Bidford and District History Society
Notes to accompany a visit to the Gloucestershire and Warwickshire Steam Railway (GWSR)

The GWSR preserves the Broadway to Cheltenham Racecourse section of the Great Western Railway's (GWR) Stratford-upon-Avon to Cheltenham line. It is one of over 200 museum, tourist or heritage railways that preserve or simulate railways of the past or operate historical motive power or rolling stock in the UK. They are represented by the Heritage Railway Association and the Office of Rail and Road (ORR) is responsible for regulating their safety. These notes aim to supplement the comprehensive GWSR website https://www.gwsr.com with some additional historical context. Publications about the railway are also available in the shop on the platform at Toddington.

History of the Stratford-upon-Avon to Cheltenham line

In 1899 the GWR proposed a new double-track railway between Honeybourne and Cheltenham and doubling of the existing single line from Stratford-upon-Avon to Honeybourne. In so doing they sought to create their own through route between the Midlands and the South-West to compete with the rival Midland Railway's (MR) Bristol-Birmingham route via Bromsgrove and the Lickey incline. Construction began in 1902 and the route, one of the last main lines to be built until HS1 in 2003-7, opened in 1906. Although engineered as a main line it wasn't built to the high standards of the original intercity lines such as the London and Birmingham or Brunel's Paddington to Bristol line. Water running off the Cotswold edge needs to get past the railway and the GWSR has had to repair several embankment landslips. The 15 arch Stanway viaduct between Toddington and Broadway collapsed while under construction on Friday 13th November 1903 causing the deaths of four men but has carried trains safely since. For the detailed story see https://www.gwsr.com/enthusiasts/History/Underneath_the_arches.html

Why was this railway built at this late stage? It was one of several lines built by the GWR to shorten routes ('cut-offs') or improve its competitive position around this time. In the

nineteenth century railway companies sought to control the traffic in their own areas and initially underestimated the potential for traffic growth. Parliament originally envisaged that railways would be open to all, as rivers, canals and turnpikes were, but it was soon apparent that railways could not be safely and efficiently run on an open access basis and needed to be vertically integrated. They were thus natural monopolies. The prevailing laissez-faire view was that monopolies were anathema and from the 1840s government increasingly regulated the railways, including providing for future nationalisation[1] to guard against monopolistic profiteering. Railways planned and financed entirely by the private sector are unusual outside the UK. Each needed a private act of parliament but an attempt at strategic oversight by the Railway Department of the Board of Trade was short lived. The resulting railway system was dense but uneven, idiosyncratic, wasteful, and expensive but the plethora of alternative routes was a boon in wartime and the multiple companies were a trainspotters' delight.

Railways require huge investment in infrastructure, investment that might be set at nought should a competing line achieve parliamentary approval and steal the traffic away. Railways thus competed for territory to secure traffic and their businesses. Competition meant expensive parliamentary battles, the promotion of 'spoiling' bills for lines of little intrinsic merit to prevent a rival siphoning-off traffic and failure to cooperate with rival companies for the good of the economy or the travelling public. Occasionally there was direct conflict – denying a rival access to a station in defiance of their legal right to use it for example, blocking their trains and even locomotive shoving matches and pitched battles. The battle of Campden tunnel, between contractors and a railway company, is a local example of conflict. Ruinous beggar-my-neighbour competition sometimes resulted, for example between the South-Eastern and the London, Chatham and Dover railways. Towns served by only one railway company such as Southampton and Hull agitated for competing lines to lower fares and freight rates.

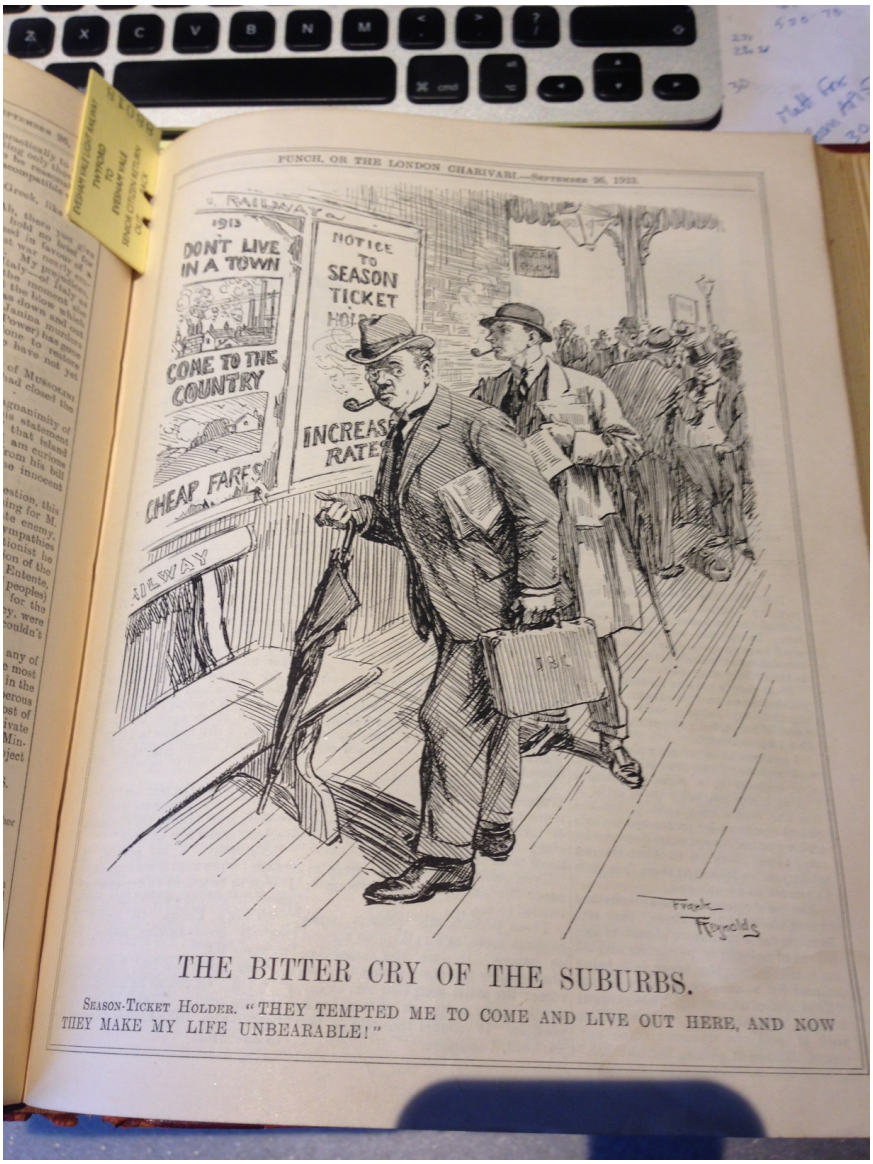
[1] Provided for in Gladstone's Railway Regulation Act of 1844, see Jack Simmons, 'Nationalisation, the concept of' in Simmons, Jack, and Gordon Biddle. (Editors). *The Oxford Companion to British Railway History*. (Oxford: Oxford University Press, 1997): 339.

Competition from urban tramways and improved steamships (for coal traffic) grew and as the network reached its peak profitability declined and new railway construction ceased. After about 1900, railway shares, once gilt-edged investments with reliable dividends, fell steadily in value[2] and raising fresh capital became difficult. Rising costs, price regulation and hostility from traders and passengers over railways charging what the market would bear forced railways to cooperate to reduce costs rather than to compete. The cartoon below illustrates public hostility to fare rises and the long-running hostility of *Punch* to the railways generally. By 1900 the railways were tightly regulated and had moved away from red-in-tooth-and-claw capitalism to behaving as public utilities. Our new line was perhaps the last gasp of nineteenth century competition for territory.

Figure 1: The bitter cry of the suburbs. (*Punch*, September 26th 1923)
A season ticket holder gestures to a tattered 1913 poster advertising cheap fares to the outer suburbs while next to it a new poster announces fare rises. Is the fare increase really going to make his life 'unbearable'? Some hyperbole surely? He looks well-heeled if a little brow-beaten while the man behind him in raincoat and bowler hat seems to be taking it all phlegmatically.

Commented [PR1]: Photo credits not yet added

[2] Referred to in *Howards End*. They '… declined with the steady dignity of which only Home Rails are capable.' E.M. Forster, *Howards End* (1910). Cited in P. J. Cain, 'Railway Combination and Government 1900-1914', *The Economic History Review*, 25 (4) Nov. 1972: 623-641.



THE BITTER CRY OF THE SUBURBS.

Season-Ticket Holder. "THEY TEMPTED ME TO COME AND LIVE OUT HERE, AND NOW THEY MAKE MY LIFE UNBEARABLE!"

Traffic on the line

The new line took long distance passenger and freight traffic between the Midlands, South Wales, and the South-West. In the 1950s 'The Cornishman' express from Wolverhampton via Birmingham Snow Hill used the line as did Welsh coal heading to the Midlands. Local goods traffic was light but included market garden produce. This was complex to handle as frequent small consignments from individual growers needed weighing, recording, packing, and storing during the season. Packing sheds for this traffic is the reason the station site at Toddington is so usefully large, but it came to an end after a rail strike in the 1950s when road transport rescued growers and took over permanently.

Most 1950s railway wagons were very old fashioned low-capacity 10-foot wheelbase four-wheel trucks and vans with plain bearings lubricated by oil-soaked packing. If the oil leaked and the bearing dried out it could overheat dramatically crippling the wagon and even setting it on fire. Goods trains routinely stopped at Toddington to allow wagon bearings to be checked.

Local passenger traffic was sparse and was initially handled by 'rail-motors', these were single open-saloon coaches incorporating a small vertical boiler and steam engine driving one of the four-wheeled bogies. They had some cost advantages over a regular locomotive and coach, and they could be driven from either end so did not need to be turned around but lacked flexibility. They were short lived but are the ancestors of the familiar diesel multiple-unit railcars of the 1950s and 60s and of contemporary trains where engine and coaches are permanently coupled as a unit rather than the traditionally separate locomotive and coaches.

One GWR steam rail-motor has been re-created, see figure two below and https://www.didcotrailwaycentre.org.uk/zrailmotor93/ and has been operational at Didcot Railway Centre. The maroon GWR livery is correct for the period.

Figure 2: Preserved GWR Rail-Motor.

By the 1930s on this line and elsewhere rail-motors had been abandoned and replaced by 'auto-trains'. These were small tank engines attached to one or more 'auto-coaches' that had a driving compartment at one end and linkages to the locomotive controls. The locomotive was usually at one end of a one coach train but could be in the middle of two or even more coaches, see figure three. When operated with the coach leading the driver sat in the driving compartment facing the direction of travel and had full control of the brakes and with the cooperation of the firemen on the locomotive footplate, a degree of control over the locomotive. The advantage over a rail-motor was greater flexibility and the power to take extra carriages at busy times. (see https://citytransport.info/Steam-MU.htm). Rail-motors were converted into auto coaches by removing the boiler and engine. Despite these economy measures local passenger services ceased in 1960.

Figure 3: Re-created auto-train at Toddington.

Decline and closure

British railways did not fully recover from the depredations of the 1914-18 war and were in a parlous state by 1945. Nationalisation in 1948 aimed at a railway system intended broadly to break even while serving industry and the nation, but no settled structure emerged, government delayed or forbade fare increases, and losses soon mounted. Dr. Beeching was brought in from ICI in one of a series of management restructures after a hasty modernization plan failed to stem losses and is popularly thought of as the villain who closed useful railways. Rationalisation was however inevitable; many lines, services and stations where badly underused, freight market share was eroding rapidly and railways were seen as obsolete technology set for replacement by road and air. The vast increase in rail passenger traffic since the 1990s could not reasonably have been foreseen. As we have seen profitability was marginal from circa 1900 and railway closures began in the 1920s as motor traffic developed

post-war and retrenchment on our line began in 1941. In the event it survived Beeching and operated until 1976. BR wanted to close it but it was the derailment of a coal train just north of Winchcombe and the damage this did to the track that triggered it. Services ceased immediately and formal closure came in 1979.

Locomotives

There are over 400 former BR steam locomotives preserved in Britain. This extraordinarily number in part reflects the actions of Woodham Brothers, scrap merchants of Barry Island, who purchased 297 withdrawn BR locomotives but eventually sold on 213 of them to railway preservationists for restoration rather than scrap them.

Figure 4: Woodham Brothers scrapyard in the 1970s

The GWSR has locomotive engineering workshops at Toddington and carriage and wagon workshops at Winchcombe. Steam locomotives are generally owned by specialist groups and societies rather than by the railway itself, but at any one time quite a number are based and maintained here and are hired to the railway to run services. Steam locomotives are often

out of service being cleaned, repaired, or building up steam. They require the grate, firebars, ashpan and smokebox to be cleaned after relatively short periods of operation, frequent manual lubrication and refuelling with coal and water, and periodic specialist servicing such as a boiler wash out. Bringing the boiler up to working pressure needs to be done gently so fires need to be lit well ahead of time. Boiler rebuilding and re-certification is required every ten years (every eight years if for use on the national network). US data shows steam locomotive availability for revenue-earning service was in the order of 50-70% and US railroads spent 25% of the original cost of a steam locomotive annually on its maintenance[3]. For comparison a relatively modern diesel freight locomotive, the class 66, of which 250 were delivered from 1998 at a cost of £375 million, was guaranteed by the manufacturer to have 95 per cent availability, a minimum of 180 days between failures, and a rebuild cost of £200,000, required only after 1·6 million kilometres, equivalent to 18 years' operation[4].

Steam locomotives were designed for about a 30-year life span[5] and could cover a million or more miles – impressive by motoring, but not by contemporary railway standards. The youngest are now over 60 years old. They have inherent safety risks, notably the potential for failure of the pressure vessel (the boiler) with the risk of explosion. Their operation and maintenance is subject to strict control. Boiler explosions are a risk because the top of the firebox (the crown) must be covered with water at all times, or the heat of the fire can weaken the crown sheet or its stays to the point of failure. There were 137 boiler explosions in the UK between 1815 and 1962 but only 15 of these occured in the twentieth century, two boiler barrel failures and thirteen firebox collapses. Of the firebox collapses, one occurred at Honeybourne on 17th November 1943 sadly killing the fireman. The GWR crew were operating a new and unfamiliar American S160 locomotive (like that in the photograph below) and believed the boiler water level to be higher than it was. The collapse of the firebox under

[3] Albert Churella, *From Steam to Diesel: Managerial Customs and Organizational Capabilities in the Twentieth-Century American Locomotive Industry*, Princeton NJ: Princeton University Press, 1998: 17.

[4] 'EWS workhorses will deliver major savings', *Railway Gazette International,* 01/04/1998, https://www.railwaygazette.com/news/single-view/view/ews-workhorses-will-deliver-savings.html Accessed 17.06.2020.

[5] Some locomotives worked for up to three times longer, usually being extensively renewed at intervals. Steam locomotives built in the 1950s had very short lives and some have worked for longer on heritage lines than they did on BR.

steam pressure projected flames and hot gases into the cab as the unfortunate fireman was in the act of stoking the fire[6].

Figure 3: Preserved USA S160 locomotive 5197 in Toddington yard, 28 May 2018

Seeing different locomotives is part of the attraction for enthusiasts so they are often moved around to work on other railways or to appear at special events. The Studley heavy haul firm Allelys is a leading mover of railway vehicles by road and there is one locomotive that I have only ever seen on an Allelys trailer at speed on the M42.

[6] See https://www.railwaysarchive.co.uk/documents/MoT_Honeybourne1943.pdf

Coal and water consumption

Steam locomotives get through large quantities of coal and water, plus lubricating oil and sand (to help the wheels grip the rails in slippery conditions). Unlike internal combustion engines steam locomotive machinery does not operate in a closed recirculating oil bath, it is a total loss lubrication system and the locomotive crew must oil round periodically. In BR days the crew might be allocated an hour to oil and prepare an engine already in steam before it turned a wheel in service.

Unlike diesel fuel, which is refined to a standard product, is of much higher calorific value weight for weight, offers extended range, simple refuelling and much reduced servicing, coal varies in calorific value, behaviour in the grate, size, purity, ash, and clinker residue and requires manual handling. Welsh steam coal is preferred on the GWSR and is widely thought to give off the most heat and comparatively little smoke. It is more expensive but as a premium product dominated British naval consumption 120 years ago and was even shipped to distant overseas coaling stations in preference to inferior local supplies. It was found, for example, that to keep the propellors of HMAS Australia at 186 rpm for an hour took 16 tons of New South Wales coal, 12.5 tons of Westport coal but only 10 tons of Welsh steam coal[7]. GWR locomotives were designed to burn Welsh coal. Appropriately sized lumps are needed for locomotive boilers, small coal or slack can fall through the firebars or be sucked unburnt through the boiler tubes and up the chimney. The future availability of suitable coal and the viability of burning it, or any fossil fuel, is a concern.

Water is also variable in quality and requires treatment to avoid compromising the boiler with a build-up of sludge and scale. Both reduce efficiency and are potentially dangerous. In 1937 the Association of American Railroads estimated that their members spent $50 million annually on water provision and de-mineralisation treatment for steam locomotives[8]. GWSR use water treatment and a blow-down procedure opening a valve at the lowest point in the boiler to use steam pressure to expel sludge.

[7] Jeremy Paxman, *Black Gold*, London: HarperCollins, 2021: 119. Stokers were constantly re-distributing coal to ensure that the trim of the ship was maintained as coal was used up.
[8] Churella, *From Steam to Diesel*: 16.

Locomotives

Commented [PR2]: These are the rostered locomotives in autumn 2021. I will revise for spring 2022.

Currently based at and operational on the GWSR are:

4270

4270 is a GWR '42xx' class tank locomotive. This locomotive's restoration started at Toddington in mid-2003 before it moved elsewhere, returning in 2013. It has been a regular GWSR performer since 2014.

- Wheel arrangement: 2-8-0T
- Introduced: 1910
- Working weight: 82 tons
- Driving wheels: 4' 7½"
- Tractive effort: 31,450lbs
- Water capacity: 1,800 gallons
- Purpose: Heavy freight work, mainly in the South Wales coalfields. 165 of these locomotives, the only 2-8-0 tank engines to run in the UK, were built at Swindon. 4270 was built in 1919 and withdrawn in 1962, making the short journey from its last shed at Cardiff East Dock to the Barry scrapyard.

7820 Dinmore Manor

7820 Dinmore Manor is a Manor class light mixed traffic locomotive, built by BR in 1950 to a GWR design. It is owned by **Dinmore Manor Locomotive Limited** and arrived at Toddington fresh from its 10-year overhaul at the start of 2015.

- Wheel arrangement: 4-6-0
- Origin: Great Western Railway. The Manor class was introduced in 1938 and is one of several derivatives of the celebrated and ground-breaking 'Saint' (29xx) two-cylinder 4-6-0 express passenger class designed by Churchward and dating back to 1902[9]. The Manor class were plagued initially by poor steaming but this was resolved in 1952 by modifications to blastpipe and firebars.
- Working weight: 69 tons (loco) plus 40 tons (tender)
- Driving wheels: 5' 8"
- Tractive effort: 27,340lbs
- Water capacity: 3500 galls
- Purpose: Mixed traffic on rural routes of the GWR limited to lighter weight locomotives, especially in Wales on the lines of the old Cambrian Railway. Weight is saved in comparison with the related 'Grange' and 'Hall' classes by fitting a smaller boiler. Dinmore Manor started its working life at Oswestry before moving to Plymouth and, finally, to Cardiff before withdrawal in 1965. It was rescued from Barry in 1979.

7903 Foremark Hall

[9] No original Saint has survived but a replica, '2999 Lady of Legend' has been built and made its debut at Didcot Railway Centre in April 2019

7903 Foremarke Hall is a 'Modified Hall' class owned and restored by **The Foremarke Hall Group**. The engine's restoration was completed at the Swindon & Cricklade Railway in 2004 and the loco has worked on the GWSR since then.

- Wheel arrangement: 4-6-0
- Origin: GWR - although the final 79xx series was completed by British Railways at Swindon in 1949. The Hall (49xx) class, dating from 1928, is the first derivative of the 'Saint' (29xx) class and has smaller driving wheels thus lowering the overall gearing and making it suitable for a wider variety of duties. 7903 is one of the final 'Modified Hall' variants.
- Introduced: 1944
- Working weight: 122 tons
- Driving wheels: 6' 0"
- Tractive effort: 27,275lbs
- Water capacity: 4,000 gallons
- Purpose: A powerful mixed-traffic locomotive, at home on express passenger trains as well as on freight work. 330 Hall & Modified Hall locomotives were built and could be found all over the GWR. The final 79xx series had a reputation for fast running and in 1951, Foremarke Hall became the first locomotive to cover the journey from London to Plymouth in less than four hours. It was allocated to Old Oak Common (London) for most of its life, but its final allocation was Cardiff East Dock, from where it was withdrawn in 1964 and moved to the nearby Barry Scrapyard. The FHTG purchased it in 1981.

35006 P&O

35006 'Peninsular & Oriental Steam Navigation Co' is a rebuilt 'Merchant Navy' class express passenger locomotive, built in 1941 and rebuilt to its present form in 1959. Owned by the **35006 Locomotive Company Limited** "P&O" made its public debut at the Cotswold Festival of Steam in May 2016.

- Wheel arrangement: 4-6-2 ('Pacific')
- Origin: Southern Railway, designed by Oliver Bulleid
- Introduced: 1941
- Working weight: 151 tons
- Driving wheels: 6' 2"
- Tractive effort: 33,495lbs
- Water capacity: 5000 gallons
- Purpose: Notionally a 'fast mixed traffic' loco, (approval to build express passenger locomotives in wartime would have been hard to come by) the three-cylinder Merchant Navy class introduced several novel and controversial features such as an 'air-smoothed' casing and enclosed chain driven valve gear. Thirty of the class were built between 1941 and 1949 and hauled the Southern Railway's premier expresses from Victoria and Waterloo. In the late fifties all were rebuilt, dispensing with the 'spam can' air smoothed casing and troublesome chain valve gear but retaining Bulleid's free-steaming boiler. They ran the last steam express services from Waterloo, regularly putting in 90+ mph performances until electrification in mid 1967. 'P&O' was based at Salisbury throughout its life and was

withdrawn in 1964. In 1983 its present owners rescued it from Barry scrap yard and brought it to Toddington.

Coaches

All the operational GWSR coaches are British Railways Mark 1s. These were built in large quantities on a standard underframe and in many different guises between 1951 and 1963. Some are open saloons, and some are the traditional corridor and compartment format. Some lasted in BR service into this century. They are painted in crimson and cream (BR livery 1948-1957), maroon (BR livery 1957-1967) or chocolate and cream (the old GWR livery, used by BR Western Region for some coaches in the late 1950s). They are heated by steam piped from the locomotive. They pre-date air conditioning, use fail-safe vacuum brakes and have battery electrical lighting recharged by dynamos driven off the coach wheels, although as trains are restricted to 25 miles per hour, they need supplementary charging from the mains.

Further reading

General British railway history

- Simon Bradley, *The Railways: Nation, Network and People*, London: Profile, 2015. (*Sunday Times* history book of the year, 2015).

- David St John Thomas (editor), *How Railways Changed Britain, a New Social and Economic History*, Derby: The Railway and Canal Historical Society, 2015. (Currently available direct from the publisher at the reduced price of £2. Previously £12.50).

Operating steam locomotives in the 1950s and 60s

- Terry Essery, *Steam Locomotives Compared*, Penryn: Atlantic Transport Publishers, 1996. (The author crewed BR and former LMS locomotives from Saltley depot in Birmingham, not along former GWR lines but on services to Evesham and Ashchurch via Broom and Bidford amongst others. Widely available second-hand).