

The evolution of permanent way

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PART 4

This is the fourth part of five of this fascinating paper. I have not edited this paper due to its historical nature.

Keeping in chronological order notice must now be made of the first railway to be sanctioned by Parliament. This was a line between Leeds and Middleton which was authorised by an Act¹ of June 9, 1758, granted to Charles Branding, Lord of the Manor of Middleton. The line was called in the Act a "wagon-way," and was probably at first of the usual wooden kind. Later this railway came into prominence as the first to be laid with rack rails for locomotive traction. So far, all the lines mentioned have been private railways dealing exclusively with the traffic and vehicles of their owners, and it seems fairly conclusive that they used flat rails – that is not flanged rails – but had vehicles with flanged wheels. This is what might be expected if it be admitted that the railway has always been a specialised form of road designed to meet the needs of the vehicles.

We now come to the period of public railways used as feeders to the extensive canal system that was developing with the beginning of the era generally termed the "industrial revolution." Neither the canals nor their feeder railways

were intended for the use of their owners' vehicles; both were looked upon as public toll highways available to all comers, and it is a fact of great significance that we find at this time our first certain records of flanged tram plates. Actually, the tram plate seems to have been devised for a private colliery line at Sheffield in somewhat exceptional circumstances, but its popularity was mainly with public toll railways, and, of course, the private lines and sidings running into them. The circumstances² of the introduction seem to be as follow. See image 1.

During the second and third quarters of the eighteenth century increasing difficulty was experienced in transporting coal from the Duke of Norfolk's collieries to Sheffield, and in 1774 the ninth Duke of Norfolk authorised his manager, John Curr, to build a wagon-way with wooden rails from the collieries to a coal depot in Sheffield where are now Duke Street, Broad Street and South Street. This line, about two miles long, proved very unpopular as it was thought that its object was to increase the price of coal by refusing to sell at the pit head and allow local people to arrange their own transport. Rioting resulted, and the wagon-way was burned, as well as many of its trucks. Later, it appears, this road was rebuilt with cast-iron plate rails that had side flanges to keep ordinary trucks on the rails. It is possible that plate rails were first used by John Curr in

1776³ for lines in the actual colliery workings and that they were adopted in the following year to re-lay the line into Sheffield. On the latter, it is stated that the plates were at first laid on transverse wooden sleepers but that rioter burned these and they were replaced with stone blocks.

It is impossible to say how far Curr had developed his ideas when this original line at Sheffield was first laid, but by 1797, when a book called "The Coal Viewer" was issued, he certainly worked out a very complete system. A feature of particular interest was that he provided special castings as run-offs, so that tricks might be transferred with some ease between the ordinary road and the plateway. The fact that Curr made special provision for such transfer shows that the plateway was designed to take ordinary road vehicles.

We thus see the plateway not a stage in the evolution of the modern railway, certainly not as the earliest forms of track, and not even as a retrograde step in permanent-way construction. It was intended to provide a highway for flat-tired vehicles that were required to make part of their journey on the ordinary road. I think we can trace the fallacy that the plate rail was an intermediate form of rail development to an assumption of Lord Armstrong in his address to the British Association in 1863. His statement that, after the introduction of iron rails, the next advance "consisted in transferring the guiding flange from the rail to the wheel," has been copied time and again ever since.

John Curr's description of his plate rails stated that they were 6ft long, 3in broad on the "trod" or tread, and ½in thick. The flange of angle was 2in high and ½in thick where it joined, tapering to a rounded top ⅜in thick. The plate had countersunk nail holes 1in off each end. The weight of the plate was from 47 to 50lb.

Curr's very complete specification made provision for shorter and heavier plates to carry greater weights, but these details do not concern us at the moment as they did not differ in Principle from his standard method, which was doubtless based on his experience with the line at Sheffield. He recommended oak sleepers either 3ft 2½in. or 3ft 4in long, 4½ of 5in broad, and 2½in thick. The plate rail was to be sunk 1in into the sleeper.

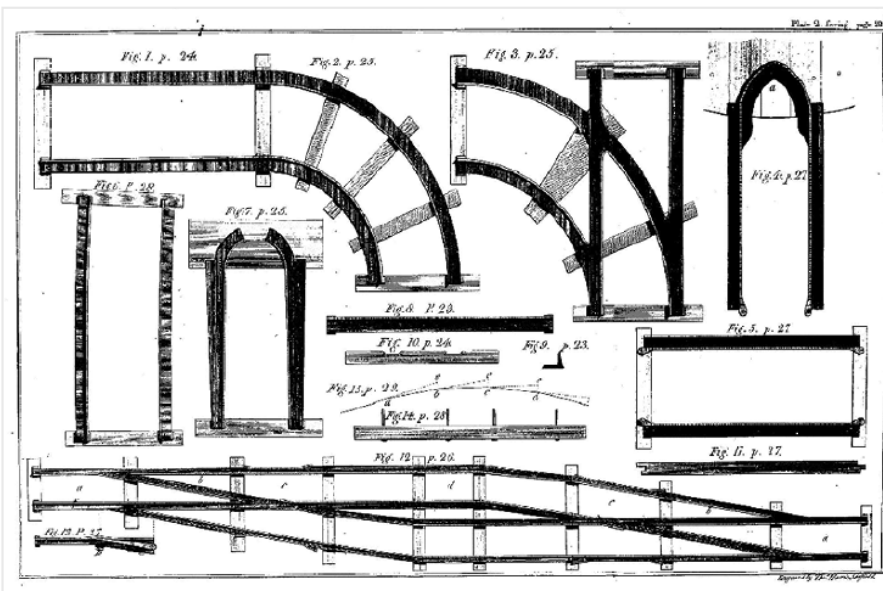


Image 1: The coal viewer

From these dimensions, it is clear that the road was quite light and must have relied to a great extent on the ballast to give it rigidity. Curr's alternative measurements were stated to have accommodated one or other of two standard types of vehicle. For one, the road must be laid 22½in wide and for the other 24in wide so as to afford about ¾in plat for the wheels. The wheels he mentioned were of 13¼in diameter and 1½in tread.

Curr seems to have become recognised as an authority in his day on tramroad construction and similar matters, and a report survives which he made in 1793 to the Coalbrookdale Company on the subject of unloading boats on to the rail. This proves that he had business relations with the Coalbrookdale Company on the subject of transport, and it seems most likely that, on his advice, the wagon-way with its temporary flat plates of cast iron was abandoned in favour of a narrow-gauge plateway laid with angle-iron plates in the seventeen-eighties.

The construction of railways as feeders to canals may be dated from May 13 1776, when the Trent & Mersey Canal Company secured an Act to build a railway from Frogall wharf to Caldon Low quarries. The canal (which had been authorised in 1766) was completed in 1777 and the railway opened at the same time. Recent researches⁴ of Dr J.R. Hollick show that the first line was badly laid and unsatisfactory, and that about 1780 it was replaced by a better aligned track.

Very little is known of either railway, excepting the course, which still can be traced for much of the distance. Precise details of the form of permanent way and vehicles have so far eluded the present writer, but Curr in 1797 said the line was laid as a "Newcastle wagon road" with timber rails faced with 1½in cast-iron strips. He referred to large-capacity vehicles and said it would have been better to have

used small wagons on one of his narrow-gauge plateways. A new alignment authorised by an Act of April 15 1802, resulted in a well-constructed plateway being built by Rennie, which survived until about 1849, when a 3ft 6in gauge railway replaced it. I have mentioned this undertaking at some length for two reasons: because it was the second railway in the country to be authorised by Parliament (the first was the Leeds – Middleton line); and also in the hope that someone will be able to produce satisfactory evidence of the form and gauge of its permanent way.

The most extensive popularity of the plateway was undoubtedly in the South Wales area, where wagon-ways had scarcely penetrated. One notable exception, however, must be mentioned – namely, the "new road or wagon-way" to the water side" built on his estate at Neath about 1698 by Sir Humphrey Mackworth in connection with his collieries and copper works. This line provides what is probably the earliest recorded example of "power" traction on rail, for Waller records⁵ of Mackworth "I believe he is the first gentleman in this part of the world that hath set up sailing engines on land, driven by the wind, not for any curiosity, but for real profit." Yalden makes poetic reference to this example of the use of wind power when he says:

The winds thy slaves their useful succour join,
Convey the ore, and labour at thy mine.

Sir Humphrey's wagon-way crossed the highway from Neath to Cardiff, and eventually a difference arose between him and his burgesses of Neath in this connection. In 1705 the latter succeeded (it is stated⁷ by surprise) in securing a verdict from the Grand Jury of Cardiff that the wagon-way was a "nuisance," and a portion of it was destroyed. In some evidence brought forward to rebut the verdict it was stated: "These wagon-ways are very common, and frequently made use of about

Newcastle, and also about Broseley, Bentall, and other places, in Shropshire, and are so far from being Nuisances, that they have ever been esteemed very useful to preserve the roads, which would otherwise have made very bad and deep by the carriage of coal in common wagons and carts."

It is clear that Sir Humphrey's example was not followed in South Wales for T.G. Cumming tells us⁸ that "as late as the year 1790 there was scarcely a single rail-way in all South Wales, whilst in the year 1812 the rail-ways, in a finished state, connected with canals, collieries, iron and copper works, &c., in the Counties of Monmouth, Glamorgan, and Carmarthen alone, extended upwards of 150 miles in length." By 1830 the railways there totalled about 350 miles, all of which were constructed on the tram-plate principle, and used stone blocks instead of wooden sleepers. The Glamorganshire Canal Act of June 9 1790; the Monmouthshire Canal Act of June 3 1792; the Brecknock & Abergavenny Canal Act of March 28 1793; and subsequent canal Acts authorised the canal companies to make railways or tramways in connection with their undertakings. In the event of the canal company not exercising these powers, the adjoining landowners whose estates contained many mines of coal, iron-stone, lime-stone, or other minerals, or the proprietors of any furnaces or other works lying within four miles (in some cases eight miles) of some part of the canal, were empowered to carry out the work themselves at their own cost without the consent of the owner of the lands, rivers, brooks, or watercourses it might be necessary to cross, on payment of such similar compensation as would be due in regard to the construction of canals.

These were very wide powers, and in some cases peculiar use was made of them. For example, the famous Pennydarran Tramroad, on which Trevithick made his pioneer

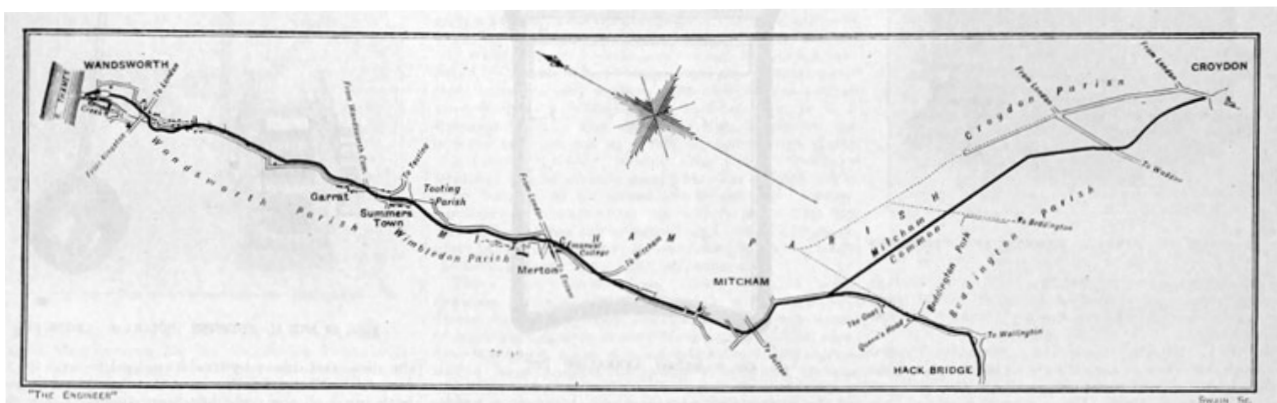


FIG. 2—MAP SHOWING THE ROUTE OF THE SURREY IRON RAILWAY

Image 2: Route of Surrey iron railway

locomotive trips in February 1804, was built about 1800 by local ironmasters under the powers of Section 57 of the Glamorganshire Canal Company's Act, which limited to four miles the distance from which works railways to the canal might be built. The line is question extended from Dowlais to Merthyr to the canal wharf at Navigation (Abercynon), which was considerably more than four miles, but the promoters of the tramroad contended that so long as their mines or works were within four miles of the canal, they had the right to lay their tramroad to whatever canal wharf they might select, and chose Navigation as the transhipment point best suited to their purposes. Mention has already been made of the fact that the word "tramroad" is not one of great antiquity; actually, the first-known use of it is in the Act of incorporation of the Brecknock & Abergavenny Canal, passed in 1793.

The popularity of the plateway in various parts of the country was due in part to the enthusiastic support of Benjamin Outram, who with William Jessop, Francis Beresford, and John Wright, established the Butterley Company in 1790 and two years later built the Butterley Ironworks.

The main reason for the widespread use of plateways in South Wales, however, were the facts that the lines were laid as public toll roads by the canal companies, or else were private sidings to them; and that the early flanged wheel had not been adopted in South Wales, so that the existing stock of vehicles had flat treads. With the turn of the century, the use of tramroads spread to the Forest of Dean colliery neighbourhood, where access was desired to the Rivers Severn and Wye.

Outram prepared a report⁹ on the subject in 1801 in which he said: "I recommend the Rail-Way to be made substantial, upon my improved plan, with stone blocks for the rails to rest upon: the rails to be of the stoutest cast iron, one yard in length, and to weigh about

37lb. each; the wagons to carry from 30 to 40cwt. each . . . one horse would take six of eight of such wagons, containing ten or twelve tone of coals, from the said summit (west of Surridge Hill) to the head of the Inclined Plane at Lidbrook, and return with an equal number of empty wagons, in two hours . . ." Within a few years three companies, namely the Bullo Pill Railway of 1809; the Lidney & Lydbrook Railway also of 1809; and the Monmouth Railway of 1810; covered practically the whole of the Forest of Dean area between the Rivers Severn and Wye. See image 2.

The first public railway promoted independently of a canal to be sanctioned by Parliament was the Surrey Iron Railway which extended from the Thames at Wandsworth to Croydon. It received its Act of incorporation on May 21 1801 and was opened to traffic on July 26 1803. An extension from Croydon to Merstham was formed as a separate company in 1803 and opened in 1805. Both lines were part of a scheme promoted in 1799 for linking London and Portsmouth by a horse tramway at a time when the military adventures of Napoleon had resulted in a great European war and exposed to considerable risk British shipping coming up the English Channel and through the Straits of Dover in order to reach London. The victory of Trafalgar in October 1805 reduced the urgency for a strategic line of overland communication, and these railways were never carried beyond the Greystone Limeworks at Merstham. At this period, the River Wandle was credited with being the busiest river of its size in Europe, but under the influence of the Industrial Revolution industries were gradually moving northward to be near the coalfields, and neither line was commercially successful. The Surrey Iron Railway appointed William Jessop as its engineer and the firm of Jessop & Outram as contractor. The line was double track and the rails were cast-iron tram plates of L section in 3ft 2in lengths, 3½in wide on the tread and ¾in thick. See image 3.

For a time, the success of the tram plate in the Midlands and South Wales blinded many to the inherent difference in function between plateways and railways, and a report of 1911 to the Board of Agriculture on Iron Railways in Monmouthshire said "The old rail-road is exploded, except that where the rails and wagons remain undecayed, the use of them is continued; but there are no new ones made upon that plan, a decided preference being given to the modern invention of tram-plates."

However, this period was not a stage in the evolution of permanent way, but rather, as subsequent events show, an adaptation of rail traction to meet the special needs of vehicles required for both rail and road use.

REFERENCES

[1] An Act for establishing Agreements made between Charles Branding, Esquire, and other Persons, Proprietors of Lands, for laying down a Waggon Way, in order for the better supplying the town and neighbourhood of Leeds, in the County of York, with Coals. 31 George II, cap. 22. Royal assent, June 9, 1758

[2] "The Coal Viewer, and the Engine Builder's Practical Companion" by John Curr. Printed for the author by John Northall and published at Sheffield in 1797; and "Railway Locomotion and Steam Navigation, their Principles and Practice" by John Curr (son of the above). Published in London by Williams & Co. in 1847.

[3] In "The Coal Viewer" published in 1797, John Curr said "The making and use of Iron rail-roads were the first of my inventions, and were introduced at Sheffield Colliery, about twenty-one years ago."

[4] See "The Railway Magazine," June, 1937

[5] See "A Plan of the Town and Port of Neath, being part of the Estate of Sir Humphrey Mackworth," By M. O'Conner about 1705.

[6] Essay on the Value of the Mines late of Sir Carberry Price, published in 1698

[7] See "The Case of Sir Humphrey Mackworth and of the Mine-Adventurers with respect to the irregular proceedings of several Justices of the Peace for Glamorgan and their Agents."

[8] "Origin and Progress of Rail and Tram Roads" by T. G. Cumming. The preface is dated Denbigh, November, 1824.

[9] Outram: "Report and Estimate of the Proposed Rail-Ways from the Collieries in the Forest of Dean, to the Rivers Severn and Wye." Hereford, printed by D. Walker, High Town, 1801



Image 3: L section plate way Croydon Merstham Godstone Railway