North East Derbyshire Industrial Archaeology Society

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Chesterfield connections to an innovative bridge at Alveley across the River Severn – a "construction world first"

David Hays

My involvement? As a young engineer with the NCB in the 1960s, I dealt with Frank Brailsford of Thomas Beighton Ltd (originally of Brimington) on civil engineering works. He had been born at Doe Lea near Glapwell and started work at a local colliery. He then joined Thos. Beighton and worked his way up to foreman (as on this job) and finally to a Company Director / Estimator. I finished up working for his sons for 30 years!

It appears he must have built up some rapport/respect with A. P. Mason who worked for The British Reinforced Concrete Engineering Co Ltd. (now BRC Ltd)) as structural engineer and designed this interesting bridge. As you see from letters they were still corresponding in 1963, 26 years after the bridge had been built!

I think Mason considered it the first pre-stressed concrete bridge of its type in the world but subsequent American, German and Indian designers were also claiming the honour as "first".

So what is this bridge, what is its Chesterfield connection, and why is it so important? The following is extracted from Mason's accounts published in the August 1937 edition of Concrete and Constructional Engineering and later edition of September 1953.

Founded in 1908, BRC is currently the UK's largest supplier of steel reinforcement and associated products for concrete. Their more recent projects have included projects for the second Severn Crossing, the Principality Stadium, Wembley Stadium, Merseylink Gateway Bridge, CrossRail, and the Falkirk Wheel.

It was BRC who in the 1930s were appointed as designers by the Highley Mining Company to draw up a scheme to build a bridge across the Severn at Alveley a few miles

RIGHT: The Highley to Alveley bridge, looking north in 2003
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The east abutment of the bridge, looking east, photographed in 2003 © Shropshire Council

from Bridgnorth, Shropshire. Highley were owners of coal mines on both the East and West banks of the Severn at that point and needed to provide access for workers and also rail line to carry coal from their new pit on the East bank over to the West bank to connect with the Great Western Railway line . The River Severn at this point is fast flowing. It's liable to regular and sudden flooding, washing all in front of it – often mature trees, agricultural debris, livestock, haystacks, animal coops etc. – so bridge construction represented severe challenges.

BRC's design involved a central span of 150ft, and two side spans of 60ft, the central scan was to have a minimum clearance of 13ft above the highest recorded water level during flood, thus permitting a good standard clearance for any river navigation. The colliery company required total minimum useable roadway width of 17ft 4in, of which 10ft 10in was for the coal wagon trackway, and a 6ft 6in wide footpath for workers access between the two banks.

Messrs Thos. Beighton Ltd of Brimington, Chesterfield were appointed as contractors, the foreman on this job Frank Brailsford. The method of construction was to be by cantilevering out from the two sides – very much an unknown technique at the time for such a large span, Today we could even say it was done very much a plunge into the unknown – if not into deep water!

Frank Brailsford and Thos. Beighton Ltd. took possession of the site on 29 June 1936 with construction complete in a surprisingly short time by April 1937. They initially rigged up a temporary ferry and then an aerial ropeway to link the two sides – which must have been quite a feat since during almost the whole period of construction the river was continually in flood and at one time the water level rose to a point only a few inches below the very highest known level. There were also several gales and snow. There was access for the constructors only from the Alveley side, and all materials used on the other side needed to be ferried or transported by this aerial ropeway.

The ropeway (second hand) was 7/8th inch dia., and was carried on poles and anchored to trees on both sides. And what of motor/engine to drive the aerial ropeway?

It was powered by an Austin 7!!

Amazingly, the team passed the haulage rope around the back wheel of an anchored down 1931 Austin 7 car – the motive power from this car hauled approx. 700 tons over the ropeway, with, it's said, up to 400 runs being made each day. The rope speed was 80 yards in 18 seconds.

Next, the two river piers were built in open excavations protected from the water by corrugated iron during July and August. These themselves became flooded during this time (one flood on 15 July was reported to have been the worst for 50 years), but to ensure good use of time, during the floods they constructed the abutments on both sides.

The bridge itself was to consist of two parallel girders of varying depth continuous over the three spans. The greater part of the weight was carried on the two river piers, the remainder carried on he abutments. The girders rested on greased copper sliding plates to allow for expansion and contraction of the structure, and these bearing plates were fitted by end August. Overlapping angle-irons were used to close the gaps in the decking at each end.

Before the design of the bridge was prepared, the order in which the various parts of the work were to be built had been settled. The abutments, piers, end spans and short lengths projecting from each girder towards the river were constructed using falsework supported from the river bed. The remainder of the central span was constructed by cantilevering out in lengths of 5ft from each side until the gap became wide enough to close in one operation.

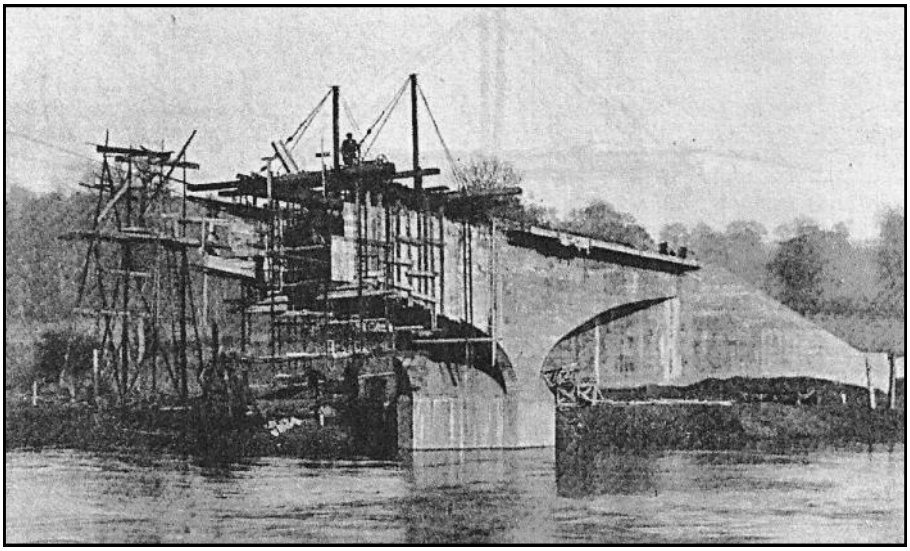
To maintain stability during construction the deck slab was omitted from the centre span, and counterweights of concrete weighing 32 tons were cast between the girders adjacent to each abutment.

The design of the reinforcement was carefully prepared to facilitate construction. In the end span bars 11/2 inch in diameter of lengths up to 40ft were used, and these overhung the river piers by amounts up to 21ft

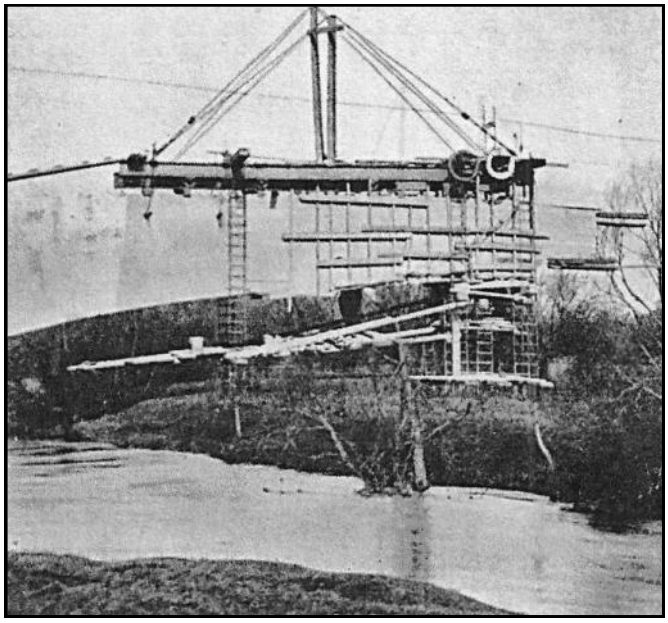
6in. The reinforcement in the cantilevered work was bars of 1½ in. diameter and 15ft length, longer bars being used to close the bridge.

The arrangement of the reinforcement made it possible to introduce a number of bars at 5ft. stage, the remainder projecting 5ft. and 10ft. respectively, and there was never more that one-third of the total number of bars required terminating at any point.

The girders were 9ft. 4in. apart, centre to centre, and the deck slab cantilevered out on each side of the bridge. By 12 October the three culverts had been concreted so completing the shore work – not a moment too soon since in 17 December the river was reported to have flooded to 100 yards wide!



The arrangement of the trolley and shuttering after stripping the first lift – *Concrete and Constructional Engineering* – August 1937



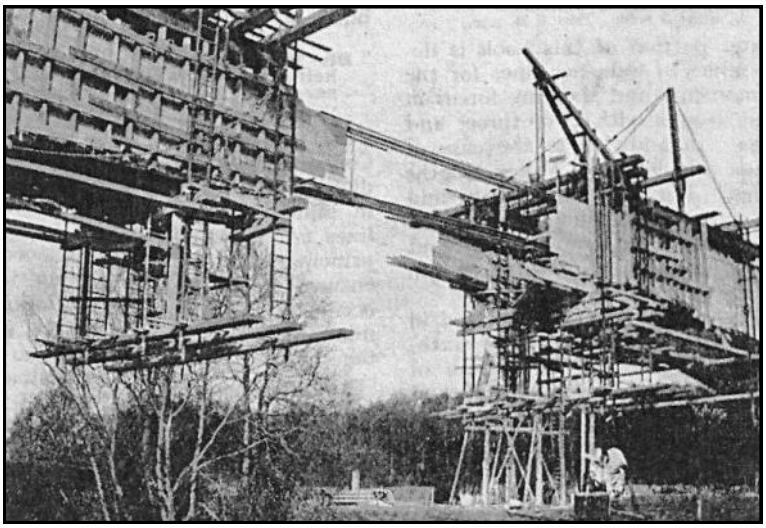
A view of one side taken just before the last cantilevered lift was deposited – *Concrete and Constructional Engineering* – August 1937

Construction of the girders was continued by concreting sections 5ft. long from each side of the bridge, with further sections continued each 10 days. The formwork for the concreting was suspended from specially made trolley carriages which ran on rails over the work previously constructed. Two pairs of heavy channels projected in front of each trolley with three steel ladders were suspended from each side. The bearers for the formwork were passed through the lower rungs of the ladders and a lower working platform was carried on the bottom rungs. Does it seem to be a Heath Robinson design?

The building of the formwork, the actual concreting and final stripping of the forms (which were simply dropped into the fast flowing river) must have been tricky and potentially hazardous. However, A. P. Mason reported that this novel method was found to be safer for the men, who could work with one hand and hang onto the ladders with the other!

Asbestos cement pipes of 3in. diameter were built into the girders, and through these were passed steel pipes to which were attached the eye-bar anchor bolts.

When concreting from each side of the bridge had reached to points 23ft. apart, the whole of the reinforcement for the central section was assembled and for the first time direct connection between the two sides was established. The bridge girders were closed on 8 March. After the central section had been cleared the trolleys were moved back and used to carry the formwork for the cantilevered deck slab. After this was complete, the trolleys were used again for painting of the iron railings before – now no longer needed – they were dismantled.



When the gap between the two sides had been reduced to 23ft preparations were made for casting the closing section – *Concrete and Constructional Engineering* – August 1937

One interesting point: holes for building in the stays for the iron railings were cored out with parsnips, yes PARSNIPS, which were reported to be easier to remove than the more conventional wooden plugs.

Mason reported that the bridge was completed in May 1937, and that the cantilevered centre span had been done *"in a period of just 4 months by the foreman, Mr A. F. Brailsford, six men and a boy"*.

Certainly, the construction of this bridge is a great tribute to Brailsford and to Thos. Beighton of Brimington – and although a construction for private rail use rather than a public highway, it ranks as the earliest pre-stressed concrete bridge of cantilevered construction in the world.

NOTE: To fully assess whether the clutch, gearbox and transmission of the 1931 Austin 7 car used for motive power for the aerial ropeway across the river was man enough for the job – it transported 700 tons of gear and raw material and made up to 400 trips per day across the river, Beighton had written to seek re-assurance from the Austin Motor Company on 23 July 1936. Austin's service department wrote back by return:

"We are afraid we cannot give much advice as to how the working parts of the transmission will stand up to this particular service, but we do not think that the clutch is likely to suffer quite as much as you anticipate despite the number of times which you state it will be employed during the day. We take it that the drive from the rear wheel is by no means positive, such as would be a chain , and the percentage of slip of the wire rope around the wheel will ease the work upon the clutch.

As to whether the differential will stand up to this continual service we are unable to state , and in this connection you will be well advised to see that the rear axle casing is always provided with an ample quantity of lubricant..

Respecting the radiator, provided that the fan belt is kept reasonably tight we do not think that excessive overheating is likely in hot weather, but we have no data with which to advise you".

In passing this letter on to Frank Brailsford, Thomas Beighton Jnr., commented: *"Herewith Austin's letter, I think you will find your car in the next issue of the Austin Magazine"*.

For more information on this innovative bridge which used what were at the time pioneering construction methods, see the August 1937 edition of *Concrete and Constructional Engineering* and later edition of September 1953.

See also *The Highley to Alveley Bridge, Shropshire: An Archaeological Assessment* by H R Hannaford; Archaeology Service Report Number 229 © Shropshire County Council September 2003

The Melbourne Military Railway

Martin Allen

Early Beginnings

The original line was created by the Midland Railway and became operational in three stages. Challesden East Junction to Melbourne opened on 1st September 1868, then came the section from Melbourne to Worthington (including the intermediate station at Tonge) on 1st October 1869 and finally from Worthington to Ashby de la Zouch on 1st January 1874. The traffic was predominately comprised of local coal and limestone and there was also a frequent passenger service.

The first purpose-built military training railway to be constructed in the UK was established by the Royal Engineers around the area of Bordon in Hampshire from 1907. Originally known as the Woolmer Instructional Military Railway, it was later renamed the Longmoor Military Railway in 1935. The Royal Engineers then established a Transport Directorate and formed three railway units, which specialised respectively in Operating, Construction and Bridging. The rail system at Longmoor was enlarged prior to WW2 to give almost 70 miles of running lines, including a circular test track. However, even this extensive railway was not considered sufficient for all the specialist training of Royal Engineer recruits that would be necessary leading up to the impending conflict. Therefore, a decision was made in 1939 that a second training establishment would be required elsewhere. There was no time to construct another purpose-built training railway, consequently an existing branch line would have to be selected and requisitioned from the national network of railways. The London Midland and Scottish railway staff School of Transport at

London Road in Derby had already been taken over for the use of RE Transportation Units and it was therefore logical to firstly consider suitable branch lines in the nearby area. The former Midland Railway line from Chellaston to Ashby de la Zouch was eventually selected, but the LMS were reluctant to hand over the line. This was because of the considerable freight traffic on the route, including coal from New Lount Colliery and a limestone quarry at Cloud Hill near Worthington. The quarry provided limestone to be used as a flux in steelmaking furnaces and thus was a vital contribution to the war effort. To keep the freight traffic operational, the military authorities therefore agreed to take over the civilian freight traffic on the line and in addition, this arrangement provided useful military training in railway operations.

Military Occupation of the Railway

Passenger traffic on the line had already ceased as from 22nd September 1930, but the goods yards were still operational at the three intermediate stations of Melbourne, Tonge and Worthington. To avoid operational complications at the south end of the line (including three level crossings over public roads north of Ashby de la Zouch), the line was closed at the overbridge crossed by the Smisby Road, where a barbed wire boundary fence was erected across the tracks. Consequently, the railway became a temporary single-ended branch line rather than its original through route, being accessible by rail only from the north end at Chellaston East Junction. This gave a self-contained training railway of 9.75 miles in length. The handover to full military operation took place on 19th November 1939 and the Melbourne line was then designated Military Railway No.2, the original Longmoor line being No.1. Railway operating and civil engineering training for the Royal Engineers was subsequently shared between the two establishments.

To add further purpose to the railway and to make the training as realistic as possible, military stores were located throughout the line and principally at Kings Newton, near Melbourne. Here, the extensive network of sidings became the largest rail-served military Transportation Stores Depot (TSD) in the country, which at its peak held 122,500 tons of stores. Near to Chellaston, an existing wagon repair facility and engineering workshops named Quarry was taken over. It was subsequently used as the principal locomotive depot, with a capacity for eight engines under cover. The nearby Donington Park motor racing circuit had also been requisitioned by the government in 1939 and taken over as a maintenance and storage base for military vehicles, many of which were ferried by road to be loaded onto trains at Tonge station, for onward shipment by rail to Europe.

Military Railway Training

From the outset, the railway was to become the principal establishment for training in specialised military railway bridge construction. At Kings Newton a worksite for bridge building was established, specifically in the use of the pre-fabricated Unit Construction Railway Bridge, or "UCRB," the railway equivalent of the famous "Bailey" type military road bridge. The design of the UCRB is credited to Lieutenant Colonel William Everall, who was the Chief Bridging Instructor at the Railway Bridging Wing and based initially at the former LMS training school in Derby. This type of railway bridge design was adopted by the Royal Engineers and the concept was also shared with the United States military and manufacture of the components being jointly undertaken both in the UK and the US.

Training also included techniques for the demolition and sabotage of enemy railways and explosives were used to blow-up mock tracks and bridge structures. This aspect did not always endear the railway to the local inhabitants, as this training was usually undertaken at night. On one occasion, all of the windows of a neighbouring farm house were blown out by an over-zealous explosion. Subsequent training demonstrated how to appease the local civilians and repair broken windows! At King's Newton, a classroom teaching aid in the form of a large "O gauge" scale model railway was supplied by the model makers Bassett-Lowke & Co. This including an intricate rendition of a UCRB bridge, complete in every detail and with all the necessary wagons and locomotives to transport the various miniaturised components.

In the period leading up to D-Day and the allied invasion of Europe in 1944, vast quantities of stores, equipment and men from overseas then started to arrive at the railway. This eventually included two battalions of Canadian railway engineers and three battalions of the US Army Transportation Corps, who were mostly billeted at nearby Weston on Trent. Basic training for railway operating procedures was undertaken during eight weeks. Railway construction training (including bridge building techniques) took sixteen weeks. More than 7,000 rail freight wagons in component form were also shipped from America and assembled by US railway workshop battalions at several sub-depot establishments in the UK, including one especially built for the purpose at Sudbury, on the Derby-Uttoxeter line.

The British War Department had placed construction orders with American locomotive manufacturers to produce an 0-6-0T shunter, based on a similar American "Switcher" design, but built to the smaller dimensions of the British loading gauge. These "Yankee Tanks" (as they were called by the British) were shipped intact from America ready for running-in trials, both at Longmoor and at Melbourne. After testing, the locomotives were repainted from their original light grey colour (as applied in America), to an overall camouflage of matt black with numbers and lettering applied. The military signwriter at Melbourne had previously been a painter of nameboards for shop fronts in "Civvy Street" and his flamboyant style of lettering set the Melbourne allocated locos apart from their dowdy sisters based at Longmoor. Despite being a potential target for enemy air raids, the railway survived the war intact. However, an ariel bombing attack on the town of Melbourne on 11th July 1940 killed nine Royal Engineers, who were billeted in a house in Church Street.

Return to Civilian Operations

The line was handed back to the LMS railway on 1st January 1945 and the government were required to pay £25,265 in compensation for repairs to the infrastructure. The sidings at Quarry became a temporary stabling depot throughout the 1960s for the storage of withdrawn steam locomotives awaiting their final call to the scrap metal merchants. The main sources of freight traffic were much reduced post-war and consequently the original double track running line configuration was reduced to a single track. All of the former military sidings were also removed, but the three main freight yards at the former stations survived. The three sets of station buildings were all eventually demolished. The extensive formation of rail sidings still functioned at Chellaston and these were served from the East Junction. The limestone traffic by rail eventually finished in 1964 and New Lount Colliery closed in 1968, when the coal workings became exhausted. The south end of the single line beyond Chellaston eventually closed in 1980, but the remaining derelict track on this section was not removed until 1988.

The Line Today

The skeletal remains of the locomotive depot building at Quarry still survives today, but now the steel frames are heavily corroded and the site is overgrown with weeds. Elsewhere along the route, much of the adjoining land has now returned to agricultural usage and today, the former station sites are in use as industrial sites or farming premises. In the adjoining fields, occasionally military defensive works can still be seen in the form of concrete "pill boxes," or gun emplacements. Fragments of the original boundary fencing complete with genuine WW2 barbed wire, can also be seen at several locations. The road-over-rail type highway bridges of which there are ten still surviving, are constructed from traditional stone blocks and these still survive in daily public use.

Further south and crossing over both banks of the River Trent, the line was built up on an earthwork embankment because the surrounding fields serve as a flood plain for the river. Here, there are two surviving stone built viaducts, on each side of the river. One on the north bank comprises of six arches and another viaduct of seven arches at the south bank. The most interesting feature on the line to survive intact today, is the steelwork viaduct built across the River Trent itself and all three of these viaducts date from the opening of the railway in 1867. These large viaduct structures were considered deserving of defensive protection in the form of some substantial brick-built sentry boxes complete with gun slits, now partly in ruins but still discernible. There is also some surviving remnants of exposed bridge piles driven into both river banks at various locations, being evidence of past military training exercises. At Melbourne, some of the concrete foundation slabs from the former military buildings are now in use for the commercial storage of caravans and shipping containers. South of Melbourne near the Isley Walton Road, there are two reinforced concrete buffer stops still surviving. Near to the site of Tonge station, the remains of the concrete ramps for loading vehicles onto rail wagons are now disappearing beneath the undergrowth. Further south at Worthington, the extensive Cloud Hill limestone quarry is still in production.

The trackbed north of Worthington was adapted to become a public cycleway and is now part of the National Cycle Network. This is known locally as the "Cloud Trail" and connects Derby with Worthington over a distance of 13 miles and was open to cyclists and pedestrians from 1988. Elsewhere, the abandoned trackbed mainly lies within a shallow earthwork cutting and can be easily followed, by evidence of the many mature trees and dense undergrowth forming a long narrow ribbon, which sharply contrasts with the well-kept farmland.

The biggest surviving example of infrastructure on the whole route is the 308 yards long single track tunnel north of Ashby. The tunnel itself has an interesting history, as it was built during 1799 to 1802, to serve the

former narrow gauge (4'-2" track) Ticknall Tramroad. In 1874, the tunnel was no longer in use by the tramroad, therefore it was enlarged internally to accommodate a single track of standard gauge (4'-8.5") and also reduced in length by 139 yards. This was to accommodate the Midland Railway's extension of the Melbourne line southwards between the stations of Worthington and Ashby de la Zouch. This single line portion of the line (including the tunnel) was permanently closed as from 9th May 1955. Today, the south end of the tunnel is no longer accessible, as the earthwork cutting beyond has been backfilled and the surrounding land is now levelled.

In Conclusion

The steel viaduct over the River Trent previously referred to, is especially deserving of some close archaeological study. The structure comprises of five spans supported by elegant latticework longitudinal beams and has held a "Grade 2 Listed" status since 1987. On the viaduct itself, it would be highly appropriate if a suitable commemorative plaque could be sponsored by public subscription and attached to one of the parapets, especially as the viaduct is ideally located on the cycle route section of the line and therefore easily accessible for viewing on a public right of way. It would make a very appropriate monument to acknowledge the history of the Melbourne Military Railway and in addition, to recognise the service of the Royal Engineers and our allies in peace and war.

Melbourne Line railway viaduct – 5 (geograph 5700939)
Alan Murray-Rust
Creative Commons Attribution Share-alike license 2.0

The remains of Chellaston Quarry Locomotive sheds
28DaysLater.co.uk - 28DL

North Derbyshire Motor Club and Wilfred Waddington

Darrell Clark

Barbara Gillmore's reference to the NDMC in the NEDIAS Newsletter No 81 (February 2021) prompts me to write about my connection with the NDMC and Service Motors.

I became a member in 1956 and in the History of the NDMC by Alan Chapman published in 2003, of which I have a copy. March 3rd 1956 Kantlehner Cup over 28 miles shows victory going to my very dear friend Michael Elliott with Bernard Barnett who came second and yours truly third.

May 15th 1956 an evening event again I was beaten by my friend Michael Elliott and I came second.

1957 photograph of John and Michal Elliott, the caption says it all.

Just for the record John Elliott became the founder and MD of Woodleigh Motors, based in Grassmoor. Sadly, he was to pass away when still a young man.

My photograph showing members in 1956 needs correcting if Alan Chapman sees this, please note: my name is spelt Darrell, no Y and Clarke has no E; the Mrs D Clark in the photograph was, in fact, Miss Prudence Lunn, an old flame of mine and never to become Mrs D Clark.

The year 1957 and I was off to serve two years National Service in the Royal Artillery and here we have the connection with Wilfred Waddington, having sold my Morris Minor VRA126 and finally finding myself at Park Hall Camp, Oswestry, doing my bit, I needed a vehicle. Standing for sale at the back of Service Motors' Garage on Knifesmithgate, which most readers will remember as the Co-op store (White Goods/Electrical Dept.) was a 1953 Ford 5cwt van, NLP660, an ex-Blundell's Cash and Carry Store (remember them?).

This van was to do sterling service for nearly two years; every weekend over the Cat and Fiddle into the Cheshire Plain and then on to Shropshire.

Many readers will remember the spare piece of ground next to the main Co-op shop. Well on Saturday lunchtime my blue Ford van disgorged up to seven, and on one occasion eight, National Service bods; most going across the road to catch the bus to Sheffield. After demob I joined Kennings on Vicar Lane – that is another story!

John and Mike Elliott with their Championship Trophies.
Mike was an 18-year old R.A.F. National Serviceman, who only finished his training just in time for his first leave to coincide with the presentation evening. This was indeed fortunate as Hasland based Mike had dominated proceedings in his first full motoring season and deserved to be present to collect his award. John, meanwhile, became the youngest ever person to receive a club trophy, as the William Rhodes schoolboy proved his prowess in map -reading throughout the season to claim the new Herring Trophy. (Courtesy North Derbyshire Motor Club)

Left to right: Back row: Vic Loupart, Lawrence Herring, Darryl Clarke, Noel Johnson, Mrs, D Clark. Front row: Winnie Herring, Joyce Johnson. *(Courtesy North Derbyshire Motor Club)*

ABOVE LEFT: Series II, split-screen Morris Minor VRA 126

ABOVE RIGHT: Michael Elliott on a night trial, having borrowed my navigator – Bryan Chadburn

In the NCO's NAAFI

A Bridge, a Railway, A Power Station and a Pioneering Engineer and Business Woman

Barbara Gilmore

In September 2020, Campbell and I spent a few days near Kirkcudbright, Dumfries and Galloway. A short walk along the River Dee, two miles north of Kirkcudbright, is the small village of Tongland.

TONGLAND BRIDGE

On the edge of Tongland, the Dee is crossed by Tongland Bridge, which was built from a design by Thomas Telford assisted by the architect and artist Alexander Nasmyth. In the early 19th century, Telford carried out the survey and construction of roads and bridges in Scotland under the 'parliamentary roads' scheme aimed at developing safe river crossings and ways of reaching isolated parts of the country. The bridge was Telford's first major bridge in Scotland and is considered to be one of his best.

Tongland Bridge is built in Gothic style using, principally, sandstone from Annan. The first to have weight saving hollow spandrels instead of solid masonry arches, the bridge has a main arch, with a span of 34.1m and a rise of 9.75m. On each side there are three pointed relief arches spanning 1.8m on each side. Between the main arc and the side arches are semi-circular cutwaters which rise to form pedestrian refuges. As the river rises and falls over six metres with the tides, the bridge had to be built by adding arches on either side to ease the passage of water at high tide.

Unfortunately the bridge is not accessible from one side but the photos above show the structure.

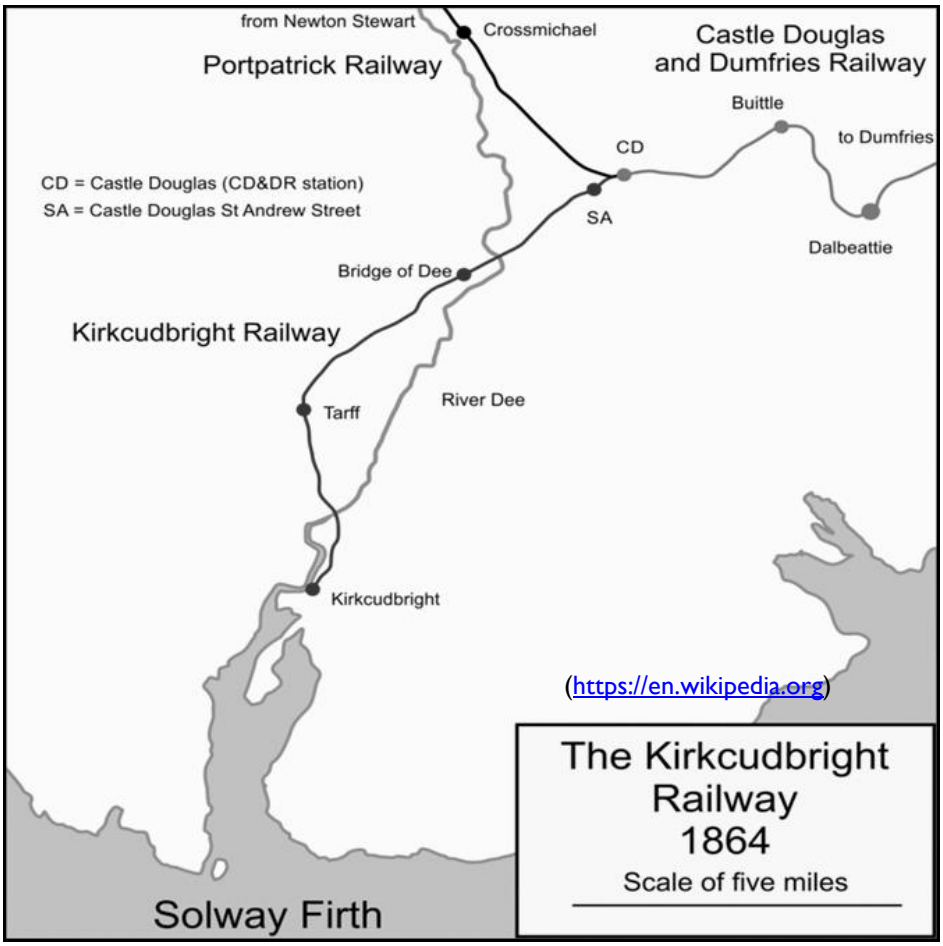
The bridge was built on a difficult site which posed significant engineering challenges. In 1803, local stonemasons were awarded the contract of £2420 to build it. The foundation stone was laid on 22 March 1804 but considerable difficulties developed and the bridge was swept away by floodwater in August 1804. The masons were relieved of the contract. Telford was asked to remedy the situation and Adam Blane was appointed the resident engineer with construction re-commencing in March 1805. The bridge was passable from November 1806 and fully completed on 21 May 1808 at a cost of £7710, the money provided primarily from the Stewartry's Commission of Supply with £1,150 from public subscription.

Today the A711 crosses the bridge which was Category A listed in 1971. It was subsequently de-scheduled in March 1996. A plaque to commemorate the bicentenary of the bridge's construction was installed by the Institution of Civil Engineers.

Across the road from Tongland Bridge are the remains of the Tongland Railway Viaduct.

TONGLAND RAILWAY VIADUCT

The railway viaduct at Tongland carried the Kirkcudbright branch of the former Glasgow and South Western Railway over the River Dee from Kirkcudbright to the Castle Douglas and Dumfries (CD&DR) Railway at Castle Douglas. The line opened to goods traffic on 17 February 1864 but the Board of Trade would not authorise the carriage of passengers until the junction with the Portpatrick Railway was improved. A station was quickly constructed at St Andrew Street, Castle Douglas, (SA on the map below), short of the junction with the CD&DR station at Castle Douglas, (CD on the map) allowing passenger traffic from 02 March 1864. Following signalling alterations at the junction at Castle Douglas and the introduction of speed restrictions a through passenger service began on 15 August 1864.The Kirkcudbright Railway closed in May 1965.



The Tongland viaduct was made up of two stone arches at one end, a central box girder section over the Dee and three stone arches at the other end. Only the arches survive.

The third point of interest in this village is the Hydro-Electric Power Station.

TONGLAND HYDRO-ELECTRIC POWER STATION

Located on the A711 and next to the River Dee, the Tongland Hydro-Electric Power Station, a two -storey Art Deco building, was built in the early 1930s and forms part of the Galloway Hydro-Electric Scheme. It is the Scheme's biggest electricity generating plant and was the first power station where its operations were managed by a remote telephonic system. Much of the equipment is original and working. On the site are the power station, a dam and a reservoir. The water is fed to the power station by aqueduct tunnels, from the reservoir, which are rock-drilled and made of concrete. Spent water is discharged into the River Dee and flows into the Solway Firth. Considerable attention is given to the effect of the operations on

the local environment, water quality, landscape and wildlife. A salmon ladder has been constructed below the power station.

The Tongland building was listed as Category A in July 2002. At its 75th anniversary celebrations on 1st February 2010 a refurbished visitor centre was opened. Scottish Power's Galloway Hydro's visitor centre, giving information about the whole Hydro-Electric Scheme, is also on the site. From 2019, the power station has been operated by the Drax Group. However, visits and tours are currently suspended.

And Finally……

DOROTHÉE PULLINGER (ENGINEER AND BUSINESSWOMAN) AND TONGLAND

Dorothée Aurélie Marianne Pullinger was born in France on 13 January 1894. She moved to England with her family when she was 8 years old. In 1910, her father, Thomas Pullinger, was instrumental in getting her a job in the drawing office of Arrol-Johnston's car manufacturing works in Paisley, where he was the manager. He oversaw the construction of a multi-storeyed glass and ferro-concrete car factory for Arrol-Johnston at Heathhall, Dumfries but it was not in full production before the commencement of the First World War. The company moved to making aero-engines for the Ministry of Munitions.

Dorothée worked at Paisley for about four years, becoming acquainted with all aspects of manufacturing, including work in the foundry and she also became forewoman of the core shop. At the onset of the First World War, she was selected as manager of women newly employed by Vickers at Barrow in Furness which made high explosive shells. Later she was in charge of 7,000 female munitions workers there and established their apprenticeship scheme for female engineers.

In 1916 Thomas Pullinger built a further Arrol-Johnston factory in Tongland. The intention was to employ only women for the duration of the First World War and also to establish an engineering college for 'ladies'. A structured apprenticeship scheme was created to train women wishing to follow a career in engineering while producing aero-engine components. After the War, the factory became Galloway Motors Ltd. and with Dorothée one of its directors and managers, it began production of a light car for Arrol- Johnston with a predominantly female workforce. Training courses and apprenticeships for local women were introduced. Dorothée had identified the need for a car particularly for women and organised its manufacture. The Galloway (10/20 CV, 4 cylinders, capacity1528cc) was based on the Fiat 501. However, the post war economic situation led to the subsequent failure of the project and the factory closed in 1923. The production of the Galloway was continued at Heathhall until the collapse of Arrol-Johnson in 1928 during the depression.

Dorothée moved to the South of England with her husband where she was a sales representative for the Galloway car. In addition to the difficulties arising from the decline of the motor industry in Scotland, Dorothée was confronted by a lot of opposition to the involvement of women in engineering in the car industry. In the late 1920s with her husband, she created the White Service Laundry Ltd. in Croydon, with innovative steam-laundry equipment imported from America. The business, which grew to seventeen shops taking in laundry in the London area, was sold in 1946.

During the Second World War, Dorothée was involved with the Nuffield Group with reference to women's employment issues in wartime and to the recruitment of female workers for the munitions factories. She was the only female member of the Ministry of Production's industrial panel. After the Second World War, she moved to Guernsey where she set up Normandie Laundries in 1950.

Dorothée Pullinger's success was achieved at a time when the engineering industry was male dominated and there was considerable opposition to women working in what were considered male jobs. As membership of the Institution of Automobile Engineers (IAE) was not open to women, she was refused membership in 1914. In 1919, Dorothée was a founder member of the Women's Engineering Society. She was awarded an MBE in 1920 for her work during the First World War. Following her achievements during the First World War and her continued success, she was accepted as the first female member of the IAE in 1923 aged 29.

Dorothée Pullinger died in Guernsey on 28 January 1986.

SOURCES:

Tongland Bridge

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A portrait of Dorothée Aurélie Marianne Pullinger can be viewed at:
Scottish Engineering Hall of Fame (www.engineeringhalloffame.org/profile-pullinger.html)
We have been unable to reproduce this here as it is subject to strict copyright conditions.

Two Dales and Daniel Dakeyne Mills

Pat Pick

How many times have people driven on the A6 by Darley Dale unaware of the beautiful village of Two Dales and the history it holds? Two Dales was originally called Toad Hall. A beautiful valley curves round the east flank of Sydnope Hill likewise the valley of Hall Dale on the west side of the hill – Two Dales.

John Dakeyne moved to Toad Hall in 1716. He lived at Knabb House overlooking Ladygrove and married Francis Watson. John and Francis had two sons Daniel junior born 1733 and Thomas born 1736.

Abraham Flint, a farmer and mineral agent, saw that Sydnope Brook was a valuable resource so in 1785 he started to build a three story cotton mill next to the brook. Unfortunately he didn't have the money to finish the mill so Daniel Dakeyne took possession of it.

This started Daniel Dakeyne's entry into the textile business. By 1787 he had formed Daniel Dakeyne & co. Cotton Spinners.

About this time efforts were being made to mechanise the manufacture of flax. A linen draper, John Marshall, obtained the rights to manufacture a flax spinning machine based on Richard Arkwright's water frame to spin cotton. Spinning flax was more difficult than spinning cotton. In 1768 his company Marshall Fenton & Co. produced an acceptable quality of flax and dominated the market for half a century.

Dakeyne became interested in this and built his flax mill (no date is recorded for this) but in1794 he took Patent no. 1961 for a machine called the "Equilinium". This machine straightened flax fibres much as a carding machine straightens and draws cotton. It was nick named "gill" and the principle is still used today. Although Dakeyne had taken out the patent it was his two sons who designed it.

The cotton mill was built next to Sydnope brook and the new flax mill was built at right angles to the cotton mill. Larger than the cotton mill but of similar construction built in stone from Knabb quarry. The mill had a slate roof and cast iron windows. Advertised sometime later as having five floors, it was three storeys high at one end but only two at the other. It was 120ft long by 30ft wide the size of a typical "Arkwright" mill.

Daniel Dakeyne & Co. were making a very large investment in their expanding business. Unfortunately a small country landowner didn't have the capital to fund a development on this scale with the cost of building the mill and fitting it out with the machinery etc. Mortgages had to be taken out.

The family spent money on grand houses all with mortgages: Knabb House, Ladygrove House and The Holt.

By 1800 the debts were considerable and they needed a massive cash injection. In August 1800 they conveyed land and assets to a group of Bankers in return for £1,000. It kept them going for a year but by October 1801 Daniel Dakeyne the Elder, Daniel Dakeyne the Younger, Thomas Dakeyne and Joseph

Dakeyne Cotton Spinners were declared bankrupt.

In those days (before law changed in 1855) the partners were responsible for the debt so houses had to be sold, the mill and other assets were seized.

Dakeyne estate was offered for sale by auction on the 27th July1802, in Manchester.

The mills were sold in separate lots:

- lot 1 the cotton mill
- lot 2 the flax mill
- also for sale shops, warehouses, cottages, houses

No buyers were found so a second auction took place on 13th November, 1804; but it made no difference they had lost the mills, houses and money.

However this isn't the end of the story.

A few years later found the family back at Two Dales and operating the mills; unfortunately few records have survived for the following twenty years

The Dakeyne mills as originally completed in 1826

Although this photograph dates from some 70 years or so later, it is exactly as the Dakeynes left it except for the new water pipes running to the tower and possibly the removal of a complex of shafts and gearing in front of the tower.

The Dakeyne Disc Engine at Two Dales, aka *"The Romping Lion"*

Cliff Lea

Pat Pick's article has covered the history of the site in this Newsletter; and my short article is an Addendum which covers the Dakeyne's great technical innovation.

During the late 1820s, three water wheels already operated the spinning equipment on site but additional power was needed. After considering steam, Daniel Dakeyne's sons, the brothers Edward and John, designed and constructed an interesting "disc" engine (later known locally as "The Romping Lion") which used the flow of the high-pressure water feeding their mill. The parts for the engine were cast at the Morley Park foundry. It weighed some seven tons and generated 35 horsepower at a head of 96 feet of water. Nothing is left of the building which housed the disc engine, but the mills largely remain and a tower which housed water wheels and later water turbines are prominent features.

The Dakeyne's engine was not to replace but to supplement the power from the existing water wheels. It was therefore built higher up the slope, so that the water which drove it could be used a second time as it then drove the water wheels. What ingenuity!

The basis of the disc engine used the power of the water flow to produce a rocking or wobbling "nutating" motion of a disc and sphere in the water flow which in its turn rotates a Z shaped output shaft. The disc itself does not rotate, simply rocks up and down as the water passes through..

Not much is known of this first engine but the Dakeyne's obtained a patent in 1830, but as with many early patents this contained only hazy detail.. Their patent 5882 described "A Hydraulic Machine for

Communicating Motion to Machinery", and indicated that these engines could be operated by water or steam. After installation of this water operated engine, many steam versions were built by others for use elsewhere, other makers being the Birmingham Patent Disc Engine Company, and Donkin and Co who obtained their own patent and built their first steam powered disc engine in 1840.

Smaller versions of the steam powered version were favoured for a time for powering canal boats. Until more efficient small steam engines were introduced, the disc engine was known for great fuel economy, said to be 18% more efficient than conventional steam engine of the time.

Interestingly it's said that John Dakeyne had also commissioned a similar disc engine to drive the bellows of an organ in the family's Two dales residence, Knabb House

A visit to Two Dales is needed to appreciate the amazingly steep drop for water to drive the engine, and to see the mill ponds constructed within the very steep Ladygrove valley above the Dakeyne's mill complex. The walk up the steep valley shows the mill ponds in a magnificent wooded setting, and the upper one particularly is regularly used these days by the locals for swimming,

The nutating disc engine lived on, and the motion of Dakeyne's nutating disc is still the basis for millions of domestic water meters used, made and supplied around the world today. Two Dales may be a small village, but it has famous heritage.

Paul Wigfull has written a great book on the subject "The Romping Lion- the Story of the Dakeyne Disc Engine" (Published by Country Books, 2011, but now out of print) and he has an excellent web site showcasing the history and how the nutating disc actually works: http://www.dakeynediscengine.com/

He states in his book: "The Dakeyne Disc Engine was quite remarkable. The design was incredibly sophisticated in many ways. How Edward and James - self taught engineers - conceived the idea in the first place defies imagination. And to design it, build it, and make it work was a massive achievement."

And finally, why was it called the "Romping Lion"? The locals called it that because it roared and groaned when in operation, just like a lion.

LEFT:

The Water Wheel Tower and Bell Cupula

The Dakeynes had three overshot water wheels operating the mills, thought to be 30ft diameter by 8ft width. They were housed in the tower, one above another, the water from one moving on to the next and lower wheel. It later housed a water turbine. When the Disc Engine was installed, this was in an engine house further and higher up the valley. The installations demonstrate great conservation of energy and maximum use of the available water power.

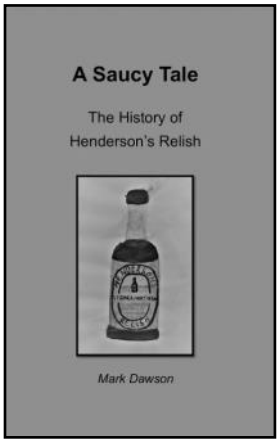
ABOVE:

Flax Mill of 1826

Both photos © Cliff Lea (2021)

A Saucy Tale - The History of Henderson's Relish

Mark Dawson

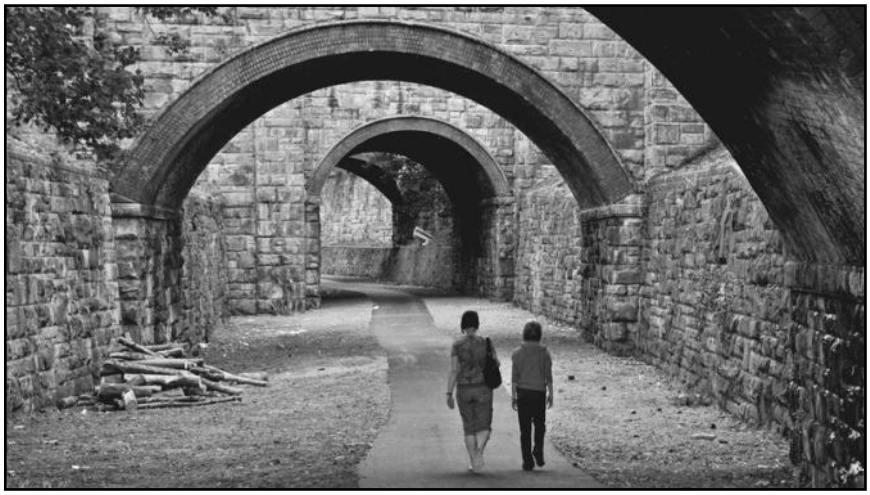


I have published a short book (50+ pages) on the history of Henderson's Relish. The sauce is something of a Sheffield phenomenon. Wildly popular in the steel city itself and well-known in the surrounding area, including north Derbyshire, but often unknown further afield. It's a true survivor from the Victorian era when there were many similar sauces and relishes.

My book tells the story of how it came into being and offers thoughts as to how it has survived and gained such a largely localised and passionate following. It's going to be stocked by Hendersons (Sheffield) Ltd on their website soon, but members can get copies from me (signed and dedicated as desired) for £5 plus £2 P&P. Just contact me by email (mdfoodhistory@gmail.com)

Campaign to save threatened English railway structures

A number of heritage and transport organisations, including Historic England, the Victorian Society and SAVE Britain's Heritage, have joined in condemnation of Highways England's plans to demolish or infill 134 disused railway bridges and tunnels, with the potential for more to follow. As well as the historical significance of these structures, many form part of proposed walking and cycle routes, and some are under consideration for restoration of the railway lines themselves. The group has set up an online petition which has attracted more than 11,000 signatures so far.



Read more about the campaign and sign the online petition at https://www.change.org/p/highways-england-protect-our-railway-heritage-from-highways-england-s-wrecking-ball/u/28560815

Chairman's Chat - Let's start meetings again *Cliff Lea*

I'm always the optimist in my family, and I'm certainly thinking that we will be able to re-start NEDIAS evening meetings later this year.

So I have tee'd up our speakers for the rest of the year and the hall at St Thomas' has been booked in readiness. If all goes well, and no more new Covid restrictions pop up to make life complicated, the programme is:

- Mon 13 Sept, Mike Ogden on canals - "*The Slow Road*"
- Mon 11 Oct, Martyn Taylor-Cockaigne on the railway pioneer "*Josias Jessop*". I think his final project was the Cromford and High Peak Railway.
- Mon 8 November, Stephen Walker, on the archaeology of the 18th century Papplewick cotton mills "*A thread in the web of time*".
- Mon 13 Dec 2021. Christmas meeting.

It will be brilliant to see everyone again!

And finally ....

.... The Mystery of the Spoon

Jamie Mather

When NEDIAS dug at the site of the Wingerworth stone sawing mill one of the areas examined was an old wood sawing pit. This had been backfilled with domestic rubbish spanning a period from late Victorian times to the 1950s. Although the pit itself was our object of interest, samples were taken from the backfill as they were all part of the history of the site. These samples were among the last of the Wingerworth finds to be examined and recorded and it was only this spring that I noticed something unusual.

The object involved is a spoon – a totally unremarkable plated spoon that could have sat on any dining table in the mid-20th century. But this one had been crudely stamped with seven digits which I soon established to be a military service number. I decided to research the owner of the number and that is when things took an unexpected and poignant turn. The number belonged to a soldier in the Welsh Guards based at a barracks in Hounslow, West London. Neither he nor his family appear to have had any connection with Derbyshire. And sadly he had been "killed by enemy action" in 1942, seemingly not in combat so perhaps in an air raid. So how did an item of his kit end up buried in Wingerworth?

We will probably never know for sure but it's interesting to speculate. It is possible that the Welsh Guards trained in the area and the spoon was simply mislaid. But records are sparse and there seems no obvious reason for soldiers from West London to be in Wingerworth. It is perhaps more likely that a second soldier was involved. The Hounslow barracks was also home to a "Young Soldiers Battalion" of the Middlesex Regiment, 18 and 19 year old volunteers from the London area. Maybe the spoon ended up in the general cutlery at the barracks and was liberated by a recruit needing one for his own use. If he later moved to Derbyshire, or perhaps married a local woman, the spoon could have made its way here and then been discarded with the domestic rubbish.

We have details of the original owner and his family, though we have not published them here as any descendants will be unaware of the find. But if anyone can throw any more light on the mystery we'd love to know.

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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