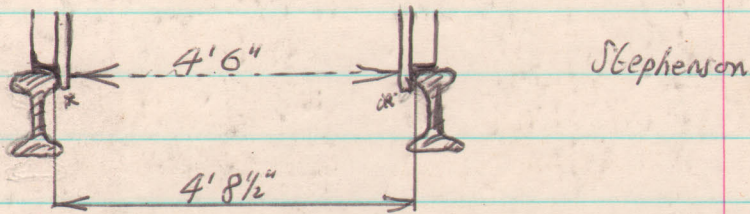
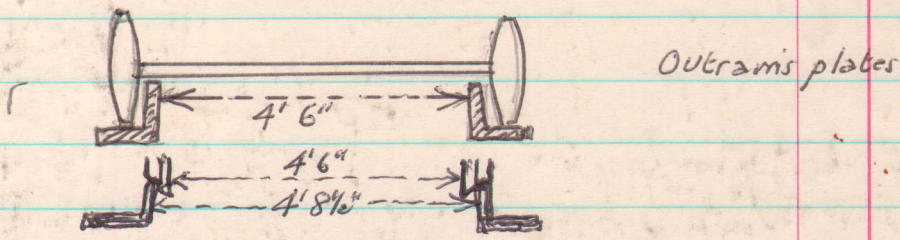


The 4' 8 1/2" gauge theory:



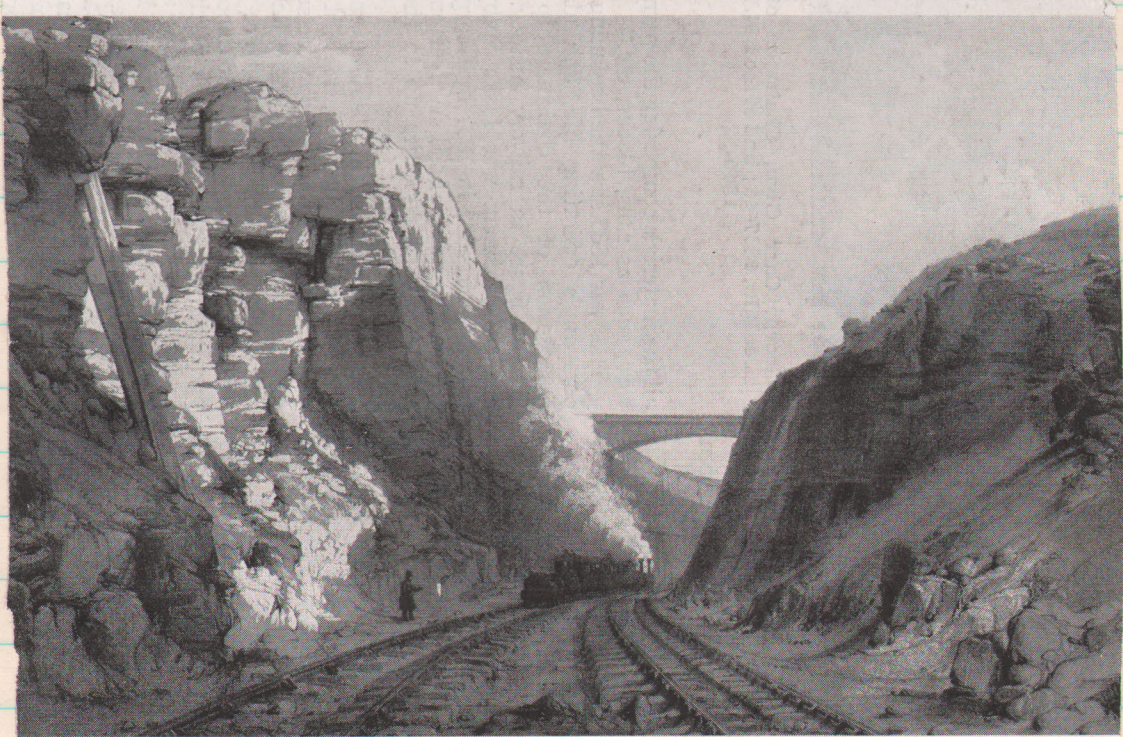
* flange width 1 1/4"

$$\text{i.e. } 4' 6'' + 1 1/4'' + 1 1/4'' = 4' 8 1/2''$$



"inclined" (1 in 20) had been adopted by LBSCR by 1838

Almost universal in Britain by 1851



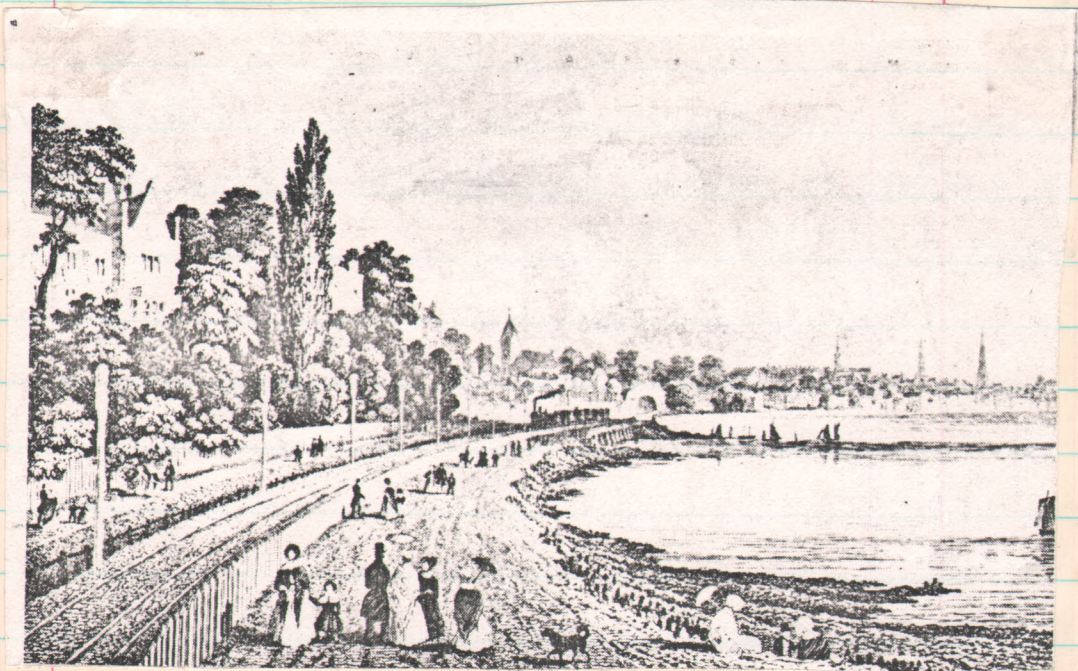
London & Birmingham Railway. Wide stone blocks, chairs, and 'parallel' rails.

1838



Southampton Terminus c. 1840. Work on track in foreground,
(Original may show rails clearer - possibly chairs in places.)

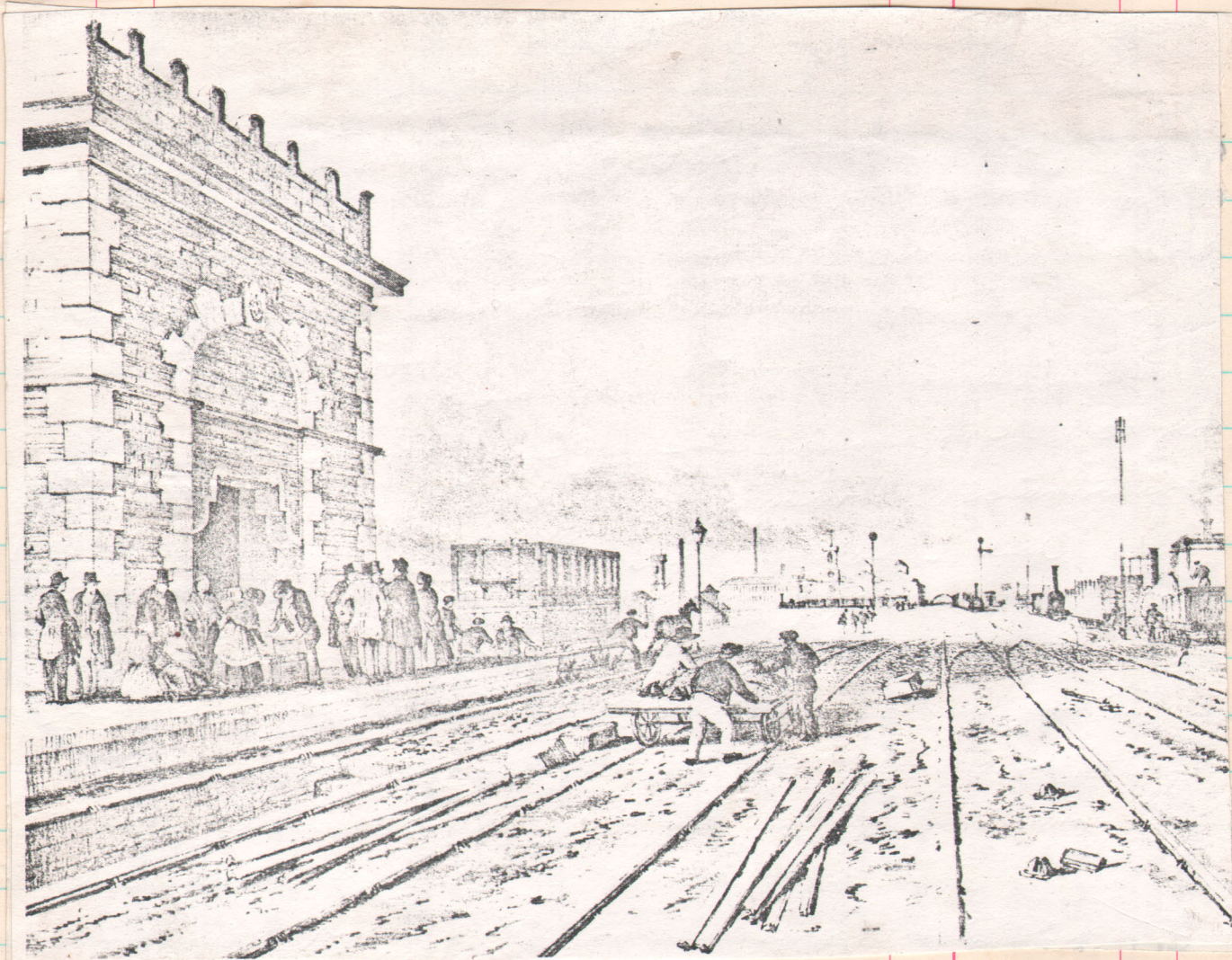
London & Southampton Railway. Opened Southampton - Winchester 1838



Southampton & Dorchester Railway c. 1848 at Millbrook. Note western
portal of Southampton tunnel. ^{Double} ~~Single~~ line from Southampton (Northam)
to Redbridge (thence single). Wooden viaducts (trestles - see above).

Probably laid with 75lb PH wrought iron rails, 15' lengths, but spacings were
too great and in 1854 more sleepers were added. The doubling from
Redbridge to Beaulieu Road was undertaken in 1857 with 70lb (sic)
rails, 3' 0" apart (were the originals 3' 6" or even more*?), some 20lb chairs
were used in intermediates. A 20lb chair was brought up during
relaying at Totton in 1983. (p. 19).

* 3' 9" even 4' 0" were common in the
early 1840s.



Crewe LNWR 1848 (A.F. Tait, artist)

formerly Grand Junction Railway - Locke, Engineer. P.W used on GJR
taken as pattern for London & South Western (ex London & Southampton)
Rails appear to be 15' 0" DH

Midland Counties Railway 1840s. (Nottingham/Derby - Leicester)

4' 8 1/2" gauge; 6' 5" inner distance; 3' 0" to cess. 45' 0" formation.

15' 0" rails @ 77lb/yard 23 1/2 lb chairs (28lb at joints) 5' 0" centres (!)

LSWR Permanent Way

Netley Hospital Branch was laid with 75lb rail in 21'0" lengths. The chairs were 32lb at joints and 23lb at intermediates, and at 3'0" centres. This would appear to be the standard about 1860. The 32lb joint chairs may have been supported for joints - they date from late 1850s - and were contemporary at that earlier date with the 23lb chairs. The rails must have been DH and wrought iron. Sleepers were Memel, rectangular and half-round.

From "Southampton Margins and Other Margins" G. Morington
Donat Publishing Co. 1984: -

A very special Owslebury product for shipbuilders was 'trennels' or tree-nails. These were straight-grained, split-oak pegs cunningly whittled down from a rough square, first to an octagon and finally to a sixteen-sided polygon which passed nicely through a metal gauge, the size of which was related to the hole made by the standard auger used by ~~the~~ shipwrights. They ~~shipwrights~~ came to the shipyard in 3 standard lengths from which the shipwright chose one a little longer than the thickness of the two timbers being joined, the excess length being cut off flush on either side ~~of~~ after the trennel had been driven in to its immovable limit. It has been claimed that because of the ridges ^{into} the timber, trennels were better than ~~iron~~ their copper or iron successors.

(Continued from p. 4)

under licence from the Permanent Way Company in August 1855 but the whole of the C&H was relaid with 80lb rails in 1858-9 in preparation for the improved services introduced after the company became part of the LNWR.

Other points to note: - From July 1853 - 21'0" bullhead rails and fish plates were produced at Crewe - "until 1876"

First Bessemer steel rails laid in Crewe station in November 1861
Chall Farm 1862

2 mills of iron rails at Shrewsbury & Birmingham were continuously welded using a semi-portable forge developed at Crewe 1866

1864 Steel headed rail/wrought iron web and foot - used increasingly until 1875.

1875 New rolling mill to produce Siemens-Martin steel rails 30'0"; from 1876 also steel 84lb main, 75lb branch.

* 1887 90lb main/80lb secondary.

60' rails laid only used in tunnels or viaducts by 1889.

NB Crewe was not equipped for rolling 60' rails until 1893 - another speculation on welding (2x30'?)

Midland Counties Railway 1840.

771b D.H. Rails 15'0" long.
Joint chairs and wooden keys.

GREAT NORTHERN RAILWAY

On 2nd April (1857) the 2.5 am mail from Peterborough was derailed while travelling at about 40 mph just after passing Algarkirk station. The wooden trenails had given way, allowing the road to spread under the train. The engine fell over.... The Inspecting Officer recommended that chairs should be secured to the sleepers by iron spike in addition to the trenails. As has been seen, these officers were already insisting on iron spikes* before they sanctioned opening of new railways. It became the practice (on the GNR) to cast the chairs with three holes, and insert one spike, and two trenails.

- 1846 721b "reversible" wrought iron. ▽ sleepers
1848 721b 18' rails. 371b joint chairs, 211b Intermediates, 2 wooden trenails ▽
1851 721b ~ "Kyanized" sleepers 10" X 5". { Creating sleepers commenced.
1862 801b rails 8'11" X 10" X 5" sleepers { ▽ sleepers no longer purchased.
1856 Experiments with fishplates at Holloway and Hatfield. Forge quantities then prepared (as successful).
1859 Iron spikes instead of wooden trenails (see * above)
1867 721b "Bull Headed" (+ 691b FB) Edgware branch.
1895 St Rests - broken rail, Morindin urges GNR to increase M.L. weight from 841b to 901b and replace all 801b on ML.
Board decided on 921b - P.W. renewed on suspense account.
150000 tons Bessemer 921b 1000 per fishplate.
1905 18 1001b on ML - 951b in were lying - 85 elsewhere

- 1875 All GNR renewals in steel
1887 (by) 95% of all rails in use were steel
1877 E. & Midlands (M&GN) 701b FB
1874 721b (Lincoln-Louth)
1872 721b Steaford-Bourne.

From LNWR Livestock (HMRS 1985)

The Liverpool and Manchester Railway was laid with fish-bellied iron rails 15' long weighing 35lb per yard in chairs spaced at 5' intervals and fastened to stone blocks set diagonally. On embankments and over peaty ground transverse oak sleepers were used. One remarkable feature was that the inner edge of the rail was shaped to match the tyre profile. As laid, the inner rails of double track were only four feet apart but this was gradually increased to six feet whenever relaying was undertaken.

The London & Birmingham, Manchester & Birmingham and Crewe & Chester Railways were also laid with this type of Stephensonian rails although by that time the fish-bellied rail originally used on the LMR had given way to a double headed rail weighing 60lb per yard.

The Wigan Branch Railway, engineered by Charles Vignoles, was laid with 45lbs per yard 'T' section rails 15' long but to a very primitive standard. Relaying with double headed rails was accomplished within a short time.

The Great Junction Railway used Fox's double headed rails of 84lb per yard in chairs with wooden keys on keyseized (after 1840, crested) timber sleepers. The latter were intended as a stopgap and to be replaced by stone blocks as a more 'permanent' way. However, even by 1845, according to the Railway Shareholders Manual, 20 miles of track still lay on sleepers and 62 miles on stone blocks while 1/2 mile was carried on longitudinal sleepers over woodwork.

The North Union Railway used Marney Vignoles rail on cross sleepers while the Lancaster & Preston used 65lb double headed rails on timber sleepers for embankments and stone blocks in cuttings. The Saltney - Chester - Chorley & Holyhead, formerly to Bangor in 1848 had 75lb double headed rails in chairs, weighing 20-24 lb with fir keys, laid on triangular or rectangular section sleepers 9'0" length. The Saltney - Chester section was equipped with fish-plates

(Cont on p. 4)

The CHR track was first jointed with fishplates experimentally between Saltney and Chester on licence from the Permanent Way Company in August 1855. The first general relaying took place in 1858-9, with 80lb to the yard rails, in preparation for the new mail service. On parts of the line the new Bessemer steel-tipped rail were used, with the web and lower part of iron, notably on the approach curves to the Britannia Bridge (replaced by all-steel rails in 1869). Iron rails continued generally in use until 1876, however, when Webb ordered henceforth to employ 84lb to the yard well-loaded steel rails on main line and 75lb rails on branches (1) For many years the rail lengths were 30 feet. By 1869 the condition of the CHR track was giving cause for concern, particularly in Anglesey where some seven miles, referred to as 'very much worn and thin'; and 'rails ^{much} crushed' were still laid with old 75lb iron rails, 15 feet in length.

1848 (Capt. Wynne's Report) 75lb/yd rails of double T form secured to 20 and 24lb chairs by fir wedges, the chair being spiked to triangular or rectangular 9' sleepers laid transversely, Ballast 2' deep, width of formation 33' (Chester to Bangor)

NB Cromford & High Peak Railway replaced their cast iron rails in 1843 (some even lasted until 1860s) Cast iron rails "breaking at rate of 700 month". Curves were a succession of angles. CI fishplates (fish bellied)

(1) LNWR permanent way, works and estate Committee 13.10.1875

Divisional Engineer's Off

Bristol T.M.

Tel. 074-2850

26th January 1984

Dear David,

Thank you for the sketches following your letter: I enclose a drawing of the B^E92J chair as made at Swindon Works; the original tracing was made here in 1958 so I presume we had need of a pair at least as recently as that. I have never seen any in the road although they were at one time quite common at the end of pit roads, cattle docks etc and there were some at Bath Goods which the GW Society rescued for Didcot a couple of years ago.

I am not very familiar with 'foreign' P.W. history but I believe Bridges Adams first used fishplates in 1847. I think there may be, in the NRM reserve collection at York, a similar joint chair with fishplate to the one illustrated in your photograph of the loco and enlargement above. Certainly there are some bracket chairs at York although I can't remember exactly what. I have got to spend a couple of days up there some time and try to get some shape into the reserve collection so as to form a display for the PWI Convention visit in July.

Joint chairs (as shewn in bottom RH corner of your larger sheet) were used before fishplates and I would imagine the combination of chair and fishplate was a fairly transitory phenomenon because of maintenance problems and possibly broken rail ends. To my knowledge, they did not reappear until the 1920s (joint chairs, that is), and then of course with suspended joints and short fishplates. If anyone is interested enough to do the research (I might - when I retire!) the Inspecting Officers' reports on newly constructed railways would be helpful in establishing where and when joint chairs, with or without fishplates, were used.

The GWR used bracket chairs on plain line, as you probably know: principally at the junction between BH/DH and bridge rails. They were also used on the W.Cornwall and the Llynfi & Ogmere. A similar version is still very occasionally to be seen on very old stop blocks - handed 'A' and 'B' because of the inclination of the rail, and designed for 86^a DH section. One of the pair has an elongated fangbolt hole so as to allow the rail to be lifted out when being changed, turned or inverted. I enclose a photo of a slightly larger version on a stop block (-no need to return it). The NE Rly used chairs with a wooden pad in the seating (there is a specimen at York) as an alternative way of trying to overcome the problem of gall on DH rails. It was not successful because the pad became compressed and the rails then became notched in the foot. Bracket chairs were not widely adopted because, apart from weakening the rail web, the bolt holes needed to be site drilled in curves and crossing work in order to keep the sleepers or timbers square.



Your bridge rail section is relatively modern, and if there is anything more than 3-4 yards of it about and it is not too corroded, it should be possible to find a rolling mark on the flange. Common marks are E V STEEL (Ebbw Vale), DOWLAIS STEEL, and PANTEG STEELWORKS & ENG C^o LD - all 1880s/1890s. The dimensions put it in the 60-70lb/yard bracket and this was the usual weight from the 1840s onwards, 62 and 68lb/yd being the commonest. The original rail designed by Brunel weighed 43lb/yd; I have never come across any and would be most surprised to do so, it was only laid between Paddington and Maidenhead and very soon taken up. I would imagine that 'cash flow' problems at the time dictated a speedy return to the mills for re-rolling!

This has been rather a long dissertation and I hope not too vague! I hope your exhibition goes well, and no doubt we shall be in touch again before then. I have not yet visited Euston to seek out line codes etc for the "lost" Divisions but hope to do so fairly soon.

Yours sincerely,
John Alcock