Railway opened in 1830. The latter was the more significant because it linked two major commercial centres in South Lancashire. The rail networks circa 1840 and 1852 are shown in map 1.² The late 1830s saw the first of three booms in railway construction in the 19th century, as a result of which lines were built between London and the North East, North West and South West of England. Further expansion in the early 1840s, and a second boom in the mid 1840s produced a network that by 1850 reached as far as Aberdeen in Scotland,

¹ J. Simmons, *The Railway in England and Wales, 1830-1914* (Leicester, 1978), p. 17.

² M. Freeman, 'Transport', in eds., J. Langton and R.J. Morris, *Atlas of industrializing Britain* (London, 1986), p. 89.

South Wales, Plymouth in the South West of England, and East Anglia with an increasingly comprehensive network between the major towns of England. Further construction, including another boom in the mid 1860s delivered 70% of the final network mileage by 1875.³

The creation and operation of this network had a significant impact on the economy and society of Britain. It provided quicker and cheaper transport for passengers and goods than travel by stage coach or canal. For example a journey from London to Southampton took 12 hours by stage coach in the 1820s and 2 hours by train in 1845.⁴ From 1842 to 1900 there was a compound growth of 6.7% in passenger numbers and 7.65% growth in tonnage carried by rail.⁵ The Post Office made early use of the railway to transport mail and the growth in the network resulted in an increase in the number of letters delivered by the Post Office from 76 million in 1839 to 863 million in 1870.⁶ There were also considerable increases in travel and the movement of produce between the countryside and towns. However the arrival of the railway was not always an advantage to the rural population because easier and cheaper travel brought increased competition from the towns resulting in the closure of some rural shops and fairs.⁷

The construction of the railways made considerable additional demands upon materials such as pig iron for rails (steel from the 1870s) and bricks for construction. The demand for capital investment was also significant, although it was obviously greater in boom periods.

There is debate between economic historians on the size of this investment. Gourvish, for

³ T.R. Gourvish, *Railways and the British Economy, 1830-1914*, (London, 1980), p. 9.

⁴ M. Freeman, 'Transport', p. 90.

⁵ S. Ville, 'Transport', in ed., R. Flood and P. Johnson, *The Cambridge Economic History of Britain, Vol. 1*, (Cambridge, 2004), p. 307.

⁶ M.J. Daunton, *Royal Mail, the Post Office since 1840* (London, 1985), p. 122.

⁷ W.A. Armstrong, 'The Countryside', in ed., F.M.L. Thompson, *The Cambridge Social History of Britain, 1750-1950, Vol. 1*, (Cambridge, 1990), p. 116.

example, quotes figures for the second half of the 1840s of rail investment representing some 5% of national income or about one half of domestic capital formation. The same figures for the mid 1860s boom were 2.5% and one third respectively.⁸

The railways also created significant employment. An average of about 1% of the male work force was employed in the construction of the railways between 1831 and 1870 rising to 4% in the boom years. The operation of the network created over 100,000 more permanent jobs by 1856 and over 200,000 by the late 1860s.⁹ The scale of most rail companies required them to become leaders in new forms of business organisation that separated ownership from management and necessitated the employment of professionals such as engineers and accountants to manage the various specialist functions of a company.

Railway works were important parts of the rail network. Their maintenance of locomotives enabled the growing network to meet the mechanical demands of longer distance rail journeys. Increasingly they also built locomotives and other rolling stock for their respective companies and became centres of mechanical engineering expertise. By 1849 there were 12 such works in England. Some were built on green field sites and others on the edge of existing towns or cities. Swindon was one of the two early works that established a new railway town and by the end of the century it was the largest works in England by number of employees. Stratford was built near to London, and urban expansion during the 19th century resulted in it becoming part of the London metropolis by the 1890s. It was the largest rail

⁸ T.R. Gourvish, 'Railways 1830-70: the formative years', in eds., M.J. Freeman and D.H. Aldcroft, *Transport in Victorian Britain* (Manchester, 1988), p. 60.

⁹ T.R. Gourvish, *Railways and the British Economy*, pp. 20-22.

works in this kind of location.¹⁰ These differences provide an interesting basis for comparison.

The Swindon and Stratford works were large in terms of the number of men that they employed compared to other sectors. In 1851 the two works employed around 1000 men each, whereas the 1851 census shows that only 14 of the 677 engine and machine makers recorded had 350 employees or more.¹¹ By 1900, Swindon employed up to 14,000 and Stratford 6,800 men.¹² Management of both works therefore must have been challenging in the context of the 19th century communications and technology. The senior management of both works were engineers and there were connections between many of them through family or professional relationships. These individuals were responsible for designing new locomotives and introducing more advanced production methods as advances in technology permitted. Both works became major producers of locomotives in the last 30 years of the 19th century. The scale and functions of both works made them key to the operation of their respective companies and to the lives of those who lived in Swindon and Stratford.

2. The early years of GWR and ECR.

New railways could only be constructed after a private members' Bill had been passed by both Houses of Parliament. From 1825 to 1835 there were 54 Railway Acts and in 1836-7 another 39.¹³ During the 1830s such Bills were the subject of considerable opposition from landlords through which the line would pass and others who believed that the railway concerned would be detrimental to their interests.

¹⁰ Later in the century smaller railway towns emerged such as Eastleigh in Hampshire (1891).

¹¹ J.H. Clapham, *An Economic History of Modern Britain, 1850-1886*, (Cambridge 1964), p. 34.

¹² M.Freeman & D. Aldcroft, *Atlas of British Railway History*, p. 98.

¹³ J.H. Clapham, *An Economic History of Modern Britain, 1820-1850*, (Cambridge 1964), p. 387.

The first proposal for a railway between London and Bristol, which at this time was the second largest town in England, originated in 1824 from a group of Bristol merchants.¹⁴ The proposal came to nothing, but the success of the Liverpool and Manchester line resulted in another proposal being put to the public in 1833, with a prospectus that estimated the cost of the line to be £2.805 million.¹⁵ A Bill laid before Parliament received considerable opposition from the landowners of Buckinghamshire, Berkshire and Middlesex, including Eton College.¹⁶ As a result the Bill did not receive Royal Assent until 31st August 1835. Thereafter the line was built in stages by Isambard Kingdom Brunel, the chief engineer of GWR.¹⁷ In June 1838 it was opened between Paddington and Maidenhead. The remainder of the line was built in eight stages, the last of which was opened in the summer of 1841.¹⁸

Building a railway line from the east of London proved to be no easier than to the west. In 1834 a proposal was put forward by John Braithwaite, for a railway from London, Ipswich and Norwich.¹⁹ A committee was formed to take this forward.²⁰ The proposal was met with opposition from the landowners through which the line would pass and ridiculed by others who claimed that railways were suited to the manufacturing areas of the north of England, but of little use in agricultural areas such as East Anglia. A prospectus for the 'Grand Great Eastern Railway', issued in 1834 pointed to the advantages to the railways of the 'greatest

¹⁴ E.T. MacDermot, revised by C.R. Clinker, *History of the Great Western Railway 1833-1863* (Shepperton, 1964), p. 1.

¹⁵ *Ibid*, pp. 4-5.

¹⁶ Rail 250/2, folio 65, TNA.

¹⁷ See appendix 2.

¹⁸ E.T. MacDermot, *History of the Great Western Railway, Vol. I*, pp. 48-71.

¹⁹ See appendix 2.

²⁰ C.J. Allen, *The Great Eastern Railway* (Shepperton, 1968), p. 1.

continuous extent of level country in the whole kingdom' and the advantages of opening up the market of the Metropolis to farmers and fisherman.²¹

The ECR Bill eventually received Royal Assent on 4 July 1836.²² On the same day, Royal Assent was also granted to the N&ER Bill for a line from London to Cambridge.²³ The first stage of the ECR line was from Stratford to Romford and was opened in July 1839, whilst the entire line to Colchester was not opened until October 1842.²⁴

N&ER made slower progress in constructing its line to Cambridge, largely because of inadequate funding. By 1840 it was extended to Broxbourne in Hertfordshire, some 15 miles from Stratford, and by May 1842 to Bishop's Stortford. Originally the N&ER's intention had been to build a London terminus at Islington, but in view of the costs involved it reached agreement with ECR to use the ECR terminus at Shoreditch, diverting the Cambridge line to join the Colchester line at Stratford. In 1843 the two companies agreed that the ECR would take over the entire operation of the N&ER.²⁵ In the same year the GWR took over the C&GUR line to Cheltenham, which joined the London-Bristol line at Swindon. Thus Swindon and Stratford became important junctions on the main GWR and ECR lines of the time.

²¹ *Eastern Counties Railway Prospectus* (London, 1834), SHL.

²² Rail 186/2, folio 136, TNA.

²³ C.J. Allen, *The Great Eastern Railway*, p. 5.

²⁴ Rail 186/5, folios 426-431, TNA.

²⁵ C.J. Allen, *The Great Eastern Railway*, p. 12.

Table 1: Comparison of GWR and ECR/GER figures, 1848-98: growth in the miles of line open, number of passengers and receipts.²⁶

GWR

	1848	1868	1898
Miles of line open	309	1387	2599
No. of passengers (000s)	1634	23304	76408
Total receipts (£ 000s)	532	3993	9878

ECR/GER

	1848	1868	1898
Miles of line open	309	806	1110
No. of passengers (000s)	1686	18458	104,176
Total receipts (£ 000s)	392	2142	5172

Both companies expanded considerably by merger, take over or amalgamation. Each year from 1848 the Government published statistics that compared key elements of each of the rail companies in Great Britain and Ireland. Table 1 sets out comparable data for GWR and

²⁶ Statistical Society of London, *Railway Returns for England, Wales, Scotland and Ireland*, (London, 1849, 1869, and 1899), 1848, pp. 3-5; 1868, p. 57; 1898, p. 51.

ECR/GER for the number of miles of railway line they operated, the number of passengers carried and the total revenue for 1848, 1868, and 1898 for each company. These figures demonstrate that after 1848, GWR was the larger of the two companies, and by 1898 it was more than twice the size of GER. The latter carried more passengers by the end of the century because it operated busy lines in and out of London and this enabled GER to earn more revenue per mile per annum (£4660) than GWR (£3800). Overall GWR was the largest company on the basis of miles of line, and GER the sixth largest.²⁷

Two other important issues are relevant to how the two companies developed: the gauge of the lines and the financial difficulties that both companies experienced. George Stephenson adopted a gauge of 4 ft 8.5 inches to build the Liverpool and Manchester railway.²⁸ The 'narrow gauge', as it became known, was adopted by most rail companies other than GWR and ECR. GWR, strongly influenced by Brunel, adopted a 7ft gauge (known as the broad gauge) because he believed that it would give greater carrying capacity than the narrow gauge. GWR continued to use the broad gauge until 1892, when it converted to the narrow gauge, although for some of this period it operated both across its network. The ECR initially adopted a 5ft gauge in its initial construction, but changed to the narrow gauge much more quickly in 1844. The debate about the advantages and disadvantages of the wide and narrow gauges is outside the scope of this paper, but the continued use of the broad gauge by GWR caused difficulty in its relations with its competitors and associates for most of the 19th century.

During this period both companies experienced periods of financial difficulty, which had an impact on both works because they affected the funds available and the climate for further

²⁷ M. Freeman, 'Transport', p. 91.

²⁸ Appendix 2,

investment. In some cases these difficulties were brought about by the mismanagement of the company, and in others resulted from wider difficulties in the economy as a whole. For GWR the cost of the line from London to Bristol was over £6 million compared to the original estimate of £2.8 million.²⁹ This, combined with the consequences of the mid 1840s boom, forced GWR to make economies. These included reducing the number of men employed at Swindon to around 600 in 1849, in a facility that was designed to employ 2000 men.³⁰ The ECR did not escape financial difficulty or accusations of mismanagement. George Hudson, the chairman, resigned in March 1849 following the outcome of committees of inquiry into the affairs of ECR and another rail companies in which Hudson had an interest. They reported that dividends had been paid out of capital and other financial figures manipulated.³¹ In February 1851, a report to the directors of the ECR on the level and control of capital expenditure in the company since it was established commented:

'We must not omit to observe, that great laxity appears to have prevailed in the management of it (expenditure), by which the cost of the works and property of the company has been rendered excessive, to a high degree injurious of the interests of the shareholders, and which a prudent and considerate stewardship of the funds subscribed by them would have greatly diminished and might have wholly prevented'.³²

²⁹ Ed. J. Simmons and G Biddle, *The Oxford Companion to British Railway History* (Oxford, 1997), p. 193.

³⁰ Rail 1008/18, TNA.

³¹ Rail 186/69, folio 296, TNA.

³² Rail, 186/74, folio 1, TNA.

In 1855 a further episode of financial mismanagement resulted in the resignation of Hudson's successor as chairman and of the locomotive superintendent, J. V. Gooch, an elder brother of Daniel Gooch, the locomotive superintendent of GWR.³³

Both companies experienced further difficulties in the late 1860s. Railway companies were financed partly by debentures which fell due periodically. In May 1867 a significant bank (Overend, Gurney & Co) failed and this created panic which put considerable pressure on the financial system. In July some £80,000 of GER debentures became due. The holders refused to renew them and the company did not have the capital available to take them up. As a result the company was put into receivership until a Bill was passed in Parliament giving authority to raise £3 million in debenture stock.³⁴ GWR also experienced difficulties, and it was necessary for Daniel Gooch, by now chairman of GWR to approach Gladstone, then Chancellor of the Exchequer, for assistance.³⁵ This was refused and the company was forced to repay loans from revenue until liquidity improved.³⁶

3. Swindon and Stratford: two different but in some ways similar locations

The works had a significant impact on Swindon and Stratford. Swindon is now the largest town in Wiltshire, due mainly to the development of the works in the second half of the 19th century and the first half of the 20th century. In the early 19th century Swindon was a small rural town. A contemporary description in 1831, described Swindon as being

³³ Appendix 2.

³⁴ C.J. Allen, *The Great Eastern Railway*, p. 53.

³⁵ Rail 1008/82, TNA.

³⁶ E.T. MacDermot, *History of the Great Western Railway, Vol. I, pp 20- 21.*

'pleasantly situated on the summit of a considerable eminence, commanding extensive and beautiful views of parts of Berkshire and Gloucestershire: the principal street is wide, and contains some good houses, and no branch of manufacture is carried on'.³⁷



Map 2. Section of an Ordnance Survey map of 1828 showing Swindon surrounded by farms and small villages. The Wiltshire and Berkshire canal is to the north of the town.

³⁷ S. Lewis, *A Topographical Dictionary of England*, Vol. IV (London, 1831), pp. 257-258.

The rural position of Swindon is shown in an Ordnance Survey map of 1828 (map 2).³⁸ The opening of the Wiltshire and Berkshire canal in 1810, which ran to the north of Swindon, provided a link with canals and navigable rivers to Bristol, London and elsewhere.

Stratford, however, was different in terms of its geographical position and the extent to which there was some industry before the railway arrived. It is located some 5 miles from



Map 3. Extract from an Ordnance Survey map of 1805 of East London and South East Essex. It shows Stratford to the north east of West Ham, with its proximity to London, the River Thames, the River Lea, and the London docks.

³⁸ Ordnance Survey, Old Series (London, 1828), sheet 34.

the City of London, on the border of Essex and Middlesex only a few miles from the River Thames and the London docks (map 3).³⁹ By the 1830's, although agricultural remained important to Stratford's economy, there was also some manufacturing. A chemical works was located in Stratford High Street from 1805, and Walter Hancock made steam engines and steam carriages there from 1824-36.⁴⁰ White's Directory for Essex, 1848, reports that Stratford was

*'a populous and rapidly improving village on the east side of the River Lea.....which is sometimes called Bow Creek, and is navigable for barges'.*⁴¹

As we will see in later sections, Swindon and Stratford works had to recruit staff with the necessary skills from other parts of the country because there were not sufficient men with these skills living nearby. But the proximity of Stratford to East London and the rural situation of Swindon had a significant effect on the approach they took to the needs of their employees.

4. Why the works were needed at the time they were commissioned.

The first locomotives in Britain were built by companies that specialised in building steam locomotives. They were located mainly in the North of England. George Stephenson established a works in Newcastle-upon-Tyne in 1823 which was associated with the Stockton and Darlington railway. Other workshops followed in Liverpool, Manchester, and Derby.⁴² These companies probably had supplied stationary steam engines for the factories in their locality. There is less evidence of where the carriages and wagons were built, but

³⁹ Ordnance Survey, Old Series (London, 1805), sheet 1.

⁴⁰ VCH, *A History of Essex, Vol. VI* (London, 1973), p. 78.

⁴¹ W. White, *History, Gazetteer, and Directory of the County of Essex* (Sheffield, 1848), p. 237.

⁴² E.J. Larkin and J.G.Larkin, *The Railway Workshops of Britain, 1823-1986* (London, 1988), p. 1.

their design suggests that they were probably produced by the makers of horse drawn carriages and then adapted to run on rails.

Early locomotives were subject to frequent breakdown. The longer distances travelled by rail between many of the larger towns and cities in England in the late 1830s and early 1840s increased the need for reliability, and engineers were appointed as locomotive superintendents for many lines. Daniel Gooch, shortly after his appointment as the first locomotive superintendent of GWR in 1837 illustrated the problem of unreliable locomotives in an entry in his diary for that year:

*'For many weeks my nights were spent in a carriage in the engine house at Paddington, as repairs had to be done to the engines at night to get them to do their work the next day.....when I look back upon that time, it is a marvel to me that we escaped serious accidents.....the failure of so many engines made the directors very anxious, and they called on me, apart from Mr Brunel, to make a report on each engine.'*⁴³

The newly appointed superintendents had the knowledge and skills to design, build and maintain locomotives. The increasing scale of the operations of GWR and ECR resulted in both companies deciding during the 1840s to set up more centralised engineering facilities to maintain their locomotives and rolling stock. Gradually they started also to build locomotives to meet their own standards of engineering quality and reliability.

For some time, Brunel and Gooch considered centralising their engineering facilities at a point reasonably equidistant between London and Bristol. Gooch wrote to Brunel in

⁴³ D. Gooch, *The Diaries of Sir Daniel Gooch* (London, 1892), p. 59.

September 1840 proposing a site to the north west of the town of Swindon at the junction of the GWR line to Bristol and the C & GUR to Cheltenham. It was a 'green field' site close to the Wiltshire and Berkshire canal which could be used to transport supplies of coal and coke. Swindon also had the advantage compared to other locations that it is at the point on the line between London and Bristol at which the average gradients change necessitating, at that time, a possible change in the type of engine used. The only disadvantage that he could

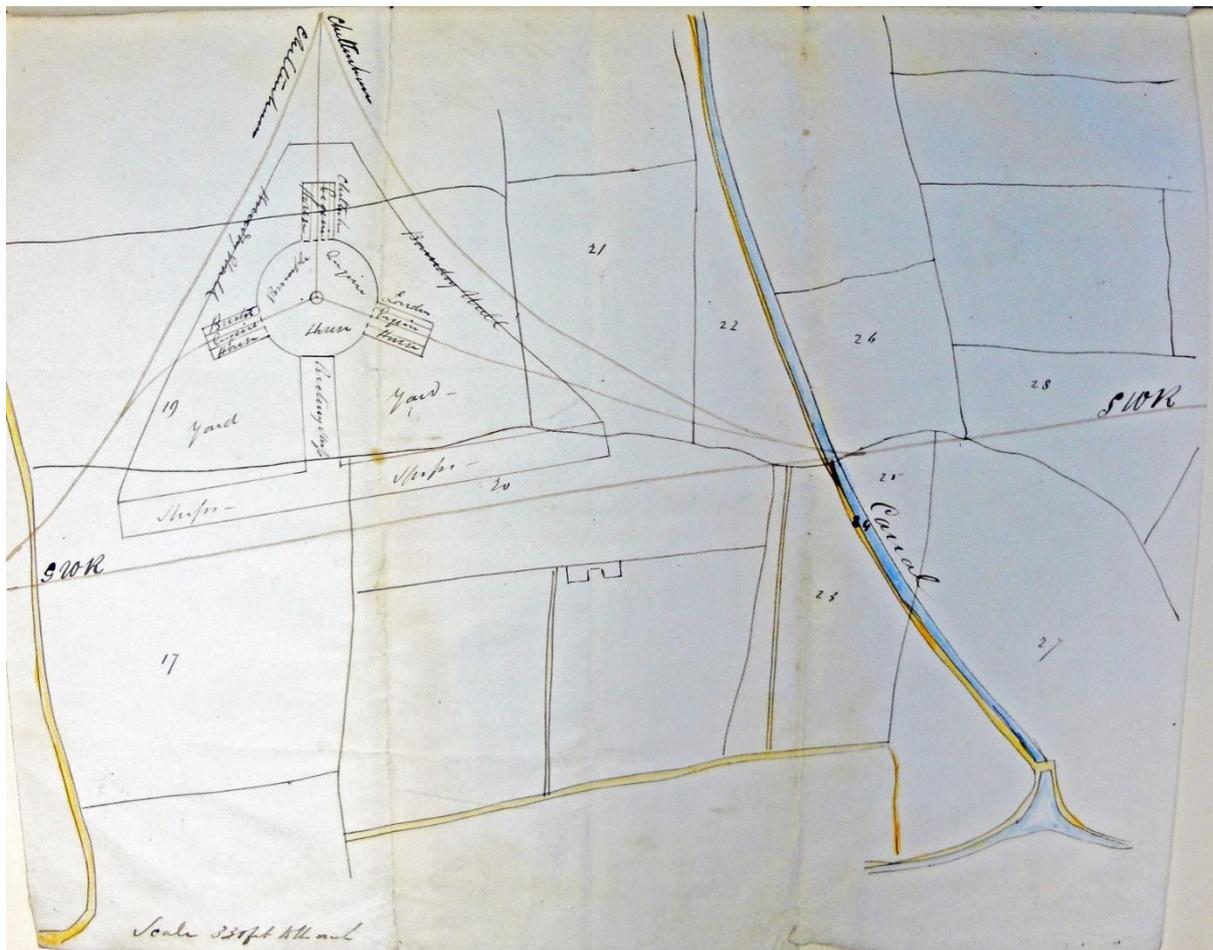


Figure 1. Daniel Gooch's drawing of 1840 showing the proposed site and layout of the Swindon works at the junction of the Bristol and Cheltenham lines.

see was poor water supply.⁴⁴ Gooch enclosed a sketch of his proposals which is shown in Figure 1 showing clearly his intended location for the works at the junction of the two lines.⁴⁵

Following this letter, Brunel and Gooch moved quickly because on 6th October, 1840 the Board resolved '*that the principal locomotive and repairing shops be established at, or near, the junction with the Cheltenham and Great Western Union at Swindon*'.⁴⁶ At a meeting in 20th April 1841 the Board voted £34,290 for its construction.⁴⁷

The first main works of ECR were located in Romford at the eastern end of the first stage of the Colchester line to be opened. ECR board minutes record that the company had purchased a significant piece of land at Hare Hall near Romford, and in October 1838 it was agreed that John Braithwaite, who had become the company's chief engineer, could live in a house on this land.⁴⁸ It is possible, therefore, that works were established at Romford because ECR already owned the land and its chief engineer lived there.

The reason why Stratford became the main ECR workshop is less clear as there is no contemporary analysis such as the Gooch letter. Like the Swindon works, the site chosen in Stratford was at the junction of the lines to Colchester and Cambridge and thus it was well positioned to service locomotives operating on both lines.

Stratford also played an early role in maintaining locomotives. The ECR's first locomotives, purchased from third parties, would have had to be transported to the ECR line. Delivering the locomotives by rail was probably not possible because of different gauges and the

⁴⁴ Rail 1008/82, TNA.

⁴⁵ Ibid.

⁴⁶ Rail 250/2, folio 143, TNA.

⁴⁷ Ibid. Folio 176.

⁴⁸ Rail 186/3, folio 328, TNA.

relatively limited railway network at this time. There were two other forms of transport available, horse drawn wagons on land or barges using navigable rivers and canals, or possibly coastal shipping. Stratford's location on the River Lea and Romford's land locked position suggests that the former may have been a receiving point for new ECR locomotives and other heavy materials. There are two pieces of contemporary evidence for this. The ECR board minutes of 27 August 1839 record that *'the Stratford engine house reservoirs to be completed next week'*.⁴⁹ Also a guide to the East Counties Railway published in 1839 makes the following reference to Stratford.⁵⁰

'We now come to Stratford Station, which is erected after the style of a plain Italian villa, with extensive and commodious waiting rooms, carriage shedding, engine house, and repairing workshops for the engines; arrangements of which appear to be well adapted for the purposes intended.'

John Braithwaite left ECR in 1843 and any bias in favour of Romford that may have existed when the Stratford to Romford line was built departed with him, and the logistical case for Stratford came to the fore.⁵¹ The ECR Board minutes for October 1845 record a decision, under George Hudson's chairmanship, to concentrate the locomotive works at Stratford as soon as possible.⁵² In March 1846 the purchase of the necessary land was approved by the Board.⁵³

In summary, the Swindon and Stratford works were at locations, which when they were built, were at the two most important junctions of their respective companies' networks.

⁴⁹ Rail 186/5, folio 12, TNA.

⁵⁰ ECR, *A guide to the Eastern Counties' Railway* (London, 1839), p. 10.

⁵¹ ODNB, Vol. 7, (Oxford, 2004), p. 297.

⁵² Rail 186/69, folio 220, TNA.

⁵³ Rail 186/69, folio 242, TNA.

Both were built on a green field site, although Stratford was close to the ever expanding London metropolis and Swindon was located in a rural area. Also, both works were near to a canal or navigable river that provided transport for coal and coke and other materials.

5. The early years of the two works.

The two works were built within a few years of each other – Swindon from 1841 to 1848, and Stratford from around 1847 to 1849. Some early plans and descriptions exist for both Swindon and Stratford, but before we consider them it would be beneficial to look at the underlying manufacturing processes that were employed at this time.

An early rail works was made up of a series of individual workshops, each dedicated to undertaking a specific task or stage of maintenance or manufacture, rather than a

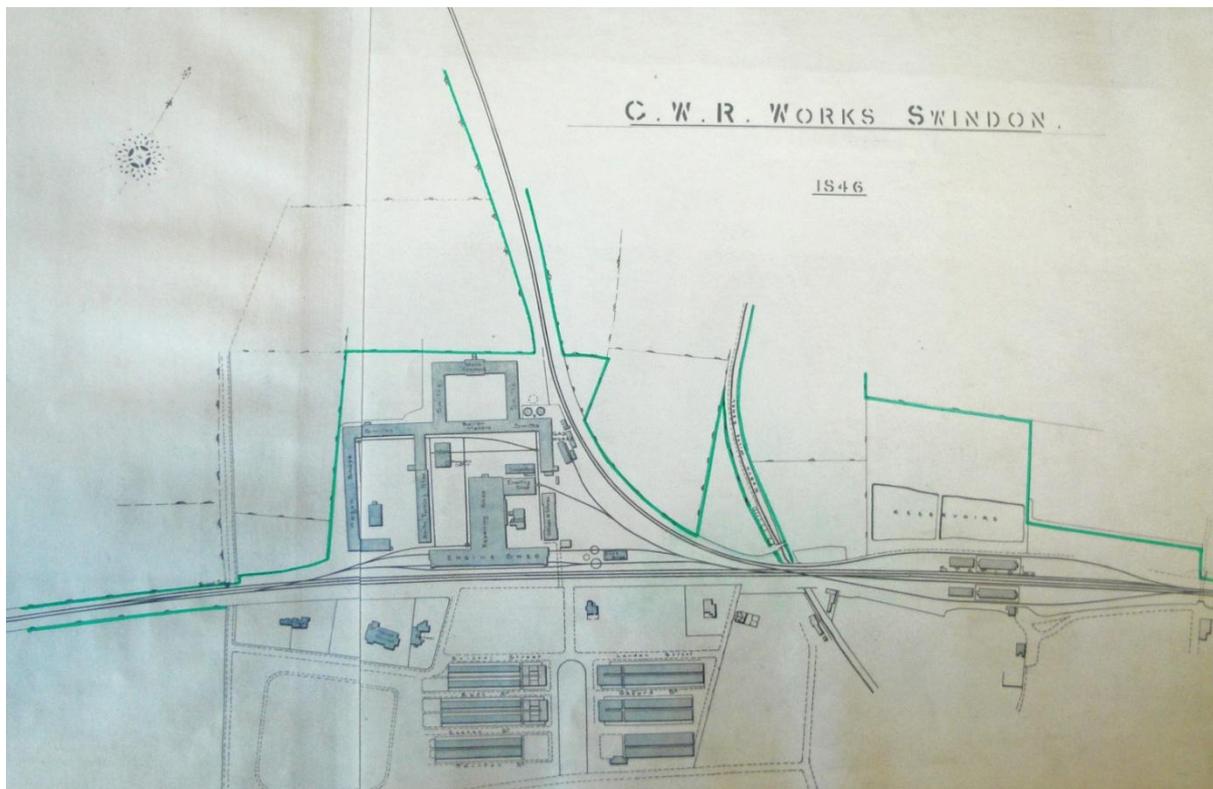


Figure 2. Hawksworth's plan of the Swindon works in 1846, showing the works to the north of the London-Bristol line and to the east of Swindon station and the junction with the Cheltenham line. New Swindon is to the south of the London- Bristol line.

production line that is typical today. The men employed possessed the specific skills to work in a particular part of the works. Thus, for example, the foundry where objects in iron and other metals such as brass were cast, employed moulders, patternmakers and furnace men; the smithy required smiths and strikers for heating and repeatedly hammering metal such as pig iron so that it was more flexible and capable of bearing weight; boiler making required platers and riveters for constructing the boiler and firebox of the locomotive; and finishing and erecting required turners and machinists, fitters and fitter erectors for finishing off the components so that the locomotive could be “erected”.



Illustration 1 and front cover. Edward Snell's impression of New Swindon in 1846. The view is from west to east and it shows the works to the left of the picture and the workers' cottages to the right. The church is in the foreground with the manager's behind it. (Museum of the Great Western Railway, Swindon).

As mentioned earlier there are more documents for the development of the Swindon works than for Stratford. Plans prepared by Hawksworth set out the works as it was in 1846 and then in ten yearly intervals from 1870 to 1910.⁵⁴ The 1846 plan of Swindon shows the works at the apex of the junction of the Bristol-London and Cheltenham lines, as Gooch had

⁵⁴ Frederick Hawksworth was chief mechanical engineer from 1941-49. The plans are undated but were probably drawn sometime in the 1930s or 1940s, SCL.

proposed (Figure 1). To the east of the works was Swindon station and some reservoirs to store water, and to the south of the London-Bristol line workers cottages, and a church and school which were the start of 'New Swindon'. Although the 1846 plan was probably drawn in the 1930s or 1940s (see footnote 54), it is consistent with a contemporary painting by Edward Snell (Illustration 1), who worked at Swindon between 1843 and 1849.⁵⁵

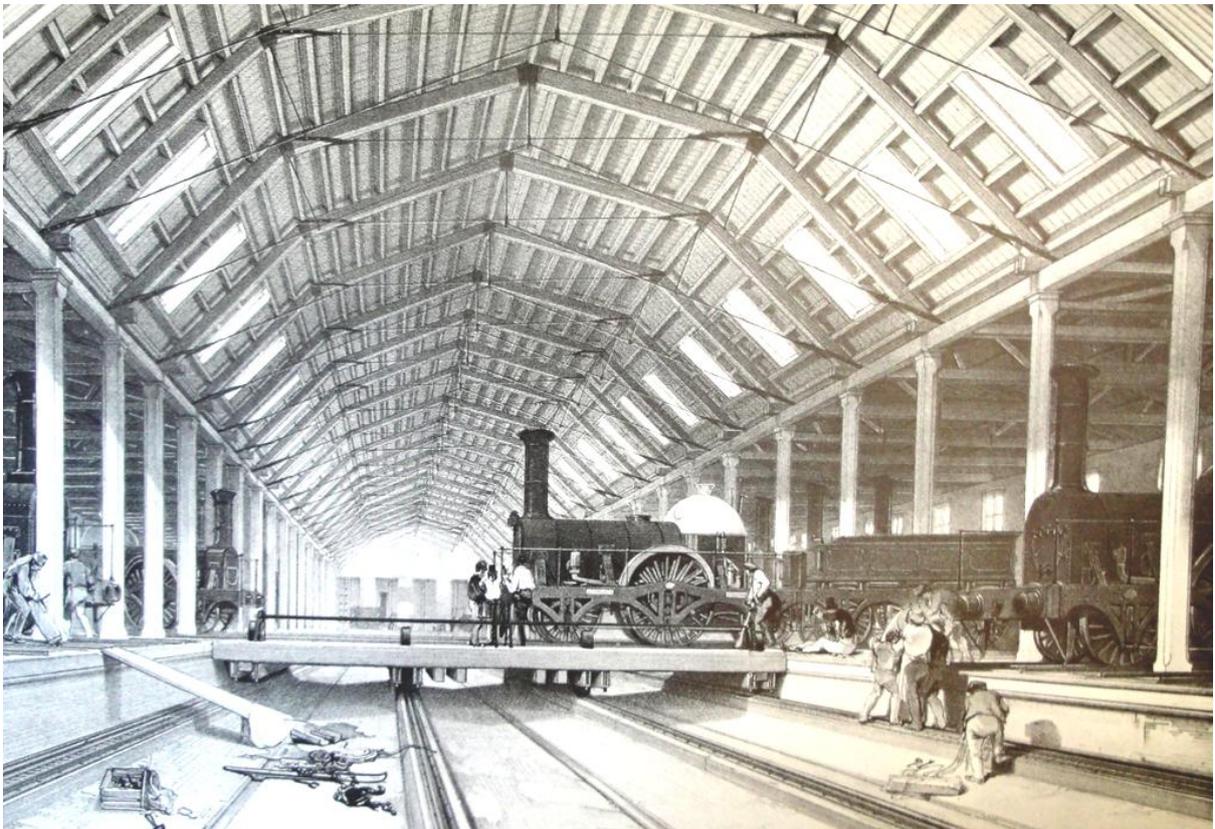


Illustration 2. The Swindon engine shed in 1846 by J.C. Bourne.

The works itself was laid out in the form of four quadrangles of varying sizes. The initial construction included an engine shed and repair shop at the heart of the works, with wagon shops, smithies, boiler shops, engine erectors and carpenters that surrounded them on

three sides. J.C. Bourne wrote a contemporary description of the engine shed which gives a good impression of its size.⁵⁶

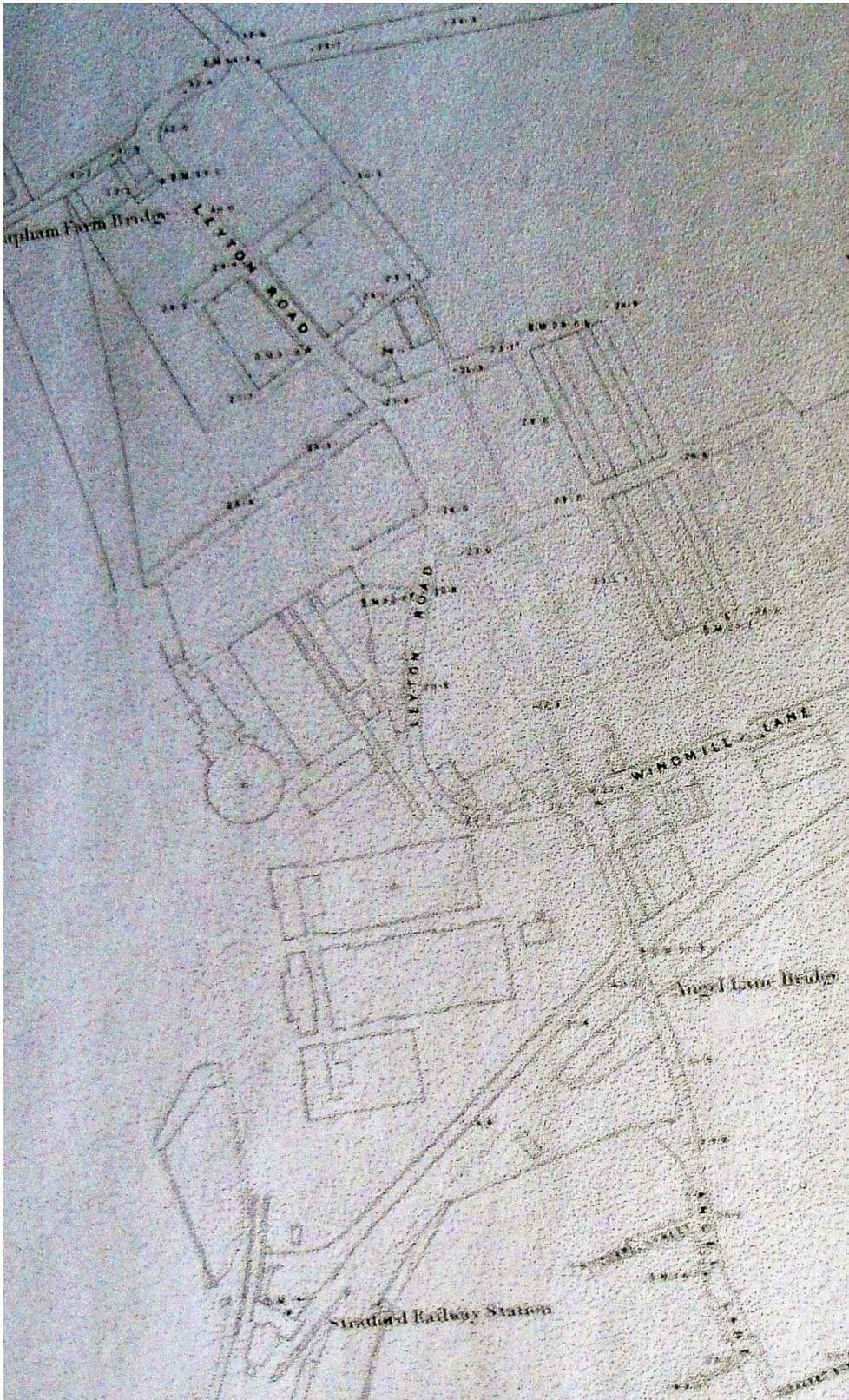
'The engine shed is a rectangular building 490 feet by 72 feet broad, and capable of holding upon its four lines of rails forty-eight engines and tenders; ... In the centre of and at right angles to this shed, and abutting against its northern side is the Engine House..... 290ft by 140ft,divided into three compartments.....Here the engines receive their lighter repairs, those which the enginemmen themselves are for the most part capable of executing. At the northern end of the Engine House, are placed the buildings employed in the repairs of the locomotive engine. The Erecting House in which the parts of the machinery when repaired, are put together, is a building communicating with the Engine House and capable of holding eighteen engines'.

This description of the engine shed is confirmed in an illustration of the engine shed by Bourne (illustration 2).

Less evidence of the early Stratford works exists, as the first complete and authenticated plan of the works that survives is dated 1914. An early map of Stratford (map 4), dated 1848-49, the purpose of which I have been unable to authenticate, shows three rectangular buildings north of the Colchester line and east of the Cambridge line.⁵⁷ To the north of these buildings is another round shaped building which may have contained a locomotive turntable. The layout of the around 1850 is confirmed by an illustration of the works which is contained in the 1851 illustrated guide to the ECR, shown in illustration 3. This shows two and possibly three buildings in the foreground, with a circular building or 'roundhouse',

⁵⁶ J.C. Bourne, *The History and Description of the Great Western Railway* (London, 1846), p.47.

⁵⁷ The map is located at NALSC.



Map 4. Stratford in 1848-9 showing an outline of the Stratford works and 'Hudson's Terrace' to the north of Windmill Lane.

which possibly contained a locomotive turntable, behind them. It seems highly probable, therefore, that the initial construction of the works was as shown in the map 4. This map

also identifies the location to the east of the works, of the first few cottages constructed for ECR workers that formed the starting point for 'Hudson New Town', which subsequently became known as 'Stratford New Town'.

There are three other pieces of contemporary evidence that provide details of the Stratford works in the first year of so of its existence. The first is a summary account submitted by Messrs Piper, a firm that seems to have been the contractor for building the works. It

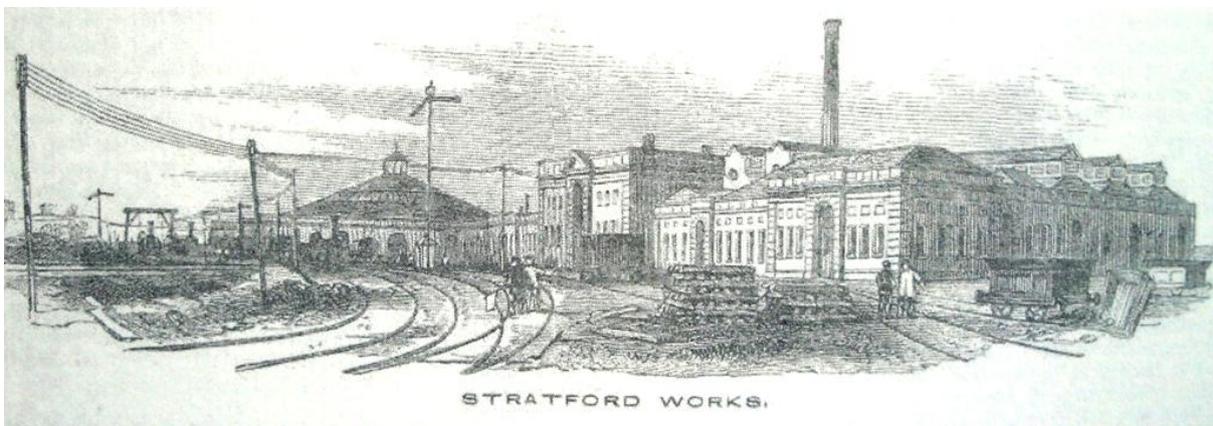


Illustration 3. Stratford works in 1851 taken from the Eastern Counties Railway Illustrated Guide, 1851. It shows the 'roundhouse' to the left of the picture.

includes references to an erecting shop, tender shop, smith and boiler shop, engine house, turntable, plus various supporting stores and offices.⁵⁸ This list is very similar to the activities shown on the 1845 map for the Swindon works, and so it is reasonable to assume that the intended roles of the two works, from the outset, were very similar.

The other pieces of evidence are descriptions of the works and the surrounding area, published at the time. White's 1848 Directory for Essex in its entry for Stratford refers to '*an extensive factory for making and repairing locomotive engines*' that covered an area of

⁵⁸ Rail 186/94, TNA.

20 acres, built at a cost of £100,000.⁵⁹ It mentioned also that the factory employs 1000 ‘men and boys’ and that the company had constructed 100 dwellings for its workers and planned another 150 dwellings. The second description appears in the 1851 ECR guide.⁶⁰ It is rather deferential and quaint in tone, but it provides further confirmation of the works around 1850. It confirms the figures for the size of the works and the number of employees reported in White’s Directory, and continues

“It is here where all the repairs of the engines and carriages are effected; in fact, these works are nothing more than a vast hospital for sick and wounded rolling stock; and in a large building or ward adjacent, the visitor will see a number of engines undergoing operations more or less severe, some merely having a bolt extracted or a screw fresh wormed, while others, after some adherence to strict temperance principles, are suffering from disordered stomachs, and having incrustation removed from their boilers, ...”

From the detail and tone of these descriptions both works were significant industrial complexes. They were considerably larger than most works or factories of their day and were dominant features of the Swindon and Stratford landscape. They carried out similar functions, which is not surprising given the relatively small number of men that had the skills and knowledge to build such enterprises and the links between them in terms of family or employment. For example Daniel Gooch was born in Newcastle and spent some time

⁵⁹ W. White, *County of Essex 1848*, p. 239.

⁶⁰ ECR, *The Eastern Counties Railway Illustrated Guide* (London, 1851), p. 11.

working at the Stephenson works in that city. His brother J.V. Gooch was the locomotive superintendent for ECR in the early 1850s.⁶¹ Later in the century, James Holden, assistant

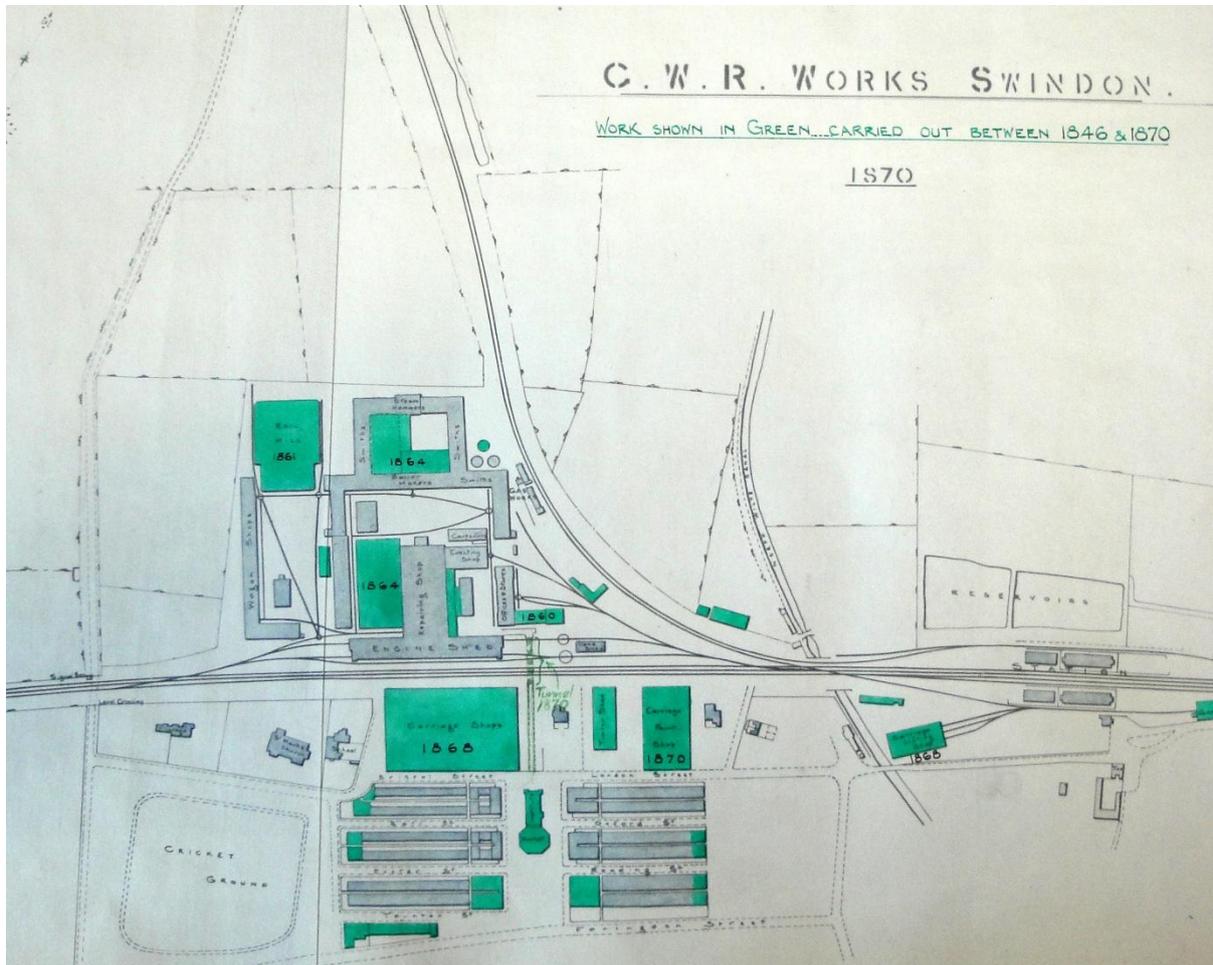


Figure 3. Hawksworth plan of Swindon works in 1870. The additions built in the 1860s are in green and include the foundry or rail mill in 1861 and the carriage works to the south of the line 1868.

locomotive superintendent at Swindon for a number of years was locomotive superintendent of GER from 1885 to 1907.⁶²

There was continued development of both works in the 1850s and 1860s. A rolling mill was built at Swindon in 1860-61 at a cost of £20,000 to manufacture iron rails. In 1864 an extension to the engine house and repair shop was built, required no doubt to maintain the

⁶¹ Appendix 2.

⁶² Ibid.

increasing number of locomotives maintained or built at Swindon. As no plans of the Stratford works of this period now exist we cannot determine the detail of significant capital work undertaken. However evidence given to the 1855 committee of inquiry attached the board minutes of 7th December 1855 records expenditure of £32,690 on the Stratford works between 1851 and mid 1855, but no detail of the expenditure concerned.⁶³

Before we consider the expansion and development of the two works in the last 30 years of the century we should look at their wider social and economic impact on their respective localities.

6. The 'New Towns' and migration.

The construction of the 'New Towns'.

The populations of Swindon and Stratford were not large enough to supply the number workers required by the two works, and did not have the necessary skills necessary to operate them. The population of Swindon in 1841 was 2402.⁶⁴ Most of the occupations recorded in the census of that year were of the kind that you would expect to find in a small market town at this time, namely gentry, shopkeepers, tradesmen and professionals, with the outskirts of the town populated by agricultural labourers. The population of Stratford in 1841 was 6676 and similarly, with a few exceptions already mentioned, lacked the skills necessary to staff a railway works.⁶⁵ As a result both works needed to import skilled and non- skilled labour from other parts of the country and provide accommodation for at least some of the labour recruited.

⁶³ Rail 186/12, folio 205, TNA.

⁶⁴ HO 107/1179/10, TNA.

⁶⁵ HO 107/323-11/12/13, TNA.

First we look at the provision of accommodation. There are no records in the ECR board minutes covering the construction of cottages at Stratford. There are two possible explanations for this. The cottages may have been built by a third party and rented to ECR employees, making reference to them in company records less likely. Alternatively they may have been paid for by the company, but omitted from its records because of the poor financial management discussed earlier. However, Kelly's Directory for 1848 refers to the construction by that date of 100 dwellings, and the map of Stratford for the same period confirms this. The 1851 census records 88 cottages in 'Hudson's Terrace', in Hudson's Town later known as Stratford New Town, and a further 22 cottages nearby in Windmill Lane, with a further 16 under construction. The name of Hudson's Terrace did not survive to be recorded in subsequent census. But from the outline of the streets shown in the 1848 map of Stratford in map 4, we can be reasonably sure that Hudson's Terrace lay between Leytonstone Road and Waddington Road, to the east of the works, as shown in the Ordnance Survey map from 1867, map 5.

No description of these cottages survives. The Ordnance Survey map of 1867 suggests that most of them were very small, and if the detail on the map is correct, some 15 or 16 cottages were built on a street that was 100 yards long. Each cottage would have been 22 feet wide, the standard width for terraced cottages of the period. By 1867, the built up area of Stratford New Town had increased considerably, from less than 6 streets around 1848, to an area around half a mile square, bordered by the works in the east, the ECR line to Colchester in the south, the Leytonstone Road in the east, and the West Ham boundary in the north. There is no record or reference to this expansion in the ECR or GER board minutes, and therefore this accommodation must have been built by private landlords for

rent. The location of Stratford on the fringes of London made such development commercially viable. Between 1840 and 1914 some 40,000 cottages were built in West ham for private rent.⁶⁶

Much more material has survived for the construction of the early cottages in New Swindon which are located to the south of the works on the southern side of the London to Bristol railway. In March 1842, the Board agreed plans presented by Brunel to build 88 cottages, in two blocks of 44 on the condition that the cost of each cottage should not exceed £100.⁶⁷

The limitation appears to have caused Brunel some difficulty as in June 1842 he wrote to the Board that he was *'prepared to build them as an experiment in the hopes that during their construction we may see means of economy'*.⁶⁸ Overall, the builder, Rigby, took six months to build the first block of cottages, much to Brunel's concern. In July 1842 he advised Rigby that *'the cottages were not going as I would have them'* and in August he wrote *'with respect to ordering more cottages, as you are six months behind in building 40, I know not what chance we have of getting the number built in any reasonable time'*.⁶⁹ Between 1842 and 1855, some 270 cottages were built along eight streets, in two blocks of three groups of back to back cottages, with small rear yards and an alley between them. In general the cottages had two rooms, one on the ground floor, and one on the first floor, although some larger cottages were built for more senior staff. The level of the rents, in which Brunel took considerable interest, was set by the GWR board in October 1842 at 3s. 6d. per week.⁷⁰ It is difficult to gauge the level of wages at this time but some estimates suggest that this level would have accounted for 30% of wages. As most employees at the works were the sole

⁶⁶ VCH, *A History of Essex, Vol. VI*, p. 55.

⁶⁷ Rail 250/3, folio 7, TNA.

⁶⁸ Rail 253/107, folio 198, TNA.

⁶⁹ Rail 253/107, folio 198, TNA.

⁷⁰ J. Cattell and K. Falconer, *Swindon, The legacy of a Railway Town* (Swindon, 1995), p. 43.

breadwinner, this level of rents resulted in many families taking in lodgers to supplement their income.

New Swindon continued to increase in size and the 1871 census records 36 streets in the New Swindon registration district. There is no record of GWR involvement in the construction of the additional cottages presumably because once the works were established it was possible to rely on by private landlords to provide rented accommodation for the increasing population.

The inhabitants of the 'New Towns'.

The first official record of the inhabitants of the 'rail' cottages in Stratford and Swindon New Towns are to be found in the 1851 census. The census returns provide evidence of three important issues that concern both works, namely the extent to which either new town provided accommodation sufficient to house all the employees at the works; the origins of those who migrated to Stratford and Swindon; and their trades or skills. However, in considering these questions we need to take account of the reliability of census information overall.

In the 19th century census returns were completed by the census enumerator using schedules filled by the head of household. A review of the returns for Stratford and Swindon New Towns suggests that for some individuals their place of birth may have not been recorded accurately or was shown in such broad terms that further analysis is not possible. For example, there are inconsistencies between the town and county of birth for some individuals born in London, Middlesex and Surrey and the place of birth of those that came

from Scotland or Ireland were recorded by country rather than city or county. For those that migrated from Scotland it is not possible to find out whether they came from a town with industries which taught them the skills that they needed in their new environment. So although the census returns of the period are the most complete records we have of the origins and occupations of those that worked at the two works, some of the information they contain may be inaccurate.

The cottages built by 1851 in Stratford New Town for rail workers provided a small proportion of the accommodation necessary for those employed at the works. The census return for Stratford New Town records 155 heads of household, of which 35 had occupations that suggest they were probably not employed at the works. In addition there were 15 relatives and 27 lodgers with occupations relevant to the works, making a total of 162 individuals resident in Stratford New Town in probable employment at the works. Some 230 individuals who lived in the remainder of the Stratford registration district had skills which indicate that they may also have been employed at the works.⁷¹ We cannot determine their place of employment as this is not shown on the census return. For this period we cannot be sure of the number of men employed at the works, but those figures that do exist suggest the figure was around 1000 or more. Kelly's directory for 1848 refers to 'employment for 1000 men and boys' at the works and this figure is repeated in the ECR guide for 1851. Edward Howarth and Mona Wilson estimate a higher figure of 1500 in 1850.⁷² On this basis the works must have drawn its labour force from those living from areas bordering Stratford.

⁷¹ HO 107/1768, folios 1-376, TNA.

⁷² E.G. Howarth and M. Wilson, *West Ham, A Study in Social and Industrial Problems* (London, 1907), p. 161.

The situation in Swindon was rather different. The 1851 census return for New Swindon district records 400 heads of household, of which 80 had occupations more relevant to the community of New Swindon as a whole (such as grocers, publicans, school teachers or clergyman), or to agriculture. In addition the census recorded 50 relatives and 60 lodgers with occupations relevant to employment at the works, making a total of some 430 individuals living in New Swindon that were employed by the works.⁷³ Overall the census for New Swindon records these individuals living in 11 streets or hamlets that were included in the New Swindon census returns. In addition there were 21 individual in Old Swindon with occupations which suggest that they may have been employed at the works, and a further 30 in villages near to Swindon. However, in reality more works employees may have worked in surrounding villages because the occupations of many individuals are recorded in relatively generic terms such as 'labourer'.

Between 1851 and 1871 the population of New Swindon expanded considerably as the 1871 census records some 2900 individuals with an occupation, of which 2270 were skilled workers. The remainder were unskilled. The 1871 census was undertaken by several enumerators and there was little consistency between them in their recording of occupations. Some enumerators recorded the occupation and the place of work and others the occupation only. As a result we cannot be sure which individuals were employed at the GWR works. However an analysis of the census returns indicates that some 1460 individuals followed occupations that suggest they were probably employed by the works. More information on individuals' occupations for 1851 and 1871 is at appendix 3.

⁷³ HO 107/1833, folios 555-618, NTA.

The 1871 census returns for Stratford are even less helpful in determining the extent to which GER works employees lived in the town because there are a number of factories in the area that could have employed the same skills as GER and there is little mention of the place of work on any of the returns. For two of the key occupations required by the GER works, boiler makers and engine fitters, the Stratford census return records 49 and 118 individuals with these occupations respectively, although some of these men may have worked in other factories. These figures are much lower than the number with these skills that would have been required by the Stratford works and therefore as in 1851 the works must have drawn in labour from areas around Stratford.

Patterns of Migration

The 1851 census enables us to identify the places of birth of those living in Swindon and Stratford New Towns. The analysis presented here summarises the place of birth by county (or by country in the case of Wales, Scotland and Ireland because for the latter two countries no county information was recorded) for heads of household, male relatives of same and male lodgers. As far as I have been able to ascertain there were no female employees at either works at this time and therefore only men and boys in employment have been included in the analysis below. There also appears to be considerable variation in the description used to describe some occupations and therefore any comparison between the two works would be likely to produce misleading results. Consequently the analysis covers the places of birth of skilled and non skilled occupations, with an examination of the origins of a small number of skilled occupations where there is less chance of a confusion of terms.

In 1851, there was barely a county in England that did not have a representative at one or both works, but there were differences between them. Tables 2 and 3 provide a comparison of the most significant sources of labour divided between skilled and non-skilled occupations, and further details are at appendices 4 and 5.

A number of factors underlay these figures. By 1851 there were significantly more workers cottages at Swindon than at Stratford. It follows therefore that more workers, skilled or unskilled, were recorded in company cottages. However the unskilled appear to have been largely excluded from the Stratford cottages, where only 10% were occupied by unskilled

Table 2: Place of birth of skilled employees - 1851⁷⁴

Swindon		Stratford	
<u>County/Country</u>	<u>Ranking</u>	<u>County/Country</u>	<u>Ranking</u>
Gloucestershire	1	Scotland	1
Scotland	2	Yorkshire	2
Wiltshire	3	London and Middlesex	3
London and Middlesex	4	Northumberland	4
Northumberland	5	Lancashire	5
Lancashire	6	Somerset	6
Durham	7	Durham	7=
Ireland	8	Surrey	7=

⁷⁴ Tables 2 and 3 have been compiled using census returns for Swindon and Stratford for 1851; Swindon, HO 107/1833, folios 555-618; Stratford, 107/1768, folios 299-312, TNA.

heads of household, compared to some 25% in Swindon. This was presumably because ECR could rely on a pool of labour in East London, whereas this facility was not available in Swindon and therefore cottages had to be provided for the first migrant unskilled as well as skilled workers. Another feature was that unskilled labourer tended to originate from nearby counties, so for Swindon 38% came from Wiltshire and 18% from Gloucestershire and for Stratford 35% came from Essex.

Table 3: Place of birth of unskilled employees - 1851

Swindon		Stratford	
<u>County/Country</u>	<u>Ranking</u>	<u>County/Country</u>	<u>Ranking</u>
Wiltshire	1	Essex	1
Gloucestershire	2	Hampshire	2
Swindon	3	Cambridgeshire	3=
Buckinghamshire	4	Kent	3=
Berkshire	5=	Somerset	3=
London and Middlesex	5=	Surrey	3=

For skilled labour whereas the places of birth were similar for both works, the ranking of some counties varied between them. Scotland figures prominently, as do Northumberland and Durham, Lancashire, London and Middlesex, and Yorkshire (in the case of Stratford). Northumberland and Durham taken together rank second for both works, which is unsurprising given that most of those involved were born either north or south of the Tyne.

Most of those that came from the northern counties of England and from Scotland were engineers, engine fitters, engine erectors and in many cases they were born close to early manufacturers of stationary engines or locomotives. Thus it is probable that many of them, or possibly a member of their family, received training from locomotive engineers in Newcastle, Manchester, or Leeds. As already mentioned the census does not record the county of birth for those from Scotland, but there were engine and locomotive manufacturers in Glasgow. Table 3 suggests that most unskilled workers were recruited from the county in which the works was located or ones nearby,

There is also evidence, on the basis of the places of birth of some of their children recorded in the census that families moved around the country probably working at other railway works before they arrived in Stratford or Swindon. Thus for example, William Wilson, engine fitter, who lived at 11 Hudson's Terrace was born around 1803 in Liverpool. His wife was born in Salford, as was their eldest child. But their second child, aged 7 in 1851, was born in Derby, their third child, aged 7, in Wolverton, and the youngest, aged 1, in Stratford. This suggests that the family moved first to Derby where the locomotive works of the North Midland Railway opened in 1840, and then to Wolverton, the location of the London and Birmingham Railway works which opened in 1838.⁷⁵ The family seems to have moved to Stratford between 1846 and 1850 which coincided with the opening of the Stratford works. But there were also families that appear to have come south in one move. For example, at Swindon, John Smith, boiler worker, who lived at in Exeter Street and was born in

⁷⁵ E.J. Larkin and J.G. Larkin, *The Railway Workshops of Britain*, p. 38.

Northumberland in 1823 moved south with his wife and child between 1844 and 1846 as his son aged 7 was born in Durham, but his daughter, aged 5, was born in Wiltshire.⁷⁶

Although it is possible to trace the migration of the inhabitants of Stratford New Town and New Swindon, it is more difficult to assess the reasons why families decided to migrate such long distances. Higher pay may have been an attraction, and following friends and relations may have been another. The promise for housing for some may have been a factor, although there is evidence from public health reports that that living conditions in both towns were not good, although they may have been better than the place they had left.

A report of the General Board of Health on West Ham dated 1855 included the following comment on Hudson's Town.⁷⁷

'It was originally laid out by the railway company, and many of the houses constructed are a marked improvement on some of the wretched dwellings I have described. The drainage however is imperfect....There is one row of houses (Waddington Street), which has a drain at the back. Nobody could tell me where it empties itself. It is at the present time stopped, and the water fills the back yardsthe smell is very bad.'

A similar situation seems to have existed in Swindon as Daniel Gooch wrote in August 1848 ordering that the drains be cleared, and at the same time the cottages were white washed.⁷⁸ A public health report on Swindon of 1851, although focused on the old town gave a relatively favourable report as commented on the new town that *'the houses built*

⁷⁶ HO 107/1833, folio 576, TNA.

⁷⁷ A.L. Dickens, *Report to the General Board of Health on a Preliminary Inquiry into the Sewage, Drainage, and Supply of Water, and the Sanitary Condition of the Inhabitants of the parish of West Ham* (London, 1855), p. 52, NALSC.

⁷⁸ Rail 250/27, folio 65, TNA.

*have been of a superior class; and the tenants, being more or less connected with the railway, are well behaved and intelligent class of persons’.*⁷⁹

Thus the motivation behind individual decisions to move to Stratford or Swindon was many and varied. Some people were no doubt escaping worse conditions, others moved because it provided some advancement in their occupation or they pay, and others in relative ignorance of what they were moving to came with the hope that life would be better than before.

Table 4: Place of birth of New Swindon residents’ with an occupation recorded in the 1871 census: top 6 counties.⁸⁰

Skilled residents		Unskilled residents	
Wiltshire (without Swindon)	1	Wiltshire (without Swindon)	1
Gloucestershire	2	Gloucestershire	2
Wales	3	Wales	3
Swindon	4	Swindon	4
Somerset	5	Somerset	5
London/Middlesex	6	Berkshire	6

As already outlined the 1871 census returns do not allow us to identify those New Swindon residents that were employed at the works and those that were not. As a result table 4

⁷⁹ G.T. Clarke, *Preliminary Inquiry into the Sewerage, Drainage, and Supply of Water, and the Sanitary Conditions of the inhabitants of the town and parish of Swindon* (London, 1851), p. 2, SCL.

⁸⁰ RG10/1882-1883, TNA.

includes all New Swindon residents for which an occupation is recorded in the census.

There are two main differences in the places of birth recorded in the 1871 census compared to 1851. There was a significant increase in the proportion born in Wales as a result of the migration of Welsh iron workers to work in the iron foundry opened in 1860/61. Also, there was a significant reduction in the proportion born in the north of England and Scotland and a considerable increase in those born in Wiltshire and surrounding counties, such that 61% were born in Wiltshire and Gloucestershire. Further information is in appendix 5.

A similar exercise was not undertaken for the Stratford works because the 1871 census does allow us to identify where they lived.

7. Education and the church

Schools and Churches

The interests of both companies in the social needs of their employees was not limited to the provision of housing but extended to their educational and spiritual requirements.

However, as in the case of housing, the GWR took a greater interest in these matters than the ECR/GER. New Swindon required additional facilities because although the old town had a parish church, places of worship for Independent and Wesleyan Methodists, and a free school for the education of 40 boys, these were not sufficient or near enough for the inhabitants of the new town.⁸¹

The Swindon School Committee was established in 1843 to facilitate the building of a church and school funded by subscription in New Swindon. Its first meeting in March 1843 was attended by the Chairman and Deputy Chairman of GWR, and the vicar of Swindon.

⁸¹ Pigot & Co., *Directory of Wiltshire* (London, 1830), p. 813.

Fortunately the minutes of the first few meetings of the committee survive and they show that the committee worked quickly.⁸² By April 1843, arrangements had been made for divine service to be held at the works in room licensed by the Bishop; in May it examined 13 proposals for a church able to seat 800 people. At the same time it also examined plans for the school and appointed the first headmaster, Mr A J Braid. A plan for the church was selected in July 1843 and by early September costings had been agreed with the architects for the church and the school. Later in the month tenders were examined and William Sissons of Hull was selected to construct the church, parsonage, school and school masters' house at a cost of £7336. As the subscriptions collected had reached only £5600, another benefactor, possibly GWR, must have paid the difference.⁸³

The church was consecrated on 25 April 1845 with the directors of GWR in attendance.⁸⁴ In addition, churches for other denominations were established. By 1875, without the support of GWR, there were places of worship for the Roman Catholics, Baptists, Wesleyans, Unitarians, and Primitive and Welsh Methodists.⁸⁵ The last of these was no doubt formed to cater for the influx of Welsh people to staff the iron rolling mill.

If the school committee continued to meet, no further minutes survive for this period, but the Post Office Directory for Wiltshire for 1853 refers to the school having 120 boys, 105 girls and 126 infants.⁸⁶ Admittance was by weekly payment by the pupils. In 1858 a local Swindon School Committee was established under the chairmanship of one of the senior managers of the Swindon works.⁸⁷ It met monthly to discuss the management issues of the

⁸² Rail 250/573, folios 1-43, TNA.

⁸³ J. Cattell and K.Falconer, *Swindon*, p. 83.

⁸⁴ Ibid.

⁸⁵ Kelly and Co., *Directory of Hampshire, Wiltshire and Dorsetshire* (London, 1875), p. 634.

⁸⁶ Kelly and Co., *Post Office Directory of Wiltshire* (London, 1855), p. 115.

⁸⁷ Rail 278/1, folios 1-2, TNA.

school and was considered significantly important for Daniel Gooch and his successors to attend most meetings. The information produced for the committee reported the growth in pupil numbers from some 265 boys, 160 girls, and 250 infants in October 1872 to 496 boys, 356 girls and 419 infants in October 1878.⁸⁸ It was obviously a struggle for some parents to send their children to the school because in 1871 Mr Braid wrote a report to the committee recommending that fees should be reduced by 1d per week to avoid some children being sent to *'dame schools to the injury of body and mind'*.⁸⁹ The school was transferred to the newly formed Swindon Education Board in 1879.⁹⁰

In Stratford schools were in existence long before the arrival of the ECR works. For example the British school for boys was founded in 1836 and by 1846 there were 160 boys at the school, a Roman Catholic primary school was established in 1846 and St John's National School was opened in 1836 for 526 children.⁹¹ ECR/GER do not seem to have been as active as GWR in considering the educational or spiritual needs of their employees. A school had been established for employees of the Stratford works by 1856, because by that year it was recorded as receiving a Government grant.⁹² An essay on the voluntary schools in West Ham by Wilfred Simms suggests that the school was part of the Stratford Mechanics Institute.⁹³ Simms records that attendance at the school increased from 114 children in 1859 to 200 in 1863. On this basis it was much smaller than the school in New Swindon. Children other than those whose parents were employed at the works attended the school because in February 1863 notices were sent to parents that were not employees of GER advising them

⁸⁸ TNA, Rail 278/5.

⁸⁹ TNA, Rail 278/1, folios 1-2.

⁹⁰ J. Cattell and K.Falconer, *Swindon*, p. 123.

⁹¹ VCH, *A History of Essex, Vol. VI*, pp. 146-147.

⁹² HC (1857), 2237, *Minutes of the Committee of the Council on Education, (1857)*, p. 96.

⁹³ W. Simms, *An essay on the voluntary schools of West Ham*, undated, NALSC.

that they would have to pay 6d per day rather than 4d paid by employees. This suggests that there might have been some subsidy of the school by GER. An inspector reported in 1867 that 50 to 60 boys were paying the higher fees and some of the parents found difficulty in finding the fee but, *'they pay the fee rather than loose the benefits of this well taught school'*.⁹⁴ In the 1870s the school experienced increased competition from the schools run by the West Ham Educational Board and consequently it ran into financial difficulty.⁹⁵ In 1880 GER gave notice to the Board that it intended to close the school and, after a negotiation that was sometimes acrimonious, the Board took over the school in 1881.⁹⁶

ECR/GER also provided less support for the church in Stratford. An annual donation of £50 was made up to April 1871 to Strafford church, after which time it lapsed.⁹⁷ In addition a surplus piece of land was donated in 1859 to the parish for a church in New Stratford.⁹⁸ But overall the relationship between the church and ECR/GER appear to have been more distant in Stratford than in New Swindon. As in Swindon there was a steady growth in Stratford in places of worship for other denominations.

Mechanics Institutes

As important in furthering the education of the employees at each works, their families and their neighbours were the Mechanics Institutes. The first Mechanics Institute in England

⁹⁴ W. Simms, *An essay on the voluntary schools of West Ham*.

⁹⁵ VCH, *A History of Essex*, Vol. VI, p. 149.

⁹⁶ *West Ham School Board minutes*, March 1881, folio 398, NALSC.

⁹⁷ Rail 227/8, folio 70, TNA.

⁹⁸ Rail 186/18, folio 126, TNA.

was established in London by George Birkbeck (1776-1841).⁹⁹ The purpose of such institutions was to '*disseminate useful knowledge and encourage rational amusement*

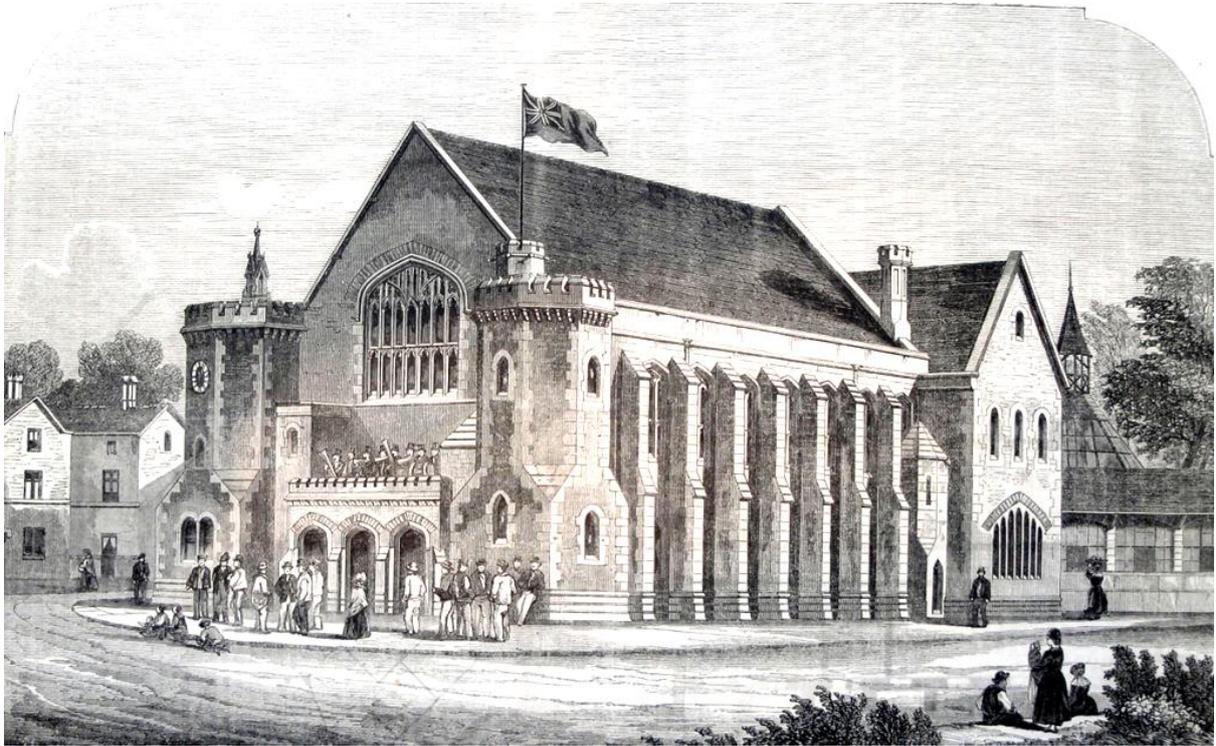


Illustration 4. The New Swindon Mechanics Institute. Illustration from 'The Builder' 1854.

amongst all classes of people'.¹⁰⁰ The Mechanics Institute in Swindon was opened in March 1844, following an initiative by some GWR employees to establish a library.¹⁰¹ The first President of the Council was Daniel Gooch and his first report as President recorded that the Institute had 129 members, 522 books, '*some useful models*' and that '*several members*

⁹⁹ ODNB, Vol. 5, pp. 832-833.

¹⁰⁰ British Railways Staff Association, *Programme for the reopening of the Mechanics Institute Swindon* (Swindon, 1959), p. 4.

¹⁰¹ Rail 253/334.

have kindly undertaken to construct a few instruments required by experimental physics'.¹⁰²

Initially the Institute was accommodated in the works, as in the second annual report by Daniel Gooch in January 1846 he referred to '*a more commodious room...kindly granted by the Company to be used as a library and reading room which the latter is well attended'*'.¹⁰³

As early as 1847 the Institute was putting on relatively learned lectures on such matters as heat and pneumatic chemistry by visiting lecturers from the Royal Polytechnic Institution in London, and musical entertainment which included pieces by Mozart and Rossini.¹⁰⁴

By 1853 the activity of the Institute and the pressure on the capacity of the works meant that the Institute had to find other accommodation. In September 1853, Daniel Gooch presented a prospectus to the GWR Board to establish a market place including premises for the Mechanics Institute. The estimated cost of £3000 was to be raised by sale of shares '*provided that the Directors [GWR] approve thereof and will afford to them the means of obtaining the land'*. The board agreed to this proposal provided that the plans for the building were agreed by the company and it was used exclusively for the purposes proposed. The board also agreed to pay the company £100 in lieu of the space it was already providing the Institute.¹⁰⁵ A board meeting on 11 May 1854 records Daniel Gooch's request to the Directors to attend the laying of the foundation stone and *The Swindon Advertiser* in an article in May 1854 on commented on the Institute as follows:

¹⁰² Rail 253/334, TNA.

¹⁰³ Ibid.

¹⁰⁴ Ibid.

¹⁰⁵ Rail 250/7, folio 66, TNA.

'It has had the effect of diverting the minds of the younger portion of the inhabitants into a channel pregnant with good things, and throwing a genial influence around the neighbourhood'.¹⁰⁶

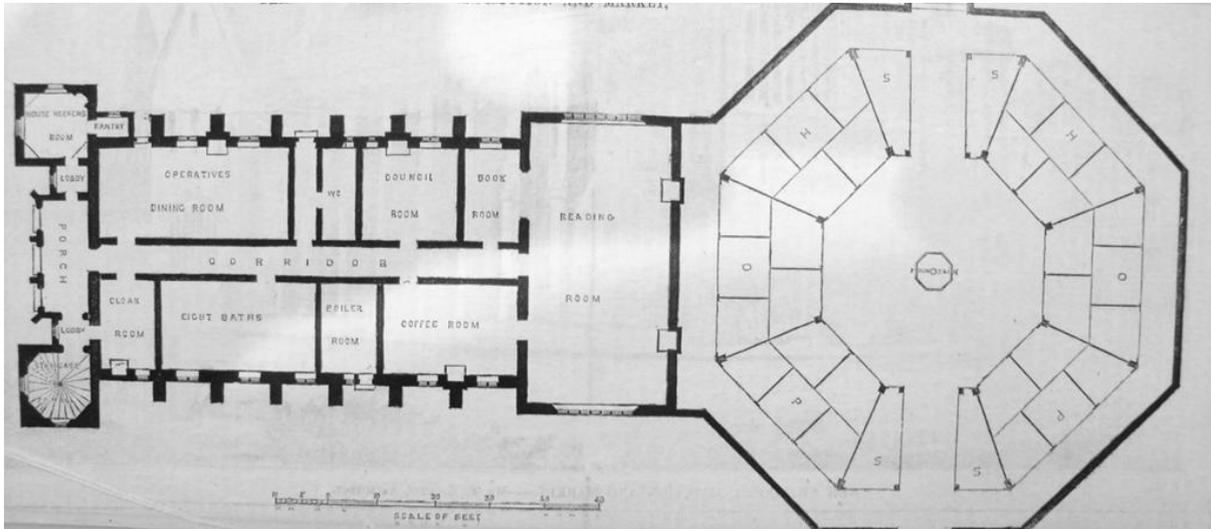


Figure 4. Plan of the Swindon Mechanics Institute, 'The Builder', 1854.

The article went on to describe the facilities provided in the new building with 'hot and cold bathrooms', a reading room, library, coffee room, dining room and council room on the ground floor and a hall with a stage for concerts, lectures and public meetings on the first floor (see illustration 4).

The New Swindon Improvement Company was registered in February 1854 and the purpose of the business was stated as,

'For providing accommodation for the inhabitants of New Swindon.....by the establishment there of Baths , Reading and Lecture and or Refreshment Rooms, a Market and Shops and for other local purposes'¹⁰⁷

¹⁰⁶ The Swindon Advertiser and Monthly Record, 29th May 1854, p. 5.

¹⁰⁷ BT 31/205/623, TNA.

There were 91 individuals listed in the original registration document. Most were employees at the works and some were shopkeepers or trades people in New Swindon, but Brunel and Gooch were also on the list. The company continued to function until the 1880s. By 1882, the Report of the Directors reported that New Swindon '*had long outgrown its original limits and the small market house....has been gradually superseded by well-built shops in various parts of the town*', at the same time expenses were increasing because of necessary repairs.¹⁰⁸ The company was wound-up in January 1891 and the administration of the Institute was transferred to a local Technical Education Council.¹⁰⁹

The Institute at Stratford was not established until 1851. As with the Institute at Swindon, it came about as a result of employee pressure as in May 1847 the board minutes record that the workers had requested a Mechanics Institute and reading room.¹¹⁰ The board responded that it would consider the matter when the transfer of the locomotive works from Romford was complete. There is no record of the company's agreement to establish the Institute, but an Inspector's report on the Institute reports that it was established in 1851, as the '*The Eastern Counties Railway and Stratford Mechanics Institute and Literary Society*' and had the objective to '*promote the improvement and enjoyment of its members by study and the exposition of literature and science*'.¹¹¹ The means to achieve this were '*the establishment of a reading room and library, the delivery of lectures, the institution of classes and schools, and the provision of specimens and drawings for instruction.*'¹¹²

¹⁰⁸ Rail 277/1, folio 58, TNA.

¹⁰⁹ Rail 277/3, certificate number 623, TNA ; H.B. Wells, Swindon in the 19th and 20th centuries (Swindon, 1950) p. 119.

¹¹⁰ Rail 186/69, folio 270, TNA.

¹¹¹ ED 114/198, folio 1. TNA.

¹¹² Ibid.

One difference between the two institutes was the source of funding for premises. It seems likely that ECR paid for the Institute's premises in Stratford because the investigation into the financial affairs of the company in 1855 records the Institute as one of the works completed since July 1853.¹¹³ Company support continued as in 1876 the GER Board approved expenditure of £2600 to build a new Institute and in 1877 it moved to new premises that it occupied for the rest of the century.¹¹⁴ The institute's facilities included a hall and stage, library, reading and lecture rooms, mechanical and electrical laboratory,

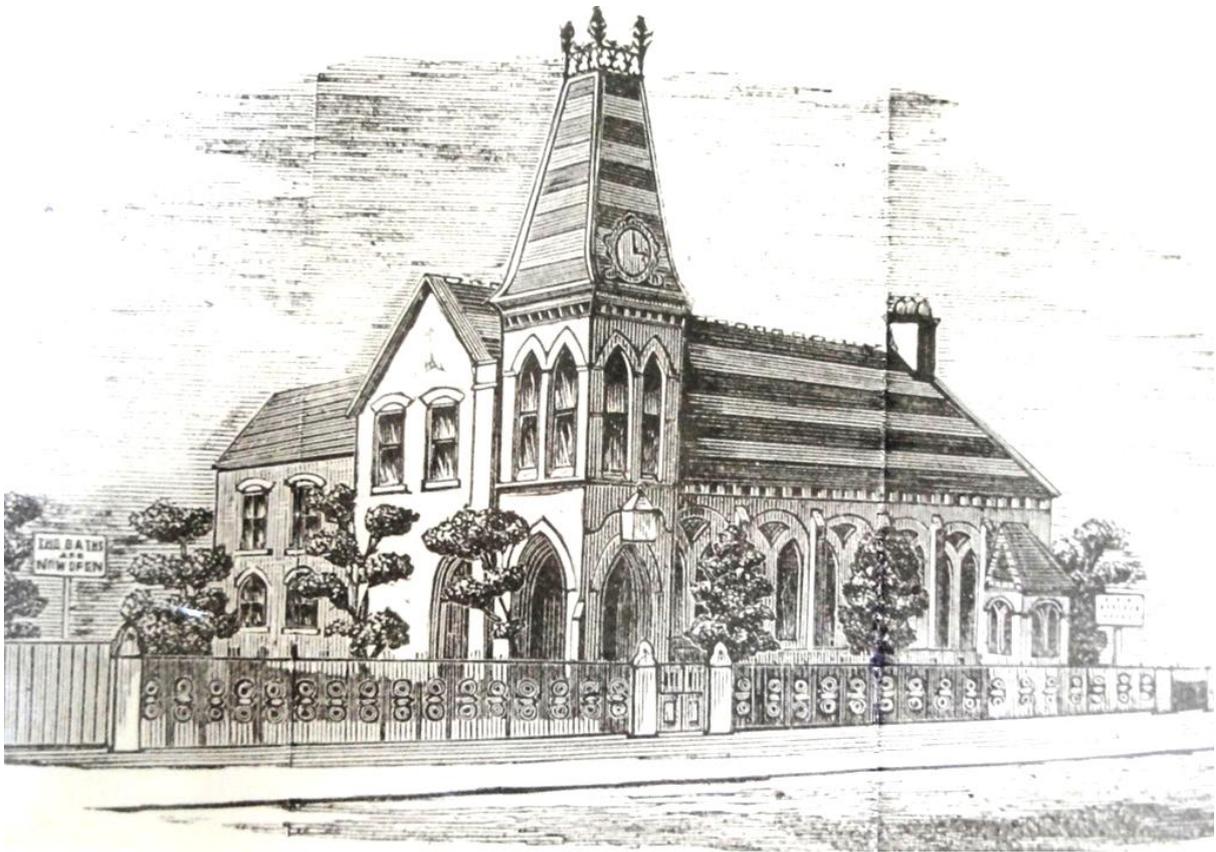


Illustration 5. The GER Mechanics Institute, 1885. The notice to the left of the picture advertises the Institute's baths. Source NALSC.

¹¹³ Rail 186/12, folio 398, TNA.

¹¹⁴ Rail 227/12, folio 46, TNA.

washhouse and baths, a gym, games room and rifle range.¹¹⁵ An impression of the Institute is shown in illustration 5.

For the remainder of the 19th century the Institutes developed increasingly comprehensive programmes to expand the knowledge and skills of the employees of the two works, their families and neighbours. The 1889-90 prospectus of the Stratford Institute records that 232 students had studied for the City and Guilds in the previous year by evening class, and some two thirds of students had been successful in their exams. The subjects covered were highly relevant to a locomotive works and included theoretical and applied mechanics, mathematics, machine construction and drawing, magnetism and geometry and inorganic chemistry. But the prospectus also included subjects of more general interest such as French, drama, and music. It also reported that the library had 6673 books (of which around half were novels), the baths had 20,346 bathers and the reading room 14 daily newspapers and some 75 weekly or monthly periodicals.

8. Other industries and employment

The populations of Swindon and Stratford grew significantly in the second half of the 19th century, from 4,876 and 10,586 in 1851 to 41,578 and 37,575 in 1901 respectively. The increase in the population of Swindon was due almost entirely to the GWR works and the employment in services and small businesses that were attracted to Swindon to provide for the needs of the works, its employees and the town in general. By 1895 the GWR works were employing some 10,000 people.¹¹⁶ The entry for New Swindon in a Directory of 1848

¹¹⁵ Plan of Stratford Mechanics Institute, 1919, NALSC.

¹¹⁶ J. Cattell and K.Falconer, *Swindon*, p. 120.

included only 28 entries and by 1895 the number of entries had increased to some 500.¹¹⁷

The entries were for various tradesmen and service providers but there were none for enterprises of any size that were likely to have existed if the GWR works had not come to Swindon. Thus we can conclude that the very significant growth in the population of Swindon was due to the rail works.

Manufacturing had already developed on a small scale in Stratford in the early 19th century. Steam carriages were made in Stratford in the early 1820s and 1830s and the chemical works of Howard & Sons operated in Stratford throughout the 19th century.¹¹⁸ A Jute factory which employed 1000 men opened in the 1860s.¹¹⁹ In addition the 1882 Kelly's Directory entry for Stratford included many small scale manufacturers that probably employed only a few people.¹²⁰ These included a black lead manufacturer, a printing ink manufacturer, a soap and tallow manufacturer, a brick maker, and an asphalt manufacturer and followed the centuries old practice of locating noxious industries to the east of London so that the prevailing westerly winds blew the smells and fumes away from the city. None of them appear to have been attracted by the GER works and the owner of the jute factory stated specifically that the main attraction of Stratford was its proximity to the London docks. By 1900 the GER works were employing 6800 men many of whom were relatively well paid.¹²¹ They and their families must have created a demand for goods and services which attracted businesses to Stratford and the surrounding area, but as a result of the other factories in the

¹¹⁷ Kelly, *Directory of Wiltshire* (London, 1895), pp. 221-225.

¹¹⁸ VCH, *A History of Essex, Vol. VI*, p. 78.

¹¹⁹ W.G. Croy, *East London Industries* (London, 1876), p. 3 and p. 64.

¹²⁰ Kelly, *Directory of Essex, Hertfordshire and Middlesex* (London, 1882), pp. 279-290.

¹²¹ Howarth and Wilson, *West Ham*, p. 161.

area it is not possible to isolate the economic impact of GER and its employees from that of other enterprises.

9. The Works in the last 30 years of the 19th century.

For this period Joseph Armstrong was the locomotive superintendent at Swindon from 1864 to until his death in 1877.¹²² He was replaced by William Dean, who had been apprenticed to Armstrong, and who remained at Swindon until 1902.¹²³

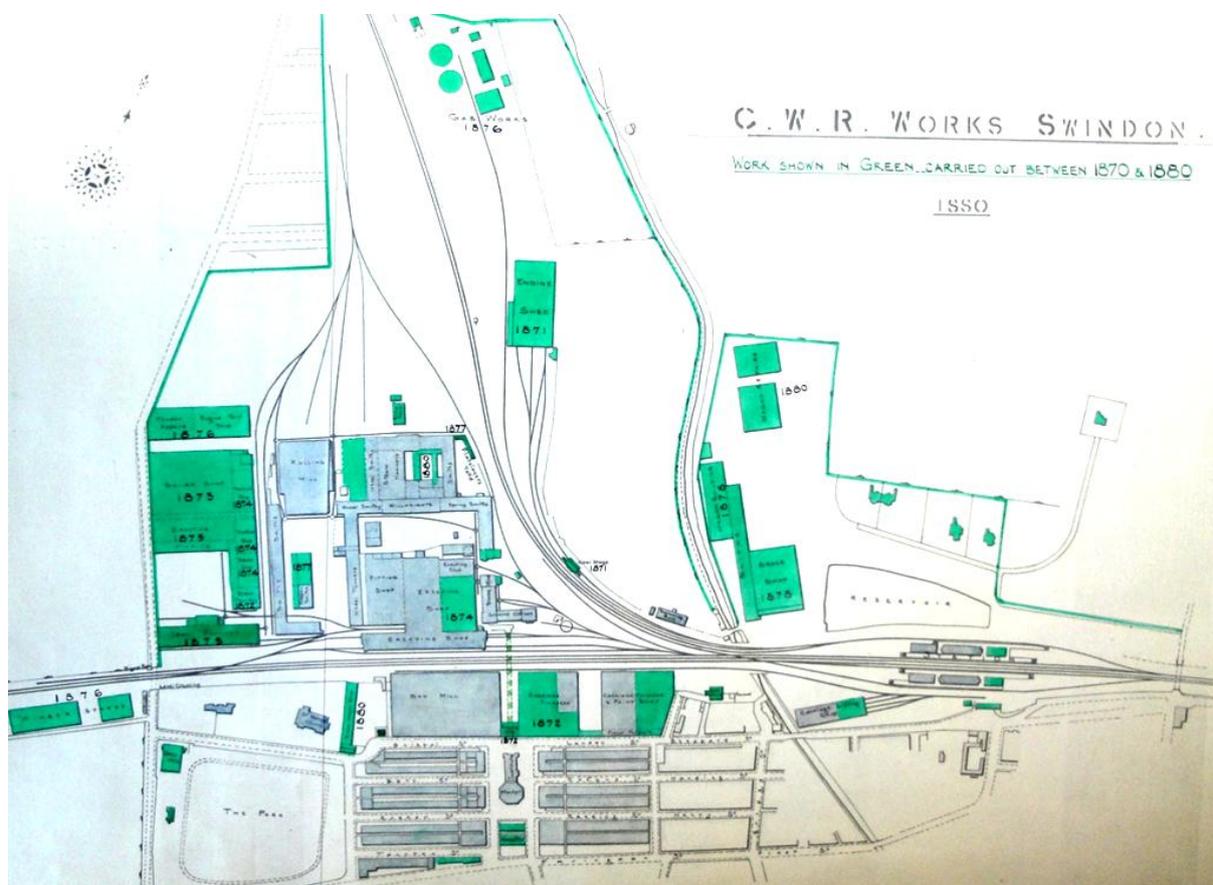


Figure 5. Hawksworth plan of the Swindon works in 1880. The new additions in 1870s are shown in green and include a new iron foundry, new boiler shop, new engine painting shop, a new engine repair shop and additional carriage works .

¹²² See appendix 2.

¹²³ Ibid.

James Holden was locomotive superintendent of GER from 1885 to 1907 after a 20 year career in the works of GWR. At the time he left GWR he was the assistant to William Dean.¹²⁴

The 1870s saw a period of expansion for both works. There are a number of sources that enable us to track these changes. The Board minutes of both companies document the approval of expenditure and the plans and maps of the works make it possible to identify significant changes 'on the ground'. There are also contemporary descriptions written for trade magazines and staff journals of both companies, which although uncritical and sometimes reverential in their tone, provide an eye witness account of each works towards the end of the century. Between 1872 and 1876, the GWR board approved expenditure of around £85,000 on various additions and improvements to the works, including a new boiler shop, a new engine repair shop, a new brass foundry and machine shop and additional carriage works. The full scope of the developments between 1870 and 1880 are shown in the Hawksworth plan of the works for 1880 shown in green in figure 5, and the dates recorded on the plan indicate that most of the expansion took place in the first half of the decade. The net effect of these developments was the creation of a new locomotive manufacturing plant as well as the continuation of their role in maintaining locomotives and rolling stock.¹²⁵

Similarly, significant expansion was authorised by the GER board, although the main approval of some £60,000 did not occur until 1876.¹²⁶ In addition, there were a series of

¹²⁴ Appendix 2.

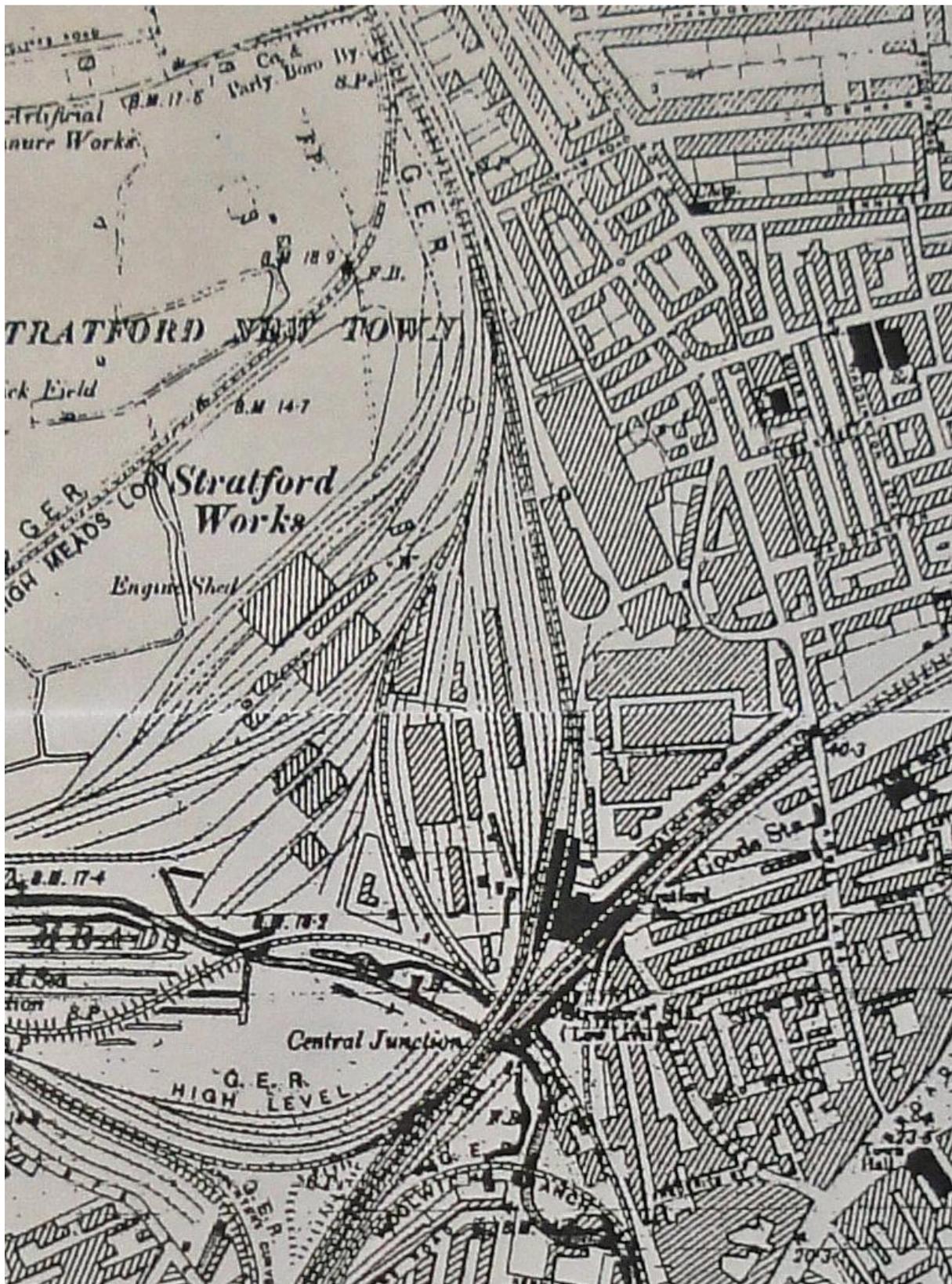
¹²⁵ J. Cattell and K.Falconer, *Swindon*, p.93

¹²⁶ Rail 227/12, folio 22, TNA.

smaller amounts approved for the Stratford works during the period, and a new carriage works was opened in 1896 at Temple Mills, Leyton, a mile to the north of Stratford.



Map 5. Detail from map of Stratford dated 1867 showing the Stratford works contained within the Colchester and Cambridge lines.



Map 6. Detail from Ordnance Survey map of 1899 which shows a significant increase in the size of the Stratford Works which resulted in expansion to the west of the Cambridge line.



Figure 6. Plan of Stratford works in 1914.

Key to main building in plan of Stratford works, 1914 (figure 6): 1. Lifting and repair shop; 2. Body shop; 3. Carriage Dept.; 4. Boiler shop; 5. Loco wheel shop; 6. Wheel fitting shop; 7. Steam hammer shop; 8. Loco smiths' shop; 9. Erecting and fitting shop; 10. Loco machine shop; 11. Carriage shed; 12. Running shed; 13. Carriage shop; 14. Tender shop; 15. Smiths' stamping shop; 16. Engine paint shop; 17. Gas works; 18. Iron foundry; 19. Boiler repair shop; 20. Stores.

As in other areas no details of the work approved for Stratford have survived and therefore the only source available to assess the work undertaken is a comparison of maps and plans for one period with those for another.

A map of Stratford for 1867, part of which is reproduced in map 5, indicates that at that date the works continued to be contained within their original site at the apex of the junction of the Cambridge and Colchester lines.¹²⁷ The Ordnance Survey map for 1899, map 6, shows a considerable expansion to the west of the Cambridge line.¹²⁸

The purpose of all the buildings is recorded in a GER plan of the works dated 1914 shown in figure 6.¹²⁹ Thus, unless there was significant reorganisation of the works, that was not recorded in the Board minutes or those of its committees, a comparison of the 1867 and 1893 maps, using the building descriptions on the 1914 plan suggests that the expansion in the 1880s included an iron foundry, a boiler repair shop and running and carriage sheds.

Although the size of both works expanded, the growth in the Swindon works was greater than Stratford in terms of the number employed. In 1850, both works appear to have employed around 1,000 people. By the 1890s in excess of 9,000-10,000 men were

¹²⁷ NALSC.

¹²⁸ Detail from reproduction of Ordnance Survey (Second Edition), 1899, Essex sheet 172.

¹²⁹ Rail 252/38, TNA.

employed at Swindon, an increase of around 8,000 or more in 40 years.¹³⁰ As already mentioned, by 1900, 6,800 men were employed at Stratford, an increase of some 5,500 since 1850.¹³¹ By the end of the century, the Swindon works was 40% to 50% times larger than Stratford by the number of people employed. The reasons for these increases were the expansion in the size of the GWR and GER networks as shown in table 1 and the growth in the type of work undertaken by each works, such as locomotive construction.

When they were first established the purpose of both works was limited to locomotive maintenance, but gradually each works started to build both locomotives and rolling stock. Swindon built its first locomotive in 1846/47, and between this date and the late 1860s, the works built 42 out of 127 new locomotives for passenger use and all 153 new locomotives operated as goods engines. Stratford was slower in starting engine manufacture as the first engine was not built until 1851, and only 36 locomotives were built there before 1870. During this period the remainder of the locomotives required were purchased from third parties. But after 1870 almost all locomotives were built by the companies. Stratford was the sole locomotive manufacturer for GER, whereas GWR locomotive manufacture was divided between Swindon and the GWR works in Wolverhampton. Between 1870 and 1900, some 960 locomotives were made at Stratford and 1190 at Swindon.¹³² But the order book for new locomotives was not necessarily constant over the years, and thus it would be misleading to portray the average number of locomotive built per year as a representative picture of the activity of each works. This was probably due to the economic difficulties of the late 1870s and early 1890s.

¹³⁰ H. Malan, 'The Great Western Railway Works at Swindon', in *Round the Works of our Great Railways* (London 1893), p. 160.

¹³¹ Howarth and Wilson, *West Ham*, p. 161.

¹³² Rail 227/441 and 254/127-135 record the date and place of manufacture of each locomotive put into service by GER and GWR, NTA.

The changes to both works in the last 30 years or so of the 19th century created works that were organised along the lines of assembly based production that we would recognise today. Two passages from articles written in the 1890s illustrate this. A.H. Malan in his account of a visit to the Swindon works around 1890 comments *that 'two points impress themselves on the mind*

- *The economy of mechanical power, through duplication of work; and*
- *The great force, invisible and unsuspected, literally beneath the feet, only requiring the touch of a handle to exert tremendous power in diverse ways and methods'.¹³³*

Alex Parker, secretary to the GER locomotive superintendent, in his account of engine assembly at Stratford, also written in the early 1890s, provides a more detailed description of the start of the assembly of a locomotive:

"We will now watch the progress of the erection, noticing first that for the lifting of the heavy parts there are four overhead cranes, each of thirty tons capacity, which traverse the length and breadth of the shop, and are driven by an endless or "flying" cotton rope running at a speed of about half a mile a minute, the cranes being actuated by the bite of the rope on the grooved surfaces of the pulleys. The engine frames are brought into position one at each side of the pit, and are stayed together by temporary bolts; the frame stays are then put in ad bolted together,'¹³⁴

¹³³ A.H. Malan, The Great Western Railway Works at Swindon, in *Round the Works of our Great Railways* pp. 151-152.

¹³⁴ A.P Parker, 'The Great Eastern Railway Works at Stratford', in *Round the Works of our Great Railways*, pp. 129.

Alex Parker also tells us that each standard goods engine had 9438 parts, the tender 7504 parts, and that a new engine is turned out every 32 hours. Such complexity and relative speed of production could only have been achieved with a well trained and disciplined workforce, each of which performed a specialised, and sometimes repetitive task in which each operative was highly proficient

10. Conclusion

The GWR works at Swindon and the ECR/GER works at Stratford were very significant enterprises when they were established in the 1840s, and their importance was maintained and in some ways increased during the remainder of the 19th century. When they were built they were amongst the largest the largest employers in the country and by the end of the century, both had increased significantly in terms of their size, the scope of their activities, the number of men that they employed and the sophistication of the engineering that they employed. Stratford was the only locomotive maintenance and construction works for ECR/GER and Swindon was the most significant works undertaking these functions in the GWR network. The maintenance that they carried out enabled both companies to provide an expanding and reasonably reliable rail service for both passengers and freight.

Both works were established and then managed by men that were engineers by background and training. Over 30 to 40 years they transformed the craft based workshops of the initial works into production lines that by the 1870s and 1880s were capable of building locomotives with 10,000 parts in a few hours. The locomotives that they built significantly reduced the travelling time throughout Britain at fares that were relatively affordable for much of the population. This significantly increased the ability of people to travel from rural areas to the towns and vice versa, and from one end of the country to the other. There were

the same possibilities for freight which opened up local and regional markets to national competition.

The size and capital requirements of the railway companies resulted in a separation between ownership and management of the companies and made necessary the introduction of more elaborate management mechanisms than were necessary in family businesses. However there were differences between the two companies in this respect. GWR papers suggest that the GWR board took a close interest in the activities of Brunel and Gooch at Swindon. No such evidence exists for ECR, and whereas it is possible that it has been mislaid, the evidence of the two inquiries into the management of ECR that took place in the early 1850s suggests that, initially at least, there were significant weaknesses in the management of ECR, including the Stratford works. However, both companies eventually introduced a more formal committee structure below board level to manage the companies and this seems to have prevented the difficulties of the early years.

A key difference between the two works was their geographic location and the impact this had on a number of aspects in the development of the works and their surroundings. Initially it was necessary for both works to recruit a significant proportion of their staff from outside the county in which they were located or the surrounding counties. Many of the skilled men recruited came from the north of England or Scotland, whereas the less skilled workers came from Wiltshire or Essex or counties nearby. The different geographical locations of Swindon and Stratford in terms of their proximity to other industry and centres of population resulted initially in the two companies taking different approaches to the needs of their employees. As a small market town before the arrival of the railways, Swindon and its surrounding villages could not provide accommodation for many of the

works' employees. As a result some 270 cottages were built by the early 1850s to accommodate employees and their families, and there is little evidence of many GWR works employees lived outside New Swindon in the 1850s. As a result most of the early employees at the Swindon works must have lived in cottages built by the company.

ECR, however, took a different approach. It built 100 cottages in Stratford New Town around 1848 with the consequence that most employees must have rented from private landlords as soon as they moved to Stratford. The question arises therefore, whether GWR built cottages for most of its new employees only for the purpose of attracting skilled staff, or whether in addition GWR had some moral or altruistic reasons. The answer is almost certainly the former, because as the number of works' employees increased in the 1850s and 1860s, GWR relied on private developers to provide additional housing rather than increase its estate of workers' cottages.

There were also differences between the two companies in the approach that they took to meeting the educational and spiritual needs of their employees. GWR took an early interest in both, and as we have seen, a committee was formed in 1845 to build a church and school in New Swindon, funded by public subscription. By the 1870s the school had some 1300 pupils. ECR/GER appears to have taken much less interest in the education of the children of its employees or the church. An ECR school existed in Stratford by 1856, but it had only one fifth the number of pupils that attended the GWR schools in the 1870s, and it seems to have been rather peripheral to the company as there is no mention of it in ECR/GER board or committee minutes. However, ECR/GER took a greater interest in adult education in the form of the Stratford Mechanics Institute. The employees at Swindon and Stratford took the initiative to form a Mechanics Institute and both Institutes were supported by their

respective companies. On balance ECR/GER provided the greater support because it funded the two buildings that the Stratford Institute occupied during the 19th century. ECR/GER took less interest than GWR in supporting the church and, with one exception of the donation of a plot of land, made few contributions to the church.

Overall, therefore, how important were the two works to Swindon and to Stratford? Before 1840 Swindon was a small Wiltshire market town. If Brunel and Gooch had recommended to the GWR board that the company's new locomotive works should be built somewhere else Swindon's importance would have increased given its position on the junction of the Bristol and Cheltenham lines, but it is likely that in the second half of the 19th century it would have remained a relatively small town. This is supported by the fact that despite the railway no other industry of significance was attracted to Swindon in this period. The GWR works therefore were the key to Swindon becoming the largest town in Wiltshire by the end of the 19th century and the county's only industrial centre of any note. The impact of the ECR/GER works on Stratford is less certain. Clearly the development of the works over 50 years that by 1900 was employing 6800 men must have had an effect on Stratford, although the census returns do not allow us to determine how many of these men lived there, and how many travelled from further afield. During the late 19th century Stratford became part of the London metropolis and other industries came to the area, but their attraction to it was more likely to have been the proximity of the River Thames and the London Docks, and the availability of labour than the ECR/GER works. Thus the ECR/GER works although important to the development of Stratford in the second half of the 19th century were not as significant to it as the GWR works to Swindon.

14,900 words

Appendix 1.

Archives and records examined in the preparation of this paper.

A number of archives and libraries were visited in the preparation of this dissertation. This note lists the categories of record that I used at each location. The board and meeting minutes of ECR, GER and GWR cover many volumes and therefore it was not practical for me to read all of them. To identify specific minutes or records I used indexes to these records where they exist, or dates of events or primary source references included in secondary sources.

1. The National Archives.

- *ECR Board and meeting minutes.*
- *GER Board and meeting minutes to 1900.*
- *GWR Board and meeting minutes to 1900.*

In addition to the above I used CDs of the original census returns for Essex and Wiltshire for 1851 and 1871 to enable me to undertake the analysis of migration and occupations.

2. Newham Archives and Local Studies Centre.

- *1848-49 and 1867 maps of Stratford.*
- *Records of the GER Mechanics Institute.*
- *West Ham School Board minutes.*
- *Trade and other Directory entries for Stratford, 1848 to 1900.*
- *Photograph of GER Mechanics Institute.*
- *Report to the General Board of Health, 1855.*

Swindon Central Library

- *Hawksworth plans of the Swindon works.*
- *The Swindon Advertiser.*

Wiltshire and Swindon History Centre.

- *Trade and other directories for Wiltshire.*
- *Ordnance Survey maps of Wiltshire.*

Essex Record Office.

- *Early 19th century Directories of Essex.*

London Metropolitan Archives.

- *Late 19th century directories of London that contain references to Stratford.*

Library and Archive, Museum of the Great Western Railway.

- *Edward Snell's impression of New Swindon in 1846.*

Appendix 2.

Biographies

This appendix sets out brief biographies of the individuals that are mentioned in the paper.

Armstrong, Joseph (1816 – 1877), replaced Daniel Gooch as locomotive superintendent at Swindon in 1864.¹³⁵ His family moved to Northumberland in 1824 where he went to school in Newcastle. He was apprenticed to an engineer at Walbottle Colliery and came to know George Stephenson who encouraged him to work on the railways. He became an engine driver on the Stockton and Darlington railway in 1836 and in 1840 became the locomotive shed foreman at the Hull and Selby railway. After several further moves he became the locomotive superintendent at the Wolverhampton works of the Shrewsbury and Birmingham Railway, and joined GWR in 1854 when his works became part of the GWR northern division.

Working under Daniel Gooch, from 1854 to 1864 Armstrong transformed the Wolverhampton works from a relatively small repair shop into a major manufacturing facility. After his transfer to Swindon he designed six types of locomotive of which 600 examples were built, and also took an interest in improving the working conditions and safety of works employees. Outside GWR he was a member of the council of the Institute of Mechanical Engineers and a lay preacher in the Wesleyan Methodist Church.

Braithwaite, John (1797-1870), was responsible for putting forward proposals for a railway from London to Ipswich and Norwich.¹³⁶ He was an engineer by profession and he inherited his father's engineering workshop in Paddington in 1818, with his brother. His brother died

¹³⁵ ODNB, Vol. 2, pp. 436-437.

¹³⁶ ODNB, Vol. 7, pp. 296-298.

in 1823 and John carried on the business and increased its scope by starting to make high-pressure steam engines. Braithwaite was introduced to George and Robert Stephenson in 1827, and in 1829, with John Ericsson, he constructed the locomotive, *The Novelty*, which was the first engine to run a mile in one minute. As a result he received an order to build two locomotives for the Liverpool and Manchester Railway.

When the Eastern Counties Railway was incorporated in 1836, Braithwaite became the engineer-in-chief for its construction. He remained in this position until May 1843 when he resigned and severed all his connections with the company. ECR records provide no explanation for his resignation. However he had other interests and so perhaps these became more interesting or profitable for him than his post at ECR. For example, he was the founder of the *Railway Times*, and its sole proprietor until 1845, and dabbled in other railway and engineering projects in the early 1840s. After he left ECR he practised as a consulting engineer, advising on patents and various engineering projects.

Brunel, Isambard Kingdom (1806-1859) was one of the great engineers of the 19th century.¹³⁷ Apprenticed to his father, civil engineer Sir Marc Isambard Brunel, the young Isambard became the chief assistant to his father in constructing the first tunnel under the river Thames from Rotherhithe to Wapping from 1825 to 1843. A serious injury sustained in 1828 during the construction of the tunnel caused Brunel to take a period of recuperation in Bristol. While in this city he won a competition for the design of the Clifton suspension bridge. This success resulted in him being introduced to a group of merchants and entrepreneurs in Bristol who obtained for him appointments to advise on the improvements to Bristol City docks, and in 1833 as engineer to GWR.

¹³⁷ ODNB, Vol. 8, pp. 358-361.

Brunel devoted much of the next 15 years to GWR, building first the line from Paddington to Bristol. This included a number significant engineering structures such as the Hanwell and Chippenham viaducts and the Box Tunnel between Chippenham and Bath. He also designed other bridges such as that across the river Tamar at Plymouth. His approach was to design a complete system including the construction of the railway and the locomotives, although as set out in the paper the latter had their disadvantages in terms of poor reliability. He was also closely involved in the building of New Swindon.

In addition to the construction of the GWR line to Bristol, Brunel was involved in other projects. His vision was that it should be possible to travel from London to New York, by rail to Bristol and then by ship to New York. To achieve this, a GWR subsidiary company, the *Great Western Steamship Company*, was formed with Brunel as its engineer. Two ships were built in Bristol for this service. A 2300 ton wooden hulled steam ship, the *SS Great Western*, made its maiden voyage in 1838, and a second ship, the *Great Britain* was launched in 1843. The latter was the first large iron ship and the first large screw propelled ship. The *Great Western Steamship Company* went into liquidation in 1846 as a result of the *Great Britain* was stranded on the coast of Northern Ireland. Thereafter the ship spent most of her working life operating out of Liverpool on the route to Australia. As a rusting hulk she was brought back to Bristol from the Falklands Islands in 1970 for restoration.

Brunel built a third ship, the *SS Great Eastern*, was much larger than the previous two ships and was designed to be able to sail to the Far East without stopping for fuel en route.

Construction started on the river Thames in 1854, but the ship was not launched until 1858, and was not ready for her first voyage until 1859, shortly before Brunel's death.

Brunel had many achievements, although some of his projects were not a success. The building of the GWR line from London to Bristol helped transform travel in Britain, and the concept of linking this to trans-Atlantic routes was revolutionary for its time. However the broad gauge that was adopted by GWR caused difficulties for the company for much of the 19th century, and overall his shipping ventures were not a commercial success.

William Dean (1840-1905), was apprenticed to Joseph Armstrong when the latter the locomotive superintendent at the GWR northern works at Wolverhampton, and in 1864 took over from him at Wolverhampton when Armstrong moved to Swindon.¹³⁸ He became locomotive superintendent at Swindon in 1877 on Armstrong's death and remained in this post until his retirement in 1902. Dean designed the locomotives that were built at Swindon whilst he was in post and was noted for simple, robust and simple designs. He also had to deal with the locomotive and rolling stock requirements of GWR's conversion of its lines from broad gauge to standard gauge in 1892.

Gooch, Daniel (1816-1889), was the first locomotive superintendent of GWR, and the chairman of the company from 1865 to 1889.¹³⁹ Gooch was born in Bedlington, Northumberland and his father was the cashier and bookkeeper at the Bedlington ironworks. The Gooch family had many associations with engineering industry, and it was through one of these connections that Gooch was able gain training in engineering at the Stephenson's works in Newcastle. This included training in locomotive construction. Brunel appointed Gooch as the first locomotive superintendent of GWR in 1837 at the age of 21, and with the exception of a brief interlude in 1864-65 he remained with the company for the rest of his life.

¹³⁸ Eds., J. Simmons, and G. Biddle, *The Oxford Companion to British Railway History*, p. 125.

¹³⁹ ODNB, Vol. 22, pp. 733-735.

Gooch was responsible for much of the planning, tooling and management of the Swindon works from its establishment in 1843 to his resignation as locomotive superintendent in 1864. Under Gooch's control the Swindon works began to manufacture an increasing proportion of company locomotives and other rolling stock, as well as rails from 1861 after the foundry was opened. Gooch favoured a strategy of 'internalisation' because of the control over quality and supply that it provided, and a challenge to this policy by a new GWR chairman, Richard Potter, was largely responsible for his 1864 resignation.

Because of the financial position of GWR in 1865, Potter resigned as chairman, and Gooch was asked to take his place. Gooch cancelled a number of projects and instituted a number of economies that returned the company to a reasonable financial equilibrium by the early 1870s. He remained as chairman of GWR until his death.

In addition to GWR, Gooch had a number of other interests. He was Conservative MP for Cricklade, a constituency that included New Swindon, from 1865 to 1885. In this position he took a leading role in defending the railway industry. He also had a number of other commercial interests, some of which by present day standards would be seen as conflicting with position at GWR. For example, in the 1850s he was chairman of the Ruabon Coal Company in North Wales a supplier of coal to GWR, a company in which he had invested £20,000. He also had interests in telegraphic communication companies which were involved in cable production and cable laying.

Gooch, J.V., was locomotive superintendent to ECR from 1850 to 1855. He was important for two reasons. He was an elder brother to Daniel Gooch and as such demonstrates a probable connection between ECR and GWR in the early 1850s and the close network of

locomotive engineers in the early days of the railways. He was also responsible for building the first locomotive at the Stratford works in 1851.

In 1855 poor financial management at ECR resulted in a committee being set up to inquire into the company's capital expenditure. The report of the committee includes the following on the locomotive superintendent.

*'The agreement entered into with Mr Gooch in May 1850, might have resulted favourably, provided it had been carried out in its integrity; and if it had not so resulted, the agreement contained a clause by which it might have been terminated. But this agreement was allowed to run on, and has made the pretext for paying Mr Gooch during the last five years sums as percentages amounting to little less than £20,000, when his salary was fixed at £600 per annum. Added to this he was permitted to be a partner in a coal company trading to the port of Lowestoft, supplying the Eastern Counties Company with coals; and was also engaged in other business on his own account: he is the owner of wagons let to this coal company, which wagons are repaired at the workshops of the Eastern Counties Railway.'*¹⁴⁰

The report goes on to recommend that Gooch's engagement is referred to the company's lawyers with a view to his dismissal. Gooch left the company in 1855 although no more details of his departure survive. Some of his outside business interests appear to have been similar to those of his brother, Daniel. He may therefore have been unlucky to have been criticised in this way, or perhaps he went too far in furthering his own interests at the expense of ECR. He does not seem to have had any further appointments in the rail industry.

¹⁴⁰ Rail 186/12, folio 310.

Holden, James (1837- 1925) was the locomotive superintendent of GER from 1885 to 1907.¹⁴¹ He was apprenticed to his uncle, Edward Fletcher, then locomotive superintendent of the York, Newcastle and Berwick railway at their Gateshead works. Holden joined GWR in 1865 in Saltney, and in 1873 was promoted carriage and wagon works manager in Swindon. He was appointed the assistant locomotive superintendent under William Dean in 1878.

In joining GER Holden continued the connection that appears to have existed between Swindon and Stratford. Whilst at Stratford, Holden took forward the building of locomotives and was responsible for designing four locomotive types that were still in service in the 1920s. Under his regime, in 1891, the Stratford works assembled a locomotive in the world record time of ten working hours. He was also credited with taking an interest in the education of engineers and obtained the board's approval for some of the more able to study full time for a period on full pay.

Holden was a member of the Society of Friends.

Hudson, George (1800-1871), sometimes known as 'The Railway King', was chairman of ECR from 1845 to 1849.¹⁴² He was also a railway promoter and in the end, a fraudster. The son of a Yorkshire farmer, he made his money through marriage and inheritance. This enabled him establish himself in politics in York and to become lord mayor of that city in 1837.

In 1833 Hudson became involved in a scheme to link York and Leeds by rail and the necessary Act of Parliament was passed in 1837, he became chairman of the York and North

¹⁴¹ Great Eastern Magazine,

¹⁴² ODNB, Vol. 28, pp. 573-575.

Midland Railway. In 1841 he persuaded the shareholders in 8 railway companies to build a line from Darlington to Newcastle, and through a number of mergers by 1844 he controlled over 1000 miles of railway. He became chairman of ECR in 1845. The attraction of ECR to Hudson was that it could form part of his plan to build a line from London to York, and his appointment was attractive to ECR shareholders because at that time the company was paying one of the lowest returns of any railway. However, his success was short lived because of the end of the second railway boom and the recession of 1846 and 1847. Railway shareholders found it difficult to meet calls made by companies and dividends had to be reduced. In 1848, Hudson was forced to repay £400,000 to the banks and this caused a further reduction in railway company share prices. Furthermore, it was alleged that one of Hudson's companies, the York, Newcastle and Berwick railway, had bought the shares of another company at inflated prices and that these shares belonged to Hudson. A committee of inquiry was set up to investigate these transactions at the same time as another investigation was launched at ECR to investigate its management affairs. These committees reported that dividends had been paid out of capital and figures for traffic, revenue and expenditure manipulated. He was forced to resign most of his company appointments, including his chairmanship of ECR.

Stephenson, George (1781-1848) and his son, **Stephenson, Robert** (1803-1859).¹⁴³ George Stephenson was one of the early engineers responsible for designing and building early locomotives. Born near Newcastle-upon-Tyne to a colliery foreman, his reputation as being the 'father of the locomotive' has been overstated. Other early engineers as well as Stephenson were involved in the development of locomotives. George Stephenson's primary importance was his work in advancing the design and construction of the

¹⁴³ [www.oxforddnb.com/catalogue/urls/lon.ac.uk/view/article/36278 & 26400](http://www.oxforddnb.com/catalogue/urls/lon.ac.uk/view/article/36278&26400).

locomotive to a form in which it could be more readily operational. He was one of the first to recognise the link between locomotive and track and he succeeded in demonstrating the economic advantages of mechanical traction.

George Stephenson was closely involved in the Stockton and Darlington Railway between the collieries of south-west Durham and the mouth of the River Tees. The building of this railway started in 1823 and in the same year Stephenson opened a locomotive manufacturing workshop – Robert Stephenson & Co. – in Newcastle. It was here that he built the famous ‘Rocket’ locomotive in 1829. He was also closely involved in the Liverpool and Manchester Railway, and later advised on many other railway developments. In this role his was highly influential in gaining acceptance of the ‘standard’ 4 feet 8 ½ inches gauge over other gauges which ranged from 4ft 4 inches up to 7 feet in the case of GWR.

George Stephenson was assisted by his son Robert in many of these projects, including the building of the Liverpool and Manchester Railway and running Robert Stephenson & Co. However, Robert worked independently of his father on some projects, including working for 4 years in South America in the early 1820s, and designing and building bridges. The high-level bridge over the River Tyne is one of the more notable examples of his work.

Further analysis of the achievements of George and Robert Stephenson are outside the scope of this paper. Their importance in terms of GWR and ECR and the works at Swindon and Stratford works are their achievements in demonstrating the benefits of the railway and their contact with Braithwaite and Daniel Gooch.

Appendix 3.

Comparison of the number of individuals living in New Swindon in 1851 and 1871 recorded following skilled occupations that suggest that they probably worked at the GWR works.

The table below compares the number of individuals who on the basis of their occupations worked in the Swindon works in 1851 and 1871. Because it lists the key occupations only and does not include unskilled labour the totals should not be taken as an indication of the number of men working at the GWR works. Nevertheless, show the significant growth that took place in most occupations over a 20 year period.

Occupation	1851	1871
Accountant	-	5
Blacksmith	8	40
Boiler maker	40	104
Bolt maker	-	4
Brass finisher	6	27
Carpenter	16	103
Carriage builder	-	23
Clerk in works	-	4
Coach builder	-	110
Copper smith	4	14
Draughtsman	-	4
Engine fitter	19	235
Engine cleaner	3	7
Engine driver	14	36
Engine smith/turner	2	60
Engineer	18	7
Erector	21	6

Fireman	5	18
Fitter	35	112
Forgeman	2	20
Furnaceman	-	24
Grinder	-	7
Hammerman	-	26
Iron worker	3	55
Joiner	2	11
Machineman	6	57
Mechanic	3	5
Moulder	3	16
Painter	4	45
Pattern maker	4	6
Pudler	-	18
Rail clerk	9	30
Rail straightener	-	9
Roller	-	9
Rougher	-	5
Sawyer	2	11
Smith	43	55
Spring maker	4	9
Striker	4	62
Switchman	5	4
Turner	10	18
Wagon builder	-	<u>6</u>
Total	293	1417

Appendix 4**County or Country of birth of skilled workers at the Stratford and Swindon works 1851.**

This appendix sets out the county or country of birth of skilled workers recruited to the Stratford and Swindon as reported in 1851 census.

	Stratford works	Swindon works
Berkshire	-	10
Buckinghamshire	-	6
Cambridgeshire	1	-
Cheshire	4	2
Cornwall	-	3
Cumberland	1	4
Derbyshire	4	2
Devon	1	13
Dorset	-	2
Durham	6	18
Essex	5	1
Gloucestershire	2	43
Hampshire	4	3
Hertfordshire	-	1
Kent	4	3
Lancashire	9	23
Leicestershire	1	-
Lincolnshire	-	1

London/Middx.	13	27
Norfolk	4	1
Northamptonshire	1	1
Northumberland	11	25
Nottinghamshire	-	3
Oxfordshire	1	8
Shropshire	1	2
Somerset	7	17
Staffordshire	2	7
Suffolk	4	-
Surrey	6	8
Sussex	-	1
Warwickshire	3	3
Wiltshire	2	35
Yorkshire	17	11
Swindon	-	7
Stratford	1	-
Ireland	-	15
Scotland	21	39
Wales	1	4
Abroad	1	5
N/K	6	-
Total	147	354

Appendix 5

County or Country of birth of unskilled workers at the Stratford and Swindon works 1851.

	Stratford works	Swindon works
Berkshire	-	4
Buckinghamshire	-	6
Cambridgeshire	1	-
Devon	-	3
Essex	5	1
Gloucestershire	-	13
Hampshire	2	-
Kent	1	-
London/Middx.	4	4
Northamptonshire	-	1
Somerset	1	3
Surrey	1	-
Sussex	1	-
Wiltshire	-	26
Yorkshire	-	1
Swindon	-	8
Ireland	-	2
N/K	-	2
Total	15	74

Appendix 6

County or Country of birth of inhabitants of New Swindon with an occupation recorded in 1871 census.

The table below shows all those inhabitants of New Swindon in the 1871 census. Of the 2900 individuals so recorded, 90% were male and 61% were born in two counties, Wiltshire and Gloucestershire.

	Male	Female
Bedfordshire	5	-
Berkshire	118	8
Buckinghamshire	26	3
Cambridgeshire	3	-
Channel Is.	1	-
Cheshire	15	-
Cornwall	6	-
Cumberland	4	-
Derbyshire	14	-
Devon	65	-
Dorset	15	-
Durham	20	2
Essex	9	3
Gloucestershire	338	26
Hampshire	16	-
Herefordshire	19	3
Hertfordshire	3	-
I.O.M.	2	-
I.O.W	1	-

Kent	16	2
Lancashire	56	6
Leicestershire	4	-
Lincolnshire	4	-
London/Middx.	122	14
Norfolk	10	2
Northamptonshire	5	1
Northumberland	26	1
Nottinghamshire	3	-
Oxfordshire	45	5
Shropshire	18	-
Somerset	167	22
Staffordshire	23	1
Suffolk	5	-
Surrey	24	2
Sussex	9	-
Warwickshire	50	-
Westmorland	1	-
Wiltshire	652	97
Worcestershire	26	3
Yorkshire	55	4
Swindon	253	63
England	2	-
Ireland	32	4

	88	
Scotland	49	-
Wales	247	17
Abroad	15	-
Not known	<u>14</u>	-
Total	2613	289

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