

Oral History and Engineering Heritage

R. RAXWORTHY
B.A. Communication, Historian

SUMMARY This paper sets out a number of cases in which the author and others have used oral evidence on engineering heritage in written and broadcast work. It considers the criteria and validity of such use.

1. INTRODUCTION

Oral evidence has been more widely used than is generally recognised. It is used daily in Parliaments, in Courts of Law and in inquiries, whether Engineering or otherwise and has been used from time immemorial. Clerks, stenographers and court reporters provided accurate transcripts long before the invention of tape recorders. A fine example of a book produced from an engineering inquiry is that by John Prebble on the Tay Bridge disaster (1).

As with all evidence, whether oral or written, a judgement has to be made on its value. Apart from the honesty of the evidence, it is realised that the memory can sometimes play convenient tricks; and that myth can be turned into fact in the retelling of a well known story. Creative imagination can use blanks in knowledge, casting doubt on the accuracy of the evidence, a situation often played on by the legal profession to raise or lower reasonable doubt. Some cases follow.

2. THE CASE OF THE BATHURST ROAD

A case of the use of oral evidence dating from 1820 was brought to the author's notice by an M.A. thesis on the establishment of Bathurst, New South Wales (2):

Private Henry Snell gave evidence at the Bigge Enquiry, that a number of timber bridges on the Bathurst Road may have carried away because of the diversion of iron bolts and spiked nails to the private use of Lieut. Hobby and Superintendent, William Cox. Snell said the spikes were replaced by wooden pins (3). Blacksmith, J. Wathen did not support Snell's evidence: "The iron bolts in the Campbell River Bridge are 2' 6". I repaired them. There are four of them and they are of a piece." He did, however, give evidence that he made 1500 nails from iron fetters, to make hurdles to enclose Cox's sheep. Wathen kept a careful record of all the work he did and of all the iron he drew from store. "Seeing how things were going on" he told Commissioner Bigge, "I thought that if I did not take an account of the work I did, and being a prisoner, they might lay the deficiency at my charge" (4).

Superintendent Cox did in fact blame any deficiencies on ex-convict storekeeper, Thomas Gorman, who had committed suicide in August, 1819. According to Cox he had "publicly denied his God and said that there was no punishment hereafter for any crime committed in this world" (5).

The weight of this and other evidence was probably against Cox, but not necessarily in the matter of the bridges. No charges were laid. The bridges were primitive in that they were all at low level, consisted of logs bolted together, covered with decking held in place by iron spikes or hardwood pins. The evidence points to the fact that the Campbell River Bridge carried away in a flood with bolts in place and these were subsequently repaired by Wathen. Even the convicts would probably applaud their leg-irons being made into nails for hurdles.

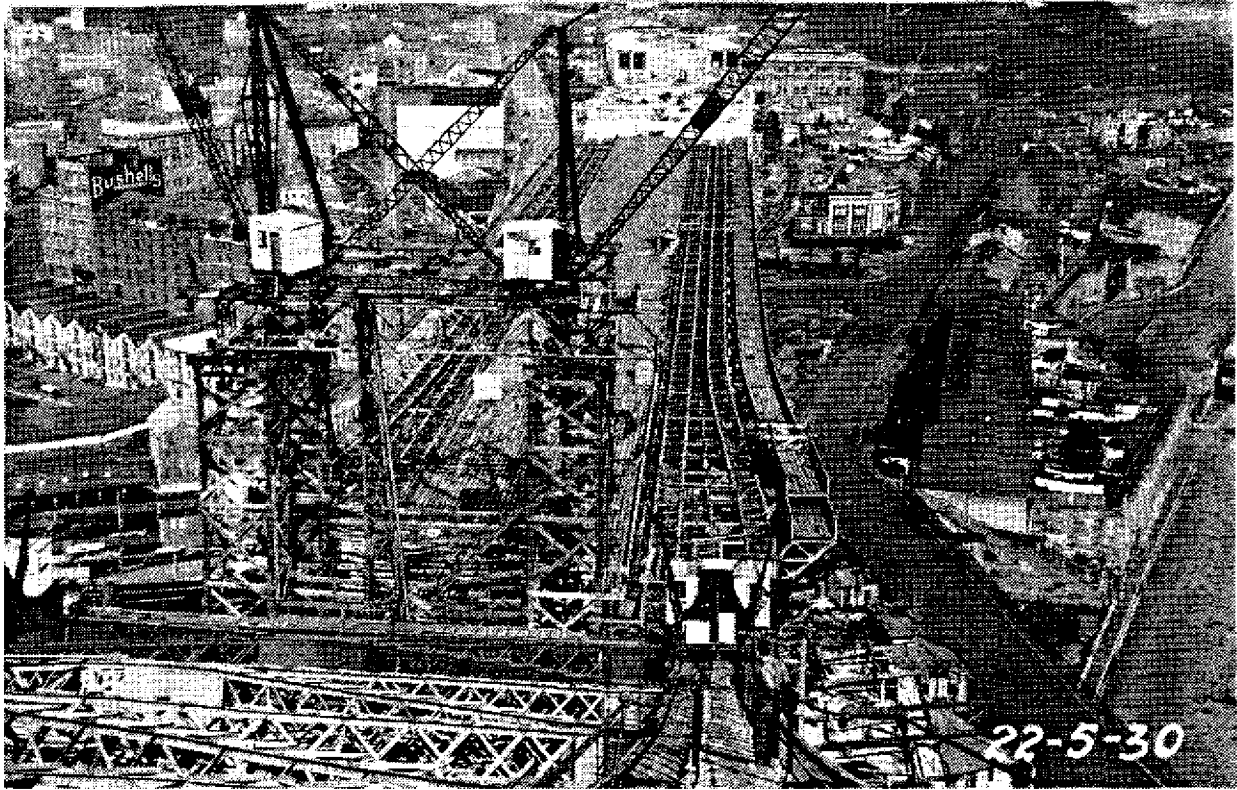
3. SYDNEY HARBOUR BRIDGE

During the author's research for a book and a television documentary on the building of the Sydney Harbour Bridge, for the fiftieth anniversary in 1982 (6), a number of mysteries developed. These could not be solved from the records. It was not until a series of oral history interviews had been completed with Bridge workers who surfaced for the celebrations, that some mysteries were clarified - and others appeared.

3.1 The Case of the Vanishing Engineers

In researching the names of the New South Wales Public Works Department Engineers who worked on the building of the Sydney Harbour Bridge, it was found that, according to the Public Service Lists, they had left during World War I and had not been replaced. The Chief Engineer, J.J.C. Bradfield and his secretary were the only ones left on the list. Since Bradfield was also Chief Engineer of the Metropolitan Railway Construction Branch of the New South Wales Government Railways, their list was searched, locating the engineers on the Railway payroll; but only until 1928, when they disappeared completely from the lists, as did Bradfield himself; yet they were all still working on the Bridge (7). Their Railway Personal Record Cards were marked "To be treated as services dispensed with". (8) It was at this time that the long standing argument about the location of Circular Quay Station came to a head; and Dr.

ILLUSTRATION 1
Sydney Harbour Bridge 1930. Photo courtesy S.C.Robertson, Roads & Traffic
Authority and Archives Office of New South Wales.



Bradfield and one of his superiors, Chief Railway Commissioner, James Fraser clashed, head-on. Fraser was under pressure from Premier and Treasurer Bavin to reduce the railway deficit (9).

It remained for oral evidence to solve the mystery of the vanishing engineers and this was provided by the late H.A.Peach, who said:

"That's right, I was one of them. I went to the Main Roads then. Dr. Bradfield was always very loyal to his staff and this - switch to the Main Roads was engineered by Dr. Bradfield and Newell, Commissioner for Main Roads. It was done on a 'you scratch my back and I'll scratch yours' basis. By Dr. Bradfield assuring Newell that Main Roads could take over the Harbour Bridge, after it was completed . . . instead of the Railways, if Main Roads took his engineers" (10).

If it were not for the oral evidence, this case would have remained a matter for conjecture. As it was, further supporting evidence came to light and the facts fit. The Department of Main Roads, now the Roads and Traffic Authority, did get the Sydney Harbour Bridge.

3.2 The Bridge and City Railway did not meet

This case concerns a discrepancy in the surveys of the City Railway, which began in 1922 from an old survey and that of the Sydney Harbour Bridge which was carried out in 1924. According to H.A.Peach, of the Metropolitan Railway Construction Branch, the surveys did not meet and he was given the job of reconciling them, of effectively 'losing' five inches. He said:

"The principal difficulty arose there that in the length of the Bridge by survey and the length of the Bridge by construction, they didn't meet. From memory I think the Bridge was a bit longer than the survey. There was about five or six inches, that was very accurately determined. There was a bit of a problem because they had worked to an earlier survey, which gave an earlier distance across the harbour; and they had started to build Museum Station and some of North Sydney Station. Then when Amphlett had done a very accurate survey with special instruments brought in for the job from overseas, he measured the same distance from bench mark North to bench mark south and there was this five or six inches difference in levels. Straight away work had been started on the Harbour Bridge on the North Sydney approach construction and in the ultimate they wouldn't have met. It was out more in the North-South direction than it was in the East-West. The difficult job was of getting rid of five or six inches of real estate between North Sydney and South Sydney. It was done".

Asked how it was done Peach said:
"Oh, calculations. On lengths of straight track you can fiddle - telescope, but with curved track it wasn't quite so easy because you can't make one circle fit another - accurately. It was a real problem, I can assure you. It worked out alright though. Nobody knows"(11).

3.3 Threatened Cancellation of the Bridge

This case also concerns the Sydney Harbour Bridge and the oral evidence of the late H.A.Peach: In 1921 World tenders were called by NSW Labor Premier James Dooley for the detailed design and

construction of the Sydney Harbour Bridge. This followed a promise by the previous Labor Premier, John Storey, who died in office in the same year. Labor lost office while the Sydney Harbour Bridge Bill, which had passed through the Legislative Assembly, was still to be passed by the Upper House and therefore lapsed (12).

Bradfield left on a round-the-world trip to talk to prospective tenderers on 16 March, 1922, as instructed by the outgoing government. A press report from New York alerted the new Fuller Nationalist-Progressive (Country) Coalition Government and a cable was sent to Bradfield instructing him to remain in New York for consultation (13). Contrary to his itinerary, he had already left for London. Suspicions were aroused, particularly amongst the Country Members, including Colonel Bruxner, who fought hard against the Bridge Act. (14).

Peach reported: "He [Bradfield] went overseas to examine possible tenderers for the construction of the Harbour Bridge and his secretary, Miss Butler was still back in Sydney in Dr. Bradfield's office. She became aware that there was a move afoot to recall Dr. Bradfield and his staff, putting a stop to any further work on the development of the Bridge itself. They were going to send him a cable and Miss Butler, fortunately knew where Dr. Bradfield was at that time. And she sent him a [private] cable, entirely of her own volition, suggesting he should be somewhere else at the time, and they never caught up with him" (15).

3.4 Tall tales and True

The informant in this case had better remain nameless, although he is now dead, there is no point in giving offence to his relatives. The man telling the story was a boilermaker of English origin, working on the southern approach spans of Sydney Harbour Bridge over George Street North in the Rocks. He told how he had been wrongfully dismissed for being drunk on the job. His story was that he had been hit on the head by a rivet and had lain unconscious, wedged into the steelwork before he was found and helped down to the street below. Here, somebody gave him a couple of restorative brandies from the pub over the road. He was then found to have liquor on his breath and was dismissed.

It was later agreed that he may have been wrongfully dismissed. He was given the benefit of the doubt, in the form of a reference (which he produced) but was not reinstated.

Later in the recorded interview he told the story of Vic (often called Ned) Kelly, the boilermaker who fell from the roadway of the Bridge into the water and survived, with only two broken ribs. His boots were supposed to have split open and the uppers were around his thighs. The union delegate and notable diver, Lou Moore, was reported to have been held back from diving after him. Moore was supposed to have jumped from the top of the jib on the Titan floating crane for a wager on another occasion. Like most good stories, the basic facts are true. Kelly was given a Commemorative Medal by Dorman Long and a gold watch by their insurance company; both were presented by the Minister for Public Works of the day, The Hon. Mr. Mark Anthony 'Charlie' Davidson. However, the informant claimed to have been working right next to Kelly when he fell off, which on his own evidence could not have been true, since he was no longer working on the Bridge when the deck was constructed (16).

The story of Kelly's remarkable survival, with the appropriate embellishments, was told by many other people. None of them claimed to have actually seen him fall, but rather to have heard shouting, seen a splash, followed by a man surfacing and swimming to the working punt. The details have assumed the mantle of legend, but the basic facts remain unchallenged. Of the 92 people who have fallen from the Bridge into the water between 1930 and 1982, 14 survived. All but 3 were suicidal leaps (17).

3.5 Sydney Harbour Bridge calculations

An insight into the methods used in the design and calculation of the Sydney Harbour Bridge was gained from three interviews. They effectively amplified the information given in the engineering papers (18). Vera (Lawson) Holiday was a comptometer operator in Dorman Long's Sydney site office in the old Artillery Barracks on Dawes Point. She told of working out the pay and doing costings, but the engineers would also rush in with long calculations for her to do in a hurry. Her machine was really only a glorified adding machine, but she could do quite complicated arithmetical calculations on it very quickly. Most of the engineering calculation was done in Consulting Engineer Ralph Freeman's Office in London, but everything had to be reconciled with Dr. Bradfield's Public Works Engineers in Sydney (19).

Ralph Freeman's 'Bridge Gang' in London were supervised by John Freeman Pain and included Gilbert Roberts, Hubert Shirley-Smith and Oleg Kerensky. Gordon Stuckey was Designing Engineer for the Bridge Contract under Bradfield and he had charge of the group of engineers who did an independent set of calculations, checking Freeman's drawings and calculations. Stuckey and his assistants James Holt and Owen Powys, with Bradfield's Secretary, Kathleen Butler, were sent to London to start the checking process. Stuckey was newly married, so he and his wife were allowed to make a honeymoon of it, travelling on another ship, at their own expense. Bradfield was to follow them independently.

Stuckey reported that there was little enough ready for them to check when they got there and when Bradfield arrived they were allowed to go North with him. They called in at Taylor's bell-foundry at Loughborough while Bradfield arranged the manufacture of the University of Sydney War Memorial Carillon bells. They called on Sir Arthur Dorman, where Bradfield and Lady Dorman talked gardening incessantly. When they got to Dorman Long's Britannia Works at Middlesbrough they saw the tests of scale model trusses and of the anchorage cables, of rivetting methods and of the rolling of the largest angle sections yet attempted, 12" x 12" x 1 1/2" (305mm. x 305mm. x 32 mm.). When they returned to London, they checked what had been done in their absence. Bradfield approved a number of design changes with Freeman and the whole party returned to Australia. Since an arch bridge is an indeterminate structure in a mathematical sense, the calculations proceeded as a series of trials. There were four in all, with batches of design changes being put through together. Stuckey said that as the design and calculation checking continued and gradually wound down, Bradfield swung his group over to physical checking on the job. They spent part of every day strain gauging. Bradfield had set the programme up well in advance and his young engineer, John Gilbert had prepared gauge points and drilled thousands of holes (20).

ILLUSTRATION 2

Public Works Engineer G.E.K Pitt, taken while strain gauging on the Sydney Harbour Bridge in 1930. Photograph courtesy S.C. Robertson, Roads & Traffic Authority and Archives Office of New South Wales.

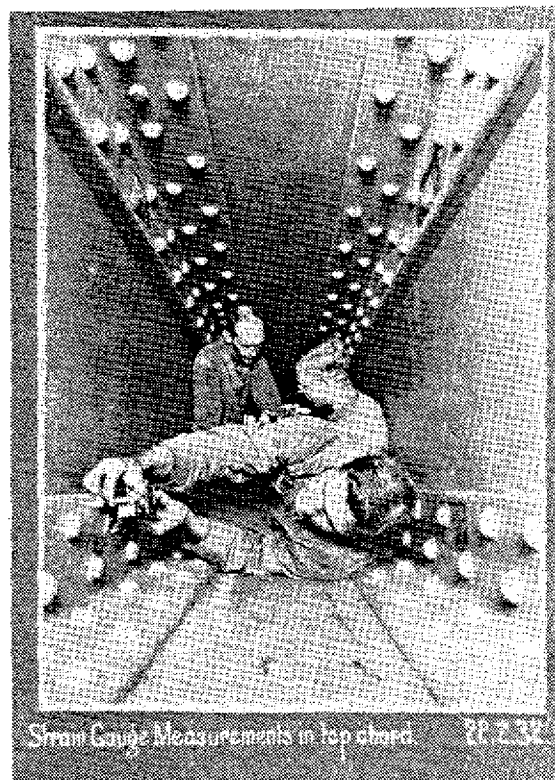


One of Stuckey's men, S.C. Robertson, who was a superb amateur photographer and later an aircraft and bridge designer, told of the methods used, he said: "They were well advanced when I got there and started work under the Principal Design Engineer Gordon Stuckey, who was a very clever chap, by the way. He was very good at giving you instructions, he was very good at doing his own calculations as well. I gather that he was one of the leading lights that helped Dr. Bradfield prepare his own design for an arch and a cantilever on which the tenders were based".

"We received blueprints of various parts of the structure, at first it was of the approach spans and it was my job to check some of the designs. I would get the dimensions and check whether, according to the specification, any part was overstressed. Not many of them were, they were all pretty right and seeing that they were being erected, my work was pretty academic. Shortly after that we received drawings for the main arch span and we received several designs of the number two trial. There were a number of points about that that I found overstressed, slightly overstressed, generally, and this was sent back to Dorman Long and they amended it. The third trial I never saw and then along came the fourth trial, we worked on that for a long while. Actually we were still checking it when the Bridge was opened. The checking we were doing then was mainly details which we felt for the sake of the record, should be finished off".

ILLUSTRATION 3

Public Works Designing Engineer Gordon Stuckey and his engineers strain gauging during the test loading of Sydney Harbour Bridge with 96 railway locomotives. Courtesy Roads & Traffic Authority and Archives Office of New South Wales.



Strain Gauge Measurements in top chord R. 2.34

"Most of the important changes were made early on. During the main design stage we also checked the calculations and the actual stresses during each stage of the erection. On the top chord where the members are now in compression, we checked them when during erection they were in tension. We checked at all stages as the arch progressed and of course you also had the great weight of the erection equipment including the creeper cranes".

Asked about the layout of Bradfield's drawing offices on the third floor of the old Public Works Department Building, Robertson could not remember apart from confirming Stuckey's remembrance of their move to the rear of the building, overlooking the Astor flats where Dorman Long Director of Construction, Lawrence Ennis lived. He also remembered the other Public Works Drawing Office, where the Bridge Roadway Approaches were designed and checked by Bill Lush's teams of engineers also under Bradfield (21). Bradfield's third drawing office was for the City Railway under R.J. Boyd, but that was greatly reduced in 1928.

In this case the oral interviews fill out what is already known from other evidence, giving it a personal touch.

4. CONCLUSIONS

While oral evidence on engineering heritage must be treated with caution, it is most valuable in covering viewpoints which in some cases would not otherwise be represented.

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