CHAPTER 5
PRAISE BE TO THE '5 FOOT 3'

And we also consider the LOADING GAUGE and the STRUCTURE GAUGE

I recall in the early 1980s making a few trips between Sydney and Adelaide. The quality of sleep in the roomette compartment of the *Southern Aurora* was less than ordinary. One slept better aboard *The Overland*. It is possible that, being a little sleep-deprived, and having been left weary by a full day in Melbourne, were significant factors. But I was convinced that the extra 6½ inches of gauge gave a much better sleep. In 1995 the Melbourne to Adelaide mainline was converted to standard gauge, and along with it some of *The Overland* cars. I had since travelled aboard the standard-gauge *Overland* and found the ride to be compromised.

In recent years there have been many references in support of the '5 foot 3' being the better gauge. But I accept, a little grudgingly, that the '5 foot 3' has three things working against it. The first is that in any discussion of gauge conversion it is easier to shift a rail in than to shift it out. The second is that the 4 ft 8½ in has become a sort of international standard and the '5 foot 3' is a bit of an oddity in the ranking of the world's railway gauges. The third is that in Australia, the decision was made, soon after federation, that the '4 ft 8½' in would be our national standard gauge and there should be no attempt to change that.

But the '5 foot 3' is showing no signs of going away. Please allow me to have, in this short chapter, a little indulgence in singing the praises of the '5 foot 3'. It has a very interesting story to tell.

But first, we must deal with the subject of loading gauge and structure gauge. They are similar in that they set about to achieve the same thing, but do it differently.

The loading gauge defines how wide and how high a railway carriage or wagon load can be. As a practical example of that, it is a pity that there are no vista dome carriages on the *Indian Pacific*. Admittedly, they would provide little excitement to travellers crossing the Nullarbor but could be quite an attraction when going through the Blue Mountains. But vista dome carriages were not a consideration when they built the tunnels.

One carriage that does need special attention is the 'Prince of Wales' carriage that was built by the Commonwealth Railways in 1920, for use on its own standard gauge route between Port Augusta and Kalgoorlie. With no tunnels or low overhead bridges the carriage was built wide and high, befitting the Royal visitor.

There are no tunnels west of Adelaide and it is common to see trains out west with double stacked containers. There is quite an industry in Adelaide, in rearranging loads of trains arriving in Adelaide from the west. The containers loaded on top have to be removed and stowed in their own wagon. For containers coming from the east and going west, special care is needed to ensure that a loaded container is not stacked above an empty. Keeping the centre of gravity low is important. In the past there were a lot of semi-trailers that were loaded aboard railway flat-tops for the trip west or north.

TOP OF PAGE. The 4.20 pm passenger train out of Adelaide is bound for Tailem Bend and seen here passing through Millswood. December 1964 was near the end of steam on the broad-gauge lines of the South Australian Railways. This is locomotive 524 of the 520 class. **JLW.**

If a railway carriage or load was ‘out of gauge’ it could smash against lineside structures. So lineside structures need to have a gauge that regulates how close they can be to the train.

There has to be a space between the structure gauge and the loading gauge. There is the overthrow and the end-throw of the carriage on a curve (Chapter 2). There needs to be allowance for imperfections of the track which magnify to greater movements at the top of the carriage. But towards the bottom of the carriage the platform needs to be close to the carriage to allow passengers to enter safely.

Narrow-gauge railways have loading and structure gauges that are of smaller dimensions.

There have been situations where it has been proposed to convert 3 ft 6 in railways to standard gauge. Some will work, others not. The line from Peterborough, in South Australia’s mid north, to Quorn is an example of one that could have worked. It was in the late 1960s, when work was underway with construction of the standard-gauge line between Broken Hill and Port Pirie.

This was going to rob Port Pirie of its title of having three railway gauges in the one yard but it would create three-gauge yards where the narrow-gauge lines to Quorn and Wilmington junctioned.

The engineers of the South Australian Railways believed that these narrow-gauge lines could be converted to standard gauge for an amount less than the cost of altering the two junctions.

But the money for these modifications was coming from Canberra and that was where the matter ended. Ron Fitch was SAR Commissioner at the time and has written about this in *Australian Railwayman - from Cadet Engineer to Railways Commissioner*, which was one of three books that he published in his retirement.

The Quorn line had no sharp curves, was mostly through wide open spaces and had no tunnels or overway bridges to bring the standard-gauge loadings crashing down. But we couldn’t do that with the narrow gauge lines in Queensland where the tunnels penetrate the Great Dividing Range.

The three-gauge junctions required the construction of complex trackwork and procedures at Peterborough and Gladstone. Common sense would say that it was a case of ‘one step forward (Port Pirie) and two steps back (Peterborough and Gladstone).

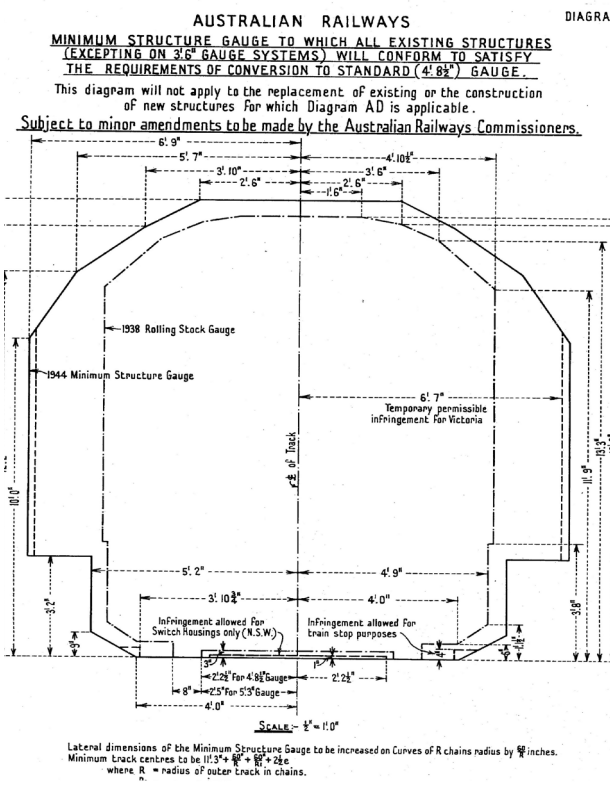
FOUR BROAD-GAUGE SCENES

LOWER LEFT: Melbourne’s Southern Cross Station. The train is a V’locity set. These multiple unit trains provide fast regional services to centres such as Ararat, Ballarat, Bendigo and Geelong. **JLW.**

TOP RIGHT: San Francisco’s BART. Gauge 1676 mm. **JOHN SHIELDS.**

CENTRE RIGHT: At Gawler on Adelaide’s north-south corridor, which is from Gawler Central in the north to Seaford Meadows in the south. The last section was converted to electric in 2022. **JLW.**

BOTTOM RIGHT: Diesel Multiple Unit (DMU) on the Adelaide suburban line to Belair. Photographed at Pinera. **JLW.**



SIR HAROLD CLAPP WAS ONE OF THE GREAT RAILWAY ADMINISTRATORS IN THE STEAM ERA. He gave us the *Spirit of Progress* in 1937 and when war came his administrative talents were applied to the Commonwealth Aircraft Factory and he was duly knighted for his contribution. Towards the close of hostilities he was set a new task by the Chifley Government to plan a grand rail gauge conversion for Australia. Grand it was but not an inch of track was converted because the states couldn't agree. Chapter 20 gives details of this plan and its fate. The plan included a loading and structure gauge that would apply to all broad-gauge and standard-gauge lines.

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For the first 50 years of railways, Europe was the powerhouse of world railways. It exported its rails and locomotives. And unless the colonies or other nations specified otherwise, what England sent them was for the 4 ft 8½ in gauge.

In the decade after Stephenson and his *Rocket* the world became over-run, or so it seemed, with railway experts, who were engaged by companies and governments.

Some of these aspiring railway operators followed the English model of having their railway owned and operated by companies.

The railway experts were thus consulted, and the matter of railway gauge was one of the considerations. There were two choices. Either to go with the Stephenson gauge, or to define their own gauge. The latter generally meant the gauge that their railway expert was touting.

There were some countries that were content to let Britannia rule the waves, but were not going to let Britannia rule the rail. There was an opinion that the English gauge was too narrow.

It is appropriate to look at the times. It was a period that some historians called the *Pax Britannica.* England had emerged from the Napoleonic wars with a powerful navy and military and, by default, had become a sort of global policeman, out of which it was able to freely trade across the globe. This was good for its manufacturing and hence England made rapid progress penetrating world markets with its locomotives and its railway equipment.

The map of Europe was divided into dozens of small kingdoms and principalities that had long existed as far back as The Holy Roman Empire. They were led by Emperors, Grand Dukes and lesser dukes prevailing over a peasant population that had been thrust into the industrial revolution. These feudal rulers sought to have their lands benefit from the new railway invention, if only to enjoy the experience themselves of their own royal railway coach, which in all probability was lavishly finished in gold leaf. The English gauge rapidly became established in Europe

But the 1840s was the decade of railwaymania that was soaking up capital that would otherwise have funded a diversity of enterprises. The railway schemes crashed, one after another .

By 1845 there had emerged the four railway gauges that would represent the circle of influence in Europe and those empires would in turn export those gauges to their colonies. These gauges were:

Stephenson standard gauge, 4 ft 8½ in or 1435 mm.

Tsar 5 ft gauge.

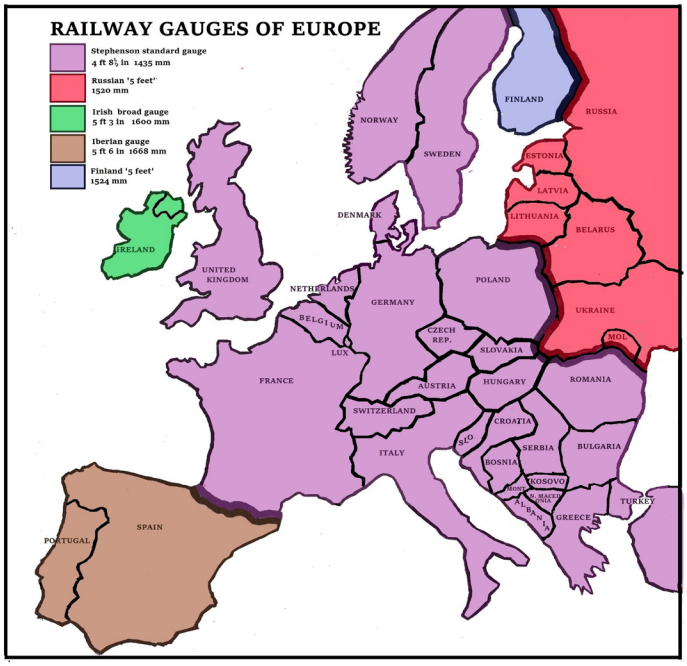
The Irish gauge, 5 ft 3 in (1600 mm).

Spain and Portugal started with the 5 ft 6 in gauge.

The Spanish gauge was originally designated as 6 Catallan feet which was the same as the 5 ft 6 in gauge, but has been redefined to 1668 mm and called the Iberian gauge. The main gauge in use in India, Sri Lanka (Ceylon), Bangladesh, Pakistan, Argentine and Chile is the original 5 ft 6 in gauge (1676 mm). As a result, those colonial outposts now boast themselves as having the widest gauge in the world, with the old home countries a few millimetres behind.

In the next two pages I set out the history of the '5 foot 3' and in so doing acknowledge the contribution of Charles Friel and his son Edward, who have researched this over some years as part of their involvement with the Railway Preservation Society of Ireland (Belfast). The short version is that they have not been able to determine, with certainty, the origin of the '5 foot 3'.

The railway companies in England were operating railways for the benefit of the companies. They were driven by profit. England had developed an unregulated rail industry but there was an increasing awareness that this needed to change. The Irish Railway Commission operated from 1836 to 1838. The driving force behind this was Thomas Drummond, a Scottish-born engineer who, in 1835, had been appointed Irish Under Secretary. He saw railways as a means of achieving economic improvement and moving away from the *laissez faire* towards a manner of operation more in line with the betterment of an impoverished society.



In 1836 the Irish Railway Commission was formed to investigate and recommend the best way forward for Ireland that was yet to build any railways. The gauge was one of the considerations.

It was convened specifically for the purpose of producing the report which was completed in 1838, after which it had no further role.

The Commissioners were:

Thomas Drummond, Professor Peter Barlow, Richard Griffith and Colonel John Fox Burgoyne. Assisting the Commissioners were engineers Charles Blacker Vignoles and John McNeil. It is recorded that Professor Barlow selected the gauge.

In the decade from 1835 to 1845, the new gauges were all wider than Stephenson's. The message that came through very clearly was that Europe was in a hurry and wanted trains that went faster. The wider gauge filled that need. During that decade there was no gauge less than Stephenson's. There are some who do not agree and say that you can go as fast on standard gauge as broad gauge. Well, what happens if you go narrower? I have trouble envisaging trains on a 2 ft 6 in narrow-gauge railway hurtling along at 160 kph.

Belgium was the first jurisdiction where the railway became a government instrumentality and this model was rapidly taken up elsewhere in Europe. Even the Vatican eventually had its own railway but it did not happen until 1934.

Hitherto it has been taught that the Irish arrived at the gauge of 5 ft 3 in by looking at the various gauges and that the average was 5 ft 3 in. That is approximatly so, but if they only considered the gauges then in use in Ireland it comes to 5 ft 4 in.

The 5 ft 3 in gauge, being wider than the 4 ft 8½ in, gives a more stable base and therefore offers advantage for urban systems in that it is possible to have a higher centre of gravity, thus making double-deck carriages possible.

Charles and Edward Friel have been researching the origin of the '5 foot 3' and are reasonably confident that General Sir Charles Pasley was the person who gave us the Irish broad gauge but admit that the 'why and how' are mysteries that may never be solved. It should be noted that whilst there were some on the Irish Railway Commission who were born in Ireland, the body was essentialy English. The recommendation of gauge that emerged from The Irish Railway Commission was to use the 6 ft 2 in.

Richard Roberts was a locomotive designer who wrote to the *Railway Times* and advised that most locomotive engineers favoured a gauge slightly wider than the Stephenson gauge and that even the Stephensons were in agreement with that advice. There was a general opinion that somewhere between 5 ft and 5 ft 6 in was right. John McNeil was the engineer for the Dublin and Drohega Railway and recommended the gauge of 5 ft 2 in, which the company accepted. The D&DR then notified the Ulster Railway. We don't know why the 6 ft 2 in gauge was dropped.

It seems that from there someone or some persons found an extra inch, but as to the who, why, when or how, it remains an unknown. The amazing thing is that they got the gauge right. The general opinion has been that if there was only to be the one railway gauge in the world that it should be the '5 foot 3'.

Charles and Edward Friel have advised that if Vignoles had been asked about gauge he would have advocated the 6 ft 2 in. They have advised that in 1842 the Railway Department of the Board of Trade was granted increased powers. Hence the impression that, regarding the decision to adopt the '5 foot 3', General Sir Charles Pasley had a significant contribution. They have also drawn to our attention that his son, Charles William Pasley was the Colonial Engineer for the Colony of Victoria at the time this was happening.

GAWLER CENTRAL is the northern extremity of the Adelaide Metro and the upgrading of the track was done concurrent with the electrification which was completed in 2022. Gauge adjustable sleepers were installed but note that they are providing for shifting the other rail at the start of the platform. **JLW March 2023.**

In 1972 San Francisco opened its Bay Area Rapid Transit (BART) with a gauge of 1676 mm (5 ft 6 in). Everything about BART was innovative and passenger comfort was an important consideration. Their trains are wide and low, thus minimising the lurching movement of trains with a higher centre of gravity and narrower gauge. It was a radical decision to adopt a gauge other than the 1435 mm that prevails in the US. It has also been said that the carriages are wider and can therefore pack in more people.

We must now turn our attention to South Australia and Victoria and address the question of whether the '5 foot 3' has a future.

In Adelaide the 5 ft 3 in Metro system has evolved into a completely self-contained network and totally given over to moving people in and out of the city. By default Adelaide has evolved into a system with similarities to the BART network. There is continuing extension of the 1600 mm gauge and land has been secured for a major extension south to Aldinga.

In 2002 there were rumblings about the conversion of the Noarlulnga Centre line to standard gauge as part of a deep sea port scheme at Port Stanvac. This would have become a major grain export facility. The scheme would have required the conversion to standard gauge of some of the diesel trains. Under this plan Adelaide Railway Station would have been a two-gauge yard. There was no mention about the other lines of the Metro network being converted. (ARHS *Bulletin* No.782, December 2002). There has been no clear statement by the South Australian Government in recent time. Meanwhile there has been a continuing programme of upgrading the track having all Metro routes with concrete sleepers that are gauge-convertible.

The main north-south corridor has recently been converted to electric traction. It was a process that did not endear itself to commuters as the services on the Gawler Central line were suspended for over a year. An anonymous source from within the Department has advised that there has been no gauge-convertible track work in the Adelaide station, and the points and crossings in the Adelaide station are overdue for replacement.

The source has advised that the time for that to have happened was before the electrification as the stanchions supporting the overhead wires will make the task more difficult. It has been suggested that any gauge conversion will require the demolition of much track. It would be a brave government that foisted another year of slow buses upon the commuters of the northern suburbs of Adelaide. Perhaps that explains the reluctance by the Government to announce a programme of gauge conversion.

My personal opinion is that we should continue with the 'five foot three'. There would be a heavy cost arising from the trackwork and there would also be the cost of converting the bogies of the train sets. The only argument in favour of conversion, that I have heard, is that it would allow the purchase of second hand or 'off the shelf' rolling stock.

Greater Melbourne is in a similar situation and I acknowledge the contribution of John Hearsch of the Rail Futures Institute for providing me with the present state of the network and its direction for the future. The metropolitan lines of Melbourne are all 1600 mm gauge, electric, and mostly with concrete sleepers but there are no convertible sleepers. John Hearsch has advised that in consideration of the size and complexity of the Met, the gauge will remain unchanged 'for all time'. Elsewhere in Victoria the regional lines that are essentially passenger routes, such as Ballarat and Geelong, will continue to operate on the 1600 mm gauge.

The broad-gauge V'locity trains providing passenger services to the regional centres have been an outstanding success and operating at speeds up to 160 kph. This has been possible because Victoria owns both the tracks and the trains. The standard-gauge V'locity trains on the Albury line are restricted to 130 kph, not because of any inherent shortcoming, but that track is the responsibility of the national ARTC.

Brazil is the only place in the world, outside of Ireland and Australia, where the Irish broad gauge exists. There is scant information, written in English, that gives a history of the origin of the '5 foot 3' in Brazil. Its first railway was opened in 1854 and was 5 ft 6 in gauge, which would be logical as Brazil had Portuguese origins. Then, in 1858 a railway was built to the 5 ft 3 in gauge and subsequently the 5 ft 3 in became the mainline gauge. Now it is interesting that Don Hagarty in his history of Sheilds (ARHS *Bulletin,* November 1999) says that Sheilds was in Brazil in 1858 on 'a matter of some importance'. The '5 foot 3' also made an appearance in Norway.

'5 foot 3' or '5 feet 3'? It seems that most dictionaries specify 'feet' as the plural of foot but a few acknowledge the foot as plural when used as a measurement. The thing that settled it was that the annual magazine of the Railway Preservation Society of Ireland is ***Five Foot Three.***

BELOW. A railway gauge. In fact it is a narrow-gauge gauge bar at the National Railway Museum on a section of track that is mixed gauge 3 ft 6 in and 5 ft 3 in. **JLW.**

Adelaide has most of its network with concrete sleeper

To better understand the evolution of these new gauges, with particular reference to the 5 ft 3 in gauge, I have constructed a chronology of events.

1829 Stephenson and his *Rocket*. 4 ft 8½ in.

1832 The Baltimore and Ohio Railroad. 4 ft 8½ in.

1833 Brunel engineer of the Great Western Railway.

1834 Ireland's first railway was the Dublin to Kingstown Railway, 6 miles, 4 ft 8½ in, Charles Blacker Vignoles was the Chief Engineer.

1835 The opening of the London to Birmingham Railway. Robert Stephenson was the engineer. The gauge was 4 ft 8½ in.

1835 Brunel to the Directors of the Great Western Railway in October and nominated the 7 ft gauge. Hitherto everyone seemed to accept that there was only the Stephenson gauge and up to this time there were many railways started in Europe.

1836 The Irish Railway Commission was established.

1837 Francis Webb Sheilds, aged 17 articled to Charles Vignoles.

1838 (1) Opening of first section of the Great Western Railway.

1838 (2) The second and final report of the Irish Railway Commission.

1839 Opening of the first section of the Ulster Railway, 7 miles, 6 ft 2 in gauge.

1841 General Sir Charles Pasley was appointed Inspector General of Railways.

1842 The gauge of the Dublin and Drohega Railway was set at 5 ft 2 in. The engineer was Charles Vignoles.

1843 The Irish nominate the 5 ft 3 in gauge as their national gauge.

1843 Francis Sheilds went to New South Wales to do surveying.

1843 Tsar Nicholas I had trained as an engineer and had a vision of a great Russian empire held together by railways. He had engaged the American engineer, Major George Washington Whistler who had advised the 5 ft gauge. That gauge had been used for the Charleston to Hamburg Railway in South Carolina, opened in 1833. It was the first railway in the Southern states in America. The 5 ft gauge became the dominant gauge in the American south before the Civil war. Those lines were converted to standard gauge after the war. Tsar Nicholas I saw advantage in having his railway to a different gauge as it would be a defence against an invading army.

An interesting fact about Whistler is that he was the father of the painter, James Whistler.

1844 The opening of the Dublin and Drogheda Railway.

1844 Spain chooses its gauge (which would be the origin of the 5 ft 6 in gauge).

THE MAP THAT HAS BEEN ADAPTED IS FROM *RAILWAY WONDERS OF THE WORLD.* The first Irish railway was the Kingstown Railway, 4 ft 8½ in, shown in red. The Dublin and Drogheda was planned as 5 ft 2 in and is shown as green. The Ulster railway was built as 6 ft 2 in and is shown as blue.This map shows the full length of the Ulster Railway. Only the first 7miles was completed in 1839.

1845 Cobden moves in the House of Commons regarding the railway gauge.

1846 Railway Regulation (Gauge) Act which prescribed the 4 ft 8½ in for England and 5 ft 3 in for Ireland. The Great Western Railway could continue to operate its (7 ft) broad gauge but would eventually be converted.

1846 Gladstone wrote to the colonies recommending that the colonies put regulations in place. This directive has been stated by some who have written on the subject that it related to gauges. It did not.

1847 The great famine of Ireland.

1848 A year of turmoil in Europe, and the end to railway mania.

1849 Francis Webb Sheilds appointed to Sydney Railway Company (SRC).

1850 Sheilds advises SRC he prefers a wider gauge, possibly 5 ft 6 in.

1850 SRC agrees to 5 ft 3 in.

1852 (or ? 1853) South Australia, first use of Irish gauge track outside of Ireland. (Goolwa to Port Elliot).

1854 5 ft 3 in Melbourne.

1854 Brazil uses the 5 ft 6 in which was consistent with its Portuguese origins.

1857 John Whitton, the new Engineer-in-Chief of NSW, recommended the Sydney railway be converted to 5 ft 3 in and all other lines in NSW be built to 5 ft 3 in.

1858 Sheilds in Brazil. In the same year the 5 ft 3 in gauge appeared in Brazil.

1862 Norway uses the 5 ft 3 in gauge.

Norway appears to have been the last county to embrace the '5 foot 3'.