

***A Land of Bridges – A Story of New Zealand***  
**Professor H J Hopkins**



**Inaugural Hopkins Lecture**  
Centennial Hall University of Canterbury  
31 May 1978

A reconstruction of  
**Professor Hopkins' 1978**  
**presentation**

Using original text and material from his slide  
collection, research papers and photographs

Compiled by  
**David Hopkins**  
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# ***A Land of Bridges – A Story of New Zealand***

## **Professor H J Hopkins**



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I have, of course, given other Memorial Lectures. On each occasion I have begun with a tribute to the life and the work of the person commemorated. I deem it neither wise nor seemly to do so on this occasion but would like to commend the wisdom of those who took the opportunity of my retirement to inaugurate an annual lecture *to encourage discussion of engineering matters within the profession and to promote public understanding of engineering issues.*

I hope I am only human in being deeply gratified to have my name associated with it.

The longer one lives the more likely are one's hobby horses to be well known. It will come as no great surprise to most of you that I was given a choice of subject and have chosen bridges. I find them fascinating, not merely the fascination of one's own technology. Indeed, no. *Bridges are built by men for men.* (And I am not going to emasculate that statement for tonight's audience – every *person* will know what I mean).

Man has many needs – sociological, economic, recreational – he needs freedom from fear of danger, freedom to move about. He needs to be inspired by the accomplishment of difficult, ennobling tasks, and he needs to *find* beauty and to *recognise* it in the works of man quite as much as in the face of Nature.

Not all bridges satisfy all of these needs, but it is rare indeed to find one that satisfies none.



New Zealand is a land of rivers and to meet man's needs it has become a Land of Bridges.

When the pakeha came to New Zealand about 150 years ago there were none.

Drowning was known as the New Zealand disease; for a long time it claimed more victims than any other cause.

(John) Henry Whitcombe, a civil engineer trained under IK Brunel, suffered great hardships in finding his Pass through the Alps; but he survived that crossing. He was drowned trying to cross the Taramakau river.

These drowning fatalities (and Whitcombe's in particular) inspired an article in *The Illustrated London News* which showed the New Zealand method of crossing a river . It depended on a bland condition of flow, as did this method of crossing the Waiau river.



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It needed no great technology to string a wire across a river, although it often entailed great physical effort and no little danger.



But the ladies crossing the Taramakau in this box would have been greatly incommoded in a high wind.

Nevertheless, this method was widely adopted and survived in many places until quite recently.

Such primitive methods must have had a traumatic effect on many children who had no other method of getting to school.



It probably explains the actions of the sons and daughters of Robert and Isabella Stewart, who dedicated this bridge to their parents, at Island Block ...



... which is not far upstream from Tuapeka Mouth where this punt is still the sole means of crossing the Clutha.

For many years punts served the Clutha despite the attendant dangers of high winds and floods.



So many bridges were needed throughout New Zealand that engineers could not advise their political masters of a priority list.

Local men of initiative tried their hands at building, local politicians brought pressure to bear to get bridges in their area. Sometimes it took a long time.

Albert Town, where the Clutha leaves Lake Wanaka, was the early focal point of the Upper Clutha Valley. It was originally known as Albert Crossing. It was the only place where the river could be forded, although not without danger.

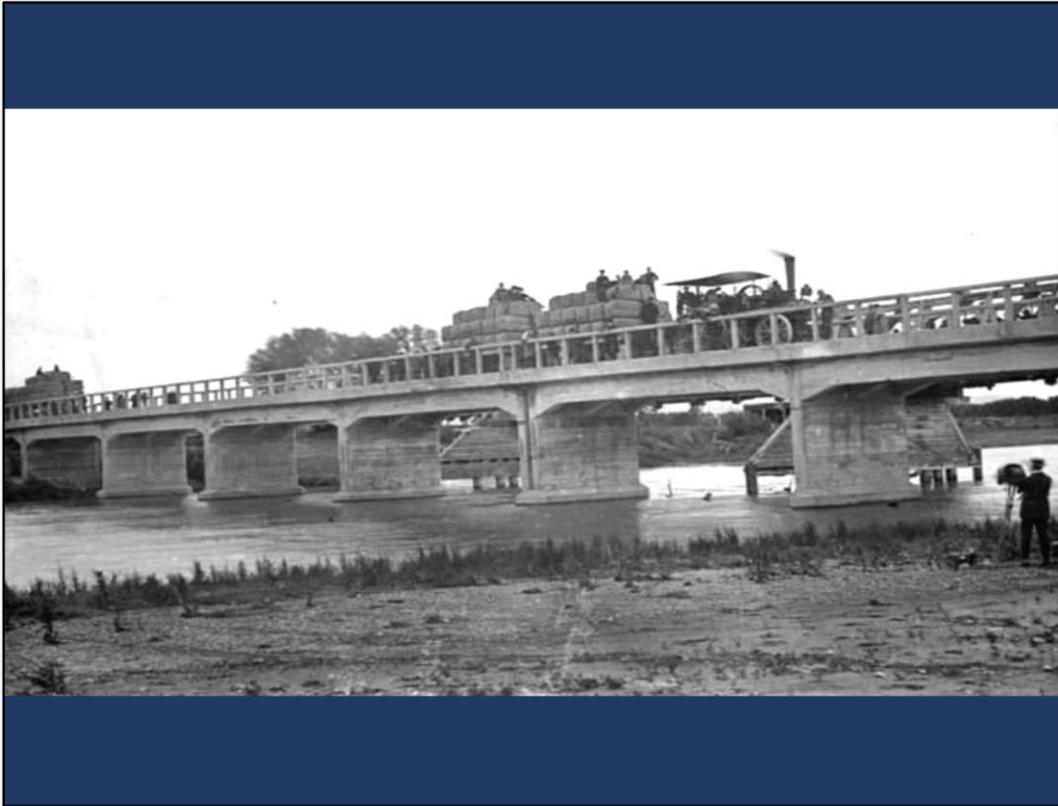
The first death recorded there (1861) was of John Gilbert, who was described as a good swimmer. He probably did not like the look of the first punt which Hastings described as *a square box that did duty for a boat*. It was in fact the body of a gig.



Despite the continual traffic across the river at this point, it was not until 1930 that James Horn, the local MP, was instrumental in having a bridge replace the punt.

It was a great day for the locals who crowded on to the punt for its last journey, then drove in cavalcade in ceremonially opening the bridge.

Doubtless part of the ceremony was in the cemetery alongside, where the records of many drownings makes sad reading.



The opening of a bridge confers such benefit upon a pioneer community that it is generally an occasion for rejoicing, sometimes exceeding the bounds of temperance.

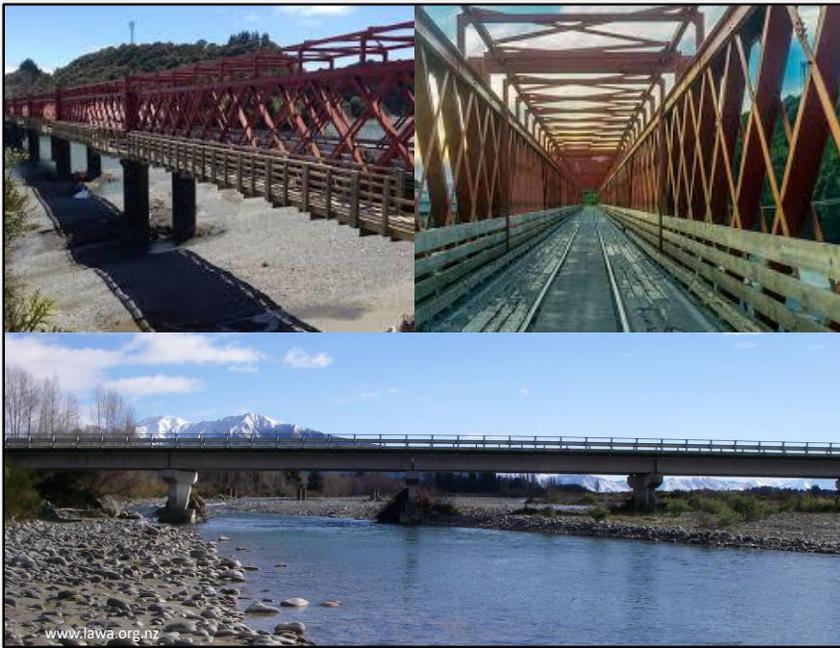
A correspondent reports from the Wairarapa:

*When the long Waihenga bridge was built over the Ruamahanga River near Martinborough in 1875, it was a major event worthy of attendance by many of political and government importance in Wellington and Wairarapa who, after the ceremony, adjourned to the nearby Waihenga Ferry Hotel, and after everybody connected even remotely with the bridge had been toasted, it was too late for many of the guests to leave for home, and it was said that many didn't even know where home was, let alone get there.*

*The fact that there were many more guests than there were beds in the little hotel didn't worry the publican a bit – he put them two or three to a bed, just as they were.*

*When the boot cleaner did his round in the night, not finding any boots outside the doors, and loyal to the hotel's boast of service, he went in and cleaned all the boots sticking out of the bed ends and still on the owners' feet.*

*I can remember my father telling me that he woke up in the morning between two Cabinet Ministers.*



Even today the opening of a new bridge is an occasion for a community gathering. The original bridge across the Rangitata at Arundel was commenced in July 1870 to the design of Thomas Paterson, Railway Engineer for Otago Province, who had been drowned in the Kakanui River the previous December when bringing the plans for this bridge to Dunedin for approval.

Originally 1100 feet of wrought iron trusses resting on cast iron cylinders was considered sufficient, but when, about 1878, the river washed out the northern approach, 800 feet of timber trusses were added.

In 1906 a scrub fire set alight to this extension. Despite the efforts of the proprietress of the Arundel, who organised a bucket brigade well into the night - until the fire tender arrived from Geraldine – about 300 feet of the northern portion was totally destroyed.

Timber truss replacements lasted until 1978 when it was replaced by a prestressed concrete bridge. At the official opening in March of that year, only one cabinet minister was present (they no longer sleep in pairs) but there were two MPs and the chairmen of two county councils. A local big wig, Sir John Acland, cut the ribbon in the presence of several hundred locals.

The original wrought iron girders are still in good condition and will shortly be taken over to the West Coast to span the Taramakau south of Greymouth, not far from where the ladies crossed in the box.

Arundel bridge was designed by a professional engineer but there were at the time several enthusiastic amateurs. Not all of them paid enough attention to hydrology and the prediction of flood levels. Not that that always helps, because the approach to the above-mentioned bridge at Arundel was washed away late last year.



The gravels of the Clutha lured men from the ends of the earth but its turbulent waters were a different matter.

*"How the pioneers must have cursed that river!"* Exclaims Robert Marks in his history of Tuapeka County.

*"A river which even an American would not contemn"* is how Frederick Tuckett, first Surveyor of the Otago Block, described it.

At times of low flow, it displayed its riches for all to gather, and in this bland condition the miners had ample water and power for all their sluicing needs. But even in this condition it offered formidable problems to the traveller, who perforce had to cross and re-cross as he forced his way up its banks.

In flood, even its tributaries are awe-inspiring. The flood of mid-July 1863 converted the Arrow, usually a small stream, into a boiling torrent that swept away a substantial dam, erected by the Hit-or-Miss party.

Overnight the Shotover rose 35 feet, the Clutha 20 feet. Imprudent goldminers camped on or close to their workings all lost their belongings, most of their gold, and some (about 100) their lives.

But the lure of gold kept survivors there.



In 1862 Hartley and Reilly had made their strike just below Cromwell. It was a desolate place to establish a mining community.

There was no timber, both skeleton and fabric of every pioneer settlement. Abundant timber was also needed for making sluices.

Two years earlier, in 1860, George Magnus Hessing with H S Thomson, Manager of West Wanaka Station had propelled a small rowboat, using homemade manuka oars, to the head of the lake and up the Makarora river to inspect the pine forest.

The following year Hessing established a mill in the area, and before the end of the year several other sawyers set up business there. However, only a trickle reached Cromwell and the shortage was so acute that an empty gin case could sell for \$3 (perhaps as much as the contents would fetch in those duty-free days). But Henry Hill was there.

*“He must go down in history as being more enterprising than honest, but it was he who gave the initial fillip to the timber trade on lake and river.”*

He went up the Makarora and bought all the timber that the sawyers had on hand and contracted to buy all their future output. In small rafts it was floated easily down the Makarora. At the head of the lake Hill had the great idea to rebuild into large rafts, each fitted with sweeps for steering, a mast and a large tarpaulin sail.

The prevailing northerly took the rafts to the outlet of the lake. Here lay the problem – the Clutha was not the obliging Makarora. Hill experimented with rafts of differing sizes, both manned and unmanned. His losses were high even though he had retrievers downstream. But enough got through for Hill to do well by it.

When the contracts were nearly finished he withdrew three-quarters of his money, filed his bankruptcy suit and departed for South America. But he had served the community well and probably thought it owed him something.



With some of the first timber brought down he had constructed two punts, one at Muttontown and the other two miles further up where Clyde now stands. He sold the punts to Duncan McPherson but reappeared in the business in July 1863 when the Provincial Government called tenders for all ferries on the Clutha and Manuherikia, based on the following charges :

<i>Each person</i>	<i>1 shilling</i>
<i>Horse alone</i>	<i>1 shilling</i>
<i>Great cattle</i>	<i>1 shilling</i>
<i>Small cattle</i>	<i>4 pence each for less than 20</i>
<i>Small cattle</i>	<i>2 pence each for more than 20</i>
<i>Vehicle</i>	<i>2 shillings</i>
<i>Horse with Vehicle</i>	<i>1 shilling</i>
<i>Bale of wool</i>	<i>1 shilling</i>
<i>Goods</i>	<i>4 pence per 100 pounds</i>
<i>with 50% surcharge from sunset to one hour after sunrise.</i>	
<i>Mail and civil servants on duty were carried free.</i>	

He had been the successful tenderer for all ferries on the Clutha and Manuherikia but because everyone thought the toll charges extortionate, the Government, two months after granting the contract, halved the rates.

Hill claimed that this would cost him \$6000 per annum and he claimed \$4500 compensation. He was paid \$3000 provided he handed over all of his ferry equipment.



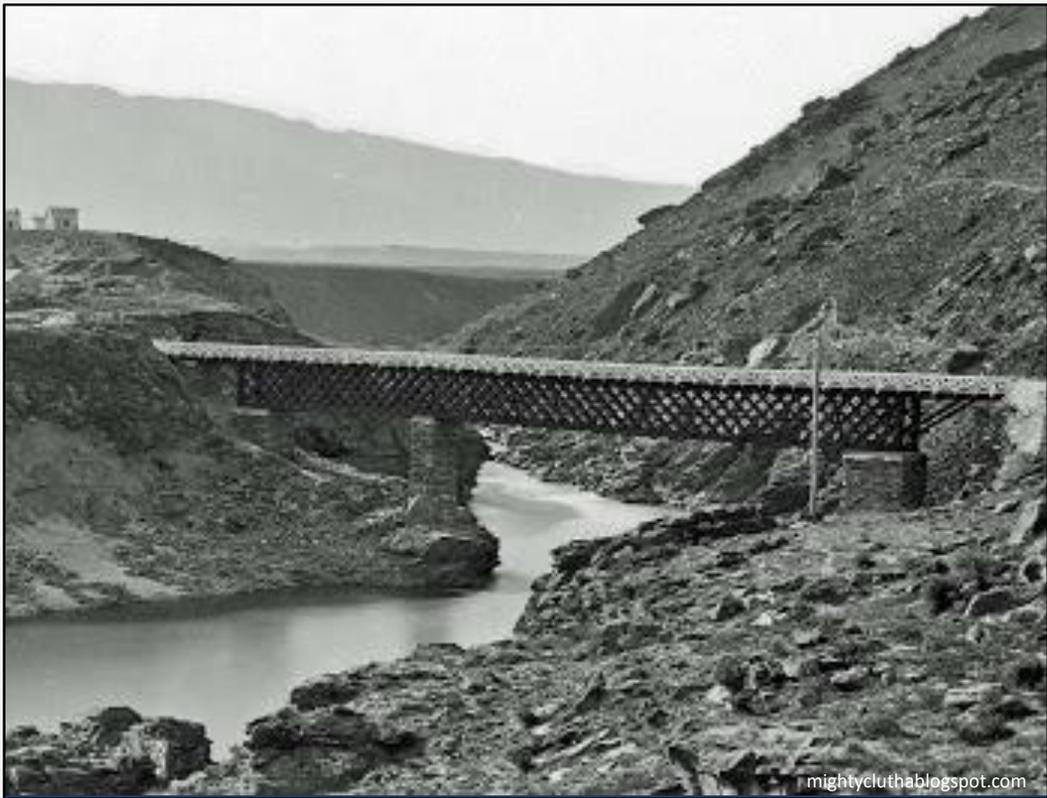
This left him disgruntled, but he still had one string to his bow.

Early in 1863 he had seen the possibilities of a bridge to carry traffic from the east bank into Cromwell. His foot and pack bridge was completed in May 1863 with a toll charge of 1 shilling for animals and 6 pence for persons. It survived the July 1863 flood but succumbed to the one in July 1864.

In that time it had clearly demonstrated its value and the Provincial Government undertook a reconstruction.

It kindled great expectations.

The foundation stone was laid over the case containing a farthing, a halfpenny, a shilling, a half-crown, a half sovereign and a sovereign, together with copies of the *Otago Daily Times*, *Witness*, *Dunstan Times* and *Molyneux Mail*.



It was no sooner completed than the Government decided it was in the wrong place.

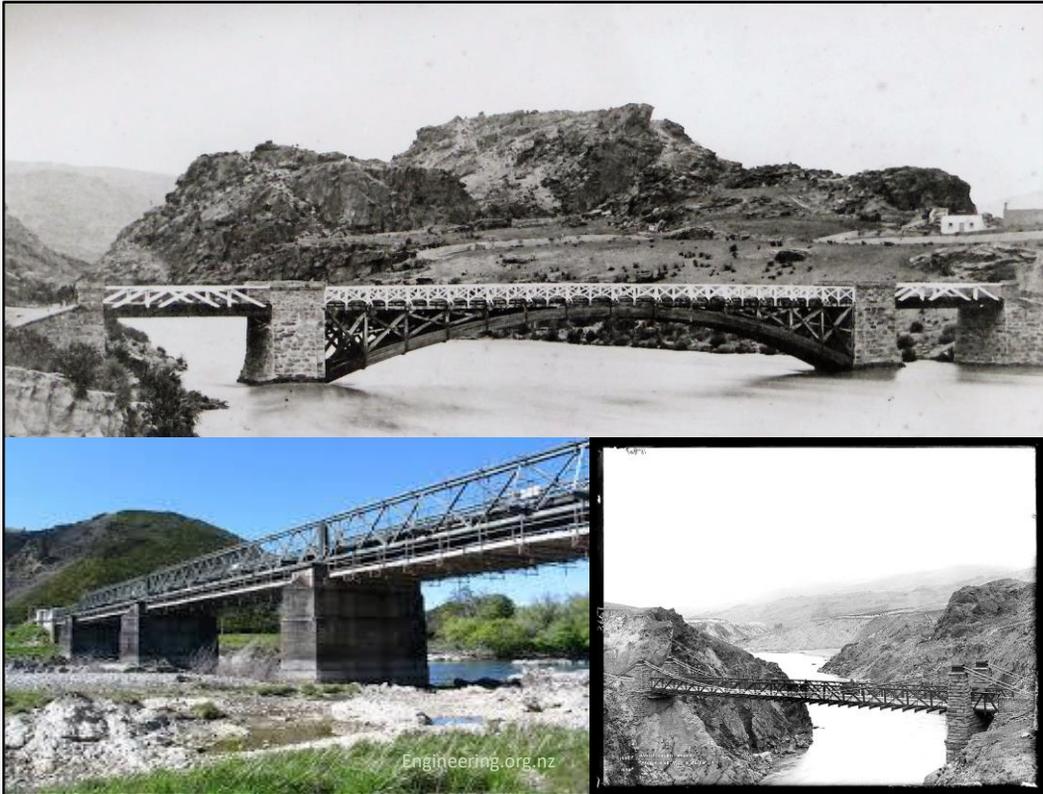
The line of the main road was fixed a little lower down.

Work started in July 1865 on a site occupied by the present bridge.

Construction was slow, but the bridge was opened on 16 January 1866 – not a moment too soon, for the Government bridge shared the fate of its predecessor and was swept away by flood the same month.

The new bridge at the Junction was a Town Lattice bridge, a type that needs protection by a roof and sidings or by continual maintenance. It had none of these, and endless bickering delayed approval of a replacement.

It was called *“that lasting eyesore of provincial neglect and imbecility.”* Not until 1891 was a new bridge completed, 308 feet long and 14 feet wide. There were 1200 people at the opening ceremony. Despite neglected maintenance from time to time, the bridge still stands.



Other bridges on the Clutha have not been so fortunate. Describing the great flood of 1878, Gilkison writes:

*The Shotover river, boiling down in flood to its junction with the Kawarau, stopped the outflow from Lake Wakatipu, and actually flowed into that lake. The Clutha rose thirty-five to forty feet at Cromwell bridge, and all the other tributaries became swollen torrents ... soon all the low-lying lands were submerged and higher parts threatened.*

*Then began the great destruction of bridges. Of the fine structures which the colonists had built with great expense and labour to span its course, only two survived – those at Cromwell and Inchclutha.*

*The great bridges at Beaumont and Roxburgh were submerged and carried off. The beautiful suspension bridge at Clyde for some time resisted the onslaught of the current, even after the water was flowing over its decking, but an accumulation of trees and debris gathered against it and the pressure became so great the wire ropes on the one side gave way.*

*Then, with a great effort the flood pushed its way through and swept the whole structure away. On 29<sup>th</sup> September at 11.30am the wreck was seen passing Alexandra and, later on, the remains of the Clyde and Roxburgh bridges, lovingly linked together, passed Balclutha on their way to the sea.*

The bridge at Balclutha survived this traumatic experience and held its own through the worst of the flood. But the centre pier was undermined and it followed the others about a fortnight later .



The bridge at Bannockburn, two miles up the Kawarau from Cromwell had joined the procession downstream. It deserved a better fate.

It opened in 1874 as a private toll bridge and continued to operate as one despite vigorous opposition led by Vincent Pyke, County Chairman and DA Jolly, Mayor of Cromwell.

Their efforts were rewarded when the Government bought the bridge in February 1878. At a grand re-opening ceremony Vincent Pyke, in a symbolic gesture, hurled a bunch of keys into the river. Little did he realise that the bridge would follow the keys seven months later. Pyke, whose contribution to the well-being of the district was monumental, lost no time in having it replaced.

Pyke was unlucky with another bridge at Rocky Point, on the Clutha just upstream of Cromwell. Hearing of the proposal to erect a private toll bridge there, Pyke arranged for it to be a county bridge instead. John McCormick completed this bridge in the early part of 1878.

In the same flood of September 1878, the river decided to leave it alone. It washed out the approaches then cut a new channel for itself some distance away. High and dry the bridge afforded some satisfaction to the promoters of the toll bridge, who were doubtless responsible for naming it *Pyke's Folly*.



John McCormick built a suspension toll bridge at Nevis Ferry, called Victoria Bridge , further up the Kawarau from Bannockburn.

This was replaced about 1960 with trusses that had been used as centering during construction of hangars at Ohakea. The reconstruction sequence is interesting.

Further up the Kawarau is the Gorge bridge, also built by John McCormick.

This was designed professionally by Harry Higginson who received a prestigious award from the Institution of Civil Engineers in London for his paper describing it.

It was built to last, as this anchorage (inset) will indicate. It has now been replaced, but the old bridge is being maintained as an ancient monument. The replacement involved a similar sequence of operations to that at Victoria Bridge, but more sophisticated.



Even this abbreviated story of the Clutha has perhaps taken more time than we can spare this evening. But it covers a period when bridges were not taken for granted and loomed large in the daily lives of people.

One cannot leave Otago without mentioning the works of one professional, John Turnbull Thomson.

Time does not allow a description of his prodigious work in the survey of Otago. But his bridges are worthy of notice because they lasted – two still operational, the others superseded while still operational.

Born in the North of England and trained as an engineer in Aberdeen, he had a distinguished career as engineer and surveyor to Singapore Harbour Board. He came to New Zealand for his health and took the job as Otago Provincial Surveyor because he was told it was a desk job.

Within three years he had traversed the whole of Otago and Southland, discovering and surveying huge tracts of land.

Using Palmerston as a starting point for many of his surveys, he must have thought it would develop into an urban community, because he built bridges of stone over both arms of the Waianakarua River, south of Herbert. Each bridge still carries the main road to Dunedin.

His suspension bridge over the Mataura River, built in 1868, lasted 71 years before being replaced by one more suitable for modern traffic.

His 1868 bridge at Skippers gave good service although not much more than an access bridge. But considering the access afforded by the road in, it was a notable construction.



The early engineers of Canterbury had their problems spanning the rivers athwart its main lines of communications. The road to the north had to cross the Waimakariri and the Ashley rivers and the early punts and ferries gave a lot of trouble. So did the early bridges.

Ashley was a toll bridge, part of the very much disliked turnpike system. There were riots from time to time to get rid of the tolls. When the toll house was moved from the Carlton to the corner of Harewood and Papanui Roads it was demolished overnight, placed on a bed of straw and destroyed by fire.

The Provincial Government sponsored a competition for the design of a bridge over the Waimakariri. The judge (Colonel Mould RE) had an easy task – there was only one entry, by Henry Whitcombe probably helped by Edward Dobson, Provincial Engineer. The Government reneged on building it, on the grounds of cost, and accepted an offer by William White for a cheaper structure.

When it was completed in 1863 Dobson declared it unfit for traffic because piles had split, bracing was bowed and joists had been made from unsuitable timber. The northern settlers were not impressed and accused Dobson and his assistant for North Canterbury, James Wylde, of professional jealousy. A personal and petty controversy raged until, as if answering a call for judgement from on high, the heavens opened, a flood poured down the Waimakariri, leaving in its wake a sorely strained government-supervised structure by Edward Wright and a completely undamaged White's bridge.

There was no further difficulty about the completion certificate. William White received the gratitude of and a gold watch and chain from the farmers of North Canterbury. The latest bridge has nothing to do with him, but it and the locality are still known as White's Bridge.



Nothing succeeds like success and he received a number of other construction commissions, notably Rakaia bridge which had a chequered history but survived as a combined road and rail bridge until 1939.



About the time he was building that bridge another maverick was building railway stations on the line from Christchurch to Rakaia. He was Joseph Dawson who had come to Christchurch from Tasmania and at the age of 26 became apprenticed as a carpenter to Daniel Reese, first President of the Canterbury Master Builders' Association.

Dawson was a magnificent physical specimen who was for some years champion sculler of New Zealand. He and his brother, with Daniel Reese and his brother joined together as a champion rowing four which won the New Zealand championships.

Dawson's relationship with Reese was not exactly that of apprentice and employer. He married Reese's sister, and ended his apprenticeship after two years, to become a foreman and went south building railway station buildings. He trained himself to be both architect and contractor. He designed and constructed many buildings in East Christchurch, including Ward's brewery in Kilmore Street.

About 1882 he went to the Wairarapa and responded to the challenge of that rugged area by building many bridges and earning himself the title of *the grand old man of Forty-Mile Bush*. He started with a bridge for a farmer at Kopuranga. It had a span of 90 feet and cost only \$100. He gradually perfected a system of building suspension bridges, the details of which are shown at Ashley Clinton where he built two bridges, one of them still in service.



His fame spread and he built Maoribank and Melling bridges over the Hutt river and the two bridges at Upton Downs in Marlborough (south of the Awatere).

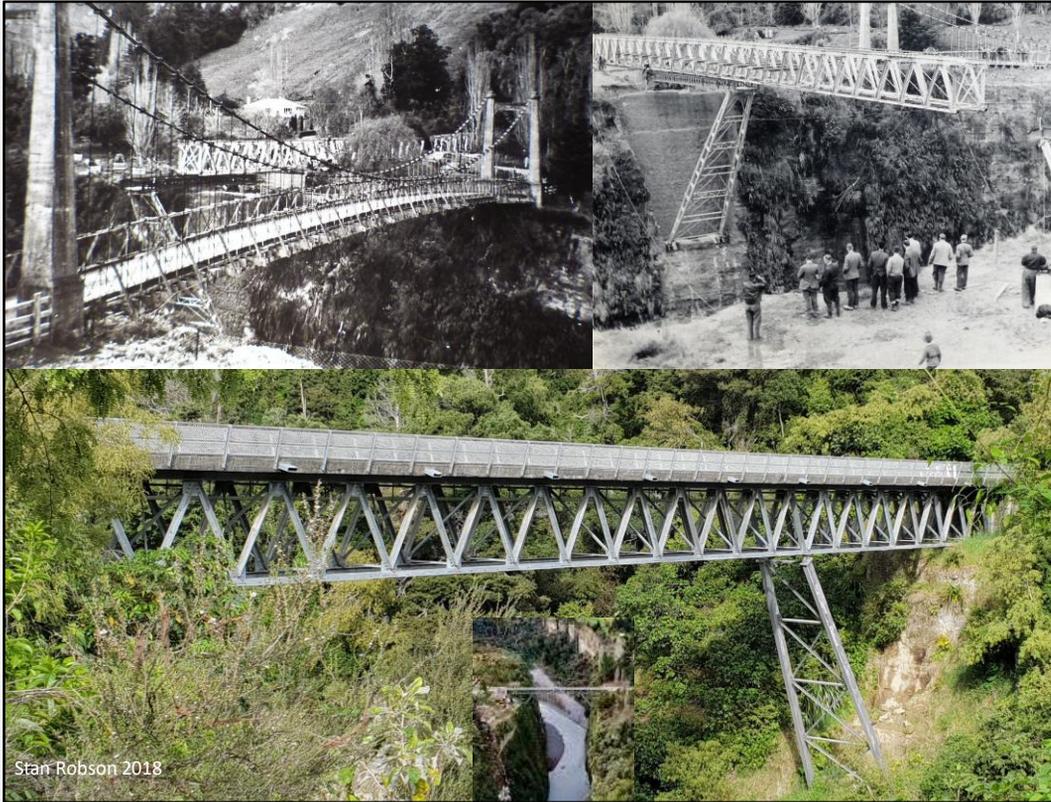


His biggest project was over the Manawatu at Opiki – a main span of 473 feet, with reinforced concrete towers 48 feet high.

A steel tramline was originally laid across it and horse-drawn trucks each weighing three tons were pulled across, bringing flax to the mill.

The bridge was built in 10 months, from March 1917 to January 1918.

When the mill closed in 1919 the bridge was converted to a road bridge and lasted until the National Roads Board replaced it in 1969.



Dawson's bridge at Taoroa was completed in 1914.

It had a span of 253 feet and the deck was 270 feet above the Rangitikei river.

In 1960 a sheep truck weighing twice the legal limit broke through the deck and plunged into the river. A replacement was built using Callender-Hamilton trusses, designed by A M Hamilton, a graduate of Canterbury University College.

These trusses had been used in many countries throughout World War II, being second in popularity to the Bailey bridges. The sequence of operation at Taoroa has military precision.

The cantilever arm dipped seventeen inches before the gap was bridged and there was only one inch to spare when it reached the outstretched arm from the other bank.



The finished bridge has an outline similar to that of Waiau ferry bridge, built by the firm founded by John Anderson, the Scots blacksmith who made good in Christchurch.

(Waiau bridge is an under-strutted cantilever with a continuous lattice deck span of 250 feet.)



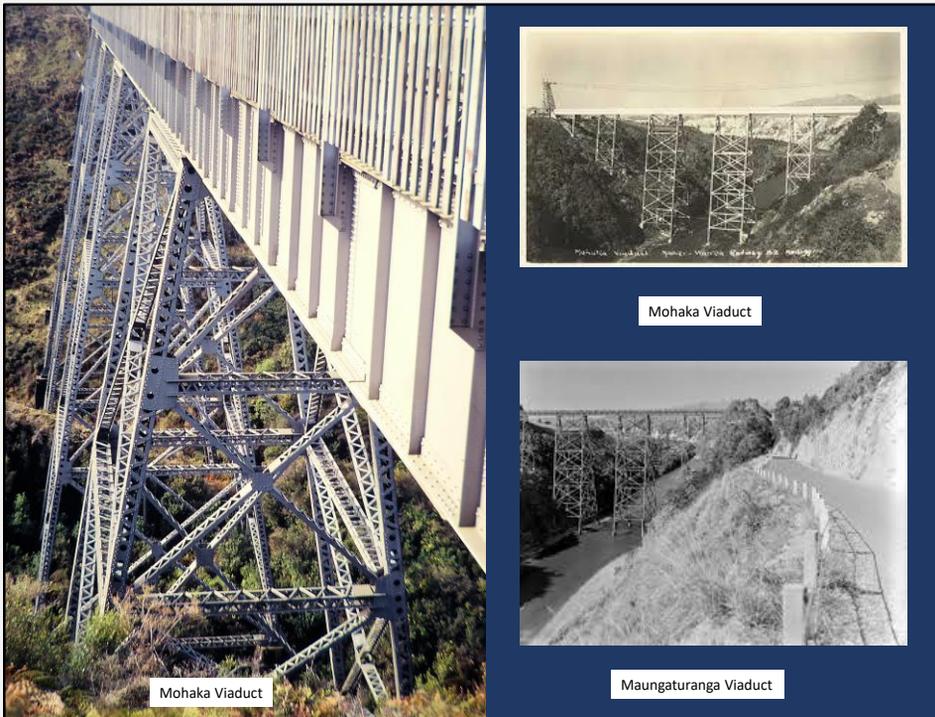
Andersons Ltd built many bridges throughout New Zealand and made a notable contribution to the construction of railway viaducts.

At Makatote (1905-08) they set up a complete structural shop using timber columns from the forest, and the whole of the steelwork was fabricated there, not only for Makatote but for three other viaducts as well. Makatote was a flourishing community for a short while.

H B Anderson, then a young engineer, marked out the steel work in the shops. At full production Andrew Anderson brought his wife and family to live on the job. Mrs Anderson was a wonderful hostess, well remembered by many of the young engineers who worked there or who were travelling through.

Andersons established a reliable routine for erecting steel structures which was followed through the building of the North Island Main Trunk.

Designers, notably P S Hay of the Public Works Department, adopted these types and they knew they could rely on a well-drilled, highly skilled cadre of workmen. They saw no reason to change. Consequently, when the East Coast Main Trunk was built about 30 years later, similar designs were adopted.

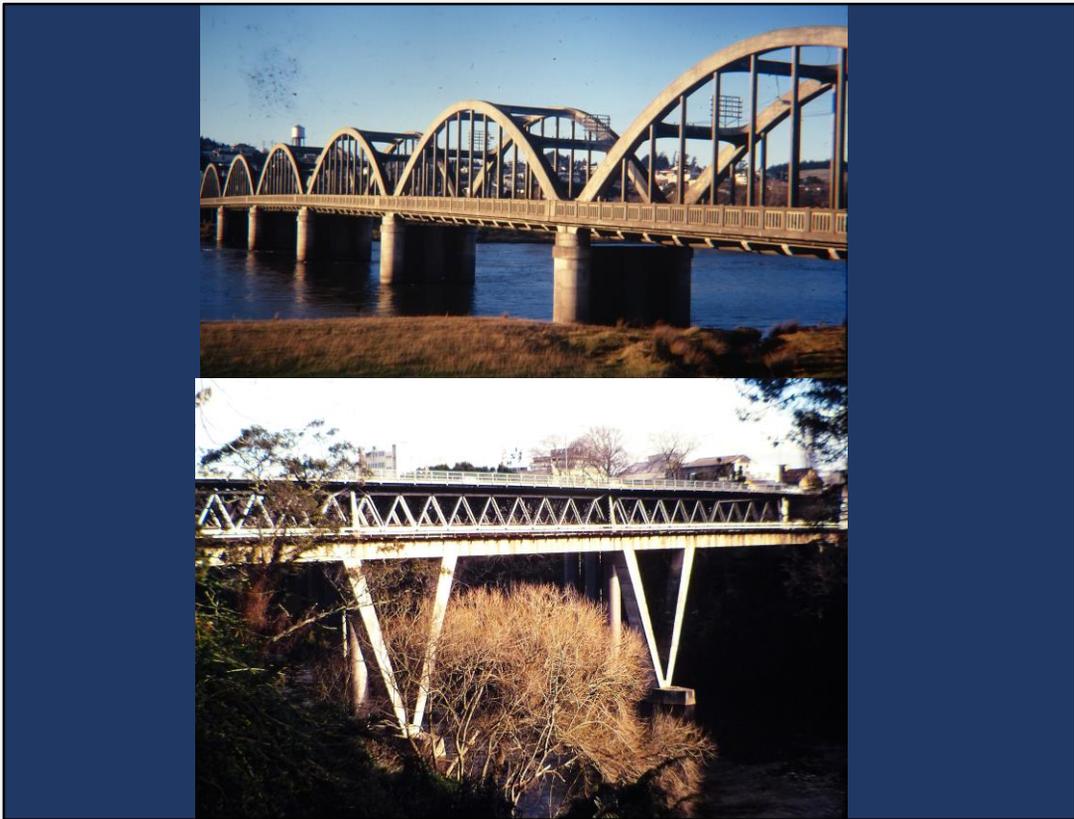


Mohaka was designed by the PWD and constructed by their work force. The sequence is similar to that at Makatote, but they had a real river to contend with.

Just north of Mohaka is a similar viaduct at Maungaturanga , easier to reach and easier to photograph.

These viaducts reflect great credit on designers and constructors but from a maintenance point of view they have a significant disadvantage.

Looking at the underside of the Makatote we see many joints from which moisture must be excluded if deterioration is not to take place . Perhaps the designers have taken too little notice of this factor and paid too much attention to maintaining the work force in an efficient groove.



But the latter were resilient practical men who could adapt themselves to all methods and materials. One of them Mr Tom Robinson, for instance, had worked on Balclutha, a reinforced concrete bowstring bridge of major proportions.

Later he came out of retirement to act in a consulting capacity on the new railway bridge at Hamilton – another reinforced concrete bridge set more than 2- feet lower than its predecessor. This has meant that the railway could be lowered beneath the main road in Hamilton, with great benefit to the flow of traffic.

The old bridge has become a road bridge but does not share its deck with the railway.



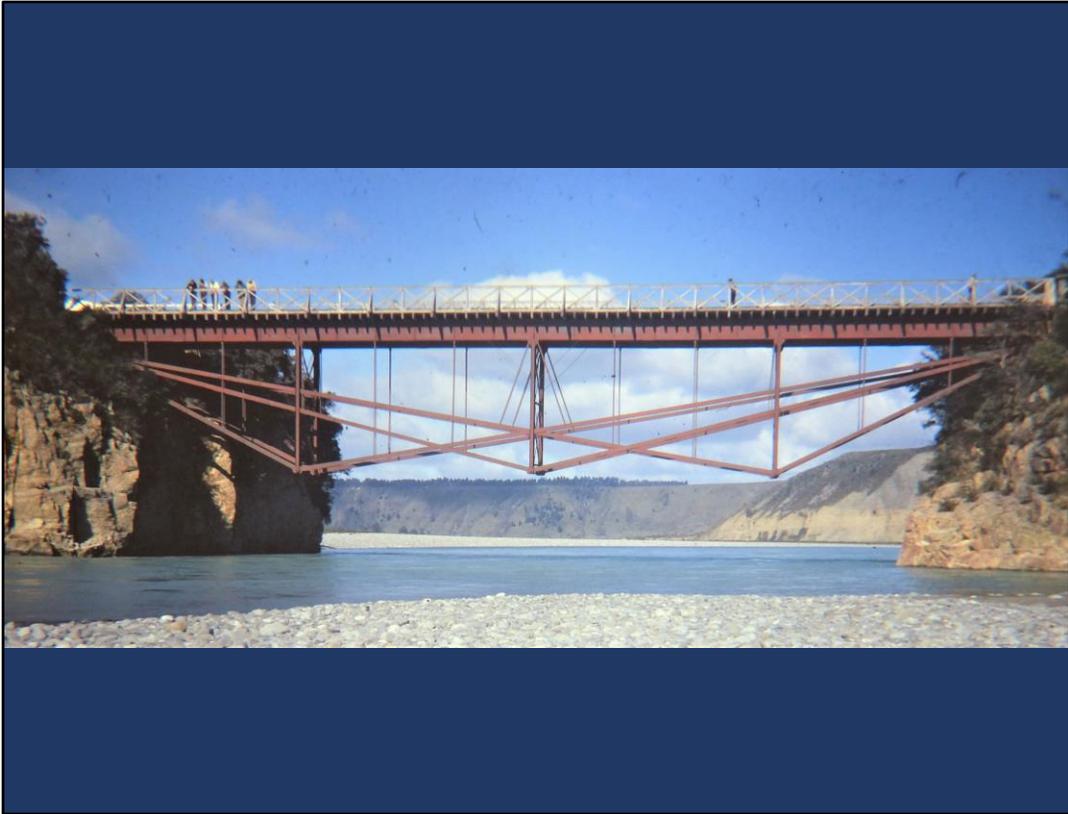
This is in line with modern thinking.

Common deck road and rail bridges are on the way out. Rakaia went in 1939, Waitaki in 1956. Waitaki might never have been a common deck bridge if John Millar's advice had been heeded. But he had run foul of the Town Board of Dunedin when he was their engineer and crossed swords with leading engineers.

Time generally has proved him right, and he certainly had his adherents during his lifetime. The *Otago Daily Times* in January 1864 referred to "*the flagrant incapacity of the Town Board ... Mr Millar, however eccentric, at any rate possesses ability, which is more than can be said for the Board*".

But at Waitaki the combined weight of the top brass, reinforced by overseas opinion, went against him. He wanted 28 spans of 133 feet each with railway on top and road beneath as against the structure built of 110 spans of 33 feet each with a common road-rail deck requiring a man on duty continuously to shut and open gates as and when a train passed through – 80 years of unnecessary labour.

Millar's idea was certainly workable, as those of you who have crossed the Awatere bridge will know.



The Rakaia Gorge bridges were intended to be common deck road-and-rail bridges but the railway was never built.

Before the proposal was scrapped, however, the bridge for the north arm had been ordered and it was erected in 1881.

Because it was designed to take railway traffic it still serves as a highway bridge and hopefully it will continue to do so. It is a Bollman truss, called after its designer, an early Chief Engineer of the Baltimore and Ohio Railroad. There is only one other example still extant. That is in the United States, and it is being preserved as part of their engineering heritage .

The south arm of the bridge was down-graded and built of timber. It was replaced with a well-proportioned reinforced concrete arch in 1944 .



When is a bridge a viaduct?

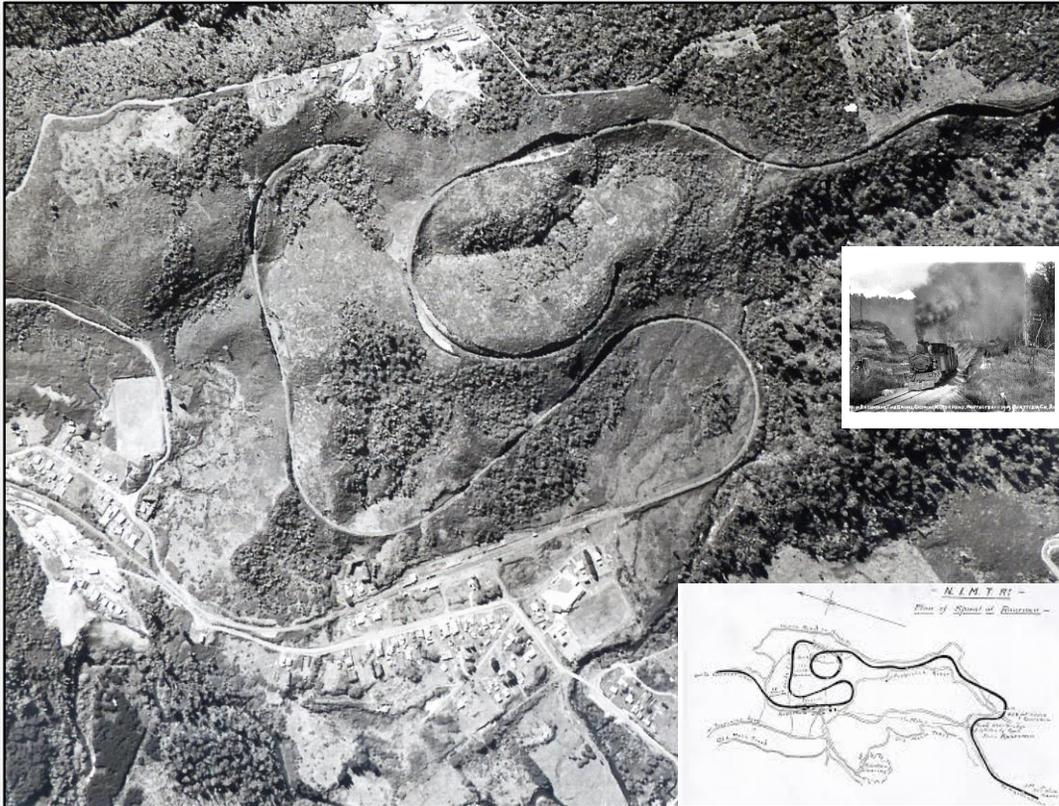
Or vice versa?

The Oxford Dictionary does not help: it defines a viaduct as a *“a long bridge-like structure for carrying a road or railway over a valley or dip in the ground.”*

Mohaka crosses a most pronounced dip in the ground, but I do not regard it as a viaduct. Makatote on the other hand is a viaduct.

The difference is that at Mohaka there is quite a considerable river to be crossed whereas Makatote, Mangaweka and the example shown here of Hapuawhenua carry a railway over a dip with nothing more than cross-drainage to contend with.

But really the question is semantic because a bridge *is* part of a road or railway.



The terrain to be traversed by the North Island Main Trunk dictated the adoption of a number of structures like Hapuawhenua. But it could be argued that the engineers were at their best when they avoided them. There is a classic example.

The route for this railway was a political hot potato.

Wellington – Auckland overland mails had always been routed through New Plymouth, but the engineers favoured the direct route.

Ultimately the problem was solved by a Parliamentary Committee consisting exclusively of all the South Island members who recommended a central route.

There was still an outstanding problem. Everyone knew that the high point was the plateau at National Park, 3000 feet up. From the south the problems were manageable and John Rochfort, surveyor, saw no great difficulty in coming the other way. He proposed a wide sweep and another half-dozen viaducts. But in the detailed stage it was not so easy.

In the end R W Holmes came up with the answer – follow the country up to Raurimu then treble the distance to National Park with a spiral. This gave him a manageable grade of 1 in 50 although some of the curvature was wicked! But it works!



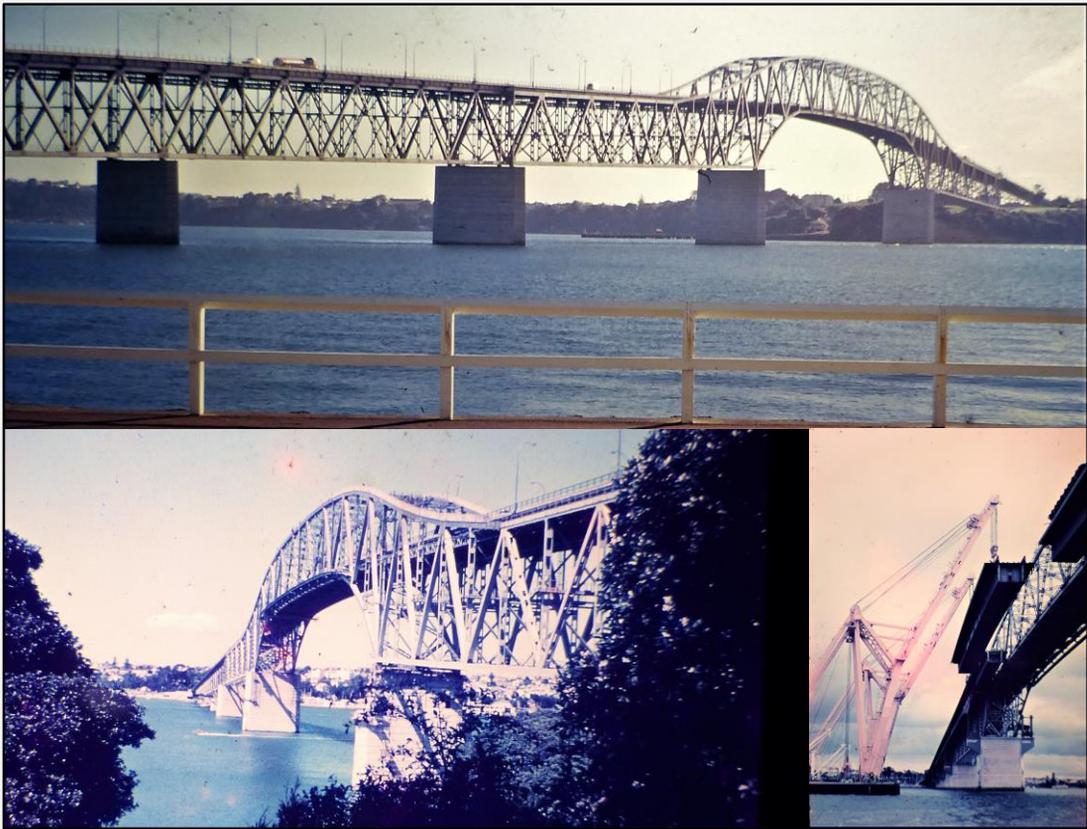
With road traffic today moving at speeds comparable with those of the railway it is necessary to build Hapuawhenua-type structures on the highway.

The Shotover bridge is a good example.

The three-dimensional characteristics of the concrete make it eminently suitable. There is a beauty of form – a sculptural quality about it that renders superfluous the extra embellishment given to the piers.



Mohaka is another fine example of the road-maker's art, where a bridge has been incorporated into a high-speed curve.



At the beginning I referred to man's need to be inspired by the accomplishment of difficult, ennobling tasks.

The North Island Main Trunk was not only difficult and ennobling, but highly beneficial to the community.

No Aucklander needs reassurance about the benefit of Auckland Harbour Bridge, the building of which was a difficult ennobling task that daunted men for more than one hundred years.

Its details will be well-known to you from its opening on 30 May 1959 to the "clip-on" widening of 23 September 1969 .

But as a record of its magnitude we note its length, 1020 metres (3348 feet), main span 245 metres (800 feet), and overall height 64 metres (210 feet) and vertical clearance 42 metres (140 feet).

A great tradition of professionalism was maintained in its construction – the sinking of caissons under compressed air, fabrication of steelwork on temporary jetties, flotation of spans into position and then, in widening, the use of two 250-ton cranes in an impressive erection schedule.

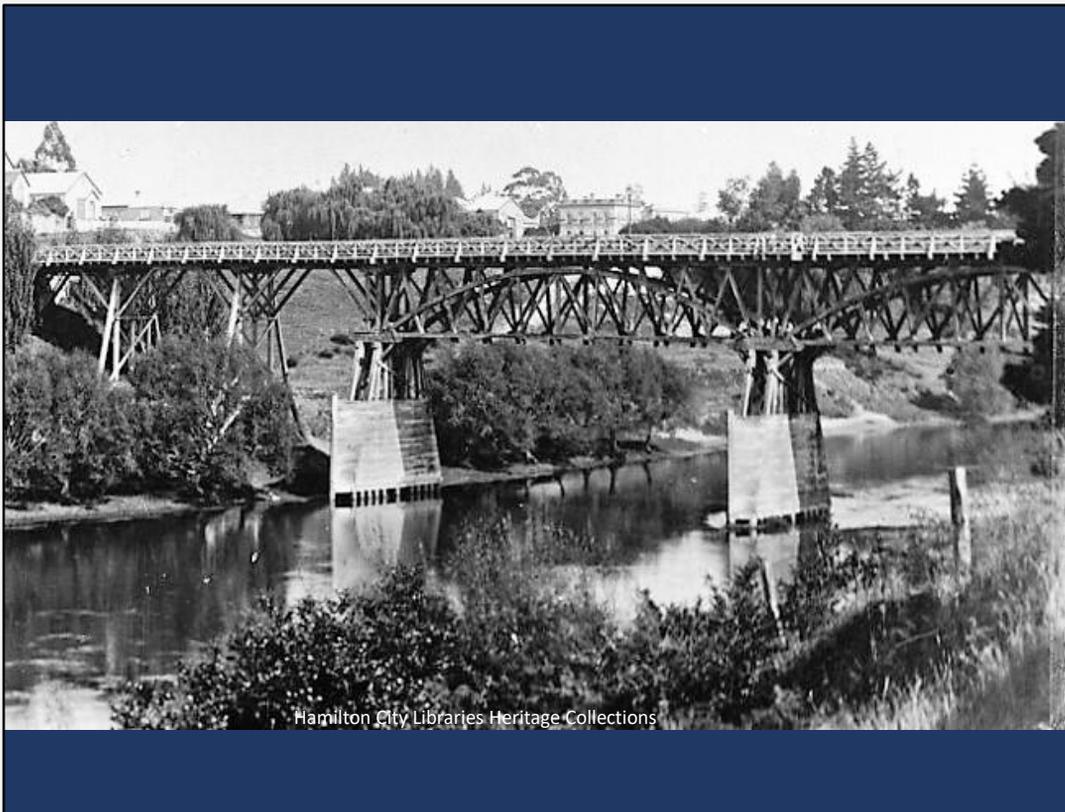


A river divides, a bridge unites.

The twin cities of Buda and Pest lay from time immemorial on opposite banks of the Danube until 1849 when Tierney Clark's suspension bridge tied the cities together in the newly-born Budapest .

The twin townships of East Hamilton and West Hamilton vied with each other on either side of the Waikato, with mutual commerce and communication limited to a punt plying from bank to bank.

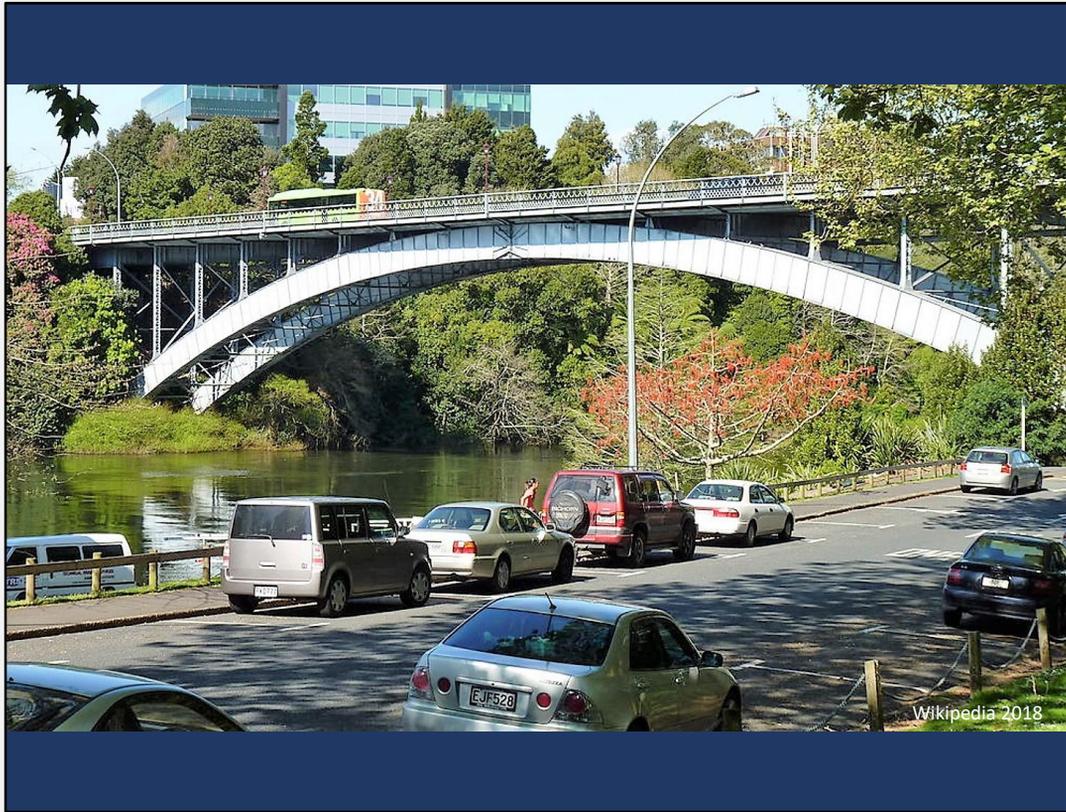
Neither Town Board had money for a bridge, but Sir George Grey promised 3000 pounds if they would combine to form a borough.



So, Hamilton Borough Council was born on February 1878 and this Union Bridge was opened in November 1879 .

The ceremony was attended by a band, mounted soldiers and most of the population. The structure was crowned with a triumphal arch at one end. Hardly had the newly-elected mayor expressed pious hopes about unity, and appropriately named it Union Bridge, than the heavens opened and a sustained thunderstorm drenched everyone present.

For a while unity was more apparent than real but, in the great expansion of the town, conflicts of interest gradually diminished.



This replacement of the first Union Bridge was completed in 1910. It spans 340 feet.

Today Hamilton's five road bridges over the river carry nearly 70,000 vehicles a day.

*(135,000 vehicles per day in 2018 – Hamilton City Council website 2018).*



The word 'environment' conjures up different images to different people.

Many New Zealanders see the unspoilt beauty spots of Nature to which they can travel at high speed without fear and without thought over well-engineered roads and well-constructed bridges.

And why not? This is what engineers are for.

I hope you will continue to do so but *not* without thought.

You have been reminded tonight of some of the harsh faces of Nature and of times when bridges occupied the thoughts of everyone in the community (and doubtless they do today, on the Taieri Plain).

If today in most areas we can take for granted the bland face of Nature, it is because enough men and women cared enough for their own technology to desire to improve it.

They will only continue to do so if they find their technology rewarding.

No danger lies therein – danger lies with all of us if we believe in the self-sufficiency of our own technology and fail to see the viewpoint of others.



If you love the rural environment, well and good.

A reviewer of my book *A Span of Bridges*, in the *Oxford Times* (University of Oxford, not Oxford, Canterbury) coined a phrase that made me envious.

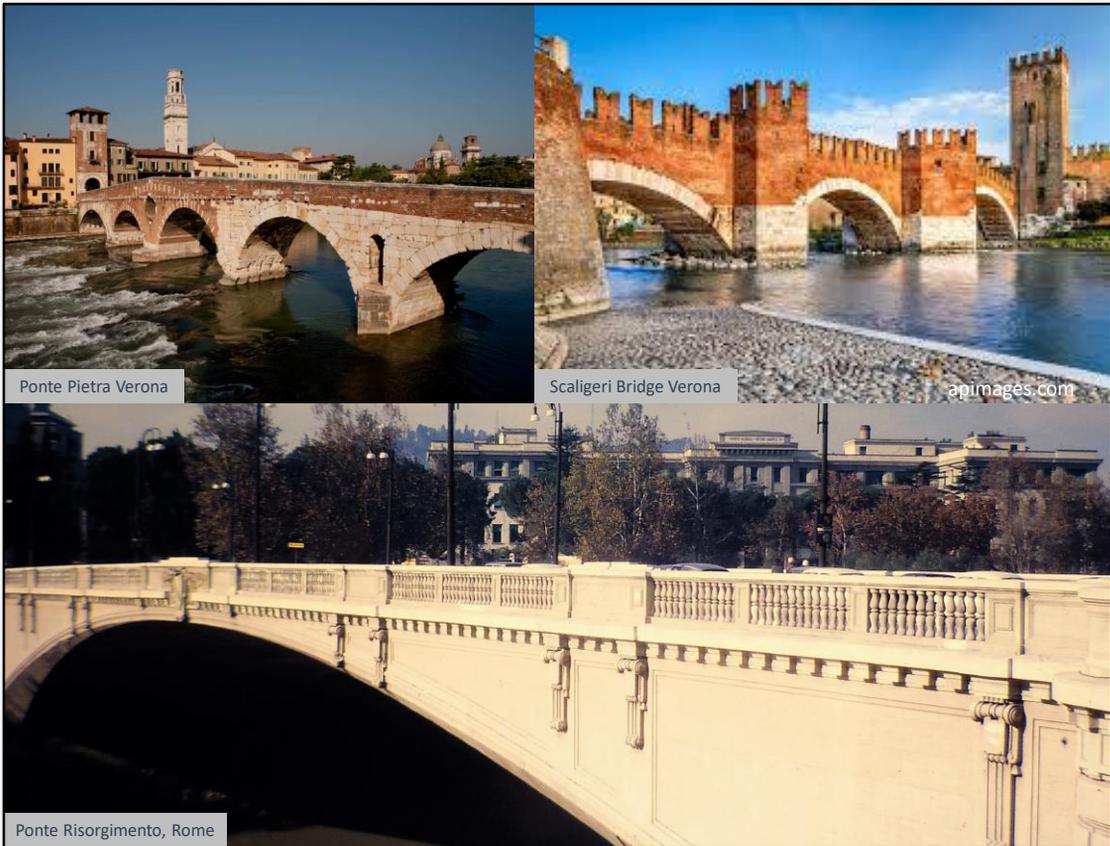
He wrote:

*Bridges that flow out of tree-lined banks do not intrude into the environment, they complete it.*

He must have been looking at this illustration of the bridge at Esbly when he wrote that.

You will only know the truth of that statement by coming down off the highway from time to time to enjoy the sight of the bridge you will not see from above, like Cambridge or Helmores Lane, Christchurch.

But you will only get full enjoyment if you *find* and *recognise* beauty in the works of man quite as much as in the face of Nature.



Ponte Pietra Verona

Scaligeri Bridge Verona

apimages.com

Ponte Risorgimento, Rome

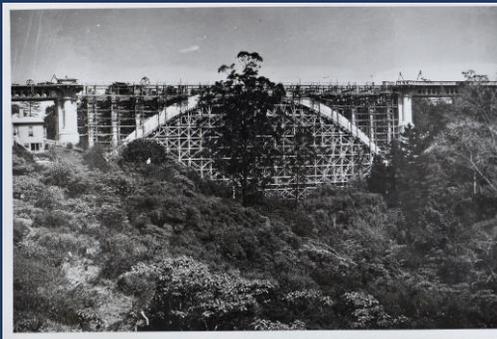
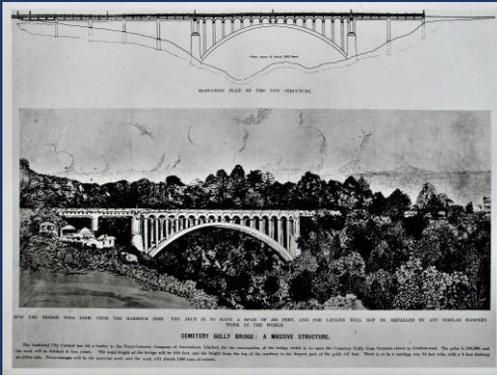
Most of us spend the major part of our lives in an urban environment. May city-dwellers not hope to be inspired by the works around them?

Like the people of Albi, even though we may not yet aspire to the heights reached by the Gentlemen of Verona. Stone by stone they resurrected Ponte Pietra from the Adige and they did the same thing with stone and brick on Scaligeri bridge.

Those who inherit beautiful bridges will build beautiful bridges.

Verona abounds with them, and so does the Tiber at Rome, which makes Ponte Risorgimento almost inevitable. Spanning 100 metres (328 feet), built of reinforced concrete, it was designed by Hennebique and completed in 1911.

Perhaps we will not reach these heights until we too have a tradition of a thousand years or more.



Photos: Auckland Public Library Photograph Collection

And yet .... let us not forget Grafton Bridge in Auckland . Spanning 100 metres (328 feet) built of reinforced concrete it was designed by Hennebique’s firm and was completed in 1910.

At that time it was the longest reinforced concrete arch in the world.

The approach spans were Vierendeel trusses, another pioneer feature.

Unfortunately, they were lacking shear resistance and were made solid in 1938. The strengthening cost 2/3 as much as the original bridge.



This bridge replaced a trestle bridge which was demolished because *“although it afforded an excellent suicide leap for pedestrians it had become unsafe for wheeled traffic.*

*And with the disappearance of the bridge the gully assumed its greatest beauty, because one could walk down (zig-zag) steps through the ferns on one side of the gully and up the steps through the ferns on the other.”*

Until recently it was possible to preserve this feeling but the recent roadworks, while displaying the full beauty of the bridge, has replaced many ferns with a forest of lighting standards.



Perhaps, after all, we shall have to re-examine our European heritage to learn how to preserve the beauty of our works of man.

*Creating beauty* is the first step, .....

*recognising it* is the second .....

and *preserving it* the third - and, it would seem, the most important.

***And not only for bridges.***

***But, of course, you would not expect me to talk about anything else.***



### **Compiler's Note**

- When my father died in 1986 he was writing a book on New Zealand bridges to be titled *A Land of Bridges*. He had done much research and I had retained his material, including over 1000 slides of bridges.
- The University of Canterbury website contains a list of previous Hopkins Lecturers and in many cases a link to the presentation is included.
- It occurred to me that I could attempt to reconstruct my father's presentation so it could be put on the website.
- The text is exactly as the original.
- Wherever possible I used images from his slide collection and the many photos in the material for his book. Other images have been obtained mainly from the internet. The selections are designed to illustrate the points made in the Lecture but may not match what was originally shown as 35mm slides in 1978.
- The final slide of the Lecture is my collage from his slide collection.
- I have added a slide from my own Hopkins Lecture of 2002. It provides some images of my father and our family. It acknowledges the support of IPENZ and the University of Canterbury in setting up the Hopkins Lecture Series and continuing to support it.

Dr David C Hopkins

December 2018

### **Acknowledgements**

Research material for *A Land of Bridges* included many black and white photos which I photographed to produce digital versions. Many of these would have come from the Alexander Turnbull Library whose contribution is acknowledged with thanks. Others showed no source and it has not been possible to attribute them.

The source of images from the internet is included on each image and I am grateful to those who made them available. Although low resolution they are sufficient to illustrate the points made in the text.

### **Further notes:**

The illustration on the title slide picks up on a comment late in the Lecture urging people to think about the effort in making a bridge and the convenience it brings.

The final slide of the Lecture is a collage from Professor Harry Hopkins' slide collection. This gives some indication of his passion for and knowledge of bridges in New Zealand and around the world.



*Each year you organisers strive  
 A Lecture here to contrive  
 Thanks to all of you, friends  
 From city, Ilam and IPENZ  
 For keeping Hopkins' memories alive*

In loving memory of:

Henry James Hopkins  
 11 August 1912 to 9 January 1986

Dorothy Louise (Trott) Hopkins  
 4 March 1914 to 20 November 1984