

# A MIGHTY IRON MISSIONARY OF CIVILISATION AND PROGRESS

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Matthew Boulton and James Watt pioneered the development of the steam engine in Birmingham during the late eighteenth century. In the century that followed, the transformative 'power of steam' would leave few West Midlands lives and livelihoods untouched.



Newcomen engine at work in an eighteenth century coalmine, Walker Art Gallery, Liverpool.

**O**n 21 August 1829 the case of Freeman vs Ledsam was heard by the Lord Chief Justice at Warwick Assizes. The plaintiff, Thomas Freeman, was a publican of Edmund Street, Birmingham; the defendant, Daniel Ledsam, the owner of a large steam-powered manufactory. Pub and manufactory stood some fifteen yards apart, and therein lay the source of the dispute.

Freeman's allegation, reported the *Leamington Spa Courier* the following day, was that 'the violent motion of the mass of the machinery produced such vibration in his house as to make the glasses jingle upon the shelves of his bar, and to shake the barrels in his cellar so as to deteriorate the quality of his ale, making it thick, sour and muddy'.



A mischievous allegation, retorted Ledsam's counsel; one brewed to gain compensation for the publican's falling trade. Defence witnesses were called and all 'cried out against the sacrilege of stopping the march of steam'. However, as the *Courier* later reported, 'malt prevailed over steam, and the honour of Warwickshire ale won the palm from the town-made triumph of steam'.

## The Triumph of Steam

What was the 'triumph of steam' and in what ways did this apparently victorious phenomenon 'march' through the West Midlands? The triumph of the steam engine was its ability to transform thermal energy (heat) into kinetic energy (work), yet the technological developments of this quintessential invention of the industrial revolution are not the direct concern of this article. Rather, it will focus on the 'power of steam': a transformative power that made possible, among other things, dramatic increases in industrial productivity; relief of the drudgery of hard, repetitive physical labour; and improvements in public health.

In 1836, the Birmingham Philosophical Institution published a table of steam engines operating in the borough between 1780 and 1835. The table showed that the earliest recorded application of steam power in Birmingham was in flour-milling in 1783 and that during the following fifty years steam engines were used to pump water, grind glass and clay, work wood and, above all, work metal. In contrast with what was to follow, however, the impact of steam power was relatively limited up to this point. Water-power remained an important source of energy in Britain in 1830, and the advantages that the steam engine offered before 1850 were fairly small.

As the nineteenth century progressed, so fertile imaginations began to see the potential benefits offered by steam power and its application. Some of these ideas – the railway locomotive, of course – became commercial successes; others developed as far as a prototype but failed to progress further (the Duke of Wellington was unimpressed by Jacob



Firing up the boilers at Coleham Pumping Station, Shrewsbury. The coal-fired boilers drove the two beam engines which formed part of Shrewsbury's sewerage system.

Courtesy of Coleham Pumping Station

Perkins's steam artillery); while still more never left the drawing board – the steam-powered walking device, for example. However, if we focus on success rather than failure, the West Midlands region witnessed the power of steam at work, particularly in three main areas of operation – pumping, hauling and driving – and across all three sectors of the economy.

## Pumping Water

The first instance of steam power being applied to pumping in the West Midlands occurred in coal mining. In South Staffordshire the main obstacle to mining was always the liability of the pits to flooding and this, together with the inefficiency of drainage methods, was a major factor limiting the depth of mines.

In 1706 an attempt was made to drain water seeping into the Wednesbury pits using Thomas Savery's 'Miner's Friend' – 'an engine to raise water by fire' as Savery described it. The engine proved inadequate, however, since it was unable to draw water from depths greater than 26 feet.

Thomas Newcomen's engine proved more efficient. One of Newcomen's 'atmospheric' engines was first erected at Lord Dudley's Coneygre colliery in 1712, pumping 120 gallons of water per minute from depths of over 150 feet. After 1776, the even more efficient Watt engines were also used. However, just as malt prevailed over steam in the Warwick court house, so water often prevailed in the pits, resulting in the eventual abandonment of large stretches of the coalfield. A 1920 parliamentary commission report described the South Staffordshire coalfield as a 'water-logged rabbit warren'.

Despite the inefficiencies in production, the coalfield was producing over seven million tons of coal per annum by 1864 – coal that was needed to satisfy the voracious appetite of industry in Birmingham and the Black Country. Even by 1839 there were some seventy steam engines along a two-mile stretch of the Fazeley canal in Birmingham. This coal had to be transported to its end-users, and the cheapest and most efficient method was via the region's canal network. Canals were prone to leakage and the lock system led to a displacement of water.



Courtesy of Coleham Pumping Station

Coleham Pumping Station, Shrewsbury, interior view. Many of the buildings erected to house the engines were designed to resemble Victorian chapels.

Three years after a Watt engine was first used in the mines of South Staffordshire, an engine was put to work by the Birmingham Canal Navigation Company. Erected on the bank of the Old Main Line canal at Smethwick, a short distance from the Soho Foundry where it was made, the engine was used to conserve water by pumping it back up a series of locks to the 491-foot summit level of the canal.

The engine lifted 1,700 gallons of water per minute and continued to do so until 1891. In Derbyshire the Leawood pumping engine, built to pump water from the River Derwent into the Cromford Canal, became operational in 1850. The engine was still in work at the start of the twentieth century, records showing that in the summer of 1905 the engine was pumping at a rate of 6,783 gallons per minute, more than four times the rate of the Smethwick engine. Technology had clearly moved on.

In Burton-on-Trent, the Bass Brewery 'Shobnall Cuckoo' engine began pumping water in the early 1870s, although it is likely that steam power was used for pumping purposes before then. Bass used steam power to pump water from the subterranean springs to the surface. The renown of Burton beer depended partly on the quality of the local water, the properties of which encouraged fermentation, and enabled brewers to use a greater quantity of hops than is usual in brewing without adversely affecting the flavour of their beer.

In August 1863, the *Birmingham Daily Post* carried an article complaining that 'we have been poisoning the towns and now we are poisoning the rivers, till we are threatened with a time when neither man nor beast will be able to drink the polluted streams,

and some dreadful epidemic will devastate both our cities and our pastures'. From the mid-nineteenth century onwards, the power of steam was a major factor in enabling improvements to be made to public health through the provision of fresh water and the safe disposal of sewage.

As in many English counties, the citizens of mid-Victorian Herefordshire succumbed to epidemics of typhoid fever and other water-borne diseases caused by contaminated drinking water. In 1854, the Hereford Improvement Act was passed enabling the authorities to provide a piped supply of drinking water, a similar provision being made in Leominster a few years later. In Hereford the particular topography and geology of the area meant that the River Wye was effectively the only source of supply for large quantities of drinking water, and a pumping station was constructed just to the west of the city centre.

As the demand for water grew, so too did the size of the pumping engine and in 1895 a huge triple-expansion steam engine was installed with a pumping capacity of a million gallons every twelve hours. In contrast, a very small steam engine was used in the Worcestershire spa town of Tenbury Wells to pump medicinal brine from a well to supply the spa fountain.

Even as late as 1900, raw sewage flowed into the River Severn at Shrewsbury, so that the associated health hazards became a major concern for the town council. The result was that a steam-powered pumping station was opened at Coleham in 1901, pumping effluent about a mile and a half to a sewage farm at Monkmoor. Shrewsbury lagged behind Kidderminster which had seen a steam-powered treatment system introduced almost thirty years earlier.



## Hauling Goods

The railway was, according to the Reverend Dr Bowles of Hereford, 'that mighty iron missionary of civilisation and progress'. To contemporaries and historians alike, the railway was both a symbol of modernity and an instrument of economic and social change. The power of steam, realised through the railway, enabled faster and cheaper transport of people and goods than ever before. It could reach (and connect) hitherto inaccessible places. It was essentially democratic, in that it offered services to people other than the rich and privileged. It was dramatically visible and audible, thus trumpeting the power of steam.

Not that everyone approved. In April 1839, a year after the opening of the Birmingham to London line, a correspondent to the *Birmingham Journal* wrote of his dislike of railways. Apart from the incivility of porters, the writer also hated 'to be made to wait for a steam engine and for a steam engine never to wait for me'. Such complaints, however, failed to halt the march of steam and its power to bring change.

Such is the nature of technological change that some elements of the economy and society benefitted while others lost out. On the one hand, for example, employment opportunities were created in Rugby when new engine sheds were built, increasing their capacity from twenty-five locomotives in 1857 to 125 in 1878. On the other, the number of long-distance carriers in Warwick declined sharply, dropping from sixty-two in 1851 to thirty-six by 1871.

In several ways, however, the quality of life for urban dwellers began to improve. Fresh food could be delivered rapidly to the towns, the populations of which became dependent upon the milk train. Excursion trains ran to Buxton in Derbyshire and to Church Stretton in Shropshire, and employers treated their workforce to a day in the country. In September 1863, Birmingham cut-nail manufacturers John Reynolds & Son hired a special train to take 200 workpeople, their families and friends from New Street Station for a daytrip to Malvern.

It was not just on the railway system that steam locomotives 'hailed'. In 1825 the Cromford & High Peak Railway Company was created to provide a link between the Cromford and Peak

Forest canals. One major obstacle lay in the way: Derbyshire's High Peak region, which rises a thousand feet between the two canals. Since no locomotive could climb steeply inclined rails, the problem was solved by using a number of steam winding-engines to haul the wagons up and down a series of inclined planes linking the level sections of line.

And if pulling was not enough, a Uttoxeter landowner lectured his local agricultural society on his idea of pushing by steam power. 'I conceive', he told his audience, 'that four or five ploughs might be arranged and propelled by a locomotive steam-engine'.

## Driving Machinery

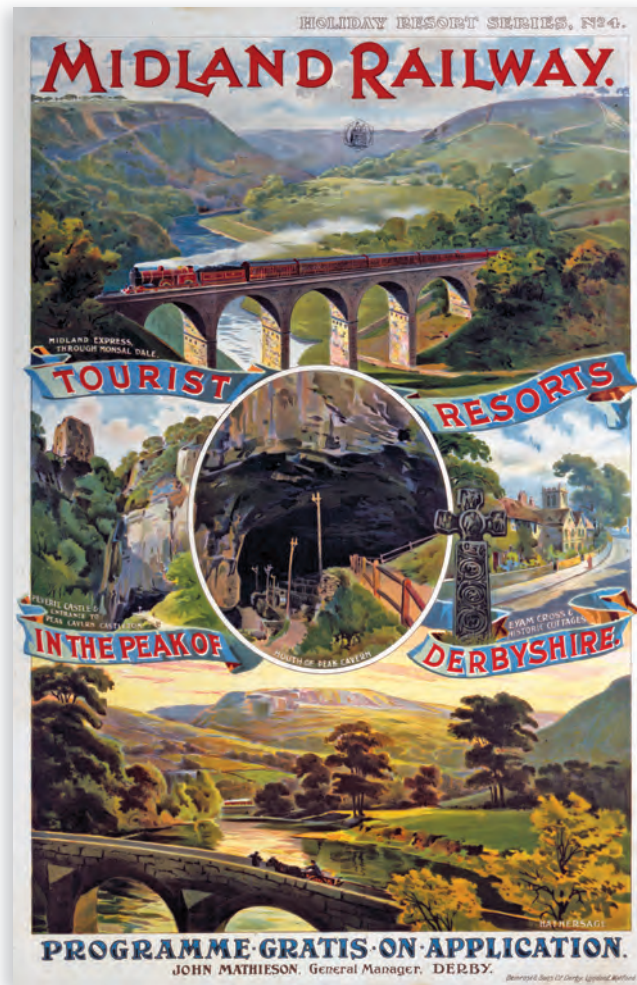
An early use of steam power to drive machinery in the West Midlands was to be found in the Potteries. In 1782, Josiah Wedgwood installed a Boulton & Watt engine to drive clay, flint and colour grinding mills. Other Stoke manufacturers, such as Spode and Minton, followed suit.

Although Birmingham had been a pioneer in steam-engine manufacture, most buyers, like the Staffordshire potters, came from outside the immediate area. Power was by no means generally applied to the local trades. Even by 1860, Birmingham and the Black Country could hardly claim to have reached a high degree of mechanical development. What machinery had been introduced was designed to replace strength rather than skill and was therefore most prevalent in the heavy metal trades.

In the Black Country, steam hammers were used to forge

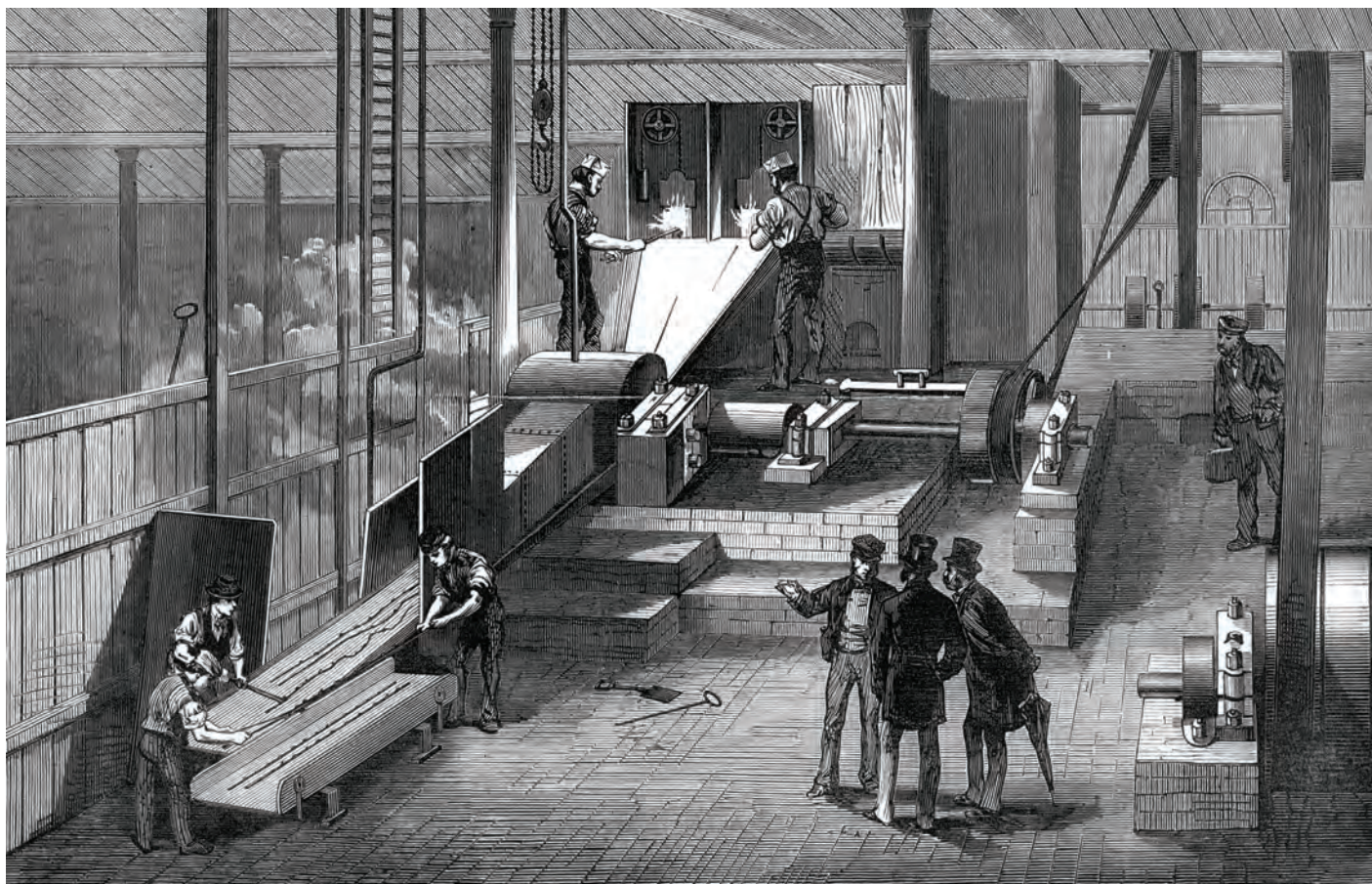
boiler plates, anchors and other similarly massive products, whilst in Birmingham steam-powered machinery was used to turn out smaller products: items such as coins and button blanks produced through the use of stamping engines.

Another small and seemingly insignificant article produced in Birmingham in their millions was the machine-cut nail. In 1812, whilst tens of thousands of people laboured for long hours hammering out nails in the Black Country, an American named Joseph Dyer arrived in Birmingham. He acquired the disused Britannia Brewery, lying close to Aston's Newtown Row, and set about transforming it into a mechanised nail manufactory, the first in the country.



*Tourist Resorts in the Peak of Derbyshire, Midland Railway poster, 1923-1947.*





New Rolling Machine for Making Horse-Shoe Nails, London. *Illustrated London News*, 4 January, 1873.

Over sixty nail machines were connected by a series of shafts and belts to a 32 hp Boulton & Watt engine. So impressive and so modern was the manufactory that it was included on the itinerary of important visitors to the town, including the future Queen Victoria visiting in 1830. By the 1850s there were twenty-six cut-nail manufactories in the town. Of these, the Britannia was by far the largest operation, the smaller ones often taking advantage of ‘power to let’.

### Cultural Impact

The railway was said to be an essentially democratic innovation. In a sense, so too was ‘power to let’. In 1836, William Hawkes Smith explained the benefits:

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

George and Thomas Attwood were copper-roller manufacturers with premises at Baskerville House Mill (on the site now occupied by the new Library of Birmingham). The mill housed a larger steam engine and more floor space than required for their manufacturing purposes. They therefore hired out workshop space to small manufacturers, allowing their tenants to take power

from the steam engine. In 1849, the Attwoods let out power and space to three glass cutters, a steel toy polisher, a bone button maker, and a nail cutter. The nail cutter was John Reynolds who, in the following year, moved to new steam-powered premises of his own in Newtown Row and subsequently acquired the Britannia Nail Works.

Steam power was not universally beneficial. While it undoubtedly contributed to advances in public health, it also caused unprecedented levels of air pollution. Steam-powered nail machines were described by one visitor to William Farmer & Sons’ Birmingham nail works as ‘the most violently crazy of mechanical lunatics, rendering the power of speech useless’.

Such was the level of noise in Felix Hadley’s nail factory that it caused him to go deaf. Of course, one can always find drawbacks to technological innovations. However, these shortcomings aside, the steam engine was without doubt a spectacular device. Equally remarkable was the transformative ‘power of steam’. ●

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#### Further Reading

G. C. Allen, *The Industrial Development of Birmingham and the Black Country 1860-1927* (Allen & Unwin, 1929; Cass, 1966).

William Rosen, *The Most Powerful Idea in the World: a Story of Steam, Industry and Invention* (University of Chicago Press, 2012).

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