ASHET News

Volume 6, number 1
January 2013

Newsletter of the Australian Society for Engineering and Technology

Delayed publication of *ASHET News* January 2013

A painful lesson in the consequences of having computers not well enough backed up

Several things delayed the publication of this issue of *ASHET News*, the main one being the theft of my computers and backup hard drives two days before Christmas while I was in Melbourne visiting the family. At that time the newsletter was almost ready for publication, and has had to be recreated from the very beginning.

My computer hard drives were well backed up to external hard drives using automatic backup software. These hard drives were stolen along with the computers, so despite being backed up I lost all the information on my computers except for a few critical files that I had taken the precaution of backing up also off-site.

Being a Mac user I back up with the Apple Time Machine software which is very reliable and simple to use. This was recently demonstrated when Apple replaced the hard drive on my main computer because some of the drives in this series of computers had experienced premature failures. That meant I had to remove all the contents of my hard drive before delivering the computer to Apple and then replace all this content on the new drive that Apple installed. Using Time Machine this worked perfectly.

Fortunately I had offsite backups of a few critical documents which included the key ASHET records, its membership register and the cash book in which all ASHET financial transactions are recorded. These were backed up by Dropbox, a software application which can provide secure automatic backups offsite for both Windows and Apple computers. Dropbox is easy to use, has been well reviewed and is free for up to 2GB of storage (enough to back up the whole contents of the hard drive installed in most personal computers).

The lesson from this for all computer users is that baking up is simple and reliable if done systematically, and the consequences of not backing up can be dire, and at the very least extremely time-consuming and inconvenient.

Most computer users experience a hard drive failure at some time, and the other hazards of flood, fire and theft are worth protecting against as well. Anyone who has in their custody the computer records of a society has an obligation to ensure that those records are secure and this includes providing adequate backup of files containing important information.

This issue of *ASHET News* is being produced on my new replacement computer, using the applications software that came with it and from my software install disks which fortunately were not stolen. My apologies for the delays in publication. It won't be as bad next time around when I will be better prepared.

Ian Arthur

New ASHET project: digitising and cataloguing images of Unilever activities at Balmain.

With the help of a grant from Leichhardt Council, ASHET has commenced work on a new project, to catalogue and digitise a collection of around 1000 images relating to Unielver's works at Balmain that are held in an archive at the Royal Australian Historical Society (RAHS). The images include many of the Balmain works and its employees, other Unilever activities in Australia and advertising material used by he company. We will use the images to mount a display in the Leichhardt municipality, The project will be carried oout with the participation of RAHS and plan to complete it during 2013.

William Hesketh Lever was a British soap maker, the first in the world to stamp soap with a brand name, and wrap it for sale. This was in 1885 and the brand name was Sunlight. In 1897 the company commenced operations in Balmain, initially to extract oil from copra that it exported to Britain for soap making. In 1900 it began to make Sunlight soap and glycerine at Balmain. The works at Balmain expanded to produce a range of other Unilever products including soaps, detergents, toilet products and foods.

Unilever works at Bamain in 1939

Following a vist to Australia by William Lever in 1914, Lever Brothers in Australia amalgamated with the Melbourne based soap maker J.Kitchen and Sons to form Lever and Kitchen. Other amalgamations and acquisitions followed and the company became Unilever Australasia following the merger with Rexona in 2000.

At the height of its activities in Balmain in 1958 the company had 1,250 working at Balmain. Its activities there began to be wound down and relocated from 1970, and production ceased in 1988. The industrial buildings were demolished and the site was sold for residential development. Only three of the original buildings remain, converted to apartments.

Original Unilever buildings at Balmain converted to apartments

Next ASHET events

Tuesday 19 February 2013
Talk by Ron Tauranac
Designing award-winning racing cars

Ron Tauranac AO has now retired from a brilliantly successful career as designer of racing cars. In this talk he will describe some of the highlights.
He was introduced to motor sport at a race meeting on a crude airstrip at Pitt Town near Sydney in 1946 and shortly afterwards started to build, with his brother, their first racing car, the original Ralt. His cars began to break Australian records from 1951, and he soon made contact with Jack Brabham who was at the time running a one-man engineering firm. The Brabham cars, built by Ron's company Motor Racing Developments, in Weybridge, Surrey, dominated Formulas Junior, 1, 2 and 3 in the 1960s. His Formula 1 Brabhams won 13 Grand Prix. In 1966 Brabham Hondas, which he designed, won 12 of the 15 Formula 3 races held. In 1974 Ron embarked on the production of a new Ralt Formula 3 car which won the European Formula 3 Championship in 1975. His company Ralt prospered and a joint venture with Honda in the 1980s was very successful in winning races. He eventually sold the business in 1988. In 1995 he started consulting to Honda Motor Sport. He returned to Australia in 2003 and retains an interest in the sport.

Venue: History House, 133 Macquarie Street, Sydney
Time: 5.30 for 6 pm
Cost: Includes light refreshments on arrival; RAHS and ASHET members $10, others $12
Bookings: phone RAHS on (02) 9247 8001 or email history@rahs.org.au

Tuesday 12 March 2013
Talks by Ian Jack, Katherine Reynolds and Hector Abrahams
The building plan for History House

This is an opportunity to learn more about RAHS Council's plan to undertake major renovations to History House. These will involve adding floors to the rear portion of the building, and relocating facilities. The orginal building dating from 1871 will remain virtually untouched, but new windows opening on to the light well will brighten the interiors. Level access to the lift at all levels of the original building will be provided. The basement will become available to provide additional space for member facilities and there will be more space for meeting rooms, library and RAHS offices. Some of the space on the new upper floors will be available for letting.
There will be three short illustrated talks by RAHS Councillors who have been involved in the planning of the renovations. Ian Jack will provide an introduction by recounting the history of the building and its heritage significance. RAHS treasurer Kathrine Reynolds will outline the overall plan and the way it is proposed that it will be implemented and financed. Hector Abrahams, a heritage architect, will describe the plans for the renovations and present drawings to illustrate them.
An appeal is under way for donations to assist in financing the renovations, which it is hoped will commence in 2014. The result will be greatly improved facilities for RAHS and its members, and a better use of the valuable site, while ensuring that the beauty and the heritage values of the historic building are retained.

Venue: History House, 133 Macquarie Street, Sydney
Time: 5.30 for 6 pm
Cost: Includes light refreshments on arrival; RAHS and ASHET members $10, others $12
Bookings: phone RAHS on (02) 9247 8001 or email history@rahs.org.au

The automatic totalisator and its inventor, George Julius

The automatic totalisator

In 1913, the world's first automatic totalisator commenced operation at the Easter race meeting on Ellerslie Racecourse in Auckland, New Zealand. As the image here show, it was a large and complex set of machinery, a collection of shafts, cables, bicycle chains, gears and weights. At its heart was a mechanism called the shaft adder, which mechanically added several numbers simultaneously.

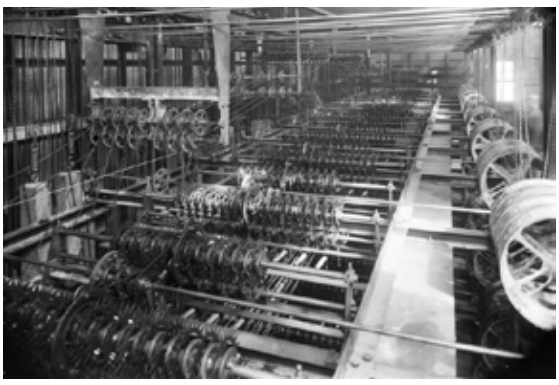
The inventor of all this was George Julius, who started development of the machine while he was working as a locomotive engineer for the Western Australian Railways. His original idea was to develop a reliable machine for counting votes in an election. The Australian government showed no interest in such a machine, so Julius adapted it to automatically performing the functions of a 'totalisator' which records bets at a race meeting, showing the odds on each horse as betting proceeds before the race, then calculating and making payouts on winning bets immediately after the race.

The concept of a gambling system known as pari-mutuel betting was conceived in the 1860s by Joseph Oller, a resident of Paris. In this system the amounts bet on each horse are totalled, and after deducting a fee, the proceeds are distributed to the winners in proportion to the amount of each bet. The system became popular in France where it was installed on race courses with a display that showed as the betting progressed, the number of bets on each horse and the total of all bets. It made a lot of money for Oller. It was soon banned in France but by 1880 had spread to many other places, coming to Australia at Randwick racecourse in 1879.

The implementation of this system came to be known as a totalisator. It employed a simple manually operated calculator that could be moved from one racecourse to another. Oller's original implementation used no special machinery at all. The progress of betting was initially chalked on a blackboard for the racegoers.

The invention by Julius of the automatic totalisator allowed the system to be implemented on a large scale with many betting windows open at the same time and with the progress of betting displayed on a large mechanical score board. Another advantage of the automatic totalisator was that it largely eliminated the opportunities for cheating.

Totalisator buiding Ellerslie Racecourse NZ



First automatic totalisator, Ellerslie Racecourse NZ

Shaft adder for totalisator, 1926

The wholly mechanical Ellerslie machine was equipped to handle bets on up to 30 horses in a race, and coincidentally had thirty betting windows. There was a shaft adder for each horse, and it received inputs from each of the betting windows, which it totalled. On its first big day at Ellerslie it collected £41,514 representing 83,000 bets.

The Australian company Automatic Totalisators Limited was formed to build the machines and install them on racecourses. By the end of the 1920s there were installations around the world with very large ones at White City in London and Longchamps in Paris. The machinery was rapidly improved. By 1920 the betting windows were connected electrically enabling them to be located remotely from the main machinery. A later development was the 'totemobile', a portable automatic toalisator that could be easily moved from one racecourse to another, making it possible to have tote betting at country meetings.

Eventually, in the 1970s, computers were able to take over all of the functions of the automatic totalisator, making it obsolete. The last one, at Harringay Stadium in London, went out of service in 1987.

George Julius

George Julius was an outstanding Australian engineer and inventing the automatic totalisator is only one of his achievements.

George Alfred Julius was born in New Zealand in1873, and migrated to Austalia with his family shortly afterwards, when his father was appointed Archdeacon of Ballarat. He attended Melbourne Church of England Grammar School and on matriculating followed his family to New Zealand where his father had been appointed Bishop of Christchurch. In 1890 he enrolled in a BSc(Mechanical Engineering) course at Canterbury College of the University of New Zealand, specialising in railway engineering.

In 1896 George Julius was appointed as an assistant engineer in the Locomotive Department of Western Australian Government Railways. In 1898 he married Eva O'Connor, daughter of the engineer C,Y,O'Connor, and had three sons, the eldest of whom, Awdry Francis, later became a partner in his father's firm.

While with the Railways, Julius conducted tests on Australian timbers and published two books containing the results. This led to a new job in Sydney with a timber company Allen Taylor & Co Ltd with the right to private practice. In 1908 he set up a consulting office, which was immediately succesful, and led to the establishment of the partnership Julius, Poole and Gibson. Meanwhile, with the help of his sons, he continued to work on the Automatic totalisator and build a prototype in his home workshop.

By the end of World War I, Julius and Poole had become concerned that the engineering profession suffered from being represented by many small societies, and pressed for the formation of a national institute. Following a conference of interstate delegates in 1918, the Institution of Engineers Australia was formed in 1919, and twelve independent societies

▶

throughout Australia had decided to amalgamate with the Institution. Julius was elected to the first Council, and was elected President in 1926.

In the same year George Julius was appointed chairman of the newly formed Council for Scientific and Industrial Research (CSIR), forerunner of CSIRO. CSIR was initially concerned primary production, with five main areas of activity; animal and plant pests and diseases, fuel problems (especially liquid fuels), preservation of foodstuffs (especially cold storage), and forest products.

Sir George Julius

In the 1930s Julius's concern that CSIR should also support secondary industry led to the establishment in Melbourne of the Aeronautical Research Laboratories in 1938.

In 1922, Julius, Poole and Gibson, along with other engineers, promoted the formation of the Australian Commonwealth Standards Association (ACESA), modelled on the British Standards Institution, and forerunner of the Standards Association of Australia (SAA). Julius was elected inaugural Vice Chairman of ACESA. By the time in 1926, when he was elected Chairman ACESA had 250 committees and over 1,500 volunteers engaged in standards work.

In 1927 George Julius was made a member of the Commonwealth Board of Trade. He joined the Rotary Club of Sydney and was elected its president in 1932 and was appointed chairman of the Employment Trust in 1934. He also became a trustee of the Public Library of NSW in 1937, a director of Automatic Totalisators Ltd, and Imperial Chemical Industries of Australia and New Zealand Ltd, and a Trustee of Mutual Life & Citizens Assurance Co Ltd.

George Julius received many honours, including the highest award of the Institution of Engineers, Australia, the Peter Nichol Russell Medal, in 1927. He was knighted in 1929, primarily for his work with the CSIR, and received the W.C. Kernot Medal from the University of Melbourne in 1939. In 1940 he was awarded a DSc by the University of New Zealand.

During World War II, George Julius served on the Central Inventions Board, the Australian Council for Aeronautics and the Army inventions Directorate.

Sir George Julius was active in a range of professional activities until shortly before his death in 1946.

Sources and further reading

The principal source of information on Sir George Julius for this article is the entry in the Australian Dictionary of Biography. There is information on the automatic totalisator on websites at http://members.ozemail.com.au/~bconlon/ and http://www.rutherfordjournal.org/article020109.html

Timber Truss Bridges of NSW

By Ian Arthur

Introduction

During the colonial period, and particularly following the discovery of large quantities of gold in many places during the 1850s, Australia's population increased rapidly and became widely dispersed. Road bridges were needed and the lowest cost and most readily available structural material for them in New South Wales was timber. At one time there were over 4,000 timber bridges in the state. NSW was sometimes known as the timber bridge state.

To meet the need, engineers in the Public Works Department (PWD) developed designs of timber truss bridges of the kinds illustrated in this article. 407 timber truss road bridges were built in NSW between 1861 and 1936 by the PWD. 63 remain. 48 of them have been maintained by the former NSW Roads and Traffic Authority (RTA) now the NSW Roads and Maritime Service (RMS), and 15 by local councils. RMS has plans to conserve 25 of these for at least the next few years and to retain them in use. The ones retained would be a representative sample of the main types and would be widely distributed around the state.

A succession of engineers in PWD introduced improvements in the design of these bridges, and their designs were original and unique to NSW. They are an important example of Australian technology development and engineering history. In a recent ASHET project two retired Chief Bridge Engineers with the NSW Roads and Traffic Authority, Brian Pearson and Ray Wedgwood, gave an oral history interview which summarises the history and gives an up to date outline of the efforts and plans to conserve a representative sample of the bridges and to maintain a permanent record of their design and history. A transcript of the interview is on the ASHET website. The interview was conducted and the transcript prepared by Frank Heimans.

The project has been assisted by funds allocated by the Royal Australian Historical Society through the Heritage Branch of the NSW Office of Environment and Heritage.

A small number of timber truss bridges were built by the NSW Railways, but John Whitton, Engineer-in-Chief from 1856 to 1890, had a strong preference for following British practice and building railway bridges in iron or masonry wherever funds permitted.

Monkerai Old PWD truss bridge over the Karuah River at Maitland,

PWD on the other hand had insufficient funding to build a large number of road bridges in iron or masonry. However NSW had ample and widely distributed sources of strong and durable hardwood. The first timber bridges in NSW were simple beam bridges with timber decks, but were suited only to short spans. William Bennett, PWD Engineer for Roads from 1862 to 1869, introduced his own design of timber truss for road bridges, based on a Palladian design of truss widely used in building. They became known as the Old PWD truss. 147 were built but only two survive. They were single lane bridges, designed for a load of 16 tons and had spans up to 90 feet.

In North America, where timber was plentiful, timber trusses were quie common and several types of timber truss were developed. American bridge technology did not reach NSW until the early 1870s when two bridges of an American design known as the McCallum truss were built that had 150 foot spans.

J.A.McDonald succeeded Bennett at the PWD in 1886 and a number of improvements to the old PWD truss resulted. The McDonald trusses, of which around 90 were built and 5 remain, allowed for higher loads, and had features to ease replacement of individual bridge members and

Junction McDonald truss bridge on Brungle Road over Tumut River

combat timber shrinkage. McDonald also introduced composite construction in timber and steel for the longer span bridges. The bridge at Cowra replacing an earlier McCallum truss bridge had three 160 ft spans with steel lower chords.

Victoria Allen truss bridge over Stonequarry Creek at Picton

NSW bridge design gained further pace under Percy Allen, who followed McDonald in 1893 as the principal bridge designer. He was able to make good use of American technology to achieve efficient truss design,

Cobram deBurgh truss bridge over the Murray River at Barooga

and make effective use of the results of Professor Warren's timber testing program at Sydney University. He introduced many design features that reduced costs and improved durability and maintainability. Following American practice, Allen employed an American Howe truss design that had vertical steel tension members and diagonal timber compression members. He introduced a number of design features for strength, stability and ease of maintenance.

The timber members employed two parallel timbers spaced apart, adding to strength and stability, while allowing the use of smaller and cheaper timber sections. This also facilitated maintenance as individual timbers could be readily replaced. Cast iron clamps and were employed at joints. They improved load transfer at timber to timber joints and helped reduce dry rot that developed in places where dust and moisture could accumulate. Stability was provided in three ways: for all bridges the ends of the sloping members were splayed; for short spans the trusses were braced externally off extended bottom cross girders; and for large spans where the trusses were deep like Morpeth, Dunmore and Hampden at Wagga, there was overhead cross bracing.105 Allen truss bridges were built between 1893 and 1927; 19 survive.

Bridge engineers in the PWD who succeeded Allen made further innovations in timber truss bridge design, and the names are associated with the bridges they designed. From 1899 E.M.de Burgh designed Pratt trusses with square ends, steel bottom chords and pin joints. The difficulty of dismantling the pin joints was a maintenance problem that shortened the period over which de Burgh's design was used. His designs were best suited to long spans, and Allen trusses continued to be used for the shorter span bridges. There were 20 de Burgh bridges built and 9 survive.

New Buildings Dare truss bridge over Towamba River, Bega Valley

Harvey Dare redesigned Allen's truss to incorporate a steel bottom chord and simplify the bottom chord joints. After 1905 there were no further de Burgh trusses built and nearly all the truss bridges from then on were composite timber and steel Dare trusses. In all 44 were built and 13 survive. The last timber truss bridge in NSW was built in 1936.

From the end of World War I steel trusses were generally used for spans over 30 ft. and steel beams for those over 20 ft. So there were very few new timber truss bridges. The first reinforced concrete bridges appeared at the end of War I, and concrete eventually became the most usual material for new and replacement road bridges in NSW.

The demise of timber truss bridges was in part a result of the need for bridges to carry heavier loads, for which steel and concrete proved more economical. Other factors were the shortage of suitable timber and of the skilled carpenters needed for construction and maintenance of timber bridges. Once the superiority of steel and concrete bridges was established, timber truss bridges have been progressively replaced. The ones that survive are mostly in locations where traffic conditions can still be met with single lane bridges having low load capacity. Some of the timber truss bridges have been upgraded by adding steel members or replacing timber with steel. Durability has been increased by installing laminated timber decks in some bridges.

Conservation of timber truss bridges

Reconstruction of Dunmore bridge over Paterson River at Woodville in 2012. The brisge nwas closed to traffic inSetember and reopened in October

It is remarkable that in a period of development of new engineering materials and technology, timber truss bridges were built in NSW for nearly 100 years. This happened only because the original design as incorporated in the Old PWD bridges dating from 1861 was progressively improved by the efforts of a succession of highly competent and innovative engineers in the NSW PWD.

These bridges represent an important part of NSW engineering history and heritage. This has been widely recognised and RTA (now RMS), which owned most of the remaining bridges, has proposed a strategy for conservation which involves retaining 25 of the 48 that it currently owns, and divesting the remaining 18 to local councils. 12 of the 18 proposed for divestment are on the State Heritage Register, so RTA does not necessarily have a final decision on their demolition or transfer to a local council. RTA published a report in November 2010 that includes details of the studies that led to its proposed strategy, and submitted the report to the State Heritage Council as well as inviting public comment.

The Heritage Council formed a sub-committee to review the proposed strategy and it presented its report to the Council in July 2011. There followed a period of consultation between the sub-committee and RTA, which during which RTA became part of RMS, and agreement was reached on a strategy which was presented to the Heritage Council in July 2012.The Heritage Council endorsed the strategy which will determine the means by which timber truss road bridges are conserved, delisted or replaced as the case may be over the next ten to fifteen years. Any proposals for delisting or removal of individual bridges from the State Heritage Register will be considered by the Council provided they are in accordance with the strategy.

It seems clear that a representative sample of the main types of timber truss bridges will be retained, and that these will be under the ownership and management of RMS, in accordance with the agreed strategy

Conclusion

The oral history interview with Brian Pearson and Ray Wedgwood provides an excellent brief summary of the history of timber truss bridges and their heritage significance. These two former Chief Bridge Engineers have a detailed knowledge of the engineering, and were members of the National Trust review team so their knowledge of the conservation aspects is right up to date.

For those seeking further information, Don Fraser's 1985 article in the Transactions of the Institution of Engineers Australia provides a detailed account of the engineering of these bridges, with an extensive set of references. It is not available on line. The RMS report and the Heritage Council review are both available on line. Also on line is a video made by RMS showing the recent restoration of the Dunmore timber truss bridge over the Paterson River at Woodville.

Sources and further reading

Fraser D.J., Timber bridges of New South Wales, I.E.Aust Multidisciplinary Transactions, 1985.

Oral history interview with Brian Pearson and Ray Wedgwood, October 2012, audio record held in State Library of NSW oral history collection. Transcript on ASHET website at www.ashet.org.au.

Timber truss road bridges: A strategic approach to conservation, NSW Government Transport, Roads and Traffic Authority, July 2010 www.rta.nsw.gov.au/newsevents/2011/2011_07_timber_bridges.html

Timber Truss Road Bridges of NSW: review of Roads and Traffic Authority's proposed approach to conservation, Heritage Council of NSW, July 2011. www.environment.nsw.gov.au/.../TimberTrussBridgeStrategy.pdf

About ASHET

ASHET, the Australian Society for History of Engineering and Technology, is a non-profit society, incorporated in New South Wales and affiliated with the Royal Australian Historical Society. ASHET currently has just under 100 members. It was formed in Sydney in 2003. Its objects are to encourage and promote community interest and education in the history of engineering and technology in Australia. It has members throughout Australia, with most in Sydney and other parts of New South Wales. ASHET has a regular program of events in Sydney, and looks forward to establishing groups with programs of activities in other centres.

ASHET holds regular meetings Sydney at History House, 133 Macquarie Street, Sydney, on weekday evenings, jointly with the Royal Australian Historical Society. ASHET also arranges daytime visits to places of historical interest. ASHET has held weekend or longer tours to the Mudgee, Lithgow and Goulburn areas, and to northern Tasmania. In 2008, we ran a tour to Broken Hill by rail and coach, and in 2011 a tour of northern New South Wales, including Lightning Ridge.

ASHET has completed several special projects, some assisted by government grants, and currently has three more projects in progress. The completed projects include digitising all the issues of two historic Australian engineering journals, in conjunction with Sydney University Library, and conducting oral history interviews with volunteers at the Queanbeyan Printing Museum, in conjunction with Engineers Australia.

Almost complete is a project to conduct oral history interviews with two retired Engineers in Chief of the NSW Department of Main Roads who made major contributions to the history and conservation of timber truss bridges. Another current project aided by a Commonwealth grant is to research and record the history of the development of machinery for the small scale mining of opals at Lightning Ridge, and present the results in a display at the Australian Opal Centre at Lightning Ridge and on the ASHET website.

ASHET has recently received a grant from Leichardt Council to catalogue and digitise a set of images illustrating the history of Unilever at Balmain and to exhibit a selection of the images.

ASHET is managed by a committee of five office-bearers and three ordinary committee members. A complete new committee is elected at the annual general meeting each year. If you are interested in the idea of serving on the committee or otherwise contributing to running ASHET or expanding its range of activities, call or email the secretary Ian Arthur, talk to any committee member or make a nomination to the committee.

ASHET News is the newsletter of the Australian Society for History of Engineering and Technology Incorporated ABN 47 874 656 639
ISSN 1835-5943
11 Heights Crescent Middle Cove NSW 2068
Phone: 02 9958 8397
Email: sec@ashet.org.au
Website: www.ashet.org.au