

Penrhyn and Padarn in 4mm scale

by K. A. Jagers

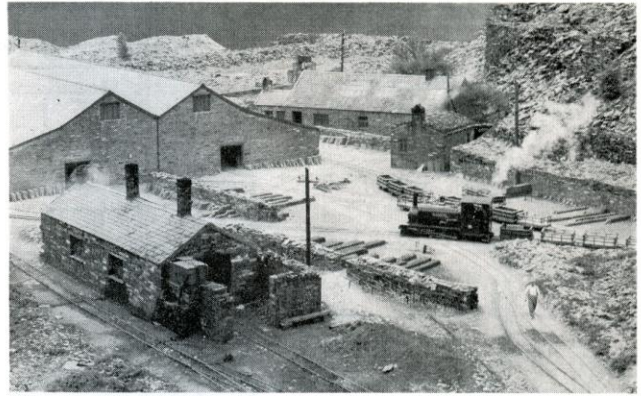
The small railway systems built to link the slate quarries of North Wales to the shipping ports, of which the Festiniog is the best-known example, have many features and peculiarities of operation that would make interesting and unusual models. Two of the lesser-known lines, the Padarn Railway, serving the Dinorwic Quarries, and the Penrhyn Railway are described in detail here, together with some suggestions for modelling various aspects.

The Padarn Railway, as it was commonly called, was a 4ft 0in gauge line from Port Dinorwic to Llanberis, about seven miles in length and connecting the 1ft 10½in ("2ft") gauge systems at either end. The reason for the change of gauge was that the larger was more suited to "main line" operation, whereas the 2ft was the only practicable size for use in the quarry workings, where tracks are lightly laid for easy modification as quarrying progresses. This did however necessitate the use of special transporter wagons, which conveyed the narrow-gauge quarry tubs, four to a wagon, over the main line to the Port.

On arrival at the High-Level terminus at Port Dinorwic, the narrow-gauge wagons were removed from the transporters and lowered down 1 in 4 inclines to the quay, half a mile distant and at a considerably lower altitude. Each 4-ft gauge wagon was locked in position at the loading dock, whilst the small wagons, which are themselves locked to the transporters during transit, were being unloaded. The layout of the loading dock is shown in the drawing: when one pair of tubs have been run off, the wagon is turned on the wagon turntable, allowing the removal of the pair on the adjacent track. When the loaded wagons have been removed, empties are run on to the transporters for the return journey to the quarries, where the reverse process was carried out.

The inclined planes in use at Port Dinorwic and the quarries were gravity-balanced; the descending loaded wagons haul up the empties on the other track, controlled by a metal band brake or by a rope brake in the drum-house at the summit.

In planning the model, it was decided to use OO gauge parts, working to 4mm scale. At 16.5mm gauge this represents 4ft 1½in and is far more accurate for the 4ft gauge than the 4ft 8½in it is intended to represent! For the 2-ft gauge, 9mm loco chassis and wagon wheels are obligatory for all but the absolute scratch builder.



A view of the slate dressing sheds at the Dinorwic Quarry, Llanberis. The locomotive is 0-4-0ST "Cackler". Photograph by R. E. Vincent

The Padarn main-line

The 4ft wagon transporters were simply a metal frame with four large wheels, carrying two sets of narrow-gauge rails. Exact dimensions are not known, but the frame should be about 59mm long and 29mm wide in 4mm scale. For this I used a piece of old-type heavy bullhead rail about 3mm deep bent into a rectangle of the above dimensions, and the open end soldered up. Axleboxes are made from the same material filed flat on both sides, drilled 3/32in and soldered to the inside of the frame to give a wheelbase of about 27mm. The wheel centres should be about 2mm below the lower edge of the frame, which is set this low on the wheels to improve stability when fully loaded. Peco "Wonderful Wagon" wheels are used, as these happened to be handy; they are slightly under scale size for a very good reason. On the prototype the large wheels of the 4ft gauge wagon would intersect the axle-line of the 2ft wagons, which are therefore built with no cross-axle, each wheel having a short stub axle in two bearings. The only commercial 9mm wagon wheels have, of course, continuous axles, and so the necessary clearance must be arranged on the model.

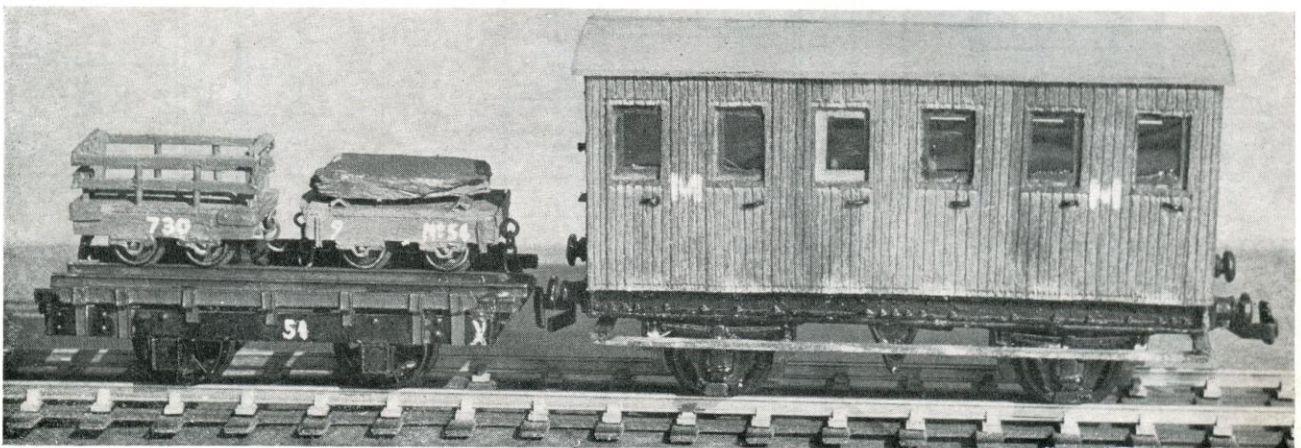
After adjusting for squareness on a sheet of plate glass, axlebox and other detail as shown in the picture is added from card. Two sets of fine-scale OO bullhead rails are soldered to the ends of the frame at 9mm gauge, 17mm centres. The outer rails are slightly higher than the inner ones, giving the narrow-gauge wagons a slight cant inwards, also to improve stability.

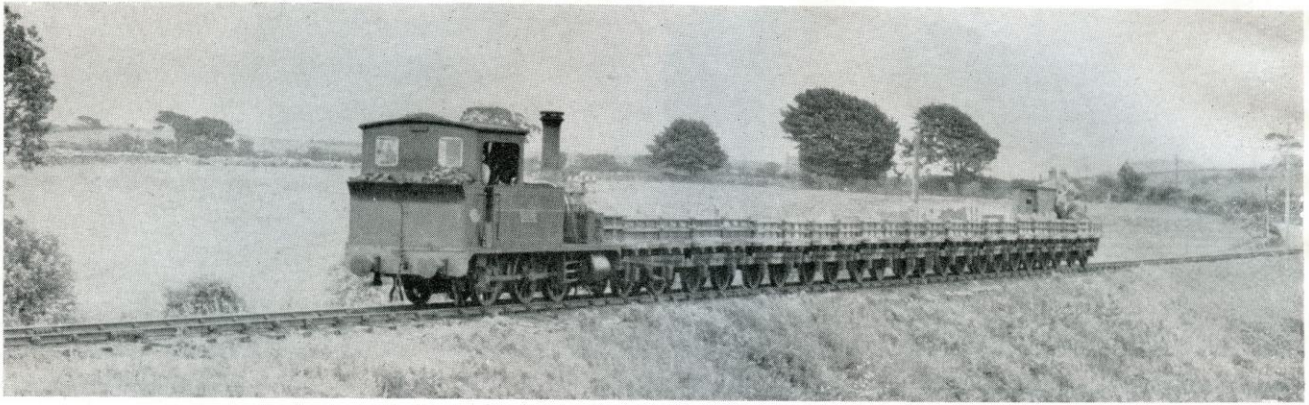
Painting details are: Ironwork, Black; all timber parts, guard rails, and tracks in track colour. Numerals, White; in positions shown, which varied considerably between individual wagons.

The end wagons in a train are also fitted with brake gear and buffing blocks. Coupling is thought to be by hook and link, although only the small fixed hook is visible in most photographs.

There were four locomotives, 3 steam and 1 petrol, in use on the 4ft system. The 3 steam locos were all neat 0-6-0Ts of Hunslet origin, named latterly, "Dinorwic", "Amalthea" and "Velinheili". They had 3ft 6in wheels at a 10ft wheelbase, and no commercial chassis seems to be

Two of the 16.5mm gauge models of Dinorwic Quarry Railway 4ft gauge vehicles, a transporter wagon and a typical workman's coach.





The 0-6-0T "Dinorwic" heads a train of loaded transporter wagons on the Padarn Railway main line near Pontrhyallt.

Photograph by R. E. Vincent

suitable, although that used for the Wills SR class "P" 0-6-0T would be a somewhat overlong approximation. A scratch-built chassis with Romford wheels, and a sheet metal or Plastikard body appears to be the only method of producing a reasonably accurate model. The petrol loco was built by Hardy Motors about 1925, and had inside frames with 4 completely exposed wheels. Any OO gauge motor bogie with removeable side frames, forms a suitable basis for a model of this locomotive. An unusual feature was the cable drum, with 250ft of steel cable, suspended under one end of the loco.

It may not be well known, but the railway also boasted a passenger service, in the form of a daily workmans train. Twenty-three carriages were built by the Gloucester RC&W Co. in about 1932, when the early style velocipedes operated by the workmen were discontinued as too dangerous. The train regularly loaded to 15 or 16 of these vehicles, hauled by the particular main-line engine that was in use that day, and at each station several coaches were uncoupled on the evening run, to form mobile waiting-rooms for the men the following morning. As there were no passing loops on the main line, it must be assumed that these coaches were pushed into Llanberis on the morning train, as the one service engine was always kept in the small shed at Port Dinorwic (High Level) overnight.

Each coach seated (or more appropriately in this case, held) 60 persons in 6 compartments each no wider than about 3ft 6in between partitions. The model is constructed on a redundant Hornby Cattle Wagon chassis but any 4-wheel chassis about the same dimensions could be used. The straight matchboard sides are of 1/32-in balsa sheet glued to a card backing-piece for strength. The grain should run vertically as on the prototype. The sides measure 78mm by 28mm, and 6 windows, 9mm by 6.5mm, are cut out on each side. Each is contained in a door which is scribed in the surface of the wood, as is the vertical planking. On a model such as this, where there is little prototype detail, I consider door-handles in relief are a necessity—these are small pieces of enamelled copper wire bent and passed through holes in the side, being secured from behind and painted matt black. Window holes are cut in the card backing such that a clear 1mm all round is still visible in the opening of the balsa side, forming the actual frame. Glazing strip is added and the sides and ends

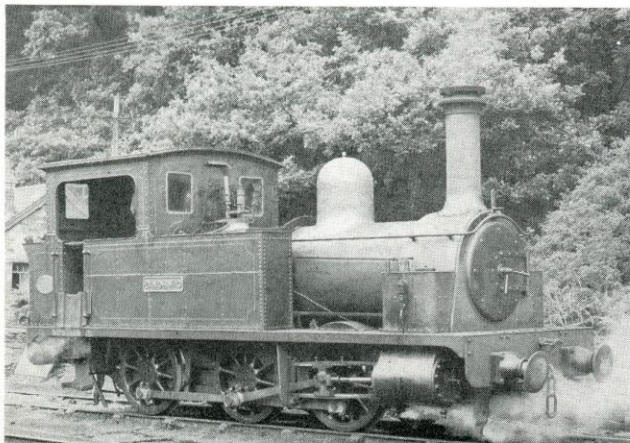
assembled on the chassis, the sides between the ends. The roof is also 1/32-in balsa, laid so that the grain runs lengthwise (it bends easier this way!). Details include footboards, end steps, pipework and a peculiar object looking like an overgrown oil-can, and presumably connected with the lighting system, if such a luxury was fitted. The livery is somewhat doubtful; the roof was definitely light grey, but on the one rather decrepit example remaining at Llanberis, the body appeared to be simply creosoted. Hence, pending further research, the model is stained with "Colron" medium oak wood dye, which produces a pleasing effect. Ironwork is black, the window frames maroon, but subsequent repairs were either left as bare wood, or creosoted, usually giving at least one odd frame on each side. The coaches were not numbered, but lettered A, B, C, etc. positioned as shown, in white. Remember to whiten the bottoms of the doors and the corresponding parts of the footboard—where dusty boots have trod!

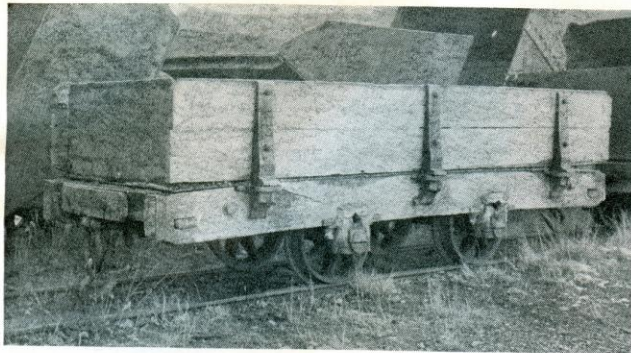
The country through which the main line ran was bleak and wind-swept gorse heath and marshland for the most part; the line is carried over undulations by high slate embankments in two places. Towards Llanberis this gives way to sheep pasture and thick copse, whilst for the last two miles the line runs along the north shore of Llyn Padarn on a stone embankment, which is still relatively clear, but further up the line thick bushes now reach a height of several feet, making exploration difficult. Would-be rambblers should take care that two bulls graze on the line near the village of Seion.

There were 4 intermediate stations, at Saron, Llanrug Bridge, Pontrhyallt and Brynrefail. The platform at Pontrhyallt holds about 10 coaches, the others held 4 each. All platforms were on the same side of the line and may have meant that the coaches only had doors on this side. At the first two places, access was by footpath from the road; at the latter two the road runs opposite the platform, separated from the line by a slate wall in which a stile was erected, consisting of 4 horizontal bars and 2 rail-built uprights about 9ft high surmounted by a crossbar which carries signs warning trespassers in English and Welsh. At the level crossings a small hut, linked by Telegraph to the ends of the line, provided shelter for the Gateman. There are also tall fixed banner signals, which make the crossings visible from a distance. Small blue enamel

Two of the Dinorwic Quarry railway locomotives. On the left, the 4ft gauge 0-6-0T "Dinorwic", and right, 0-4-0ST "Holy War", from the quarry section.

Photographs by R. E. Vincent





Two typical slate wagons on the 1ft 11⁵/₈ in gauge Penrhyn Railway.



Photographed at Bethesda

signs protect all road and foot crossings, and these carry the official title "Dinorwic Quarry Railway" (the title "Padarn Railway" was the popular name). The line is bounded throughout by slate walling, except on the Lakeside section.

The Quarry Section

On the main line everything is intact bar the track, which was dismantled in 1962, and many who read of this could be forgiven for thinking that railway activity in the quarry ceased from that date. This is in fact far from the case, as I found when I came to stay in North Wales for several months last October. The 2-ft gauge line is still very much alive at the quarry end, the finished slates now being taken away from the bottom level by road vehicles. The locomotive stock consists of a number of steam locos of the 0-4-0ST variety, built by Hunslet of Leeds, several of which are reported in working order and in daily use around the slate dressing sheds. They formed part of a class of 18, the names of which are as follows: *Velinheli, King of the Scarlets, Red Damsel, Rough Pup, Cloister, Jerry M, Cackler, Bernstein, Covert Coat, George B, Holy War, Alice, Maid Marian, Irish Mail, Wild Aster, Lady Joan, Dolbadarn* and *Michael*.

The names given are those which the locos now carry, or carried prior to withdrawal. *Jerry M* and *Cackler* have cabs and are slightly larger than the others, being used in the bottom level of the quarry. *Lady Joan* and *Dolbadarn*, as "No. 1" and "No. 2", were formerly shunters on the quay at Port Dinorwic, but are now at the quarry.

There are many minor variations between the locos, such as perforated buffer beams, wooden dumb buffers, domed boilers, extended handrails, and longer chimneys. No 2 engines are alike in these details, and features changed regularly with overhaul. The best policy is to model from a photograph of one particular locomotive if a scale model is desired.

The only suitable chassis for any of these locos is that fitted to the Minitrains Baldwin 0-4-0ST. This has all the advantages of working valve gear, good slow-running qualities and low cost. Wheels are 7mm dia., representing 1ft 9in, at 3ft 9in centres; the small locos had 1ft 8in wheels at 3ft 3in spacing, and the larger ones 2ft 2in dia. at a 4ft 6in wheelbase. Thus a reasonable model of either type could utilise this chassis.

For my model of *Jerry M* the Baldwin body is retained as this can be difficult to remove from the chassis. All body detail, including chimney, domes, and the top half of the cab are filed away, and a footplate is added all round from 40 thou' Plastikard on edge. The cab and saddle tank are of thin card, the latter being placed over the original Baldwin tank, which now becomes the boiler, slightly over size, but not too objectionable. Dummy outside frames are added from thin card, cut to a close fit round the wheels, which may be removed to facilitate fitting. These carry the correctly placed inspection holes. Chimney and dome are turned from aluminium blanks on the electric drill; these blanks originally served as spacers in an old TV chassis, which is a useful source of metal sections. Handrail knobs and wire complete the detailing, the sandboxes are from thin card.

The livery is basically—saddle tank, cab, footplate edge, cylinders—"Midland" red lined yellow and black. Coupling rods, buffer beams—Vermillion. Wheels, frames, boiler, smokebox—Black. Coupling rod pins, pipework, dome, safety valves and worksplate—Polished Brass.

Name plates are made from thin foil such as a milk-bottle top, with the name embossed from behind with a scribe. Colour is gold, with a red background. Any nameplate or worksplate can be made by this method, providing care is taken with the scribing process.

The narrow gauge wagons were all of one standard type—as shown in the picture, the sides are slatted and of thin timber. The cut slates are packed in with a mallet to avoid mishaps on the inclines, and this causes the sides to bulge characteristically. On the model, Peco 'Hardlon' 9mm wagon wheels are used—it is no discredit that spokes are lacking as they are only 5mm dia. overall. The wagons have a frame built up of balsa sections, overall dimensions usually about 25mm by 14mm. Horizontal side bars are $\frac{1}{8}$ in square balsa, connected by pieces of copper

wire pushed through holes in the bars. They are spaced apart by threading 2.5mm long sections of plastic wire covering onto the wire between the bars. The assembled sides are pushed into holes in the frame floor. A piece of lead, approximately 17mm by 9mm by 5mm is glued in the centre of the floor, and is covered with small pieces of thin card stacked on end to represent the slates—one of the wagons is left empty to show the side detail. Painting is a mixture of wagon grey and track colour, applied to give a weathered effect.

There were no 4ft gauge brake vans; the last vehicle of a train carried 3 of the above wagons and a 2-ft gauge brake van. This is assembled on a similar balsa frame. The only other 2-foot wagons used were crude iron tubs used at the actual quarry work face, and a model of these defies the imagination!

The Double-Flanged wheels of the narrow-gauge wagons necessitate special stub-points, as shown in the drawing and the photographs. Using the soldered track construction principle with "Kingsway" OO scale bullhead rail, these points were found simpler to make than the orthodox type; no filing of wing rails or blades is necessary.

Ballast is crushed slate—any other material giving a medium grey colour can be used, but slate in great quantity is useful for the scenic side of the model also. The actual working faces of the quarry are large pieces set in plaster, whilst smaller sizes are used to represent the tips. The slate I used was purloined from the huge waste tips at an abandoned quarry—there is plenty to spare!

It may perhaps be thought that such a model is dull in appearance, but this need not be so. The locos are painted in a bright livery for the very purpose of relieving the scene, and the surrounding country of this beautiful part of North Wales more than compensates for the appearance of the quarries themselves. I myself find the quarries depressing only on damp days, which unfortunately is frequently the case in these parts.

The Penrhyn System

For those who prefer more orthodox methods of operation, there is the nearby Penrhyn Railway, of 2-ft gauge throughout, running from Bethesda to Port Penrhyn, on the Menai Straits at Bangor. Hunslet engines of basically similar types to those of the Dinorwic Line were used, but there were also several second-hand ones of assorted types, the last of which, *Stanhope*, an 0-4-2ST of Kerr Stuart design, only disappeared from the quarry in December last, together with the last 2 Hunslets. Several small diesels are still in use, however. The steam locos were painted black, with red and white lining, and were always kept well polished. The diesel engines are painted Brunswick green, and are numbered, not named. Of the "main line" locos, *Linda* and *Blanche* are now on the Festiniog, and *Charles* is in the Penrhyn Castle Museum at Bangor. These locos are dimensionally similar to the Dinorwic *Jerry M*, only without the footplate, and have raised, sharply inclined cylinders. This allowed the connecting rod to be placed inside the coupling rod, reducing the overall width of the loco as the cylinders could then be moved inwards. Modelling notes for the *Jerry M* also apply to these locos, with the above modifications.

Wagons were of many types, and included flat sleds for the carriage of large slabs as in the photo. They were built on the same standard frame and 9mm wheels as used for the Dinorwic types. Workmans carriages were similar to the corresponding types on the Festiniog Railway, and the special coach used by Lord Penrhyn and the Directors is at Penrhyn Castle. It is painted chocolate brown with buff upper panels, similar to an old LSWR coach livery.

Passing Loops were formerly in use at Felin Hen and Tregarth, but in common with most 2-ft gauge lines, no raised platforms were provided. The loop at Felin Hen was disused many years before the main line was abandoned in 1963.

The route is easy to follow although waterlogged in places, and all underline road bridges are now out. The line follows the Cegin and Ogwen valleys, and is accompanied by the standard gauge L&NW Bethesda branch, which it crossed 3 times, and from Maesgeirchen to Port Penrhyn

by a siding off the LNW main line. Port Penrhyn is now used by the Army as a landing site for helicopter training flights, and much track-lifting has taken place recently, although a large amount still remains.

Scenery is mainly wooded and open fields, with the mountains of Snowdonia as a backdrop. As the line runs for the most part along a ledge in the valley side it would be ideal for a shelf layout around the walls of a room, with the river to the foreground. Due to its close proximity to standard gauge lines, it would also form a good prototype for a narrow-gauge feeder line.

The reader may be forgiven for thinking that rather a lot of prototype material has been included in this brief survey—there are two reasons for this; some of the information has not been published before, and is set down to put the record straight, and also I hope it will be of some assistance to those who are seriously considering modelling one of these lines as it stood. To these, if any, I would recommend a personal visit to the line as essential, but must warn that the quarry premises are strictly private, and intending visitors should always write for permission

first; casual visitors are not allowed under any circumstances. Also, some parts of the main line sections are now owned by farmers with adjoining premises, from whom permission should be secured before walking along these sections of route.

Very little has been published concerning these two lines, and many questions remain unanswered. I should be glad to hear from any reader with additional information, especially photographs, or constructive criticism.

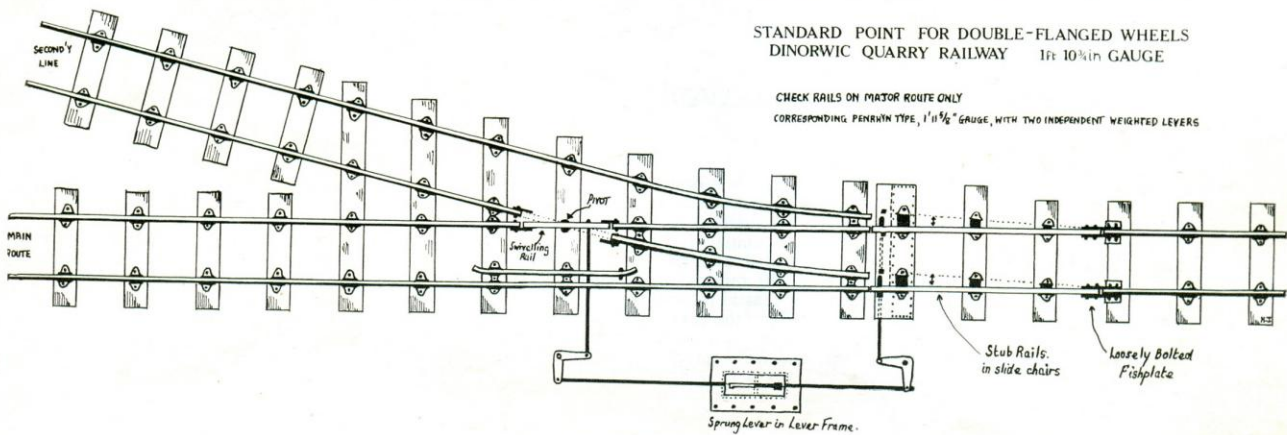
For those interested, useful information is contained in:

Narrow-Gauge Railways in North Wales, Charles E. Lee, Railway Publishing Co. 1945 (from the public library).

Railway Magazine, November 1962, P. 775.

Model Railway News, September/November 1966, March 1967.

In conclusion, I would like to acknowledge the assistance of those concerned in the preparation of this article, particularly the Penrhyn Quarry Authorities, for permission to visit their premises.

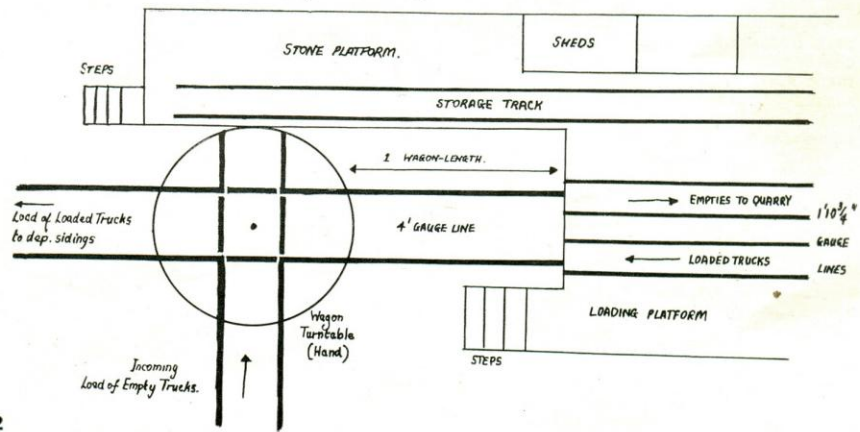


1 Diagram of a typical point built for double-flanged wheels, as used on the Dinorwic Quarry Railway.

2 Plan of a transshipment dock at the interchange between the two gauges used on the Dinorwic quarry railway.

3 A DQR stub point, similar to that shown in the diagram. Photographed after a snowfall in the quarry yards at Llanberis.

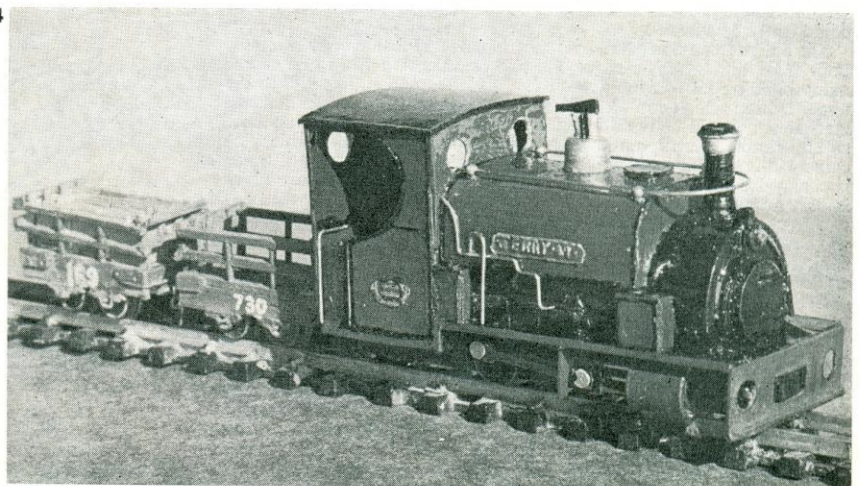
4 Some of the narrow gauge DQR models built by the author. The 0-4-0ST "Jerry M" employs a Minitrains chassis, while the tiny slate wagons are scratch-built.



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