LOCOMOTIVE DEVELOPMENT IN QUEENSLAND

An overview of the development of Queensland Railways' locomotives

John Armstrong

1. An Introductory Background

Before talking of its locomotives, it is worth knowing where Queensland has stood in the development of the 3 feet 6 inch medium gauge railways.

The first true 3ft 6in railways were built in Norway and predated Queensland's by a few years. However, as the Norwegians later converted theirs to standard gauge the QR has the distinction of being the oldest continuously operated 3ft 6in railway in the world. In the nineteenth century, locomotive developments were pioneered in Queensland, such as the first 3ft 6in tender locomotives, the first double boiler locomotives, the first British built 2-6-0 and possibly 4-6-0 locomotives. Sharper curves and fewer earthworks showed how capital costs could be reduced particularly in hilly country.

The first railway, the Southern & Western, was constructed for pastoral interests from Ipswich to Dalby with a branch to Warwick. Its first locomotives built in 1864 came from Bristol and were built to the specification of Sir Charles Fox & Son, a British firm appointed to supply railway equipment. Fox had become interested in the narrow gauge lines being built in Norway. So too had Robert Fairlie who wanted to promote his patent double boiler locomotives. Both were acquainted with Charles Abraham Pihl, the builder of the Norwegian 3ft 6in lines.

George Stephenson is called the father of the steam locomotive. Pihl should be called the father of the 3ft 6in gauge. It was through Pihl's work that the advantages of the gauge were recognised. He got his first locomotives from Robert Stephenson. But, it seems Stephenson did not heed suggestions, and insisted on using a long rigid wheelbase that circumvented an advantage the 3ft 6in gauge had of being able to employ sharper curves. When Pihl was constructing a line using such sharper curves he turned to Slaughter Gruning (Avonside) of Bristol to build a more suitable locomotive. It was a tank engine that incorporated a swinging pony truck invented by Levi Bissel. The next four locomotives built by Slaughter Gruning were for the S & W Railway. These engines were built to the same specification, but had 4 wheel tenders and cab roofs instead of side tanks and spectacle plates.

Political pressure soon resulted in a second railway being built in Queensland. If Ipswich had a line, Rockhampton wanted one, too. So a railway was built west towards Emerald Downs in 1867. That year Depression and failure of a major bank put the Colony's Treasury in dire straits. A reward was offered for discovery of gold and James Nash claimed it for his findings at Gympie. Within a decade, pressure for railways was coming from mining as well as pastoral

interests. By the 1880s several separate railways were in operation including Maryborough to Gympie, North Bundaberg to Mount Perry, and Townsville towards the Ravenswood and Charters Towers goldfields. Brisbane and Ipswich were connected. Eventually separate railways were built from no fewer than ten ports - Brisbane, Maryborough, Bundaberg, Rockhampton, Mackay, Bowen, Townsville, Cairns, Cooktown and Normanton. The S & W, Maryborough and Bundaberg Railways were connected to form the Southern Division in 1891. Construction began from Gladstone to link them with the Central Railway system. Rockhampton was joined in 1903 but it was not until December 1924 that the North Coast Line linked the remaining lines except Cooktown and Normanton.

These isolated railways had a distinctive effect on early locomotive development as they hastened the early adoption of locally designed locomotives using technology from both Britain and America. Important factors in the first two decades were (a) The railways were under the direction of Civil Engineers, and (b) they relied on overseas designers and builders. There was a Chief Engineer of the southern railways and a Chief Engineer for the Central and Northern lines. Each had Locomotive Foremen and Superintendents, but there was no Locomotive Engineer until 1883. Henry Horniblow, who became the first appointee was junior to the civil engineers and even after his status was raised, he controlled stock only on the S & W Railway at first.

The reliance on Fox and Company to make specifications and supply stock had a disastrous sequel within four years of their appointment.

The second batch of locomotives, the "B" class had came from Neilson & Co of Glasgow. Like the "A" class, these small engines were not expected to haul much up the ranges to Toowoomba. So an innovation was tried. Robert Fairlie was pushing sales of his patent double boiler locomotives for mountain railways. Fox and Son decided this type of engine would be ideal and three were ordered from Cross & Co. Unfortunately, Fairlie had fallen out with Cross. So Charles Douglas Fox, Sir Charles' son, prepared a design for a 12 wheel Fairlie style locomotive with sufficient modifications to circumvent the patents. The builder then interfered with the design as well and, to cut a long story short, they were abject failures. Only one was erected on arrival and its testing, particularly on the Little Liverpool range was such a disaster that the other two were never even unpacked.

Their failure was reported in the British engineering press. Fairlie, fearing repercussions, refuted any claim they were Double Fairlies, and defended his patent principles. Fox and Company lost face and Fairlie began a liaison with Queensland. He later purchased the Cross locomotives for return to England for rebuilding, and eventually sold the S & W one of his own patent engines. Coincidentally, it was an engine ordered by Pihl, but the Norwegian had refused delivery because it was far heavier than specified. So Fairlie fitted it with smaller tanks and an open cab, and put it on trial in Queensland in 1876. It was more successful and the Queensland government bought it. But no others were acquired. Fairlie did get extra business, but it was in the form of

conventional locomotives. It was reported that Horniblow designed three of the locomotives that Fairlie arranged for the Avonside Engine Company to build.

Meantime, the "C" class or B11 2-6-0 engines introduced in 1867 had been more successful and become the type on which further Queensland development was being based. The four "C" class engines were the first "Moguls" built in Britain. The firms of Dubs and Kitson supplied almost identical but slightly larger "D" and "E" class engines. They had small boilers and open cabs, so they pose an interesting challenge to anyone wishing to model them in the smaller scales. But they are ideal little units for live steam model engineers.

In the 1870s there was some divergence of opinion about the type of locomotives and stock needed. Horniblow, Henry Stanley the Chief Engineer, and Robert Ballard the engineer of the Central and Northern Railways did not always agree. In one breath Stanley advocated articulated locomotives and in the next tiny tank engines. Ballard favoured extremely low 4-ton axleloads for developmental lines – even the use of 2 feet gauge - and powerful American engines for established railways. His concern about axleloads is interesting. It was not until 1878, just as plans for the Northern Railway were being prepared that Queensland workshops had any means of weighing locomotives at all!

Following a visit by a sales representative from the Baldwin Locomotive Company seeking a market in the South Pacific, Baldwin products were bought for the S & W and Ballard advocated more American engines for the north. At first, it had been the practice to run only mixed trains. Ballard favoured running passenger and goods trains separately, and wanted engines accordingly.

What did Horniblow think of this? At an inquiry into railway workshops in 1879, he stated that although Chief Engineer Stanley did consult him on locomotive matters he had no official dealing with the Bundaberg, Maryborough and northern railways. So, little 4D9 tank engines were imported from Dubs for Stanley's Bundaberg Railway and 4-4-0 passenger and 2-6-0 goods engines from Baldwin for Ballard's Northern Railway. The first locomotives used on the CR were similar to those on the S & W, but Ballard introduced larger American "Consolidation" engines there, too.

2-4-2T

2. Classification and Numbering

The S & W first used letters to class the locomotives. "A" to "G" was used, but not systematically eg some engines were simply given names such as "Small Consolidation" etc. After 1889 letter "A" was used to represent 4 coupled wheels, "B" six, "C" eight, and "D" tank engines. Numerals were added behind the letter to indicate the locomotive's cylinder diameter in inches. Tank engines had the number of driving axles added in front, so they became 4D10, 6D13, 8D15 etc. Locomotives and rolling stock was renumbered at this time into a Statewide system. Letters were introduced to classify wagons, too.

3. Nineteenth Century British style Models and Modelling

Twelve "B" class A10 Neilson 0-4-2 engines with Bridges Adams' patent sliding radial bogie were obtained from Glasgow and another was purchased from contractors. They were the first locomotives to which Neilson & Co ever fitted a radial axlebox. Two of these locomotives have survived, having been kept as part of our railway heritage. No. 6 is the oldest operating steam loco in the southern hemisphere, and the oldest operating 3ft 6in locomotive in the world. For anyone wanting to model No 6 in its original form, it is possible to use contemporary photographs, as with three main exceptions it is almost in its original condition. The exceptions are that it now has Westinghouse brakes, a plain instead of a balloon chimney and it is now painted maroon. When it was donated by its owner, Robert Gibson of Bingera sugar mill for the QGR centenary it was planned to restore it in Caledonian Railway blue, because the Caledonian ran near Neilson's works. But it became sky blue then maroon in a subsequent restorations. The original colours of these and other early locomotives are not known, but I would be absolutely amazed if any of them was ever painted maroon. No. 6 ran for most of its working life on Bingera tramways painted green.

To model any Queensland government train in the period before 1888, you should omit air brake pumps, reservoirs, pipes and hose bags. Air and vacuum brakes were tried on locomotives in the late 1870s but no Queensland train had air brakes before 1888. In fact it was decided in 1887 to adopt vacuum brakes. The Westinghouse Brake Company soon pressed claims, comparative tests were made, and air brakes were subsequently adopted. Coaches in the SD were fitted with oil lamps at first, then Pintch's gas lighting until after 1910 when Commissioner Thallon decided to change to electric. It took a number of years to convert them. Electric lighting for locomotives did not come along until 1913. Four 4 wheel brake vans were common before World War 1 and six wheeled coaches and wagons were used, the last 6-wheelers being eliminated in 1914.

Another prominent feature of Queensland engines, the cowcatcher, arrived with the Baldwin locomotives, but other engines were being fitted by about 1879. For modellers using fine scale couplers, three and four link couplings were used before the screw coupling was adopted. Initially wood was burnt as fuel and the first engines had tapered or balloon stacks. Most locomotives of the 1870s and up to about 1883 had diamond stacks. Coke was tried on the S & W in 1867 and coal there within three years.

The first locos had 4 wheel tenders, but 6 wheel tenders were supplied in 1877 with Fairlie's B12 engines from Avonside. Other B12s were fitted retrospectively. The Baldwin engines introduced an 8 wheel bogie tender to Queensland in 1879, and bogie tenders were adopted thereafter.

4. Nineteenth Century American Locomotives and other Developments

Three small 4-4-0s were obtained from Baldwin in 1877. One went to the CR. Ballard subsequently obtained Baldwin engines for his Northern line. He ordered two quite tiny 4-4-0s, a pair of "Moguls", and two C13 "Consolidations"

The latter were premature and they were sent to the S & W in 1879 where they made an interesting comparison with British style locomotives and a larger C15 Baldwin 2-8-0 there. Bigger C16 Baldwins were obtained for the CR as construction neared the Drummond range

Most successful of the Baldwin engines was a larger "American Passenger" type imported in 1882 and later. This A12 class was fitted with 48 inch instead of 37 inch driving wheels and it successfully handled most passenger services in the south of the State for 25 years. Eighteen were imported and 25 were built locally making them the biggest fleet of American style 4-4-0s in Australia. So here was the interesting development of British and American locomotives working side by side. Apart from 1901 when Nisbet introduced his very British 6D16 tank engines, a blend of the most suitable features from Britain and USA were henceforth used in Queensland steam locomotives.

The last example of a purely American style engine emerged in 1894 when eight A14 4-4-0 engines were built locally. They were basically enlarged A12s with 51-inch (1296mm) driving wheels and higher pressure boilers that gave them almost twice the haulage capacity.

Ipswich workshops had built six locomotives from spare parts in the late 1870s. Amidst much rail expansion next decade the government decided it was time to support local industry and in the late 1880s locomotive engineering companies were established at Brisbane, Ipswich, Toowoomba, and Maryborough.

In 1883 when Horniblow was promoted to Locomotive Engineer, his influence was limited initially to supervising a drawing office and rollingstock matters on the S & W Railway. Repair facilities at Ipswich were becoming inadequate as rail construction continued. Carriage and wagon repair shops were improved but locomotive repair facilities were not. New larger engines were being developed, but a regular boiler inspection code was not adopted. Reduction of shops personnel in 1890 and the big flood of 1893 increased a backlog of repairs. Matters came to a head in 1898 when the boilers of two locomotives exploded at Roma Street. Horniblow, although mainly exonerated in the subsequent Inquiry, acted as scapegoat for Commissioner Gray and maybe the government that had failed to fund new facilities. But when William H. Nisbet of the North British Railway was appointed to the new position of Chief Mechanical Engineer, Horniblow was retained as his Assistant. The important result of all this was that a new locomotive workshops was erected at Ipswich.

5. Ten-Wheelers.

The first type of locomotive used Statewide was the "F" or B13 class ten-wheeler of 1883. It was a mixed traffic engine and was the most successful of the nineteenth century British built locomotives. A significant development occurred at this time due to a change from Newcastle to local higher ash coals. It forced a look at better firebox design. Trials were made with level grates and engines with slightly deeper fireboxes were ordered. Adoption of extended smokeboxes soon followed. In Rockhampton some B13s were fitted with rocking grates – sixty years before some English locomotives did. The success

of the changes ushered in an era of 4-6-0 engines that lasted until the end of the steam days, the last example being the 1924 or Walschaert's valve gear type PB15. "P" meant 'Passenger' and was used to distinguish them and the earlier Passenger B15s from the B15 Goods engines introduced in 1889.

Although twenty-five B15 engines were imported, the other 73 engines of this type were built locally. Amongst them were 30 from Walkers Limited, the first of which can be seen today at Maryborough station. The B15 used American balance slide valve cylinders and a mix of components that at the time of introduction put them up with contemporary British and U.S. practice.

The most successful 19th century design was the versatile PB15 class, Horniblow's crowning achievement, though he was involved with the bigger C16s built later and the B17 that was designed just before his death. However, Queensland was starting to slip behind in the matter of locomotive size. Robert Gray in his report in 1898 mentioned the trend to use of larger and more powerful locomotives and noted that such engines were in use in New Zealand, Western Australia and on the Cape railways. He urged careful consideration be given to locomotive design, pointing out that track and bridges would have to be strengthened to enable bigger locomotives to operate. Despite Gray's words of wisdom, the economic reality was that such funds were not available.

The Passenger B15's or PB15s weighed only 57 tonnes and were a logical development of the B13 and B15 Goods engines. They were successful from the time the first one was completed in 1899 and were built for several years. Updated versions with Walschaert's valve gear and bigger tenders were built in 1925-6 for existing light lines. At first, PB15's were employed on important passenger trains, but as many remained in service until the end of regular steam in December 1969, they were used on everything from mail trains to shunting duties! Altogether 202 PB15 and 30 Walschaerts or 1924 PB15 were built. Two Stephenson and two 1924 PB15s have been preserved.

After a few years in service, the B15 Goods engines were giving trouble slipping, and breaking rails so when they came up for boiler replacement it was decided to alter them. Their tractive effort was too high for their adhesive weight and their 3 feet (914mm) driving wheels were too small for anything other than slow goods trains. They were fitted with larger 3ft 9in (1143mm) wheels and boilers of higher pressure. Ninety-three were altered most between 1905 and 1916. They then became known as the B15 Converted class and looked very much like slightly scaled down PB15 locomotives. But they hauled slightly bigger loads. The B13's were also rebuilt to two different designs, Nisbet's less successful Wide firebox type, and Nutt's better Deep firebox type. But essentially they were already of secondary value.

The need to haul bigger loads eventually did lead to strengthening track and bridges. The next Ten-Wheeler, the B17 class was built in 1911 to haul the new Sydney Mail to the new 12 ton axleload standard adopted for main lines. Apart from the first C18, they represent the biggest of the QGR saturated

steam locomotives. Their boilers were well proportioned and steamed well, but had a large appetite for coal and water. They had Walschaert's valve gear, separate regulator and steam domes and a big gap between their centre and rear coupled wheels to accommodate a long narrow firebox.

6. The Eight coupled Mastadons

"Mastadon" was a term used to describe George Nutt's C16 4-8-0 in 1904. This was the first 8 coupled 8 ton axleload locomotive built in Queensland. Nutt took over from Nisbet when he resigned. and seems to have had a much more practical approach than the flamboyant Nisbet. He built only one for trial, the first engine completed at the new Workshops at Ipswich. Lined out, it was a handsome looking machine. Production models did not come on stream until 1907 when track and bridge upgrading had progressed further. The prototype C16 was short of steam so Horniblow designed it a slightly larger boiler. The extra power of the C16 made it an obvious selection to haul the Sydney Mail until the B17s came along, but it was essentially intended for livestock traffic. However, three were specially painted for the Mail – .427 chocolate, 428 blue and 429 green. Although 152 were built up to 1917 they were not easy engines to work. Exhaust steam injectors were tried and superheating was trialed, but the class remained saturated. From 1945 they were improved by fitting an American Master Mechanics front-end arrangement with tapered chimney and C17 type fire grate. The important thing about the C16 was that it was the basis of the more successful C17 introduced when Charles Pemberton was CME.

Without detracting from Pemberton's undoubted contribution to the advancement of local steam locomotive design, the C17 was little more than a superheated C16. Nevertheless it was a successful one. Pemberton channelled exhaust steam from the Westinghouse brake pump up the chimneys of his engines. This created their distinctive "panting". The C17 locomotives were as big as the civil engineering branch would permit on most secondary lines so they continued to be built over a long period of time. The first was completed in 1920, the 227th in 1953, and others were built for the Commonwealth Railways. A revised version introduced in 1938 was fitted with improved Pennsylvania cylinders, a better cab and welded tender. The last forty (Nos 961 to 1000) were fitted with roller bearings and were painted brown with black and green trim. Polished up they looked smart. Two of these "Brown Bombers" – named after World Heavyweight boxer Joe Louis – are preserved by QR.

The biggest QGR conventional steam locomotives, Pemberton's C18s, were built in 1914 to haul the Sydney Mail. The first of these 10-ton axleload 95 ton locomotives was not superheated, but the other two were. No. 693, which was named "Sir Wm MacGregor" had a Schmidt superheater, and No. 694 "Lady MacGregor" had a Robinson superheater. After trials, the Robinson or M.L.S. type was adopted for subsequent locomotives. Material was ordered after the war for ten more C18 class but it was decided to fit them with 19-inch cylinders. These C19s were virtually identical. It was intended to construct more but only twenty were completed at Ipswich, the last ten having top-feed boilers with the

regulator and safety valves combined in a single dome. Walkers Limited built six more in 1935. With polished brass dome and brass boiler bands these engines freshly painted in black with red trim looked handsome. The C18s were later fitted with 19-inch cylinders and called CC19s. Originally passenger engines, soon more interest was being focussed on "Pacific" locomotives for this type of work and they spent more time on important freight trains.

The South African Railways had began developing much bigger machines for the 3ft 6in gauge around the turn of the century and had already built the world's first 4-8-2 in 1904, an much larger machine than the C18 and C19 classes. QGR tracks were never upgraded beyond 12 ton axleload standard in steam days, so its designers could never match the size of locomotives used elsewhere. They stuck to the 4-8-0s and with 388 examples, owned probably the largest proportion of "Mastadon" locomotives of any rail fleet in the world.

7. Pacifics

The railways in eastern Australia were very slow to adopt the 4-6-2 wheel arrangement with its advantage of a trailing bogie to support a wide firebox. A problem of the C19 was its very long narrow grate – almost as long as a suburban living room. The prototype, B18¼ No. 84, was built in 1926, a quarter century after George Nutt had proposed building a Pacific. "Robbie" Chalmers was CME, having taken over from Works Manager Robinson, who succeeded Pemberton who resigned in 1921. The design was restricted to 12TAL, so even with a low adhesive factor its tractive effort was relatively small. Consideration was given to fitting a booster cylinder to drive the rear pony truck but it was not done. The first ones had all-steel cabs of typical contemporary pattern and C16/C17 type tenders. By the thirties subsequent batches were built with modifications such as sedan cabs and finally, a welded tender with raised bunker. In all 83 were completed between 1926 and 1947. They too were handsome locomotives painted black with red lining and polished brass dome and boiler bands. From 1948, QGR began to paint its locomotives in brighter colours. The B18¼s were repainted a light Brunswick green. After 1951, the headlight was relocated from the top of the boiler to the centre of the smokebox door. This detracted from their appearance.

The B18¼ was easy to fire, and well liked by the crews. Although the drawing office at Ipswich had not been permitted to design a bigger locomotive, they had incorporated good features such as a free steaming boiler, a smokebox cleaning jet, rocking grates, and ashpan water feed.

From 1937, the QGR became a leader in the use of roller bearings on locomotives, carriages and railcars, but was hampered by lack of funds. Sufficient capital for major modernisation had been denied between the two World Wars, its effect being thrown into sharp focus during the critical days of WW2 when a Japanese invasion was imminent. After hostilities much needed injections of funds were made to rehabilitate the railways. The postwar BB18¼ was a revised and updated version of the B18¼ with better cylinders, roller bearings, and larger tenders. Local manufacturers could not deliver, so once more British manufacturers began building locomotives for Queensland

bridging a 23 gap since a British engine had been bought. Vulcan Foundry of Newton-le-Willows near Warrington built thirty-five.

There is no need for me to go into the success of these locomotives designed under the direction of CME Vincent Hall. You can still see a couple of them today. They were painted Hawthorne green and had chrome plated steel instead of brass boiler bands. A contract for twenty with Walkers Limited, who were going through a bad period, took ten years to fulfil, so the final one, No. 1089 became the last full size steam locomotive built for an Australian railway. Walkers engines were the only ones equipped with electric lights on the tender, although a few other types had been specially fitted for working certain lines. The Walkers engines reverted to Brunswick green livery.

8. Baldwin again, a Mikado

An American C16 was developed as a result of collaboration between the Allies in World War 2. The Australian Land Transport Board wanted to build Garratt locomotives but Queensland wanted more C17s. In short, it was decided that America should build a locomotive suitable for use on metre and 3ft 6in gauge railways in the Allied war zone. A Garratt was out of the question. Drawings of the C17 were sent to America. What transpired is too complicated to go into here, but resulted in the design of a locomotive that incorporated U.S. practice but conformed to C17 weights. It was vastly different in appearance, a 2-8-2 with a high-pitched boiler and large if unstable tender. It had bar frames and features previously unused by QGR such as Master mechanics self-cleaning smokeboxes and arch tubes. They did have a few undesirable features but the AC16 was a free steaming useful locomotive. They saw service in a number of countries. Some were even built to 3 feet gauge later and used in Alaska. They were the widest travelled steam locomotive design in history.

Although 60 were promised, only 20 got to Queensland. As their tenders rolled and pitched badly they were quickly banned from passenger duties. Rail historian John Knowles was awarded a bonus for a suggestion to fit them with C16/C17 tenders. So for a period in the 1960s they were back on passenger trains, notably the "Midlander". If you model an AC16 with original tender, put it on goods trains. If you want it to haul passenger trains, fit a C16 tender! If you are a contemporary modeller you can run one hauling a passenger excursion train soon as 221A is being restored at Ipswich with an original modified tender.

(air conditioned train)

9. Tank Engines

Tank engines were built for specific duties and their development and design was based upon such needs. The first were tank versions of the A10s built in the 1880s, but a few bigger ones were bought in the 19th century, notably the 8D15 2-8-2T Dubs engines built for the Main range but later fitted with tenders. Two types of rack tank engines were built for the Mount Morgan line. The smaller 4D11½ Abt class 0-4-2T was very similar to those used in Tasmania. Larger 6D13½ Abt 0-6-0Ts were built soon after. There were other interesting examples including crane and shunting engines, but otherwise, 20th century

Queensland tank engines were intended solely for Brisbane suburban services.

Nisbet's twenty 4-6-2T 6D16 suburban tank engines built in 1901-02 were the only conventional Queensland steam locomotives fitted with Belpaire fireboxes. Any advantage this had was negated on narrow gauge unless it could be mounted above the frames to avoid severe angulation of the sides. That could not be done with the 6D16 and it was necessary to replace the firebox with the QR round top kind and fit extra trailing wheels and an extended bunker before it became a success. In its original form the D16 was a handsome machine.
The Pemberton/Robinson 6D17 introduced in 1924 was a useful suburban superheated 4-6-4T. In later years they were known as "Black Tanks". Because the brake pump exhausted up the chimney, the frequent application and release of brakes on suburban trains made these engines never seem to stop fussily panting. Incidentally, it was not until 1951 that they were fitted with electric lights and in the 1930s and 1940s they carried circular advertising plates front and rear.

The DD17 was a new postwar design combining the best features from the AC16s and local practice. Much use was made of welded construction and lightweight alloys. With well-designed steam passages and roller bearings on axles and side rods they were amongst the nippiest tank engines to be found anywhere. The first was painted black, the next five dark Royal blue, and the last six, later all of them, an attractive lighter Midway blue. So they became known as "Blue Babies". Examples are preserved here and on the Zig Zag Railway in NSW. The fitting of the nameplate "Blue Baby" to 1051 when it was restored to operating condition was well meant but historically inaccurate, as is the red colour presently used by the Zig Zag railway.

10. Articulated Types
Fairlie's double boiler 0-4-4-0T has already been mentioned. It was used for a while on the Toowoomba range, but due to problems with steam leaks at swivel joints, it was transferred back to Ipswich where it lasted until 1902.

Several proposals for articulated power were made, including Mallet and Beyer Garratt types. A lightweight Garratt would have been welcomed by the traffic administration to run on secondary lines. Though some proposals were seriously considered, others were not and none were built.

The QR Commissioner and the CME vigorously opposed introduction of the Australian Standard Garratt during the second world war. The State government supported QGR but was forced to accept them. In view of their shortcomings, an alternative would have been better. From the point of view of tractive effort, the ASG was the most powerful steam locomotive run on QGR 3ft 6in tracks. Its many defects have been dealt with extensively elsewhere. Ipswich drawing office was in no way involved in its design as it could not spare any technical staff. The Garratts ran in Queensland from 1942 to 1944, when as soon as the Allies looked like winning the war, the enginemen banned

them. But they make an attractive model with their rounded contoured tanks and cowl on top of the boiler. For a wartime design they were surprisingly streamlined!

The last class of steam locomotive was the Beyer Garratt introduced in 1950. They were handsome machines polished up in their maroon colour with red buffer beams, black trim, white tyres, brass metal bands and gold lining and "QR" lettering. In reality, they were fairly small articulateds for their time and they were not particularly successful despite what has been claimed. Drivers had to check extra bearings, and firemen had a much larger firebox to feed than on other engines. They would not steam on most local coals, and had to be supplied with Blair Athol coal. Administrative, engineering, running shed and workshops personnel disliked them because of the extra preparation time and maintenance they required. Certainly, when out on the road they could run fast, and they had every mod con that a steam locomotive of the time ever had. But to keep their weight down they had a very limited coal and water capacity. Despite a 40% larger grate they carried 37% less coal than the BB18¼s. This limited them to runs of little more than 175kms, less than half the distance the Pacifics and C17s could go on a tender of coal. There was also a tendency for them to prime. Extra time required at every loco stop to take water and check running gear outweighed any advantages of faster running. The extra load they pulled was only about 40% more than a Pacific and did not justify the additional cost of operation. But they make a very fine model.

11. Diesels

In 1938 Ipswich Shops built the first government diesel locomotive in Australia, DL1 a small diesel mechanical unit for the Etheridge Railway. Fitted with a 153hp Gardner diesel and gearbox, it was originally a jackshaft drive 0-6-0, but was fitted with pair of leading pony wheels at the insistence of the then Commissioner. Three others were built later and seven diesel mechanical locomotives were built for the 2 feet gauge (610mm) Innisfail Tramway.

Diesel electric locomotives were first used in 1952. With their introduction came a reversion to the practice of railway engineers supplying general specifications to locomotive builders. Ten diesel electric locomotives were imported from USA and ten from England. The first were 1,100hp General Electric hood units that began service in November 1952. Strangely, their buffers and drawgear were mounted talgo style on their 6-wheel bogies. English Electric supplied ten full width semi streamlined car body units with conventional drawgear mounts and they went into service shortly afterwards. Both these designs weighed about 90 tonnes. The Chief Engineer had agreed to allow a 15-ton diesel axleload on tracks where 12TAL steam locomotives had run after curves were double spiked. The double spiking was to counter the side thrust caused by 6-wheel diesel bogies. The increased weight was permitted because the hammer blow of the reciprocating steam engine was eliminated.

Then General Motors through their Australian agents, Clyde Engineering in NSW supplied one of their standard export G12 models modified to suit

Queensland conditions. This involved fitting 6-wheel bogies to spread the weight but these locomotives, which became the 1400 class, had only four traction engines and weighed about 76 tons. The next and subsequent GM diesels supplied by Clyde had six motors like their competitors. The 90 ton 1450 class retained the angular body and cab of the 1400 series.

The only other four-motor diesel electrics were the lightweight "Paw "Paw" units from Walkers Limited, nicknamed after a cartoon character. QR created interest in engineering circles in 1955 when it called for the supply of lightweight 60-ton diesel locomotives for main line use.

In 1959, English Electric first began building locomotives at Rocklea for the QGR, their initial product being an interesting cab-hood unit, that combined the benefit of a full width cab at a time when high nose hoods obscured visibility, and a hood over the engine compartment for accessibility. They were thought odd at the time and only a couple of railways used the configuration. Thirty-five years later it became a railroad industry standard in USA!

Government policy to give Queensland made products preference, forced Clyde to set up business in Brisbane at Eagle Farm. They arranged for ComEng (Qld), at Rocklea to assemble the locomotives. Diesel purchases began in earnest in the 1960s with an aim to replace steam locomotives. Clyde produced the 1460 class in 1964. It had the same output as the 1450 class but was fitted with a neater looking, Australian designed body with roomier cab and had provision for multi unit operation. English Electric began supplying their comparative 1270 class, then the more powerful 1300 class. Both Clyde and English Electric supplied secondary line diesels of 59 to 62½ tons weight that were rather more successful than the earlier "Paw Paws". They were the 1700 and 1720 2-strokes and the slightly heavier 1600 and 1620 class 4-strokes

At first the QGR pitted these two firms against one another, believing this was a way to keep tendering competitive. This led to development of more and more powerful units. Horsepower climbed to 2350hp with engines built by English Electric in 1973. In turn for a time the 1300, 2100 and 2350 classes were the most powerful narrow gauge locomotives in Australia.

Unfortunately, the control system used by these companies was incompatible and when it became necessary to introduce multiple working as train loadings increased, they could never be used together. This was inefficient, as often one had to haul the other as a vehicle on a train. Most English Electric units were then concentrated on coal and goods traffic in the Central Division. Beginning 1975 Clyde gained a virtual ten year monopoly. Construction of the Goonyella coal lines to higher standards enabled bigger 96-ton units to be introduced in 1970. This was the Clyde's chopped nose 2100 class with 2,000hp for traction, rather more successful than the English Electric's response, the high powered but lighter 2350s that had a tendency to slip and had so many in-built safety devices that they often shut down in traffic. Clyde supplied the first Australian diesel with alternator instead of generator with the

1550 class of 1972. General Motors' "Dash-2" technology was introduced in 1977 with the 2400 class.

The coal units that they subsequently supplied were Dash-2 variations of the 2100 class, and included 2130, 2150, 2170 and 2200 classes. When more than 30 2170s were built, the 2200s were renumbered 2141 onwards. All these locomotives had minor differences but their general appearance was the same. This was changed in later years when the noses were lowered and front windows were altered for Driver Only Operation.

12. Diesel Hydraulics

At the other end of the scale, as steam locomotives were being phased out, there was a need for a shunting engine to replace the PB15 engines. This type of locomotive was also called upon to work some of the C17 branch lines.
Walkers built "W1", a demonstration unit in 1966. It was tested for an extended period before the firm was awarded the largest locomotive contract at the time of 70 diesel hydraulic locomotives. When deliveries commenced in 1968, these locomotives appeared in the same green and grey colour scheme devised for the demonstrator rather than the sky blue, white and grey of QR diesel electrics. Incidentally, the present DEL "Broncos" maroon and yellow dates from 1992 and if you model 1952-53, the "Yank" diesels hood tops were white!.

The 41-tonne DH class fulfilled a need for a number of years, but tended to overheat on extended climbs. As QGR moved towards greater employment of "block" trains, and closed a number of goods yards as part of administrative change, the need for shunting engines of low capacity diminished. Therefore they were withdrawn. Some were sold to overseas railways, and a number of them have been converted to 610mm gauge for Queensland sugar lines.

13. Electrification and Electric Locos

The increasing value of export coal created a more prosperous situation for Queensland Railways than in the past, and technology advanced as it was decided to electrify the Central Queensland coal lines. 25,000Kva locomotives were then purchased from Com-Eng (Qld) and Walkers Limited, both of whom enlisted the technical assistance of established overseas Japanese and Swedish suppliers. The first electric locomotives went into service in 1986. Clyde Engineering also supplied electric locomotives commencing 1994. The design of the last thirty of the Walkers units was revised when it was decided to electrify Caboolture to Gladstone. These 3900 class are geared for 100kmh maximum speed compared with the coal engines' 80kmh. They are used on services between Brisbane and Rockhampton including 'lander trains between these points and the "Spirit of the Outback" to Emerald.

All QR electric locomotives have three 4-wheel bogies, which have less dynamic impact of track than two six wheel ones. Up to six electric locomotives – three on the lead and two or three Locotrol slaves have been used on coal trains in excess of 10,000 tonnes.

14. New Generation Locomotives

Electrification put a brake on the construction of diesel locomotives. The opportunity to sell the 90 tonne English Electric units was taken. Many went to Tasmania. The lighter 1600 and 1620 classes remained in service longer, a few examples of the 1620 class lasting until 1995. The last 90 tonne diesels bought by QGR were the 2470 class built by Clyde in 1980.

General Electric, through Goninans of Newcastle who set up a works at Townsville, re-entered the Queensland diesel market in 1983 with 13 U26C model 2600 class locomotives for Collinsville coal traffic. The company was then successful in obtaining two much more significant contracts after it was decided to replace most of the ageing locomotives in general traffic north of Rockhampton. This was the 2800 class of 3,000hp that brought the GE Dash 8 technology to Australia. These locomotives weigh in the vicinity of 115 tonnes. The double-ended full width body 2800 class provide the bulk of non coal services in North Queensland including mineral services on the Mount Isa line.

Since their introduction a program has been started to fit turbo chargers to General Motors diesels in the 90-94 tonne range to bring their power up to 1380Kw (2250hp). The revamped units are classed 2300 and are being selected apparently randomly from normally aspirated Dash 2 units.

The Moura Short Line, the first of the export coal lines built in the 1960s was never electrified. The Clyde diesels that were cascaded into this traffic when other lines were electrified themselves now need replacement. This led to the latest development of the 4000 class GM powered diesel. They are being supplied by Walkers Limited, once a competitor of Clyde-GM, but now through a consortium, a user of General Motors equipment.

15. Modelling

For modellers of various eras a table is included to show basically when the major classes were in use. For modellers who like the popular mixture of steam and diesel locomotives, the 1966 to 1969 period offers the greatest scope. There were still some locomotives of the PB15, 1924 PB15, C17, B18¼ and BB18¼ classes in service, also some DD17s in the Brisbane area and a couple of Beyer Garratts at Rockhampton. At that time diesels of the 1150 ("Yanks"), 1170 ("Paw Paw"), 1200, 1250, 1300, 1400, 1450, 1460, 1502 ("Queen Marys"), 1600, 1620, 1700, 1720 and DL classes were in use. "W1" the first DH was built in 1966 and production model DHs were in use from 1968.

16. Conclusion

Finally, what can be said of locomotive development in Queensland? Certainly that it has come a long way. The pioneering experiments gave way to adoption of features suitable for Queensland conditions. Though it was to the fore in the development of 3ft 6in locomotive design in the late nineteenth century, economics forced adoption of a modest 12-ton axleload that stifled the development of and size of 20th century steam locomotives. So locomotives were called upon to haul heavier loads than comparable engines elsewhere.

Funding for locomotive development and workshop facilities was not always available. QGR engineers kept up with latest features, pioneered the use of roller bearings but were slow to adopt improvements to cylinder design. Many saturated engines were allowed to continue in service longer than they should.

Dieselisation had a huge impact in Queensland. From owning locomotives with adhesive weights generally around 36 tons, suddenly they had at their disposal locomotives with 90 tons adhesive weight. Equate adhesive weight with pulling power and you immediately see the advantage.

Acquisition of large export coal contracts commencing 1965 improved QR finances and hence its ability to advance technical possibilities. It not only enabled QGR to catch up but to pass development of many other railways. The first 1,000 ton train did not run in Queensland until after the introduction of diesels but by the use of Locotrol, trains of 15,000 tonnes have been operated. QR is one of the first and relatively few railways to adopt the Locotrol system. Electrification at 15,000kV AC has produced spectacular results. Freight and passenger traffic has benefited. QGR in conjunction with Walkers-Hitachi have developed the first successful 1067mm gauge tilt trains, and now they hold the world speed record for this gauge of 213km/h! Is it a coincidence that it is the same speed achieved by steam speed record holder "Mallard"? Even if some business practices have been questioned, QR has regained technical initiative.

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PRINCIPAL LOCOMOTIVE CLASSES AND THE YEARS THEY RAN

Steam	A10	B12	A12	A14	B13	B15	PB15	C16	C17	C18	C19	PB15
1870	*	*										
1885	*	*	*		*							
1895	*	*	*	*	*	*						
1905		*	*	*	*	*	*					
1915		*	*	*	*	*	*	*		*		
1925		*	*	*	*	*	*	*	*	*	*	*
1935					*	*	*	*	*	*	*	*
1945						*	*	*	*	*	*	*
1955							*	*	*		*	*
1965							*		*		*	*

	B18¼	BB18¼	6D13½ Abt	6D16	6D17	AC16	DD17	Beyer Garratt
1905			*	*				
1925			*	*	*			
1935	*		*	*	*			
1945	*		*	*	*	*		
1951	*	*	*	*	*	*	*	*
1955	*	*	*	*	*	*	*	*
1965	*	*		*	*	*	*	*

Diesel Some IGE, Walkers and Clyde diesel electric locomotives were renumbered in 1956 (1210-1222 to 1300-1312, 1270-1271 to 1500-1501, 1230-1232 to 1400-1402) and the IGE and Walkers units were again renumbered in1965 (1300-1312 to 1150-1162 and 1500-1511 to 1170-1181). The 1965 numbering system is shown.

			1270		1450		1550		2350			
"90-96 ton"	1150	1200	1250	1300	1400	1460	1502	2400	2100	2370	2170	2470
1955	*	*										
1965	*	*	*	*	*	*						
1975	*	*	*	*	*	*	*	*(1550)*	*			
1985	*		*	*	*	*	*	*	*	*	*	
1995						* (1460)*	*	*		*	*	
2000							*	*	*		*	*

"40-60 ton"	1170	1600	1620	1700	1720	DH	**"115 & 94.5t"**	2600	2800	2300	4000
1956		*									
1965	*	*	*	*							
1975	*	*	*	*	*	*					
1985	*	*	*	*	*	*		*			*
1995			*	*	*	*		*	*		*
2000				*	*			*	*	*	*

Electric	3100/3200	3300/3400	3500/3600	3900
1986	*		*	
1988	*		*	*
1994	*	*	*	*
2000	*	*	*	*

Devils Elbow 2nd October 1995. *Photo A Hayes*