



ENGINEERS
AUSTRALIA

EHA MAGAZINE



Engineering Heritage Australia Magazine

ISSN 2206-0200 (Online)

January 2020
Volume 3 Number 4

EDITOR:

Margret Doring, FIEAust. CPEng. M.ICOMOS

The Engineering Heritage Australia Magazine is published by Engineers Australia's National Committee for Engineering Heritage. Statements made or opinions expressed in the Magazine are those of the authors and do not necessarily reflect the views of Engineers Australia.

Contact EHA by email at:

EHA@engineersaustralia.org.au

or visit the website at:

<https://www.engineersaustralia.org.au/Communities-And-Groups/Special-Interest-Groups/Engineering-Heritage-Australia>

Unsubscribe: If you do not wish to receive any further material from Engineering Heritage Australia, contact EHA at :

EHA@engineersaustralia.org.au

Subscribe: Readers who want to be added to the subscriber list can contact EHA via our email at :

EHA@engineersaustralia.org.au

Readers wishing to submit material for publication in the Engineering Heritage Australia Magazine, can contact the Editor via email at :

EHA@engineersaustralia.org.au

Cover Images:

Front: 1st July 1946, the day of the opening of the second Hawkesbury River Rail Bridge. The dignitaries walk past loco 3810 on their way to the dais for the ceremony. NSW Railway Commissioner Hartigan is beside NSW Premier William McKell. The first HRRB provides a backdrop to the picture. The first bridge had carried its last train and its trusses were dismantled soon after.
Source: ARHSnsw RRC 47436.

Back: The first Nowra Bridge over the Shoalhaven River, photographed from the south bank. The piers of the new bridge are visible in the background.
Photo: rickylynch, from the internet.

This is a free magazine covering stories and news items about industrial and engineering heritage in Australia and elsewhere. It is published online as a down-loadable PDF document for readers to view on screen or print their own copies. EA members and non-members on the EHA mailing lists will receive emails notifying them of new issues, with a link to the relevant Engineers Australia website page.

CONTENTS

Editorial	3
Australasian Engineering Heritage Conference 2020	4
Nowra Bridge across the Shoalhaven River	6
Concrete Pontoon at Circular Quay	13
Major General A.C. Fewtrell	14
Connections	22

“Wonders Never Cease”

“100 Australian Engineering Achievements.”

Engineers Australia (EA) celebrated its centenary year in 2019. To mark the occasion, Engineering Heritage Australia has produced a book of 100 significant Australian engineering achievements, from the Stump Jump Plough, to the Sydney Harbour Bridge, to the Snowy Mountains Scheme. A celebration of our rich engineering heritage, these stories will appeal to engineers and non-engineers alike, and are accompanied by an array of remarkable images. Engineers have taken often visionary ideas and turned them into practical realities, and the pages of this book highlight the combination of toil and genius which has shaped the Australia we live in today.



For the price of the book, to EA members & non-members, and how to buy it, see a link to EA Books below.

On the same link you can also find a companion book “Anything is Possible: 100 Australian Engineering Leaders”

<https://www.eabooks.com.au/Engineers-Australia-Centenary-Book-Wonders-Never-Cease>

Editorial

How does one explain why a magazine that was due out at the end of January appears nearly a month later? The answer is that putting the magazine together is the responsibility of your Editor, and she was completely taken over by this Summer's events, which started here in Spring – on 23rd November to be exact. That day we saw the so-called Abbeyard Fire start, about 30 km east of our eyrie above the King Valley, and we reported it of course. Nothing seemed to be done about it for several days until it took hold and eventually it burned through more than 100,000 hectares, and was still burning around the edges two months later. I hasten to say that we were extremely fortunate, in that none of the fires reached our property, and nothing was burnt here. My heart goes out to those who lost their homes and fences and livestock and businesses. Our problems were trivial in comparison.

Nevertheless, living in fear and tension and smoke, and packed ready to flee at a few hours notice for two-and-a-half months does leave its scars, both mentally and physically. Physically, for me, in terms of what seems to have become chronic asthma from the constant heavy smoke. At least we could laugh when Melbourne complained of smoke pollution for a few days every now and then!

We started by packing all our “extensive historical records” (another's words) both professional and personal, and taking them in car loads and van loads to safe storage in Wangaratta, an hour's drive away. I had enough foresight to realise that I was never going to find anything again unless I numbered and labelled every box and uploaded numbers and descriptions to a backed up digital data base. The next thing was to decide what we must not lose and pack it so we could fling it into car or van and flee with it when the time came. What is it that one must not lose? Title deeds etc., some clothes, medications, external hard drives (back-ups), a few favourite kitchen tools, mobile phones & chargers, things like a tiny carved bear sent to me from Damascus by Dad during WW2, a notebook/laptop and all its bits and pieces, two dogs and their beds and food. The photos were all in store already! This was on top of all the slashing and mowing and trimming and raking and gutter cleaning that had to be done outside.

We finally had to flee on 4th January, taking two cars and a van, Carl, me, our daughter and the dogs to Benalla. We stayed there for four nights and returned home to the uneasy thought that it could happen again, and again, and next time we mightn't be so lucky. In 2006-7 we had a bushfire at Whitlands which started on December 1st and burned around and on our property for three months - sometimes only 150 metres from the house – but we never felt the fear of this summer. There was a bad drought then, and little feed, but the temperatures were 10°C less than this year and we had many teams of Firies here, protecting us and our neighbours at all times. But that was 14 years ago – it was a different age and a different climate! Literally! Black Saturday fires in 2009 didn't come close to us, but they were quantitatively worse than 2006-7 in temperature and fierceness and this summer's fires are worse again.

This spring and into summer we watched what was happening in other states, and then in East Gippsland (not far away) and it was terrifying. We knew that if the fires came to us there would be no Firies to care for us like last time. That's why we had to leave. I should have seen it coming, but like most of the population, I suppose I have had my head in the sand. The reason I should have seen it coming is I have been watching climate change happen around me for 74 years – but I didn't know that's what it was and I didn't know what caused it until recently.

I am an engineer and conservationist now, but back in 1946 I was a child and a would-be skier. To ski at Mt Hotham, it was usual to ride horses up the Bon Accord Spur to the Razorback and then walk the rest of the way to Hotham Heights, because the Great Alpine Road was closed with snow all winter. In 1950 Dad and I had no horses, so we walked from 5 miles above Harrietville, Dad cutting steps in the ice with the heel of his skis around Blowhard, while carrying my skis strapped to his pack. By the time I had grown up, the road was rarely closed below Hotham Heights and there were only a couple of months when you couldn't drive from Harrietville all the way to Omeo. 60 years later, the road over the mountains is very rarely closed for more than a few hours in winter, and the so-called snowline has retreated a couple of hundred metres up the mountains. How long before we see Mountain Ash trees infiltrating the Snow Gums?

Of course the retreat of the snows has been happening for a lot longer than my lifetime. Witness the grand tourist hotel (the Belvedere?) built in the 1870s to overlook the ice falls of the Rhone Glacier. It still did so in the 1920s, but when we passed in 1986, there was no ice to be seen. The glacier has retreated far up its valley and out of sight.

Where we live, the road to Mansfield was closed by snow most winters in the 1930s and 40s. We bought our place in 1993, partly because of the superb views, but also because, on a 40° day in Melbourne, it was in the mid twenties up here at nearly 900 metres elevation. We were assured by the locals that the temperature never exceeded the twenties, and it still snowed in winter. That was correct then, but snowfalls here are very rare now and we get multiple days above 30° every summer. I am sure the temperature rises are accelerating every year. At the present rate of change, Australia will become an uninhabitable desert before many years have passed.

Don't think this summer has been an aberration, and things will soon return to “normal”. There is no longer any normal. And don't assume that it will be possible for the world to “adapt” to temperatures above 50°. What we must do – and do very quickly – is reduce carbon emissions to pre industrial revolution levels. Then the world will have a chance.

Margret J. Doring, FIEAust., CPEng., M.ICOMOS.

Australasian Engineering Heritage Conference 2020

Pre- Conference tour: Thursday 19 - Sunday 22 November 2020

Conference: Sunday 22 - Wednesday 25 November 2020

The Conference

The Dunedin Conference Committee is putting together an exciting package of events for the 2020 Australasian Engineering Heritage Conference. Our theme, *The Future of the Past* focuses on heritage engineering and technology that has endured, been redeveloped, undergone restoration, or repurposing to claim a place in the future.

Our principal sponsor is Naylor Love, New Zealand's largest privately-owned construction company with a 109-year history. They are currently involved in the restoration of several iconic New Zealand landmarks.

The Conference opens on the evening of 22 November at Toitū, Otago Settlers Museum, where delegates and partners will be welcomed by Mana Whenua.



The Dunedin Railway Station.

Source: Engineering Heritage NZ

Toitū is in the middle of the historic Railway Station Precinct, the home to Josephine, a railway locomotive imported in 1872, as well as JA 1274, the last main line steam locomotive to roll out of Dunedin's Hillside workshops in 1956. Close by is the original Dunedin Prison and the refurbished and strengthened Dunedin Court building, which we hope to have open for inspection.

Conference proceedings on 23 and 24 November will be based at the Dunedin Centre, part of the Dunedin Town Hall complex, located in the central city. It is within 10 to 15 minutes' walk from the University, museums, the thriving warehouse precinct and a range of hotel and motel accommodation.



Otago University.

Source: Engineering Heritage NZ.

The Conference will include a very interesting range of papers, headlined by four keynote addresses.

The four keynote speakers are:

Takerei Norton, a Ngāi Tahu historian talking about New Zealand's pre-European transport infrastructure.

Keith Paterson, Project Director for the restoration of Christchurch Cathedral which was severely damaged and closed by the 2011 earthquakes.

Matthew Churchward, Curator for Museums Victoria and closely associated with the restoration of the Great Melbourne Telescope.

Glen Hazelton, Director Organisational Development, Heritage New Zealand Pouhere Taonga.

The Conference Dinner will be held after the first day of proceedings, featuring Ian Taylor CNZM as the after dinner speaker. He has had a varied career as a rock musician, a children's television presenter and an entrepreneur and is the CEO of Animation Research Ltd which works at the cutting edge of sports television coverage.

A half-day guided Engineering Heritage tour of Dunedin is planned for the morning of 25 November, which includes the Gasworks Museum, harbour reclamation, the cable car and the warehouse precinct. A relaxed partner's programme is being developed.

Australasian Engineering Heritage Conference 2020

The pre-conference tour

The pre-conference tour will start in Queenstown on 19 November with a twilight cruise on the TSS *Earnslaw*, the 108-year-old, Dunedin-built “Lady of the Lake”.



TSS “Earnslaw” Source: Engineering Heritage New Zealand.

The route for the next two days starts in Queenstown, travelling to Milford Sound then looping round the south coast to Invercargill and through central Southland to Dunedin. Tour highlights will include engineering heritage sites ranging from a state of the art alpine highway avalanche protection programme for a heritage tourist highway, to a restored and working flax mill. In Invercargill there will be an opportunity to visit Bill Richardson Transport World, a comprehensive road transport collection. On the way to Dunedin, highlights will include a visit to the Croydon Aviation Heritage Centre with its collection of de Havilland vintage aircraft. The tour will then travel via the Tuapeka punt over the Clutha river and arrive in Dunedin on the afternoon of Sunday 22 November. There are flight options direct to Queenstown from within New Zealand and the Australian East Coast.

Call for papers

The detailed call for papers has been published on the Engineering New Zealand website with other conference information. The moderating panel is taking an inclusive and flexible approach. We are keen to receive abstracts of up to 300 words. Papers will need to fit a 30-minute slot, including questions. As an alternative, poster displays will be welcomed on topics of particular interest.

As is normal practice, people delivering papers will need to register for the Conference. The Abstract deadline is 3 April 2020. Please email to:

ehconference2020@engineeringnz.org

Early bird registration

Early bird registration will open on 28 February. Full information on costs, programme and Dunedin accommodation options will be available at that time. For more information go to:

<https://www.engineeringnz.org/our-work/heritage/australasian-engineering-heritage-conference-2020/>



Image Left: The Alexandra Bridges. Source: Engineering Heritage NZ.

Nowra Bridge

across the Shoalhaven River, about 170km south of Sydney

by Bill Phippen

Preliminary

By common understanding the Nowra Bridge across the Shoalhaven River was built as a railway bridge, but never used as such, and in 1881 was the first bridge in Australia to be fabricated from steel. Neither of these contentions can be supported by research.

Nowra is a large coastal town, situated on the Shoalhaven River, about 170km south of Sydney. Since 1893 it has been connected to its capital city by the Illawarra railway, which terminates at Bomaderry, close to the northern bank of the river, but which does not enter the town proper.

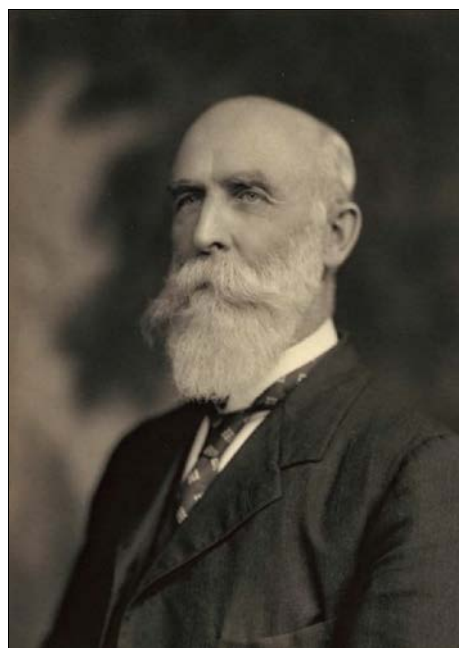
Was it intended as a railway bridge?

There is no doubt that discussion in Parliament and the press at the time of this bridge's planning and construction imagined that it could be a railway bridge. It was opened, to road traffic, in August 1881. At that date there was no Illawarra Railway from Sydney at all. Hurstville, only a few miles south of the city, was not reached until 1884 and so the concept of making the decision to build a railway bridge so much further south in 1878, when no commitment had been made to have a railway at all, seems fanciful. The decision to build any railway was an onerous one, only arrived at after parliamentary process. There was no Act or approval to build any railway towards Nowra.¹ The construction of new railways was the responsibility of the Engineer-in-Chief for the NSW Government Railways, John Whitton, yet he played no role in the creation of the Nowra bridge.

Further, the decision to build a double-tracked bridge is worrying. Como bridge across the Georges River, on the Illawarra line within the suburban area of Sydney, even in the 1880s, was built as single-track, after the Nowra bridge was opened, and the many tunnels ultimately built to reach Bomaderry were all single-track. Double-track railway bridges were rare and then only close to Sydney.



The Nowra bridge just before completion. The road surface on the northern approach is still being formed and the timber 'guard rail' is being painted. Note the different finished heights of the two nearer cast iron cylinder piers. Photo courtesy Shoalhaven Historical Society.



Henry Deane MICE, eminent engineer & botanist (1847-1924), Engineer-in-Chief for NSW Railways from 1890 to 1905. From a portrait by John Henry Newman in the NLA

Later, in 1889, a Parliamentary Public Works Committee enquired into the extension of the railway from its then terminus, just north of Kiama, to Nowra. Its recommendation was to build the line only to Bomaderry to save the great cost of a railway bridge across the Shoalhaven. The evidence given by Henry Deane and John Wright well illustrates what was probably the true circumstances. The evidence is recorded in Parliamentary papers as question and answer.

Wednesday, 4 December, 1889

Examination of Henry Deane Esq., Acting Engineer-in-Chief for Railways.

138. Do you know whether that bridge was designed for the purpose of carrying a railway? *I do not remember whether they had any intention of doing so. I am quite certain it would never carry a railway.*
139. Was it not stated at the time that with additional piers it would carry a railway; was not that one reason for constructing the bridge? *The bridge is not suitable for a railway. It is a link and pin bridge, the same as the Hawkesbury. You could not put any additional supports underneath the spans.*
140. Not strengthen it sufficiently to carry a railway temporarily; would it not be safe to take a train travelling at a slow pace across it to Nowra? *I would be very sorry to attempt to do it. I have stood on that bridge when a buggy was driven over at a rapid pace and I felt the vibration. I do not know what it would be if a train were driven over the bridge.*

¹ *The Kiama Independent, and Shoalhaven Advertiser*, 3 September 1880, p2.

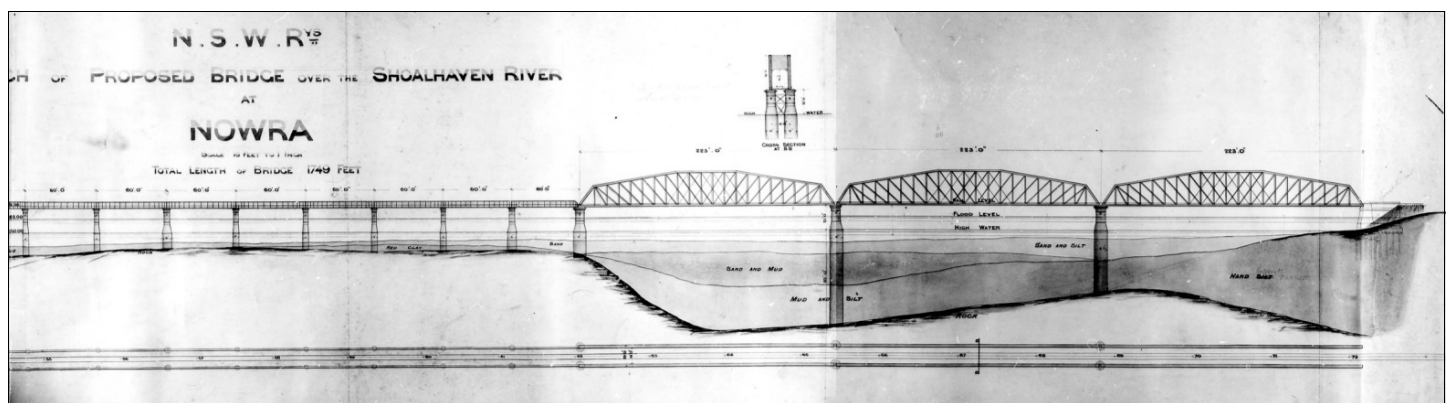
Nowra Bridge

142. I understand that then a severe test was applied which the bridge stood satisfactorily? *Yes, for vehicle traffic, perhaps.*
143. You are satisfied it would not carry a train?² *It is most unsuitable, and I would doubt very much whether the foundations of the piers would be sufficient.*
144. It would be necessary to build a new bridge in order to take the railway to Nowra and Jervis Bay? *Certainly.*

Thursday, 5 December, 1889

Examination of John Wright Esq., District Engineer, Dept of Engineer-in-Chief for Railways.

365. Has it been considered by the Department whether the present bridge can be utilized for the purpose of railway communication at any time? *Mr Deane and I examined the present bridge, but arrived at the conclusion that it was not strong enough to carry a railway.*
367. Of iron cylinders? *Yes. But it is of light construction, and the cylinders have not been sunk to the rock. The bridge was thus not available as a railway bridge at the time of its construction, even if some persons in ignorance imagined that with modifications it could be made so.*



Part of a drawing of a proposed single track railway bridge at Nowra, prepared by the railways section of the Public Works Department in about 1890, long after the subject Nowra (road) Bridge had been completed. No such railway bridge was ever built. Image from Australian Railway Historical Society NSW.

The 1890 report [of the enquiry] contains details of a bridge which could have been built, especially in noting the location of suitable foundations etc., and that location is not the 1881 bridge. At no stage was taking the railway into the town across the existing bridge considered by the railway authorities.

A new Parliamentary Public Works Committee report in 1911 looked into a proposal to extend the railway to Jervis Bay. About a third of the cost of this 16-mile railway was the Shoalhaven bridge. There was some mention in that 1911 report of a 1907 meeting convened by Clyde Shire Council exploring the possibility of carrying a tramway to Jervis Bay across the existing bridge using *an ordinary motor engine or light description of tank engine*, but only as a single track.

The truth of the oft-cited claim that a double-track railway bridge was built at a significantly greater span than was standard at the time, so far from Sydney, on a line which was not otherwise even commenced, requires documentation which has not been seen.

Is it fabricated from steel?

Steel in the quantities required for large structures such as bridges was not available until the 1870s, when use of the Bessemer converter became the established technology. The first substantial bridge using steel for the main load carrying members was the combined road/rail Eads Bridge over the Mississippi River in St Louis, Missouri, opened in 1874. If indeed the Nowra Bridge, planned and fabricated in the late 1870s, were proved to be made from steel it would be of significance beyond NSW.

The Nowra Bridge was fabricated by the Edge Moor Iron Company of Delaware USA. In 1886 Edge Moor was an unsuccessful tenderer for the Hawkesbury River Railway Bridge. The design they offered was a Whipple truss, very similar to the Nowra Bridge, but it was offered as steel. Only a few years after they had finished Nowra, they were working in steel. No contemporary reference to the use of steel has been sighted.

² The test load was 30 tons of rock on a wagon. The first locomotives used in NSW, 25 years earlier, weighed 45 tons.

Nowra Bridge

The many later references to the bridge vary in their specification of the material used, although several remark on the use of steel so many years before its general use in Australia. Some refer to a wrought iron truss bridge with a steel beam approach span. This concessional claim is also not supported by the evidence. On 29 October 1880³ tenders were called in the NSW Government Gazette [issue No.416 page 5587] for girders for this approach span. The tender specifically mentions wrought iron, and the contract was awarded in early November⁴, also specifying wrought iron, to Bubb and Rees who operated the Victoria Foundry at 575 George Street Sydney.⁵ The suggestion that such a small local firm would have found steel, outside the specification, at short notice in 1880 to fabricate these girders is unreasonable.

Construction of wrought iron girders for | 2 Nov., 1880 | Office of Commissioner and Engineer |
Nowra Bridge, Shoalhaven River. | for Roads, Sydney. |

Selection from the pages of "Tenders for Public Works", under "Roads", p5587 of NSW Govt. Gazette, issue 416 of 29 Oct. 1880. Image from TROVE.

The Roads and Maritime Services report on proposals for a new bridge describes the old trusses as wrought iron, and such a specification by that authority would seem to be telling. In the absence of compelling documentary or metallurgical evidence to the contrary the Nowra Bridge is not the earliest steel bridge in Australia, or indeed one of the earliest steel bridges in the world.

Pin-Jointed

The trusses of the existing Nowra bridge are pin-jointed. This technique was very much identified with American engineering. The British, and thus preferred, design at that time was the lattice girder. The attraction of the pin-jointed design was that much more of the work was done in the convenience of a workshop rather than in the field. Assembly on site was amazingly rapid – several of the Nowra spans were self-supporting only five days after assembly commenced – with little opportunity for compromised workmanship. Only four bridges in New South Wales were built using the pin-jointed technique.

- Nowra Bridge (1881)
- The replacement spans for the original stone arch bridge on the Main Suburban railway at Lewisham (1886)
- The original Hawkesbury River Railway Bridge (1889)
- The river span of the very long timber truss railway bridge across the Murrumbidgee River at Gundagai. (1903)



A pin joint at the top of the raking end post on the bridge. The pin connects all the members, including the raking end post and the top chord. Note the two diagonals connected to this point.

Photo: Bill Phippen

Of these the original Hawkesbury River Railway Bridge was by far the largest, but it was demolished after it was replaced in 1946. One span of the three at Lewisham is preserved, somewhat overgrown with weeds behind a chain wire fence, adjacent to its original location. The Gundagai bridge still exists though the ruin of the timber approaches makes detailed appreciation very difficult. The Nowra Bridge is still in service and will likely remain so as a public place in a major town.

Whipple Truss

The Nowra Bridge is an example of an early form of truss – the Whipple Truss. This style is most readily defined by the details that diagonal members cross two panels and that more than one diagonal member meets the top chord at the end panel point. The Lewisham bridge is certainly Whipple and the Hawkesbury Bridge was a Whipple design in the accepted tender, but not built as one. The Gundagai Bridge is not Whipple. Thus, in terms of demonstration of this design, Nowra Bridge is pre-eminent, the Lewisham Bridge being smaller, later in construction, incomplete, somewhat damaged in its relocation, not in service and less accessible. Nowra Bridge is the only Whipple truss bridge in service in NSW.



Image Right: Although in a Whipple truss the diagonal members cross two panels, they are not connected where they cross the intermediate post at its half height. The large cast iron washer simply stops the diagonal eye-bars from rattling. The tiny (25mm x 25mm) diagonal passes through slots in the post, probably provided to allow the threading of the eye at its ends. Photo: Bill Phippen

3 *Sydney Morning Herald*, 29 October 1880, p2.

4 *Evening News*, 11 November 1880, p7.

5 *The Sydney Morning Herald*, 29 October 1880, p1.

Nowra Bridge

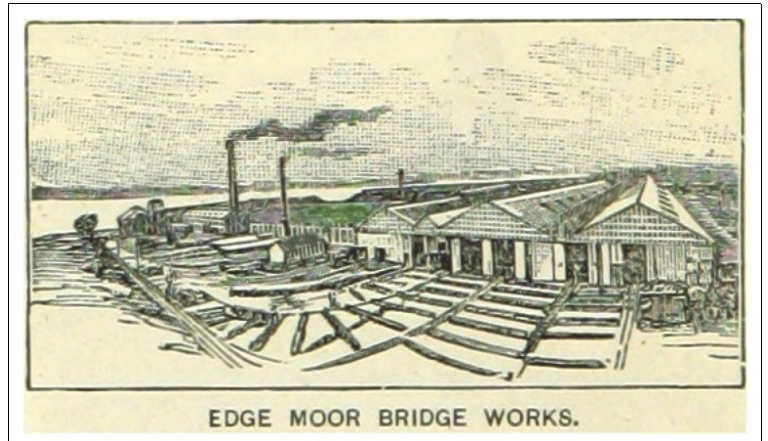
Building the Bridge

The NSW Department of Public Works, through the office of the Commissioner and Engineer for Roads, called for tenders for the work on 27 September 1878. *Separate tenders will be received for Supply of Superstructure, Supply of Piers, Erection of Superstructure, and Sinking, Fitting, and Erection of Piers.*⁶ Tenders closed on 5 November 1878.

The casting of the iron cylinders for the piers was awarded to Atlas Engineering of Darling Harbour, Sydney. This was the heaviest casting work yet undertaken in the colonies being 130⁷ seven-foot diameter cylinders. A fascinatingly detailed account of their manufacture may be read in *The Telegraph and Shoalhaven Advertiser* of Thursday 17 July 1879.⁸

*The Telegraph and Advertiser*⁹ also reported that the engineer entrusted with the onerous duty of erecting the gigantic structure was *Our energetic friend, Mr Williamson*, and that he was progressing rapidly with the various preliminary details before entering upon the construction of the substructure. Williamson seems to have been an engineer in the Public Works Department given responsibility for supervising the contractors. The first cylinder was placed on 4 November 1879.¹⁰

Borings had established the presence of rock at 104 feet on the south side of the river and that *a good bottom* existed at a depth of 98 feet on the north side.¹¹ The bridge was erected from the southern or Nowra end, working northwards. The method of sinking was first the weight of the iron cylinders alone, and as the ground resistance became greater extra weight was added, up to three times the load which the pier would bear in service. Once the cylinder ceased sinking under this load it was deemed sufficient, irrespective of whether it had reached rock or not. Much later in the work, after all of the trusses were in place this (perhaps naïve) procedure was proved faulty when several of the cylinders settled significantly further, one by many feet (several metres).



An engraving of the Edge Moor works in Wilmington Delaware, USA.
Source and date not supplied.



The task of the fabrication of the trusses was awarded to 'The Edge Moor Iron Company of Delaware USA, and they were designed for Edge Moor by C. Shaler Smith. In the American style he went by his second given name, his mother's maiden name, rather than Charles.

Edge Moor did not delay the fabrication of the trusses while waiting for the foundations and piers to be built. One complete span was erected at the northern end of the Garden Palace on Macquarie Street in Sydney, as part of the 1879 International Exhibition, in a display of the technology. Adjacent to it, for comparison, was a span of the rivetted lattice girder intended for the *Iron Cove and Parramatta River Bridge*. According to the *Sydney Mail and NSW Advertiser*, . . . *the latter being of British manufacture, much interest will attach to the expedition with which each is put up, as they differ in the important particular, that the American is a pin bridge and the British is riveted.*¹²

Image Left: C. Shaler Smith as an officer in the Confederate Army.

Source: The Journal Of Bridge Engineering, Vol.15, No.2

6 *NSW Government Gazette* 25 October 1878.

7 Cited number of cylinders vary. Piers were driven until refusal and special length sections were manufactured to bring piers to a uniform level above the river.

8 <https://trove.nla.gov.au/newspaper/article/132979058?browse=ndp%3Abrowse%2Ftitle%2FT%2Ftitle%2F631%2F1879%2F07%2F17%2Fpage%2F14505384%2Farticle%2F132979058>

9 *The Telegraph and Shoalhaven Advertiser*, 17 July 1879 p2.

10 *The Maitland Mercury and Hunter River General Advertiser*, 4 November 1879 p6.

11 *The Telegraph and Shoalhaven Advertiser* 17 July 1879 p2. This reference states that construction proceeded from the north. Numerous other references and photographic evidence contradict this.

12 *The Sydney Mail and NSW Advertiser*, 25 October 1879, p702.

Nowra Bridge



The Nowra bridge, and the still extant Iron Cove Bridge, relocated to several locations near Forbes, are thus rare tangible remnants of the Sydney International Exhibition. This lone span of the Nowra bridge, in place in Sydney in October 1879,¹³ must have been an early delivery, for the bulk of the iron, 600 tons, arrived on *Aminta* in March 1880,¹⁴ and all 700 tons had been landed at Nowra by 24 June.¹⁵

Image Left: This image of Macquarie Street Sydney shows the Garden Palace, site of the International Exhibition, on the left in the Botanic Gardens. Between it and the street the span of the Iron Cove Bridge is displayed. The Nowra span is either yet to be erected or has been already dismantled for carriage to its place of use. The Garden Palace was totally destroyed by fire in 1882.

Source: Charles Bayliss, National Library of Australia, nla.obj.10701795

The erection of the trusses at Nowra was also undertaken by Edge Moor under the supervision of their field superintendent John Kane. The great advantage of the pin-jointed design was the rapidity of assembly and at Nowra the timing of the placing of the several spans was truly amazing.



Image at Right: The builder's plate, still in position on the southern truss at Nowra. It reads "1880 - Built By - Edge Moor Iron Co. - Delaware - U.S.A."

Photo: Bill Phippen.

Timber falsework was erected between each pair of piers and on this the truss was assembled, by as few as ten men, using a travelling gantry crane. Dates of completion are a little vague as newspaper reports use terms such as *yesterday* and *this afternoon*, and several newspapers which use the same copy exactly appear on different dates! Notwithstanding this potential for error, the sequence of dates well illustrates the speed of the work. The reported completion of a span is termed *swung over* and this seems to mean the weight of the span transferred from the falsework to the bearings rather than any gross movement of the whole assembly.

- Span No.1 Friday 16 July 1880 – *The Sydney Mail and New South Wales Advertiser*, 17 July 1880 p126.
- Span No.2 Thursday 22 July 1880 – *The Sydney Morning Herald*, 22 July 1880 p5.
- Span No.3 Thursday 29 July 1880 – *The Sydney Morning Herald*, 29 July 1880 p5.
- Span No.4 Saturday 7 August 1880 – *The Sydney Morning Herald*, 7 Aug 1880 p5.
- Span No.5 Wednesday 18 August 1880 – *The Telegraph and Shoalhaven Advertiser*, 19 August 1880 p2.
- Span No.6 Tuesday 31 August 1880 – *The Sydney Morning Herald*, 31 August 1880 p5.
- Span No.7 Saturday 18 September 1880 – *The Sydney Mail and New South Wales Advertiser*, 17 July 1880 p126.

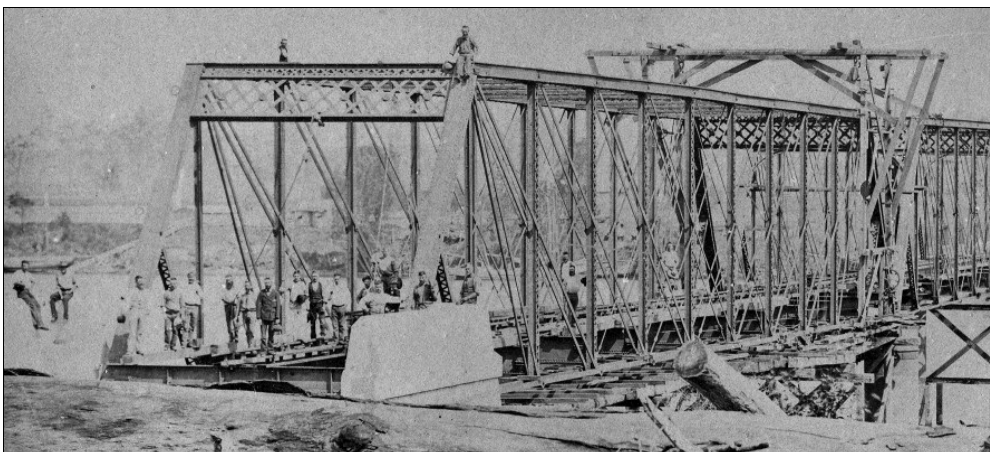


Image Left:

The northern (8th) span was the last erected.

In this image it may still be supported on the timber falsework.

There appears to be a lack of straightness in the top chord and the decorative cresting is as yet unfitted.

The method of erection using a travelling gantry is shown.

Photo: Shoalhaven Historical Society.
No date provided.

¹³ *ibid.*

¹⁴ *The Sydney Morning Herald*, 16 March 1880, p4.

¹⁵ *The Telegraph and Shoalhaven Advertiser*, 24 June 1880, p2.

Nowra Bridge

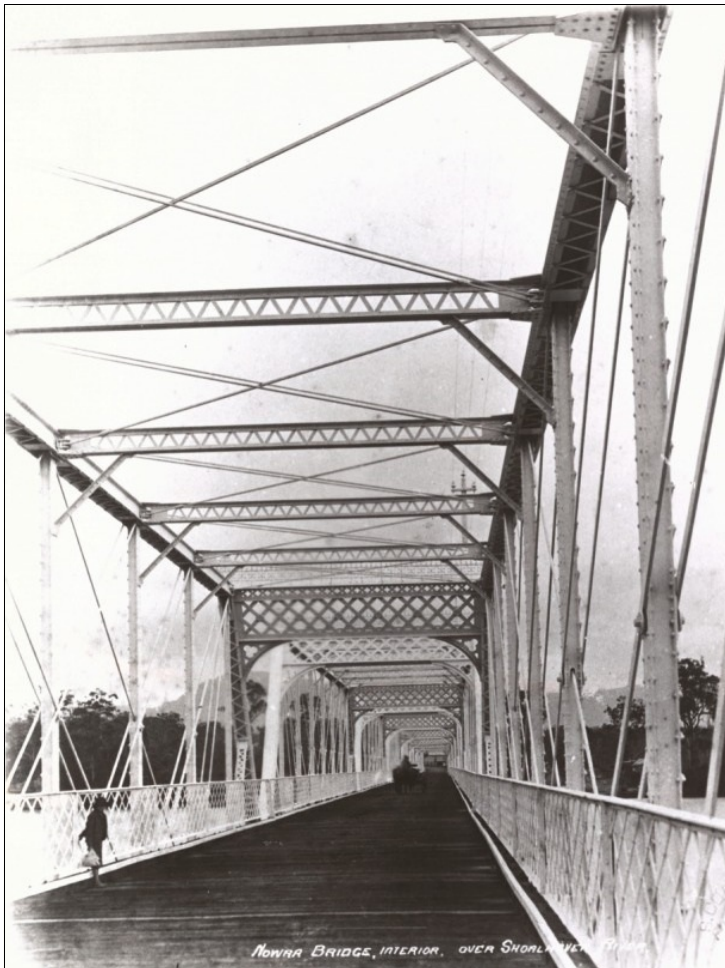
On 21 September 1880 a severe storm swept through the site, blowing the travelling crane off the falsework which was also wrecked.¹⁶ Span No. 8 was not 'swung over' until November. The whole work had been completed without accident to any worker.

The bridge had a timber floor and this seems to have taken longer to build than the trusses, though of course most of the work on the trusses had been done before they left Delaware. The bridge could have been opened much sooner had not a deficiency of the foundations become apparent.

The details of this are set out in a newspaper report of 3 February 1881¹⁷ giving questions asked of the Secretary of Works, Mr Lackey, in Parliament, by Mr Ninny Melville. Lackey answered that, yes, the piers had sunk. Pier No.7, one of those of larger diameter had sunk 1 foot 2 inches (350mm) on 7 November and had since sunk and been forced down a further 2 foot 6 inches (750mm), Pier No 5 had sunk 10½ inches (270mm), Pier No.4 three inches (75mm), and pier No. 3, 7½ inches (190mm). The other piers, 1, 2 and 6 had not moved. Lackey remained optimistic and *hoped* that Pier No. 7 could be forced down to rock in a fortnight. The Daily Telegraph was, not unreasonably, alarmed at these movements and asked *But how comes it that the bridge was ever built without a foundation?* The reluctance of Henry Deane and John Wright, in 1889, to adapt the bridge for railway use is thus more understandable. Wright, at least, knew that the foundation cylinders had not reliably reached rock.



The timber floor of the bridge being placed. Photo source: Shoalhaven Historical Society.



A long appreciation of the whole bridge project given by *our correspondent* in *The Sydney Morning Herald* on 8 August 1881 (page 7), gives more details of the crisis. When the movement in the piers was first noticed it was considered to be impossible and more likely a surveying error, but this was soon dismissed. An extra load of 50 tons, in addition to the weight of the trusses, was imposed, but the movement became so rapid that this extra load had to be thrown off. The weight of the trusses was transferred to staging and the pier forced down another 12 feet (3.6m) until it became stationary under a load of 150 tons, as well as the weight of the superincumbent spans. The article states that every pier in the bridge, but one, subsided *slightly*, but the exact meaning of this term is unclear as the many inches of movement reported by Lackey in parliament presumably correspond to these *slight* movements. Special lengths of cast iron cylinder had been obtained from Atlas and accurate capstones were used to adjust the spans to their true levels.

The bridge was tested in May 1881 with a 30-ton load of rocks on an 11 foot (3.3m) wheel-base *applied over the whole structure* being allowed to rest at mid-spans and over the piers. The bridge was opened on 1 August 1881 by John Lackey after travelling from Kangaroo Valley where he had stayed the previous night.

Image at Left:

An undated but clearly early image with the timber deck and sparse traffic. The bridge appears to be painted a very light colour, perhaps white rather than the modern 'bridge grey'. Source: NSW State Archives NRS17420_2_921/18

¹⁶ *The Sydney Daily Telegraph*, 25 September 1880 p5.

¹⁷ *The Telegraph and Shoalhaven Advertiser*, 3 February 1881 p4.

Nowra Bridge

Relationship to Other Bridges in NSW

At the time of its completion Nowra Bridge was the longest bridge in NSW.¹⁸ There are claims that it retained this distinction until the completion of the Hawkesbury River Railway Bridge in 1889, but at 1,103 feet it was in fact eclipsed by the Iron Cove Bridge (1125 feet) only a year after its opening.

Subsequent History

The bridge as built had no separate footway. This was particularly alarming to pedestrians as often herds of livestock were driven across it. Some relief from this hazard was made soon after construction by means of gated refuges where pedestrians could shelter pending the passing of the stock. A cantilevered footway was added on the downstream side in 1937¹⁹, and while the rivetted support brackets appear to date from that time, the concrete paving and metal railing are more modern. About 1959 the timber deck of the road carriageway was replaced with a corrugated steel deck in-filled with asphaltic concrete and in 1980 a duplicate north-bound bridge was provided to cope with increased traffic, and this afforded the opportunity for temporary closure of the old bridge in 1981 for the complete replacement of the deck in concrete. In 1981 the old bridge became the south-bound carriageway of the Princes Highway.



The footway on the downstream side. The rivetted brackets date from 1937. The superimposed steel section and the concrete slab are modern.

Photo: Bill Phippen.



In 1997 the trusses of the northern span were damaged severely by a heavy vehicle - a Council roller falling off a low-loader. The bridge was closed to heavy vehicles, one lane was closed to traffic and two-way traffic provided on the new bridge for five months until repairs were effected.

Image at Left: Two pairs of diagonals on the downstream side and one pair on the upstream side were damaged and repaired. The inherent limitation of the pin joints – the pin cannot be removed to insert a replacement member without the bridge collapsing – meant that the patch is grotesque. Photo: Bill Phippen.

Options have been considered by Roads and Maritime for the replacement of the 1881 bridge with a further modern bridge and the decision has been made that this new bridge will be on the upstream side, away from the old bridge. It has been agreed that the old bridge will remain, out of traffic use, as some form of community space.



Images Above: Roads and Maritime Services are anxious that an over-height vehicle could damage the bridge beyond repair, although they seem a little uncertain as to the actual height limit. Photo: Bill Phippen.

¹⁸ Plaque beside carriageway at southern end, erected by Department of Main Roads and NRMA, 1988.

¹⁹ *Nowra Leader*, 24 July & 26 November 1937.

A Reinforced Concrete Pontoon for Circular Quay, designed & built by Stone and Siddeley in 1914.

Rediscovering significant but forgotten and sometimes demolished engineering works has become easier with the digitisation of Newspapers and Journals, and with access to them online, such as through Trove - <https://trove.nla.gov.au/>

An instance was discovered a few years ago in a newspaper article published during World War I that described proposals to the Australian government, by the engineer Edward Giles Stone (1874-1947), to construct a fleet of concrete ships for the coastal trade. In it is mentioned a then existing large concrete barge/pontoon.

In *The Argus* of Friday 8 June 1917, p6, (see: <https://trove.nla.gov.au/newspaper/article/1624032>) it was reported that:

Mr. E. G. Stone, of Messrs. Stone and Siddeley, engineers and contractors, has put before the Prime Minister a proposal to construct a 4,000 ton concrete vessel within seven months, and after that, if the work is organised on a large enough scale, to maintain an output of one similar vessel a week.

The vessels would be built of concrete, with a framework of steel bars, which can easily be obtained. Messrs. Thompson Brothers, of Castlemaine, and other engineering firms have offered to supply the necessary engines within the specified time. They will be internal combustion engines, of the semi-Diesel type, and the vessels will be capable of a speed of 10 knots. A greater speed could be attained, but it would not justify the expense. The vessels will be purely cargo-carriers, of course. My firm has offered to back my opinion that the vessels will be seaworthy and satisfactory, by a guarantee of £10,000, and Messrs Thompson Brothers will back their engines.

Within the article it was reported:

We built the biggest concrete barge in the world, continued Mr. Stone. It is 180ft. long, with a beam of 80ft., and is now in use in Sydney Harbour, where it serves its purpose well, and has stood many heavy shocks.

When this article was re-discovered, it was thought that this pontoon might have formed part of the Circular Quay Ferry terminal, but this could not be confirmed, at the time. However, recently in *The Commonwealth Engineer*, Volume 1, No.11, June 1914, p370, I discovered the following illustrated article:

Reinforced Concrete Pontoon

A reinforced concrete pontoon has been constructed to the order of Sydney Harbour Trust by Messrs. Stone and Siddeley, of Sydney, Melbourne, and Geelong. The pontoon is to be placed in position at the eastern end of Circular Quay for the use of the Lavender Bay and Parramatta River ferry service.

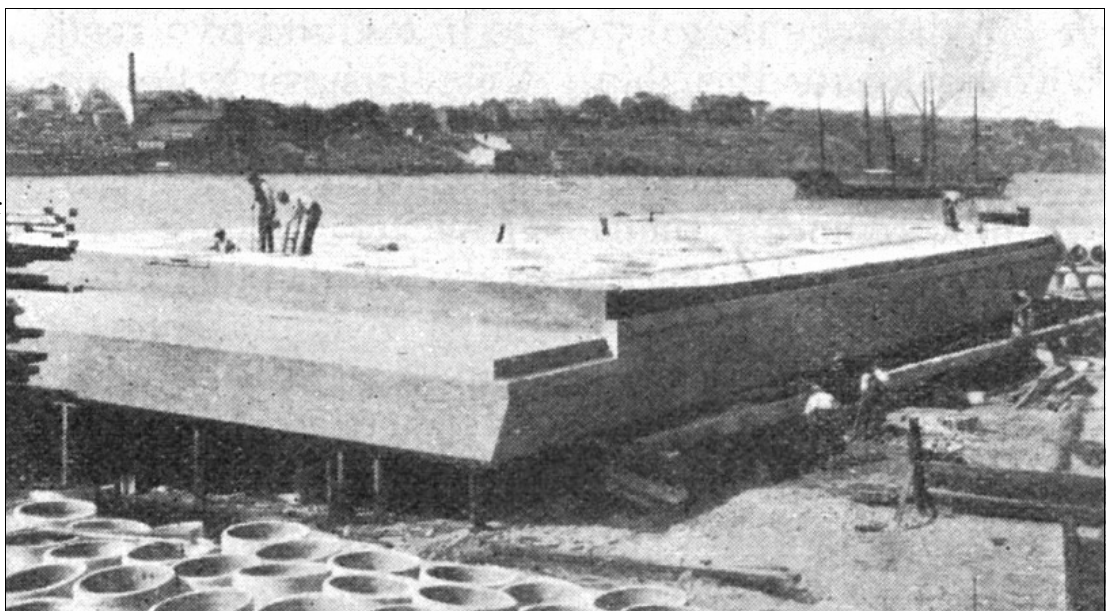
The dimensions of the pontoon are: - 100ft. in length, 53 ft. 3 in. wide at one end, and 67 ft. 7in. at the other, depth 7ft. 9 in., with a 32 in. freeboard. The bottom is flat and the sides and ends are sloped to an angle of 70 deg. Special attention has been given to the design of the steel work with a view to enable the construction to withstand the excessive strains likely to occur should vessels be berthing at each side of the pontoon at the same moment. In the construction of the top and bottom of the pontoon allowance has been made for a live load of 150 tons, which will be distributed over the centre length between the posts. The pontoon has been constructed of half-inch blue metal concrete, reinforced with steel bars. The whole construction is divided into 48 watertight compartments, and weighs about 650 tons.

This newly re-discovered article confirms that this pontoon was located at Circular Quay, so helps support the idea that the larger (and later) 180 foot by 80 foot *biggest concrete barge in the world* might also have been located there as well. More research is needed to confirm this. I have looked through all the articles in *The Commonwealth Engineer* up to 1918 but have not found any other related articles. Perhaps the Sydney Harbour Trust Archives might provide answers, but I will leave that to a Sydney based researcher. It would also be nice to know whether any of these century old concrete pontoons still exist around Sydney Harbour.

Ken McInnes

Image Right: The reinforced concrete pontoon under construction, as shown in the June 1st, 1914 issue of "The Commonwealth Engineer".

One also wonders where in the Harbour the pontoon was built. (Ed.)

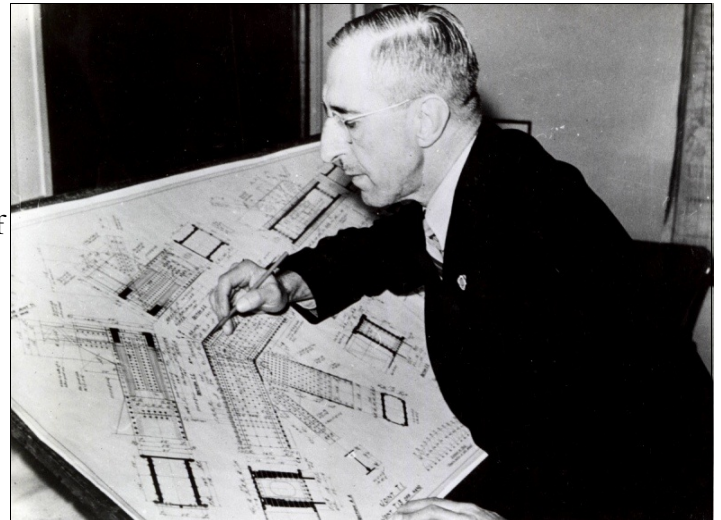


Major-General Albert Cecil Fewtrell

Introduction

by Frank Johnson

Within organisations, there arise from time to time 'larger than life figures', who stand out and continue to do so even after their death. In the New South Wales Government Railways (NSWGR), one of these was Albert Cecil Fewtrell, usually known by his military rank of Major-General. I joined the NSWGR some 13 years after Fewtrell's death in office, but he still ranked as a legendary figure. Fewtrell was the first Chief Civil Engineer of the Way & Works Branch when this position was created in 1932. He held this title for 18 years, a record unbroken over the 57 years, until the position was abolished as part of a short-lived restructure. Further, Fewtrell was of that age that allowed service in World War 1 and World War 2, and he distinguished himself in both. Thus, Fewtrell's story is one worth telling, for his achievements and his legacies. He is the engineer behind the NSW Railways' most notable landmark – the second Hawkesbury River Railway Bridge.



Chief Civil Engineer of NSW Government Railways Albert Fewtrell, at his desk, examining plans of the 2nd Hawkesbury River Railway Bridge. Date not given, but circa 1944. Source: State Archives NSW NRS 17420-344-3.

Brief background

Fewtrell's life started in 1885 in Chester, England, the son of John and Sarah Lilla Fewtrell. Within a year of his birth he was en-route to Australia, after his father obtained a role as a teacher with the Queensland Education Department, the family arriving in Brisbane in March 1886.

Fewtrell's first school was at Woodford¹, a small village about 75 km north of Brisbane, and he then moved around, in line with his father's teaching appointments. He finished his high school years at Townsville Grammar School, winning various academic prizes. While still at high school, Fewtrell passed (with credit) the Scale Drawing examination at Brisbane Technical College. At 16 years of age he was awarded a school scholarship soon after passing the Junior University examinations. Thus Fewtrell's rise to engineering fame started.

Early railway career in Queensland and NSW



The Power House at Ipswich Railway Workshops in Qld, photographed in 1914. The Power House was built in 1901 to 1902, so if Fewtrell was involved in the construction perhaps he could have used his knowledge gained at Ipswich later, in building the Zaara St Power Station at Newcastle when he went there in 1920. Source: Qld State Library.

In 1902, Fewtrell joined Queensland Railways as Cadet Mechanical Engineer at the Ipswich Railway Workshops. However, it was said that he found the building of steam engines too monotonous, so he transferred to the civil engineering side, a sentiment that many railway civil engineers may well identify with. Pursuing his destiny in civil engineering, Fewtrell obtained a position in 1907 as a draftsman in the Railway Construction Branch of the NSW Public Works Department, which was then headed by J.J.C. Bradfield, famous designer of the Sydney Harbour Bridge.

In 1908, Fewtrell transferred to the NSW Railways, and in 1911 was promoted to Assistant Resident Engineer, Alexandria (a Sydney suburb). He was promoted to Resident Engineer, Alexandria, followed by similar positions at Goulburn and then Newcastle in NSW².

Fewtrell joined the Australian Militia and began his military training while at Ipswich in Queensland. When his engineering career took him to Sydney, he became a Commissioned Officer, commanding the 5th Field Company, Australian Engineers. However, Fewtrell's part-time militia involvement soon turned much more serious when Australia's involvement in World War 1 started on 4 August 1914, about a week after Britain declared war on Germany.

1 Woodford State School Enrolment Register.

2 Fewtrell's History Record, from NSW State Archives

Major-General Albert Cecil Fewtrell

World War One³

Railway employees required a grant of leave to enable them to enlist for the First World War. Fewtrell was granted leave on 23 August 1915 and was promoted Major on 29 September 1915.

Mining under enemy trenches was being used by both sides on the Western Front. This led to Australia offering to raise a Mining Corps in September 1915. Fewtrell was selected to command the corps and was promoted to Lieutenant-Colonel. The Mining Corps had a strength of nearly 1,300 men when it left Sydney aboard HMAT A38 Ulysses on 20 February 1916.

When the Mining Corps arrived on the Western Front in May 1916, the British preference for smaller units that could be readily moved as required resulted in the Mining Corps being split up. Its three mining companies becoming independent tunnelling companies and the technical staff was formed into the Australian Electrical, Mechanical, Mining & Boring Company. Fewtrell was judged too senior to command any of these units, so on 6 July 1916 he took command of the 4th Australian Pioneer Battalion.

The 4th Pioneer Battalion was based near Armentieres at the time but was about to move to the Somme. They arrived at Albert on 28 July 1916 where they worked as a typical pioneer battalion until 24 August when the unit began to work on a 600mm light railway running from Albert to Pozieres. The British had been reluctant to use light railways on the Western Front, believing that the trench war would soon give way to a war of movement which would not suit light railways. The transport failures during the Battle of the Somme (July-November 1916) forced a review of this policy.



Lt. Col. Albert Cecil Fewtrell as C.O. of the Australian Mining Corps. The source of this portrait, probably taken in early 1916, is the Imperial War Museum in the UK.



Soldiers from Australian 4th Pioneer Battalion moving behind the lines on a light rail train, around Warlencourt on 19 April 1917. This is the only image found of Australian soldiers engaged with Light Rail construction on the Western Front.
Source: AWM Image 00468.

The 4th Pioneers were then sent to Ypres for more light railway work. Major-General Eric Geddes, who was charged with fixing the British transport problems, visited Fewtrell at Ypres and was sufficiently impressed to suggest Fewtrell as an assistant director for the proposed Directorate of Light Railways, but General Birdwood refused: Fewtrell was needed for the Anzac Light Railways project.

The Anzac Light Railways were built around Albert in the winter of 1916/1917. Fewtrell became the CO of the 1st Anzac Light Railways on 6 November 1916. It was created to control the project with the 4th Pioneers and the 6th Field Company Engineers fully committed.

Labour was provided by seconding soldiers from infantry units being cycled through the rear areas for rest.

When railway operations commenced, the 1st Anzac Light Railway Operating Company was formed from Australian railwaymen already on the Western Front. This was said to be the largest light railway project undertaken by British forces prior to the creation of the Directorate of Light Railways. It was handed over to the Canadians in May 1917.

³ Information from material supplied by John McNamara

Major-General Albert Cecil Fewtrell

With the disbanding of the 1st Anzac Light Railways, the 4th Pioneers and the 1st Field Company Engineers (who had replaced the 6th) returned to their usual work, while the 1st Anzac Light Railway Operating Company became part of the Directorate of Light Railways. Fewtrell then served as the Australian representative at the headquarters of the Director General of Transport on the Western Front, but he fell ill in November 1917 and was sent back to Australia. His military appointment ended on 28 September 1918.

For his service, Albert Fewtrell received a DSO for his work on the Somme in August and September 1916 and he was twice mentioned in despatches.

Back to the railways



An undated photograph of the Zaara Street Power Station in Newcastle, photo by Bert Lovett. Source: Norm Barney collection, UofN Library.

Following demobilisation, Fewtrell returned to his position of Resident Engineer Newcastle, where he managed the construction of the Zaara Street Power House, which supplied electricity for the railways. He remained at Newcastle until 1926, when he was promoted to Supervising Engineer in Head Office back in Sydney.

In 1932 Fewtrell was promoted to Transport Commissioner and later that year, following a restructure, was given the title of Chief Civil Engineer, in charge of the Way & Works Branch and reporting directly to the Railways Commissioner. The Way & Works Branch was responsible for the design, construction and maintenance of all track, bridges, buildings and other structures right across the NSW government railway network.

NSW Railways in the 1930s

The railway network that Fewtrell assumed control over as Chief Civil Engineer in 1932 was vastly different to the fragmented NSW railways of the 21st Century. The total network was still in service across the state and it was a vertically integrated railway organisation, operating both passenger and freight services, and under the full control of the Commissioner.

However, 1932 was not a good year to take on a major role in the Railways, for Australia had plunged into the Great Depression. Despite the severe economic conditions then, there was still an extensive network to maintain, totalling almost 10,000 km of track. Even with the financial restrictions current during the Depression, Fewtrell had an extensive works program, and in the first year of his tenure as CCE, renewal works included 239 miles of track, 75 miles of re-railing and the placing of over a million sleepers.



Even in the Depression, Fewtrell's Way & Works branch still pursued innovation with the establishment of the Rail Welding Depot at Chullora, to weld 45 foot (13.7m) long rails into 360 foot (109.7m) lengths. This resulted in a significant reduction in the number of joints in track and hence the amount of maintenance required, while improving ride quality.

Also, in the 1930s there were major capital works to manage, including Railway House⁴ at Wynyard in the city, which was constructed by Railway day labour forces and received the RIAA Sulman Medal in 1935 and the Royal Institute of British Architects Medal in 1939. There was also progress noted on completing the City Railway, the Sutherland to Cronulla line and the Bungendore to Captains Flat line.

Image Left: The completed Railway House photographed in 1940. Source: National Library of Australia.



April 1917. Canadian soldiers ride the first train to run on the light railway built on Vimy Ridge by the Australian company. This was before the Canadian Army took over the building of light railways in May 1917. Source: Canadian Archives.



Railway House (or Transport House) under construction in Wynyard Square, Sydney in the early 1930s. Source: not known.

4 See <https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=2423858>

Major-General Albert Cecil Fewtrell

In 1938 ongoing problems with the 1889 Hawkesbury River Railway Bridge (HRRB) came to a head. The bridge had showed signs of defects within 12 months of its opening in 1889 and the contractors were called back to repair some faults with the piers. Through the 1920s and 1930s, many more design or construction faults became evident. In 1938 a severe crack in No.4 Pier was discovered resulting in the decision to replace the bridge. Fewtrell was reading an American text book which stated that the interior of the piers of the HRRB comprised rubble, and he noted this was contrary to the specification, which required concrete to ensure stability when the iron casings rusted.

Indeed, Fewtrell maintained that he was personally responsible for locating this defect and avoiding a major rail catastrophe, saying in the Australian Professional Officers Association Salary Case in 1949:

If I had not located this defect, a major catastrophe unequalled in Australia would have resulted no later than 1942. One or two fully loaded trains could have crashed through the bridge.

Any other problems that Fewtrell and his Way & Works Branch faced were soon to become much more critical with the advent of WW2 in September 1939 and even more so with the entry into the war of Japan in December 1941, thus bringing hostilities closer to Australia's doorstep.

Military Service Continues

Fewtrell continued to serve in the militia as a colonel during the inter-war period, including the positions of Commanding Officer 1st Field Brigade, Commander Royal Engineers, Commanding Officer 9th Australian Infantry Brigade, and Chief Engineer, 1st District Base. Fewtrell's ongoing involvement with the Australian Militia would not have been easy, given his high levels of command and the time demands of his role as NSW Railways CCE. However, Fewtrell gives us some idea in his response to a question in the Engineers Salary Case of 1949. When asked whether his subordinate officers assumed a lot of responsibility, *That is my method. It is army organisation - delegation of commands.*⁵ So, the next level down in the Way & Works Branch AND the militia must have been left to their own initiatives much of the time. Certainly, Fewtrell does not sound like the 'micro-manager', so prevalent in 21st Century management ranks.

World War II

World War II saw Fewtrell again serving his country, re-enlisting in the Australian Army on 9 October 1941, attaining the rank of Major-General. His service positions included Commandant of Eastern Command Base and General Officer Commanding NSW Lines of Communication. Fewtrell's final post is irrelevant, for he was essentially in charge of the Army's administrative and logistics functions across NSW, which included keeping the system operating for the movement of troops and supplies. Equally, there was a role to hinder Japanese movements should the expected invasion occur. The piers of the first Hawkesbury River Railway Bridge were prepared ready to be blown up, to stop the railway being used by the feared invaders. Thus, during his two-year tenure in command of the Army's Lines of Communication, Fewtrell maintained his involvement with the Hawkesbury River Railway Bridge.



Sydney, NSW, 24 December 1942 - Major General A.C. Fewtrell, CB, DSO, VD, General Officer Commanding, NSW Lines of Communications Area, stands at the microphone addressing a ceremonial parade of the HQ of his command at Victoria Barracks. Source: AWM 106022



In September 1943, after 35 years in the militia and Australian Army, Fewtrell retired from the military. It was reported that the Premier of NSW, Mr. McKell, commended Fewtrell, noting: *His extraordinary knowledge of New South Wales gained while an engineer in the service of the State Railways, combined with his military experience, had made him an ideal man for his command.*

Major-General Fewtrell was given a farewell parade by the Army and then resumed his position as Chief Civil Engineer of the NSW Government Railways.

Image Left: on 24 December 1942, Major General A.C. Fewtrell takes the salute during a march past of personnel of the NSW Lines of Communication Area at Victoria Barracks in Sydney. Source: AWM 069791.

⁵ Sydney Morning Herald, 10 December 1949, p7.

Major-General Albert Cecil Fewtrell

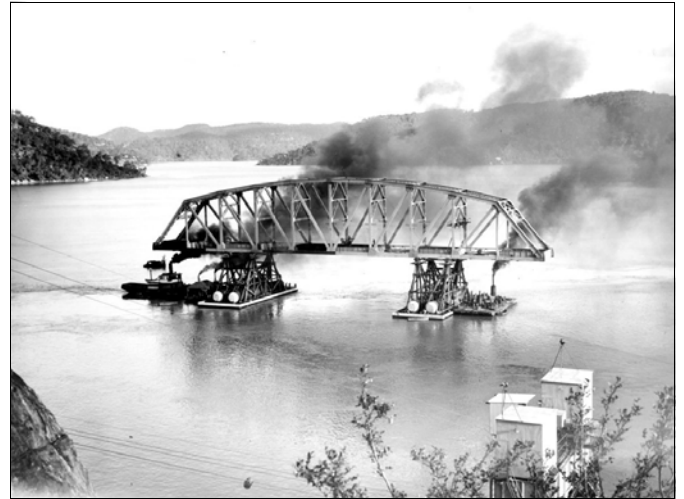
The new Hawkesbury River Railway Bridge

The major task facing Fewtrell when he returned to the railways was the completion of the new Hawkesbury River Rail Bridge. This was a critical task, for the bridge was carrying up to 100 trains a day and this really taxed the already poor condition of the structure. Trains were restricted to 14 miles per hour (23 km/h) and finally 4 miles per hour (6 km/h), with only one train at a time allowed on the bridge.

The complete design, foundation work and fabrication of the new bridge were undertaken by the Railways. There is no doubt the bridge is a substantial structure: 785 metres (0.49 mile) long, with 2 x 44.81 m (147 feet) trusses, 2 x 135.64 m (445 feet) trusses and 4 x 105.92 m (347 feet) trusses, all on concrete piers supported on caissons.

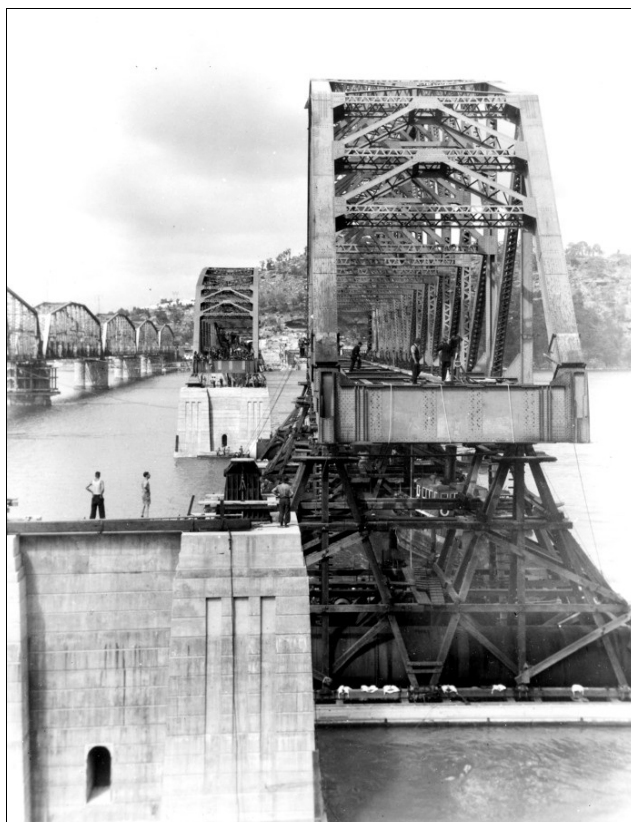


27 February 1944 - Span 3 of the bridge about to be fitted between its piers. Is that CCE Fewtrell standing on the centre of the bottom chord of the truss? Probably.
Source: ARHSnsw RRC 47326.



27 February 1944 - Span 3 of the new HRRB midway on its journey from Long Island to its bridge piers. The smoke is from coal fired boilers on two power punts, controlled by winches. A tug leads the way. CCE Fewtrell was riding the span into position, as he did on every span. Source: Australian Railway Historical Society NSW, Railway Resource Centre 47323.

The steel spans were constructed adjacent to the bridge site on the northern side of Long Island (off the south bank of the Hawkesbury River), raised to the correct height, placed onto barges and floated out to the piers at high tide.



Indeed, it was noted that this was very much like a military operation, with the construction technique being set out in models in the site offices.

Again, we can see the essence of Fewtrell's character coming through, as very much the 'front-line' manager, for he rode each span as it was floated out and lowered into place on the new piers.

Image Left:
5th April 1946 - Span 7 is being floated slowly and carefully into position between its two piers. A tug can be seen between the two pontoons, used to prevent the span overshooting its mark. One of the men standing on the end of the span is thought to be Fewtrell.
Source: ARHSnsw RRC 43373.

DEPARTMENT OF RAILWAYS, NEW SOUTH WALES.

X3076

WAY AND WORKS BRANCH, Railway House, 19 York Street, Sydney. 27th November 1945.

Postal Address: G.P.O., BOX 29A, SYDNEY, N.S.W. Telephone: M 4401 Extension _____

In reply refer to **B/GH.**

Mr. C. C. Singleton, Head Office.

I propose, weather permitting, to float out the first of the large spans of the new railway bridge across the Hawkesbury River on the 30th instant, which will necessitate the use of three flotation punts for the first time, and extend to you an invitation to be present.

If you can make it convenient, I should like you to witness the floating out. The distance to be travelled is very short, as the span will be placed on the southern end of the structure and consequently soon after the pontoons leave the docks the span will be turned at right angles to enter between the piers. In view of this, the early hour and the fact that no road transport can be made available, you may decide to await the flotation of the next span of similar size.

Albert Cecil Fewtrell
Chief Civil Engineer.

The enemy has long ears. Don't gossip.

An invitation issued by Fewtrell to a fellow engineer at Head Office to witness the floating of Span 2 of the new HRRB. Cyril Corbett-Singleton was well-known as an historian of the NSW Railways, and was probably a friend of Fewtrell's. One assumes they rode the span together.
Source: ARHSnsw RRC Collection.

Major-General Albert Cecil Fewtrell



Over 500 men worked on the project, and its completion was a major achievement, given the limitations on man power, materials and equipment during WW2. It was also noted as a major technical achievement at the time of its construction, with its large riveted steel trusses, and its footings which were still among the deepest in the world. It remains the longest purpose-built rail bridge in the NSW network.

The new bridge was opened by the Premier of NSW, Mr McKell, on 1 July 1946, with the first train across the new bridge hauled by Locomotive 3810, which had been built in the NSW Railways' workshops in Sydney. This was appropriate, as the new Hawkesbury River Railway Bridge had also been constructed by the Railway's own staff.

Image Left: The official opening of the new Hawkesbury River Rail Bridge on 1st July 1946. Here the Chief Commissioner introduces the Premier, the Hon WJ McKell. Gen'l Fewtrell is seated on the right of the dais. When the ceremonies were over, the dais was removed so trains could pass through the tunnel.

Source: ARHSnsw RRC 47442.

The Institution of Civil Engineers Baker Gold Medal

Fewtrell wrote a paper on the construction of the Hawkesbury River Railway Bridge and for this the Council of the Institution of Civil Engineers (UK) in 1949 presented him with the Baker Gold Medal, which was awarded every three years for outstanding civil engineering work. Fewtrell was the first Australian engineer to win this award but he was still quite modest in his response: *I accept the honour not only for myself but for the Railways Department whose staff helped to build the bridge.* Interestingly, this award of the Baker Gold Medal to Major-General Fewtrell even rated a mention in the Australian Women's Weekly magazine.⁶ One cannot imagine the Women's Weekly of the 21st Century mentioning anything related to engineers or engineering, with its much different concept of who is a 'celebrity'.

The NSW Railways after World War II

Even with the completion of the Hawkesbury River Railway Bridge, Fewtrell's problems were far from over. Heading the Way & Works Branch would have presented a major management task for Fewtrell and his engineers, for they had almost 10,000 kilometres of track to maintain, with some 15,000 employees. Further, the NSW Railways system had greatly increased traffic during WW2 but operated with reduced staffing and maintenance funding. This continued after the war, with the NSW Railways Annual Report of 1949 including the following maintenance issues:

- Shortage of staff and materials
- Critical shortage of rails
- Heavy locomotives taken off North Coast Line due to the condition of 80 pound rails

The critical shortage of rails that Fewtrell faced forced the Railways to look at suppliers from overseas, even from Australia's former wartime enemies of Japan and Germany. In the end, the Railways settled on a French supplier – perhaps a bad decision in the longer term, given a broken French rail was the likely cause of the Spirit of Progress derailment near Bowral in 1969.

Track maintenance was not the only issue facing Fewtrell and his branch, for the 1949 Report also listed a number of major construction works underway or planned, including new lines, such as the Sydney City Circle (the Underground), the Eastern Suburbs, Southern Suburbs, South Eastern Suburbs, the duplication from Kingsgrove to Herne Bay, a new bridge over the Parramatta River at Meadowbank, and removal of the remaining spans of the old Hawkesbury River Railway Bridge.



**MAJOR-GENERAL
A. C. FEWTRELL**
... engineer honored

CHIEF Civil Engineer of the N.S.W. Railways, Major-General A. C. Fewtrell is the first Australian to be awarded the London Institute of Civil Engineers' Baker Gold Medal. A paper on The New Hawkesbury River Railway Bridge, and work of standing its piers on solid bottom under silt, won him the distinction. A soldier of two wars (won D.S.O. in first), he was Chief Engineer Eastern Command, is now connected with construction of controversial elevated railway at Circular Quay, Sydney.

A cutting from page 33 of "The Australian Women's Weekly" of 8th October 1949.

⁶ See: *The Australian Women's Weekly*, Saturday 8 October 1949, page 33, under the heading "Interesting People"

Major-General Albert Cecil Fewtrell

The 1949 Railway Engineers Salary Case

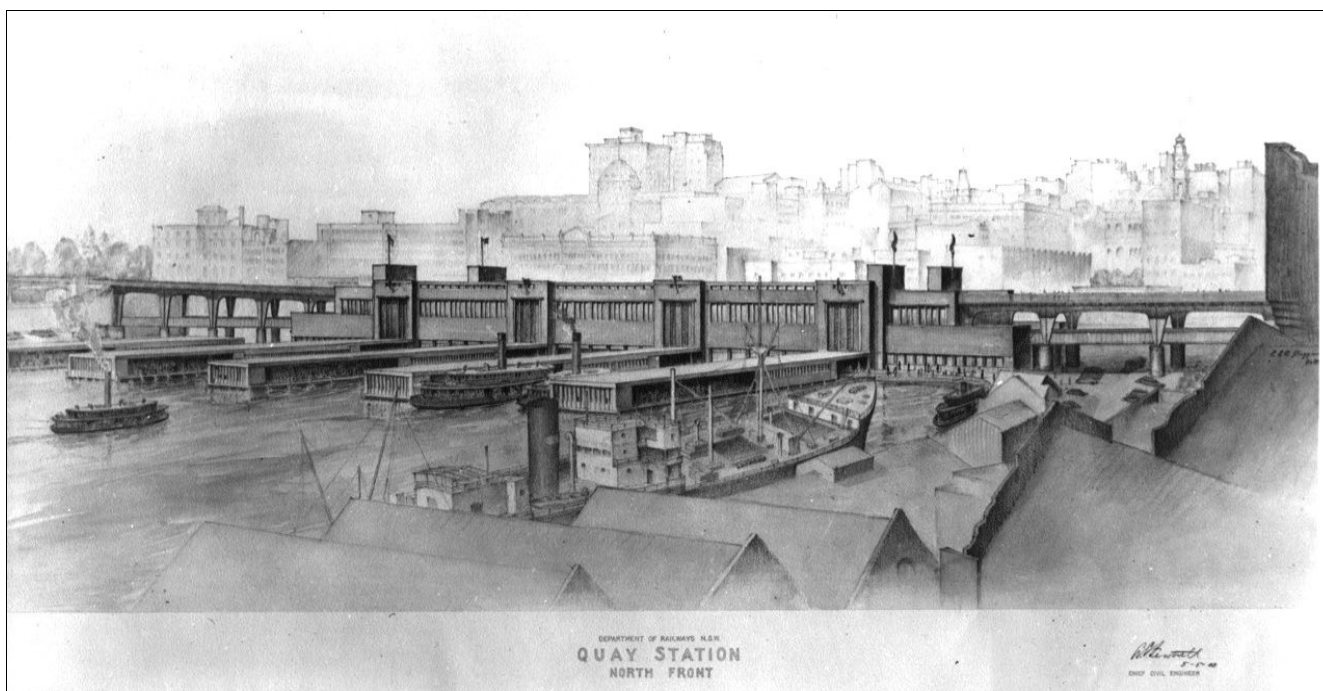
In 1949 the Association of Railway Professional Officers of Australia mounted a case before the Federal Conciliation Commissioner for substantial salary increases for engineers.⁷ Fewtrell was a key witness and his evidence was reported in the Sydney papers, giving us some further insights to his character. Fewtrell was quite dismissive of the responsibilities of chief engineers of other government enterprises. He cited the head of the Snowy River Scheme, who received about double Fewtrell's salary, noting: *When you get down to tin tacks, the Snowy River scheme comprises only tunnels and dams.* To further make his point, Fewtrell stated that amongst other projects, he was responsible for the construction of Circular Quay Station, the new bridge over the Georges River at Como (completed in 1972), the new bridge over the Hunter River at Singleton (completed late 1970s), and the quadruplication of the line between Strathfield and Hornsby (never completed). Another of Fewtrell's comments in the Salary Case may sum up his opinion of himself: *There are no heavier duties than mine anywhere in the Commonwealth.* While he was no doubt trying to push his case as hard as possible, this does seem like more than a touch of arrogance.

Circular Quay Railway Station

Fewtrell's reference to Circular Quay in the salary case is worth pursuing, for this also shines the spotlight on the man and his role as CCE. One of the most contentious issues with completing the City Circle was the design of the Circular Quay Station, which attracted a good deal of attention and controversy, with Fewtrell in the box seat. The NSW Government set up the Circular Quay Supervisory Committee in 1938, with Fewtrell as chairman, and here we see some of his character coming through quite strongly.

The NSW Railways had prepared a design for the station, with Fewtrell's signature on the plan. However, there was an alternative scheme proposed by the government authorities' panel of architects, which Fewtrell criticised as *Most Stupid*, maintaining that the architects' design . . . *looks like nothing but a tomato-house.* He went on to say *Our original plan is the proper plan. I can say that without being biased.*⁸

This did not endear Fewtrell to the NSW Government and led to a great degree of public criticism of him in the press. The Daily Telegraph reported that the Minister for Local Government, Mr Cahill, said that Major-General A.C. Fewtrell's criticism of a design for the Quay railway was *most undignified*. Personally, I would side with the substance of Fewtrell's comments but not necessarily how they were expressed. Perhaps with his very senior military background and his CCE role, he had reached the stage where he 'wouldn't suffer fools gladly'. Stuart Sharp⁹ considers that: *the evidence suggests a degree of arrogance, which would have been typical of any head of branch at that time. He scoffed at outsiders, believing in the informal railway cultural notion that only Railway officers knew what was best for customers.*



Chief Civil Engineer A.C. Fewtrell's plans for the Circular Quay Station, signed by Fewtrell as CCE in 1948. Image source not supplied.

7 Sydney Morning Herald, *900 Rail Engineers Seek Big Salary Increase*, Friday 9 December 1949, p6.

8 Sydney Morning Herald, 25 November 1948, p5

9 From notes on Fewtrell, supplied by Stuart Sharp, notable railway historian and heritage expert.

Major-General Albert Cecil Fewtrell

In the end, another design was accepted for Circular Quay Railway Station and the City Circle was finally opened on 21 January 1956. Sadly, Fewtrell had died some five years previously and did not see the completion of a project obviously dear to his heart.

The End of the Journey

Major-General Fewtrell died on 16 October 1950, aged 65, still in the position of Chief Civil Engineer. The cause of death was a coronary occlusion, which Stuart Sharp notes may have been linked to the bitterness and other feelings which Fewtrell must have felt at the time. His death was reported right across NSW and interstate, and by the Institution of Civil Engineers in London. The NSW Minister for Transport, Mr. W.F. Sheahan, said, *The country will be poorer by the death of a great engineer, a great administrator, and a great soldier.*

As well as family and the usual run-of-the-mill politicians, Fewtrell's funeral on 17 October 1950 was attended by the NSW Governor, Lieutenant-General Sir John Northcott, high-ranking military officers and senior government officials. His pall bearers comprised three lieutenant-generals, three major-generals and two brigadiers. This must be indicative of Fewtrell's standing amongst his military peers, when the Governor and eight high-ranking officers took part in the ceremony with only a day's notice.

Fewtrell's Legacy

Major-General Fewtrell left a significant legacy, which is evident in two ways: the tangible and intangible.

So far as the tangible is concerned, the Hawkesbury River Railway Bridge stands out. Over 72 years on, the Hawkesbury River Railway Bridge is still performing well and is a vital part of the interurban, country and freight railway networks in NSW. Indeed, it was remarked that: *The Hawkesbury River Railway Bridge is to the railways what the Sydney Harbour Bridge is to the road authorities.*

His intangible legacy is more difficult to assess. However, one could cite engineer training in the Way & Works Branch, which continued successfully from Fewtrell's time until the NSW Government decided to fragment the NSW rail system in 1989.

The *Newcastle Morning Herald* report on the opening of the Hawkesbury River Railway Bridge noted:

A feature of the construction of the bridge was the absence of any technical disorder. The engineers and workmen operated to a well organised plan which Mr Fewtrell said was a result of his army training. The delegation of command to junior officers has been woven into the Civil Engineering organisation of the NSW Railways. It has proved good training for young civil engineers who joined the services.

I agree and would consider myself part of this legacy. Whereas professional engineers of other branches in the Railways tended to be mainly placed in design or other office roles, Way & Works civil engineers after graduation had the option of line management positions in the field. At age 21, I went to Goulburn, with responsibility for 50 miles of track on the Main South Line and 50 fettlers, and by the age of just 23 I had the responsibility for 350 men and 900 km of track, bridges and buildings in the north west of NSW. The success of Fewtrell's engineer policy could also be seen in the number of Way & Works Branch civil engineers who advanced to senior executive positions in the railways and other government and private organisations.

So, Major-General Albert Cecil Fewtrell, civil engineer and soldier: a story worth telling,
and one hopes that memories of him will live on for many years.

Frank Johnson

Acknowledgements

Assistance was received from Trevor Edmonson and John McNamara on Fewtrell's WW1 career, and from Stuart Sharp on Fewtrell's later role as CCE. Bill Phippen's book on The Hawkesbury River Railway Bridges was also an invaluable resource. And, of course, the National Library of Australia's Trove, with its vast collection of digitised newspapers and periodicals, is an invaluable resource to any researcher. Likewise, the Railway Resource Centre of the Australian Railways Historical Society (NSW) provides access to a huge range of historical railway records, including the NSW Railways Annual Reports cited above.

Connections



BHP Newcastle: A City Within A City: A reader thought I might find this film – a pictorial history of the BHP Newcastle steelworks – of interest. I did, and I thought other readers might too. Published in 2019, it can be found at: <https://www.youtube.com/watch?v=Khun-ZY3Srw>
Part of the “blurb” says: *If you grew up in Newcastle, then you're probably connected to the BHP story. In 1959, one in ten Novacastrians worked there. It's an industry that above all others built this town. This film is about that industry but mostly it's about the people who worked there, risked their lives and loved their jobs. It's about community.* If you happen to be looking for some more detail, in print, as a follow-up, the NSW Heritage Inventory entry for the BHP Newcastle Admin Building contains a useful brief history of the Steel Works at: <https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=2173907>

Sadly, the former Administration Building is the only piece of physical evidence surviving of the great venture that was the Steel Works. How wonderful it could have been if the industrial structures on the site had been left in situ, like the Volklingen Ironworks in Germany that I wrote about in the January 2019 EHA Magazine. What a great opportunity lost to demonstrate our past industrial greatness in the future. Who would bother to visit a boring old former Admin Building?

In 2000, Film Australia produced a film, “Steel City”, all about the 1999 closure of BHP's Newcastle Steel Works. The closure marked the end of an era for the City and, as the *Newcastle Herald* noted at the time, *BHP had helped make Newcastle and Newcastle had helped make BHP.* *Steel City* can be purchased from the National Film & Sound Archives (NFSA) for a moderate sum at: <http://shop.nfsa.gov.au/steel-city>
More easily accessible is a short clip from *Steel City* titled *Closing Day at BHP's Newcastle Steelworks.* A synopsis of the clip says: – *Two thousand steelworkers collect their final paychecks and walk out of Newcastle's BHP steelworks for the last time. Men break down and cry. Many have laboured here all their working lives.*

The clip is freely available at: <https://dl.nfsa.gov.au/module/442/>



Industrial City – The Story Of Newcastle



And further, if the above connections have triggered an interest in what Newcastle might have been like in the heyday of BHP's Newcastle Steel Works, I found the following documentary film on the NFSA site. It is *Industrial City – The Story Of Newcastle*, a film made by the Commonwealth Film Unit in 1959. It gives a description of the city of Newcastle, its industries and the life of the people generally. See: <https://www.youtube.com/watch?v=IAehKzh8X0Q>

Jack Garman, Whose Judgment Call Saved the Moon Landing, Dies at 72,

by Sam Roberts, Sept. 24, 2016 in the New York Times.

I have had this story on the back burner since 2016, when a link was sent to me by my daughter. I wasn't sure how I could use it then, but it suddenly resurfaced as a follow-up to the moon landing story of the September 2019 EHA Magazine. The story starts as follows:

On July 20, 1969, moments after mission control in Houston had given the Apollo 11 lunar module, Eagle, the O.K. to begin its descent to the moon, a yellow warning light flashed on the cockpit instrument panel.

“Program alarm,” the commander, Neil Armstrong, radioed. “It’s a 1202.”

The alarm appeared to indicate a computer systems overload, raising the specter (sic) of a breakdown. With only a few minutes left before touchdown on the moon, Steve Bales, the guidance officer in mission control, had to make a decision: Let the module continue to descend, or abort the mission and send the module rocketing back to the command ship, Columbia.

By intercom, Mr. Bales quickly consulted Jack Garman, a 24-year-old engineer who was overseeing the software support group from a back-room console.

Mr. Garman had painstakingly prepared himself for just this contingency — the possibility of a false alarm. “So I said,” he remembered, “on this backup room voice loop that no one can hear, ‘As long as it doesn’t reoccur, it’s fine.’”

At 4:18 p.m., with only 30 seconds of fuel remaining for the descent, Mr. Armstrong radioed: “Houston, Tranquillity Base here. The Eagle has landed.”

Mr. Garman, whose self-assurance and boned judgment effectively saved mankind’s first lunar landing, died on Tuesday outside Houston. He was 72. His wife, Susan, said the cause was complications of bone marrow cancer. . . .

You can read more about Jack Garman at:

<http://www.nytimes.com/2016/09/25/us/jack-garman-whose-judgment-call-saved-moon-landing-dies-at-72.html?rref=collection%2Fsectioncollection%2Fscience>

If you can't open the New York Times text, I can send you a PDF copy.



Image right: Jack Garman in 1968. He had a long career at NASA. Source: NASA via the NYTimes.

More Connections

A Heritage Award for the Barque “James Craig”

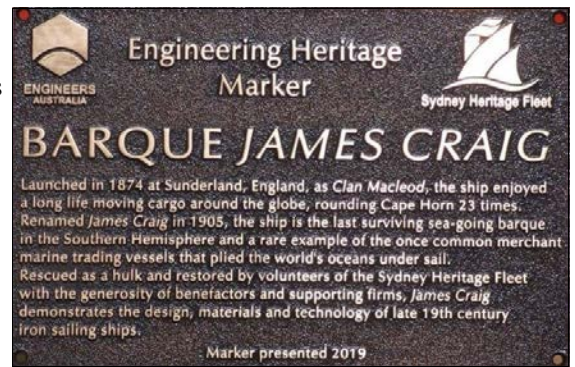
The story of the *James Craig* was told in the October 2016 issue of this magazine (Vol.2 No.4), and on 15 October 2019, on her after deck, she was presented with the award of an Engineering Heritage Marker, by Engineering Heritage Sydney. Alan Edenborough of the Sydney Heritage Fleet and the prime mover in rescuing the hulk from Recherche Bay in Tasmania, conducted proceedings and gave a brief account of her recovery and restoration. Bill Phippen provided an outline of EA's heritage recognition process that led to the award, and Bruce Howard, President of Sydney Division, presented the award to Peter Hemery, Chair of the Sydney Maritime Museum



Trustees. The plaque will be mounted with other awards, on a bulkhead below deck. Michael Clarke sent us news of this occasion. The Nomination Document for the award can be found at:

<https://portal.engineersaustralia.org.au/system/files/engineering-heritage-australia/nomination-title/HRP.James%20Craig.Nomination.2%20Nov%202015.pdf>

Following the ceremony, guests were invited to the nearby National Maritime Museum for first viewing in Sydney, of the new documentary *The James Craig - The Great Iron Survivor*. This film has viewings at specified times, but not on the internet. However, I found *James Craig Voyage to Hobart 2017* (<https://www.youtube.com/watch?v=cSIIQPvXKfg>) and a 6 minute clip *The James Craig - The Great Iron Survivor Old Ships Company* (<https://www.youtube.com/watch?v=cKQjuYf6QBQ>) on youtube.



3801 is Back on the Tracks Under its Own Power

Recently I received an email congratulating Transport Heritage NSW on the completed restoration of Locomotive 3801 of the NSW rail heritage fleet. If you don't live in Sydney, you probably won't have a clue about the significance of this locomotive, but another emailer gave me the following background and history, to which I have added one or two memories.

The 38-class was the ultimate design of express passenger steam locos built in NSW. The first five (3801 to 3805) were built by Clyde Engineering in Sydney during the first half of the 1940s. 3801 was delivered in 1943. It had been designed by Chief Mechanical Engineer Harold Young within the NSW Railways Department. It was particularly imposing as it was 'streamlined' with a conical smoke box door in the centre of which was mounted the headlight. Harold Young's grave, in Switzerland, allegedly has an image of 3801 with the headlight lit and the words 'His mind a shining light'. To many people 3801 has gained a special status as a heritage item - probably way beyond its true significance.

25 more 38s were built after the war by the NSW railways themselves in their workshops at Eveleigh in Sydney and Cardiff near Newcastle, though they were not given the special streamlining. 3801 has not always been painted green, it was delivered in grey undercoat and was sometimes black, with or without red lining. The green livery is the form in which it is best remembered, racing the Newcastle Express (aka 'The Flyer') between Sydney and Newcastle (see photo above).

3801 was retired (from mainline service) in 1962, but continued to work off and on, with heritage organisations, until 1983, when it was sent to Newcastle for repairs. In 1986 it returned to service with heritage trains. When I saw it in about 1990, it was on display in the big Erecting Shop at Eveleigh - there, as I thought, for more restoration work. But it returned to service again until about 2007, when a major overhaul was needed.

A new, welded boiler was ordered from Germany in 2008. Two years later it arrived, but there were so many things wrong with it, that eventually it was retired unused. A decision was made to completely rebuild 3801's original rivetted boiler, and so that was done, along with much other work. 3801 had passed its steam tests and was ready to go in December 2019, but because of the fire risk, a grand celebration of the occasion had to be put off until January 2020.

I hope we will have a full history of the restoration to publish in a future issue of the magazine. In the meantime, there is much material online for reference. Transport Heritage NSW has *About the Locomotive 3801 Project – Bringing an icon of steam back to life* at <https://www.thnsw.com.au/3801-project> The Engineers Australia – Engineering Heritage Register has: <https://portal.engineersaustralia.org.au/heritage/locomotive-3801-1943> (3801 was awarded an Historic Engineering Marker in 1994) Lastly, Wikipedia has <https://en.wikipedia.org/wiki/3801> – a fairly comprehensive account of 3801's history.



