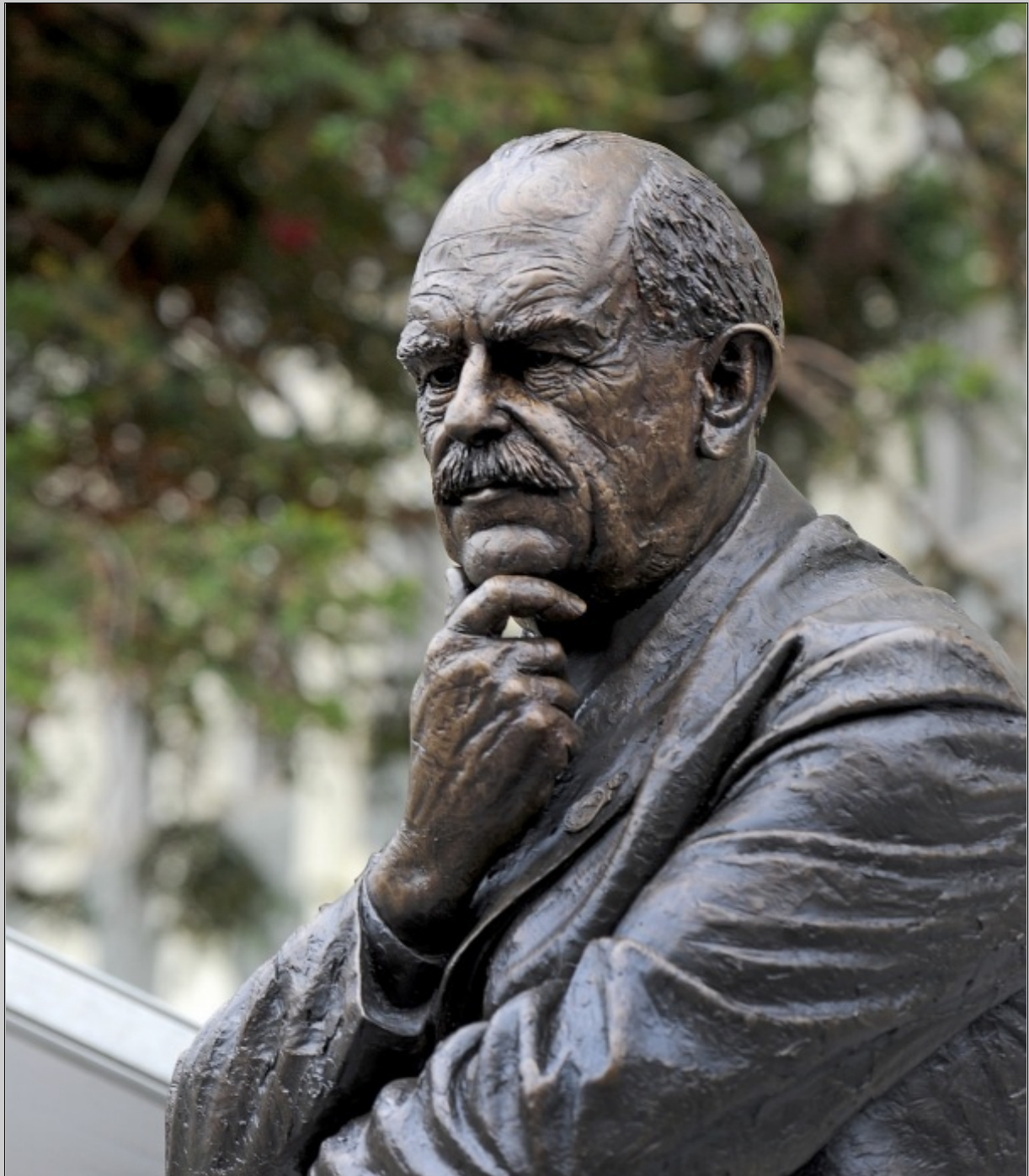


# EHA



ENGINEERING HERITAGE AUSTRALIA



# Engineering Heritage Australia Magazine

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EDITOR:

Margret Doring, FIEAust. CPEng. M.ICOMOS

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Cover Images:

Front – Sir John Monash statue at Monash University  
Photo Joe Castro for Monash University

Back – Views of flume aqueducts in the Stawell Water Supply.  
From an 1881 poster published by David Syme & Co., Melbourne.

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.

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# Editorial

There have been some questions about how many people receiving a notice about each issue of the EHA Magazine, have actually downloaded the PDF file and opened the magazine. I would like to know more about the readership, so I would be very grateful if, having opened it, you emailed me at [doring.belgrano@bigpond.com](mailto:doring.belgrano@bigpond.com). All you need to do is put “Yes” in the subject space. If you would like to give me some feedback as well, that would be great!

On the topic of feedback, a reader from Queensland answered my question in the last issue about the location of the Tug Forceful in the Brisbane River on 21<sup>st</sup> January 1929. He said: *it appears to be near the Colonial Sugar Refinery at New Farm which has now been converted to apartments/units. The ramp into the river may have been the New Farm vehicular ferry to Bulimba.* Thank you BB.

In this issue I have attempted to cover a fairly broad field as compared to the predominance of water stories in the last (March) issue. Keith Baker has written about Colin Crisp, a pioneer heritage engineer in this country (or anywhere else for that matter) – the man who has EHA’s award for outstanding engineering heritage projects named after him.

Sir John Monash, after whom the Engineers Australia John Monash Medal is named, makes several appearances in this issue. It’s rather difficult to ignore John Monash, or his bridges, in this 150<sup>th</sup> anniversary of his birth and the 100<sup>th</sup> anniversary of the ANZAC landings at Gallipoli. A group of the very first students to attend Monash University when it opened its doors 50 odd years ago, got together in 2011 to organise the commissioning of a statue of John Monash for the university. I was very pleased to attend the unveiling and write a story about it. John Monash features again in a story about an engineering heritage recognition ceremony for the 1905 St Kilda Street Bridge over the Elwood Canal in Melbourne. This was Monash’s first attempt at a new concept in structural design – a reinforced concrete pier and girder bridge.

There is a short account of the EHA Award of Merit given to South Australian engineer John Woodside. The award is given for outstanding service to engineering heritage, often over many years. Coincidentally, one of Woodside’s most recent heritage engineering projects was the restoration of the Sir William Goodman bridge in Adelaide, designed and built by John Monash. Opened in 1908, this reinforced concrete pier and girder bridge demonstrates the extraordinary refinement of design Monash achieved in the three years following St Kilda Street.

Brian McGrath has given us another story from his visit to Hong Kong – this time about the Hong Kong Museum of Coastal Defence. And expect more from Brian about Hong Kong – next time trams. Owen Peake writes about *The Great Melbourne Telescope*. The brand new Melbourne Observatory was fitted out in 1869 with what was then one of the largest astronomical telescopes in the world. When the observatory closed in 1945, the telescope was moved to Mt Stromlo Observatory near Canberra and rebuilt for continuing use in a modern format. After the terrible Canberra fires of 2003 which destroyed the Mt Stromlo Observatory, the salvaged parts of the Melbourne telescope were returned to its original home, where it is being reconstructed. Owen also sent us a great story about the Stawell Water Supply and the visionary engineer who designed it.

I was honoured to be able to reprint an obituary for Ken Kelsall, an inspiring, dam building engineer from Western Australia, who died recently at the great age of 94. He took part in the building of 26 WA dams throughout his career, including the Ord River Diversion Dam which we wrote about in the first issue of this magazine. One other sad duty was to write an obituary for an old friend – Swiss writer, editor, publisher and industrial historian, Oskar Baldinger. I hope to bring you some stories from his magazine, *Industrie Archaeologie*, in future issues of EHA Magazine.

*The Editor*

## ***Stop Press – some stuff just turned up that missed the Connections pages.***

I received an email from an archaeologist colleague announcing a new website which is worth exploring. This website is the culmination of detailed historical and archaeological investigation of the mining community at Cadia, 30km south of Orange in the Central West of NSW. Mining commenced in the 1850s, but took off in the 1860s with the investment of the Scottish Australian Mining Co. Cadia Village survived the ups and downs of mining up to the 1940s.

See <http://www.cadiavalleyheritage.com.au>





# From the Chair – Who was Colin Crisp?

Engineering Heritage Australia's major award for outstanding engineering heritage projects is the Colin Crisp Award. I was recently asked who was Colin Crisp? We have the John Monash Medal for outstanding personal contributions to engineering heritage, and John Monash is well known to most Australians and many people internationally as an outstanding engineer and military leader. Colin Crisp is well known in a smaller circle. He should be better known because he was the outstanding pioneer of engineering heritage in Australia from the 1960s, when heritage was just beginning to gain wider recognition.

In January 1990 after the Newcastle earthquake, the Sydney Morning Herald referred to Colin Crisp as Australia's leading conservation engineer. Others who worked directly with him on conservation projects, like Carl Doring, said his word was accepted as gospel by both the Heritage Council and the National Trust. In the obituary written for the National Trust, industrial archaeologist Don Godden described Colin Crisp as a building conservationist with an extraordinarily well-developed sense of the elegant and beautiful in structures, having an empathy with the built environment which was ahead of its time. The full text of this tribute is reproduced on the EHA website, describing not only his personal qualities and achievements, but also some of the innovative technical approaches he adopted. It can be found at: <https://www.engineersaustralia.org.au/engineering-heritage-australia/colin-crisp-award#Obit>

Colin Crisp graduated from Adelaide University as a structural engineer in 1953 and had his own consulting practice for two decades before becoming the principal heritage consultant in 1978 of McBean and Crisp, an engineering consulting firm that still operates in Sydney. In those days, as now, heritage work was rarely full time for engineers, and Colin did all the heritage work for his firm, as well as a large amount of voluntary work for the National Trust.



Colin Crisp FIEAust.

From a Crisp family collection.



The Great North Road near Wiseman's Ferry.

Photo: M. Doring.

Heritage projects where his engineering expertise was invaluable included conservation of the Great North Road from Wiseman's Ferry to Bucketty in NSW, Hyde Park Barracks in the Sydney CBD, Tathra Wharf on the NSW South Coast, restoration of the Sydney GPO Clock Tower, and numerous other public and privately owned buildings and structures. He was a Fellow of Engineers Australia and from 1964-1990 Colin Crisp was Honorary Engineering consultant for National Trust (NSW) -- service for which he was recognised with the Trust's silver medallion in 1986.

At Right: The Sydney GPO and its Clock Tower, photographed in 1900. From Wikipedia.



Hyde Park Barracks in Sydney.

Photo: J. Bar, Wikipedia.



The Tathra Wharf on the South Coast of NSW – photographed partway through its restoration works in May 1985. Photo: M. Doring.

He wasn't always able to save engineering works, as with the Walter Burley Griffin Incinerator at Pyrmont, where after years of neglect his recommendation was for recording rather than restoration as deterioration had been allowed to go too far. Also with the Carrington Chambers in Newcastle after the 1989 earthquake, where demolition occurred in spite of an injunction being sought to prevent it, and before he was allowed the opportunity of inspecting it to give an authoritative opinion on its condition.



The Walter Burley Griffin Incinerator at Pyrmont in Sydney, photographed on November 30<sup>th</sup> 1988, not long before its demolition. Photo: Carl Doring.

Apart from his numerous reports, and provision of expert advice for the National Trust, he was also a member of the Engineers Australia Sydney Division Heritage Committee from its inception in 1978, as well as serving on the Department of Main Roads Bridges Committee and several Department of Planning Committees. Colin was chairman of the project steering committee of the Warren Centre for Advanced Engineering report: *The Economic Recycling and Conservation of Structures*. This landmark report which is still available and informative was published in 1990, the year before he died. Our Magazine editor advised me that she worked with Colin on a number of committees from the early 1980s including the Warren Centre report, and always found him ready to discuss projects and generous with his advice.

So back to the Colin Crisp Award. Entries are open for recent projects or publications concerning engineering heritage, closing on 31 July. See <https://www.engineersaustralia.org.au/engineering-heritage-australia/colin-crisp-award> and give some thought to whether you have a heritage engineering project, conserved piece of machinery, adapted industrial site, a book, report, or outstanding interpretation of an engineering heritage work to enter for this prestigious award. Maybe knowing more about Colin Crisp's pioneering work might inspire you to nominate a project for the award that honours his name. The engineering heritage group in your state or region is able to help with advice.

*Keith Baker Chair EHA*

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### *An example of a Colin Crisp Award from 2011 Restoration of the Lake Margaret Hydro-electric Power Station, Tasmania*



Lake Margaret Power Scheme is located on Tasmania's west coast, approximately 10 kilometres north of Queenstown. The scheme was built by the Mt Lyell Mining and Railway Company in 1914 to provide electricity for its mines and associated townships. The power station, which represented a relatively early use of hydro-electric power, proved to be very successful and was progressively enlarged and extended and eventually connected to the Tasmanian electricity grid in the 1940s. Hydro Tasmania assumed ownership of the Lake Margaret scheme in 1985. The complete scheme remained in operation until 1995 when the lower power station was shut down due to serious corrosion in the steel penstock. In 2006, the main power station was taken out of service due to safety concerns over the condition of the woodstave pipeline.

The two subsequent redevelopment projects have resulted in the retention of a significant level of heritage on the site along with the use of some modern technology. The main power station project involved refurbishment of the original machinery and the addition of some new controls to automate the station. This work included the construction of a replacement woodstave pipeline. The lower station was fitted with a new turbine and generator with higher output achieved by using a more modern turbine design. The old turbine and generator were retained as a heritage exhibit alongside the new machine.

*This story from the Engineers Australia website – see link above.*



# John Woodside FIEAust CPEng receives the Award of Merit

*News from Richard Venus in Adelaide:*

We were delighted to be present at the South Australia Division's Sir Eric Neal Address held in the Adelaide Town Hall on 11<sup>th</sup> February this year to witness the presentation by Engineers Australia CEO Steve Durkin FIEAust of an Engineering Heritage Australia Award of Merit to our colleague, John Woodside FIEAust CPEng. John is pictured holding his certificate, with Steve Durkin FIEAust (left), SA Division Deputy President Niki Robinson MIEAust, and Richard Venus MIEAust.

*The Engineering Heritage Award of Merit is aimed at recognising and showing appreciation for outstanding service, 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.*



## The Citation

John Woodside is an active member of the South Australian Division's Engineering Heritage Committee. John is a key contributor to the SA Engineering Heritage Conferences, recruiting presenters and delivering well-researched papers, typically illustrated with his own excellent photographs, which form a valuable part of the historic engineering record.



The Sir William Goodman Bridge during restoration. Photo - John Woodside.

involved in the structural upgrading of St Georges Anglican Cathedral in Perth to improve its resistance to earthquake loads. This won the WA Engineering Australia Excellence Award for Small Company Projects in 2008.

In 2010, John was engaged by the City of Charles Sturt in Adelaide, to report on the repair and restoration of the Sir William Goodman Bridge. This was the first reinforced concrete structure in metropolitan Adelaide. It was designed by Sir John Monash for the Municipal Tramways Trust and opened in 1908. Following acceptance of his report, John was appointed project manager for the restoration and reconstruction work which applied modern engineering techniques to the century-old structure, returning it to public use. The bridge was reopened in September 2014. He was also instrumental in having two Engineering Heritage Markers (one for the bridge and one for the Ridley Stripper, which was built just across the road) placed at the site. The success of this project was largely due to John's passion to bring back to the community a heritage-listed work which is now set to last for another 100 years.

John has been a consulting engineer for more than 45 years, specialising in structural design. His projects include the Millennium Dome in London, the Adelaide Bicentennial Conservatory (recently recognised as a State heritage icon), and earlier works on the grandstands at Adelaide Oval and the MCG. In 2006, he was awarded the prestigious John Connell Gold Medal by the Structural College of Engineers Australia for his outstanding contribution to structural engineering. He was a member of the Standards Australia Concrete Code Committee; Chairman of the Standards Australia Code Sub-Committee on Seismic Loading; and Chairman of the SA branch of the Concrete Institute of Australia in 1988-89 including being chairman for the 1989 CIA Biennial Conference in Adelaide.

John's interest in heritage restoration was triggered when he was invited by noted heritage engineer, Ian Maitland, to be



Sir William Goodman Bridge after restoration.

Photo - John Woodside.



# “Monash Pioneers” Honour their University’s Namesake

## Peter Corlett’s statue of Sir John Monash unveiled at Monash University.

By the Editor

We all know some things about General Sir John Monash, GCMG, etc., as a career soldier and a famous Australian General in the First World War – but most of us know less about him as an Australian engineer. I chose two photographic images of him to reproduce here. One of these somehow epitomises my idea of him as the distinguished soldier, but in ordinary service dress, without all the usual panoply of medals and decorations, and clearly fresh from the fields of battle – worn and rather tired looking and somehow vulnerable.

The other photograph shows Monash the engineer, in business dress, complete with the obligatory pearl gray Homburg hat that business men of those days wore when venturing out of the City. He is on some field trip, judging by the background – probably during his tenure as the General Manager of the State Electricity Commission. He definitely has the air of the man-in-charge – wherever he is. I wonder if the sculptor used this image, or one like it, for his statue of Monash.



Sir John Monash, engineer business man, c1920s.  
Source unknown

EHA Magazine is using the occasion of the Centenary of WW1 to publish several stories about Monash and his engineering works – particularly his innovatory work in the

(then) new science of reinforced concrete. We started in the December 2014 issue with stories about the design and construction of Monash’s eight Bendigo Bridges, and the almost accidental saving from demolition of his two- span concrete T-Girder bridge in Hepburn Shire, Victoria, because the contractor discovered its concrete was so hard that it would be too costly to demolish.

This issue has another story about the heritage recognition of a Monash T-Girder bridge – in the middle of the Melbourne beach suburb of Elwood.

A couple of years ago a friend sent me some publicity about a proposed new statue of Monash, planned to be located at Monash University. It didn’t fit well with my writing plans at that time, and I thought no more about it – until March this year, when I unexpectedly received a very formal invitation to me and a guest to attend the official unveiling of the Sir John Monash statue by His Excellency the Honourable Alex Chernov AC QC, Governor of Victoria, at the Menzies Lawn on the university’s Clayton campus on Wednesday 22<sup>nd</sup> April 2015 at 10.00 am. Who could resist? Even though it meant leaving home at 5 am and driving more than 300 km with no breakfast! Fortunately the occasion was well worth the effort, and the statue far exceeded my expectations. I only wish it could be located somewhere closer to the City and more accessible to the general populace and visitors to Victoria. However, at Monash University Clayton campus it had to be! That’s where it belongs!



General Monash in 1918. Photo: Bassano Ltd. From the UK National Portrait Gallery.



The statue unveiled by the Governor of Victoria.  
Photo: Joe Castro for Monash University



Sir John Monash standing on a representative concrete arch bridge in his setting outside the Menzies Building at Monash University  
Photo: M. Doring

Monash University was established by an Act of Parliament in 1958, and built on land way out in what was then, to us city types, the far, far south-eastern suburbs of Melbourne. Indeed Clayton was hardly a suburb, being largely orchards and small farms at the time. When the doors first opened, in March 1961, the vision then *was to create a research-focussed tertiary institution with an emphasis on science and technology* – most appropriately for an institution named after a distinguished scholar and engineer. The University soon broadened its vision and was quickly successful and making its mark in Melbourne consciousness.

The earliest students of the University – from 1961 to 1965 – formed lasting bonds, probably because of the isolation of the campus and their need to be self sufficient and creative in building their own traditions. In later years, some of them formed *The Monash Pioneers* – a group that organises reunions and encourages foundation students and staff to stay connected. It was this group which, after a 50 year reunion in 2011, decided to establish a fund and an appeal to enable *the commissioning of a new significant sculpture for the Clayton campus – a work that represents the University's namesake, Sir John Monash.*

The Chair of the Monash Pioneers Sculpture Project, Mr Michael Headberry said, *the sculpture celebrates Sir John's significant contribution to Australia as a scholar, engineer, lawyer, soldier, educator, businessman, patron of the arts, Rotarian and visionary. We want to celebrate the University and honour the first students and staff of Monash University. What better way than to recognise the life and work of Sir John Monash whose life and accomplishments stand as an inspiration to all members of the Monash University family.*

When the appeal got going, and it appeared the project would be a goer, a brief for the sculpture was prepared to solicit detailed concept proposals from invited artists. Here is the organiser of one Donor Group, an early Monash Law graduate, expressing his vision for the statue as – *Supporting this project is the perfect way to give something enduring back to Monash [University] to which we owe so much. We want to celebrate the University and honour its first students and staff*

*and what better way than to recognise Sir John [Monash], whose life and accomplishments stand as an inspiration to all members of the Monash family. It is also timely to have a statue of Sir John on campus so that students and visitors appreciate that the University was not named after a nearby freeway, but a man who has had an enormous impact on Australian life.*



*The statue will be a permanent reminder to the Monash community about where we have come from and what values we uphold. I like that the statue will not represent Sir John merely as a military commander, but his character as a thinker, a leader and a visionary, who did whatever needed to be done with great determination; not a bad example for university students to aspire to.*

The artist commissioned was the distinguished sculptor Peter Corlett, OAM, known for his large bronze figures, including his noted *Simpson and his Donkey*, outside the Australian War Memorial in Canberra, and other WW1 subjects like *Cobbers* at the Australian Memorial Park at Fromelles in France, and *The Bullecourt Digger* at Bullecourt in France. Corlett must have seemed a natural for this job, and in my opinion he has lived up to and exceeded all expectations.

The Monash website describes the three-metre bronze statue thus: *Renowned Australian sculptor Peter Corlett OAM was commissioned to produce the sculpture, which depicts Sir John's traits as a thinker, leader and visionary. He is standing on a concrete bridge, symbolic of his engineering career, and wearing a coat lapel badge to represent the Returned Sailors and Soldiers Imperial League.*



A closer view of the Monash statue..

Photo M. Doring.



At the unveiling - (L to R): Michael Headberry, Chair of the Monash Pioneers Sculpture Project; Willys Keeble; the sculptor Peter Corlett; and Michael Bennett, a member of the Monash family. Photo: Joe Castro for Monash University.

I like the way Monash is depicted wearing the ordinary business dress of his time – a three-piece suit plus what looks like a pair of workmanlike boots, fit for tramping around on construction sites. But he wears no hat, an almost inescapable accompaniment to the outdoors in his day.

I find the absence of a hat somehow makes his presence less commanding, but it enhances his piercing, thoughtful, and kindly gaze, suitable for the Father of the Campus – a caring figure who will be compatible with the spirit of today's students.

*Quotations in italics are taken from the Monash University website at: <http://www.monash.edu/>*

*A brief discussion of the life and career of Sir John Monash is in the Australian Dictionary of Biography at: <http://adb.anu.edu.au/biography/monash-sir-john-7618> and much of his engineering career is outlined in Alan Holgate's website at: <http://www.abolgate.com/>*

*Find more about Peter Corlett and his works at: <http://petercorlett.com/> and [http://en.wikipedia.org/wiki/Peter\\_Corlett](http://en.wikipedia.org/wiki/Peter_Corlett)*



Long after the ceremony – morning tea trumps statue gazing.

Photo M. Doring

# Engineering Heritage of Hong Kong

## The Hong Kong Museum of Coastal Defence

*In November 2014 Brian McGrath, of Queensland Engineering Heritage, spent eleven days as a tourist in Hong Kong. He took the opportunity while there to check out some items and places which are interesting from an engineering heritage perspective. In the March 2015 issue of this magazine we published his account of his exploration of the Tai Tam Waterworks Heritage Trail. This story tells you something of the Hong Kong Museum of Coastal Defence.* *The Editor*



Caption from the Coastal Defence Museum website:  
British 10 inch breech-loading gun.  
Length 8.7 metres Weight 32,513 kg, Shell size 226 kg.  
Remarks: In the 1880s it was mounted on the Upper Belcher's Battery in the Western District of Hong Kong. The battery was abandoned in the 1930s. Nothing remained except this gun which was displayed in its original position until 1997 when it was removed to the Museum for display. (In this photo a dark armoured vehicle is parked at right behind the gun).

Photo: Brian McGrath

I (Brian McGrath) was indebted to Rod Caldwell, Newcastle representative on the EHA Board, for suggesting I visit the Hong Kong Museum of Coastal Defence. It is a venue not terribly well known, even in Hong Kong. It is located at the eastern end of the northeast corner of Hong Kong Island, at 175 Tung Hei Road, Shan Kei Wan, in what was the British Fort at Lei Yue Mun. This fort was built in the 1880s to defend the eastern approach to Victoria Harbour. It was thought to be impregnable, but was overrun by Japanese troops in WWII.

On an Historical Trail on the site, downhill from the main fort on the hilltop, are some 16 items/sites of interest. At the entry gates are 3 Military Vehicles and two heavy cannon, but it is best to start the Trail at the top. Here, around the Redoubt which has the date 1887 above the entry, are situated some eleven exhibition galleries. During my visit for example, Galleries 1 to 5 were occupied by displays on the theme *CONFLICT AND WAR, China And Japan, 1894 – 95*. These linked displays were in commemoration of the 120<sup>th</sup> anniversary of the first Sino-Japanese War in 1895, and were to be in place until March 2015. Other galleries contained displays on themes such as the early development of British coastal fortifications in the area, the Japanese invasion in WWII, and the Chinese garrison of the Peoples Liberation Army.



The rather fanciful "Map" of the Museum Trail (above) makes it look like an island. It is not. Tung Hei Road runs past behind the fort and the coastline continues on to the south of the fort. This image is adapted from the Museum website. You can find a larger image with (just) readable text if you go to :

[http://hk.coastaldefence.museum/en\\_US/web/mcd/floorplanfacilities/historicaltrail.html](http://hk.coastaldefence.museum/en_US/web/mcd/floorplanfacilities/historicaltrail.html)



Left: The Formal entry to the Redoubt. The date 1887 is engraved over the entry. The galleries are beyond this doorway.

Right: This gun is at Central Battery (No.1), outside the doorway to an Underground Magazine.

Photos: Brian McGrath.





On the flanks of the main fort, and downhill on the Historical Trail, are many examples of concealed defensive battery positions (caponiers) observation posts, disappearing guns, underground magazines etc. The remains of a barracks which once housed soldiers of the Royal Artillery still shows many bullet/shell marks in the walls from the Japanese attack in December 1941.

At the base of the hill, adjacent to the waterline, is the Torpedo Station, constructed not in the 1940s, but between 1892 and 1894 by cutting from the water into the rocky headland. It's a fascinating site, where still exist some of the rail tracks for conveying the torpedos from the adjacent pier to the torpedo station.



Above: A view of the old artillery barracks, showing some of the WW2 damage inflicted by artillery shells and bullets. Photo: Brian McGrath



Left: The Brennan Torpedo launch slot, cut into the rocky hillside at sea level. Photo: Brian McGrath

Below: A replica of the Brennan Torpedo. Photo: Brian McGrath

There is a replica of the Brennan Torpedo on display. It has a very interesting engineering history. One Louis Brennan, an Irish emigrant to Australia, patented a design for his torpedo in 1877. It overcame the inaccuracy inherent in earlier models of torpedos by incorporating internally two drums on which wire had been wound. On launching the torpedo, a winding engine onshore would start retrieving the wires, thus turning the drums which in turn rotated the torpedo's propellers. By varying the relative retrieval rate of the wires, the torpedo could be steered. The torpedo also had a sealed depth control mechanism the method of operation of which is not fully understood.

In 1887, the British Government paid Brennan and his associate one John Temperley the very large sum for those days of £110,000 for exclusive use of their torpedo and supervision of its manufacture. An information sign at the display states "*(it) remains as a testament to the inventiveness of an Irish engineer...*"

For anyone visiting Hong Kong, and who is interested in the history and heritage of Military Engineering, a visit to the Hong Kong Museum of Coastal Defence should be a must.



Brian L. McGrath, PSM.

It is rewarding to have a detailed look at the site on Google Earth, and the website of the Hong Kong Museum of Coastal Defence can be found at: [http://hk.coastaldefence.museum/en\\_US/web/mcd/aboutus/introduction.html](http://hk.coastaldefence.museum/en_US/web/mcd/aboutus/introduction.html) The Editor

# The Great Melbourne Telescope

*An engineering masterpiece makes a comeback – a Phoenix rising from the ashes.*

## Introduction – by the Editor

*Victoria became a colony, separate from NSW, and established its own government in 1851, at the same time as the Gold Rushes to Ballarat and Bendigo started. Considering the enormous problems the gold rushes created for the government, with the population increasing exponentially, it is amazing that it could keep up with the need to build infrastructure and housing for all those new people, and still find the energy and money to create the enormous cultural capital that the present people of Victoria have inherited – to their great advantage. In the first few years of the colony the State Library of Victoria was established, and local architect Joseph Reed was commissioned to design the ambitious and grand building that survives today. The SLV's foundation stone was laid in 1854, on the same day as the foundation stone of the first building of Melbourne University.*

*The Royal Botanic Gardens were established even earlier, south of the Yarra River, and the eminent botanist Baron Ferdinand von Mueller was engaged as Director in 1857. A few years later, in 1862, on a slight hill on the eastern fringes of the Botanic Gardens – a picturesque site in parklands which would never become overshadowed by city buildings – the Government founded the Melbourne Observatory, to do general astronomical research in the Southern Hemisphere and accurate timekeeping for the Colony. Perhaps the Melbourne Observatory was partly founded to compete with the Sydney Observatory, established in 1858 in an old fort on a hill close to Sydney Harbour. Even then the competition between the two cities was becoming notorious.*

*The Melbourne Observatory, equipped in 1869 with what was then one of the largest astronomical telescopes in the world, plus other telescopes installed to observe (and photograph) the 1874 Transit of Venus, took a valuable part in international projects to map the sky over the next 50 years. Its value in astronomical observation was enhanced by its location as the furthest south of any astronomical observatory. After Federation in 1901, the Commonwealth government took over responsibility for national timekeeping and astronomy from the States, and later embarked on construction of a solar observatory at Mt Stromlo near Canberra. The astronomical value of the Melbourne Observatory had gradually declined in later years, due to growing light pollution from the electrically lit city surrounding its site. The construction, virtually next door, of the floodlit Shrine of Remembrance in 1933 was the last straw, and the Melbourne Observatory was closed in 1945. Fortunately the buildings survived, able to be used many years later for the return of the Great Melbourne Telescope.*



Left:  
The Melbourne Observatory building & Astrograph House – the original and future home of the Great Melbourne Telescope. The Government House tower can be seen in the background.

Photo: Donaldytong.

## A Brief History of the Great Melbourne Telescope – by Owen Peake

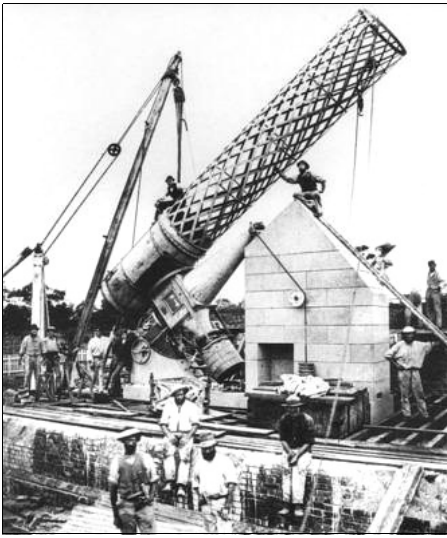
The Great Melbourne Telescope (GMT) was the largest fully steerable reflecting telescope in the world when it was commissioned at the Melbourne Observatory between the present site of the Shrine of Remembrance and Government House and on the edge of the Royal Botanic Gardens. The telescope was built by Thomas Grubb of Dublin in 1868 and placed in service in Melbourne in 1869. Its primary mirror was 48 inches diameter (1200 mm) and made of the bronze alloy 'speculum' which was capable of taking a high polish in an era before large glass mirrors could be made.

In Melbourne the telescope was mainly used for the observation of distant faint nebulae and distant galaxies. Observations were recorded by sketching the images over many nights of observation. After closure of the Melbourne Observatory in 1945 the telescope was transferred to Mount Stromlo, where it was fitted with a new 50 inch glass mirror. It worked in this configuration from 1961 until the 1970s.

In the 1990s the telescope was rebuilt again. It now became a digital telescope for the observation of Massive Astrophysical Compact Halo Objects (MACHOs)<sup>1</sup>. The rebuilt GMT had the distinction of observing the first evidence of 'dark matter'. The GMT was almost completely destroyed, along with most of the rest of the Mount Stromlo Observatory, in a bushfire in 2003. The Museum of Victoria had kept a close watch on the old telescope over the decades and had rescued and stored many components from the original instrument as it was modified and modernised.

<sup>1</sup> MACHO is a general name for any kind of astronomical body that might explain the apparent presence of dark matter in galaxy halos. Galaxy halos are the gaseous atmosphere surrounding galaxies – from *Wikipedia*





Above: The Great Melbourne Telescope under construction at the Melbourne Observatory in 1869.  
Photo from Wikipedia.



Right: The Great Melbourne Telescope in use at the Observatory in 1880.  
Photo from Wikipedia.

## *The Reconstruction Project*



Two views of what was left of the Great Melbourne Telescope after the 2003 bushfire at Mt Stromlo Observatory.

Above: Soon after the fire in 2003.  
Source: Australian National University.

Right: The Telescope photographed at almost 180° from the photograph above. Photo taken by Enoch Lau in September 2004, more than 18 months after the fire.



The telescope is being reconstructed, to something close to its original specification, at the Moreland Storage Facility of Museum Victoria. It is hoped to have the reconstruction complete and the Great Melbourne Telescope back in its original house at the Melbourne Observatory by the 150<sup>th</sup> anniversary of its commissioning in 2019. Planning for the reconstruction is essentially complete and significant progress has been made on cleaning and repairing recovered parts of the telescope from Mount Stromlo and matching them up with original parts which had been stored away awaiting just such a time. Much of the mechanical structure has now been rebuilt. The main optical components were destroyed in the fire and new glass mirrors will soon be built. The telescope house has yet to be restored and new piers constructed as the original bluestone piers had been removed.



## The Remaining Original Speculum Mirror

One of the most impressive components which survived (in storage) is one of the original 'speculum' primary mirrors (48 inches in diameter). This mirror is currently mounted on a support frame in the workshop alongside the main support tube for the mirrors. Although the speculum mirror will not be used in the rebuilt telescope it is a very important artefact made at the time when 'speculum' was about to be replaced by large glass mirrors for telescopes. It is therefore an important survivor from the era of the largest 'speculum' mirrors for telescopes.

At right: The original 48 inch speculum mirror, mounted on a frame in the Museum Victoria Workshop. Photo: Owen Peake, October 2014.

Below: Rebuilding in Progress in October 2014 at the Moreland Workshops of Museum Victoria. Photo: Matthew Churchward.



## Visit by EHV and YEAV

Engineering Heritage Victoria and Young Engineers Australia, Victoria, arranged a site visit to the restoration project in October 2014 with 16 people attending. The visit was conducted by several staff and volunteers of Museum Victoria, headed by Matthew Churchward who is a curator at Museum Victoria and is also a member of Engineering Heritage Victoria.

## Conclusion

When completed and placed back in service the Great Melbourne Telescope will be an important engineering heritage survivor. It is a very large reflecting telescope from the mid-nineteenth century, planned to be rebuilt to be very close to its original form, notwithstanding its long life of important scientific work, involving many modifications. Despite the damage from the 2003 bushfire it will return to service, in its original house, as a powerful reminder of Melbourne's important place as one of the great cities of the world – Marvellous Melbourne - built soon after the Gold Rushes.

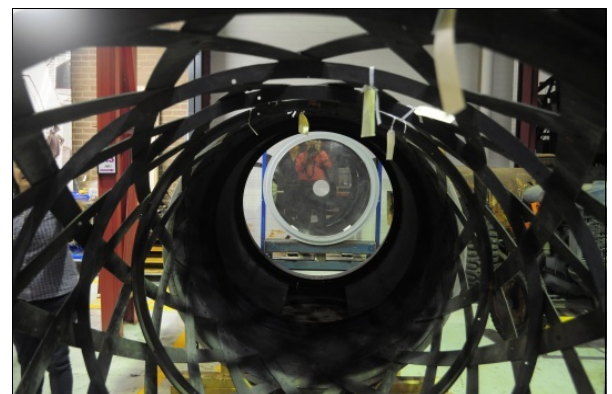
Owen Peake  
Engineering Heritage Victoria.

### Further reading:

Museum Victoria has a page: <http://museumvictoria.com.au/collections/themes/2626/great-melbourne-telescope> with a great deal of information and many images. A book about the great Melbourne telescope, by Richard Gillespie, is available from Museum Victoria. Other sites include the GMT project website at <http://greatmelbournetelescope.org.au/> and the Astronomical Society of Victoria webpage devoted to the GMT: <http://asv.org.au/greatmelbournetelescope> This provides links to the Phoenix Newsletter about the GMT project.

These sites, and Wikipedia entries for the Melbourne Observatory and the Great Melbourne Telescope have a raft of references and links which can take you off on a journey into space, and back underground to the original footings of the GMT, in Phoenix Newsletter No.9.

The Editor



The author, viewing (and photographing) the speculum mirror through the spiral lattice tube of the telescope at the Museum Victoria Workshops. Photo: Owen Peake



# The earliest Monier concrete pier & girder bridge

## John Monash designs & builds a bridge of novel construction.

Continuing the story of John Monash the engineer, and only a few days before the statue of Sir John Monash was unveiled at Monash University, Engineering Heritage Australia and VicRoads (the successor organisation to the Country Roads Board and before that the Board of Land & Works of Monash's time), celebrated Monash's heritage at a Recognition Ceremony for the St Kilda Street Bridge over Elwood Canal in Melbourne.

This small bridge in the Melbourne suburb of Elwood, built in 1905, was another departure in design for Monash, following the eight reinforced concrete arch road bridges he and Joshua Anderson designed and built in 1901-02 over a creek that ran through Bendigo<sup>1</sup>. After they completed the Bendigo job in 1902, Anderson left the partnership for New Zealand. Monash continued the practice in Monier-based concrete design with the help of some engineer assistants, testing his design ideas with practical experience in construction.



St Kilda Street Bridge photographed from the west side.

Photo Heritage Victoria.



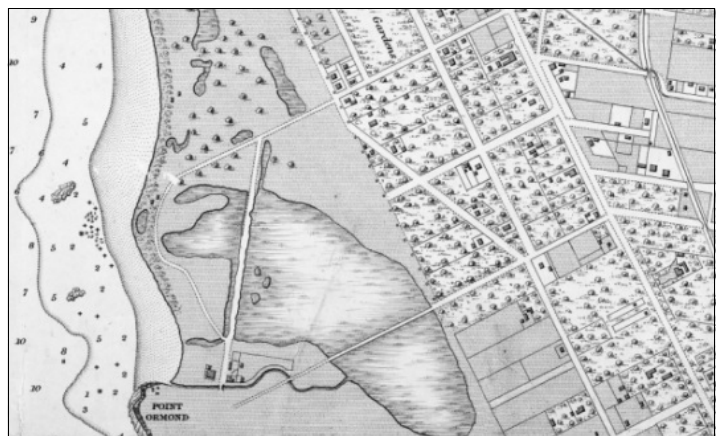
St Kilda St Bridge Load Test, 20<sup>th</sup> November 1905. Source - Melb University Archives.

*Starting in 1904 he began to promote pier-and-girder bridges in preference to arches.<sup>2</sup> Supported by David Mitchell of Lilydale, Monash formed the Reinforced Concrete & Monier Pipe Construction Co. in 1905 and one of the company's first contracts must have been seven small pier and girder bridges over the Elwood Canal. Of these seven, St Kilda Street Bridge was the first to be built and is one of only three survivors.<sup>3</sup> There was some hesitation on the part of the client (the Public Works Department) to accept the new-style Monier design, and when tenders were called it was stipulated that a Monier bridge would be subject to a test with a 15 ton steam roller and that only half of the tender price would be paid before the bridge was satisfactorily tested.<sup>4</sup>*

The Elwood Canal was itself the solution to a serious drainage problem experienced by the developing suburbs of Elwood and Brighton, where the Elster Creek ran through low-lying flat land, collecting sewage as it went – past swamps and out to sea through a periodically silted up mouth. The Monash bridges were a small part of the major project of forming the drainage canal, and were built along the canal as it advanced.

Unless the coastline has changed a lot since 1886, street directions on the map at right are considerably distorted. It is said that the road crossing the swamp from (roughly) west to north-east is the modern Glen Huntly Road. If so, then all the street directions are way out of kilter and possibly St Kilda Street did not yet exist or is way off the map.

The Editor.



1886 sketch map of the Elwood Swamp.

From the SLV Map Collection.

1 See Page 11 of the March 2015 issue of EHA Magazine.

2 Alan Holgate - *Monash's Engineering Career prior to WW1* at <http://www.aholgate.com/mainpages/jmcareer.html>

3 Alan Holgate - *T-girder bridges, Part 1* at <http://www.aholgate.com/girdertexts/gdrtext1.html> et seq.

4 *ibid.*





St Kilda Street Bridge - west side. 1997 photo by Lesley Alves.

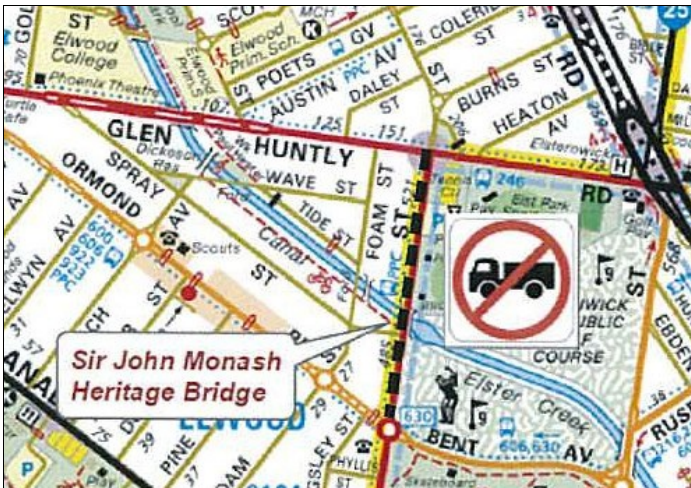
The St Kilda Street bridge looks insignificant, but we need to remember it is only the second attempt at a whole new concept in concrete design<sup>5</sup>. It appears primitive, with a small forest of piers underneath, but again, it was very early in the design development, and Monash was still feeling his way. Holgate implies that subsequent Monash bridges over the Elwood Canal showed increasing sophistication and refinement. I believe that Alves 1998 Statement of Significance<sup>6</sup> could not be bettered in its simplicity and directness, viz., *The St Kilda Street Bridge is the earliest extant example of a reinforced concrete girder bridge in Victoria and possibly in Australia. It demonstrates the technical innovation achieved by John Monash and the Reinforced Concrete & Monier Pipe Construction Co. in the early years of the twentieth century and as such demonstrates the earliest stages in the development of reinforced concrete technology for bridge building.*

*This innovation eventually led to the adoption of reinforced concrete as a standard bridge building material by road construction authorities in Victoria. The bridge is also historically significant for its association with the drainage works that led to the development of the suburb of Elwood.*

The length of the bridge is 30.5 metres, with 8 continuous longitudinal reinforced concrete T-girders spanning 6.1m over concrete piers. Including the abutment piers at each end, there are 6 piers under each girder. Under the roadway, the girders are spaced 1.42 metres apart to make a roadway 9m wide with an additional smaller girder under the 1.7m wide footpath on the west side of the roadway. So — with 6 piers longitudinally under each girder, and 8 girders altogether, it really is a forest of 48 piers under the deck. The VHR photograph at right illustrates the layout well. The deck slab, about 160mm thick, spans across the lines of T-girders, and provides adequate lateral **connection/stiffness/strength** if, as is said, piers, T-girders and deck slab were poured all in one. That must have been quite a job, in the days before tailor-made form-work systems and ready-mix trucks.



View of the St Kilda St Bridge structure from the west side. From Heritage Victoria.



Part of the VicRoads map announcing the truck ban on the bridge – 2014.

A year or so ago, there was talk of the bridge being in such poor condition it should be demolished, or if it wasn't to be demolished, it should just be closed to all traffic. Fortunately for the future of the bridge, it was already on the Victorian State Heritage Register. Heritage Victoria was strongly opposed to a replacement bridge – even if it had a similar design – and there was strong resistance to VicRoads closure proposal by both local councils involved. In July 2014, VicRoads announced a ban on trucks over 4.5 tonnes using the bridge – *Since the bridge cannot be replaced due to its heritage status, it has been determined that a truck restriction is currently the best option to help preserve the bridge, while long-term solutions are explored.*<sup>7</sup>

In August 2014 GHD was employed to assess the condition of the bridge. They concluded that the bridge was in poor condition, the main problems being concrete spalling and some corrosion and loss of reinforcement. Presumably the report was not too pessimistic, because VicRoads went ahead with a plan for repairs, got a permit from Heritage Victoria to do those works, and employed GHD to prepare a nomination document for the heritage recognition.

5 Monash's first attempt at a girder bridge (at Stawell Street, Ballarat in 1904) was a failure, for complex reasons, which are comprehensively discussed in Holgate at <http://www.aholgate.com/girdertexts/stwlst.html>

6 At <http://www.aholgate.com/girdertexts/gdrtext1.html>

7 See <https://www.vicroads.vic.gov.au/newsmedia/2014/truck-restrictions-for-st-kilda-street-bridge-elwood>



At the beginning of March 2015 VicRoads announced *Works to repair historical St Kilda Street Bridge* were underway, and at the same time, they had agreed to and were planning the recognition ceremony to happen on the 18<sup>th</sup> April. In a letter to EHA the regional director of VicRoads said, *The engineering heritage recognition is timely in 2015, as it is the centenary anniversary of the ANZAC landings at Gallipoli in which John Monash participated.* Invitations were sent out by VicRoads, the Victorian Government's Anzac Centenary organisation, and Engineering Heritage Victoria.

The Heritage Recognition Ceremony on April 18<sup>th</sup> was an unusual one. First of all it was entirely organised and budgeted by the owner of the bridge, VicRoads, as were the **three** interpretation panels, which were judged by VicRoads to be necessary to tell the full story – of the canal, the bridge, and John Monash.



Map showing the location of the three interpretation panels: grey = John Monash panel in the park at the north end of the bridge; blue = St Kilda St Bridge panel; black = Elwood Canal panel.



Paul Balassone (L) & Geoff Hayes (R) at the John Monash panel, after the unveiling. Photo Owen Peake.

The ceremony turned into a real celebration with speakers Geoff Hayes, Victorian President of Engineers Australia, Philip Dalidakis, a local Member of Parliament, Cr James Long, the Deputy Mayor of Bayside City Council, and Paul Balassone, representing Melbourne Water, who spoke about the Elwood Canal and its history. The MC, Nicholas Fisher of VicRoads, invited the speakers to unveil the panels, and then everyone there was invited to attend a barbecue lunch, held in the park near the John Monash panel, and organised and funded by the Bendigo Bank and the Rotary Club of St Kilda.

*By the Editor*  
(Who could not be there, but was pleased to receive the invitations.)

Owen Peake, the Chair of Engineering Heritage Victoria, who was there of course, wrote:

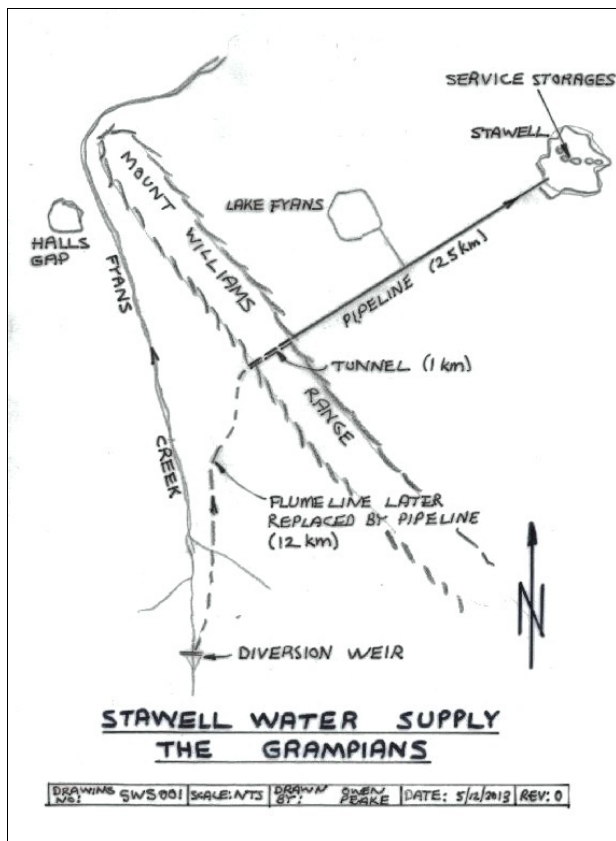
*The Heritage Recognition Ceremony was organised by VicRoads, Metro North West Region, in Sunshine. Whilst many people in VicRoads had an input into the project, Structures Engineer Jay Caliskan had the key roles as far as Engineers Australia and Engineering Heritage Victoria were concerned. Hearty congratulations to Jay for his first-class work on this project.*



After the ceremony, passing cyclists stop to examine the panels along the canal path on the east side of the bridge. At right is the Bridge panel, at left is the Elwood Canal panel. Ph. - Owen Peake.

# Stawell Water Supply - sourced in the Victorian Grampians

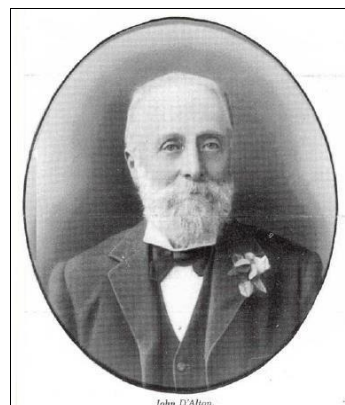
## A tale of a visionary engineer and great engineering achievement



Sketch Map of the district by Owen Peake – Not to scale.

Following the Gold Rushes around Victoria in the 1850s the gold towns developed rapidly but struggled to build permanent water supplies. Often temporary and inadequate water supplies resulted and sometimes the gold had gone before a permanent water supply was built. The town of Stawell, in the Northern Grampians Shire of Western Victoria experienced the problem of an inadequate water supply, with good quality water being required both for the health and well-being of the community and to support the local gold mining activities. However Stawell was lucky and got a very adequate water supply long before the gold ran out. In fact even now the gold is still being taken out of the ground and the water supply system is still functioning very much as it did when it was first built.

Stawell built a water supply system, commissioned in 1881, which was remarkable for its foresight, the engineering innovations incorporated and for its sustainability and longevity. The system has served Stawell for more than 130 years. Their water supply project was largely the brainchild of Stawell Borough Engineer John D'Alton. He lived in the Halls Gap area not far from Stawell for a long time.



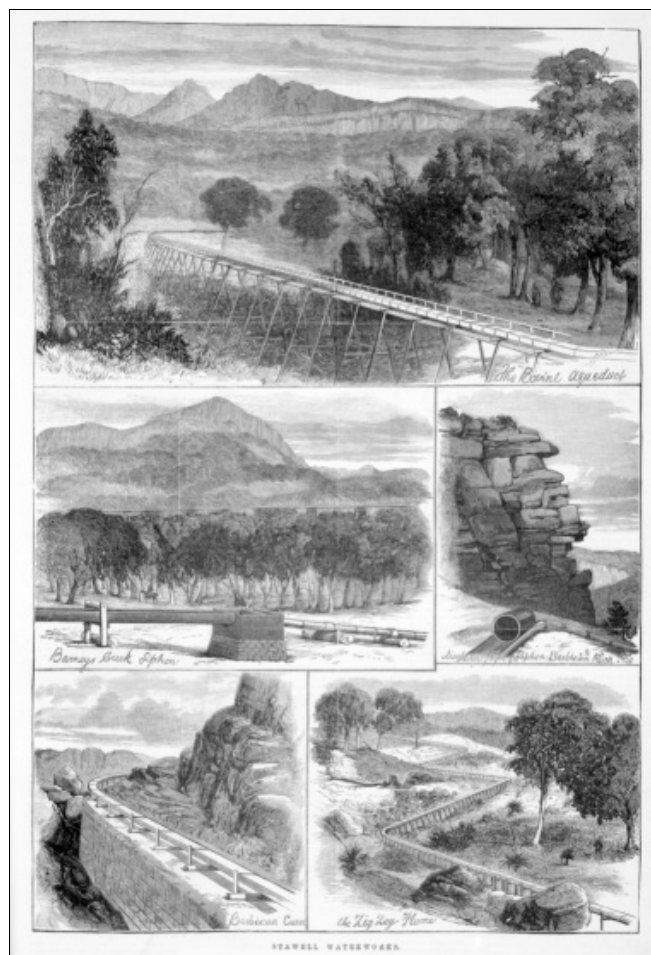
John D'Alton. Source: Kingston 1989.

John D'Alton had many children and his family continued to serve the community for generations. I noted that the Honour Rolls in the Town Hall at Halls Gap for both World Wars include the names of several D'Altons.

The Borough of Stawell owned and operated the Stawell Water Supply for most of its history. The present owner and operator is GWMWater (Grampians Wimmera Mallee Water Corporation).

The water supply system involved a small diversion weir on Fyans Creek high in the Grampians. This is still in service although much modified. Leading from the weir was an open flume system taking the water to the entrance of a 1 km tunnel through the Mount Williams Range, the easternmost range of the Grampians. The flume became much modified, primarily to make it more fire resistant, but it served for over 70 years. The tunnel is still in use. From the tunnel mouth, a pipeline carried the water 25 km to a service reservoir at Big Hill in the centre of Stawell. The scheme as originally built required no pumps and has delivered pure mountain water to Stawell to meet community needs from the 19<sup>th</sup> Century to the 21<sup>st</sup>. The system now incorporates some pumping to deliver the water to a water treatment plant and thence to the community.

The separate elements of the scheme are, in principle, quite simple however each required clever engineering and great fortitude and foresight to bring them together and put them into service.



The original flume aqueducts from a David Syme & Co. poster of 1881.



The maintenance tasks were considerable, particularly in the area of the flume. It had to be regularly patrolled, repaired and augmented. There was a small community at Borough Huts, on the banks of Fyans Creek quite close to the Diversion weir and about 10 km south of Halls Gap, which operated and maintained the water supply system. The diversion weir was a simple enough construction, however its placement – high enough to deliver the water to Stawell without pumping and low enough to provide a sufficient flow from Fyans Creek – was typical of John D’Alton’s vision and attention to engineering detail.



The original diversion weir on Fyans Creek.

Source: PROV



An original timber trestle viaduct carrying the flume across a creek. Source: Unknown.

The flume and its aqueducts proved to be vulnerable to bushfires and they were replaced by steel fluming supported on rock piers with a progressive move to syphons using cast iron or wrought iron pipe to cross the gullies in place of the aqueducts. The flume remained in service until 1955 when it was replaced by a buried pipeline more suited to following the undulations of the terrain.

The twelve kilometre flume was originally built of the abundant timber available throughout the Grampians. The construction of the flume was complex and difficult as it traversed very rough terrain and crossed many streams flowing down to Fyans Creek from the Mount William Range. Originally the flume crossed the streams on complex timber trestle structures. The initial construction depended on a consistent grade to give sufficient fall to deliver the required quantity whilst maintaining an even grade over the rough ground.



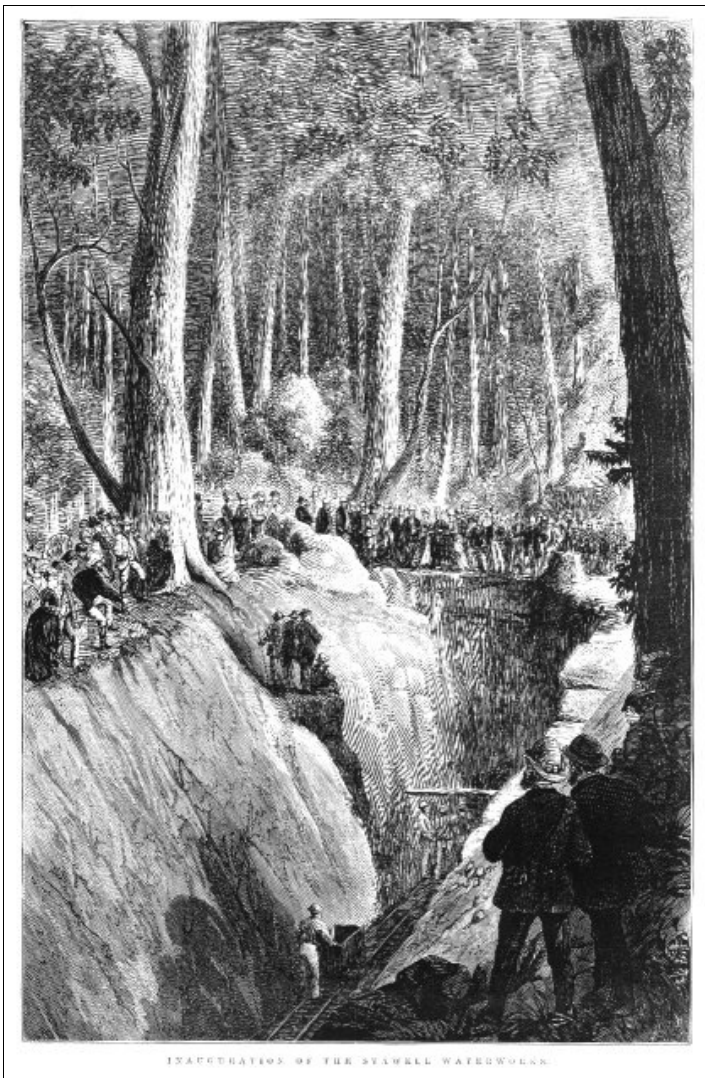
Digging the eastern end of the tunnel under the Mt William Range. Source: Public Records Office Victoria.



Steel flume carried on stone pillars, photographed in February 2014. Source: Flickr - Rf-toaster, Stawell Water Supply Walk 2014 - img7256

Then for the big challenge! D’Alton and his crew drove a one kilometre tunnel through the Mount William Range, drilling and blasting the tough freestone which made the Grampians famous for beautiful and durable building stone. They achieved this feat by throwing technology at it. D’Alton adopted a new explosive, Dynamite – more powerful and safer to use than the traditional black powder (gunpowder) – to speed up the rate of progress.





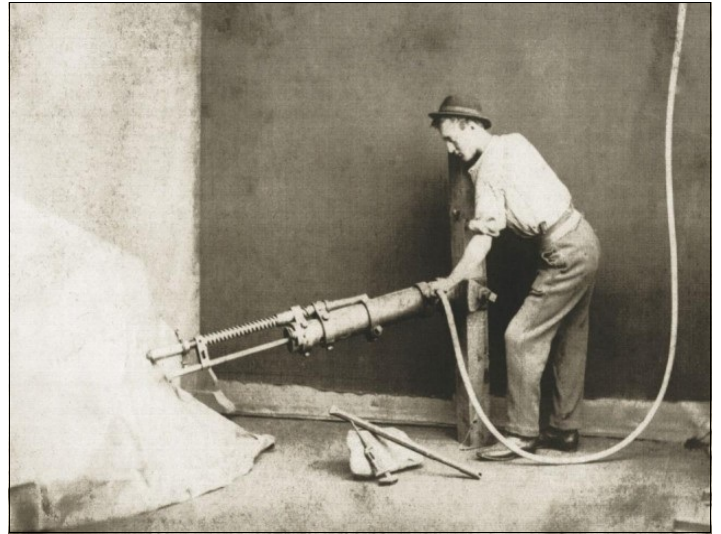
Ceremony for the commencement of tunnelling in 1875. Source: Unknown.

Once out on the plain the going was easier with conventional cast iron pipe laid below ground to the service reservoir at Big Hill in Stawell. While there have been some upgrades and some components have been replaced the system remains in service very much as it was commissioned in 1881. The contribution of D'Alton is well recognised locally and the family is remembered with fondness and appreciation.



A modern, roofed water storage tank built inside the original open topped circular No.1 reservoir on Big Hill in Stawell. Source: Owen Peake 2013

Cutting edge Australian rock drilling technology was used with steam-powered air compressors and rock drills designed by Robert Gray Ford from Bendigo in the 1860s. Ford's innovations were copied by many manufacturers worldwide. The tunnel took longer to drive than expected but eventually the two ends joined with impressive accuracy and the tunnel remains in service today. There were no lasers and GPS in those days to help the surveyors. The tunnel has only needed the most rudimentary repairs over its long life.



Robert Gray Ford demonstrating his rock drill in October 1868. Photo by B.P. Batchelder, Bendigo.



Inside the water supply tunnel in 1979 Photo: Miles Pierce

Engineering Heritage Victoria recognised the engineering heritage significance of the Stawell Water Supply at twin ceremonies on 12 October 2014 – one at Borough Huts in the Grampians, close to the head-works, and the other at Big Hill in Stawell. The two events were part of an engineers' Country Weekend based at Halls Gap. GWM Water and Northern Grampians Shire Council, along with the Wimmera Regional Group of Engineers Australia, the Institute of Public Works Engineering Australasia and several other organisations helped make the event a great success.

*Owen Peake  
Engineering Heritage Victoria*



# Obituary – Oskar Baldinger

*Eminent industrial archaeologist, writer, publisher, editor and friend.*

Nearly 30 years ago, my partner Carl and I were visiting Switzerland to meet and discuss Swiss industrial heritage with people in the equivalent of the Australian Heritage Commission in the capital Bern. We came away with a long list of places to visit and another list of contacts. A week later, we realised that one of those contacts lived in the same town where we were staying, in Brugg, one of the main railway junctions in Switzerland, and a hub for excursions to dozens of recommended industrial sights.

The next morning, as early as we could, we set out to visit Oskar Baldinger, the Editor and Publisher of the German language *Industrie Achaologie* magazine, and spent hours discussing IA in Switzerland, Austria, Germany, Australia the USA and Canada, his magazine and our itinerary. We came away with some recent copies of the magazine (a quarterly) and took out a subscription which we have faithfully renewed every year since. That acquaintance became a friendship, and we visited him again, nearly 25 years ago, and since the advent of email, have corresponded many times.



Oskar Baldinger.

Photo sent to MD in 2010.



Oskar & Carl viewing Oskar's bridge in 1992.

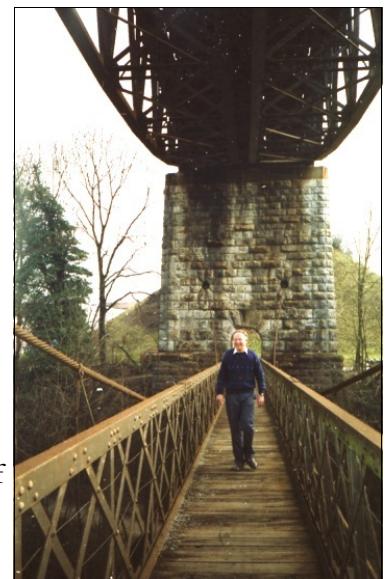
Photo M Doring.

In early May, I was devastated to hear of his sudden death, on February 26<sup>th</sup> this year, in a posted letter from his family. They announced that he was still working on the March issue of *Industrie Achaologie* when he died, and that the December 2014 issue would therefore be the last. Oskar was born on 7<sup>th</sup> April 1936. I know very little of his early life, but I think he spent most of his adult life in the northern city of Brugg or its neighbouring suburb of Umiken, across the Aare River. From his home in Brugg, for 38 years, he produced a wonderful quarterly magazine on the subjects of industrial archaeology and the history of technology. Brugg is an eminently suitable place to put together such a magazine, being the hub and junction of most of the railways crisscrossing Switzerland since the 1850s, and with his house almost underneath a famous rivetted iron/steel railway bridge over the Aare. Oskar started his publishing business in the 1970s, publishing

books and papers on industrial archaeology and the history of technology by himself and others over the years, but always his great love was his quarterly *Industrie Achaologie*. This was never self-supporting financially, but drew on the profits from a successful IT and computer magazine he also published.

We still have every copy of *Industrie Achaologie* we have ever received, and they are a valuable part of our professional library. Notwithstanding our German names, neither of us can speak German, and I have only a very elementary knowledge of the language, but despite that, Oskar's magazines have been a valuable source of insight and knowledge about European industrial history, most particularly because of his wonderful diagrams and drawings and brilliant photographs, which almost make the text redundant. Oskar believed that in explaining and exploring technological ideas, the images (or ideas for images) come first – diagrams, drawings, photographs – then titles and subtitles and, very important, the captions which interpret the images. Only then should one build the text around the images (or the images in one's head). With that explanation, I can understand how useful and interesting his articles are, despite not knowing the language. Oskar has been a mentor to me for a long time, and particularly while I was developing my ideas for this magazine. I was very pleased when he once told me, regarding one of my conference papers, *I admire you for your good and interesting writing. Like a good bestseller author.* I still haven't achieved his mastery of the illustration as story, but I do try.

Oscar is survived by his daughters Ingrid (an architect) and Astrid and three grandchildren whom he cared for regularly. I am sure he used to take them for walks across the river on the footbridge built under the railway tracks and through the great stone piers of his beloved iron railway bridge. It is obvious that Oskar's enthusiasm has rubbed off on at least one member of his family – his daughter Astrid has a university degree in history and has studied Industrial Archaeology for a year at Ironbridge in the UK, so perhaps she will carry on some of his work. I hope so.



Oskar & the footbridge. Photo M Doring.

*From the Editor.*

# Obituary – Kenneth “Ken” Kelsall, 1921 to 2015.

*Dam builder, inspiring leader and extraordinary engineer.*



Kenneth ‘Ken’ Kelsall was a gifted engineer involved in building 26 dams across Western Australia and he was a pioneer of one of Australia's biggest water projects, the Ord River dam and irrigation scheme. On top of that, fellow engineers and colleagues around the nation remember him as a generous, fabulous bloke who mentored and helped guide the careers of scores of engineers.

Ken was born in Perth in 1921. He started as a cadet engineer with the Public Works Department in Perth in 1939, the year after he graduated from Aquinas College where he had been dux and school captain. He later graduated from the University of WA with a Bachelor of Engineering with honours. In his account, *The Initial Phase of an Engineering Career*, Ken recalled being sent to Stirling Dam near Harvey [south of Perth] in 1941. His accommodation was a *10 ft x 12 ft tent mounted on stumps with a jarrah floor*. But there were perks, of a sort: he was provided with a horse to inspect the nearby forest for deposits of ironstone rock.

The next three or four decades were of unprecedented expansion of water supply and irrigation systems throughout WA, with Ken involved in many of them. Ken’s son Peter Kelsall recalls his father’s passion for engineering became part of a family holiday ritual. *I got to realise that dad had been involved in the construction of a lot of dams around WA before I was born – because every time we ever travelled down South we would often go and check out a dam because we were ‘in the area’,* he recalls. Ken helped generations of water supply engineers provide reliable water supplies to a vast, thirsty State. *For all he achieved in his career, Dad’s greatest thrill was to see the development of the young engineers – it is a repeated theme in the messages we have been receiving – Dad’s ability and commitment to mentor young engineers,* Peter says.

Ken was also one of the pioneers of the Ord River project. In 1945, he supervised the drilling of the foundations of the Ord River dam site and from 1968 to 1972 was the engineer in charge of the contract covering construction of the dam. The Ord River project in the remote top end of WA was an extraordinary engineering feat of national significance, creating the huge Lake Argyle reservoir – which held the equivalent of 42.5 times the volume of Sydney Harbour during the 2011 wet season – and opening up 76,000 hectares of land for irrigated agriculture.





August 1968  
Abutment of the Ord River Dam

Chris Fitzhardinge, a former President of Engineers Australia WA Division, worked with Ken and is a family friend. He remembers Ken as someone who could see how engineering could be applied to non-traditional areas and that he was a respected leader.

*I think that the quality and reliability of our irrigation and water supplies in Western Australia are a tribute to his efforts, he says. Dams are inherently risky structures, depending on how they are designed and constructed. WA has been very fortunate in that it's had very reliable dams, largely due to the diligence and oversight of Ken Kelsall.*

As a leader and mentor, Fitzhardinge says Ken brought out the best in people. *I think Ken is part of a group of engineers who changed the face of WA, who saw its development from its post-war period, he says.*

Away from work, one of Ken's hobbies was using his engineering skills

to design and improve the safety and performance of trotting tracks. *He provided a lot of engineering input for tracks at Bunbury, Harvey and Gloucester Park to improve their reliability and performance, says Chris.*

WA's Water Minister Mia Davies paid a special tribute to Ken in the WA Parliament, saying he was an outstanding engineer who was a pioneer in the development of the water industry and a "truly great Western Australian".

During his career, Ken rose from being a cadet engineer to become Chief Engineer, then Deputy Director of Engineering with the Public Works Department (PWD). In 1980, he was appointed Chief Engineer of the Metropolitan Water Board and also held other positions. He retired in 1985 and the following year was awarded the Order of Australia. He was an Honorary Fellow of Engineers Australia, a past president of the WA Division of Engineers Australia, and a national Vice President.

Ken Kelsall AM HonFIEAust CPEng died in late February. He was 93.

By Tony Malkovic

*This obituary was first published in the April 2015 issue of Civil Engineers Australia Magazine. It is republished with permission. The images were all provided by Engineers Australia WA office.*

*The photo at right shows Kelsall in 2008, examining a plaque marking the start of work on the Ord River Dam in April 1969.*

*The photo at the top of the page shows Kelsall at the Ord River in 1968 – perhaps keeping an eye on the exploratory drilling happening in the river below.*

*The charming portrait on the previous page is undated.*

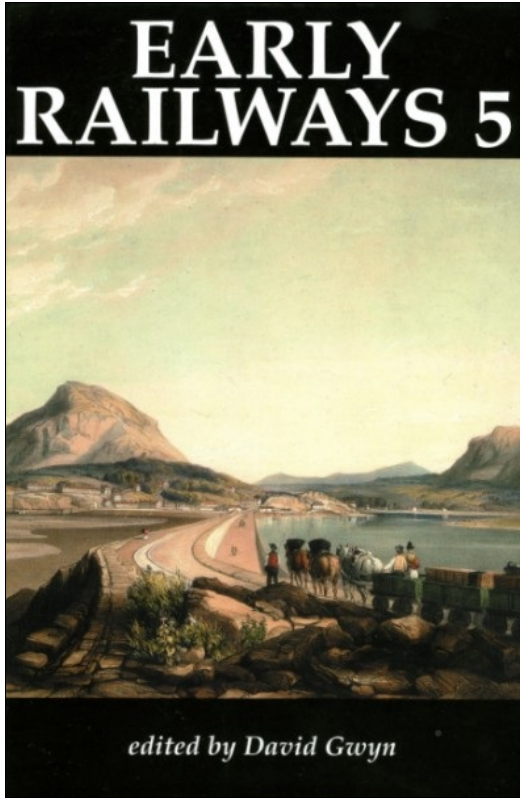
The Editor.



July 2008  
Ord River Dam

# Review – Early Railways 5

## *Papers from the Fifth International Conference on Early Railways*



Some of you may remember an invitation to subscribe to the book *Early Railways 5* in the June 2014 issue of this magazine. This book, now published, is a collection of papers from the Fifth International Conference on Early Railways, held in Caernarfon, Wales in 2012. I thought some of you could be interested because, I think, this was the first Early Railways conference to feature papers from Australasia. Specifically, there was a paper from Professor Ian Carter and Dr Ellen Carter about the earliest adventures in building and operating railways in New Zealand; one from Jim Longworth and Phil Rickard with a catalogue of the earliest “railed ways” in colonial Australia; and one from Rod Caldwell, David Campbell and John Brougham on the Australian Agricultural Company’s first coal mine and railway in Newcastle NSW, and the discovery there of a remnant cast iron fish-bellied rail used in that first railway.

There are 18 other papers: a discussion on which came first in about 1603 or 04 – a colliery waggon-way in Shropshire or one in Nottinghamshire; many different footrills (of various spellings), waggonways, railways, stoneways, plateways, inclined planes, nearly all associated with mines all around the UK; the wealthy families who pioneered the (mostly) coalmine railways, and their sources of funding; the economics of railway companies and where they bought their iron; the “Walking Horse” – an early steam loco designed to climb a rack railway; and an even stranger “mechanical traveller” which used steam engine operated “legs” to push (or walk) a waggon-pulling locomotive along a railway.

I have to admit now that I know very little about early railways as expounded in these early railway conferences – that is, from about 1600 to 1820 or 1830. I do have some experience of the history of railways of a later age – but specifically of the great railway workshops of the later Victorian era – so many of the papers in this book were a bit of an eye-opener to me. I hadn’t thought of things like inclined planes and stone causeways being the forerunners of the cross-country railways we know today and I was surprised to realise that nearly all of these early railways were less than a mile long.

Most of the papers required much concentration to absorb, but the reward for me was a great deal of knowledge of subjects of which I was pretty ignorant before. I just wish more of the writers had a better grasp of the narrative form, and a stronger control of the footnote. And there were dozens of terms I was unfamiliar with and could not find in a dictionary. To the early railway cognoscenti no doubt these things are commonplace, but I would have appreciated a glossary. Some of the papers were hard work. Nevertheless, to the aficionado, this book would be a treasure trove.

*The Editor*

### *Papers from the 1st International Early Main Line Railways Conference*

Unfortunately all subscriptions to Early Railways 5 have been filled and remaining copies have sold out. However, some people may be interested in subscribing to *Early Mainline Railways – Papers from the 1st International Early Main Line Railways Conference*, which should be published late in this year. Watch out for invitations to subscribe. This conference was held at Caernarfon, Wales in June 2014.

*Building on the success of the International Early Railways Conference series, the conference diversified to accommodate the interests of historians pursuing the origin and development of mainline railways between 1830 and c1870. This reflects the all-important years when railways first developed routes and networks and became major contributors to economic growth around the world, made possible by rapid advancements in civil and mechanical engineering techniques.*

This conference was truly international, with papers about railways in Victorian Britain, Ireland, Argentina, Australia, India, North America, Colombia, Egypt, and Austria. More information can be found on the Railway & Canal Historical Society website at: <http://www.rchs.org.uk/trial/gwvf.php?wpage=EMLRC>





# Connections

## A Reminder

### The 18<sup>th</sup> Australian Engineering Heritage Conference

“From the Past to the Future”

happens 7<sup>th</sup> – 9<sup>th</sup> December 2015  
in Newcastle NSW



Honeysuckle Point Boiler Shop (L) and Blacksmiths' Shop (R).  
The linking structure is new and was built for the Museum.

Read all about the conference at  
<http://www.engineersaustralia.org.au/heritage-2015>  
Plenty of information there about the venue, accommodation, registration and the pre-conference tour.

The conference venue is the Newcastle Museum, housed near the waterfront in the 19<sup>th</sup> Century Boiler Shop and Blacksmiths' Shop of the former Honeysuckle Point Railway Workshops. The Workshops were founded and hard at work in 1856 – a year before the first train ran on the railway from Honeysuckle Point to East Maitland, and very many years before construction started on Eveleigh Workshops in Sydney and Newport Workshops in Melbourne. These two fine buildings date from the early 1880s and are a perfect place to host a conference on Engineering Heritage, being redolent of engineering history for the past 130 years.

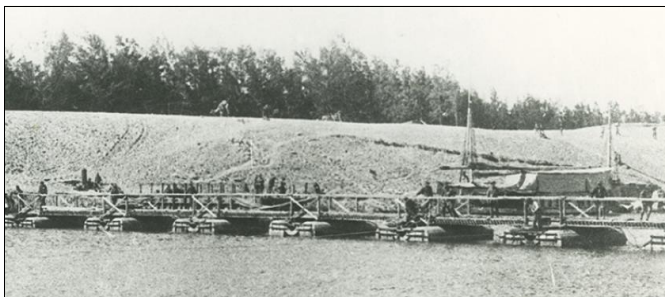
A major feature of the Museum displays is the 1885 Craven Bros 16-ton rope-driven overhead crane in the Boiler Shop – the world's only such crane in working order – for demonstration purposes only (see photo at right). This travelling crane is powered by means of a very long, endless, re-circulating rope which drives the crane up and down the building on rails and drives the hook back and forth and up and down. The power source originally was a steam engine on the floor, before the days of electricity. Now the rope is driven by a small electric motor. I hope you will see it working.



The pre-conference tour promises to be very interesting. Over four days from Thursday 3<sup>rd</sup> December 2015 until Sunday 6<sup>th</sup> December, it starts at Sydney's magnificent Central Station (you can get there by train of course) and, after visiting Sydney's three landmark large span bridges travels west, via another famous bridge and a spectacular cable railway, to the Blue Mountains and Katoomba. The next three days are spent doing an inland loop around Sydney and Newcastle, looking at all sorts of interesting things (details and other links on the website), and finishing up in Newcastle on Sunday evening for a welcome reception before the conference proper starts.

If you would like to present a paper at the conference, the last date for submitting an abstract is 30<sup>th</sup> June 2015. I do apologise if you've only just thought of it, and this magazine gets to you too late.

## Engineering at War and at Home – from Engineers Australia Magazine April 2015



Bridge Building in WW1.

From the EA website.

*With commemorations of the 100<sup>th</sup> anniversary of the Gallipoli landing bringing the role of the military to national consciousness, Engineers Australia is launching a website and program of events to highlight the role of engineering in World War I. Military engineers carried their skills and experience from civilian employment in Australia and applied them successfully to military operations. Their contributions didn't stop with the war – many of these engineers returned home to contribute to the development of Australia through their work in government, various companies and other organisations. Engineers Australia itself had a host of returned war engineers as founding members and presidents. . . . .*

The website is up and running, and is being expanded and being added to continually. Find it at:

<http://www.engineersaustralia.org.au/engineering-and-world-war-1>

# Connections

## *“The Contractors”, by Hugh Ferguson & Mike Chrimes*



The story of British civil engineering contractors, from the early 18<sup>th</sup> Century – even before Civil Engineering was recognised as a practice – until today. Published by the Institution of Civil Engineers (ICE) in 2013, it has only recently come to my attention. It is an extraordinarily detailed history of many Contractors and their works, throughout the UK and overseas. A comprehensive bibliography and 10 pages x 4 columns of index, all in fine print, are remarkable. I did note there was no mention of *The Ironbridge* in the index – but I suppose it didn't have a Contractor as such! Both the index and bibliography are surpassed by 14 pages of picture acknowledgements, listing between 500 and 600 illustrations, a huge number of these from the ICE Archives. The pictures are wonderful – many tiny (4 or 5 per page) but still remarkably detailed – there are drawings, paintings and photographs – portraits, structures, workmen, work sites, maps, plans, documents – amazing!

Find it at: <http://www.icevirtuallibrary.com/content/book/102879>

## *ICE Bridge Engineering Paper – Forth Bridge: the restoration challenge.*

From Proceedings of ICE - Bridge Engineering, Volume 168, Issue 2, March 2015. The Forth Bridge is a symbol of engineering excellence and remains an icon for both railway and civil engineers throughout the world. Following in the footsteps of designers Sir Benjamin Baker and Sir John Fowler and contractor Sir William Arrol, this first full restoration project since its opening in 1899 proved to be a significant challenge. In undertaking this unique restoration project, Network Rail and Balfour Beatty were required to understand the dynamics and engineering principles of the bridge. The restoration works to the world's first cantilever bridge and Britain's first all-steel bridge were complex and were carried out with its protected status as a grade A listed Victorian engineering icon in mind. If this paper interests you, it can be found for sale at:

<http://www.icevirtuallibrary.com/content/article/10.1680/bren.14.00003>



## *Adaptive Reuse of Industrial Heritage: Opportunities & Challenges*

This is a Heritage Council Victoria issues paper relating to 12 case studies which demonstrate the potential of adaptive re-use of industrial heritage. Find it at:

[http://heritagecouncil.vic.gov.au/wp-content/uploads/2014/08/HV\\_IPAWsinglepgs.pdf](http://heritagecouncil.vic.gov.au/wp-content/uploads/2014/08/HV_IPAWsinglepgs.pdf)

It is quite an interesting paper, but oddly enough does not have any sort of list or description of the case studies referred to in it. Fortunately these can all be found at: <http://heritagecouncil.vic.gov.au/research-projects/industrial-heritage-case-studies/>. The photo is of the Canberra Glassworks, sited in the former Kingston Powerhouse. It is a concern to me that no industrial archaeologist or heritage engineer is mentioned as part of any of the project teams for any of the 12 projects!



## *Swords into Ploughshares How WW I Transformed British Engineering*

If any of you just happen to be in London during October 2015, the Newcomen Society is hosting a one-day conference to examine the effects of conflict on developments in Engineering and Technology. The address, cost, how to book, the programme, and synopses of all the papers to be presented can be found at:

[http://newcomen.com/?ai1ec\\_event=swrods-into-ploughshares-a-newcomen-conference&instance\\_id=1787](http://newcomen.com/?ai1ec_event=swrods-into-ploughshares-a-newcomen-conference&instance_id=1787)

Topics include the wartime rise of the British oil industry, the beginnings of chemical engineering, the birth of ICI, supercharging aircraft engines, new steel alloys, and the need for a national electricity grid – at 50Hz.

This conference is an event of the 2015 *European Industrial and Technical Heritage Year*.





# and yet more Connections

## 2015 ICE Publishing Awards

These have been announced and the papers are available for you to read at: [http://www.icevirtuallibrary.com/cms/viewpage.action?path=info/awards2015&locale=en\\_GB](http://www.icevirtuallibrary.com/cms/viewpage.action?path=info/awards2015&locale=en_GB) Each year the ICE awards authors of the best papers published in ICE journals in the previous year. The award ceremony happens in their Great Hall at 1 Great George Street, a short stroll from the Houses of Parliament (would that EA had somewhere like that for our grand ceremonies!). After the ceremony, the prize papers became free to view on the ICE Virtual Library. The papers come from many disciplines within Civil Engineering – some being new materials, energy, Geotechnics, Concrete Research, not to mention Bridges, Tunnels and History. A few that caught my interest included:

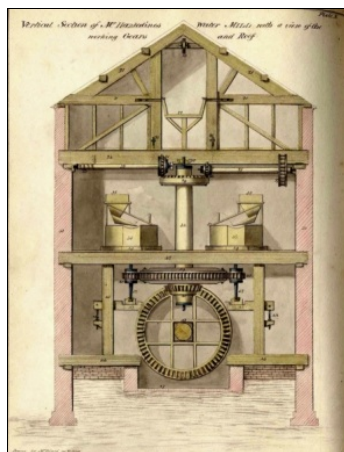
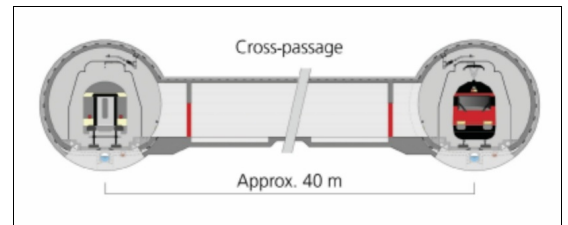


### *Preserving Ireland's iconic railway viaducts*

Three nineteenth-century structures rehabilitated in the past decade stand out as iconic structures in their own setting and will now continue to provide service into the foreseeable future. One of these, the Cahir viaduct suffered what looks like catastrophic damage (see image left), but was repaired and back in service within 9 months. The paper relates the innovative repair and strengthening techniques used in all three viaducts.

### *Gotthard base tunnel, Switzerland*

When it opens in 2016 the 57 km long Gotthard base twin railway tunnel under the Swiss Alps will be the world's longest. Hundreds of metres below the historic St Gotthard railway tunnel, it will provide a virtually flat (and boring) railway across Switzerland. So what does this have to do with engineering heritage you say? Well, it's replacing the historic St Gotthard railway tunnel in one of the most picturesque train journeys in Europe with its fantastically scenic route up to Airolo from the south, and then the mind-blowing glimpses, through windows in the rock wall, of the same village from far, far above, then lower, then level with the church tower, as the train roars down a spiralling tunnel to the valley. I wish I could go back and ride those rails just once again before they vanish into history.



### *William Hazledine (1763–1840): pioneering iron founder*

Hazledine, a virtually forgotten figure in the history of engineering, worked closely with Thomas Telford, and the list of their joint achievements in the UK is unmatched in the history of bridge and aqueduct engineering, including the suspension bridges at Conwy and Menai and the Pontcysyllte aqueduct. Hazledine's expertise also won him many other contracts, including the ironwork for the first all-iron-framed multi-storey building in the world, the Flax Mill at Ditherington in his home town of Shrewsbury. Recent research has begun to reveal his importance in the production of cast and wrought iron. The paper highlights the outstanding quality of the iron that Hazledine made and the rigorous proof tests he undertook to verify the properties of the metal. These results will be of great interest to engineers today working on heritage cast and wrought-iron structures, if only to learn of the high-quality results that were possible 200 years ago. The image is a vertical section through a Hazeldine corn mill.

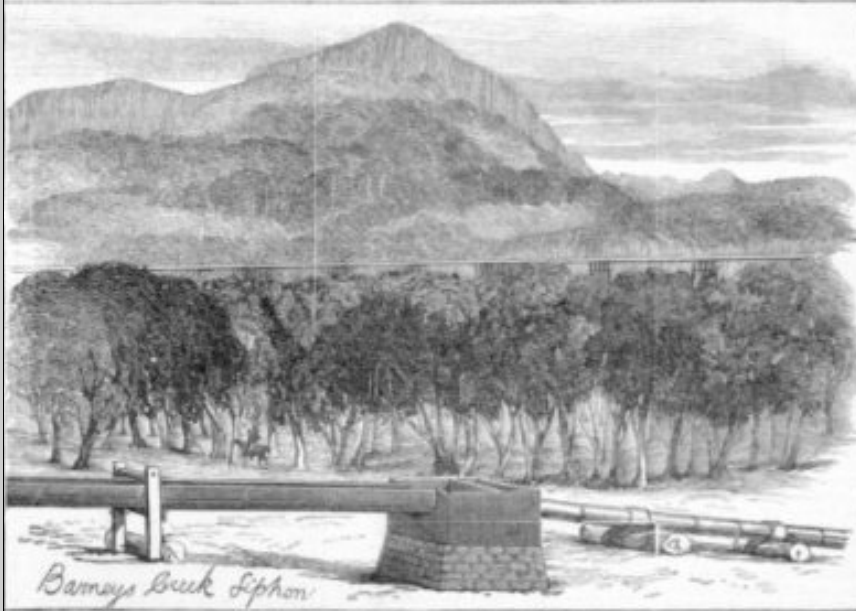
### *B-24 Liberator Willow Run Assembly Plant*

Remember the story about Liberator bombers in the September 2014 issue of this magazine? If you would like more, go to: [www.youtube.com](http://www.youtube.com) and search on "B-24 Willow Run Assembly Plant". This 1940s newsreel (7-minutes) has impressive footage of airplane assembly, along with a jaunty "march of industry" soundtrack.

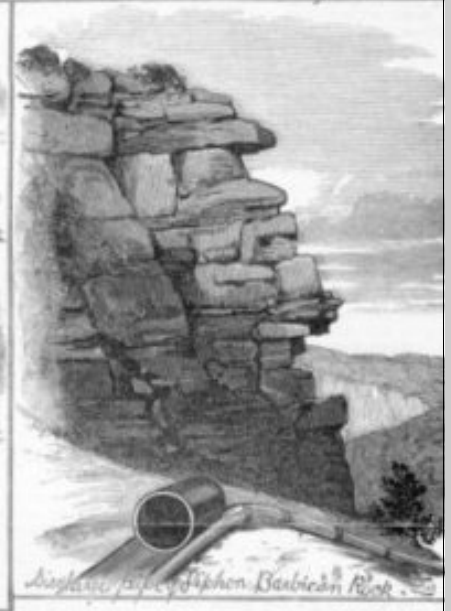
*From the Editor*



*The Bovine Aqueduct*



*Barnays Creek Siphon*



*Siphon Barbican River*



*Barbican Curve*



*the Zig Zag Flume*