

WELSH HIGHLAND HERITAGE

March 2019

ISSN 1462-1371

£2.00

Issue No. 82

Web : www.welshhighlandheritage.co.uk

Betws Garmon - Station Building Conservation



The station building after the conservation exercise - left a view of the 'rear' (west elevation) of the building with the F&WHR track beyond - right, looking south along the 'platform' face of the building. Both photographs by Mike Hadley, 22nd January 2019

Betws Garmon (then spelt Bettws Garmon) Station is believed to have been last used in 1936. Along with Dinas Junction, Tryfan Junction, Rhostryfan, Bryngwyn, Waunfawr, Snowdon Ranger and Rhyd Ddu it is one of the original NWNGR structures with a pitched and hipped slated roof and walls of roughly 500 mm thick random stone with brick (possibly Ruabon) quoins and door and window reveals. It was constructed in 1877 and, surprisingly for a structure of that age, has a damp proof course. It is rectangular and measures 9225 mm x 5700 mm externally. It had a chimney at the Rhyd Ddu (south) facing end, the stack was of random stone but the breast, which was internal, was of brick. It appeared to have a suspended timber floor at least to the south half, although there is no evidence of under floor ventilation.

By the time the Welsh Highland came to be rebuilt through Betws Garmon in 2002/3 the station had been closed for nearly 70 years and much of the structure had vanished. The roof and its timber work had gone as had much of the building's north elevation (facing Waunfawr), parts of the west elevation and almost all of the east (track facing wall).

Mike Hadley reports on the conservation of the remains of the Bettws Garmon Station Building.

The internal floors, all windows, doors and other joinery has also disappeared. Some of the stonework was lying around the site. I presume the timber/joinery had rotted away and some of the materials were probably 'robbed' on the entirely

reasonable assumption that the railway had gone forever!

As the line was reconstructed, we (the WHRHG) concentrated on Tryfan Junction but there was a growing awareness that Betws Garmon Station was in an equally bad, if not worse, condition. Not only was it degrading even further but some of the stonework had become unstable and in danger of collapse. The first decision to make was whether to reconstruct it (like Tryfan Junction) and try to get it reopened or simply conserve what's there and try to prevent it getting worse.

Several issues emerged which made it unlikely at present that the station would be reopened, namely:

- 1) The Company believed if there were to be a station/halt it ought to be in or near to the campsite (but the proprietor was not keen).

2) The Company did not want to take on the liability of yet more buildings. We (the WHRHG) already maintain Tryfan Junction Station building but could we guarantee for the foreseeable future that we will have enough income to cover another?

3) Volunteers to man Tryfan Junction are scarce on the ground; could we manage two stations?

4) The alignment of the bridge over the Avon Gwyrfa is slightly different to the original which means that the track is much closer to the building than before. Without track realignment any platform would have to be at one end of the building, and no entrance or exit to the building could be allowed via the track-facing elevation.

There was a proposal to convert the building into a holiday let but it would have produced a very small unit and the cost of renovation/conversion is unlikely to have been recouped, especially bearing in mind that it is owned by the Company and not us (the WHRHG) and so we could not lay claim to all of any rental income.

So, a couple of years ago a scheme was proposed to conserve the building to prevent/slow down further deterioration. The scheme basically comprised re-bedding any loose stonework/brickwork found in the immediate vicinity, re-pointing (raking out old mortar to about 50 mm depth and inserting new) the rest where necessary and generally tidying up the site. Lime mortar was to be used. Lime mortar was the standard 'bonding' agent between bricks, stones and other materials from Roman times onward until the use of Portland cement became common in the early 20th century. It is difficult to mix and, because it absorbs water, can create damp in buildings. Portland cement suffers from none of those problems but is so hard it can cause frosting and decay to soft stonework.

Nick Booker our chairman was alerted via his membership of the board of Ffestiniog and Welsh Highland Railways Heritage Ltd. to an article by Alan Cathersides, National Landscape Adviser Historic England upon 'soft capping'. This is basically a method whereby earth and turf is put on the top of the remaining walls of historic buildings to

reduce the rate of decay which would otherwise occur. It is really a quick way to establish the conditions which developed in many ruined monasteries and abbeys whereby, over time, grass developed on the tops of walls, thereby helping to bind the material together. This vegetation was often removed by building owners/managers in the belief that it was harmful.

It's one thing writing an article such as that by Alan Cathersides, but it's an entirely different matter to convince a builder quoting for the job to do it:

This looks like a simple job.

Well, it basically is but you've got to use lime mortar to re-bed the stonework....

Why?

Well it's mostly lime mortar now, so if we use sand and cement it will be too hard allowing frosting of the stone surface.

It's granite.

Look, just do it, and by the way, put some turf on top of the walls

And just how are you going to get a lawn mower up there?

That was roughly the conversation with one of the builders, but we eventually appointed our 'regular' chap from Waunfawr who is not only good but is open to new ideas. Work started in late 2018 and was completed in late January 2019.

Upon closer inspection we found that whilst the stonework is bedded together with lime mortar, the exterior had been re-pointed with conventional sand and Portland cement. I can only assume that this was done by Sir Robert McAlpine & Sons in 1922/23 when the Welsh Highland took over, so we used lime mortar to bed the stones but, as there was no sign of the stonework frosting, replaced 'like with like' as far as the external pointing is concerned. Finally, to make the interior of the building safe we arranged for crushed slate to be poured into what had been the under floor void.

We are hoping to add a running-in board.



Looking across the stabilised remains towards the north-west corner of the building.
Photo taken by the Contractor, 23rd January 2019.

Betws Garmon Station - 1995

The Gwynedd Archaeological Trust Survey

In 1995, Welsh Water proposed to construct a new service reservoir at Tyddyn Sir Hugh farm approximately 0.5 km to the west of Betws Garmon. The company consulted the Gwynedd Archaeological Planning Service (GAPS), in its role as archaeological curator to advise on the implications of the scheme. As a pipe trench associated with the scheme would cut through the track bed of the Welsh Highland Railway and the embanked tramway line to Hafod y Wern Slate Quarry¹, GAPS recommended that an archaeological watching brief be carried out to record these features during ground disturbance by the contractors.

Welsh Water contracted Gwynedd Archaeological Trust (GAT) in March 1995 to carry out a programme of archaeological recording to address GAPS' recommendations. To put the work in context, this was the same month and year as The Welsh Highland Railway (Transfer) Light Railway Order enabling the Festiniog Railway to make an agreement with the official receiver to acquire the WHR's assets as a prelude to the rebuilding

Subsequently, because of the contractor's tight work schedule and the resultant limited scope for archaeological recording between excavation of the pipe trench and laying of the pipe, the project engineers requested that any archaeological recording be carried out before work started rather than as a watching brief during the works and this was agreed. The recording therefore ultimately took the form of an evaluation excavation.

The project report was published in April 1995² from which this article is derived by permission. The photographs that accompanied the report were kindly found and provided by Sean Derby, Historic Environment Record Archaeologist of Gwynedd Archaeological Trust.

The work comprised three stages, firstly, a desk top study that looked at the history of the railway and the site, secondly a field survey and thirdly the digging of some trial trenches. The report covering the first stage covers familiar ground and it is the other two stages that are of interest. In order to provide context, the J M Lloyd map of Bettws Garmon from Boyd's book³ is included in this article.

When first established by the North Wales Narrow Gauge Railways Company in the late 19th century, the station comprised the stone station building and a signal box. In 1902, following the resurrection of operations at the Hafod-y-Wern quarry, a looped siding joining to the quarry tramway branch was laid behind the platform and station building. These continued in use until the closure of the NWNGR in 1916.

During the refurbishment of the railway by the WHR in the 1920's, the quarry extension and the northern end of the siding were dismantled as were the signalling equipment. The station continued in use until the closure of the WHR to passengers at the end of the 1936 season.

The field survey found that the main fabric of Betws Garmon station was in reasonable condition and 9.0 x 5.0 metre in

dimension of well constructed stone. Walls survived to almost their original height on three sides while the north facing side was substantially collapsed and robbed.

The route of the main line was defined by the platform edge on the south side which was visible as a low kerb of slate blocks all but overgrown by turf, and on the north side by the break of slope forming an embanked edge above the marshy ground bounding the nearby river. The extent to which the raised area occupied by the station and

railway is a natural topographical feature or a prepared embanked terrace was not apparent and this was investigated in stage 3. It's assumed that the 'low kerb of slate blocks' was swept away in the rebuilding of the WHR some years later.

The siding formerly looping behind the station building was visible as a very shallow linear depression some 1.8 m in width. To the rear of the station building it was possible to make out slight depressions in the turf cover forming sub-rectangular scoops left following the removal of the railway sleepers.

To the south of the former siding and adjacent to it several rough slate slabs were exposed through the turf cover indicating a possible pathway or area of laid hard-standing adjacent to the siding.

16 m to the north of the station building on the south side of the main line, there were the remnants of a rectangular bolted fixing identified by the arrangement of sheared iron bolts protruding through the turf cover. The report's authors concluded that this identified the location of the former signal box serving the station approach.

The GAT team dug two trenches, A & B as part of the archaeological investigation. Trench A of 19 m x 1.5 m was excavated by machine under the supervision of GAT in a SW/NE direction, 10 m to the south of the station building to provide a profile through the possible man-made embankment and the route of the main line and siding.

The nature of the raised ground upon which the station stands was found to be of natural glacial and/or alluvial origin comprising a series of clay, clay-silt, and shingle deposits. On the northern edge of the natural slope some material had been used to extend the natural bank for the purposes of the railway. This was found to be limited to 0.5 m width of dark brown silty clay overlaid by a further dump of very dark brown coarse sandy silt.

The foundation for the railway line itself was represented by a thin spread of coarse stone chippings cut into a slight depression in the underlying geology.

Evidence for the railway siding circa 5.0 m to the southwest consisted of a shallow depression in the embankment profile. Within here lay further deposits of very dark brown coarse sandy silt which was spread within the depression and to the northeast in a low bank. Coarse stone chippings levelled the depression to form the foundation for the track.

To the southeast of the siding the geology was sealed by a thin spread of poorly sorted stones which appeared to be associated with an area of hard-standing within the precinct of the station. To the northwest of the trench several worn slate slabs protruded through the surface adjacent to the line of the siding but were not in evidence within the recorded section. The origin of the stone deposit remains slightly ambiguous and the report concluded that these were of natural origin.

'Intrusive cultural material' was absent from all deposits excepting the turf cover to the south west of the siding, from which two large iron nails were recovered.

Trench B was 5.0 m x 1.5 m was excavated by machine to bisect the low embankment which formed the foundation for the quarry tramway. The man-made embankment, which measured 1.5 m in width on top and 3.0 m at its base, stood to a height of 0.6 m above the surrounding ground surface. The make-up of the feature was identified in section as consisting of a single deposit of waste slate in fragments up to 0.5 m in size in a matrix of yellowish-brown clayey gravel. The embankment appeared to have been laid directly over the former ground surface.

The embankment was covered in a thin turf. No details regarding the track or sleeper arrangements were apparent.

The report's authors concluded that the project had been successful in recovering information regarding the construction of the 'two railway systems'. Perhaps the most surprising discovery was the limited foundation preparation that was apparent for the NWNGR/WHR lines. A thin spread of stone chippings was the only evidence for this preparation, with the relatively soft underlying clays taking the weight of the traffic. The embankment upon which the line of the WHR runs at this point was discovered to be of natural origin and

merely strengthened and steepened on its northern edge by dumped material in order to support the railway line.

The quarry tramway embankment was found to be of simple design consisting of a single phase of dumping of slate waste to provide support for the tramway wagons.

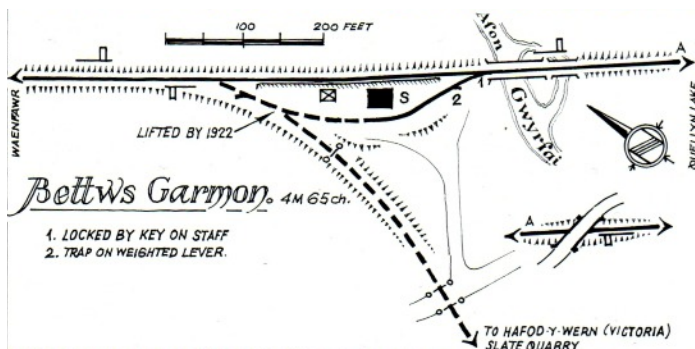
The archaeological investigation ensured that no important elements of the railway and tram line would be destroyed by the development and a full record was made of those elements which were to be disturbed by the pipe line works.

Today, apart from the fenced off WHR line running close to the conserved remains of the station building, Bettws Garmon is little changed from 1995, although the quarry tramway embankment is not so evident. Sheep no longer wander around the site and thus the vegetation is more luxuriant. To the south of the building remains and close to the railway line, the presence of manhole covers provide evidence of the Welsh Water pipeline.

My thanks to Sean Derby, Historic Environment Record Archaeologist and to Gwynedd Archaeological Trust for permission to reproduce extracts from the report and the photographs of the project.

References

- 1 See Hafod y Wern Slate Quarry, Richard Watson, *WHH49*, September 2010.
- 2 *Cwellyn Service Reservoir Archaeological Recording* (G1135), J Carver and H Flook, Gwynedd Archaeological Trust Report No. 156
- 3 *Narrow Gauge Railways in South Caernarvonshire* Volume 1, Boyd, JIC, Oakwood Press, 1988



Above left - a reproduction of Jim Lloyd's map of the Bettws Garmon station area, showing the loop installed to give access to Hafod-y-Wern slate quarry.

Above right - the south elevation of the station building

Below left and right - exploratory trenches dug as part of the GAT site investigation - all photos by the GAT Team - taken in 1995.

Permanent Way



Figure 1 - Original NWNGR track-work at Rhyd-ddu ca. 1892. Note the use of logs as sleepers, the method of attaching the rails to the sleepers and the indifferent alignment of rail levels. At this time there was no passing loop here and train reversal - this was the terminus of the line - would have been 'interesting'. WHR 1093

Michael Bishop has submitted the following notes on Permanent Way standards, and trials and tribulations, across the history of the NWNGR, PB&SSR and WHR.

THE NWNGR

On 31 July 1877 Major Marindin reported for the Board of Trade on his first inspection for public opening of the Dinas-Quellyn and Tryfan Junction-Bryngwyn sections:-

The width of the line at formation level is 10 ft. The gauge of the line is 1' 11 ¼". The width between the rails is 6 ft. The rails employed are iron of the Vignoles section, 8 yards long and 35 lbs weight per lineal yard. The rails are secured to the sleepers by fang-bolts and dogspikes. The joints are fastened by fish plates with 4 bolts. The sleepers are of larch 4' 6" x 9" x 4½" half round fixed at 2' 5¼" from centre to centre, except at the joints where they are 2 ft apart from centre to centre. The ballast is gravel mixed with a clay shale and is said to be 7" deep under the sleepers.

On 28 May 1878 he reported that the extension to Snowdon Ranger had a similar formation.

On 5 May 1881 he inspected the final section to Rhyd-ddu, saying that the rails were 40 lbs as well as 35 lbs in 24 ft lengths. As before, it was a dogged road, but two fang bolts at joints with one fang-bolt and one spike at intermediate sleepers which were laid at the same 2' 5¼" centres.¹ J.I.C. Boyd mentions 38 ½ lbs rail, quoting another un-named contemporary report.²

But all was not well. Less than 12 months later the NWNGR Directors told shareholders in their report of 2 March 1882 that parts of the line where the gradients were the most severe and traffic the heaviest required renewal.³ £100 had been reserved in the accounts at 31 December 1881 for the purchase of steel rails. The news must have distressed and angered the 238 shareholders.⁴ After spending a substantial £9,000 per mile getting the line built the interest payments meant that it was barely profitable. The Company was still in debt, and they were now being told that the rails were not up to the job and were failing after less than 5 years. They must have guessed that all the rails would eventually have to be replaced, meaning little likelihood of any return on their investment in the near future. J. C. Russell, the Chairman, told shareholders in 1893, when relaying was partially completed, that the line was 'originally badly laid, and that part of the expenditure now was due to that fact'.⁵ 'The Railway Engineer' published a description in 1883 stating that as the iron rails were worn they were being replaced by steel rails of 40 lbs per yard. The drawings of the track fittings accompanying the article are shown in Figure 2.⁶

On main line railways iron rails had been found to be adequate with light loads, but heavy coal trains had shown up their poor wearing properties, exacerbated by steep gradients and sharp curves.⁷ On the NWNGR there were plenty of both of

Continued on page 7

PLATE CC.

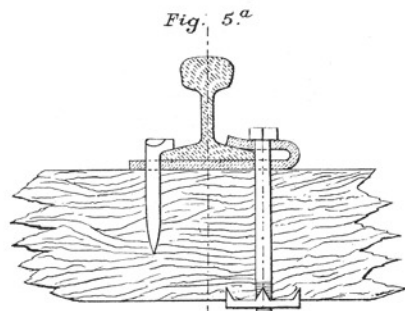
*Pain & Cleminson's
Patent Sole-plate.*

Fig. 5b.

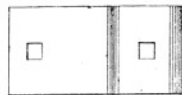


Fig. 5c.

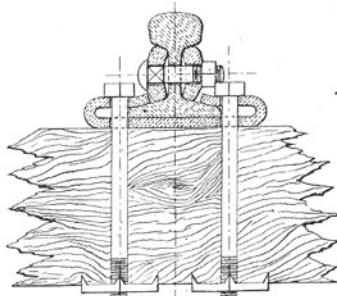


Fig. 5d.



Fig. 5.

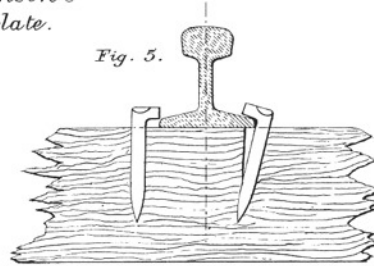


Fig. 5e.

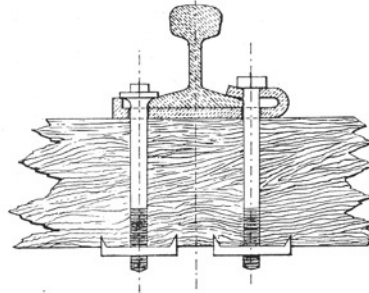
*North Wales . Narrow Gauge*

Fig. 5f.

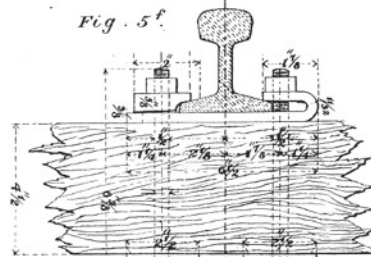


Fig. 5g.



The next Permanent Way we have to deal with, and the last at this present time, is that of the North Wales Narrow Gauge Railways, traversing the neck of land westward of Mount Snowdon. The gauge is $23\frac{1}{4}$ in. The rails are of the Vignoles, or flange type. Those originally laid were of iron, 35 lbs. to the yard. But as these are worn they are replaced by steel rails at 40 lbs. per yard. They are in length either 20 ft. $2\frac{1}{2}$ in., 22 ft., or 19 ft. $9\frac{1}{2}$ in., have a height of $3\frac{1}{2}$ in., width of head $1\frac{13}{16}$ in., width of base $3\frac{1}{4}$ in., and thickness of web $\frac{7}{16}$ in., and have a sectional area of 10 square inches. They are laid without any side cant. The sole-plates adopted are those of Pain and Cleminson's Patent, as shown Figs. 5 to 5g. Figs. 5f and 5g represent the precise form adopted on this Permanent Way. The area of base is about 18 square inches, and they are held down, as will be observed, by two fang-bolts, and on one side a clip. The sole-plate weighs $2\frac{1}{2}$ lbs. The fish-plates are of iron, and weigh $9\frac{1}{2}$ lbs. per pair; the fish-bolt weighs $\frac{3}{4}$ lb. The sleepers, which are principally of larch, are 4 ft. 6 in. in length, and 7 in. by $4\frac{1}{2}$ in. rectangular sectional area, and weighs $30\frac{1}{4}$ lbs. They are laid at 2,000 to the mile, or 2 ft. $7\frac{1}{2}$ in. centres, and are not creosoted.

The ballast used is light gravel and coarse river sand. The sharpest curve is about 2 chains. A short rigid wheel-base is obtained by use of the Fairlie system, or altogether avoided by use of the Cleminson flexible wheel-base.

The steepest gradient worked by locomotives is 1 in 30. But there is an inclined plane with a gradient of 1 in 10 where stationary engines and wire ropes are used. The maximum weight

on locomotive axle is 6 tons. A speed of 30 miles an hour is often attained, though the ruling speed is 15 miles. Total mileage 12 miles.

With regard to the Pain and Cleminson Patent Sole-plate, as illustrated (Figs. 5 to 5e), Fig. 5 represents the state of things liable to take place when a Vignoles rail is held down simply by spikes driven in outside the flange. The desirability of using some means for preventing the slackening and shifting of the rails, and the consequent widening of the gauge, is thus rendered obvious. Figs. 5a to 5e represent three forms of this Patent Sole-plate designed to meet this evil, besides that shown, Figs. 5f and 5g. At Figs. 5a, 5b are represented, in Section and Plan, the sole-plate for use on sleepers intermediate between those at the joints, and for light traffic only. At figs. 5c, 5d is the plate designed for use at the joints where the joint is on the sleeper. It will be noted that this one grips the flanges of the rail on both sides, the ends of the rails being slid in. In the case where the joint is suspended between two sleepers, two of these sole-plates are used, one each side of the joint, and by bringing them close up to the fish-plates, so we are informed, creeping of the rails is prevented. This and the last one may be held down by either fang-bolts, wood screws, or dog spikes, according to circumstances.

In the case of heavy traffic, a form of sole-plate is designed with a lip turned up at the opposite end to the gripping end. Fig. 5e. This is held down by fang-bolts, one of which, for use on the side with the turned up lips has a collar to it as shewn.

Figure 2 (left and below) - Details of track fittings from *The Railway Engineer*, 1883, together with a transcript of the descriptive text that accompanied these drawings of the fittings (below).

(See also the note in Reference 6).

In particular, compare the detail visible in Figure 1 with drawings 5^f and 5^g, together with the supporting descriptions reproduced here.

Continued from page 5

these - the line from Dinas ascended at 1 in 47 or 48 to Tryfan Junction, 2 ¼ miles, and on the Bryngwyn branch at 1 in 41 to Rhostryfan, 1 mile, followed by 1 in 41 and 1 in 35 to Bryngwyn, 2 ½ miles.⁸ The 1 in 30 stretch mentioned by the *Railway Engineer* might have been the 'horrificing gradient' Mr Boyd suggests just beyond the road crossing at milepost 2 on the Bryngwyn branch.⁹ On the Tryfan Junction to Rhyd-ddu line the gradients were much lighter at 1 in 76 passing Snowdon Ranger, and then varying from 1 in 79 to 1 in 290 from Glanrafon. J.I.C. Boyd quoted the 'excessively sharp curves' of 3½ and 4 chains (231 ft to 264 ft) mentioned in the 'Railway Press' in 1889.¹⁰

Experience of rails elsewhere suggested that steel lasted 16 times longer than iron, some of which had to be replaced every 3 or 4 years. They had been produced since the early 1860's after the work of Bessemer and others in the 1850's; several UK railway companies had started converting in 1870, including the LNWR.¹¹ At the time steel rails cost about twice that of iron.¹² Charles Easton Spooner, as the NWNGR Engineer from 1872 until at least the opening in August 1877, must surely have drafted the construction contract with Hugh McKie in December 1872, and his replacement, John Boys in 1876. Alternatively it would have been the Resident Engineer, Spooner's son, Charles Edwin, until the summer of 1876,¹³ and then the Festiniog's John Sylvester Hughes, again, until at least the opening in 1877.¹⁴ With their experience of the FR with its maximum gradient of 1 in 79.82 and an average of 1 in 92,¹⁵ they clearly did not recognise iron rails as a problem. And it would seem that nothing changed with Boys' contracts awarded in 1878 (to Glanrafon) and 1880 (to Rhyd-ddu).¹⁶ At some stage, James Cleminson took over as Consulting Engineer, maybe evidenced by his patent 6-wheeler coaches being delivered in December 1877, but the start of wholesale track renewal had to wait until January 1884¹⁷ when Robert Livesey added the responsibility for the track as Engineer to his role as Secretary and General Manager.¹⁸

On the FR some of the iron rails were lasting at least 14 years, but in February 1878 Spooner convinced the directors to buy steel rails,¹⁹ used in Moelwyn Tunnel,²⁰ and a gradual relaying programme was embarked upon in 50 lb steel replacements.²¹ In 1891 it was decided to complete the process, and it was finished in 1893.²² In 1921 Major Spring reported a siding in the FR's Harbour Station as having iron rails.²³ Fred Howes recently recalled finding some iron rails on the FR in 1967.²⁴ It raises the question as to whether the original NWNGR iron rails were poor quality rollings.

The relaying of the NWNGR in steel appears to have extended until about 1903.²⁵ It might explain the fresh-looking track in the 1895 Frith photograph reproduced as Figure 3 below. Directors' Reports indicate that new fishplates were part of the process. The Company being in receivership, Russell got the permission of the Court each time before a quantity of rails and fishplates were acquired.²⁶ 4 miles from Dinas Junction was replaced in 1886/8 using 41¼ lb rails (Indian Standard for Metre Gauge).²⁷ Around 150 tons of rails and 4,500 new sleepers were put in in 1887.²⁸ By 1892 6½ miles had been done followed by a further 2½ miles by 1893, and the remaining 3¼ followed that. The cost of new steel rails and fishplates varied from about £270 per mile in 1886²⁹ to about £320 per mile in 1893³⁰, plus labour, and the inevitable renewal of at least some of the sleepers. So, the whole 12¼ mile line must have cost at least £4,000 to renew plus the additional labour costs. It is no wonder that the Company could not pay off substantial 'Old Creditors' (as they came to be described in the Balance Sheet), and only a fraction of the Debenture Interest. The shareholders got no dividends. Sir James Szlumper was appointed Engineer in 1891³¹ and was ordering 41½ lb rails in the late 1890's.³² A Permanent Way Renewals Reserve was set up in the accounts in 1888 to spread the cost.³³

In 1899 there were 8 permanent way staff - split into two permanent way gangs of 4 each, headed by a ganger.³⁴

A visitor in 1896 found that the fang bolts had been almost completely discarded. The ballast was described as 'dirty



Figure 3 - Newly-relaid track between Snowdon Station (Rhyd-ddu) and the Ffridd Curve - photographed by Frith in 1895

material, but well boxed up'. There was no loose rough material.

J.I.C. Boyd in his quote about sharp curves mentions the tendency for the rails to be spread and that Robert Livesey designed iron ties in 1886, which were fitted 3 to each rail length to hold the gauge on the sharpest of them, and that he introduced barbed track spikes to alleviate the constant re-spikeing that was necessary. This clearly was an ongoing problem because in 1904 George North, the local NWNCR manager under Aitchison, patented a track device with James Metcalfe to stop rails spreading. Presumably this was the James Metcalfe of Davies & Metcalfe who had re-boilered the Vulcan Fairlies in 1902 and 1903.³⁵ The device involved a metal tie-bar below the rails on curves with a strut round the base supporting the rail in a vertical position by being wedged between the head and web. A summary description and diagram of the patent is viewable on the internet.³⁶

In 1906 the North Wales Power & Traction Co. Ltd agreed to spend £2,500 on 'restoring the NWNCR to present steam working', including a steam locomotive. The evidence in the NWPT Directors' Minute Book suggests the surplus beyond the cost of *Russell* was spent on the track.³⁷

Major G.C. Spring reported as follows on the NWNCR section in 1921³⁸:-

The two permanent way men cannot of course keep the Permanent Way even weeded and the track is in a very poor state of maintenance. Between Dinas and Junction and Bryngwyn Station the majority of the traffic takes place and 1000 sleepers have been recently renewed in this length, and the bars introduced to check the spreading of the gauge. A further 500 sleepers are urgently required. Bryngwyn Station Yard requires immediate attention.

The track from Tryfan (mile 3) to about a mile from Snowdon Station say 8½ mile requires at least 300 new sleepers per mile, before any passenger trains could be run without serious risk of derailment.

Every curve requires packing and lifting and a lot of ballast especially under joint sleepers is required.

From Mile 8½ to Snowdon Station i.e. the 92-foot span bridge onwards the track is well ballast (sic) and in good order as regards sleepers.

Some of Sir John Henderson Stewart's contribution of £1,500 in 1921³⁹ probably went on the track before McAlpines came of the scene to renovate the line to be part of the WHR.

THE PBSSR

In July 1904 a cargo of 252 tons of steel rails arrived in Carnarvon harbour from Belgium 'for the extension of the Narrow Gauge Railway to Beddgelert'⁴⁰ This was enough for almost 4 miles of track. This was clearly for the PBSSR and some of them may have been for the rails laid from Snowdon Station to Pitt's Head.

The Harper Bros & Co report of March 1905 for the electrified PBSSR proposed as follows:

The Permanent Way will be laid according to standard railroad practice, and as usual as soon as the bottom

ballast is laid the permanent way shall be linked on, properly secured and afterwards lifted, straightened and boxed up. The sleepers will be of creosoted fir wood, properly spaced and laid according to standard railroad practice. The sleepers in tunnels will be of steel. The rails as already mentioned will be of steel, Vignole section, weighing approximately 41¼ lbs, per lineal yard, the standard length of the rails being about 30 feet. The fishplates as shown on enclosed Drawing No 537 will weigh about 9 lbs 2 ounces per pair. The fish bolts and nuts and dog spikes will be of mild steel of the forms and sizes shown on enclosed Drawing No. 537.

The NWPT/PBSSR contract of 31 July 1905 specified the PBSSR track:

The sleepers to be of Oak Creosoted to be 4 feet 6 inches long by 9 inches wide by 4½ inches deep.

The standard length of the rails to be 30 feet. An allowance of ¼ of an inch above or below will be permitted, but if there be any further deviation the rails may be rejected. 95 per cent. of the rails to be of standard length, the remainder may be in lengths of 27 feet and 24 feet, or as directed.

On curves, special short lengths to be cut and drilled, where necessary, to keep the joints opposite one another and the sleepers at right angles to the centre line.

Expansion plates to be put in at each joint, and not removed until the permanent way has been lifted and straightened.

No closure to be less than 12 feet in length.

Sleepers are to be properly spaced, 11 sleepers per rail, 2 feet 9½ inches centres, leaving 12½ inches from end to end of each rail, and placed perfectly square to the centre line or its tangent.

An iron bearing plate to be placed on the sleeper either side of rail joint. The sleepers to be adzed to give the proper inclination to the rails.

The dog spikes to be 4½ inches long.

The rails are to be laid with an inclination of one in twenty and true to gauge, perfectly parallel to one another and with proper super-elevation of the outer rail on curves.

Round curves of less than 15 chains radius, the rails should be laid one-quarter of an inch wide to gauge. All curves of 10 chains radius or under to be properly checked.

Ballast. The bottom layer is to consist of hard rough stone pitching, the stone to be approved by the Engineers, each stone 5 inches deep, laid on edge, and hand-packed as closely as possible, with the interstices filled with chippings of the same. The 4 inches of broken stone up to the sleeper, the stones being 2 or 2½ inches. The top dressings to be gravel or broken stone laid to the top of sleeper (in case it is intended crushing 2 inches through and through, this would do for the ballast as it would have some small in it). A border of larger stones 9 inches by 9 inches, should be laid so as to keep the small 5 inch pitching up to its work, the whole to be laid upon the line and trimmed, to the form shown on the drawings.

THE WHR

In 1922 McAlpines, the WHR contractor, refurbished the 41¼ lb mile in 30 ft lengths laid south of Rhyd-ddu (ex-Snowdon) to Pitt's Head and part of the Croesor Tramway laid by the PBSSR contractors. Most of the rest was laid with 40 lb rail in 33 ft lengths. More detail on permanent way materials, ballast, curves and platelaying can be found via the WHHG's website in a transcript of the Sir Robert McAlpine & Sons Contract of 1922 ⁴¹. Refurbished Croesor Tramway metals were used on that section. ⁴²

J.I.C. Boyd records that in 1935 £600 - £700 needed spending on the track and rolling stock, probably never done before closure in 1937.

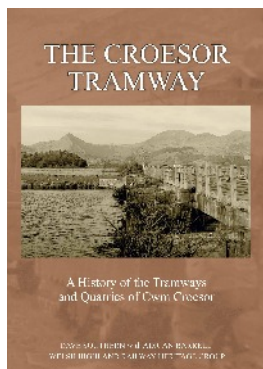
References

- 1 Inspectors' reports at TNA MT6/1351/1. Also in MT29. They have been transcribed in *Snowdon Ranger*.
- 2 *Narrow Gauge Railways in South Caernarvonshire (NGIRSC)*. J.I.C. Boyd 1972 ed. p 228.
- 3 Directors' reports and attached half-yearly accounts from 1881 onwards are at the Stock Exchange Collection, Guildhall Library, London. Unfortunately copies earlier than 1881 have not been traced at TNA or elsewhere.
- 4 Given at half-yearly meeting 16 September 1878. *Manchester Guardian* 17 September 1878
- 5 Report of half-yearly Ordinary General Meeting 10 October 1893. *North Wales Chronicle* 14 October 1893.
- 6 Attempts have been made to trace any surviving owner of *The Railway Engineer* title without success. It is not clear if this magazine which ceased publication in 1935 merely ceased or was taken over by another organisation.
- 7 *The Railway - British Track Since 1804* A.R.G. Dow. 2014
- 8 From a printed description of the line sent to the Board of Trade in 1892. TNA MT6/1108/1. Also in a circa 1895 description in an unidentified newspaper in Lynton & Barnstaple Railway newspaper cuttings. ND Record Office.
- 9 *NGIRSC* 1972 ed. p 195.
- 10 *ibid* p 228/9.
- 11 *The Railway - British Track Since 1804* A.R.G. Dow. 2014
- 12 *ibid*
- 13 According to his application for Associate Membership of the Institution of Civil Engineers 1882.
- 14 Hughes was resident engineer and C.E. Spooner engineer at the time of the BoT Inspection 14 August 1877. *North Wales Chronicle* 18 August 1877.
- 15 Captain Tyler's inspection report of 27 October 1864 quoted by Peter Johnson in *An Illustrated History of the Festiniog Railway* p 21.
- 16 Advertisements for Tenders in *North Wales Express* 18 October 1878, and *Y Genedl Gymreig* 15 July 1880.
- 17 Report of half-yearly ordinary general meeting 26 September 1887. *North Wales Chronicle* 1 October 1887.
- 18 Biography of R.H. Livesey. *Carnarvon & Denbigh Herald* 28 June 1889 quoting *The Railway Press*, Vol. IV, No. XCIV (Vol. 4, No. 94), 21 June 1889, page 11
- 19 Peter Johnson in *An Illustrated History of the Festiniog Railway*. pp 45 and 60.
- 20 *Festiniog Railway* Vol. 2, J.I.C. Boyd, 1962. p 210.
- 21 William H. Bishop in *Scribners Monthly* for August 1879. ebooks.library.cornell.edu
- 22 *Festiniog Railway* Vol. 2, J.I.C. Boyd, 1962. p 210.
- 23 From Spring report of 1921. Transcript courtesy of Peter Johnson.
- 24 *FR Magazine* No 236. Spring 2017 p 616. 'Penrhyn Quarry rail was used to replace . . . the worst of the double-headed rails between Portmadoc and Tan y Bwlch, some of which were still iron (rather than steel) and many extremely corroded, with daylight showing through the web.'
- 25 The credits for (Permanent Way) materials sold showing in the 6-monthly accounts ceased in 1903.
- 26 e.g. J.C. Russell's Affidavit to the High Court, Chancery Division of 28 March 1893. TNA J4/4631 Doc 151
- 27 NWNGR Directors' report dated 22 August 1887.
- 28 R. H. Livesey reported 30 tons of rails and 2,000 sleepers were laid in the first half of 1887. WHH 72 p 6 (with a misprint of 50 for 30 tons) A large part of 130 tons of rails purchased were used and 2,500 sleepers were laid in the second half, per the report of the shareholders' half-yearly meeting on 22 March 1888. *Carnarvon & Denbigh Herald* 23 March 1888.
- 29 Directors' report 2 March 1887. Guildhall Library Stock Exchange collection.
- 30 J.C. Russell in an Affidavit sworn 28 February 1893. 2½ miles cost about £800.
- 31 Signatory to Permanent Way Certificate March 1891 after departure of Robert Livesey.
- 32 Statement as Arbitrator of Lynton & Barnstaple Railway Arbitration October 1899. NLW MS 10244.
- 33 Directors' reports and accounts 1881 onwards. Guildhall Library Stock Exchange collection.
- 34 G. C. Aitchison evidence to Lynton & Barnstaple Railway Arbitration October 1899. NLW MS 10244.
- 35 *Falkirk Herald* 31 May 1905.
- 36 GB patent 190420607 submitted 24 September 1904, granted 13 July 1905. Brief summary text and diagram can be found on the European Patent Office website: <http://tinyurl.com/y76cfzsl> (verified 29 January 2019)
- 37 Quoted in *Ghosts of Aberglaslyn* J. Manners and M. Bishop from transcripts. Minute Book at Manchester Museum of Science & Industry. Ref ES1 37/1
- 38 Peter Johnson *An Illustrated History of the Welsh Highland Railway* 2nd edition 2009 p 49
- 39 *ibid*. p 46.
- 40 *Carnarvon & Denbigh Herald* 16 July 1904.
- 41 <https://www.welshhighlandheritage.co.uk/history/archives/> or directly at <http://www.railchronology.free-online.co.uk/WHR-contract.htm> (verified 29 January 2019)
- 42 *The Croesor Tramway*. Dave Southern with Adrian Barrell, WHRHG, 2018.

Note:

- TNA - The National Archives (Kew)
 NLW - The National Library of Wales (Aberystwyth)

Book Reviews



The Croesor Tramway

by Dave Southern and Adrian Barrell
Soft cover: 120 pages
Publisher: WHRHG (2018)
Language: English/Welsh
ISBN-10: 9789930821
ISBN-13: 9780993082160

Your present reviewer first visited Cwm Croesor seventy years ago but, even then, the quarries had long ceased to function and what remained of the Tramway was a grass grown pair of rails and the odd derelict wagon. However, he became enchanted with the scene and years later met his wife-to-be on a hill farm on the slopes of the Moelwyn.

My library contains most of the titles covering the narrow gauge railways which converged at Portmadoc but the Croesor and Gorseddau railways are but chapters in more general works, so the appearance of 'The Croesor Tramway' by Dave Southern and Adrian Barrell happily fills that gap.

The book is laid out on similar lines to 'Ghosts of Aberglaslyn' and other WHRG publications and our designer and printer, ZPQ Designs, has produced another splendid title.

We learn that in addition to the major outward traffic of slate from the valley to ships at Portmadoc harbour there was inwards traffic of coal and oil for the quarries, and also general goods traffic to serve the two village shops, the school, and valley population of around 200.

No advertised passenger service was operated but for such occasions as the annual Sunday school outing a train was operated along the Tramway to Portmadoc to connect with Cambrian trains to places like Criccieth, Pwllheli and Barmouth.

There are eight chapters in this book covering every aspect of the Tramway and I much enjoyed reading about the personalities involved and their memories. Moses Kellow, manager of the Croesor Quarry, stands out beyond all others as a remarkable engineer and innovator who brought electricity to Croesor long before MANWEB existed.

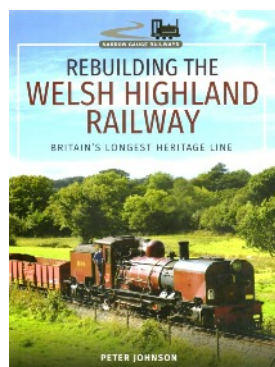
In addition to the Tramway there is a detailed description of the operation of the several inclines including the formidable Rho-sydd and Croesor inclines which were among the steepest in North Wales.

The arrival in 1923 of the WHR at what became Croesor Junction was to bring great changes to the operation of the Tramway and most of the traffic was then handled by the new railway. However, their very disappointing traffic returns soon brought about a suspension of services for much of the year and the Tramway had to revert to horse operation to Portmadoc.

My only criticism of this book is the lack of a clear overall map of the district. The late Jim Lloyd's map of the Croesor Valley drawn for one of Boyd's books is included, as is a small part of the OS 6" map showing the Parc Incline and Quarry.

Highly recommended.

Michael Davies



Rebuilding The Welsh Highland Railway: Britain's Longest Heritage Line

by Peter Johnson
Hardcover: 288 pages
Publisher: Pen & Sword Transport (2018)
Language: English
ISBN-10: 9784738272
ISBN-13: 9781473827271

Peter Johnson's latest book on the Welsh Highland Railway, its predecessors and subsequent rebuilding covers the past and present in 288 pages of well illustrated but detailed and densely written prose. His publishers have served him well as the book is beautifully produced and the photographic reproductions of even the old photographs are generally very good. Some of the historical pictures are familiar and have appeared elsewhere including Mr Johnson's own books but there are enough 'new' ones to provide some interest. There are plenty of maps but the detail on some of the Ordnance Survey reproductions is not of much use because of their size and scale and would have been better omitted. In contrast, the end papers feature well drawn and detailed maps by Gordon Rushton of the FR/WHR route from Blaenau Ffestiniog to Caernarfon.

The book is neatly divided into two sections, the second part covering the rebuilding of the Welsh Highland Railway by the Festiniog Railway. For those who were either involved or have read for example, Gordon Rushton's monumental tome on the subject¹ this will be familiar territory albeit written in a slightly less partisan manner. Johnson deals fairly overall with the early years of the original Welsh Highland Railway Society that became the '64 company, with the tortuous negotiations with the Official Receiver and local authorities and with the subsequent emergence of the Festiniog Railway as the secret 'under bidder' and all that then transpired. However, the emergence of the WHR Society from a group of disgruntled former volunteers on the FR, fed up with Allan Garraway is not really explained. Bob Honeychurch, as author of a letter to *The Railway Magazine* on the idea of the WHR's restoration and the Society's secretary, may well have started the ball rolling but there were others who played key roles. Names such as Bill Brown the chairman come to mind and Brian Evans, the surveyor who was also instrumental in getting Charles E Lee's history of the railway re-published by David & Charles along with *More about the Welsh Highland Railway*, although the author does mention Laurence Brydon, the Civil Engineer. However, the disruptive intervention of the mysterious Mr Green, who was instrumental in Messrs Brydon and Hilton leaving the '64 company, is covered. Interestingly, at least two of the original directors survive from the 1960s and they wait to be consulted on their memories of that time and subsequently! Of course, the ultimate rebuilding of the WHR was a great triumph and the second section of the book celebrates that well in words and pictures.

Part 1 of the book, mostly covers the history of the North Wales Narrow Gauge Railways Company, the emergence of the Welsh Highland Railway in the 1920s and its failure and closure in the 1930s. In doing so, the author sets the scene with a brief history of the Croesor Tramway in Chapter 1 and Chapter 2 'The Electric Railway' is devoted to the 'Ghosts of Aberglaslyn' story, namely

From the Editor

Mike Hadley sent me the following notes looking ahead to this year's Heritage Train program.

We few, we happy few, we band of brothers

Well it's not England, it's not St. Crispin's Day and there are sisters as well as brothers but the sentiment remains for those who volunteered to help run last year's Heritage Trains, now known as 'Journey into the Past'. This year the dates are Sundays 4th, 11th, 18th and 25th August. The work involves talking to passengers on the heritage trains as well as at Caernarfon, Dinas, Tryfan Junction and other locations. I think that those who were involved last year thoroughly enjoyed the experience and this year there are likely to be a number of improvements including, hopefully, a pre recorded commentary.

Can one desire too much of a good thing?

My apologies for the continued Shakespearean theme.

This year, as well as Journey into the Past the railway is organising a WHR heritage event to be known as 'WHR-Past, Present and Future' on Friday 21st June to Sunday 23rd June. This event will be concentrated between Boston Lodge and Beddgelert and should include a visiting iconic locomotive, a locomotive of the same class as another iconic locomotive, others and a lot more!

Volunteers are required for stewarding and other general duties, I can't be more specific than that at present.

Please do volunteer, we can make a real difference to the success of these events.

Please contact Mike Hadley

email: mikehadley@gmx.co.uk

landline: 01386 792877 mobile: 07860 828876

For a complete change of subject (I guess we all have other interests besides 'peculiar railways' in the top-left corner of Wales) I recently received the following letter from Keith Holland:

Dear Editor,

Whilst this has no direct connection to the Welsh Highland, I would just like to make readers aware of another "back from the dead" railway project.

There is a scheme to re-create locomotive 10000, the UK's first mainline diesel.

Full details can be found at:

<https://lms10000.co.uk/>

Thanks

Keith Holland (219)

Pickering Brake Composite

The WHHR have initiated a project to produce a replica Pickering Brake. The programme, managed by Bob Menzies, is charged with producing a vehicle in the intermediate dual-braked configuration that operated on the railway during the transition period after the opening of the Welsh Highland. This development was briefly noted in the Chairman's report in Issue 189 of the *WHHR Journal*.

If the brief is handled strictly, the replica will be of NWNGR No. 4, the one Pickering that was dual-braked, in its untrimmed configuration. This vehicle was renumbered as WHR No. 8 when its roof was lowered in March 1924.

Bob Menzies is asking for assistance, particularly in respect of details of the fixtures and fittings. Bob may be contacted at:

bob.menzies1@icloud.com

Continued from Page 10

the abortive Portmadoc Beddgelert and South Snowdon Railway project, well covered in the WHRHG's own book on the subject. It is a pity that the author's research fails him here as the rather pointless and categorical statement is made that 'There was nothing published about Russell's death on 29th August 1912 until details of his will were released in October'. Had the author bothered to look at *WHH* 25 pp. 4 to 7 or at the biographical blog ² of Russell's life on the web, he would have been able to see that Russell's funeral was reported in some detail in the *Farnham, Haslemere and Hindhead Herald* of September 7, 1912 and the *Oban Times* of the same date. Perhaps a minor but irritating lapse but which makes one wonder about some of the other details. Connections are also not always made between the people involved in the saga, such as Ernest E. Lake, a legal friend of Russell, who was not only one of the original shareholders in The Moel Tryfan Rolling Stock Company but who succeeded him as chairman and was an executor of his estate.

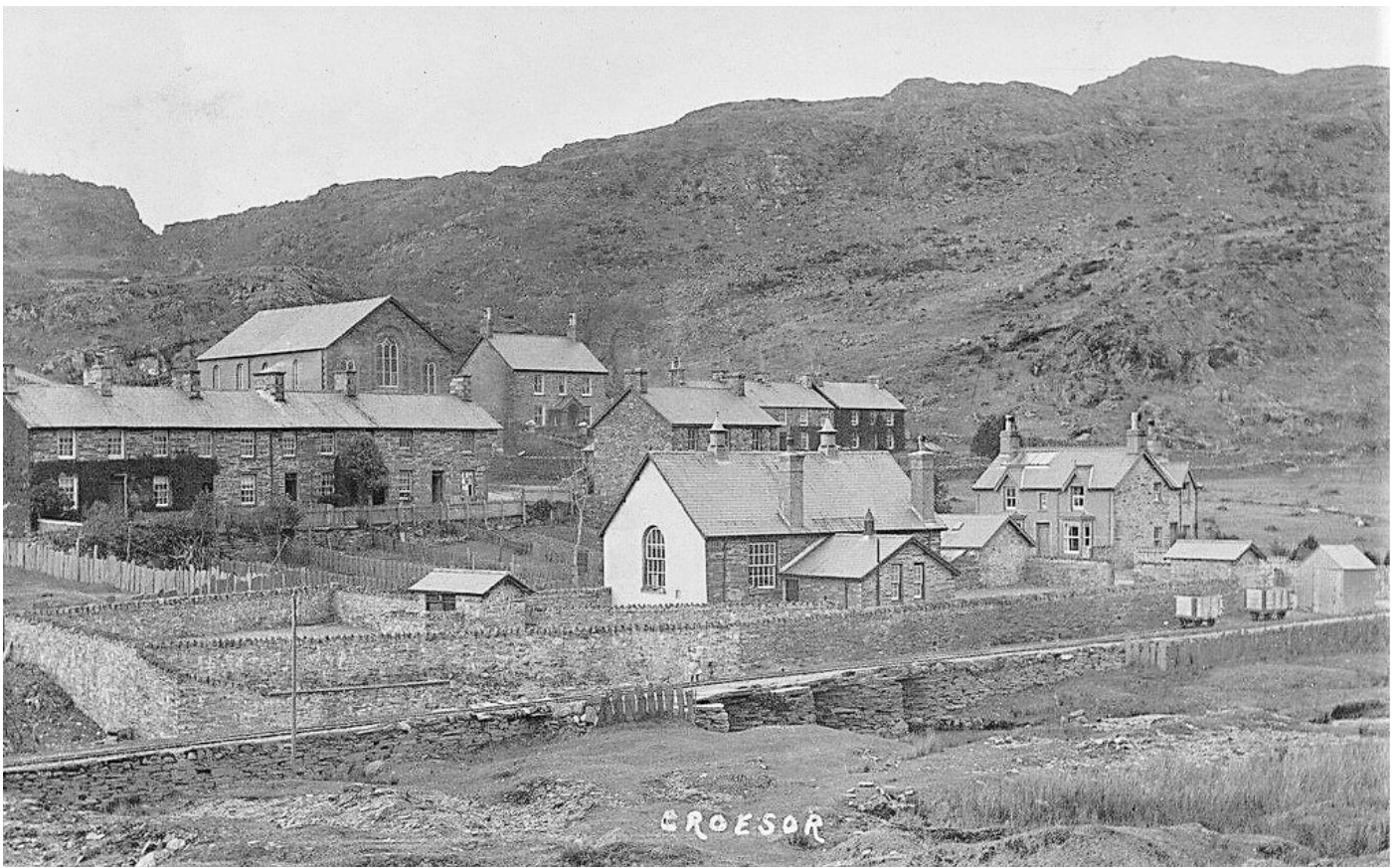
These caveats aside, this is a nice looking book, albeit not always an easy read, but which should find a ready market among those who are looking for a one volume history of the WHR and who might even find themselves in one of the many pictures of the re-building phase. Finally, the economics of railway book publishing continue to puzzle this reviewer, as the cover price of the book is £30 and this particular reviewer's copy was acquired brand new for £16 postage paid from a reputable source.

Nick Booker

1 *Welsh Highland Railway Renaissance: The Story of the Restoration of the Welsh Highland Railway 1991-2011* Gordon Rushton, Adlestrop Press, 2012

2 <http://jamescholmeleyrussell.blogspot.com/2008/>

Peter Liddell's Photo Analysis



Sod's Law is but one of many formulations of what appears to be an unfortunate truth, to wit despite best endeavours not everything will work out as either hoped or planned.

Just such an instance occurred quite recently when, shortly after the Croesor Tramway book was sent to the printers, we 'discovered' this rather splendid photograph of the centre of Croesor Village, clearly showing the tramway siding leading to the shed installed adjacent to the level crossing to store goods pending their collection by the intended recipients.

The school is centre image with the house known as Llys Helen to the right.

Whilst there are no horses visible - photographs showing actual horse-drawn traffic operations are still, it would seem, extremely scarce - we can nevertheless see two FR box wagons standing on the siding. The right-hand of the two wagons, standing alongside the 'coal hole' that pierced the end of the school's coal store building, appears to be the subject of some activity, presumably unloading.

The clapper bridge carrying the tramway over the Afon Croesor is clearly visible in front of the school and judgements as to the length of the photograph's exposure might be aided by examining the figure(s?) standing on the track on top of the bridge.



To continue the Croesor theme, I have made a rather brutal enlargement from our recent book (Figure 3.20 therein). The photograph shows one of the Croesor-fawr horses waiting at Croesor village at the head of a train destined for Bryn-hyfyrd and Blaen-y-cwm. The book was not the place for detailed photo analysis, but this image clearly, and interestingly, shows that Croesor traffic was not limited just to slate wagons and open box wagons. The train appears to include one of the FR end-door covered vans, specifically one of those with the more highly curved roof (FR No. 96 or equivalent).

Main Picture via Martin Pritchard

Detail from picture originally provided courtesy of Edgar Parry Williams.

Editor:	Peter Liddell	e-mail	peter.liddell@welshhighlandheritage.co.uk
Chairman:	Nick Booker	e-Mail	nick.booker@welshhighlandheritage.co.uk
		Address	Brook House, 4 Lawrence Gardens, KENILWORTH, CV8 2GH
Secretary:	Cedric Lodge	e-mail	cedric.lodge@welshhighlandheritage.co.uk
Membership Secretary:	Derek Lystor	e-mail	dick.lystor@welshhighlandheritage.co.uk