

A View from the Bridge

A Newsletter for the Friends of the Union Chain Bridge



December 2018



A Christmas Message from our Chairman, Robbie Hunter



2018 has been a transformational year for the future of the Union Chain Bridge. In March, the Heritage Lottery Fund provided Stage 1 grant funding to develop plans for the complete restoration of bridge. These are nearing completion and the project partners will shortly submit a further application to the HLF for substantial funding to aid with the restoration. We expect to receive the HLF's decision in the Spring of next year and if successful, work could commence on the bridge by the end of next year. The owners of the Bridge, Northumberland County Council and Scottish Borders Council, are both fully committed to see the successful completion of this project although, it is clear that we would not be on the verge of the restoration without the committed support of the Friends and so please do renew your membership, buy mugs, pens, our book and look out for others to join. Once the restoration is underway it will provide a number of opportunities for the community to be involved and benefit from this exciting project. There is a real sense of momentum growing behind the restoration. We recently hosted a visit of eminent bridge engineers from the US and I was reminded just how important this bridge is from an international perspective.

We are starting to ramp up our own fundraising plans and recently received a very substantial grant from the Fallago Wind Farm Community Fund, which was wonderful news.

Thank you for all your support over the last year and may I take this opportunity to wish you all a very happy Christmas and New Year. I hope and trust 2019 will see us secure the future of this wonderful bridge.

Robbie Hunter

Project receives £50,000 Fallago grant

The Trustees are delighted to have secured a £50,000 grant from the Fallago Environment Fund



towards their target of a £250,000 contribution to the heritage aspects of the restoration project. Robert Hunter, our Chairman, said:

“We are incredibly grateful to the Fallago Environment Fund for this very significant grant. It will help enormously to build the momentum behind our fundraising strategy for the restoration of this historic bridge as we head towards its bicentenary. The Fallago Environment Fund shares the benefits of the Fallago Rig Wind Farm in the Lammermuir Hills with projects across the Borders that enhance the region's built, natural and cultural environment.

L to R in the photo above: Cllr Glen Sanderson (Northumberland) Gareth Baird (Fallago chairman) Robbie Hunter (Friends) and Cllr Gordon Edgar (Scottish Borders)

Welcome to our new Trustee



Welcome to Stephen K Jones, our new Trustee, who was elected at the AGM in October. Stephen, who gave a talk on Samuel Brown's chainworks, Brown Lenox & Co, at the AGM, specialises in

industrial and engineering history, and has been a student of the Union Bridge for over 40 years. He has published several books and contributed a chapter on Brown Lenox to *Samuel Brown and the Union Chain Bridge*, published by the Friends last year. He sits on the Institution of Civil Engineers' Panel for Historical Engineering Works as the member for Wales and is Convener of the Chainbridge sub-panel. His extensive knowledge of Brown and his chainworks and his "links" with the ICE and our Welsh Friends will be of immense value to the Trust. Stephen has contributed an article on Brown Lenox's Newbridge chainworks at Pontypridd later in this Newsletter.

Border Salutation!

We are very grateful to Northumberland County Council, Spence and Dower – the restoration project conservation architects – and Chris Baglee, their on-site conservation architect, for



giving us a copy of Chris's survey report (now in our archive) on the *Cast-Iron Crests on the Bridge Faces of the English & Scottish Pylons*.

Using a "cherry-picker" hydraulic lift, Chris surveyed and recorded the condition of every individual stone in the pylons and the type and condition of the mortar, as well as the Crests, and made a discovery

which he mentioned to a fascinated audience at our AGM and which we now recount.....

A Fascinating Discovery!

Most, if not all, of us, looking up at the rose and thistle crests high on the English and Scottish pylons of the Bridge will have assumed that they were placed in those positions as part of the original construction works in 1819/20 on the instruction of the Berwick and North Durham Turnpike Trustees in a gesture of patriotic exuberance...the marvellously symbolic intertwined emblems of the two Nations – roses, thistles and oak leaves, surmounting the motto **Vis Unita Fortior** – (*United Strength is Stronger*). Not so, it seems!

Looking from below, as all but Chris have done, the crests seem simply to show the floral symbols, still retaining a semblance of their red, green and blue hues, although probably not tickled by a paintbrush for at least 50 years, as shown *left*.



Surveying the crests at eye-level, from his cherry-picker, Chris made a fascinating discovery. The roses and thistles surmount two hands clasped in salutation, virtually hidden from any viewer at ground level; and in



addition, he noted that the devices comprise "a two-piece cast iron box with circular holes in each end" (as shown *left*) on the Scottish pylon.)

The motto is on a cast-iron plate with raised dark blue letters, welded on to the front of the main box. But

several questions arose:

-) Why is the support to the crest in the form of a 245mm deep hollow box?
-) Why is it constructed in two separate interlocking halves?
-) Why are the two sections bolted together rather than welded?

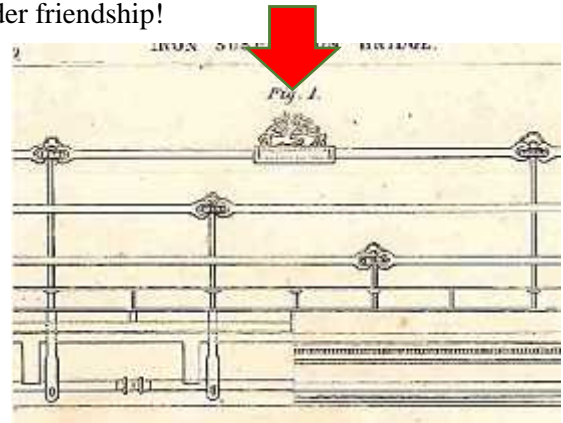
) Why are there large holes at either end of the box – a semi-circle formed in each section?

) Was it designed to also be a bird nesting box?

The answer to this conundrum seems to lie in two pieces of persuasive evidence:

Recording the opening of "*this curious and elegant structure*" in its July 29th 1820 edition, the *Berwick Advertiser* reported that "*In the centre of the bridge on each side is the following inscription: "VIS UNITA FORTIOR"*

And, secondly, in his "*A Dictionary of Architecture*" in 1830, Robert Stuart includes engravings of Samuel Brown's 1819 designs for the Bridge, (below) including details of the deck, which clearly show a crest with clasped hands and roses and thistles attached to the top chain at the mid-point of the Bridge – the actual border between the two Nations: a symbolic gesture of cross-border friendship!



This would account for the hollow box construction of the Crest, in the form of two halves, each with a central semi-circular hole, which would have attached around the chain and then have been bolted together to enable them to be removed when painting the chains; and paint analysis suggests that the Crests were not attached to the chains initially, but a year later, in 1821.

When, and why, the Crests were relocated to their new positions high above the Bridge, is unclear and there is no archival evidence to assist us but Chris believes that they may have been moved in 1871 when major works were undertaken, including the replacement of all the hangers, the deck and its support timbers; the installation of cross-bracing; and the complete re-painting of the Bridge. At the same time, several weight-reduction measures were undertaken, including the removal of cast-iron cart rails, hoof grips, kerbs and deck cornices and, as the Crests may have been considered large and heavy "windcatchers", it is possible that they were included in these works of improvement and alteration.

The current restoration proposals do not include any provision for the restoration of the Crests to their original position on the actual border but we understand that an engraved metal decking insert to mark the border is under consideration..... and the marvellously emblematic expressions of friendship are likely to remain where they have been for well over 100 years.

Images © Spence & Dower

An alehouse on each side of the Bridge



In the background of the very old photograph above, the Union Bridge can just be made out, with the English bank on the right. In the left foreground is the old Dritness fishing shiel with its washing drying over the roadside hedge; and to its right is a public house, the history of which is something of a mystery. Like most of the land in this part of the parish of Norham (as it then was) during the latter half of the 19th century, the inn was within the extensive Longridge estate, and is described in an Abstract of Title of the Estate as “*the public house situate near the Union Bridge in the Township of Loanend in the ...Parish of Norham and now in the occupation of the Border Brewery Company*”. From photographs and postcards of the time, it can be established that the inn was built after the Bridge was completed but the only census records showing the “*Public House, Union Bridge End*” are those for 1861, recording as residents *Margaret Rogers, Widow, 57, Publican (born at Ford), William Rogers, her son, 31, Agricultural labourer (born at Ford) and Jane Rogers, his wife, 20, (born at Norham)*. There is no mention of the property in the 1851, 1891 or 1901 census returns, so it seems that it had a short lifespan and that it was demolished some considerable time before the end of the 19th century, perhaps at the same time as Chain Bridge House, almost opposite, was built? We have no other details of its trading activities or customers, although we must assume that they comprised largely, drovers and waggoners as well as salmon fishermen.

But the **Berwickshire Turnpike tollhouse on the Scottish side of the river** also held a liquor licence for a while. The late Francis Cowe, Berwick historian of Cockles fame, writing in *Country Life Magazine* in 1961, says that “*it [ie the Berwickshire toll] acquired for itself an unwelcome notoriety during the period when Scottish toll-houses could be licensed for the sale of liquor. In 1848 its cheap liquor was attracting railway workers, fishermen and others from the district on Saturday nights and Sundays and it was reported that there were frequently serious brawls and scenes of “riot and abomination”. However, celebrations of a less sordid kind also took place here, for the bridge was a common resort of English men and women who wished to be married under the Scottish laws.*[We have examples of the marriage certificates in our archive] *The whisky drinking came to an end in 1854 and the marriages in 1857*” If anyone has any information about the Union Bridge inn or indeed the heyday of the

Berwickshire Turnpike tollhouse, we would be very pleased to have it for the archive and for a future Newsletter.

Exciting Times Ahead!

Jane Miller, Project Co-ordinator, Crossing Borders: Inspiring Communities, writes:



Thanks to a development grant from the Heritage Lottery Fund (HLF), plans for the main funding application, which will be submitted in March 2019, are well underway.

Although the conservation of the Bridge will be the focus of the funding application, HLF are also passionate about the difference their projects make, not just for heritage, but for people and communities; so education activities and community projects are being developed to run alongside the conservation work.



Teachers and other education professionals taking part in a Learning Advisory Panel meeting. The panel will advise the project team and help shape the learning offer for schools

Northumbria University are working with us to develop a STEM (Science, Technology, Engineering and Maths) learning programme for schools and Archaeology Scotland are supporting the development of heritage workshops through their Heritage Hero Awards. Education workshops and site visits will be delivered by project staff and offered to schools on both sides of the border, free of charge.

Archive research and archaeology projects will encourage volunteers to get involved in a bid to uncover new evidence about the Bridge. Consultation with local groups, teachers and communities has already been undertaken but if you have not yet had your say and would like to get involved, there is still time. Please contact the project team if you would like more details. jmiller@museumsnorthumberland.org.uk

Last Minute Gift Suggestions



Samuel Brown and Union Chain Bridge by Gordon Miller, with a chapter on Brown Lenox's chainworks by Stephen K Jones – the definitive history of the Bridge and its designer and engineer 300 pages; 138 illustrations **£17.50**



A pair of fine porcelain mugs with contemporary prints showing, on one, the Scottish side of the Bridge, and on the other, the English side.

A beautiful gift for lovers of the Bridge or as an introduction to it. **£15 per pair**

Orders received by December 18th will be sent First Class for £5 P&P; applicable to book and mugs.

Otherwise, the cost of second-class P&P is £3.75, applicable to book and mugs.

These items are available from the address at the foot of page 6 (please phone before calling) or in person from Chain Bridge Honey Farm during trading hours. Cheques should be payable to The Friends of the Union Chain Bridge.

The following article is contributed by one of our Patrons,

Prof Roland Paxton MBE PhD DEng FRSE CEng FICE EGIS . Since joining the staff of Heriot-Watt University, Edinburgh from industry in 1990 in an honorary capacity he has represented civil engineering history and conservation disciplines extensively in teaching and research at home, in the USA, Scandinavia and Japan. His work has attracted major awards from the American Society of Civil Engineers, the Institution of Civil Engineers, an HonDEng and an MBE. This work has enabled him to appreciate and promote the engineering significance of historic structures including Union Bridge in publications in the UK, USA and Japan. Five years ago he became particularly concerned at Union Bridge's deteriorating state and inclusion in English Heritage's *Heritage at Risk* register.

International Recognition for the Union Bridge

Professor R A Paxton



To date, more than 200 projects worldwide have earned the designation of ASCE Historical Civil Engineering Landmark, illustrating the creativity and innovative spirit of

civil engineers. Almost always performed under challenging conditions, each of these engineering feats represents the achievement of what was considered an impossible dream. These include the Eiffel Tower, Sydney Harbour Bridge, Victoria Falls Bridge, Thames Tunnel, Menai, Wheeling, Brooklyn and Golden Gate bridges, the Forth and Tay Bridges and the Liverpool & Manchester Railway.

On 7th November 2018 the American Society of Civil Engineers approved a nomination initiated by me through the Institution of Civil Engineers [ICE] in association with the Japan Society of Civil Engineers, [JSCE] that the Union Chain Bridge be designated an International Historic Civil Engineering Landmark.

In 2014 in an invited lecture at the inaugural meeting at Paxton House of *The Friends*, I outlined the case for conserving the bridge and stated my intention of seeking international recognition for its achievement. This has now been approved and hopefully will help to secure funding for the bridge's ongoing conservation.

The technical importance of Union Bridge was that, by means of long wrought-iron eye-bar cables suspended in catenary it became in 1820 the world's longest span carrying vehicular traffic, erected in just 12 months, at a fraction of the cost of a stone bridge. It is now more than just a useful bridge on a minor road - it is a unique, readily viewable, exemplification of state-of-the-art experimentally-based bridge technology at the dawn of modern 'strength of materials' design practice.

In order to help best plan and promote this landmark conservation project and realizing that no drawings of the bridge's buried Scottish anchorages were known, I

initiated a *pro-bono* research exercise (reported in the September Newsletter) with Dr Colin Stove of state-of-the-art radar specialists ADROK with whom I had worked successfully on previous projects. The results revealed a large iron anchor block about 7.5m vertically under the road approach on the downstream side. It is proposed to excavate and display this and its upstream-side companion for the information of posterity. Union Bridge's main claim for recognition as an international historic engineering landmark rests on its world-record span carrying vehicular traffic from 1820 until the completion of the Menai Bridge in 1826 and now, as the longest serving such suspension bridge. Its type is still of great significance in bridge design as the means of achieving the world's longest spans. Union Bridge's place in the progressive development of the longest spans is shown in the table below.

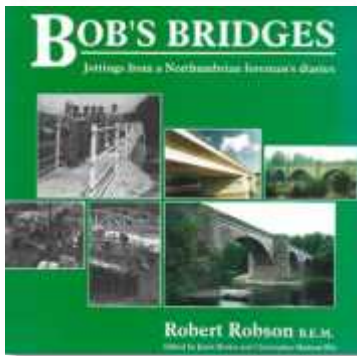
A restoration solution that would minimise inconvenience to the public and best preserve the bridge's historical integrity in terms of its world record continuity in service, would be for the 1820 chains to be inspected and restored in situ, which is how this matter has been dealt with at the existing Union (1974), Conwy (1826), Melrose (1826), Aberdeen (c1830), Clifton (1864) and other chain bar suspension bridges.

Chronological list of the world's longest road or railway bridge spans 1810-2018 © Paxton

(All are operational suspension bridges unless otherwise indicated)

Bridge, Engineer, Main Cables, Dates	Cable Span (ft/m)
Newburyport, USA (Finley 1810, bar chain, replaced 1909)	244/74
Union, UK (Capt. Brown & Rennie 1820, bar chain, 2t limit)	437/133
Menai, UK (Telford 1826), bar chain, renewed in steel 1940	580/177
Fribourg, Switzerland (Chaley 1835, iron wire, replaced)	c.870/265
Wheeling, Ohio USA (Ellet 1849 – wire)	1010/308
Queenston-Lewiston, USA (Serrell 1851-64 wrecked, wire)	1040/317
Cincinnati-Covington, USA (Roebing 1867 – wire cable)	1057/322
Niagara-Clifton, USA-Canada (1869-89 wrecked, wire)	1268/387
Brooklyn, USA (Roebing 1883, wire; bar chain anchorages)	1596/486
Forth, UK (Fowler/Baker/Arrol 1890, steel cantilever type)	1710/521
Quebec (Vautelet et al 1917, zenith span steel cantilever type)	1800/549
Ambassador, USA-Canada (McClintic & Co.1929, steel wire)	1850/564
George Washington, USA (Ammann/Gilbert 1931, steel wire)	3500/1067
Golden Gate, USA (Strauss et al 1937, steel wire)	4200/1280
Verrazano Narrows, USA (Ammann/Brumer 1964, steel wire)	4260/1298
Humber, UK (Freeman Fox & Partners 1978, steel wire)	4526/1380
Akashi Straits, Japan (Satoshi Kashima 1998, steel wire)	6532/1991

When the Bridge was almost lost



We are grateful to Willie Robson of the Chain Bridge Honey Farm for drawing our attention to this marvellous little book, self-published in 1998 by Robert Robson, Northumberland

County Council's Bridges Foreman from 1937 to 1982, interrupted only by the war years. As the editors say in their Prologue, it's not meant to be a gazetteer of every bridge in the County - but it would be difficult to find one that isn't mentioned, from Akeld to Wylam; from Berwick to Bellingham. The editors have kindly allowed us to publish the following extracts from Bob Robson's diary which will be new and fascinating information to many Friends:

"In 1953, at the same time as Canvey Island was flooded, the wind was from the north and the east, and it started to oscillate the [Union] bridge. It tore the bridge out from its moorings, both ends, and the first ten feet of the bridge, at the English side, was smashed beyond redemption. The first twenty feet of parapet wall at the east end was demolished, knocked in the river, and a gap at least ten foot wide appeared in the decking, so the whole lot was torn adrift altogether. And at quarter point on the Scottish side, the bridge, when it was oscillating, started to twist and break the hanging bolts. Two of them had already been shorn off, and had the gale continued any greater length of time, in all probability the bridge would have failed at that point. The first thing was to get some more bolts in. We slung a scaffold under the quarter point and put two new bolts in from the nearest blacksmith's shop, [Dick Simpson at Horncliffe?], and tightened them up, and they remained there for a number of years. Once that was done, we anchored the Scottish end and then maintained the south end. The bridge bounces when a car comes across. When we've had people on painting the tie rods and so forth, when they've got off they've been properly sea sick. If there's a slight wind and it oscillates nicely and quietly, it knocks them seasick in no time."

Until 1986, the Bridge was owned and administered by the Tweed Bridges Trust (successors to the North Durham and Berwick Turnpike Trust after the abolition of turnpikes) along with its sister border-crossing bridges at Norham and Coldstream. While the Clerk to the Trustees was always a local solicitor, traditionally from the Berwick practice of Sanderson, McCreath and Edney, the Trust Surveyor was always the Surveyor to Northumberland County Council

(latterly the late Basil Arthur) and the Council maintained the three bridges on behalf of the Trust. Bob Robson recalls an incident reminiscent of *Whisky Galore* when his workforce were widening Coldstream Bridge..." *a loaded Vaux brewery wagon burst its safety net and shed half its load...I've never driven home a happier load of workmen from any site and for days after that you couldn't move a piece of timber or pick up a piece of hessian without disclosing a cache of bottles or tins"*

Bob's Bridges by Robert Robson BEM and edited by Janet Brown and Christopher Hudson, is out of print but copies can be found on the usual out-of-print book websites.

A meeting of engineering minds



On Saturday October 27th, a delegation of eminent American engineers, members of the American Society of Civil Engineers (ASCE), visited the Bridge together with their colleagues from the Institution of Civil Engineers, at the Friends' invitation, to hear about the restoration plans from NCC's Greg Simpson and to discuss in detail their proposals for a bicentenary plaque, referred to in Professor Roland Paxton's article elsewhere in this Newsletter. The US visitors had travelled to London to attend the bicentenary celebrations of the ICE and made the journey to Berwick especially to visit the Bridge; and they also made time for a brief visit to Paxton House, where Trustee John Home Robertson showed them the Alexander Nasmyth painting of the Bridge and the only known portrait of Capt Sir Samuel Brown.

The visitors then paid a brief visit with Prof Roland Paxton to Berwick's other three famous bridges, the Old Bridge (1634), the Royal Border (1850) and the Royal Tweed (1928) and, before catching their train back to London, vowed to return for the Bridge's centenary in 2020.

Picture above by Jane Miller: L to R: Dr Colin Stove, Chairman Adrok Ltd; Prof Jerry Rogers ASCE; Bill Bulloch ASCE; Dr Kathlie Jeng-Bulloch ASCE; David Gilbert ASCE; Greg Simpson, Northumberland County Council; Prof Gordon Masterson, Edinburgh University; Robert Hunter, Chairman of the Friends; Sandra Purves, Chair, Scottish Panel for Ancient Buildings; Theodore Green, ASCE; Prof Roland Paxton, Heriot-Watt University and Patron of the Friends; John Home Robertson, Trustee of the Friends and of the Paxton Trust

A Link with the Past

The Newbridge Chainworks of Brown Lenox

Stephen K Jones

The famous Newbridge chainworks of Brown Lenox at Pontypridd was established by Captain Sir Samuel Brown with the lease by of a former nailworks on the Glamorganshire Canal. In November 1817 he took possession of the site and following adaptation and new building work the Newbridge Chainworks opened in 1818.

Although established as Samuel Brown & Co., the company name of the chainworks soon changed to reflect the important input made by his cousin Samuel Lenox. Brown Lenox was a multi-stranded business story, covering the development of iron chain cables, the early suspension bridge and more, and figured strongly in the industrial history of south Wales and beyond. First and foremost, it was a commercial undertaking, led by Samuel Brown and his Welsh born smith and works manager; Philip Thomas, to manufacture iron chains for the anchoring, mooring and even rigging of ships. Brown Lenox produced the chain cable for every Royal Navy ship up to 1917 and many of the mercantile fleets of the world.

Brown's first purpose built chainworks was established at Millwall on the Thames in 1813 followed by Pontypridd, the latter works also supplying suspension chains for Brown's chain bridges. In this field Brown was the first to design iron suspension bridges capable of carrying wheeled traffic and had been experimenting with a test span at Millwall in 1813. In 1818 he was planning his first full scale bridge; the Union Chain Bridge and Newbridge would supply the chainwork for this and individual chain commissions such as William Tierney Clark's Hammersmith Chain Bridge. Existing records indicate that Newbridge supplied all of Samuel Brown's round eye-bar chain link suspension bridges.



Chainsmiths at work at Newbridge

Brown took advantage of the Glamorganshire Canal, and the access the works enjoyed with its own canal basin to receive bar iron from the ironworks of Merthyr Tydfil, particularly iron from Crawshay's Cyfarthfa Works. The finished chain cable would pass through the floor of the chain test house into canal boats and was then transported down to the sea lock at Cardiff from

where coastal vessels would carry the chain cable on to shipyards and in the case of suspension bridges, the nearest point for land transport to the bridge site. Famous ships supplied by Brown Lenox included Brunel's *Great Eastern* steamship and Cunard liners up to the *QEII*. The latter being the last chain cable order for Pontypridd in 1969. In that year Brown Lenox became a wholly-owned part of the F H Lloyd Group and with the change of ownership came diversification into new products. Even after this the skills of the chain smiths continued to be drawn upon with a demand for specialist chain accessories such as Bedwell swivels and shackles. The main activity of the works at the end was the manufacture, under licence, of ore and waste processing machinery, such as jaw and gyratory crushers, hammer mills and domestic refuse shredding machines. [The last sighting (and frightful sound!) of a Brown Lenox stonecrusher was at Low House, Loanend, about four years ago! Ed]



The Millwall works closed in the 1980s and in 1987 part of the Newbridge site (left) was sold off to form a retail estate, the works finally closing in

1999 with the site now occupied by Sainsbury's supermarket. No traces of the works remain although a section of the canal and Ynysangharad locks remain. Whilst this drew to a close one of the longest established and successful Welsh companies, examples of Brown Lenox's work, such as the chain links of the Union Chain Bridge, can still be seen today.

Photographs: S K Jones collection

New Information Boards



Fantasy Prints' signage fitter Craig Todd (left) and Trustee Alex McGregor stand next to one of two notice boards erected by the Trust at either side of the Bridge. The boards, which are not intended to be permanent, will inform local residents and visitors of the proposed restoration works. The Boards contain the Trust's QR code which

directs the visitor to the Friends' website.

The opinions and views expressed by contributors to this Newsletter do not necessarily reflect those of the Trustees.
Newsletter published by The Friends of the Union Chain Bridge ©

The Friends of the Union Chain Bridge is a charitable trust registered as a charity in England (No 1162687) and in Scotland (No SC046208). It is a Charitable Incorporated Organisation under the Charities Act 2011.

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