

EHA



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EDITOR:

Margret Doring, FIEAust. CPEng. M.ICOMOS

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Contact EHA on (02) 9410 5649, email

eha@engineersaustralia.org.au

or visit the website at:

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Cover Images:

Front: (Top) The Loco Boiler Shop at the Honeysuckle Point Railway Workshops in Newcastle, viewed from the SW in early 1990, soon after the earthquake struck Newcastle. Photo: M. Doring.

(Bottom) The Boiler Shop again, but viewed from the NE in June 1994, after much restoration work had been undertaken. Photo: C. Doring.

Back: The Craven Bros. rope-drive gantry crane in the former Boiler Shop of the Honeysuckle Point Railway Workshops (now part of the Newcastle Museum). Photos: C. Doring.

This is a quarterly magazine covering stories and news items about engineering and industrial heritage in Australia and elsewhere. It is published online as a downloadable 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 |
| Bushfire destroys historic Yarloop Railway Workshops | 4 |
| Bruce Cole receives the EHA Award of Merit | 6 |
| 18 th Australian Engineering Heritage Conference | 7 |
| Who was H.B. Fraser? | 10 |
| Paddle Steamer "Mary Ann" | 13 |
| The Humphrey Pumps at Cobdogla | 18 |
| Rotary Converters in a Melbourne Tram Depot | 22 |
| Chefchaouen and the Wadi Laou in Morocco | 24 |
| Farewell Margaret Henry – a passionate Novocastrian | 26 |
| Connections | 27 |

Apology / Correction

In the October 2015 issue of this magazine, the story "The Sons of Gwalia Goldmine" was condensed from the Nomination of the headframe & winder engine for Engineering Heritage Recognition, prepared by Ian Maitland, Chair of Engineering Heritage WA. The nomination document did not explicitly acknowledge the original authorship of parts of its text which I unfortunately included in the magazine condensation unaltered and unacknowledged. This was drawn to my attention by the original author of that text, Dr Peter Bell, who is a joint author of the "Gwalia Conservation Study: South Australian Department of Environment and Planning" (State Heritage Branch – Authors P.Bell, J.Connell & J.McCarthy) July 1985.

I sincerely apologise to Dr Bell for this oversight.

The Editor.

Editorial

I was pleased to get Merv Lindsay's interesting article about the December 2015 Engineering Heritage Conference in Newcastle. Merv is a native Novocastrian with a civil engineering degree from Newcastle University, and with his own consulting firm, which he established in Newcastle in 1980 at the ripe old age of 30! The firm is now Lindsay Dynan, with branch offices in Sydney, Perth and the Central Coast of NSW. I met Merv when he was National President of Engineers Australia in 2011, and making his Presidential visit to Victoria Division.



Bushmaster at the Centenary of Military Aviation Airshow at Point Cook in 2014.
Photo hpeterswald.

We visited the Thales Group site in Bendigo, where they were building the Bushmaster armoured vehicle. Fascinating, but not heritage (yet) although I think they could become so. I knew Merv had been involved with EH Newcastle for some years, and with restoration of the Craven Bros Rope Drive Crane in the former Honeysuckle Point Railway Workshops (now Newcastle Museum) where the Conference was held. I was delighted to hear that Merv has taken on the duty of Chair of EH Newcastle this year.

Not having attended the December Conference myself, I was not "in" with all the happenings, but it seemed quite fitting that part of the proceedings had been a demonstration of the Rope Drive Crane in action. However I was rather taken aback at Merv's report that *The crane demonstration was followed by a fascinating history and film of the closure and demolition of the Newcastle Steelworks.* It jolted me back 30 years to the 2nd National Conference on Engineering Heritage – *The Value of Engineering Heritage*, held in Melbourne at the now defunct Clunies Ross House in Parkville in May 1985.

I had driven down from Sydney, on paid leave from my NSW Department of Planning employers to give a paper, approved by my Director, on *The Role of Government in the Conservation of Engineering Heritage.* I was gob-smacked when my paper was followed, later that day, by the Country Roads Board of Victoria (now VicRoads) proudly presenting a film showing bulldozers demolishing several historic Victorian bridges. Apparently that was their idea of conserving engineering heritage. In hindsight, I should have written a paper on *The role of Government and Industry in the Conservation of Engineering Heritage*, having spent most of the years since trying to prevent Government and Industry around Australia from destroying their own heritage.

Newcastle perhaps takes up a disproportionate amount of space in this issue of the magazine, what with the December Conference and the front and back covers, but the Hunter Region has been much in my mind recently, ever since I heard of the death of Margaret Henry – a farewell to whom will be found on page 26. Readers may wonder what Margaret Henry, a Labour and then Greens politician, a former Councillor of the City of Newcastle, and an academic historian has to do with Engineering Heritage. Well, she was a great fighter for the conservation of what is important in Newcastle's and the Hunter's heritage, and of course much of that heritage is related in some way to industry and engineering. Please take a moment to reflect on the life of one of our greatest champions.

Keith Baker has retired from the position of Chair of the Engineering Heritage Australia Board after two years of dedicated hard work. There was no particular requirement that he produce a "From the Chair" article every quarter, but he nevertheless wrote us an interesting and insightful article (or story) for each of the last seven issues of the Magazine. He has been a great support to me throughout the last two years, and I am pleased that he will be continuing his engagement with the magazine into the future. I hope he will occasionally find the time to write us more stories.

Our new Chair is Neil Hogg, a Sydney Division member of Engineers Australia who says: *(I) first became interested in Engineering Heritage after attending an IEAust. public lecture and have been especially interested in protecting items of movable cultural heritage, particularly items of technological and industrial significance.*

By the Editor



Engineers working on the restoration of the Craven Bros. Crane in 1995.
Photo Carl Doring.



Movable heritage something like this Neil? Ph: Kogo

Bushfire destroys historic Yarloop Railway Workshops

By Owen Peake



Part of an aerial view of the Yarloop Railway Workshops, taken soon after the fire went through the town. Railway Parade is on the left. Parts of the wreckage can be identified from the sketch Site Plan below. The little Power House appears to be the only building left standing, if only partially. The remains of the Steam Shop are bottom centre of the image.

Source: part of a photo by Richard Polden, Mandurah Mail.

Locals are very angry at the lack of adequate warnings and updates on the progress of the fire. A high level enquiry has been set up to look into the circumstances of the fire and try to find out what went wrong.

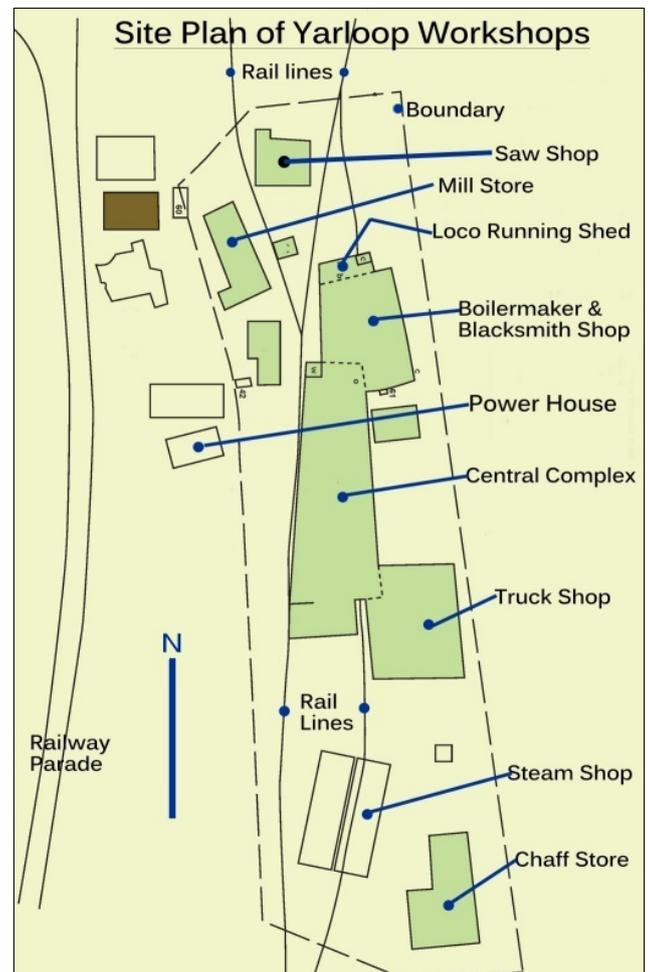
Yarloop is an old saw milling town in the Karri and Jarrah forests of south-west WA, 126 km south of Perth. The saw mill operated from 1901 to 1978. It was originally operated by Millar Brothers and was sold to Bunnings in 1983 but closed down some years ago. The saw mill once operated a substantial railway system and the Yarloop Railway Workshop serviced this network. It was a very self-contained workshop facility, if somewhat smaller than the state-owned railway workshops of that era. The workshops contained a wide range of machine tools and a huge collection of casting patterns, among other features.

The Steam Shed was reported on by the International Stationary Steam Engine Society (ISSES) Bulletin twice in mid-1999 and again in early 2004. One of the most important exhibits was an Austral Otis two-cylinder duplex horizontal steam mill engine of 350 horsepower. It operated the Dean Sawmill near Manjimup from 1910 to 1979. Austral Otis was a large Melbourne-based manufacturer which built high quality steam engines and other machinery around the turn of the twentieth century.

On the evening of 7 January 2016 a bushfire called the Waroona-Harvey Fire ran out of control through parts of south-west Western Australia. It caused great damage over a wide area, however the most concentrated devastation was in the township of Yarloop. The town of about 500 population was massively impacted with about 128 homes and about 15 other, mostly community, buildings destroyed and two people killed.

From an engineering heritage perspective the Yarloop Railway Workshops Museum was completely destroyed. The loss consisted of the old railway workshop buildings, the plant and machinery in the workshops, locomotives and rolling stock. Also lost was the Steam Shed (or Steam Shop) which held a separate and very significant collection of stationary steam engines on the same site.

Pretty much everything which could have gone wrong went wrong for the fire authorities. Yarloop lost its water supply nine hours before the fire hit due to loss of electricity supply to pumping equipment (you might ask what happened to the backup generators) making fire-fighting efforts almost impossible. Fire fighters complained of incompatible hose connections.



Site Plan from the Yarloop Workshops Museum website, adapted for this magazine by M. Doring.

The second notable engine was built by Davey, Paxman & Co Ltd, Colchester, Essex, England and was imported for use on the Western Australian Goldfields in 1896. It powered Lyall's Sawmill near Collie, Western Australia from 1940 to 1969. It was a single cylinder horizontal mill engine of 180 horsepower. The Steam Shed also contained two Bellis and Morcom high-speed totally enclosed engines (one was connected to an electrical generator and the other previously drove an air compressor); a steam winch; a steam saw; a Weir non-rotative pump; a twin-cylinder vertical totally enclosed Alley & MacLellan engine and a Marshall twin-cylinder horizontal under-type engine, minus its boiler.



Davey, Paxman & Co Ltd steam engine at Yarloop.
Image from the Yarloop Workshops Inc. website.



Bellis & Morcom steam engine driving a generator at Yarloop.
Image from the Yarloop Workshops Inc. website.

The losses at Yarloop are a salutary reminder that all heritage is at risk from bushfires and other natural disasters. These risks are increasing with Climate Change and with the alarming propensity for governments of all descriptions to step back from the provision of services and ask communities to fend for themselves, particularly where significant capital resources are required – as is the case with fire-fighting. The owners of heritage assets need to give greater priority to the preservation of their assets during disasters (natural or man-made). This might dictate moving the heritage assets to safer ground or the provision of active protective services such as fire-fighting equipment, people resources, management systems and training.



Austral Otis steam engine at Yarloop.
Image from the Yarloop Workshops Inc. website.

About Owen Peake

By the Editor

Owen is an electrical engineer and Fellow of RMIT who spent most of his professional working life in New Guinea for a few years, and then in the Northern Territory from 1968 until early 2002. He topped off his professional career as CEO of the Northern Territory Power & Water Authority, and with a year in 2000 restoring water & electricity supplies in Timor L'Este after the devastation. After an active role in EA and EHA in Darwn, he retired to a rural small-holding in Gippsland, Victoria. Except he didn't retire, he started an entirely new career in Engineering Heritage. His first interest was stationary steam engines, but as he got strongly involved, his EH interests have broadened. He has served on and chaired committees within EHA and EA in NT and Victoria and nationally. In 2008 he was made an Honorary Fellow of Engineers Australia, and in 2013 he was awarded the EA Sir John Monash Medal.

He is one of my best supporters and I don't know how we would survive without him. He is eminently qualified to write about Yarloop, because he has visited the Workshops and he knows first hand about bush fires. He and his partner and their two little dogs were spending a weekend in Melbourne with family on Black Saturday – February 7th 2009. They had about a week in limbo before they could discover that their house and sheds and everything in and around them had been entirely destroyed. The family now lives in Melbourne, and I think they have made a wonderful recovery – but I expect events like Yarloop bring it all back!

PS: Owen had his own photographs of the Yarloop Workshops and the machinery in them, but we couldn't use those here, because they were all lost on Black Saturday. *Ed.*

Bruce Cole receives the EHA Award of Merit



Bruce Cole (at Right) is presented with his Award of Merit certificate by John Heathers, convener of the EHA Award of Merit sub-committee. Photo: Engineers Australia

At the 18th Australian Engineering Heritage Conference held in Newcastle in December 2015, Bruce Cole was presented with an Award of Merit recognising his significant contribution to the conservation of engineering heritage.

The Engineering Heritage Award of Merit is aimed at recognising and showing appreciation for outstanding service, and is awarded to people who make significant contributions to the cause of engineering heritage in a variety of ways, mostly as volunteers and often over many years.

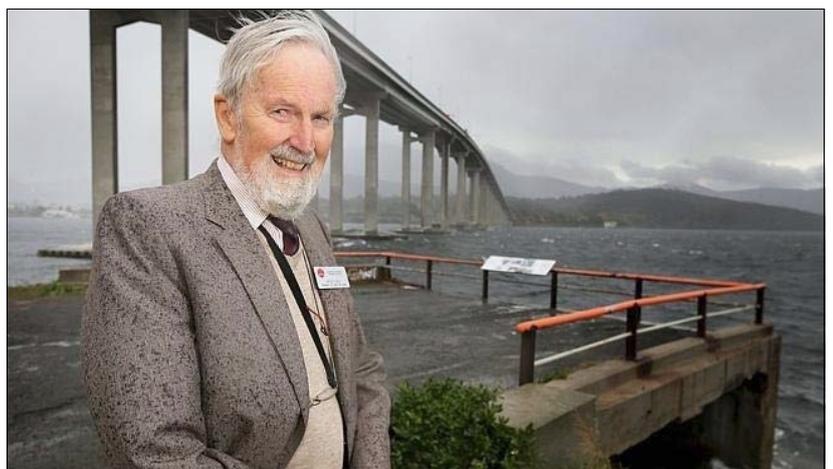
Bruce Cole graduated in Civil Engineering from the University of Tasmania in 1953 and, after 3 years at Oxford University and one year in Canada, he joined the Hydro-Electric Commission (HEC) in Tasmania in 1957. The HEC was engaged in the rapid development of Tasmania's hydro-electric resources, and Bruce spent the next 20 years on the

design and construction of large dams of various types. He eventually rose through the ranks to become Asst Chief Civil Engineer Design and then Project Director for the last two power developments to be built by the HEC. He retired in 1993.

Bruce's introduction to engineering heritage came in 1996 when Tony Moulds invited him to join the project team for the Institution of Engineers' Heritage Dams Project. The team organised a review of major dams in Australia, with the aid of members of the Australian National Committee on Large Dams (ANCOLD) and a grant from the National Estate. One outcome was the preparation of 26 nominations for dams to be listed on the Register of the National Estate. Another outcome was the editing of six histories, each describing the development of the technology for a different type of dam. These histories formed the major part of two books published by the ANCOLD in 2000 and 2003. Bruce was the lead author in these publications. He has edited one book on the history of dam technology and written another on Australia's large dams. In 2015 Bruce was elected an Honorary Life Member by ANCOLD.

Bruce joined Engineering Heritage Tasmania in 1998 becoming Secretary in 1999 and Chair in 2006, a position he has held ever since. He became a member of Engineering Heritage Australia (EHA) in December 1999 and was Chair of EHA in 2003 and 2004. His first engineering heritage conference was in Newcastle in 1996. In 2011 he led the organising committee for the highly successful 16th Engineering Heritage Conference in Hobart which attracted 44 papers and made a profit! He co-authored three papers.

He has prepared five nominations for heritage recognition awards for important Tasmanian icons (most recently Hobart's Floating Bridge) and organised eight public recognition ceremonies, thus putting Tasmania firmly on the Engineering Heritage map. Bruce managed the John Monash Medal awards panel for four years and convened the Heritage Recognition Committee for four years. He is currently Convenor of the Centenary Book Committee which is aiming to produce an exciting book of engineering achievements for Engineers Australia's centenary in 2019. He has presented a talk entitled "A Taste of Tasmania's Engineering Heritage" on five occasions.



This Photo of Bruce Cole was taken on the occasion of the Heritage Recognition Ceremony for the former Hobart Floating Bridge. Bruce is standing close to the eastern abutment of the bridge with the Tasman Bridge in the background. Photo Richard Jupe 2015.

What a Conference!

An account of the 18th Australian Engineering Heritage Conference

By Merv Lindsay.

The 18th Australian Engineering Heritage Conference was held in Newcastle in the first week of December 2015. Over three days we had a diversity of papers that were a credit to our supporters. There were papers across the range of heritage engineering interests including the construction of the Norfolk Island Airstrip during World War 2, insights into the evolution of Newcastle's coal handling, and early road construction in Western Australia.



The Conference logo was used extensively in promotions.



The Newcastle Museum – site of the Conference. The Boiler Shop at left and Blacksmith Shop at right were part of the former Honeysuckle Point Railway Workshops. Photo Bill Jordan.

There were also international papers including one on the construction of some 19th century rail tunnels under London that are still in use today, another on the role of Australian and New Zealand engineers in the introduction of rail to Japan and the excellent keynote paper by Dr David Gwynn covering Technology Transfer during the Industrial Revolution. However, for the sheer unexpected, almost to the point of bizarre, one can't go past David Beauchamp's paper on *The world's first guided missile – a Victorian invention*. His presentation provided us with a fascinating history of a torpedo designed and developed in Australia.

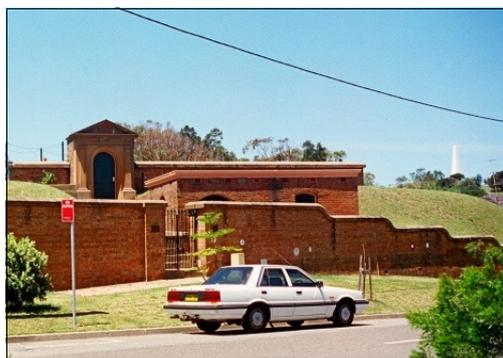
At the conference Judy Lindsay and Jeffrey Gleeson presented a video production of the construction of the Oakey Creek Dam near Armidale. This video was produced from the outputs of an oral history recorded in 1999 with Zihni Buzo, the engineer who

designed and built the dam. The oral history was matched to a 16mm film that Buzo made of the construction to create a valuable film record of dam construction in the mid 1950's by a migrant engineer. The 15 year evolution of

this film from the original oral history to its completion is an interesting story in itself that demonstrates the relevance of oral history.



Oakey Creek Dam & Gorge. Photo James Goodwin, Gorean Collection.

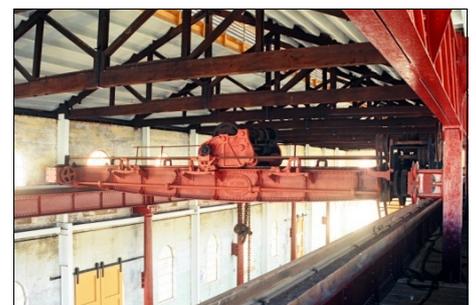


Newcastle No1 Reservoir in 1994. Photo Carl Doring.

There was something for everyone at this conference but for me one of the highlights was a presentation by one of the youngest delegates, Mr Tim Proctor of Arup titled *Due diligence in the operation and maintenance of heritage assets*. To sustain the technical relevance of conferences like this it is essential that we encourage debate on the technical challenges facing heritage engineering practitioners and Proctor's paper should contribute to the debate of the very important issues around sustaining the serviceability of important heritage

and cultural assets when their performance cannot be conveniently or rigidly measured against modern design codes. The paper did not present all the answers but we who regard the preservation of our past by sustaining its relevance or by adaptive reuse need people like Tim in our corner.

Other highlights included recognition with a National Heritage Marker of the Walka Waterworks scheme, which was Newcastle's first water supply. The event was held at the Number 1 Reservoir at the top of Newcastle. This reservoir has only recently been opened up to the public to reveal a time capsule of 19th-century masonry water reservoir construction including a masonry vaulted roof structure sprung off a grid of cast-iron beams on columns. We were also treated to a demonstration, held at the Newcastle Museum, of the Craven Bros rope-drive Crane, the last remaining operating rope-driven gantry crane in the world. The Crane is in the Boiler Shop of the former Honeysuckle Point Railway Workshops, a small part of which survives as the Museum. The crane demonstration was followed by a fascinating history and film of the closure and demolition of the Newcastle Steelworks.



The Craven Bros. Crane under restoration in 1994. Photo Carl Doring.

Some 80 delegates networked and socialised throughout the conference and were joined by partners and others at the very successful conference dinner. At that dinner the Colin Crisp Award¹ was presented by the widow of Colin Crisp for the first time. Mrs Louise Crisp had not been aware that there was an award in her husband's memory and it was only through a



Left to Right: Mr John Woodside, Owen Peake (EHA), Helen Link (General Manager EA Newcastle Division) and Mrs Louise Crisp at the presentation of the Colin Crisp Award. Photo credit: John Woodside.

chance meeting with Rod Caldwell (of the Conference Committee) that the connection was made. She attended the conference dinner with her son and made this presentation of the award particularly special. The award was presented to John Woodside, of Adelaide, whose consulting firm was in charge of the restoration of the Sir William Goodman Bridge. The bridge was designed by Sir John Monash and built in 1909 to carry trams across the River Torrens. It is now used for cycle and pedestrian traffic.

The conference ended with a visit to the William the Fourth replica of a paddle boat that plied the Hunter River in the 19th century and which is about to be officially relaunched after substantial repairs. Of course the absolute highlight of any heritage conference is meeting up again with the cohort of engineers who are passionate about their profession and passionate about preserving our engineering legacy, history and heritage. There were delegates from every state in Australia as well as from the UK, New Zealand and Japan. A fantastic group of people!



Replica William IV under way. The source of this image has been lost.

And What a Pre-conference Tour!

Bill Jordan and Rod Caldwell put together an unforgettable pre-conference tour. About 30 delegates and partners met at Central Station in Sydney to begin the four-day trek that started in the bowels of Central Station and ended near the recently abandoned Newcastle station.

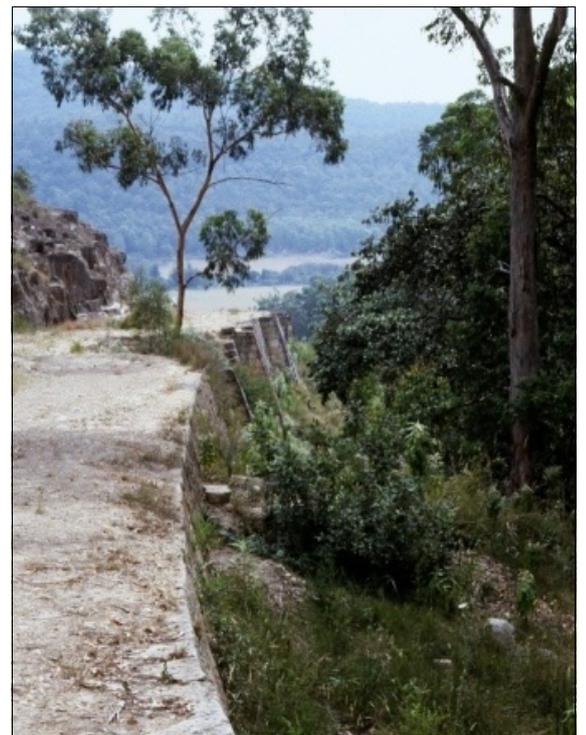


Delegates Miles Pierce & Bruce Cole at Lake Parramatta Dam on the early part of the tour. Photo: Bill Jordan.

Day one was through Sydney to Katoomba and a tour of the Skyway and Incline Railway and an overnight stay at the heritage listed elegant Carrington Hotel.

In the days that followed we travelled the convict-built Great North Road, visited the Baiame Aboriginal cave paintings near

Wollombi (that despite having lived in Newcastle all my life, I had no idea existed) travelled to Murrurundi to its long abandoned shale oil mine, to Tyrrell's winery at Pokolbin and much, much more.



Great North Road above Wisemans Ferry in 1983. The feral tree has since been removed and the stonework repaired. Photo M. Doring.

¹ The background to the Colin Crisp Award was discussed in the June 2015 issue of the EHA Magazine. Ed.



Baiame Aboriginal cave painting near Wollombi.

Photo Bill Jordan.

A pre-conference tour is a great way to meet people and share our career stories and socialize. In four jam-packed days of highlights, for me the shale oil mine at Murrurundi was the surprise number one, closely followed by an impromptu story by one of the delegates, Mr John Teacle from Adelaide, about his father's war experiences traced through the history of the Matilda tank. John presented his story in front of a Matilda tank on display in the Singleton Australian Army Infantry Museum and his story gave me a whole new context to that otherwise very static display.

There were many other highlights for me but I sensed the interstate and international participants were blown away by the scale of the Hunter Valley coal mines and the extent of the industry which really has to be seen to be believed. That glimpse of coal mining today must have contrasted with the insights into Newcastle's mining past presented by a number of papers at the conference.

Thanks to Bill and Rod and all participants for a very enjoyable few days on the road through the Hunter Region.



The Matilda tank at Singleton Army Museum.

Photo credit – Shaun D, Trip Advisor.



Remnants of the shale oil works at Murrurundi.

Photo Bill Jordan.



Delegates inspecting part of the shale oil works.

Photo Bill Jordan.

Further notes on the 2015 Colin Crisp Awards

By the Editor.

For those interested in finding out more about the 1909 Sir William Goodman Bridge, the June 2015 issue of EHA magazine told of John Woodside receiving the EHA Award of Merit last year, and there is much, much more, including nomination of the bridge for a heritage marker in 2009 at: <https://www.engineersaustralia.org.au/portal/heritage/sir-william-goodman-bridge-1909>.

In addition to the winner of the Colin Crisp Award, there were other projects which were highly commended. One was the *Sydney Harbour Bridge Heritage Project*, which aims to restore many of the original features of the bridge such as the bronze lanterns, with modern replicas, and to remove outdated or redundant non-heritage fixtures. The Colin Crisp Award for a book went to *Tulloch – a History of Tulloch Engineers and Manufacturers: Pyrmont & Rhodes, 1883-1974*. This history of the Sydney engineering firm Tulloch Ltd was written by David Jehan and published by Eveleigh Press.

Another Highly Commended award went to *End of the Line – The Electric Train Staff System*, an oral history project occasioned by the retirement of the last Electric Train Staff system (ETS) on the Sydney suburban rail network – Kiama to Bomaderry Line. The project was commissioned by Sydney Trains in 2014. It comprised the making of an 18 minute video, a CD of 47 minutes and a Report in PDF format at: <http://www.sydneystains.info/about/heritage/201503-End-of-the-Line-Report.pdf>. From when the Staff system was first introduced in the 1850s it was essential for safety (prevention of collisions) on single track lines for more than 100 years. First it was superseded by the timetable, and that was a disaster waiting to happen – then wireless would replace it, but it didn't. Now electronics provide a safer alternative?

Who Was H. B. Fraser?

Brian McGrath researches an engineer noted in his Blackall Woolscour story.

The Blackall Woolscour was awarded an Engineering Heritage National Marker by Engineering Heritage Australia, and it was presented by the then Governor of Queensland Ms Penelope Wensley AC on 19th May 2014. In preparing the Nomination that led to the Award, I travelled down a few research avenues, during which what I considered was interesting information was discovered. The information itself and the route by which it was obtained may be of interest to others.¹

While researching the background of the Blackall Woolscour in preparing its Nomination, I examined a series of 21 old blueprints and whiteprints stored at the University of Queensland's Fryer Library. One of these was titled *Proposed Siding at Blackall Wool Scour*. It was signed *H.B. Fraser, Resident Engineer, Jericho – Blackall* and dated *11-09-07*. It was also initialled *A.H.F. 10/9/07*. I became interested in finding out a bit more about H.B. Fraser.

A trial of Google search engine for H.B. Fraser didn't yield any useful result and I also determined that he was not included in either Volumes 1 or 2 of the EAQ publications *Eminent Queensland Engineers*. My next enquiry was directed to Queensland Rail who advised that there was no employee information available on him. However they did direct me to the Queensland Government Gazette special annual editions of that era which published the names and other details of all Queensland Government employees, and they supplied some extracts in which I found details of H.B. Fraser. These special edition Queensland Government Gazettes were popularly known as the *Blue Books*, and were published annually for many years from 1869. *Blue Books* were published in several of the Australian States, and the State Library of Queensland has copies of the Queensland issues and several from other States.



The railway siding at the Blackall Woolscour in 2014

Photo – Brian McGrath

From the *Blue Books*, I traced H.B. Fraser's Queensland Railways career between the years 1898, when he was a *Resident Engineer, Engaged in Construction* under Henry C. Stanley, MICE, Chief Engineer (who does appear in *Eminent Queensland Engineers, Volume 1*) on a salary of £350 with a £150 allowance, until 1928 when he was Assistant Chief Engineer on a salary of £550. Positions he occupied in the Department included Resident Engineer, Assistant Engineer, Acting Assistant Engineer Construction, Assistant Engineer Construction, District Engineer Cairns, Acting Divisional Engineer Townsville and Assistant Chief Engineer. It appears that he retired from the Railways Department in 1928, aged 67.

His name in the *Blue Books* is variously given as *Hugh B.* and *Hugh Barron*, and an entry in the 1920s indicates his credentials as *M.Inst.C.E.* I contacted the Institution of Civil Engineers in London by email and received a very prompt response with a copy of his membership application, proposed by H.C. Stanley on 1 July 1902.

This application contains a deal of interesting information relevant to engineer H.B. Fraser, who it states is of *Gladstone, Queensland, Australia* and was born on *fifth of February, 1861*. Stanley recommends Fraser because:

He entered the Dept. of Chief Engineer for Railways, Queensland 1878 & served under H.C. Stanley, Chief Engineer 'till 1882.
1882 – 1885 was Assistant to Resident Engr. Bundaberg (heavy work incl tunnel thro' granite) 22miles £100,000.)
1885 – Acting Res. Eng. Warwick – Killarney Rly. Qld, 25 miles, £70,000.
1886 – 1887 Resident Engineer, Harrisville Rly Qld 17 miles, £63,000.
1888 – Actg Res. Engr Maryborough – Bundaberg Rly Qld
1890 – 1892 Engr for Contractors, Rosedale Rly Qld 33 miles £110,000.
1893 – 1896 Private Practice, embracing light railways and schemes for Water Conservation.
1896 – 1900 Res Engr Hughenden – Winton Rly Qld 131 miles £197,000 pounds.
1901 – resident Engr Gladstone – Rockhampton Rly Qld heavy work incl long span steel bridge 27 miles £109,000 & is still engaged on same.

The nomination also states that he attended the Brisbane Grammar School for 4 years from 1874 to 1877.

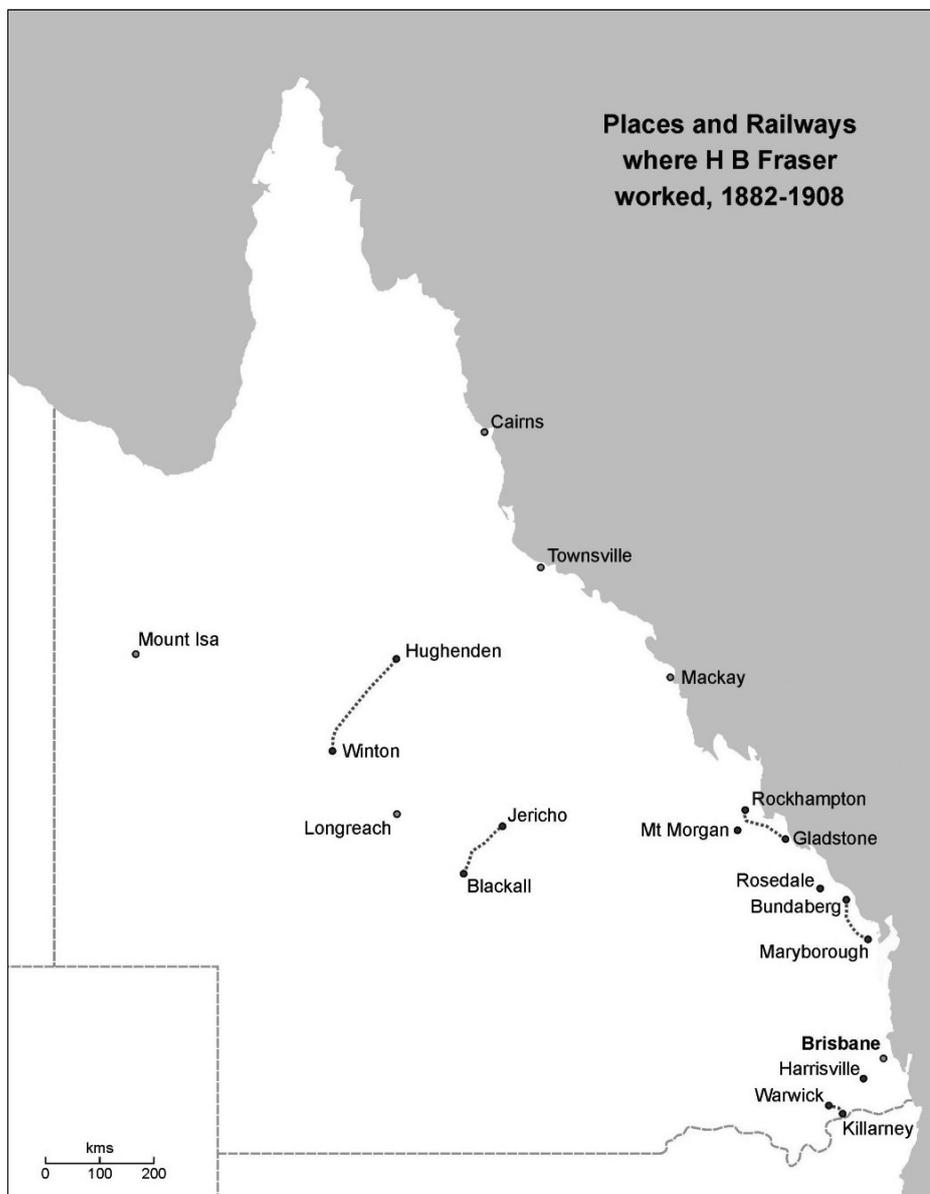


Hugh Barron Fraser, Railway Engineer.
Image supplied by B. McGrath.

¹ A story about the Blackall Woolscour was published in the EHA Magazine in June 2014. If you missed that issue, you can find it at: <https://www.engineersaustralia.org.au/engineering-heritage-australia/activities-publications>

Fraser must have been held in high esteem by his peers, since his application is supported by 10 local members of the Institution of Civil Engineers. Two of the decipherable names are Alfred B. Brady and E.A. Cullen, both of whom appear in *Eminent Queensland Engineers, Vol.1*. His application for membership was passed by the Inst.C.E. Council in November 1902.

**Places and Railways
where H B Fraser
worked, 1882-1908**



Map of the State of Queensland, showing principal cities and some of the places Fraser worked during his career as a railway engineer. The scale at bottom left indicates the great distances Fraser must have constantly travelled throughout his career. Map drawn by Richard Venus.

My enquiry to the Queensland State Library about the Blue Books also yielded another interesting snippet about Fraser. From the *Queensland Horse and Cattle Brands Index*, one learns that *Hugh Barron Fraser, of Naroo, Kolan*, (near Bundaberg) was allotted the brand 6SF on 10th November 1894. This would have coincided with the period when he was in private practice. I do not know for how long he kept the brand registered.

From documents provided by Leith Fussell,² I was able to clarify that Fraser resigned from the Railways Department on 4th March 1889 and, as his Inst.C.E. application states, he worked on railway construction for a firm of contractors on the Rosedale Railway until 1892. Henry Stanley stated in a letter to Fraser dated 13th March 1889 that he (Stanley) regrets *circumstances in connection with the duties devolving upon you as Trustee in your Father's Estate should necessitate your retirement from the service*.

Other letters confirm that on 16th September 1892, Fraser was appointed Council Clerk to the Council of Five Dock, NSW [a suburb of Sydney], and he performed that role and that of Council Engineer for about a year. No primary sources listing details of the work he did while in Private Practice from 1893 to 1896 have come to light.

The Fussell documents also contained the letter from the then Chief

Engineer William Pagan dated 25th May 1906 appointing Fraser to the Jericho-Blackall railway line construction. It is worth quoting in full:

Subject to the Commissioner's approval I am prepared to offer you the position of Resident Engineer Construction of the Jericho-Blackall Line by Day Labour at a salary of £400 per annum and £100 allowance. The work will probably commence in July next. The length of the line is 70 miles.

You will require to find your own instruments, but horses, horse feed and buggies will be found by the Department. It is essential that you reside on the works in quarters in the shape of a gatekeepers cottage, which will be provided. Sufficient staff will be provided and you will have the same privileges as a Resident Engineer on contract work.

Of interest is that this letter is addressed to: *H.B. Fraser, Esq., Mt Morgan Gold Mining Coy., Mt Morgan*, so again Fraser must have worked on private rail construction for the Mt Morgan Company in the months from Sept 1904 until that letter. In another document, Fraser confirms that his Railways Department services were *dispensed with* on 19th September 1904 when work on Section 1 of the Gladstone to Rockhampton Railway was completed.

² Leith Fussell is the aunt of a great grandson of H.B. Fraser, namely the Qld Supreme Court Judge, The Honourable Justice Hugh B. Fraser.

Fraser's death certificate – he died on 2 November 1937 in Brisbane – indicates his birthplace was Liverpool, that he came to Queensland aged one year and that he was married in Bundaberg when 33 years old in 1894. His death was reported in the Courier Mail of 3 November 1937 as follows:

Mr. Hugh Barron Fraser, a former assistant chief engineer in the Queensland Railway Department, died yesterday, after a brief illness. Mr Fraser, who was aged 76 years, was born in Liverpool, and came to Brisbane with his parents in the sailing ship Maryborough in 1862. His father, Mr. Simon Fraser was a well-known Parliamentarian. Educated at the Normal and Brisbane Grammar Schools, Mr. Fraser entered the railway service in 1878, and was construction and resident engineer in many



The Work Chest of H.B. Fraser, conserved with pride by his descendants. Just imagine how many times this chest must have been carefully packed and unpacked and repacked, over and over again throughout his career. Photo – Brian McGrath.

parts of the State. He became a member of the Institute (sic) of Civil Engineers (London) in 1903, and at the time of his death, was chairman of the local advisory committee of that body. Mr. Fraser was a member of the Diocesan Council of Church of England, and for many years was a Rector's warden at St. Andrew's, Lutwyche. His wife and one son, Dr. K. B. Fraser, survive him.

The above report was sourced from Trove. On the 3rd November 1937 The Brisbane Telegraph also printed an obituary. A similar obituary appeared in the Townsville Bulletin on 5 November 1937.

Hugh Barron Fraser had only one child, a son, Kenneth Barron Fraser, was born in 1897 in Hughenden. A Google search of Kenneth reveals an extensive entry in the *Australian Dictionary of Biography* for Sir Kenneth Barron Fraser, surgeon and soldier. A later Google search for Hugh Barron Fraser revealed that another of H.B. Fraser's descendants is a current Supreme Court of Queensland Judge, The Honourable Justice Hugh B. Fraser. He is a great-grandson of H.B. Fraser, Railway Engineer. He drew my attention to the book recently published (2010) by author Jean Stewart entitled *Sir Kenneth Fraser, A Twentieth Century Crusader*. It contains - as would be expected - quite some detail about Sir Kenneth's father.

Contact with Justice Fraser led me to his aunt, Leith Fussell who with her husband Douglas provided a number of original documents relevant to the engineer H.B. Fraser and his career. These documents yielded information to clarify, confirm and correct some of the earlier details I had about his engineering career. This information has been incorporated into the above text. Also, Leith had the original Work Chest used by Fraser in his role as Assistant Chief Engineer.

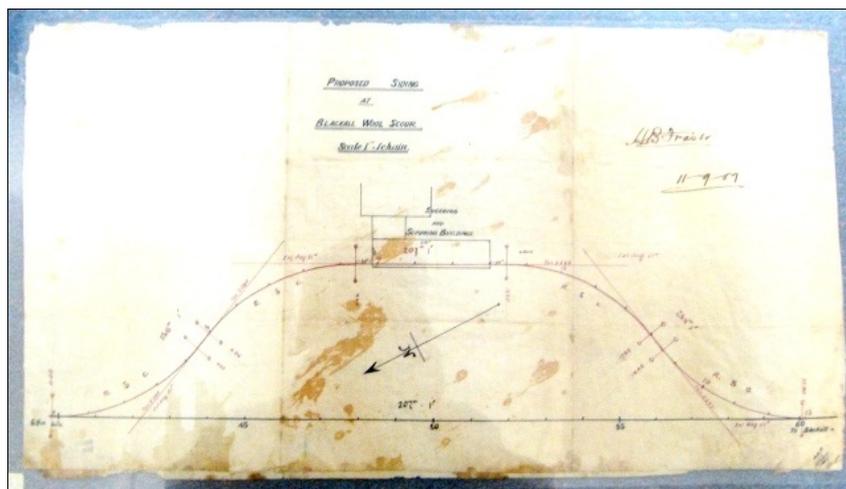
I feel we have fleshed out a lot about Hugh Barron Fraser from that signature on a siding plan. Not only did he have a long and distinguished career as a railway engineer in Queensland, being significantly involved in the major economic boost which building the extensive rail system brought to the State of Queensland, but he and his extended family have been very influential in the State's progress over the past century. He is, without doubt, one of many distinguished engineers who contributed significantly to the early development of the State of Queensland. He holds an important place in this Country's engineering heritage.

Footnote: The initials on the Siding Plan were A.H.F. Queensland Rail could not shed any light on this person, but in examining the *Blue Book* extracts for Fraser, I found the following in the Railways Department listings:

In 1907, an Aubrey H. Freeman, aged 17, Cadet
 In 1909, Aubrey H. Freeman, aged 20, Cadet
 In 1913 Aubrey H. Freeman, aged 24, Resident Engineer.

Also in 1913 is listed an Aubrey R. Freeman, aged 57, Plan Record Clerk – probably Aubrey H's father. I wonder what sort of a career Aubrey H. Freeman had after he drafted the *Proposed Siding at Blackall Wool Scour* plan for Fraser?

B.L. McGrath, PSM.



Drawing of the Railway Siding at the Blackall Woolscour.

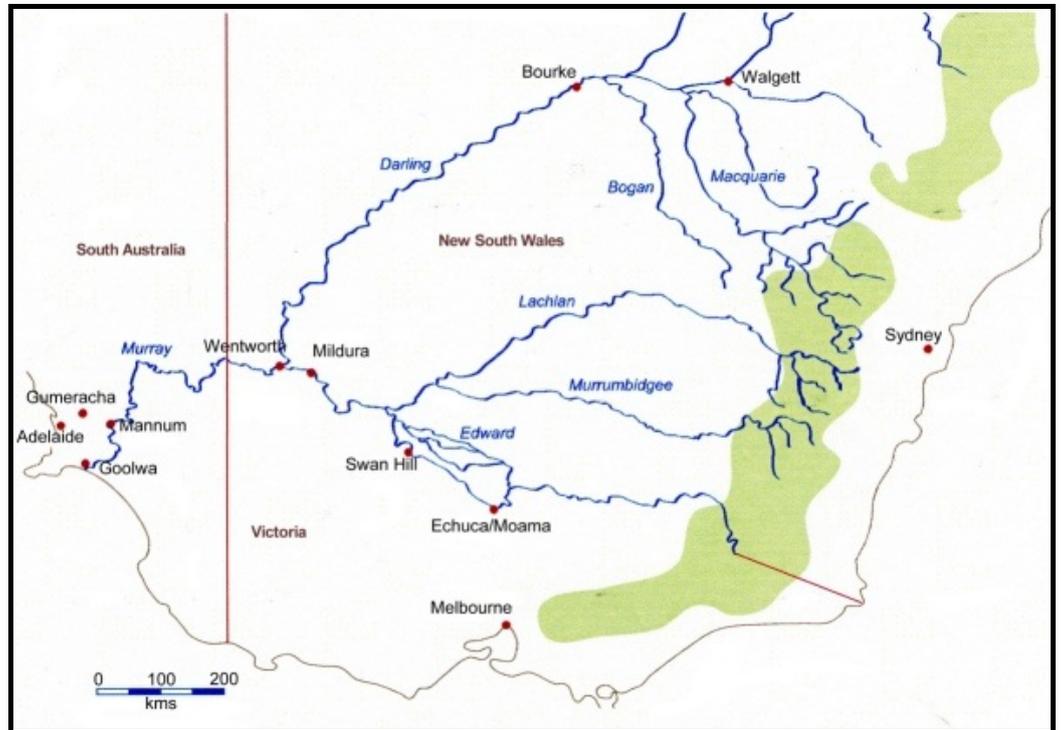
Photo – B. McGrath

Paddle Steamer “Mary Ann”

The first steam powered vessel to travel the Murray River.

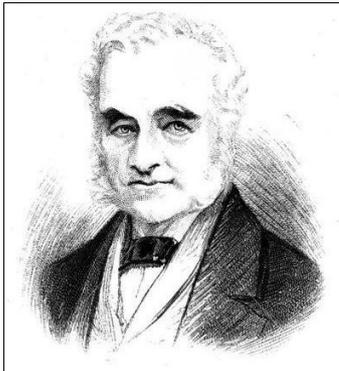
In the early 19th century, when there were poor rural roads and no railroads, the waterways of the Murray-Darling system had the potential to provide natural trade routes for commerce between South Australia and the inland of Victoria and New South Wales, but that potential was not realised for some years – not until powered navigation by shallow-draft paddle steamers became possible. The other perceived obstacle was the difficult and dangerous passage through the River Murray mouth to the sea. A ship or boat big and powerful enough to make that passage safely was unlikely to be suitable for travelling the upper reaches of the river system. What the traders would need was a boat at home in the shallow, winding river channels, and capable of crossing Lake Alexandrina to Goolwa, near the Murray mouth, but without needing to be equipped for regular trips through the river mouth to a then non-existent seaport on the Fleurieu Peninsula.

There was talk of *The immense importance to South Australia of opening an inland navigable communication of many thousand miles ...¹ very soon after the colony of South Australia was proclaimed in 1836. In 1840 the second Governor, George Gawler, was taken on a five-week excursion up and down the river to suss out the possibilities for inland navigation. In his opinion The Murray is admirably calculated for steam navigation. The stunted pine woods and pine scrub, frequently close to its banks, would furnish an inexhaustible supply of the best wood fuel. Navigation by sailing craft would be attended with delays from the lulls, eddies, and shifts of wind in a deep and winding valley.²*



Principal rivers of the Murray–Darling river system, in SA, NSW and Victoria.

Drawn by Richard Venus.



Lt Colonel George Gawler – a portrait from 'Picturesque Atlas of Australasia Vol II', 1886, by Andrew Garran

The fifth Governor, Sir Henry Edward Fox Young arrived in South Australia in 1848, and in August 1850, announced *a bonus of £4000 to be equally divided between the two first iron steamers of not less than 40-horse power, and not exceeding two feet draught of water, when loaded, as shall successfully navigate the waters of the River Murray, from the Goolwa to (at least) the junction of the Darling.³*

Later in 1850, he set out on a trip up and down the river to see for himself the viability of the navigation. The *Launceston Examiner* tells of: *The latest, and, perhaps, the most remarkable event which has distinguished Sir Henry's colonial career, is the opening up of the navigation and commerce of the River Murray, the importance of which to the three Australian colonies can hardly be over-estimated. It forms no part of our present purpose to dwell upon the details of this auspicious undertaking, which are already very generally known; it is sufficient to state that in the 1850 Sir Henry, being strongly impressed with the belief that the Murray would be found navigable, traced its stream by land as far as the junction of the Darling, and returned to the Goolwa, near the mouth of the river, in an open boat. He was accompanied by Lady Young and her infant, who, in an undertaking so adventurous, had to suffer many hardships.*



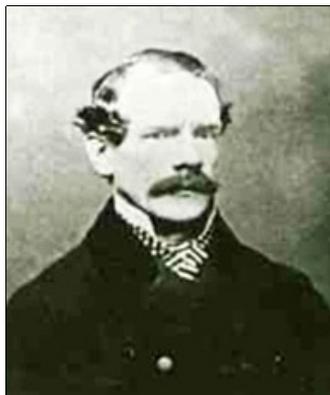
Sir Henry Young. State Library SA, B3754.

¹ *SA Gazette and Colonial Register*, 6 January 1838, p3b

² *SA Register*, 4 January 1840, p4c

³ *South Australian*, 15 August 1850, p1b]

The result of this expedition was that Sir Henry became thoroughly satisfied of the river's capabilities; and, to remove the only difficulty, that of entering its sea-mouth, which is guarded by tremendous rollers from the Southern Ocean, he commenced a railroad seven miles in length from Goolwa to Port Elliot, a small harbor on the southern coast.⁴ The Governor was travelling for about six weeks, mostly on horseback until they got to the Rufus, not far beyond the NSW border. A diary account of the journey in the *South Australian*⁵ tells how a reduced party proceeded on up the river to the Darling junction, about 90 miles and back again, in a whaleboat towed by four Aborigines, then continued in boats all the way downstream to the Goolwa.



Captain Francis Cadell.
State Library SA, B13508.

There seems to have been little response to the bonus until, in 1851, gold was discovered in Victoria and the subsequent Gold Rush offered a market for South Australian and imported goods such as food, picks and shovels, tents and clothing. An English adventurer, Captain Francis Cadell, found the bonus offer appealing, and in June 1852 arranged for the building in Sydney of a small steamer for the purpose of navigating the River Murray.⁶

Cadell, with the iron hulled *Lady Augusta* (a bit of flattery for the Governor's wife!) claimed the government bonus in 1853, but the *Lady Augusta* was not the first steamer to ply the Murray's waters. *While the Lady Augusta was nearing completion in Sydney, a much smaller vessel was being manhandled down the banks of the Murray at Reedy Creek, south of today's Mannum, and being fitted with a spindly engine of only about seven horsepower and a box boiler which flexed alarmingly when in steam. This was the Mary Ann and it was built, not by a ship's captain or even a boat builder, but by a 28-year-old flour miller who named it after his mother. William Richard Randell, miller, pioneer river trader, farmer, and later Member of the SA Parliament, not only earned his unassailable place in posterity but became one of the legendary captains on the Murray.*⁷

The Randell family emigrated from Devon to South Australia in 1837, when Wm Richard was 13. The family settled on land in the Torrens valley at what became Gumeracha, about half-way between Adelaide and the Murray River. Randell Snr built a flour mill at Gumeracha in 1848, which Wm Richard Randell and his brothers operated. *In the early 1850s, when he was about 28, Randell conceived an idea. At a time when, it seemed, half of South Australia had gone to the Victorian goldfields to seek their fortune, Randell's vision was to use the river as a trade route, supplying the produce of his mill and other goods to the miners and settlers.*

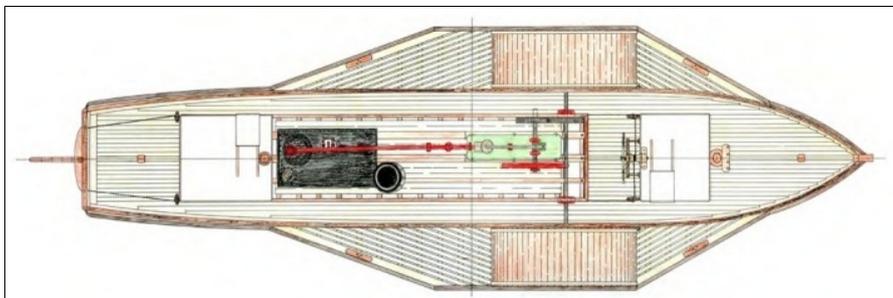
*Randell's practical knowledge of machinery had been acquired by working at the mill. With the aid of local carpenters, Randell began building the frame of a small steamer. There is no indication of where he got the plans or the ideas for a sea-worthy vessel – one can only assume there was sufficient knowledge of shipbuilding among the community or local tradesmen.*⁸

The steamer PS *Mary Ann* was to be a small side-wheel paddle steamer, the timber frame of which was put together near the mill then deconstructed and carted across country to the Murray River at Mannum, about 30 miles away over a rough bush track. The steam engine and boiler were made by separate tradesmen in Adelaide and similarly carted overland to Mannum by family members. *The component parts were then reassembled on the river bank.*

*Installing the boiler and engine must have been quite a challenge.*⁹



Captain William Richard Randell,
about 1880. State Library SA, B9439.



Captain Dick Bromhead's concept plan of the "Mary Ann" shows a simple beam engine driving the paddle wheel shaft through a pair of gears.

Reproduced from the "PS Mary Ann" nomination document.

The boat was constructed in an interesting manner, according to another pioneer settler, Simpson Newland, speaking at the official opening of the Randell Memorial in Mannum on 1st January 1914:¹⁰ *Randell had little or no experience in boatbuilding or machinery, but such details did not daunt, much less deter, old settlers. Perhaps some of the initial difficulties were overcome by a new process being adopted. The vessel was built bottom up, and then turned over right side up for completion. When the river rose the boiler was put in and she was floated off.*¹¹

4 *Launceston Examiner*, Tuesday 2nd January 1855

5 See <http://trove.nla.gov.au/ndp/del/article/71627504> – a fascinating account, well worth a visit.

6 A brief note in the *South Australian Register*, 22nd July 1852, p3d, quoting the *Argus*.

7 From the *Nomination for Engineering Heritage Recognition – Ps Mary Ann, Mannum Dock Museum*, page 23.

8 *ibid* p.23.

9 *ibid*. p.24.

10 *ibid*. p.25

11 *Mount Barker Courier and Onkaparinga and Gumeracha Advertiser*, 9 January 1914, 4g

There seems to be no surviving complete record of the *Mary Ann's* steam engine. It is said that it was about 7 or 8 hp and it had a 10 inch cylinder and could have been entirely manufactured in Adelaide. There is a comprehensive discussion of the possibilities in Chapter 8, p.47 of the *Nomination for Engineering Heritage Recognition – PS Mary Ann, Mannum Dock Museum*, which concludes that it was probably the light and compact design known as the Grasshopper, or half-beam engine, the discussion of which is beyond the scope of this magazine!



William Richard Randell with the original "Mary Ann" boiler, in about 1905.
State Library SA, BRG 210/13/2/1.

The original boiler was an extraordinary rectangular box shape with rivetted joints and a large tubular firebox. Only one other such box boiler is known to have been fitted to a paddle steamer in Australia, on the SS *Young Australian*, and both steamers were in South Australia in the same year. Could their boilers have come from the same maker? It appears there was no firm in Adelaide at the time which could have built a (much stronger) cylindrical boiler. On Randell's own account: *We could only procure at the time, 1/4 inch iron, which is too weak for making a square boiler – consequently we could not put sufficient pressure on it to make the most of the power of our engine; twenty-five pounds per inch [sic] is the highest power that we have been able to place on the boiler; whereas had it been constructed of stronger material, we should have been able by the power of the engine to have worked up eighty pounds per square inch.*¹²

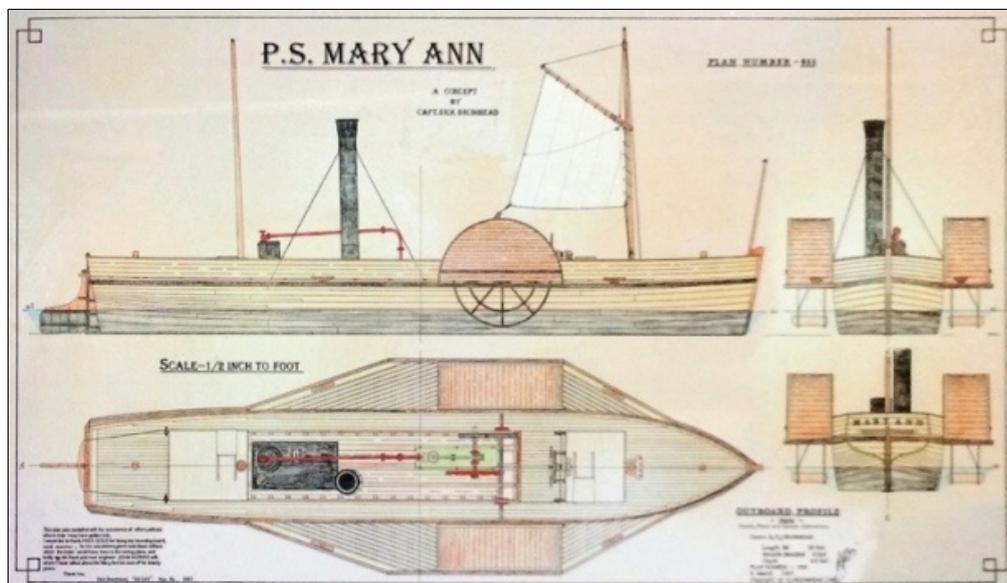
Reports suggest it bulged alarmingly under pressure, even after having been wrapped with heavy chains. Not surprisingly, it was soon replaced by a more conventional boiler after less than a year's service.¹³ Apparently it was abandoned on the river bank at Mannum when its successor was installed and, almost miraculously, it survives to this day.

Richard's brother George Randell's description says the *Mary Ann* was 56 feet long, 9 foot beam, 2 foot draft, and had a 7 hp engine with a 10 inch cylinder and cost £1,800 to build. She is said to have had fore and aft masts and a lugsail (although Captain Dick Bromhead's drawing shows a gaff rigged mast, which would have been easier to handle).¹⁴

She was launched and had her maiden voyage on 19th February 1853 and did a few miles down the river and back. Randell wasted no time in loading *Mary Ann* with 112 bags of flour, 24 bags of bran, 5 bags of biscuits, 69 bags of sugar, 21 boxes of tea, 4 cases of sundries, 400 lbs of tobacco, and about 4 tons of wood fuel.¹⁵

But before setting out on the voyage proper, and because he was travelling to another colony, he first had to travel 140 miles down river to Goolwa to have his cargo cleared by customs officials. He reached Goolwa on 4th March 1853 to be greeted by a large cheering crowd, including the Governor, and a volley of gunfire. He entertained the Governor and party for lunch on board, and set out back up river the next day.¹⁶

Unfortunately *Mary Ann* encountered shallow water and shoals and Randell turned back after getting a couple of hundred miles up river from Mannum. He had to wait until August to set out again, so took the opportunity to work on the boat and revise down the amount of cargo he carried by about half.



The complete conceptual drawing by Captain Dick Bromhead — a plan and elevations of the PS Mary Ann.
Drawing reproduced from the PS Mary Ann nomination document.

12 *South Australian Parliamentary Papers*, No 102, November 1853, "Minutes of Evidence", p5

13 From the *Nomination for Engineering Heritage Recognition – Ps Mary Ann, Mannum Dock Museum*, page 42

14 *South Australian Parliamentary Papers*, No 102, November 1853, "Minutes of Evidence", p5

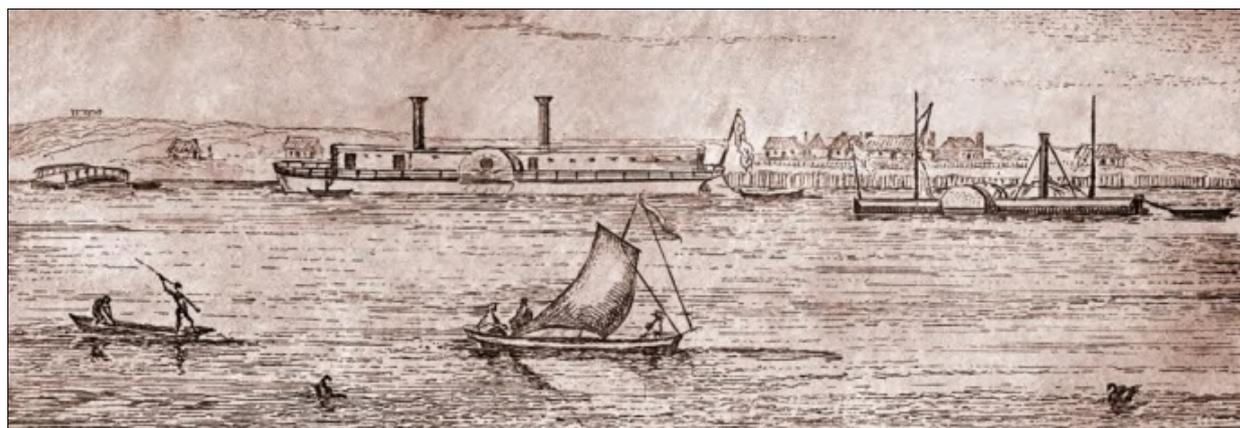
15 *SA Register*, 31 March 1853, p3a

16 From the *Nomination for Engineering Heritage Recognition – Ps Mary Ann, Mannum Dock Museum*, page 27

Mary Ann set out again on the 15th August 1853 – the same day that Cadell took the *Lady Augusta* past the Murray mouth to anchor at Goolwa. The crew of the *Mary Ann* had a comfortable trip – sailing during the day and anchoring overnight, and spending Sundays, the day of rest, usually at stations or homesteads they encountered on the way. They passed the junctions with the Darling on September the 3rd and the Murrumbidgee on the 14th September and must have thought themselves almost within coo-ee of their goal at Swan Hill when, *having moored the boat at the bank of the river and gone to rest, we were awakened by an unusual noise upon the water, and when we turned out to ascertain the cause of the commotion, we beheld the Lady Augusta steaming up the river at the rate of three or four knots an hour. It was then near 11 at night, and although our sleep had been disturbed, we followed in a few hours, and passed her again the next morning. During the day, however, as we were stopping at a station, the Lady Augusta came up, and, for the rest of the afternoon and night, we were not far from each other; in fact, we had a race which lasted till long after sun-set, and during which we passed and re-passed each other four or five times.*¹⁷ The race went on until the morning of the 17th, when the *Mary Ann* crew discovered Cadell in *Lady Augusta* had tricked them by sneaking away in the night, and arriving at Swan Hill in the afternoon, three hours before *Mary Ann*.

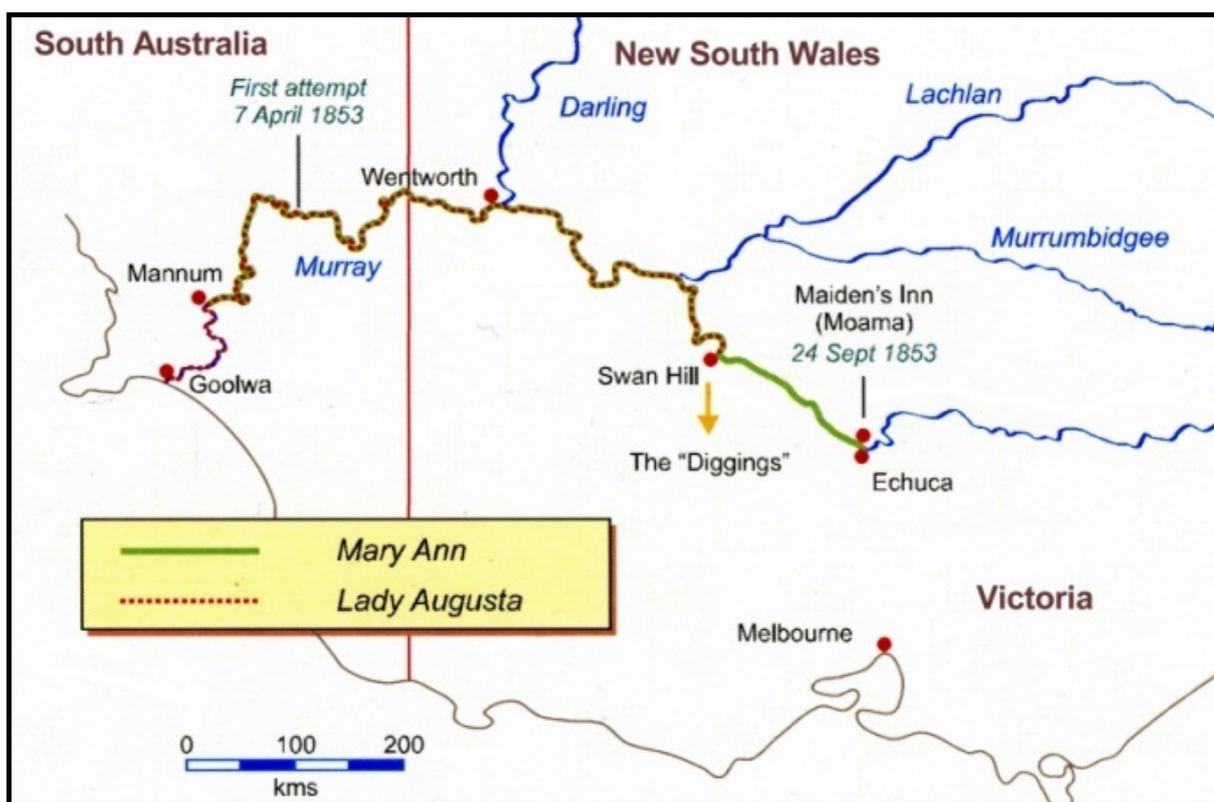


The Port of Goolwa in 1854: the "Lady Augusta" is on the left. State Library SA, B12160.



A sketch by James Allen of the "Lady Augusta" and the "Mary Ann" at Swan Hill in 1853.

State Library SA, B6852.



Voyages of the "Mary Ann" and the "Lady Augusta", April to September 1853.

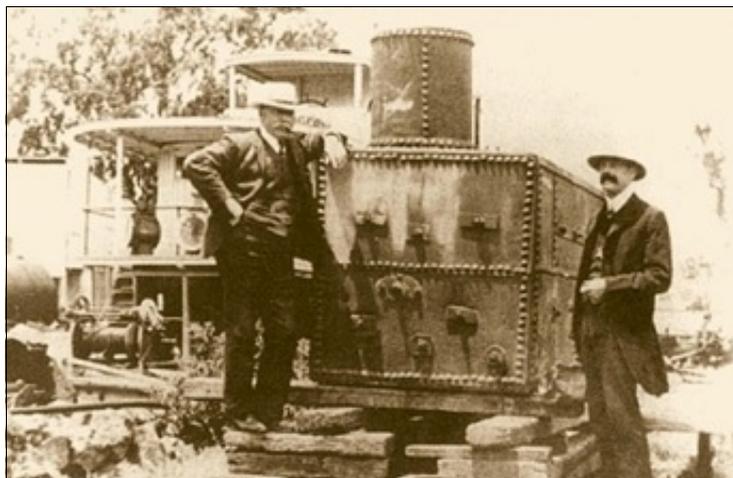
Drawing by Richard Venus.

¹⁷ SA Register, 14 October 1853, p3f

Cadell had won the race, and more than proved his claim to the Government bonus, but Randell continued on another 190 miles up the river to Moama (and Echuca on the Victorian side of the river), where he established that he was only 56 miles from the Bendigo diggings, and in a region which was already becoming widely cultivated and rich with potential for him. He returned to Mannum triumphant, to be recognised, with his brother, as the *First Steam Navigators of the River*.¹⁸ Captain William Richard Randell's pretensions were more modest than those of the swashbuckling Captain Cadell, but he had given Cadell a run for his money, and although he was not eligible for the £2,000 bonus (because *Mary Ann* had a wood hull), he was awarded a smaller sum of £300 and later, £300 again, and in February 1855, a further £400.

The little wooden paddle steamer *Mary Ann* was the first steamer to travel the river, and if not the fastest, it certainly travelled the furthest. After her original box boiler was replaced with a more conventional boiler at the end of 1853, the *Mary Ann* continued to ply the river for another year, but only went as far as Echuca/Moama one more time, and as she became increasingly cranky and unreliable, Randell decided to replace her – but not entirely: apparently the hull of the *Mary Ann* was incorporated in her successor, the twin hulled *Gemini*, with a single paddle wheel between the two hulls.

The *Gemini* had a somewhat troubled life, but she travelled immense distances, getting as far up the Murrumbidgee as Hay, and up the Darling and Barwon Rivers to Brewarrina, thousands of miles from her home port. Eventually, about 1869, Randell separated the two hulls of *Gemini*, building the newer half into a barge, and



Captain Arnold (left) and Town Clerk of Mannum John Baseby, with the "Mary Ann" boiler alongside the [Randell] dry dock.

Photo from the Mannum Dock Museum. No date.



In 1930, the original boiler of the "Mary Ann" (left) was shifted to the Mary Ann Reserve in Mannum, and an old beam engine, used at the Dry Dock, was displayed alongside it. State Library SA, B69842/1.

abandoning the *Mary Ann* half on the river's edge, where she eventually sank and where she still lies in the mud somewhere near Mannum. *Mary Ann*'s original boiler has been conserved and is now on display in the Mannum Dock Museum. I wonder if someday, *Mary Ann*'s hull could be found and conserved, as was Henry VIII's *Mary Rose*, near Portsmouth.

On the 30th November 2014, Engineering Heritage South Australia presented an Engineering Heritage National Landmark to Dave Burgess, recently-elected Mayor of the Mid Murray Council, to recognise the Paddle Steamer *Mary Ann*. The presentation was made in the Mary Ann Reserve at Mannum, on the banks of the Murray River, where there is a small rotunda containing a replica of the original *Mary Ann* boiler. In the photo below, and standing alongside a replica boiler and the new interpretation panel are (from left) Bernard Arnold, Mayor Dave Burgess, Dave Prescott, and Richard Venus.

From the Editor

All references are contained in the footnotes. The *Mary Ann* story and images here are almost totally derived from Richard Venus's Nomination of PS *Mary Ann*. This substantial document can be downloaded from the EHA website at:

<https://www.engineersaustralia.org.au/portal/heritage/pad/desteamer-mary-ann>

For more information, *The Engineering of the PS "Mary Ann"*, by Bernard Arnold & Richard Venus, and *Randell's Dry Dock, Mannum*, by Andrew Klenke, can be found at:

https://www.engineersaustralia.org.au/sites/default/files/2015_engineering_heritage_conference_transactions_print.pdf



¹⁸ From the *Nomination for Engineering Heritage Recognition – Ps Mary Ann, Mannum Dock Museum*, page 31.

A brief history of H. A. Humphrey & the Humphrey Pumps.

By Richard Venus

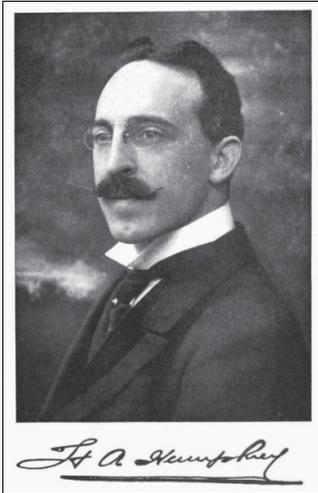


Image from the "List of the Papers of H.A. Humphrey in the Imperial College Archives."

Humphrey developed his unique and ingenious water pumping device as a means of utilising Mond gas, primarily hydrogen, which was made from coal in a process discovered by Dr Ludwig Mond in 1889. Humphrey had a particular interest in large gas engines which he saw as a better alternative to steam plant, especially for electricity generation.

In 1904 he signed an agreement with the South Staffordshire Mond Gas (Power and Heating) Co Ltd as a consulting engineer. The company provided the necessary facilities and materials for Humphrey to carry out experimental work and from this he developed a working pump and was granted a patent in 1906. The first model used a two stroke cycle but Humphrey soon abandoned this in favour of a four stroke cycle. An experimental pump was built in 1908 and tested in 1909. Humphrey presented a paper to the Institution of Mechanical Engineers on 19 November 1909 and the pump was displayed at the Brussels Exhibition in 1910 where it won two Grand Prix, one for gas engines and one for pumps – demonstrating the melding of its two functions. The patent rights were controlled by the Pump & Power Co Ltd which had Humphrey as Managing Director and Consulting Engineer. This company undertook the design and development of the pump and granted manufacturing licences in Britain, Europe, and India.

The first commercial application of the pump was at the King George V Pumping Station at Chingford in the Lea Valley, north of London. Five pumps were made by the Siemens Brothers Dynamo Works at Stafford and the pumping station was opened by the King on 15 March 1913. In the meantime, the Pump & Power Co had gone public and changed its name to the Humphrey Pump Co Ltd. Negotiations were in hand for 20 pumps: in addition to the five at Chingford, there were proposals for three more in England, six in India, three in Italy, two in Germany (one of which was to be installed in Egypt), and one in South Africa. Development work was also being carried out in Germany and America. A 1000 horsepower prototype pump – to be used as an air compressor – was built at Nonnendam (Berlin) in Germany in 1912 but work was halted by the onset of World War One.

The Producer Gas System at Cobdogla.



2nd hand charcoal gas producer plant installed in 1985 after original Saunders gas producers were scrapped. Photo Keith Baker, 2014.



Gas from the producer plant was stored in this gasometer awaiting use in the Humphrey Pumps. Photo Miles Pierce, 2005.



Producer gas charge holders (gas bags) on a floor above the combustion chambers of the Humphrey Pumps. Photo from the EHA nomination document.

The Humphrey Gas Pump Company was established in New York in 1911 and, after considerable development, two pumps were installed: one on a Texas irrigation estate in 1914 and one at a Pennsylvania shipyard in 1925. The Texan pump was used until 1930 and then scrapped about 1952; the pump in Pennsylvania was demolished in 1955. One pump was built for a sewerage scheme in Essex and installed early in 1914. There were various problems and delays, largely because of the war. The contract was cancelled in 1915 and the equipment was removed. In 1910 a Dutch company saw the potential of the pump to drain polders and an experimental unit was built. It was not entirely successful and a new pump was designed and built; however, its efficiency was found to be too low and no further tests were carried out. The Dutch Government had expressed interest but withdrew the Bill to authorise the work in 1913.

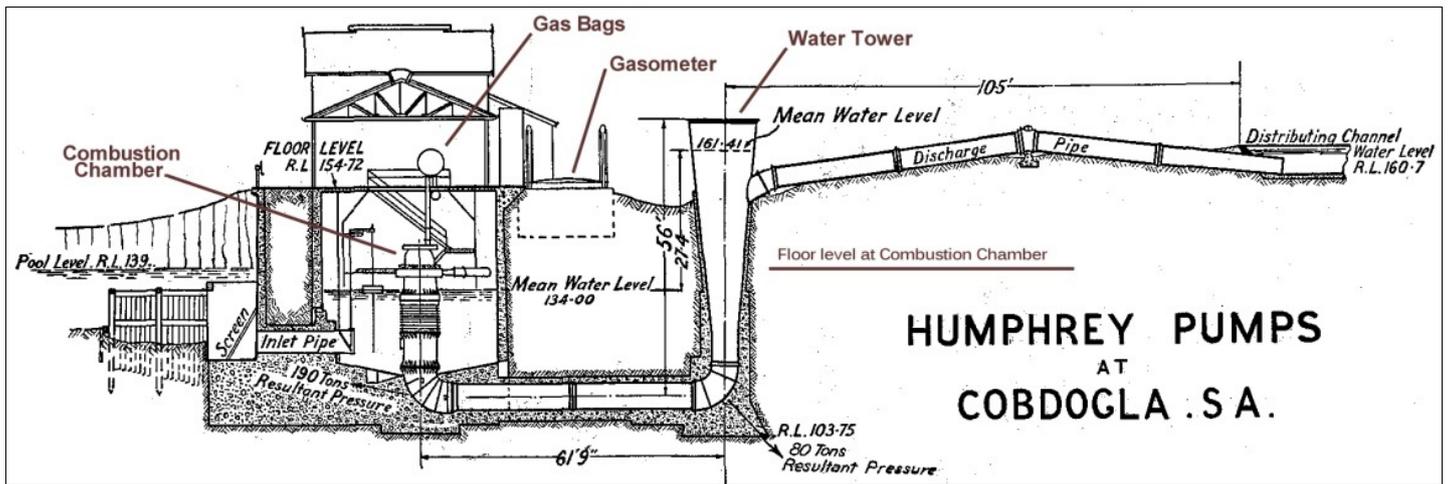
The largest Humphrey installation – with 18 pumps to be made by Beardmore – would have been in Egypt, near Alexandria, and Humphrey himself visited Cairo in 1913. Plans were drawn but never completed and the project was abandoned as World War One enveloped Europe. Clearly World War One had a significant impact on the development and adoption of the Humphrey Pump. In the 1920s and 30s, electric power became available on a large scale and the need for big gas engines diminished. The only new installations in this era were the one in Pennsylvania and the one at Cobdogla which was, in fact, a carry-over from before the War.

During the War, Humphrey was involved in designing and equipping explosive factories. (His offer to steer the one-man suicide torpedo he had proposed in 1914 was, fortunately, rejected by the Admiralty.) An important ingredient was ammonia, a by-product of the Mond gas process, and Humphrey became a director and consulting engineer for the Synthetic Ammonia and Nitrates Company which was formed in 1919 and became part of Imperial Chemical Industries in 1926. Humphrey remained with ICI until his retirement in 1941.

The Humphrey pump was chosen for the Cobdogla irrigation scheme by Samuel McIntosh, Director of Irrigation for South



A Humphrey Pump combustion chamber at Cobdogla. For its location in the pumping station, see the diagram below. This photograph taken from the Cobdogla Museum website.



Humphrey Pumps diagram, from a paper by James Ivey McLauchlan in IEAust Transactions, Vol.XII, 1931, page 417.

Annotations in brown by M.Doring.



Water towers for the two Humphrey pumps at centre with the gasometer and then the pump house behind. The discharge pipe for the restored pump is at left. For locations, see the diagram above. Photo M. Pierce.

Australia, following a visit overseas to assess suitable plant in 1912. A contract was signed in February 1914 and the Humphrey Pump Co appointed the Adelaide firm of Clutterbucks as their agents. Then, in January 1915, the Company asked to be released from its contract citing a number of problems, mainly the outbreak of World War One. However, the irrigation scheme went ahead with a number of temporary plants. McIntosh also prepared a specification for two smaller Humphrey pumps at Mypolonga (due east of Adelaide between Mannum and Murray Bridge); however, after inspecting the site, he decided they were not appropriate for the river conditions.

Negotiations were eventually reopened with Clutterbucks in August 1921. William Beardmore & Co, who made the pumps for Humphrey, agreed to undertake the manufacture at their factory in Scotland and a contract for two 66-inch pumps was signed on 6 October 1922. Wilfred Farrington Saunders, a principal of Clutterbucks, designed the updraft gas producers (to be fuelled by timber) which were made by May Brothers in Gawler.

Civil works commenced in September 1921 and by early 1922 all the major parts of the pumps had arrived on site. The installation was completed on 30 April 1925 but a number of operating problems were encountered. Beardmore eventually built new steel combustion heads in 1929. With further modifications, the pumps ran without problems for 12 hours straight

on 19 November 1930. After five and a half years, Beardmore's resident engineer, W H Tubbs, could finally go home. The two pumps supplied irrigation water until 1965 when they were replaced by electric pumps of equivalent capacity. The pumps were still in good mechanical condition but the issue was the cost of firewood which had to be brought from interstate to fuel the gas producer.

After 1965, the Humphrey pumps stood idle but, over the next few years, the (then) Engineering & Water Supply Department gradually assembled a collection of other irrigation equipment in the interests of preserving this aspect of SA's engineering history. In 1982 a feasibility study to recommission one pump was undertaken. This led to a proposal to the Jubilee 150 Board for this work to be a project to celebrate South Australia's 150th anniversary and the restored pump was successfully tested on 24th February 1986. It continued to be regularly operated by volunteers until 2012, when a starting problem resulted in two operators being affected by the producer gas used to fuel the pump. It is now maintained as a static display pending a decision about the future ownership and management of the pump.

The Chingford pumps (in UK) were decommissioned in 1968. The building is heritage-listed but two of the pumps have been removed so that modern units could be installed. The remaining three pumps are now in the care of Thames Water. Interest in the Humphrey pump was briefly revived in the 1970s when a four-inch experimental pump was built at the University of Reading where David Fulford had an interest in the pump's potential for use in developing countries with biogas as a fuel. Chinese engineers were also said to be interested. The concept of a *liquid piston* had also been investigated in 2008 and, as recently as 2013, one person put forward an idea based on the Humphrey pump in a Greenpeace challenge to find alternatives for "dirty diesel pumps" in the fields of India. Also fuelled by biogas, it ranked 39th out of 252 ideas submitted.

Progress Report

At the time of writing, the Humphrey pump at Cobdogla has not been run since the shutdown ordered in 2012. The site owner, SA Water, has entered into an agreement with the volunteers to sponsor the Cobdogla Irrigation and Steam Museum for five years. The factors causing or contributing to the problems in 2012 have been identified and solutions have been planned. The next step is to actually carry out the work and have the pump running again – to the delight of volunteers and visitors alike. There were hopes that this could be done by 7 March, the 30th anniversary of the pump's restarting, but this is looking increasingly unlikely.

With a new category of Engineering Heritage Marker available, the pumps were reclassified from a National to an International Marker in March last year but no presentation was arranged because of the pumps' then uncertain future. The restarting of the operational pump would be an ideal event at which to present the hard-working team at Cobdogla with their new Marker. We will report progress in future issues of the Magazine.

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Humphrey Pump combustion head with gas hood. Photo R. Venus.
Note: The gas hoods collect lighter-than-air combustion products – including the carbon monoxide which caused the problem in 2012 – and a fan draws them away from the operating floor (presumably vented through the roof – we're not entirely sure) Originally canvas, they were replaced with the clear material (probably a PVC) so visitors on the upper level could see the valves operating. – RV.

Rotary Converters in a Melbourne Tram Depot

Rare survivors in an age of solid-state rectifiers.

By Miles Pierce

The former Malvern tramway substation attached to the still operating Malvern Tram Depot in Melbourne is a rare survivor from the time when alternating current to direct current (AC-to-DC) conversion for electric traction (electric trams and trains) was performed by rotary converters. The Malvern tramway substation contains a pair of 1000 kW English Electric manufactured 600 volt rotary converter machines together with brick cell enclosed 6.6 kV incoming AC supply switchgear, step-down transformers, converter starting and control panels and a large open-panel 600 V DC switchboard. All are substantially intact, including interconnecting power and control cabling.

The Malvern tramway substation was constructed in 1929-30 by the then Melbourne & Metropolitan Tramways Board (MMTB). In 1920 the newly formed MMTB took over the assets of the former Prahran & Malvern Tramways Trust which established the original Malvern tram depot in 1909 and from whence they supplied their local tramway network via a motor-generator set powered from the then Melbourne Electric Supply Company's 4.2 kV single-phase AC distribution. This was superseded by the MMTB's rotary converter substation in 1930. The MMTB's Malvern substation operated for over sixty years and was one of the last of many such rotary converter substations serving the Melbourne electric tram network to be shut down, with its retirement only occurring in the 1990s. This late decommissioning date, along with the required DC power subsequently being provided by modern semi-conductor rectifier substations located elsewhere, has evidently accounted for its survival.



The 1910 Malvern Tram Depot building, viewed from the start of Coldblo Rd. The 1929 Substation can be seen at the far end (at right) of the original depot building.

Photo from Biatch at en.wikipedia.



The Substation Building viewed from Coldblo Rd.
Photo - Miles Pierce.

Rotary converters are built like a DC generator with fixed, multi-pole, field windings – the stator component – and a rotating armature assembly with a conventional commutator and associated brush-gear at one end of the shaft. The armature winding however is also tapped at intervals and connected to slip rings at the opposite end to the commutator. It is fed from an alternating current supply via a step-down transformer whose secondary side voltage is selected to match up to the desired DC output voltage from the commutator.

The rotary converter was invented in the United States in 1888 and is generally credited to Edison employee, C S Bradley. It was further developed and perfected in the following two decades. The rotary converter was superior in terms of space and efficiency to the then alternative arrangement of using an AC motor to drive a separate DC generator – the rotary converter having only one stator and rotor assembly and one pair of shaft bearings. Its invention at the time of the 'battle of the systems', i.e. AC versus DC for public power supply, was fortuitous when AC, due to its easy ability to be stepped up and down in voltage by transformers to suit transmission and distribution/end-use respectively, gained the ascendancy.

By then many existing public electricity supplies in USA, UK, Europe, and Australia, were low-voltage direct current. The rotary converter in this context enabled electricity generation and transmission at high-voltage AC (and thus relatively low current and associated losses) with final supply to existing local DC distribution networks from rotary converter substations. This applied in both Melbourne and Sydney. The early superiority of series connected DC motors for electric traction – electric trams and trains – could also be accommodated from AC generation and transmission by then converting to DC locally using rotary converters.



Aerial view of Malvern Tram Depot showing the car sheds & substation & their location relevant to Glenferrie & Coldblo Roads. Image from Miles Pierce's VHR Nomination of the Rotary Converters.



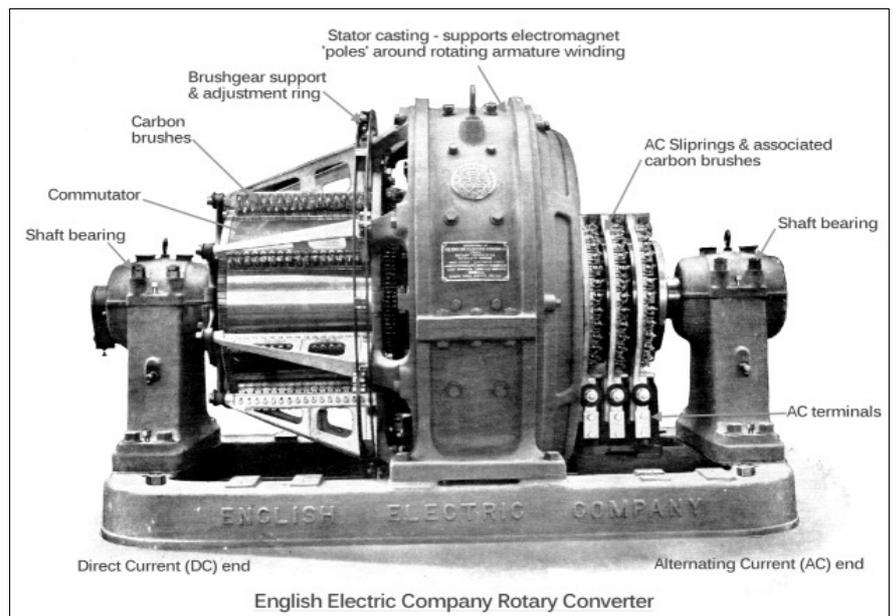
The interior of the former Malvern tramway substation, showing the two 1000kW rotary converters and the open panel DC Switchboard.
Photo - Miles Pierce.

Electric trams and metropolitan electric trains have to stop and start frequently, so series-connected DC motors were initially preferred as, in addition to inherent variable speed capability, they give high torque and acceleration at low speeds, even from a static start. The DC motor torque drops off at higher speeds, but can easily maintain a steady cruising speed between stops. The evolution of power electronics in more recent times has facilitated the use of the more rugged AC induction motor for traction applications.

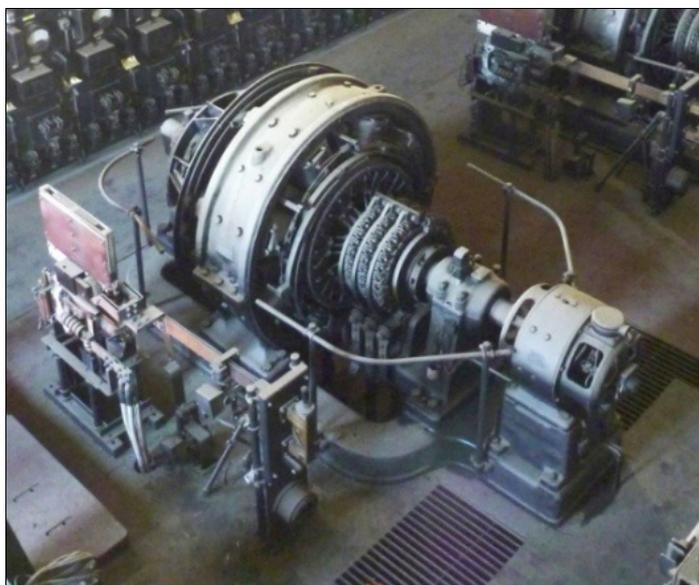
The 1500 volt DC suburban electric railway networks in both Melbourne and Sydney initially employed rotary converter based substations, typically housed in large purpose built buildings located adjacent to the rail tracks. Similarly, electric trams that at various times plied the streets of all State capital cities and a number of regional centres from the 1890s onwards, also made wide use of the rotary

converter to furnish their typical 600 V DC traction supply (as at Malvern). By the middle of the twentieth century, mercury arc rectifiers, both the glass bulb and steel tank varieties, became available in larger ratings and with their low maintenance and higher conversion efficiency superseded the 'rotaries'. More recently, they in turn have been displaced by solid-state semi-conductor rectifier assemblies that offer even higher conversion efficiency and compactness.

Many substation buildings that were erected to house rotary converter plant for public DC supply and for tram or train traction purposes remain in situ – sometimes still in use with modern AC-DC conversion plant or recycled for other uses – but the intact rotary converter plant at the Malvern tramway substation is a



Photograph found on the internet & annotated by Miles Pierce.



Detail – one of the Rotary Converters at the substation. Photo - Miles Pierce.

very rare survivor. Interstate inquiries by the author have not revealed another example in Australia. Indeed, surviving large rotary converter machines by themselves appear to be rare with most having ended their life as a source of scrap metal.

In view of the evident uniqueness in Victoria, and possibly nationally, of the essentially intact rotary converter plant at the former Malvern tramway substation, an application has been lodged with Heritage Victoria for it to be added to the Victorian Heritage Register. The 1929 substation building is already on the VHR as a part of the Malvern Tram Depot, but current interpretation of the Victorian heritage legislation does not confer coverage of internal fixed plant and equipment.

For further information on rotary converters see: Blalock T J, 2013, The Rotary Era – Early AC to DC Conversion, IEEE Power & Energy Magazine, Part 1 Sep/Oct and Part 2 Nov/Dec. at

<http://magazine.ieee-pes.org/septemberoctober-2013/history-9/> and <http://magazine.ieee-pes.org/novemberdecember-2013/history-10/>.

Chefchaouen and the Wadi Laou

From Owen Peake, travelling in Morocco last year – a picture essay.



Chefchaouen with its predominantly blue and white buildings.
The Wadi Laou runs through the middle ground with the Ras el-Ma off to the right at the top of the old town.

Nowhere in Morocco did I see a better example of a well-engineered water management system, dating back over 500 years, than in the town of Chefchaouen in the Rif Mountains of northern Morocco, just 40 km from the Mediterranean Coast and less than 100 km south east of the major city of Tangier on the Strait of Gibraltar.

Chefchaouen is best known for its tightly packed blue and white painted houses within a city wall clinging to a steep mountainside. The town is picturesque and well preserved as well as being an important historical site as it was the centrepiece of a war against the Portuguese shortly after it was established in 1471.

The key to the success of Chefchaouen as a fortress town lay partly in the rugged terrain on which it was built and partly due to the presence within the town of the Ras el-Ma, a large freshwater spring in the north east of the town which feeds into the Wadi Laou whose waters cascade down through the town. In those days of long sieges an unassailable water supply was a key strategic asset.

The resource, as well as providing the water supply, was developed to provide power for seven grain mills which are built in series down the course of the wadi from just below the spring. The abundant water supply also made the town rich in gardens and fountains whilst on the river are several covered communal wash houses which were then, and are still, centres of community activity.

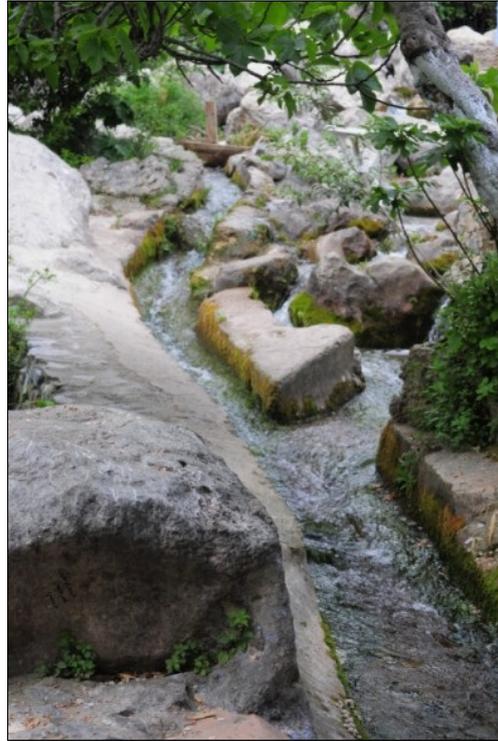


A house in the old part of town.



Diversion weir serving the channels to the mills.

The water supply was all gravity fed, the mills were supported by a network of diversion weirs and channels and the centralisation of the towns washing facilities in the multiple wash houses below the off-take for the water supply provided added value to the management scheme.



Water channels feeding the mills.

Today we would call this an integrated water development scheme. It is totally sustainable with not a pump in sight and sufficient horsepower developed to drive the mills which ground all the town's flour.



A flour mill converted into a cafe.



A wash house on a working day.

We were there on a holiday weekend and there were large crowds of locals around all the features near the river. It was late April and the climate in Spring in the mountains is extraordinarily pleasant.



A party in the wash house at the weekend.

In modern times little has changed. There is now a modern water treatment plant at the springs and the water-driven mills have now been converted into cafes, shops and in one case a bakery.

Otherwise the Wadi Laou is probably little changed from hundreds of years ago and the only Portuguese in town are tourists.

From Owen Peake, our intrepid traveller who also took the photos.



The Portuguese Bridge

Farewell, Margaret Henry.

The Newcastle Herald says: a passionate Novocastrian. The city is poorer for her passing.

It was a great shock to me to open my Sydney Morning Herald, only a few weeks ago, to find an obituary of Margaret Henry, a person I have admired and respected for many years and who seemed to be always there in Newcastle, reliably fighting for the conservation of the City's heritage and there to be called upon when she was needed. Margaret Henry was a passionate conservationist and distinguished historian who is a huge loss to Newcastle – and indeed the whole Hunter Region. She died on the 9th of September last year, and she was held in such huge respect in Newcastle that the Newcastle Herald dedicated its Editorial the next day to her memory:

EVEN Margaret Henry's many opponents must concede her virtues. Ms Henry, 81, who died on Wednesday night from pancreatic cancer, was above all a passionate Novocastrian. Authentic in character, staunch in her beliefs and consistent in her philosophy, she seldom missed an opportunity to fight for what she believed was best for the city and community she loved. And though her detractors loved to portray her as negative and reflexively oppositional when it came to planning and development issues, her arguments were not infrequently proven to be right. For example, some may still remember how, in the aftermath of the 1989 earthquake when heritage buildings were being demolished across the city, Margaret Henry boldly accused some property owners and others of using the disaster as a smokescreen to rid themselves of unwanted buildings. Her intervention almost certainly saved the North Wing of the old Royal Newcastle Hospital.



Margaret Henry in November 2009.

Photo from the University of Newcastle.

When she left the ALP she suffered all the usual denigration such decisions attract, but Ms Henry never seemed especially perturbed by criticism, however fierce. As a member of the Greens she certainly attracted her share, partly because the party's position is so often against the interests of some businesses, and partly because there seldom seemed any issue she was unprepared to comment on in public. Vocal, and prolific in her commentary, she was never mealy-mouthed and she seldom resorted to euphemisms or ambiguous statements to deflect disagreement. On the contrary, she could be blunt to a fault. As a councillor of the city of Newcastle Margaret Henry seemed to relish political cut and thrust, but few could ever have been left in doubt that she genuinely wanted the best for the city.

Younger Novocastrians will remember her best for her passionate opposition to the removal of the heavy rail line. Her surveys, petitions and lobbying in that cause were all undertaken with her characteristic relentless energy. That remarkable energy drove her to take on roles on the National Trust, the NSW Council on Ageing, the council of the University of Newcastle and the Women's Electoral Lobby. Margaret Henry's instinct was always to stand up for the underdog, and many of her battles were fought unsung at the grassroots of her community. Her detractors often deplored her seeming ubiquity, but a passion for involvement and a determination to improve her community were her central and defining characteristics.

Feisty, courageous, opinionated and relentless, Ms Henry was a valuable ally and a formidable foe. Newcastle's public life will be poorer without her and without her good-hearted energy and idealistic drive.¹

I first came across Margaret Henry during that same fight in 1990 to save many of Newcastle's historic buildings which were still standing after the earthquake, but were nevertheless threatened with demolition, for the same reason noted in the *Herald* editorial above. We were engaged in that fight too, trying to save the threatened – but virtually untouched by the earthquake – buildings of the “Civic Workshops” aka the Honeysuckle Point Railway Workshops, as well as the Wangi Power Station on Lake Macquarie not far away. We, also, had some success in that fight and, probably consequently, returned to Newcastle and Lake Macquarie many times to work on other heritage projects. I never knew Margaret Henry as a politician or local councillor, but we knew we could always rely on her support via her leadership of the National Trust in the Hunter. In recent years she was Patron of the Hunter Heritage Network, and as such presented us with a beautiful cut glass model of Newcastle's Obelisk for jointly winning, along with Ed Tonks, the 2010 Hunter Perpetual Bonafide History Award for Outstanding achievement in the service of history and heritage in the Hunter Region.

Thank you Margaret Henry, *from Carl and Margret Doring.*

¹ Reprinted from the Newcastle Herald of 10 September 2015 with permission.

Connections

Margaret Henry Oral History Archive – Digitised Collection

In its “News from Cultural Collections, UON Library at the University of Newcastle, Australia” on 10th November last, the University announced the establishment of the Margaret Henry Oral History Archive. This is a collection of audio tapes, transcripts, summaries and essays that were part of the Oral Histories Open Foundation Course (1986-1989). Margaret Henry was a history lecturer at the UON in the 1980s. The oral history tapes have been digitised by Cultural Collections, UON Library and made freely available to the wider global research community. The Oral History Archive contains over 200 interviews in total and with many stories of Newcastle, the Hunter Valley and its surrounds. It records voices describing the Region’s cultural, intellectual and social life. It is an incredible legacy to Margaret Henry. The original audio tapes and written sources are held in Cultural Collections at the Auchmuty Library, University of Newcastle (Australia). Online access to the collection is via: <https://uoncc.wordpress.com/2015/11/10/margaret-henry-oral-history-archive-2/>



For those interested in the industrial history of Newcastle, a random sampling of the collection reveals: Coal Mining in the Northern Coalfields – Depression; A Pioneering Engineering Firm – Morison & Bearby; Newcastle Train History; Goninan & Co. Limited; Electricity in the Hunter; History of Shipbuilding in Newcastle; and many, many more.

Celebrating 60 Years of Circular Quay Station



In an email of 20th January 2016, our new Chair of EHA, Neil Hogg, told us of the goings-on in Sydney, where Sydney Trains was celebrating the 60th anniversary of the official opening of Circular Quay Station on 20th January 1956. That day also marked the completion of Sydney’s ‘City Circle’ underground railway, with trains able to run in a loop between Central, Town Hall, Wynyard, Circular Quay, St James and Museum stations.

The celebrations are over now, but you can still get access to a web page at http://www.sydneytrains.info/about/heritage/circular_quay with lots of info, a collection of superb images, and a pdf booklet published for the anniversary. Going back one step, to <http://www.sydneytrains.info/about/heritage/> takes you to the Sydney Trains Culture & Heritage page, about exhibitions, conservation, oral history, the heritage register and much more.

If you happen to be in Sydney, and this issue of the Magazine gets to you in time, Engineers Australia, Engineering Heritage Sydney Committee, has arranged a **talk on Circular Quay and the City Circle** on 15th February 2016. The talk will highlight the history and engineering that led to the station as we now know it – at the gateway to Sydney and an essential part of Sydney’s rail network. The talk will be presented by Frank Johnson, a Railway Engineer of many years’ experience around the Sydney network and with a keen interest in railway history. **Date:** Monday 15 February 2016. **Time:** 6.00pm. **Venue:** Engineers Australia, 8 Thomas Street, Chatswood. No bookings required.

Melbourne from the Air – 1945 to 2015

Hours of fun on a wet Sunday – especially for Victorians. Just how much has Melbourne changed in 70 years? Find out by going to <http://1945.melbourne> where Nathaniel Jeffrey has created a fascinating website, combining 1945 and recent aerial photos/maps of Melbourne on a split screen with 1945 on the left and 2015 on the right. Move the image back and forth or up and down to see the whole of Melbourne as it was and is now.

At <http://www.lib.unimelb.edu.au/collections/maps/historical/1945melb/> a Melbourne University site shows just the 1945 aerial photos in detail.

A story in *The Age* picks out a series of places from the Jeffrey website to show the most striking changes that have happened to places like Doncaster, or the Port of Melbourne over 70 years. See: <http://www.theage.com.au/victoria/a-birdseye-view-of-melbournes-transformation-from-1945-to-2015-20150226-13pd5v.html>

(Thanks to Anna Foley at the National Trust for 1945.Melbourne)



