Wargrave Local History Society

Latest News - November 2023

Brunel and the Great Western Railway - Lionel Williams

For the November meeting, Lionel Williams charted the period from the inception of the Great Western Railway to the time of British Rail. Brunel's forward-thinking ideas enabled the GWR to be one of the most progressive of the country's railways, and his legacy enabled it to continue to innovate and develop. He began by recalling that as a child, he had lived close to a railway station, and that if a goods train passed with a steam engine at the front and back, his mother would rush out to get the washing in where it was drying !

The background to the life of Isambard Kingdom Brunel began with the work of his father, Marc (*left*). The latter was an engineer who had been born in France, in 1769 but came to England to work in 1799. Later in the same year, he married Sophia Kingdom, in London. By the 1820s, however, Marc, was seriously in debt from involvement in failed engineering projects, so sent to the debtor's prison in south London. Looking to find a way to resolve his problems, he corresponded with the Russian Tsar, Alexander. The British government were so concerned at the prospect of such a respected engineer as Marc Brunel moving to Russia, that they paid the £5,000 debt to enable his release from prison. In 1824, he became the engineer for the Thames Tunnel Company. There had been proposals to construct an under-water tunnel between Rotherhithe and Limehouse since 1805, but early attempts had not been successful. It was an invention by Marc of a special shield that was to enable a tunnel to be built under the river.

Marc and Sophia had a son, born in Portsmouth in 1806, named Isambard Kingdom Brunel, and he became the assistant engineer for the Thames Tunnel project. Water broke through from the river into the tunnel workings below in 1827, and again in 1828, when 6 men died, and Isambard also nearly lost his life. However, work continued, and with further delays to the work, the tunnel eventually opened as a pedestrian walkway (*right)* in 1843 - the first under-water tunnel in the world (now part of the Underground network . Isambard had needed to rest following the 1828 flooding incident, and whilst convalescing at Brislington, near Bristol, he heard about a scheme to build a bridge over the Avon gorge at Clifton. He was appointed its engineer in 1831, although the Clifton Suspension Bridge was not completed until 1864 (5 years after Isambard died).

There had been a project to link Bristol to London with a railway as early as 1824. This would have followed the route of the A4 road, but that would have involved somewhat hilly terrain, notably near Marlborough, and so the project lapsed. In 1833, Isambard Kingdom was appointed as the engineer for a new venture, and application was made to Parliament for the necessary Act to allow it to be built. At the first attempt, in 1834, it was rejected, but eventually in 1835 the Bill was passed by the House of Commons and the House of Lords, receiving Royal Assent on 31st August.

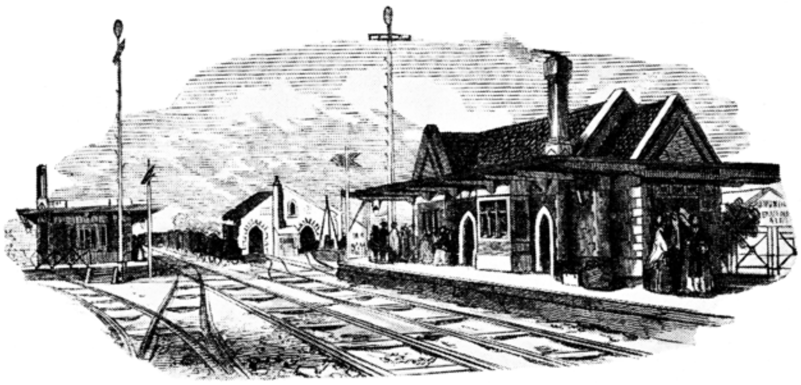
Thus was born the Great Western Railway - the GWR - sometimes known as 'God's Wonderful Railway', but, as the route it followed was less direct than that previously suggested, it was also called the "Great Way

Round'. This was because Brunel laid out his route to have as gentle a gradient as possible, to help higher speed running - becoming known as '"Brunel's Billiard Table". Unusually, the Act of Parliament did not specify the gauge (ie distance between the rails) to be used in building the new railway. The 'standard' gauge of 4ft 8½in had been adopted as being convenient for a horse to walk between the rails pulling wagons. Isambard Kingdom Brunel (*right*) considered that there was no scientific basis for adopting this, and so adopted the wider broad gauge, of 7ft, again aiming to have higher speeds than on other railways. Originally, the plan was to join the existing London and Birmingham Railway line in north-west London, and share their terminus at Euston, but Brunel fell out with that railway, and so a diversion was agreed upon to a station at Paddington (just to the west of the present station).

A problem which affected the railways - especially one that ran west- east, was that of time. In the era of the stagecoach it did not matter that clocks in Reading were 4 minutes behind those of London, at Oxford 5 minutes behind, and Bristol 11 minutes, but with the faster journeys possible using the railway, such matters became critical. As a result, towns along the route adopted the standard 'railway time' (ie London) time. (although the cathedral in Oxford still works by 'Oxford time', 5 minutes behind London time!).

Building the line began in 1836 between London and Maidenhead. There was to be no station at Slough, as the Provost of Eton College thought that boys there might be tempted to travel into London to go to some of 'the nastier places' in the city. Instead, Brunel built a public house close to the line, and then rented two rooms to use one as a ticket office and the other as a waiting room. The College soon realised that the railway could bring them benefits as well, and so a station was constructed there in June 1840.

The next major obstacle was the River Thames approaching Maidenhead. The two arch bridge would be the widest and flattest brick one to be constructed. Many 'experts' thought that it would collapse. After a minor initial problem due to cement not having fully set, the wooden framework below the bridge was lowered slightly, so it was no longer supporting the brickwork. When a strong storm struck a year later, the timber frame was blown away, but the bridge still stood - as it still does.



Twyford's original station, seen about 10 years after it opened.

Having crossed the river, the railway continued to a temporary terminus at Twyford, which opened in July 1839. The line could not continue further west at that time, as the major task of constructing the 2 mile long Sonning Cutting was still under way. In due course, Twyford became the junction for a line to Henley-on-Thames, which opened in 1857, with just one intermediate station at Shiplake. The GWR thought that Twyford station was near enough to Wargrave, so a station was not added for the village until 1900, originally with a double track and 2 platforms, but changed to single track in 1961, with the station building being demolished in 1988. The task of building Sonning Cutting was hazardous for the workforce, and the first patient recorded as having treatment at the Royal Berkshire Hospital was one of them. It was recorded that 1220 men and 196 horses were employed on the task. The task was completed in early 1840, when the railway was extended to a station at Reading.

As the town was situated to the south side of the railway, the station was built to Brunel's one-sided design. Trains towards London used a platform at the east side of the station, and those that were going towards Bristol would use a platform at the west end, with London bound trains having to cross the westbound track to reach the platform, and then cross back again to continue their journey eastwards. Close to the station, Brunel also erected the Great Western Hotel (a building that still exists).

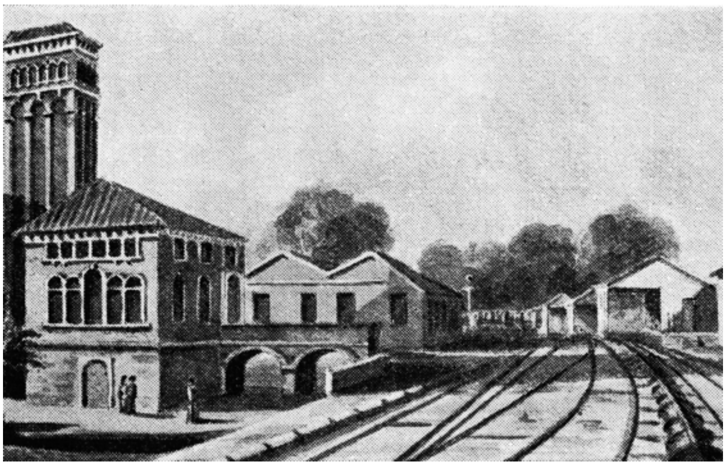
Further west, the small town of Swindon, with a population of 2159, was to be developed by the railway with its main works for building and repairing engines and carriages there. By 1891, the population had risen to about 19,000, with around 95% of those in employment working for the GWR. To provide for the workers at Swindon Works, the railway set up a GW Medical Scheme in 1847, it being compulsory for the workers there to belong.

Beyond there, the hill just to the east of the village of Box was penetrated by a tunnel - the longest in the country when built. There was a gentle slope through the tunnel, and one 'expert' claimed that if the brakes on a train failed as it entered the tunnel, it would be going at 128 mph by the time it emerged at the other end. Brunel, however, was able to show that these calculations ignored the effects of friction or of air resistance! It is said that on Brunel's birthday (9th April), the sunrise can be seen through the tunnel.

The line then continued through Bath to Bristol, where the original Brunel built station still stands. Building the 116 mile line had been estimated to cost £3 million, although the actual cost was about double that. Brunel's Broad Gauge was to last until 1892, when over one weekend in May that year the line from Penzance to London was converted to standard gauge.

Brunel's engineering skills did not extend to locomotive design. In order to stop a train, the method used was to put the engine into reverse. His railway had been designed to achieve high speeds, but he had not thought about how to stop a speeding 100 ton train, and the brakes were said to be 'tolerably useless'. Fortunately, 21 year old Daniel Gooch was appointed as the locomotive superintendent in 1837, and was able to design more serviceable engines to be built at Swindon. The carriages at this time were of 3 classes - in 1st class the passengers were enclosed and relatively comfortable, in 2nd class they sat on benches in open vehicles which had side sheeting, whilst 3rd class passengers rode on benches in open wagons. Passengers in 2nd and 3rd class were advised to travel with their back to the engine to avoid particles of ash getting in their eyes. It was also cold, especially in winter, when it was not unknown for a person to be frozen solid. Other hazards included passengers trying to ride on the roof (as they had on the stagecoaches), or jumping from an open wagon moving at speed to try and retrieve a hat that had blown off - the risks were not understood.

Beyond Bristol, the terrain was much more hilly, and Brunel could not set out his railway as with such gentle gradients as on the original line. He decided to use a different means of propelling the trains. His atmospheric railway had a metal tube between the rails. A piston inside was drawn along by a series of stationary engines that created a vacuum ahead of the piston. The slot in the top of the tube, which allowed the piston to be fixed to the carriage, was sealed by a leather flap, coated with a grease. Unfortunately, this encouraged rats to chew the flap, meaning there was no longer an air tight seal. By 1852, the Great Western Railway had reached Plymouth, and wanted to cross into Cornwall. Brunel's original idea had been for a wide single-span bridge to cross the River Tamar. The Admiralty, however stipulated that there should be sufficient clearance for 100 foot sailing ship masts, and so Brunel designed the Royal Albert Bridge, with 2 spans, each being a combination of an arch and a suspension bridge, balancing out the endwise forces. It was opened in 1859 - Brunel being able to be taken across it shortly before he died.



Newton Abbot atmospheric pumping engine (left) with the iron tube between the rails visible in on the right

Brunel's ability to solve problems and innovate was continued by the GWR. In order to shorten the route from London to south Wales, for example, the Severn Tunnel was built under the river - becoming the longest on the railways when it was built at over 4 miles. Whilst being dug, in 1879 the workings were flooded. This was not due to water coming in from the river (as had happened with the Thames Tunnel), but by a spring that the work encountered. A set of pumps were put to work to remove the water - and pumps still extract about 30 million gallons of water a day from the tunnel.

Another innovation by the GWR was a method to control trains automatically. This was first tried out on the Twyford - Wargrave - Shiplake - Henley line in 1906. The fail-safe system would sound a whistle in the driver's cab if the signal was at danger or if there was a fault in the system, and if the driver failed to react to that, it would apply the brakes. It would be many years before a similar system was adopted by other railways.

Speed was something that was gradually increased and in 1904 the GWR was the first to achieve 100 mph, when the *City of Truro* locomotive was hauling a train between Exeter and Bristol. Lionel's presentation included film of this engine, which still exists. To help maintain faster overall journey times, the GWR installed water troughs at various locations, including at Goring. A steam engine could replenish the water supply without stopping - but if the fireman did not judge the time to lift the scoop out of the trough correctly, the front coach could get drenched. If two trains happened to pass at the water trough, the small stones in the track could be thrown up, and might break the windows. As a result of this possibility, a rule was made forbidding a train to pass the Royal train at a water trough!

Another way to speed up the service, but still enable passengers to travel to an intermediate station, was for coaches to be detached from the rear of a train on the move. These 'slip coaches' (a GWR speciality) were controlled by a guard who would pull a lever at the appropriate time to release the coupling, and gradually bring the coaches to stop at the platform, whilst the main part of the train continued ahead. This worked well - so long as track workers or level crossing gate keepers remembered that there were carriages still to come after the train passed. If in murky weather the guard mis-judged the point at which to pull the lever, the coaches could come to a stop some distance short of the station (such as in Sonning Cutting instead of Reading station). An engine would then have to be sent the wrong way up the track to retrieve the coaches!

Diesel railcars were something else pioneered by the Great Western, who introduced them in 1934 (including for use on the Henley branch), the originals lasting unto the 1960s.

Members listening intently to Lionel Williams

Lionel concluded by recalling a little-known aspect of Brunel's work. During the Crimean War in the 1850s, the conditions in the hospitals were so poor that diseases, such as typhoid and malaria, were spreading amongst the patients. It was reported that more soldiers died from these illnesses than died during the battle. With a 42% mortality rate in the hospitals, it was likely that Britain would lose the war from disease, not the battle. Two developments helped improve the situation - the work of Florence Nightingale to improve standards of cleanliness being well-known. The design of hospitals, however, was a problem that caused the Government to take action. Architects were more interested in 'fancy decoration and finials' in their designs, so it was to Brunel, an engineer, that they turned. He had experience of timber structures (some of the bridges over Sonning Cutting were timber, as were many viaducts under the railway). He designed a set of parts that could be assembled on site by local labour, adaptable to the site conditions, quickly manufactured, and in due course 23 steamers were used to transport them to the Crimea. The design included means to provide suitable ventilation, and a hospital for 1000 patients was built. It was an early example of a 'flat pack' kit !

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