

North East Derbyshire Industrial Archaeology Society



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Derbyshire's Contribution to the War Graves *Pat Pick*

A little known fact is that Derbyshire produced over 100,000 war graves. So how did a Wirksworth quarry produce them? Firstly we need to go back in time to see how the limestone for the graves was formed.

Millions of years ago most of the British Isles were under water. Conditions in the sea were favourable for the existence of marine creatures. They included corals, crinoids, and brachiopods. Their skeletal remains which comprised calcium carbonate deposited on the sea floor. Pressure over millions of years formed layers of limestone. The time is known as Carboniferous and as a result Hopton-Wood Stone is formed. It contains more than 99% of calcium carbonate, the fossils of the marine creatures.

Hopton Wood Stone is either dark or light depending on where it was formed.

The qualities of Hopton Wood Stone were early recognised and its reputation as a stone of beauty span over 150 years. Middleton-by-Wirksworth quarries is where Hopton Wood limestone of exceptional stone is found. It can be cut into very thin slices up to thick slices. Example of the worked stone can be found in Sheffield City Hall, the Bank of England also various churches and cathedrals. The list is endless.



The scene is now set to continue our story.

During the Second World War more stone was needed for the war graves. Hopton Wood Quarry was



Pictured above – LEFT The gravestones of Lijssenthoek Military Cemetery, Belgium (© Wernercv – This file is licensed under the Creative Commons Attribution-Share Alike 3.0 Unported, 2.5 Generic, 2.0 Generic and 1.0 Generic license.) and RIGHT all three stones loaded aboard the SGLR train at its Middleton terminus, ready for the trip to Steeple Grange on 11 November, 2018 (courtesy of and © Glyn Williams and Derbyshire War Memorials – [Wirksworth - End of WWI - Images \(derbyshirewarmemorials.com\)](http://Wirksworth-End-of-WWI-Images.derbyshirewarmemorials.com))



<https://www.facebook.com/nediaschesterfield/?fref=ts>



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asked to produce some 100,000 head stones. The quarry employed 30 engravers. The finished stones were transported down Steeple Grange railway to Cromford Canal and forwarded across the English Channel to Belgium. The head stones made their way to Lijssenthoek Military Cemetery near Poperinghe, in the province of West Flanders. Also the Helles Memorial, near Sedd el Bahr, in Turkey, on the headland at the tip of the Gallipoli peninsula overlooking the Dardanelles, and some in the nearby cemeteries. Most of the stones were laid in the 1920s but some as late as 1939.

At the anniversary of the ending of the First World War in 2018 the quarry owners were asked to produce three grave stones. The grandson of one of the original engravers engraved them. On the anniversary of the ending of the First World War one was erected at Holy Trinity Church Middleton and one at Steeple Grange Railway Station. The final one was transported from the quarry by Steeple Grange Light Railway to the waiting carriage (which transported King Richard 111's remains to Leicester Cathedral) to the Wirksworth Memorial Gardens, St Mary's Church. After a service it was erected in their memorial garden.



Pictured above (Top left to right) All three stones loaded aboard the SGLR train at its Middleton terminus, ready for the trip to Steeple Grange; The Memorial Gardens stone at Steeple Grange loaded aboard the gun carriage for transport to St Mary's Church for the Remembrance service; the stone in St Mary's Church for the service. (Bottom left to right) The Steeple Grange stone being blessed; the Middleton stone on the gun carriage outside Holy Trinity Church. (Far Right) The Steeple Grange stone in situ. (All courtesy of and © Glyn Williams and Derbyshire War Memorials – [Wirksworth - End of WWI - Images \(derbyshirewarmemorials.com\)](http://Wirksworth-End-of-WWI-Images.derbyshirewarmemorials.com))

WHAT'S ON?

NEDIAS Lecture Programme

Meetings are held at: St Thomas' Centre, Chatsworth Road, Brampton (opposite Vauxhall/ Bristol St Motors) S40 3AW. There's plenty of parking in their own car park, including disabled spaces, as well as on-road parking in front of the Church. All meetings commence at 7:30pm.

Monday, 14 February 2022	A talk on "Pleasley Pit" direct from director Neville Buckle
Monday 14 March 2022	"The Industrial Heritage of the Rivers of the Don Catchment; the remains and the future" by Rachel Walker.
Monday 11 April 2022	"The Workhouse" by Terry Bradley
Monday 9 May 2022	DAVID WILMOT MEMORIAL LECTURE. "St Pancras Station and Hotel" by Mike Higginbottom.

The Chesterfield Canal

Martin Allen

Our corner of Derbyshire is rich in industrial archaeology. Anyone with a pleasant summer stroll in mind would appreciate a walk along the surviving section of the Chesterfield Canal in Derbyshire, which is owned by Derbyshire County Council and managed by its Countryside Service. The Chesterfield Canal Trust run two tripboats, there is *Madeline* from Hollingwood Hub as well as *John*



Tapton Lock House c1880 (Courtesy of Chesterfield Canal Trust)

Varley II from Tapton Lock. The Trust only run full length trips from Tapton to Staveley once a month and they are usually pretty fully booked, so it is not possible to walk one way and cruise back the other. There is also an interesting visitors' centre at Tapton Lock, which is operated by Derbyshire County Council and is open every weekend. Along this five mile section, the tow path is fully accessible and is popular with dog walkers, hikers and the occasional horse rider. The canal is directly accessible from both Shireoaks (Nottinghamshire) and Kiveton Park (South

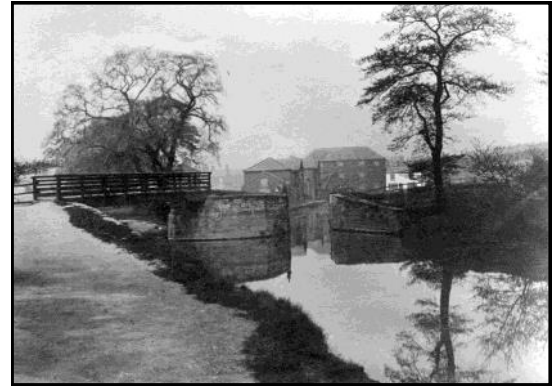
Yorkshire) railway stations, which are both on the eastern section of the canal – owned and managed by the Canal & River Trust. There are nine derelict miles between Staveley and Kiveton. Nothing exemplifies the dawn of the Industrial Age like an impressive flight of canal locks. There is an excellent example of these at Turnerwood, which is nearly three miles from the eastern portal of Norwood tunnel. The fifteen Thorpe Locks between the eastern portal and Turnerwood were the first to be built, but they were restored in 2002/3 and are an absolute delight. There are two trebles, two doubles and five single locks. Norwood Locks, just



Norwood Locks (Courtesy of Chesterfield Canal Trust)

below the western portal of the Norwood Tunnel, consists of a quadruple and three triple staircases which have not been restored. Sadly, this section of the canal is currently abandoned but impressive nonetheless. Thankfully, the remaining section close to the Eastern portal of Norwood tunnel and all the way to the River Trent at West Stockwith, is restored and still navigable. The remote hamlet of Turnerwood and the disused limestone quarry of the same name are close by and both make for a worthwhile visit in themselves.

The heyday of the canal came in the 1840s, when it was used to convey limestone blocks from the North Anston Quarry on the first leg of the journey to London, for the construction of the Houses of Parliament. Almost 500,000 cubic feet (about 36,000 tons) was conveyed in five years. From the beginning of the 20th century, the fortunes of the Chesterfield Canal began to wane. The first blow came when the roof of Norwood tunnel collapsed in 1907 and was never repaired. This effectively cut the canal into two parts and all commercial traffic then terminated at Shireoaks. The middle section of the tunnel was eventually lost to coal mining. The canal company formed an alliance with the Manchester & Lincoln Union Railway and Chesterfield & Gainsborough Canal Company (M&LUR/C&GCC). This line eventually became the Manchester, Sheffield



The original canal basin in Chesterfield (Courtesy of Chesterfield Canal Trust)



Norwood Tunnel, Western Portal 1910 (Courtesy of Chesterfield Canal Trust)

& Lincolnshire Railway (MSLR) on 9 July 1847. Ultimately, this undertaking became the Great Central Railway and with the grouping of the railways on 1st January 1923, the canal passed into the ownership of the London & North Eastern Railway.

The carrying of coal by the canal from Shireoaks Colliery could not normally compete with the railway, but the canal traffic was kept going because the railways were overworked during World War Two. After the war, there was no further justification in keeping the canal open and conveying coal ceased. Other minor traffic continued, such as bricks from the kilns at Walkeringham but this ceased in 1955. A curious enterprise was the collecting of river silt from the Trent, which was ground down and filtered to produce an ingredient called warp, which was used in the manufacture of silver polish. This merge trade struggled on, but was finished by 1955. The entire length of the canal was then proposed for official abandonment. However, all was not lost. The tale of long arguments with officialdom, of fundraising, many a public meeting and innumerable committee debates. Eventually, the Chesterfield Canal Trust emerged triumphant. After a concerted protest campaign, the long-term future of the canal was secured when the 26 mile section between Worksop and Stockwith was designated as a "Cruse Way" under the Transport Act of 1968. This became the catalyst to save the last remaining 20 mile section and the Chesterfield Canal Society was formed in 1976 with this objective. The society changed its name to the Chesterfield Canal Trust in 1998. Restoration of the five mile section of the canal from Chesterfield to Staveley began in 1987 and Tapton lock was reopened in 1990. Derelict Land grants were obtained by Rotherham and Nottinghamshire councils in 1995 and restoration between Norwood and Worksop began in earnest. The five mile section from Chesterfield which included four more locks and three new bridges, was at last made navigable and reopened in 2002. In 2003, the Worksop to Norwood Tunnel stretch of the canal was reopened, which now includes 30 restored locks, one new lock and three new bridges. Owing to the collapsed tunnel

and the mining of coal around the Norwood area, this portion of the canal will hopefully be rebuilt in the open air, probably at a higher level with locks at each end. The eastern end of the tunnel will be retained; no firm decision has been made on the western end of the tunnel, which could be reused, or the new higher summit level extended to the west. The future promises the reward of giving the canal a second outlet, for the first time in its history. The dream is to make the River Rother navigable between Killamarsh and Rotherham, thereby linking the Chesterfield Canal to the South Yorkshire Navigation canal. The long-term aim of the Trust is to link the canal with the River Rother and making it navigable between Killamarsh and Rotherham, which in turn would connect with the South Yorkshire Navigation. Many challenges will no doubt arise in the future and 10 miles of canal await to be restored or rebuilt. A significant diversion will also be needed around the village of Killamarsh, where a housing estate has been built around the route of the canal. Long may the Chesterfield Canal Trust flourish and we await further developments with great interest.



Thorpe Top Treble Locks (Courtesy of Chesterfield Canal Trust)



Chesterfield Canal Trust's trip boat *John Varley II* at Tapton Lock (Courtesy of CCT)



Interested in joining the Chesterfield Canal Trust? Here is the link: <https://chesterfield-canal-trust.org.uk/membership/how-to-join-the-chesterfield-canal-trust/>

Sir Richard Arkwright's unsurpassed biography by Robert Fitton* makes many references to "Robert Peel", and to the family who like the Arkwrights became textile industrialists; one of them became Prime Minister. But did you know that there were SEVEN Robert Peels in this family – rather like the numerous Richard Arkwrights.

So who were they, what did they do, and what were the links to Arkwright?

1. Robert "Parsley" Peel, 1723-1795.

Robert "Parsley" Peel was the son of a Lancashire yeoman farmer, William, whose family was also involved with domestic textile work. In the 1760s Robert established a Calico printing works near Oswaldtwistle. For spinning he initially used Hargreaves Jenny. Their most successful print design was a simple parsley leaf print, and so Robert's nickname "Parsley" Peel.

In 1772 and with funds from his father, "Parsley Peel" established a further mill at Altham near Accrington on the River Calder, using Arkwright's patented technology for spinning. Did Peel pay him a licensing fee? Fitton, p93, suggests he did, and that he paid "£2 per spindle". This Altham mill – like Arkwright's Birkacre Mill in Chorley - suffered from the riots in Lancashire in 1779. He had bought a medieval corn-mill, converting it for his needs. It still stands, although with later additions and a chimney added in 1850s. It was converted to flats by a community cooperative in the 1980s.

Due to the unrest, Peel decided to move somewhere quieter and set up business in a new very successful mill at Winhill, Burton-on-Trent. His four-storey mill was set up on the site of an earlier fulling mill. It still stands by the River Trent, and like Arkwright and Strutt, before 1790 Peel established a number of other cotton mills. In fact, due to the activity of the Peels, Burton's main industry before industrial beer brewing was cotton! His first mill at Winhill still stands. The Peels ceased to work these mills in 1841.

2. Sir Robert Peel, MP. 1st Bart. 1750-1830

The second Robert was son of Robert "Parsley" Peel, and whilst still in Lancashire was made a partner in his father's business at age 23. He established his own first Calico mill in Bury which quickly became a leader in Calico prints.

In 1790 he had moved to Fazeley, developing another mill there and a second in Tamworth. He became MP for Tamworth, buying the Drayton Manor estate. He had businesses now in Lancashire, Tamworth and Fazeley, and said to be eventually employing 15,000 people. Unlike the Arkwrights, Peel used workhouse children from London to staff his Staffordshire mills.

Whilst Sir Richard Arkwright had been knighted in 1785, Peel became an MP in 1790 and was awarded a hereditary Baronetcy (of Drayton Manor and Bury) in 1800 after donating £10,000 to the government war bond. In the Commons he supported Pitt's Tories. He was supportive of the factory act of 1802 and continued to call for extra reforms. He chaired the 1816 enquiry into employment of children.

Richard Arkwright Junior (whom Fitton describes as a friend of Sir Robert Peel, 1st Bart) gave evidence to this enquiry on employment of children at Cromford in which he confirmed details of education practices there. This enquiry led to the 1819 Factories Act, limiting hours of work for children.

It was at this time after the Napoleonic wars when the cotton trade in England was temporarily in the doldrums, that Peel was corresponding and commiserating with Arkwright Jnr over lack of trade. (Arkwright's businesses showed losses before coming back into profit in 1821, see Fitton p 227).

Sir Robert Peel, this first Baronet, died at Drayton Manor in 1830, leaving some £1.5 Million.

3. Viscount Sir Robert Peel, MP and Prime Minister. 2nd Bart. 1788-1850.

This is the most famous Peel, who became MP at age 21, serving for three other constituencies before following his father as MP for Tamworth; he became Prime Minister in 1830. Born in Bury, he was largely brought up at his father's Drayton Manor estate. His many credits include moulding the Conservative Party and as Home Secretary founding the Metropolitan Police; he became Speaker of the Commons and was created Viscount Peel.

It was Peel's 1846 repeal of the Corn Laws that had such devastating affects on the agricultural returns at John Arkwright's (RA Jnr's 4th son) Hampton Court Castle and the steady decline of the estates there in the late 1800s.

At Drayton Manor in later life, Peel rebuilt the house on a much grander scale, leaving in 1850 a fortune of over £1 Million.

On his death, Queen Victoria said of him: "Everyone seems to have lost a personal friend"

4. Sir Robert Peel, MP. 3rd Bart. (1822-1895)

Robert Peel 4 inherited the great fortunes made by his predecessors, but appears to have none of the entrepreneurial spirit, and became known as a great socialite and bon viveur, spirits of a different sort. Some say the ruin of the family.

He spent a fortune at home on horse racing, developed a fully equipped and for the time most modern stud and race course at Drayton Manor, where he entertained quite lavishly. There and in the family's houses in London and Geneva.

His election to Parliament was not without problem, he was indicted on charges of bribery and corruption.

By the mid-1840s, with fortunes spent and debts mounting, parts of the estate and stud were being parcelled off for sale, and Drayton Manor was now in Trust. On his death little of the family fortunes remained.

5. Sir Robert Peel. 4th Bart. (1867-1925)

It was clear that Robert Peel 5 had inherited the traits of his father and he lived beyond his means. As a young man he spent much time in London society, and in the group surrounding Edward, Prince of Wales. He too entertained at Drayton Manor, often attracting actresses including Lily Langtry.

But the Estate was now in Trust, and he was permitted just £3000 per annum. Much of his time was spent abroad in Paris and Switzerland, whilst the Trustees sold off the Manor's contents, goods and chattels (including a celebrated library) to defray massive legal expenses and costs of debts.

To try to inject cash, Robert Peel 5 married a Baroness whom he thought to be wealthy, but she turned out also to have little money. It turned out to be a disappointing match but she did leave him with a son and heir.

Robert Peel 5 died at Drayton Manor, and left probate effects of just £205.

6. Sir Robert "Bobby" Peel, 5th Bart. (1899-1934)

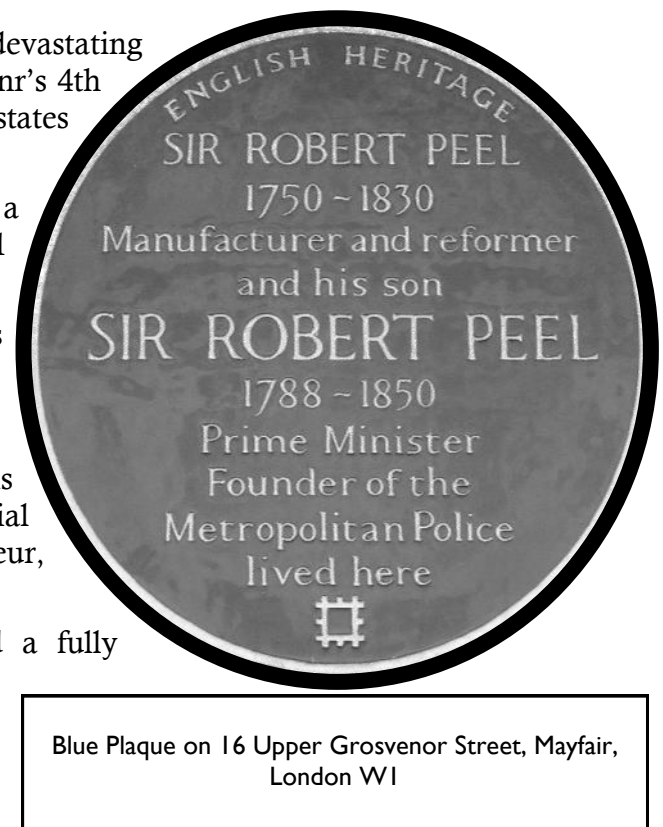
The sixth Robert Peel was a flamboyant, colourful and locally very popular man. He had absconded from Harrow to join-up in WW1. Returning after a spell in the Coldstream Guards and after his father had become bankrupt again, he became for a while a used car salesman. Like his father he moved in theatrical and society circles in London, but inherited a love of gambling.

Wooing Beatrice Lillie, a Canadian actress, their wedding in Fazeley and Drayton Manor was a society event, and they went to live in St Johns Wood. She was no heiress to help out with the family debts (to the annoyance of his father) but it was in London and later on Broadway that Beatrice's career took off. He passed away at age 35 just 10 years after his father, but left a son --- the seventh Robert Peel in the line, who at age 15 inherited the family Baronetcy.

7 Sir Robert Peel, Ordinary Seaman. 1920-1942

This 7th Robert Peel, the 6th to inherit the Baronetcy, was born and brought up in St Johns Wood, occasionally visiting Drayton Manor. On outset of WW2 he joined the navy, but died aboard HMS Tenedos in 1942 when the ship was bombed in Ceylon.

Was there a further Robert Peel? After number 7, the direct line through successive Robert Peels was now broken, the Baronetcy to be inherited by a second cousin.



Drayton Manor

The first Baronet had bought Drayton Manor, which had been a plain Georgian manor house in 1799. His son, the second Baronet who became PM, had the Georgian home demolished, and rebuilt in 1830s in the Elizabethan style. By the 1920s the family fortune had gone, and the contents of the house sold off, much to Museums in America. Marble columns stripped out, lead flashing, water pipes, garden statuary and all. Without protection, the structure suffered.

The final years of the Peel's Drayton Manor have great similarities to the final years of the Arkwright's Sutton Scarsdale Hall

In summary, the first three Robert Peels established the great family businesses in cotton spinning and calico, and moved on into politics. The next three generations were to contribute to and see the demise of the family fortunes, the destruction of their great estate in Staffordshire and erosion of the family name and stature.

To learn more about the Peel family, visit the Robert Peel Museum set up within Middleton Hall, Tamworth (<https://e-voice.org.uk/thepeelsociety/>) (<https://www.middleton-hall.co.uk>)

*Reference: *"The Arkwrights - Spinners of Fortune"* by R. S. Fitton , Manchester University Press, 1989



Drayton Manor in 1842
Unknown engraver, published by J&E Harwood, London, Public domain,
via Wikimedia Commons

https://commons.wikimedia.org/wiki/File:Drayton_Manor.jpg

The Little Eaton Gangway

Martin Allen

Derbyshire is rich in railway history and it does not come any older than 1793, when the Little Eaton Gangway (or Plateway) was granted an Act of Parliament to proceed. In expounding our story, we must first define what a “plateway” actually is. It relates to the form of the wheel profiles being without flanges and with the permanent way built with rails manufactured in cast iron. Since the wheels are flangeless the vehicle guidance is provided by the rails having an integral flange or upstand in an “L” shape, also called an “edge rail”. Due to the primitive casting process for the rails, these could only be manufactured in 3 or 4 feet lengths. Consequently, the ends of the rails had to be supported by stone blocks and a hole in the base of the rails was provided for an iron nail that was driven into a wood plug set in a hole made in the upper surface of the stone block.

The famed canal engineer William Jessop prepared plans for a canal system based on the Derwent Valley and these were presented to the subscribers for the canal on 3rd November 1792. This was later modified by Benjamin Outram to incorporate a tramroad or gangway. William Jessop went on to be involved in the famous Cromford & High Peak Railway near Wirksworth in Derbyshire and Benjamin Outram had been involved in another tramway from his own quarries at Crich to serve the Cromford Canal. Construction work for the gangway including earthmoving and bridge building, which started in August 1793. The “Committee of the Proprietors” then met in December 1793 and agreed to purchase the first set of iron rails weighing 28 pounds each, from Joseph Butler of Wingerworth near Chesterfield for £10 and 10 shillings per ton. These were delivered in February 1794 when construction of the plateway commenced. The stone blocks forming the sleepers were made from gritstone and excavated from quarries adjacent to the line near to Coxbench and Little Eaton. Conveniently for the operation, there was a downhill gradient of 100 feet in 5 miles down from Smithy Houses to Little Eaton, in the direction that the loaded wagons would operate. By 11th May 1795, a length of gangway nine miles long was opened, when the first load of coals from Denby Hall colliery was received in Derby via the canal at Little Eaton, where it was donated to the poor as a celebratory gesture. The plateway originally ran for five miles from the canal wharf at Smithy Houses, with

short branches at Salterwood North, Henmoor Collieries, Horsley Quarry at Coxbench, Kilbourne Colliery, together with the potteries of Denby and Belper. In 1827, an extension of the original plateway was proposed to serve Streetley Colliery at Smithy Houses and the survey was made by George Stephenson. However, the work was never carried out and the project was finally abandoned in 1832. The horse-drawn gangway was already obsolete, since railways with steam locomotives as motive power had already been proven with the earlier Liverpool & Manchester Railway together with the Stockton & Darlington Railway, both of which were engineered by George Stephenson.

The gangway was constructed as a single running line from the canal wharf at Little Eaton, serving numerous collieries, quarries and potteries. Several passing loops were provided along the route, so the traffic must have been quite intense. The turnouts for the passing loops and sidings comprised of a single moving point blade which was operated by a pinch bar (or the heel of the boot!), as no proper levers were provided. The track gauge has been the subject of much conjecture, having been variously quoted as anything between 4 foot 5 inches and 4 foot 7 inches, probably because the stone blocks which formed the track were not rigid enough to tie the gauge together. In any case, the wheels on the wagons were a generous “sliding fit” on the axle, as a preserved example in the National Railway Museum at York will testify. The wagons themselves (confusingly referred to as “trams”) had flangeless wheels. A train of eight wagons could be hauled by four horses. There is some conjecture that oxen were used in the early days and some ox shoes were discovered when a water main was being dug along the Duffield Road in 1952. It was not unknown for the wagons to deviate onto the roadways when delivering to nearby properties, but the damage to the road surface was considerable and this practice was officially frowned upon. Three types of wagon existed, the principle traffic being coal and these types were therefore the most common. The coal itself was carried in skips or containers mounted on undercarriage frames and therefore this was the world’s first example of freight containerisation. The carrying capacity was approximately 48 hundredweight. The second type was for carrying stone and differed slightly in being smaller in overall height and it had open slatted sides to keep the tare weight to a minimum. A third type called a “mule” was slightly smaller again and could carry one ton of produce which was typically agricultural foodstuffs. In all cases, the braking method was to insert a sparg of wood into the spokes of the wheels. Unloading into canal barges at Little Eaton for onward shipment was achieved by fixed cranes at the quayside and direct into the waiting barges, another early example of mechanical handling ahead of its time. Alternatively, the contents of the containers could be end-tipped into two wheeled carts for local deliveries by road. Modern “integrated transport” at its finest!

When the Midland Railway built the branchline to Ripley in 1856, the gangway lost most of its commercial trade and it was the beginning of the end. The gangway lasted for 105 years and was finally closed in July 1908. In the 1950’s, the trackbed was used for the construction of the A61 road which eventually became today’s B6179 road. The only surviving traces are the Clock House wharf building at Duffield Road in Little Eaton. Two bridges also survive, one of two arches over Bottle Brook and the fragments of another called Jack O’ Darley Bridge, both near the village of Little Eaton. Some of the original stone blocks for the track can also be seen at Openwood near Belper. The most intact fragment of the route is the Henmoor Colliery branch near the A38 road and the roadside stone walls in this area incorporate some of the stone blocks from the gangway.

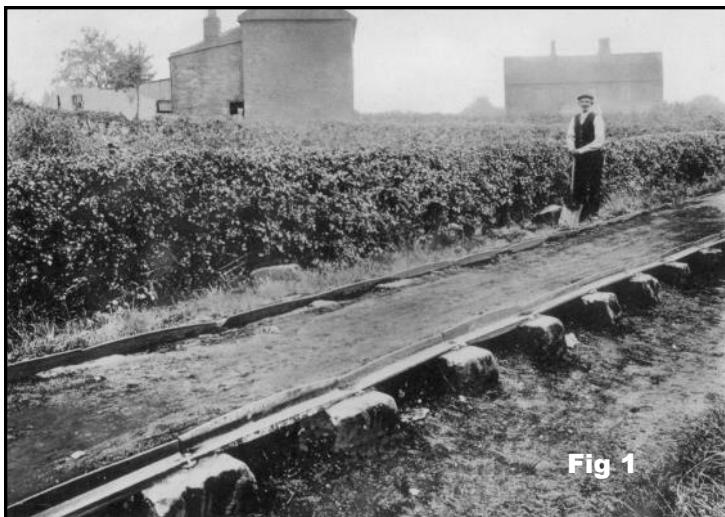




Fig 3



Fig 4

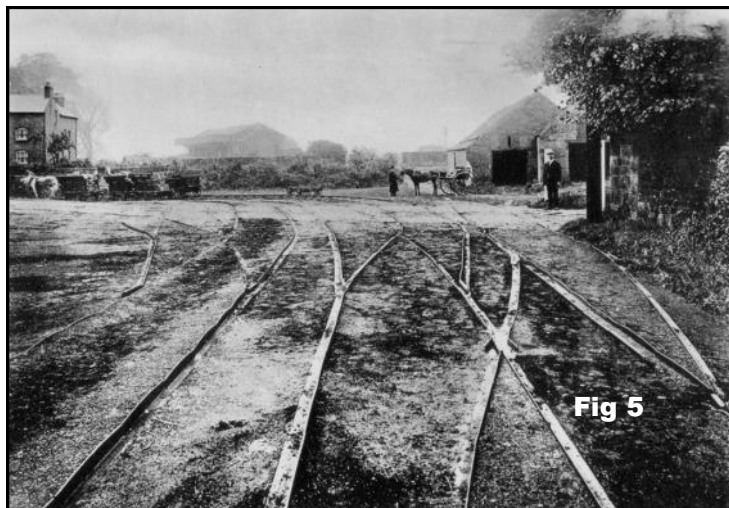


Fig 5



Fig 6



Fig 7

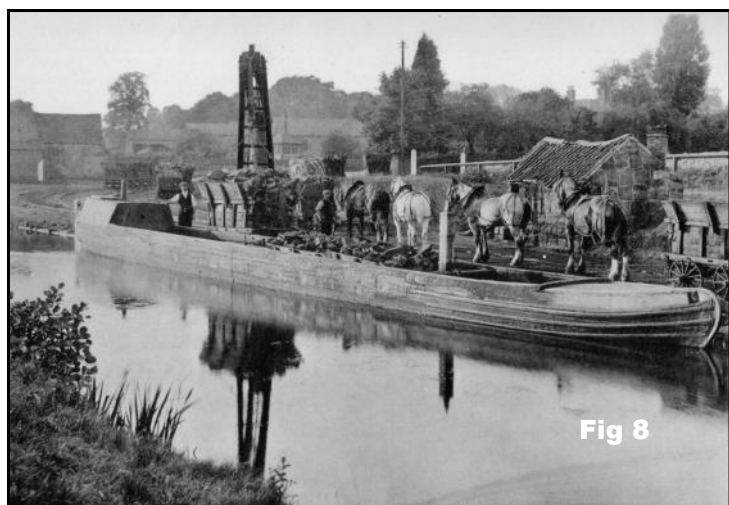


Fig 8



Fig 9



Fig 10



Fig 11

For descriptions please see overleaf

The pictures above are of the **Little Eaton Gangway** in Denby constructed by Benjamin Outram and opened in 1795. This 5-mile long track was built around the same time as the Caerleon Tramroad to carry coal to the Derby Canal at Little Eaton. The photos are from *Some Chapters in the History of Denby* by Mark Fryar published in 1934. They were taken just before the line closed in 1908. <http://www.caerleon.net/history/tramroad/outram.html>

1. Outram's Railway showing construction
2. Outram's Railway showing construction and wagon
3. Outram's Railway, Coxbench – Waggon and Horses, July 1908. Driver, W Wooley
4. Outram's Railway, between Coxbench and Little Eaton – Waggon and Horses, July 1908
5. Outram's Railway, Little Eaton – Points and Crossings, July 1908
6. Outram's Railway, Little Eaton – Arrival of Last "Gang", July 1908
7. Outram's Railway, Little Eaton – Arrival of Last "Gang", July 1908
8. Outram's Railway, Little Eaton – Loading into Boats, July 1908
9. Outram's Railway – Crane
10. Outram's Railway – Rails and Crossings
11. Outram's Railway – Rails and Crossings, Reverse Side.

Sir Harry Ricardo FRS (Automotive Engineer)

John Hodson

Harry Ricardo is remembered for his considerable achievements in the area of automotive research, in particular with regard to the petrol internal combustion engine. However, in common with many great engineers, he has never been given full credit for his work. His research into small scale high speed Diesel engines led to the world's first Diesel passenger car in 1934. Harry Ricardo's work was behind the sleeve-valve air-cooled radial engines that powered many British Civil and Military aircraft over so many years. His work on fuels led to the method of classifying fuels by their octane rating. The aforementioned are just a few examples of his work.

Harry Ricardo had an interest in motorcycles over many years. In addition to the Ricardo Triumph, Harry built two other motorcycles during his life. His early work on the motorcycle brought about his interest in the internal combustion engine which led to his lifelong work in this and related subjects.

Harry Ricardo was born at 13 Bedford Square, London on the 26th January 1885.

Distant ancestors can be traced back to Portugal and the family arrived in England via Holland. Several members of his family were members of the London Stock Exchange, but Harry's father, Halsey Ricardo, was an architect by profession.

Young Harry showed an interest in practical mechanical matters watching craftsmen at work whilst walking around the streets near Tottenham Court Road/Bedford Square with his father. Here he gained admiration for skilled craftsmanship of any kind.

Within hours of his birth a place had been reserved for Harry at Rugby School. This was followed by time at Cambridge University. However, early schooling took place near Rottingdean and was not a great success from Harry's viewpoint. He left Rottingdean in July 1898 without any regrets except for parting with Rudyard Kipling with whom he had struck up a friendship.

Harry started at Rugby school in 1898; on his second day there he discovered the school workshops which contained three lathes, one screw cutting, a drilling machine and several vices. He took the trouble to make friends with the workshop foreman. He was also interested in the Crossley gas engines driving Ferranti alternators for the school electrical power supply.

Whilst at Rugby Harry set about constructing a steam engine. This was a two vertical cylinder engine with Poppet valve mechanism. Difficulties with the valve mechanism were overcome as were difficulties with the piston ring seals. The workshop foreman helped out by remaking the piston rings. Attempts to make a flash boiler were unsuccessful and Harry concluded that it was impossible to make a small enough flash boiler. A conventional vertical fire-tube boiler was used and steam engine and boiler were fitted to Harry's pedal-cycle to form his first motorcycle. The boiler was started with a paraffin stove and then coal fired. His friends demanded demonstrations of this steam motorcycle but they were mainly entertained by Harry falling off. By



The Blue Plaque outside
Ricardo's birthplace 13, Bedford
Square London

1902-1903 there were petrol driven motorcycles about and the many practical difficulties associated with Harry's steam motorcycle led to its abandonment.

In 1903 Harry started at Cambridge University and initially his studies were directed towards joining his grandfather's firm of consulting civil engineers. There was no engineering society at Cambridge so Harry joined the recently formed University Automobile Club and eventually he became the secretary. Harry did not take long to familiarise himself with the excellent engineering facilities in the university workshop and as a result he decided to make a motorcycle of his own design using ideas derived from the experience of riding many different models.

Harry discovered that Chater Lea supplied robust components and bought a frame, wheels, handle bars etc., to his own design, for a small sum. Old friends at the Laystall Engineering Co produced De Dion type crankcase castings, cast iron air cooled barrels and cylinder heads. Harry bought the biggest cylinder and head castings he could get. He designed his own piston avoiding the use of a fixed gudgeon pin by using the now familiar floating gudgeon pin. The piston was made as light as possible and in two parts with the ability to adjust the compression ratio. Harry preferred the run and jump on method of engine starting so he decided to dispense with pedals and fitted long running boards to assist with starting. Stretch of the leather drive belt was overcome by providing a method of moving the rear wheels to adjust the belt. The engine, which was of nearly 900cc capacity, was difficult to start. To overcome this Harry decided to follow the gas engine practice of starting on half compression by using a half compression cam. Once started and travelling at about 10-12 mph full compression was applied. It took Harry less than two terms to complete his home-made motorcycle. It performed very well but was not very fast due to the rather small automatic inlet valve.

According to Harry, the home-made motorcycle was instrumental in changing his whole future career, presumably from civil engineering to automotive engineering.

At the suggestion of Professor Hopkinson, Harry entered his home-built motorcycle in a fuel consumption competition being organised by the University Automobile Club. The route followed was Cambridge to Royston to Newmarket and back to Cambridge and about fifteen machines of engine capacities 150cc to 900cc were entered. At nearly 900cc Harry's motorcycle was by far the largest in capacity of any of the competitors and was therefore not expected to win. Not daunted, Harry set about applying a scientific and systematic study to the problem.

1. Harry studied the route and considered the terrain to be such that it would not be necessary to adjust the carburettor after initially setting up.
2. A large pulley was fitted to the engine. The high gear ratio, small flywheels and large engine resulted in progression by a series of violent lunges, but with practice Harry managed to control the machine.
3. A Longuemare spray carburettor was used rather than a surface or wick type.
4. Petrol spraying out of the carburettor inlet was recycled by fitting a secondary rudimentary wick carburettor made out of a cocoa tin and a lamp wick. This resulted in a 20% reduction in petrol consumption.
5. The air/fuel ratio was finely tuned by use of a valve fitted between the carburettor throttle and the inlet valve.
6. Because of its low viscosity and oiliness, sewing machine oil (sperm oil) was used for sump lubrication. This reduced petrol consumption by another 10%.

The result of the fuel economy trial was a resounding win for Harry as he finished several miles ahead of his nearest rival who was mounted on one of the smallest machines. Harry Ricardo regarded the win as his greatest triumph "for I had put my whole heart and all my thoughts into its achievement".

Partly as a result of winning the economy trial, Harry accepted an invitation from Professor Hopkinson to join him on a research programme into the internal combustion engine with the aim of overcoming factors limiting the performance of the engine.

Whilst still at Cambridge University Harry Ricardo continued to work on the two-stroke petrol engine that he and his cousin Ralph Ricardo had first produced in 1902. With two fellow undergraduates, Harry Hetherington and Michael Sassoon (brother of Siegfried Sassoon), Harry developed the engine such that it was capable of powering a small car. The four of them set up a company to manufacture a range of two and four cylinder two-stroke engines in large numbers. The Two Stroke Engine Company Limited was set up in

March 1908 and was based at Shoreham, West Sussex. The Dolphin engine, as it was called, turned out to be particularly useful for powering fishing boats and before long the entire fleet at Shoreham had been converted to use this engine. Unfortunately all efforts to sell the Dolphin marine engine elsewhere came to nothing and so the company returned to the original idea of producing cars and car engines. Unfortunately for The Two Stroke Engine Company Limited, significant developments had been made with the four-stroke engine such that it was universally regarded as the engine of choice for the car. Only about nine cars were ever made and of these seven were sold, one was kept as a works demonstrator and the other, a single cylinder model, was used by Harry Ricardo for over ten years. The Shoreham works was closed in 1909 and the company was dissolved in August 1911.

After briefly working for his grandfather's firm of civil engineers Harry Ricardo formed his own company. The company, which was registered as Engine Patents Ltd in August 1915, got off to a slow start but within two years the situation had changed as a result of Ricardo's involvement with aero-engine design and the new engine for the Mk V tank. Ricardo was introduced to the new weapon called the tank in early 1916. Before very long he became increasingly involved with a project to replace the under powered Daimler engine then being used to power tanks. To Ricardo's great credit he was soon called upon to design the new tank engine, despite there being many more experienced engine designers and his reputation was such that manufacturers promised their full cooperation with the development of the new engine. When tested the engine was found to have 50% more power output than the Daimler engine despite the fact that both engines had the same cubic capacity. Over 8,000 of these 150hp six-cylinder tank engines were assembled at Gardner's works at Manchester in 1917. In July and August 1918 the Mk V tank fitted with Ricardo's 150hp engine saw significant service in France which contributed to the collapse of enemy morale and the Armistice which followed 100 days later.

Ricardo set up a private research centre for research into the internal combustion engine using £30,000 that he had received from the government in recognition of his work on the Mk V tank engine. It was not until 1919 that the company returned to Shoreham moving to the Bridge Works. The Ricardo Company was named in 1920.

In early 1919 Major Frank Halford joined Ricardo's company after he left the army at the end of the First World War. Halford, an engine designer, was very keen on motorcycling and had a 500cc Triumph with a side valve engine which Harry considered to be well made and well designed. In 1921 Halford entered the Triumph in a trial at Brooklands, using a new alcohol based fuel developed by Ricardo's, and easily won. Following this success they decided to design and construct a new cylinder, cylinder head and piston for the Triumph. The cylinder head was constructed with four inclined valves operating in pairs from the original valve mechanism. A bronze alloy head was utilized and this avoided the need to use valve seats. Further improvements consisted of centrally positioning the spark plug, using efficient cooling fins, increasing the valve area and fitting a light aluminium domed piston. The compression ratio was 8 to 1.



The Triumph Ricardo Engine

Halford entered his machine in races against motorcycles with larger capacity engines and once again he easily won. He used a fuel prepared and supplied by the Shell Company and known as racing spirit, the fuel was so successful that it was considered by some to be based on a new explosive developed during the war (actually it was a mixture of benzene, acetone and ethanol, with castor oil as lubricant). Ricardo's company was awarded a contract from the Triumph Company to redesign their engine including the Ricardo features except that the compression ratio was lower for use with ordinary petrol and the cylinder head was of cast iron. The Triumph Ricardo was created and proved very popular over the next decade bringing in several thousands of pounds in royalties and much credit to the Ricardo Company.

Ricardo and the Ricardo Company's interest in motorcycle engine design continued into the 1930's and beyond. Harley Davidson where one of Ricardo's earliest American clients and this collaboration resulted in the use of the Ricardo designed cylinder head in the big twin 1200cc model introduced in 1930.

Space allows only a few of Sir Harry Ricardo's great achievements to be mentioned in this article. Over the years Sir Harry Ricardo's work included:-

- Research resulting in the transformation of the internal combustion engine.

- Fundamental studies on combustion.
- Research on lubricants.
- Development of the sleeve valve engine.
- Investigation into knock in the petrol engine.
- Research on fuel economy which facilitated the first Atlantic crossing by air.
- Work on WW1 tank engines including design of the Mk V tank engine.
- Special air compressor development.
- Work on small high speed Diesel engines.
- Providing assistance to Sir Frank Whittle with the development of the jet engine.

In 1929 Ricardo was made a Fellow of the Royal Society, between 1944 and 1945 he was President of the Institution of Mechanical Engineers and in 1948 he was awarded a knighthood. Over his lifetime he was awarded numerous certificates, diplomas, medals and honorary degrees.

Sir Harry Ricardo FRS retired in 1964 and died in 1974. His organisation became a public company in 1962; in 1978 it became Ricardo Consulting Engineers Ltd and in 1990 the company merged with SAL International and it is now known as Ricardo plc.

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IA News and Notes

DCRT HIDDEN HERITAGE SECRET STREAMS PROJECT

REDISCOVERING THE RIVER ROTHER

The River Rother and its many tributaries came to prominence in the early days of the 17th century, when the fast-flowing brooks and streams were tamed and damned to serve watermills, that powered the growing industrial revolution.

In the 19th and 20th centuries heavier industries arrived, bringing toxic pollution that all but wiped out aquatic life. For many years the 'dead river' was left unwanted. It was unnaturally straightened, culverted and covered up, built upon and hidden away from sight.

NATIONAL LOTTERY FUNDING

Thanks to support from the National Lottery Heritage Fund, the Don Catchment Rivers Trust aims to restore Chesterfield's rivers. The project will re-wild a section of the river Rother, allowing it to behave more naturally and function better, whilst boosting the potential for returning wildlife to flourish.

Anthony Downing, for the Environment Agency's Don and Rother Environment Programme, said: "This project is a great opportunity to deliver some important improvements to the natural environment of the River Rother, once one of Europe's most polluted rivers. A great benefit of working with DCRT, and HLF support, will be to bring this once neglected river into the heart of the community through their great volunteer and engagement work."

As well as restoring the river, DCRT aims to help communities rediscover the Rother by...

SPARKING COMMUNITY PRIDE: As part of the three-year project, communities can celebrate and discover the history of Chesterfield's waterways by uncovering archaeological evidence and taking part in community walks and events.

CHANGING ATTITUDES: Schools, uniformed groups and local families are offered free educational activities, focused on protecting wildlife and the future of our rivers. New trails and interpretation will be created, allowing communities to access and rediscover the river.

ENABLING PEOPLE: Catchment volunteers are working to eradicate damaging invasive species and remove decades of industrial waste from the river. Citizen scientists, trained in wildlife identification skills, are helping to monitor the river's changing diversity and record wildlife.

NB: Make a note of this date (our March 2022 Meeting) Monday 14 March – "The Industrial Heritage of the River Don Catchment – the remains and the future" by Rachel Walker

Proposed cuts at Stoke's industrial museums

A public consultation has been launched on Stoke-on-Trent City Council's plans to make major budget cuts at two of their industrial museums. These include cutting 19 full-time museum roles – including two specialist curators – and replacing these with 5.5 new posts. The proposals will also significantly reduce opening hours for the grade 2*-listed Gladstone Pottery, and the Potteries Museum and Art Gallery.

Stoke-on-Trent is famous for its pottery heritage. It was home to World-renowned ceramic producers and innovators such as Clarice Cliff and Josiah Wedgewood, and the city's industrial museums and collections are internationally important. Gladstone Pottery has also become known in recent years as the location for Channel 4's Great Pottery Throwdown, which has raised its popularity as a filming location. The current proposals include closing Gladstone Pottery to the public for five months a year, so that it can be rented out as a film and events venue, with a reduced museum team working across both museum sites for the rest of the year.

The Association for Industrial Archaeology commented that although they recognise the difficult financial position that all Local Authorities face at the moment, they feel that the proposals, particularly the loss of experienced curatorial staff, are short-sighted. Stoke-on-Trent City Council fail to acknowledge the importance of Stoke's industrial museums (and collections) to the local and national cultural landscape and visitor economy.

[Arts Industry article about the proposed heritage cuts in Stoke](#)
[Comment in the Stoke-on-Trent Council budget cuts public consultation](#)

Historic England Heritage At Risk

In November, Historic England updated their Heritage at Risk register. In the past year, 233 buildings and sites have been removed from the register, but 130 new sites have been added. Amongst the notable industrial sites added to the register this year are the Severn Wharf Building in Ironbridge, Shropshire (home of the Museum of the Gorge), Thorington Tide Mill in Essex, and Bursledon Brickworks, Swanwick, Hampshire, a 19th-century steam-powered brickworks, now a museum.

[Full details of the changes to the Heritage At Risk register.](#)



Gladstone Pottery, Stoke-on-Trent.
(Image by NotFromUtrecht - CC BY-SA 3.0
[Creative Commons Licence](#))



Bursledon Brickworks. Image courtesy of
Historic England.

John Rennie commemoration

To mark the 200th anniversary of John Rennie's death in October 2021, a new web site was set up by members of the Institution of Civil Engineers and the Rochester Bridge Trust to celebrate the life and work of this pioneer of civil engineering. The site includes an interactive map and essays describing dozens of Rennie's most important projects.

[Rochester Bridge Trust Life and Works of John Rennie](#)



Chairman's Chat

Cliff Lea

We start our talks programme on Monday 14 February with a bang! A really great subject: Neville Buckle, director of Pleasley Pit Trust, will talk about the history, rescue and regeneration of the pit and site. What a great subject to kick off this season. Pleasley Pit was sunk in the 1870s and produced massive amounts of coal until 1983. It still has its two winders in situ, one from Lilleshall, the other from Markhams. I am in awe of the vast amount of work carried out by the Friends of Pleasley Pit and we'll set up a visit there later in the year following Neville's talk to us.

Diana Allen has recently photographed this information plaque which is in the courtyard area of the restored Dronfield Barn and which draws people's attention to grinding stones and roof tiles unearthed by NEDIAS excavation of the nearby Damstead Works. Goodness, this was 15 years ago! It's a timely reminder that we do get involved with practical work. It's an appropriate reminder; our second talk of the year will show some of the NEDIAS involvement with our assistance in surveying tributaries of the River Don in our area much more recently.

The full programme is:

Mon 14 February: **"Pleasley Pit"** by Neville Buckle

Mon 14 March: **"The Industrial Heritage of the Rivers of the Don Catchment; the remains and the future"** by Rachel Walker. In the days before-Covid, members of NEDIAS A-Team assisted the Don valley Catchment Trust in surveys of the tributaries in this area, looking for tell-tale signs of early industries.

Mon 11 April: **"The Workhouse"** by Terry Bradley

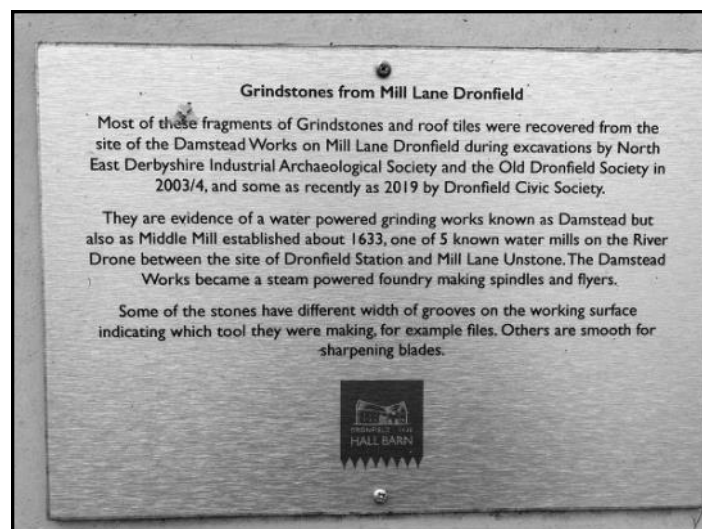
Mon 9 May: **DAVID WILMOT MEMORIAL LECTURE. "St Pancras Station and Hotel"** by Mike Higginbottom. St Pancras Station is a celebration of Victorian architecture and engineering. Two contrasting, exceptional Victorian structures, the train-shed by W H Barlow & R M Ordish (1863-5) and the magnificent Midland Grand Hotel by Sir George Gilbert Scott (1868-74). Threatened with demolition in the 1960s, Scott's hotel was recognised as a major work of the Gothic Revival, and has thankfully been restored. I for one am looking forward to seeing Mike's amazing photos of the interior.

In the Autumn, Richard Booth will talk on one of his passions, the Ashover Light Railway, and we have a talk lined up from the team behind the restoration of the Ecclesbourne Valley Railway and the Wirksworth workshops.

So what about visits? Following that great tour and walk across the recently saved half mile long wrought iron Bennerley Viaduct the Committee have a few visits in preparation. But first keep **Saturday 21 May free - we have set up a visit and tour of Wortley Top Forge**. Wortley Top Forge is said to be the oldest surviving heavy iron forge in the world. We're lucky to have it almost of our doorstep, and I'm really pleased to say that Gordon Parkinson himself has agreed to take us on tour. More information later.

We haven't collected subscriptions for two years now, despite the Committee's great efforts to "keep us together" coupled with Doug Spencer's brilliant work with all those extra and themed Newsletters. But the coffers are looking depleted and attached with this Newsletter is Members Subscription Form. Please remit your subs to Jean by post or at our next meeting.

See you soon!



Cliff

And finally

.... The Long Wait is Over - The Viaduct is Open

B **rilliant News!** By now, you may have well heard that Bennerley Viaduct is open to the public. On Wednesday 14th January, the viaduct's owners, Railway Paths and the Railway Heritage Trust announced that the contractors had finished installing the deck and that the viaduct was open. The BBC and ITV featured the opening day on their news bulletins and since then, the viaduct has been thronging with people walking, cycling, running, chatting, socialising.

A Community Vision: The re-opening of the viaduct is the realisation of a long held community vision to re-purpose the viaduct as a walking and cycling trail. From the moment the viaduct closed in 1968, a wide range of community groups campaigned to save the structure from demolition by promoting an alternative use.

Working Together: The re-opening of the Iron Giant is testimony to the way which groups have worked together. The owners, Railway Paths, the community, funders, councils and special interest groups all joined forces to achieve a common goal. The Friends of Bennerley Viaduct thank the generosity of the funders who have supported the project and helped bring their long held vision to fruition. Special thanks go to Railway Paths who led the project.

World Monuments Fund: The Friends of Bennerley Viaduct also thank the World Monuments Fund (WMF) for their outstanding support. Bennerley Viaduct was the only site from the UK to be included in the 2020 World Monument Watch. Its inclusion on the global watch list elevated our Iron Giant from a humble viaduct to an international treasure. A World Monument Watchday event will be held at the viaduct on Sunday February 20th 2022 to celebrate the contribution of the World Monument Fund with this community driven project.

Official Opening Ceremony: There will be an official opening ceremony later in the year but in the meantime, have a walk across our Iron Giant and celebrate the achievement which we have all contributed to.

[The Friends of Bennerley Viaduct – Dedicated to restoring, conserving and celebrating Bennerley Viaduct](#)



Contributions, no matter how short (maybe about a visit you have made), and preferably by email to editor@nedias.co.uk, for inclusion in future editions of this newsletter are most welcome.

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NEDIAS Committee:

Chairman – Cliff Lea; **Vice-Chairman** – Derek Grindell; **Secretary** – Patricia Pick; **Treasurer** – Pamela Alton; **Membership Secretary** – Jean Heathcote; **Lecture Meetings and Visits Co-ordinator** – Brian Dick; **Committee Members** – Diana Allen, David Hart, David Palmer.

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