

## **LLANTHONY RAILWAY YARD AND SWING BRIDGE OVER THE SEVERN**

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A quay wall, a former office building and a derelict railway bridge (Figs 1-3) are all that remain to mark the site of a once-busy railway yard beside the Gloucester & Sharpness Canal at Llanthony (Grid Ref. 825181). The yard was established in the 1850s to provide a means of exporting coal from the Forest of Dean, and it was served by the broad gauge Dock Branch of the Gloucester & Dean Forest Railway, the main line of which formed the northern section of the line from Gloucester to South Wales (1). To carry the branch across the navigable channel of the River Severn, the railway company's engineer Isambard Kingdom Brunel came up with a pioneering design of bridge, the significance of which has not been properly recognised.

The railway company had originally intended to build their own dock linked to the canal, but as construction of the main line seriously depleted their funds, they reached an agreement with the Canal Company just to widen the canal and build a quay wall like the one at Bakers Quay opposite (2). The main contracts for constructing the branch across Alney Island and building the quay wall beside the canal were awarded to Robert Sharpe of Chepstow, who began work in 1852 (3). The new quay wall was built in a huge trench dug parallel with the canal, and the original canal bank was left in place to keep the water out. Unfortunately, work was delayed when the bank was breached and the trench was flooded for a time, but by the end of the year, the wall was completed and the bank in front was being cleared away (4). The project also suffered due to a major river flood in November 1852 when it was said that the water was rushing over some parts of the embankment across Alney Island "with the brawling din of a weir". It is likely that this flood was the cause of the movement of part of the foundations of the bridge being built over the river which required remedial action (5). A further difficulty arose when the Gloucester & Dean Forest Railway Co finally ran out of money and had to leave completion of the branch to the Great Western Railway Co who had agreed to lease the line (6). As a result of all these troubles, it was not until September 1853 that the works were considered sufficiently advanced to allow a locomotive to run over the bridge to test its strength (7).

### **Llanthony Railway Bridge**

The bridge over the river had presented a significant challenge as the railway company's Act specified a 50ft wide passage for boats and the line needed to cross at a skew angle of almost 30 degrees. Brunel's solution was to design a swinging span with wrought-iron girders 103ft long supported on timber piles (Fig. 4). Each girder was fabricated from iron plates riveted together, the upper flange being in the shape of a balloon and the lower flange triangular (Fig 5). The pivot was off-centre, so that two-thirds of the span's length crossed the river passage and the shorter tail section carried more than enough additional weights to provide a counter-balance, the excess being supported by two wheels running on a section of circular track. The main pivot was supported on a central group of six 14in square piles, and two side-wheels ran on a 6ft radius circular track supported by 14in and 12in piles. When the span was across the river, it rested on timber piles on either side of the opening. When the bridge needed to be swung, the pivot could be raised slightly by a manually operated hydraulic press, which took most of the weight off the side-wheels and allowed the bridge to turn easily on the water in the cylinder of the press (8). The timberwork was provided by William Eassie of Gloucester, and the ironwork was fabricated by Fox Henderson & Co of Smethwick (9).

The importance of this design is that it is believed to be the first railway swing bridge to use hydraulic power. Early swing bridges had their whole weight carried by a ring of wheels, but with a long heavy span, such a bridge would be very difficult to turn. By using an hydraulic press to lift the span, the load on the wheels was much reduced, making turning much easier. Brunel had first tried this innovation on a road bridge across the Cumberland Basin lock at Bristol Docks, and Sir William Armstrong believed that the first railway swing bridge to use this principle was erected in 1852 over the River Severn on the Gloucester & Dean Forest Railway. There was a swing bridge on the main line of the railway built in 1851, but this never needed to swing as it was upstream of Westgate Bridge which was not capable of opening (10). Thus it is appropriate to claim that the branch line bridge was the first actually to use hydraulic power in operation.

To test the strength of the bridge in September 1853, a GWR locomotive with railway officials on board approached across Alney Island and was met at the bridge by merchants and others interested in the business of the docks. The first passage of the engine over the river was at a slow rate, and the absence of any vibratory or rocking motion encouraged confidence in the strength and good workmanship of the structure. Subsequent trials were at higher speeds, the transit being ultimately effected at almost twenty miles an hour, and the scrutinising eyes of the engineers searched in vain for any weak point. At the end of the trial, the engine was driven to the quay wall beside the canal where it signified its presence by two loud triumphant shrieks, which greatly astonished those in the neighbourhood who were unaware of what was going forward. The gentlemen involved in the trial then gathered in a nearby cottage for refreshments, including champagne, while the navvies who had worked on the project were provided with earthenware pitchers full of beer. Some further work was required to finish the line and to raise the quay wall to make it level with the ballast, and the branch was eventually opened to traffic on 20 March 1854 (11).

### **Hydraulic Coal Tips**

While the yard was being finished off, work was also going on to build two hydraulic coal tips designed by William Armstrong of Newcastle. Each structure comprised a wagon hoist, a coal chute and a traverser for moving the empty wagon sideways to a return siding. The wagon hoist had a strong wooden frame and four chains worked by hydraulic cylinders that together were capable of lifting 36 tons. By raising the back of a loaded truck higher, the coal could be made to slide out of the front end and down the chute into the hold of a vessel. When the empty wagon was returned to ground level, it was moved sideways on a platform worked by another hydraulic cylinder until it lined up with a second siding, along which it could be taken away. Water pressure for the hydraulic cylinders came from a steam engine and accumulator 200 yards away on the south-western boundary of the yard. One of the tips was first used in November 1854, when 120 tons of coal from Messrs Nicholson's Park End collieries were loaded on board the Irish schooner *Lucinda Jane* for Wexford in four hours. The operation was evidently a messy one as a local paper noted that it in no way added to the pleasure of promenading on the canal banks (12).

### **Llanthony Railway Yard**

The yard was provided with fourteen sidings, branching from the single line that crossed the bridge over the Severn and terminating near the quay wall beside the canal. Another branch turned south to run along the southern end of the quay wall, and near the north-east corner of the yard was an office building (13). In 1862, a further branch to the north was laid to serve the warehouses and yards on the west side of the Main Basin. This was of mixed gauge as it was a joint venture with the Midland Railway who laid a connecting line across a rebuilt

Llanthony Bridge (14). The new quay was a useful additional place for vessels to discharge imports, but the hoped for exports of coal did not materialise as most masters preferred to load at Cardiff. For a time, the steps and elevated platforms of the wagon hoists did find a use by providing access to the decks of large vessels, rather than having to use the ship's ladder, but in 1869 the hoists were removed (15). In the same year, the Dock Branch lines were converted to mixed gauge, and three years later to standard gauge only. It was probably also at this time that a double line of rails was laid along the full length of the quay (16). The 1884 Ordnance Survey map of the yard is shown in Fig 6.

Several developments affected the yard in the 1890s. Firstly, the GWR Co built a large new sheet works along the south-west boundary of the yard for the repair and reconditioning of the tarpaulins that were used to cover the contents of open wagons when necessary. The building had an elevated water tank at the south-east end with cast-iron pipes feeding fire-hydrants in front of the building (17). The railway company also extended their lines to the south of the yard to serve premises around the new Monk Meadow Dock, they provided a water supply for locomotives and travelling steam cranes, and they built a large transit shed near to the quayside. The transit shed provided space for temporary storage and customs inspection of goods being transferred from ships to railway wagons. It was particularly used for handling cargoes (principally sugar) imported by the regular steamers of the Bristol Steam Navigation Company (18).

### **Rebuilding Llanthony Railway Bridge**

While these changes were being made in the railway yard, major work was also carried out on the swing bridge over the river at the entrance to the yard. The first project, requiring a five months stoppage in 1890-91, was the replacement of the wooden piles supporting the pivot of the bridge with two large cast-iron cylinders. It seems that the foundations of the south-eastern abutment were also rebuilt at this time, and it is possible that all this work was prompted by damage during the major river flood in May 1886 (19).

The second project on the bridge was the replacement of the swinging section by a riveted steel span in 1899. It may have been a coincidence, but this followed complaints about the condition of the bridge from Frederick Wood, master of the trow *Finis*, one of the few vessels still using this stretch of the river. Wood maintained that the hydraulic machinery was out of repair, making swinging the bridge a long hard task, which on occasions had required the aid of horses to move it. Because of the length of time this could take, the foreman in charge of the railway yard frequently refused to open the bridge because it formed part of the railway shunting yard. When coming up the river on a big tide, Wood said he had to wait until the level dropped to get under the bridge, and when there was much fresh water in the river, he had on occasions had to wait several days to get under. These complaints were totally refuted by the GWR General Manager, who claimed that the opening apparatus was in good working order and that the operators absolutely denied the imputations made upon them. Whatever the truth of the matter, following a meeting with officials of the Severn Commission, the GWR Divisional Engineer gave notice that the superstructure of the bridge would be replaced, and the new span opened for the first time on 26 Dec 1899 (20).

### **Llanthony Footbridge**

While the bridge replacement was being considered, John Bradley requested the addition of a walkway to improve access to his house beside the nearby Llanthony Lock. The existing official access was by a small rowing boat crossing the river only a short distance above Llanthony Weir. As an employee of the Severn Commission, Bradley himself was allowed to

cross the railway bridge when no train was moving, but this concession did not extend to his family or to visitors, and the gateman had objected to a doctor crossing the bridge to reach the lock house. To save expense, Bradley suggested supporting a walkway on brackets hooked over one side girder of the main bridge, but the railway company would not consider anything that added additional weight (21).

The matter of a footbridge remained in abeyance until the railway company began negotiations with the Severn Commission about rebuilding the north-western abutment of the swing bridge by sinking cast-iron cylinders into the shelving bank of the river. The outcome was that the Severn Commission erected their own footbridge across the river to the lock house in 1908, using a pair of second-hand lattice girders purchased from the railway company, and the railway company rebuilt the railway bridge abutment in 1910 (22). By this date there were still about 100 vessel movements a year on this stretch of river, but few of these needed the bridge to be opened as boats could usually pass underneath. Ten years later, the number had dropped to around 30 movements a year, and traffic stopped altogether in 1924 when it was found that one wall of the nearby Llanthony Lock was in danger of collapsing and beams were put across the lock to hold it up. The railway bridge was recorded as opening on 8 August 1922 – which was presumably the last time (23).

### **Railway Yard in the Twentieth Century**

The railway yard was very busy in the early years of the twentieth century handling imports destined for the Midlands, particularly those carried by the regular steamers of the Bristol Steam Navigation Co. There were four mobile steam cranes on the quayside to help discharge cargoes directly to wagons or to temporary storage in the transit shed. An 0-6-0 shunting locomotive was kept busy moving wagons in the main yard, and horses were used for reaching the outlying private sidings (24). After the First World War, direct imports to Gloucester were much reduced, but the railway yard, augmented by the Docks Branch Sidings on Alney Island, became a distribution centre for goods brought in to Gloucester by rail. During the Second World War, a pedestrian bridge was attached to the railway bridge (as had been requested so many years before) in order to provide convenient access to the power station built on Castle Meads (25).

In the 1950s, the railway yard was still busy dealing with full wagon loads to and from traders in the docks and the local area, including heavy loads that needed a big mobile steam crane kept in the yard. The Docks Branch Sidings on Alney Island were much used for shunting wagons from the main line and forming up trains to be sent away. Three or four times a day, a few wagons were moved between those sidings and Llanthony Yard by the docks pilot locomotive, accompanied by two shunters who opened and closed the level crossing gates across Llanthony Road. In the office building near to Llanthony Bridge were three clerks who dealt with all the paperwork, including recording the labels taken from recently arrived wagons, notifying consignees and sending out invoices. Also in the building was an office for the foreman in charge of the outside workers who transferred goods between wagons and lorries. The railway had a few delivery lorries based at the yard, and some local traders used their own. Coal merchants bagged coal directly from a wagon and took it away for delivery. There was a weigh-bridge between Llanthony Bridge and the office building where lorries could be weighed before and after loading to determine how much they were carrying. On the south-west side of the yard, the sheet works was still in use for re-proofing tarpaulins and refurbishing tie-ropes. Beside the crossing gates was a cabin where the shunting staff had their meal breaks, and the other outside workers used that too (26).

The goods handled in the 1950s reflected the businesses located in the area. Coal arrived for Harry T Shelswell of Bloomfield Rd and Buchanan & Co of the Docks. Timber arrived for the Hatherley step works in Melbourne St, for Stephens incubator works in Llanthony Rd and for Ingram's and Moffatt's timber yards at Monk Meadow. Fertiliser arrived for West Midlands Farmers of the Island Mills, Westgate St – mainly basic slag. Cement from Bletchington, Oxon, was stored in the transit shed and collected by builders merchants. Paper arrived for the Citizen and for Powell Lane Manufacturing Co. Steel in long bars arrived for Helipecbs. Petrol arrived for the depots around Monk Meadow Dock. There were many wagons of sacks for Gopsill Brown - 20-30 vans on some nights. Outgoing traffic included scrap metal loaded in empty coal wagons for Margam and Port Talbot and bones sent to Newport, South Wales, for making glue (27).

Although the railway yard was busy at this time, very little use was made of the canal-side quay, but this was set to change. The newly nationalised management of the canal had been making various improvements to encourage steamers to trade to Gloucester again, and in 1961 they took over the canal frontage of the railway yard, put a new surface on the quay and constructed two large storage sheds at either end of the old transit shed. The refurbished quay was then much used by motor-coasters bringing cargoes such as fertiliser, grain and granite sets that were mainly distributed by road (28). This traffic continued until 1984, when a section of the quay wall subsided and the coasters had to use Monk Meadow Dock instead.

Meanwhile, there had been big changes in the operation of the railway yard following the development of national policy – particularly the phasing out of traditional short wheelbase wagons, the growing use of single-cargo trains and the withdrawal of railway-owned delivery lorries. This led to the end of small consignments for local firms and to the closure of the sheet works, and part of the yard was redeveloped as a small business park. The sheet works building served as a tile warehouse for a few years, and then it was abandoned (Fig 7). For a few years, Blue Circle Cement operated a depot in the remaining part of the yard with two big silos for filling road tankers, and there were occasional groups of wagons moving to and from the grain silo at Monk Meadow. These uses declined, however, and the yard finally closed circa 1990 (29).

### **A New Era**

After lying unused for almost fifteen years, the site of the railway yard entered a new phase in its history in 2005 when a start was made on the construction of a new campus for the Gloucestershire College of Art and Technology. This work involves the virtual obliteration of all traces of the railway yard, but one building will survive – the former office building is due to become the crèche for the new college. Apart from this, the only features that will indicate the location of the yard will be the canalside quay wall and the now isolated railway bridge over the River Severn.

### **References**

- 1 For more background on the G&DFR, see MacDermot, E T, *History of the Great Western Railway*.
- 2 TNA RAIL 829/34.
- 3 TNA RAIL 217/19; GA D1950/E8(ii).
- 4 GJ 12 Jun 1852 p3c3, 14 Aug 1852 p3c3.
- 5 GC 20 Nov 1852 p3c1; GJ 13 Aug 1853 p3c2.
- 6 GA D1950/E8(ii).
- 7 GJ 1 Oct 1853 p3c2.

- 8 Network Rail, Swindon, GWR Drawings 17654-8; Brunel, Isambard, *Life of Isambard Kingdom Brunel, Civil Engineer*, 1870.
- 9 GJ 1 Oct 1853 p3c2.
- 10 Brunel, Isambard, *loc cit*; Armstrong, Sir William, Proc Inst. Mech. Engineers 1869.
- 11 GJ 1 Oct 1853 p3c2; GJ 25 Mar 1854 p3c3.
- 12 Bristol Univ DM1306/X/16, letter from Armstrong to Brunel dated 25 Jun 1853; Ibid DM1237, drawing of lorry for Gloucester hoist dated 17 Oct 1853; British Waterways Archives map BW155/3/1/6; GC 11 Nov 1854 p3c2.
- 13 British Waterways Archives map BW120/11/1/1 dated 1866.
- 14 GJ 26 Jan 1861 p2c1; GJ 18 Oct 1862 p6c5.
- 15 GC 28 Jan 1860 p8c3; GJ 20 Feb 1869 p5c5.
- 16 MacDermot Vol 2 p309-10; First edition OS map 1884.
- 17 Wilts & Swindon RO 2515/405/547 plan 1889.
- 18 Wilts & Swindon RO 2515/410/0155 map 1896; OS map 1902; TNA RAIL 864/4 p427.
- 19 GA D2460/2/3/1/2 Engineers report Jul 1889; Ibid D2460/2/3/2/54 Plan & section of the bridge c1889; Ibid D2460/2/1/9/135 Letter dated 17 Oct 1899.
- 20 GA D2460/2/3/2/49 Correspondence; Ibid D2460/2/3/3/69 & 70 Correspondence; British Waterways Archives BW120/8/7 Llanthony Lock Register.
- 21 GA D2460/2/3/3/71 Correspondence.
- 22 GA D2460/2/3/1/4 Engineers Report Aug 1908; Ibid D2460/2/3/3/89 Letter 9 Aug 1910.
- 23 British Waterways Archives BW120/8/7 Llanthony Lock Register.
- 24 Memories of Harold Done.
- 25 British Waterways Archives BW163/11/10/5.
- 26 Memories of Richard Howells.
- 27 *Great Western Railway Journal* Summer 2003.
- 28 *Citizen* 18 Sep 1961; memories of Brian Waters and Ken Gibbs.
- 29 Memories of Richard Howells.



Fig 1. Llanthony Quay in 1986 with the sheds formerly used for storing cargoes discharged from coasters but subsequently demolished.



Fig 2. The former Llanthony Yard office building and adjoining weigh-bridge in 2004.



Fig 3. Llanthony Railway Bridge over the eastern arm of the River Severn in 2006.

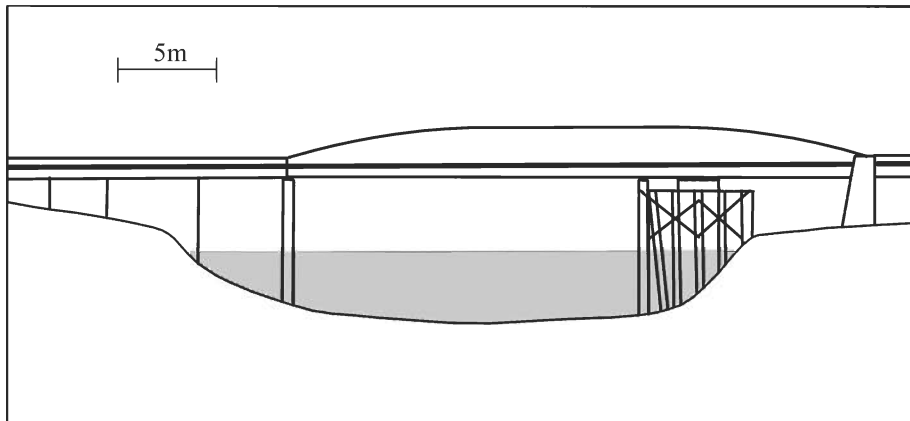


Fig 4. A sketch of the original railway swing bridge over the River Severn at Llanthony, based on the design drawing (now labelled GWR Drawing 17657) currently in the care of Network Rail, Swindon.

Fig 5. A sketch of a section through a girder of the original swing bridge based on the design drawing (now labelled GWR Drawing 17654) currently in the care of Network Rail, Swindon.

