ISSN 0033–8834

Journal

of the

Railway and Canal Historical Society

VOLUME XXIV No. 1 MARCH 1978

THE RAILWAY & CANAL HISTORICAL SOCIETY
Founded 1954 Incorporated 1967

JOURNAL OF THE RAILWAY & CANAL HISTORICAL SOCIETY

VOLUME XXIV No. 1 MARCH 1978

CONTENTS

The Location of Railway Stations

BY H. P. WHITE

(Originally presented at the Society's Biennial Seminar, Bristol University, July 1975)

> "And quite where Rugby Central is
> Does only Rugby know.
> We watched the empty platform wait
> and sadly saw it go." – John Betjeman.

For the passenger the location of a railway station is a matter of considerable importance, and since he is the *raison d'etre* of the railway, location should be a matter of importance to the operator as well. If the said passenger arrives at a station late on a wet winter night and finds it is over a mile to the town centre, the next bus is in half an hour, and there are no taxis, the chances are he will try and make the journey by car next time.

A principal factor in the ultimate collapse of the greatly improved suburban services introduced to the Bristol area in 1959 was the peripheral location of Temple Meads in relation to Bristol's central business district. Conversely an important contributory factor in the success of the Glasgow "Blue Trains" was the central location of Queen Street and Central stations. Finally, to give a rural example of inconvenience, the centre of Goudhurst (Kent) lay one mile distant and 280 ft above its railway station.

Yet the location of railway stations and depots has received scant and only passing attention from historians, who for the most part tend to record without comment the siting of stations. Nor are they concerned with how the decisions affecting location were arrived at. In fairness, it must also be said that there is little evidence the promoters and operators arrived at those decisions by any logical thought process. Nor, with all the modern tools available, is there much sign of rational decision making gaining ground, if the siting of the Transfesa railhead opened in 1974 at Paddock Wood is anything to go by.

Before attempting to explore the question of location of stations, we should consider *first* the nature of passenger and freight transits and *secondly* the function of stations.

We can define a passenger transit as the negotiation of the spatial gap between the ultimate origin and final destination of the individual making the transit. In total, transits are very numerous. Let us imagine a city of 500,000 inhabitants. The number of transits involved in the journey-to-work alone will be the same in number as the number of people in employment. The number of origins will be each house in which an employed person lives, while the number of destinations will be the number of factories, offices, shops and all other places of employment. Obviously public transport, railways most of all, can deal only with some portions of some of the transits. Equally obviously it is only personal transport which can deal with virtually all the transits, hence the universal popularity of the car.

However, at certain places, individual transits, whether they be suburban or long-distance, tend to converge to use a common line of movement before reaching another place at which they diverge again. It should be the function of railway operators to locate their stations to take maximum advantage of this tendency by optimizing the number of transits and the proportion of each transit which they can accommodate.

For freight transits the principals are similar. But in addition, unlike passengers, some freight originates at a single point in sufficient bulk to make it economic to provide rail access to the points of origin, factory or mine, as well as to some of the ultimate destinations, perhaps a power station or steel plant.

A station is therefore a place at which interchange can take place between the railway and other transport modes to enable onward transits to be completed or incoming transits to be grouped for the common trunk movements. Normally the other mode is public or private road transport, but some stations were located to allow interchange with shipping (e.g. Dover Marine, Parkeston Quay), with aircraft (e.g. Gatwick Airport, Southampton Airport), or with railways of different gauge (e.g. Waterhouses, Dinas Junction). At many stations interchange with other trains is also possible.

A station is thus a point of interchange for (a) passengers, (b) parcels and mail, and (c) freight. But it is not normally the ultimate origin nor the final destination of any of these. The economic function of the station is (a) to maximize traffic, (b) to maximize revenue and (c) to minimize operating costs.

There is a further function, to assist in the operation of the railway. There are three aspects of this function:

(i) The train control and signalling function. The control of entry to the section ahead on multi-track lines, and the passing of trains on single-track ones.

(ii) The service function. This includes the changing of locomotives, attaching or detaching assisting locomotives, the cleaning and watering of passenger coaches, and refreshments for passengers.

(iii) The marshalling function. The re-marshalling of freight trains, attaching and detaching through coaches and vans to and from passenger trains.

A large station such as Crewe will perform all these traffic, economic and service functions. Crewe passenger station is a junction where six routes, all with passenger services, meet. Many passengers change trains, but many more will arrive and leave by car, bus and on foot. In suburban areas, and to an increasing extent elsewhere, stations may deal only with passengers. Many deal only with freight while a few, such as Mayfield (Manchester) deal only with parcels. On single-track routes some stations are (or were) only passing places without commercial function, e.g. Gorton (West Highland line), and Loch Skerrow (Dumfries-Stranraer), though on the West Highland passengers are allowed to join and leave trains at Corrour.

With these basic principles in mind, let us try and discern some of the location patterns revealed by railway history and then look at some case studies in the form of particular stretches of line. I will concentrate on the location of passenger stations, as this is more in line with the theme of the conference.

In the early period most lines were promoted to connect two important towns, as the names of so many early companies indicate, e.g. London & Birmingham, Liverpool & Manchester, Edinburgh & Glasgow. Thus the first point is the location of termini in our large cities.

Obviously the railway companies were concerned to minimize the cost of land purchase. The termini would therefore tend to be located on the edge of the built-up area. The historian should always consult maps of the appropriate period. Examples include:

(i) Townhead, the original Glasgow terminus of the Garnkirk & Glasgow,

(ii) the twin Curzon Street terminals at the Birmingham ends of the London

& Birmingham and the Grand Junction, which were "driven like a broad wedge into the outskirts of Eastern Birmingham" (Kellet)

(iii) Crown Street, the Liverpool terminal of the Liverpool & Manchester.

It is significant that in all these cases extensions were later provided to bring the lines to more central locations at Buchanan Street, New Street and Lime Street respectively.

Kellett[1] shows that the location of city terminals and of the lines leading to them were greatly influenced by the pattern of land ownership. His thesis is that fragmented ownership led to increased costs of negotiating as well as of eventual purchase, small owners being motivated more by greed and less by a knowledge of the market value of their property. Companies preferred to deal with a few large owners. In the case of Manchester, Kellett states the site of Oldham Road and the approach line was owned by the Earl of Ducie, who had a very large block of land on the northern outskirts of the city. The ability of the Manchester & Leeds to promote the Miles Platting and Salford Link and to provide a station at Victoria against determined opposition was due partly to the ease of the property transactions. In contrast the MSJ & A spent seven years obtaining land along the River Medlock to build their viaduct between Piccadilly and Deansgate, due to the extremely fragmented ownership.

Kellet also makes the point that the siting of Moor Street station in Birmingham was due to the exceptional opportunity given to the Birmingham, North Warwickshire & Stratford-on-Avon Company by a block of land in the central area coming on the market with the transfer of the Police Station and Public Offices to another site. The exceptionally favourable location of New Street was, in Kellett's view, the result of (i) compromise rather than competition between companies, (ii) favourable topography and (iii) good planning.

One of the few examples of conscious planning was the location of the northern terminals along the line of the Euston Road in London. In the 1830s it more or less bounded the built-up area. The Parliamentary commission set up in 1846 to evaluate the sixteen railway Bills affecting central London ruled that since the lines were unlikely to be used for suburban traffic the New Road (as it was then called) should be the site of their termini to prevent undue interference to property. On the other hand, since the built-up zone south of the Thames was much narrower and the property poor anyway, the southern lines could approach close to the river.

The dual nature of London, City and West End/Westminster[2] also explains the multiplicity of the southern termini. Each company strove for both a City and a West End terminus. The SER ended up with Cannon Street and Charing Cross, the LCDR with the St. Paul's-Holborn Viaduct complex on the one hand and Victoria on the other, and the LBSCR with London Bridge and Victoria. While the LSWR had to be content with Waterloo as their West End station, they did not rest until they had promoted and finally gained control of the Waterloo & City Tube.

The lines between the cities had to be more or less direct. There could be some divergence to serve intermediate towns which were not very far off the direct line. But the possibilities were limited, and many intermediate stations were sited on turnpikes so that connecting road services could be provided to neighbouring towns.

Thus Crewe was from its opening one of the First Class stations on the Grand Junction, yet there was no nearby settlement. It lay in the Township of Church Coppenhall, but was named after the adjacent Crewe Hall. Even today it is on

the very edge of the town. Chaloner[3] states it was selected as the junction for the Chester line. This is true but the first proposal was that the junction should be at Winsford. I submit the decision for the precise location of Crewe was its position on the Nantwich-Congleton turnpike (A534). Table 1 shows the original Grand Junction stations and the places each was expected to serve.[4] The reason for Whitmore, Crewe and Hartford being First Class stations becomes apparent.

Divergences would increase the mileage to be constructed and therefore the cost of the line. They would also increase journey times. They might however be expected in order to serve important towns. But oddly I am unable to cite any examples, and would be very pleased to learn of any. Diversion away from a town is perhaps more common. This may have been for technological reasons. I have explored the relationship between lines of communication, their technological limitations and the physiography in the Kidsgrove-Whitmore area.[5] In this case no important station is involved. But the existence of the Whitmore Gap, a glacial meltwater channel through the Bunter Sandstone ridge, determined the course of the line between Stafford and Crewe and thus led to the location of the First Class station of Whitmore on the Market Drayton-Newcastle turnpike (A53) at Baldwin's Gate, a mile from the insignificant village of Whitmore, and several miles from Newcastle and the Potteries.

A much better-known example is that of the by-passing of Northampton by the London & Birmingham. Here the physical constraints were (i) the need to cross the Lias uplands by the Watford Gap (or rather the Kilsby Tunnel under it) and (ii) the need to cross the Nene Valley.[6] The technological constraint was the need to keep gradients below 1 in 330 as mechanical engineering was less advanced than civil and contemporary locomotive performance extremely limited. The valley floor at Weedon is 70 ft higher than at Northampton Bridge. Furthermore it is narrower and the line could be carried on a high embankment exactly 100 ft above the lowest rail level at Northampton.

Incidentally, 4.25 miles south of Blisworth the four-track main-line on a high embankment slices clean through the village of Ashton. Imagine the row if a motorway alignment of this nature were authorized. Ashton never had a station, though it was no less unimportant than Roade. But the latter lay on the Stony Stratford-Northampton Road (A508) and presumably could have served as a station for Northampton.

The other main reason for diversions was the influence of large landowners. Robert Stephenson listed as one of three basic point in laying out a line the need "to avoid Parks and Pleasure Grounds in every practicable case." J. Hepple has studied this aspect exhaustively.[7] Two examples can be quoted briefly. Brunel's original survey of 1835 for a branch from Didcot to Oxford shows the line passing close to Abingdon. This and succeeding proposals with the same object were warmly supported by the town. But in spite of the clear wishes of Abingdon the 1844 line was routed through Appleford well to the east because of the opposition of Captain Pechell, who owned an estate between Culham and Abingdon. The latter had to wait until 1856 for its inconvenient branch from Radley.[8]

The second example is Stamford. Again, the original schemes for what eventually became the GNR envisaged the town, then just as important as Peterborough or Grantham, should be directly served. But the line was eventually routed through Tallington, 4 miles to the east along the A16.[9]

With the growth of the railway system most towns of any importance were connected by branches, e.g. the Cheltenham & Great Western Union, Midhurst & Mid-Sussex Junction. This brought to an end the very extensive road-rail

co-ordination which had grown up. This was to the eventual loss of both the traveller and the railways, as in this country we seem unable to re-establish it to any degree, in contrast with so many European countries.

Many of the junction stations were so remote they had no source of local traffic and were named after the town at the other end of the branch, e.g. Seaton Junction, Llandudno Junction and Killin Junction. Others were named after some local feature, e.g. Craven Arms (an Inn), Dovey (a river) and Verney (a family of local landowners). Many of these remote junction stations never attracted any settlement, but others became the centres of important urban centres. Craven Arms is now the most important centre in south Shropshire apart from Church Stretton. The settlement around Sevenoaks Junction far outgrew the neighbouring village of Swanley and the station became Swanley Junction on 1 January 1871. Although the station is now just Swanley, the settlement is still known locally as "the Junction".

A large number of stations and halts were provided for specific purposes. At some of these trains were stopped occasionally only for these purposes, at others they called for general purposes. Thus all trains called at Baynards which appeared in the public timetables, while Falloden was Earl Gray's own private station. Some stations, like both just mentioned, were sited to serve country houses and this was often the price of the landowner's agreement to the building of the line. Other purposes included golf clubs, race courses, airports, and service establishments. A selection is listed in Table 2. Many of these stations lost their functions and thus were closed, others were adapted to serve a changed function (Gatwick Airport was rebuilt on the same site as Gatwick Racecourse). In other cases general population growth caused the specialized stations to be thrown open for general traffic, Carpenders Park and Warwick Road among them.

Stations were provided to serve housing estates (see Table 3) either by the railway companies or opened under guarantees by the builders. Not all these were successful. Christ's Hospital was opened in anticipation of housing development which never came and now serves little more than the school. Lullingstone was completed and the name inserted in the timetable, but it was never opened as first the War and then the Green Belt policy prevented the anticipated housing development. Of course in many other cases the estates were built round existing stations, e.g. Bellingham, Elmstead Woods.

Passenger stations, originally termini, were sometimes relocated on the through line when the route was extended. There are a number of examples, among them Peebles, Witney (Oxon), Braintree and Godalming. In the case of the last named the new location was more convenient, but that was not always so.

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TABLE 1: TOWNS SERVED BY STATIONS ON THE GRAND JUNCTION RAILWAY, 1838

Places lying west		*Places lying east*
	BIRMINGHAM	
Handsworth 1:	Perry Bar	
W. Bromwich 2:	Newton Road	
Wednesbury 1: Dudley 5½:	Bescot Bridge	Walsall 1½
Darlaston ¾:	James's Bridge	
Bilston 1½: Shifnal 14: Bridgenorth 15:	Willenhall	
Town of Wolverhampton 1:	WOLVERHAMPTON	
	Four Ashes	
	Spread Eagle	
	Penkridge	Cannock 5
Newport 12:	STAFFORD	Uttoxeter 14: Sandon 5: Rugeley 9: Lichfield 17
	Bridgenorth	
Ecclesshall 1½:	Norton Bridge	Stone 3: Cheadle 14
Market Drayton:	WHITMORE	Newcastle 5: Lane End 9: Trentham 5: Leek 16
Woore 2¾:	Madeley	Newcastle 5: Betley 3: Potteries 7
Nantwich 4:	CREWE	Sandbach 5: Congleton 11: Macclesfield 19
	Coppenhall	
	Minshull Vernon	
	Winsford	Middlewich 2
Tarporley 8: Chester 16:	HARTFORD	Northwich 2: Knutsford 9
	Acton	
	Preston Brook	
Frodsham 3: Chester 13:	Moore	
Runcorn 4:	WARRINGTON	Altrincham 12
	Newton Junction	

First class stations in capitals. Figures in miles.

From – A poster announcing the opening of the G.J.R. as reproduced in N W Webster, "Britain's first trunk line", 1972, p. 104/5

TABLE 2: EXAMPLES OF STATIONS SITED FOR SPECIFIC PURPOSES

Purpose	*Stations*	*Location & Pre-Grouping Ownership of lines*
Country Houses	Baynards	Horsham–Guildford (LBSC)
	Sheffield Park	Lewes–East Grinstead (LBSC)
	West Moor	Hereford–Three Cocks (MR)
	Falloden	Alnmouth–Berwick (NER)

TABLE 2:—continued

Purpose	*Stations*	*Location & Pre-Grouping Ownership of lines*
Golf Clubs	Bramshott Halt	Woking—Basingstoke (LSW)
	Carpenders Park	Harrow—Watford (LNW)
	Golf Club Halt	Aldrington—The Dyke (LBSC)
Race Courses	Gatwick Race Course	Redhill—Three Bridges (LBSC)
	Race Course Halt (Stratford)	Stratford—Cheltenham (GW)
	Race Course (Cheltenham)	
Service Establishments	Tinker's Green Halt	Whitchurch—Oswestry (Cambrian)
	Bramshott Halt	as above (re-opened)
	Idmiston Halt	Basingstoke—Salisbury (LSW)
Rifle Ranges	Milton Range Halt	Gravesend—Strood (SE & C)
	Churn	Didcot—Newbury (MSWJ)
Airports	Gatwick Airport	on site of Gatwick Race Course
	Southampton Airport	Eastleigh—Southampton Ctl. (LSW)
Football Grounds	United Football Ground	Oxford Rd—Warrington (CLC)
Cricket Grounds	Warwick Road	Oxford Rd—Altrincham (MSJ & A)
Educational Establishment	University Halt	Coleraine—Portrush (NCC)

TABLE 3: EXAMPLES OF STATIONS SITED TO SERVE HOUSING DEVELOPMENT

Station	*Location*	*Notes*
Letchworth	Hitchin—Royston	Garden City
Welwyn Garden City	Hatfield—Hitchin	Garden City
Stevenage (New)	Hatfield—Hitchin	New Town—replaces Stevenage (Old)
Basildon	Upminster—Southend	New Town
St. Helier	Wimbledon—Sutton	LCC Estate
Dagenham Heathway	Barking—Upminster	LCC Estate
Chestfield & Swalecliffe Halt	Whitstable—Herne Bay	opened under guarantee
Brooklands	Oxford Rd—Altrincham	opened under guarantee
Lullingstone	Swanley—Sevenoaks	built but never opened
Christ's Hospital	Horsham—Ford	development never took place
Durrington-on-Sea	Worthing—Ford	Private speculative estates
Albany Park	Sidcup—Dartford	Private speculative estates
Falconwood	Blackheath—Bexleyheath	Private speculative estates

(*To be continued*)

The Role of Iron in Reconstructing the Oxford Canal, 1829–35

BY D. W. HADLEY

Introduction

The complex story of the reconstruction of the northern end of the Oxford canal between 1829 and 1835 has been summarized by Charles Hadfield[1] and is dealt with more fully in two forthcoming books[2,3]. With William Cubitt as consulting engineer, closely following a survey by Charles Vignoles, a meandering contour canal was almost completely replaced by a succession of cuttings and embankments that reduced the overall length by nearly thirteen miles.

Further information about the reconstruction has become readily available to canal historians, following the transfer to Warwickshire County Board Office from BWB Hillmorton Depot of several OCC letter and account books, which complement Cubitt's personal copy of the survey plan already at Warwick[4]. "New works-bills paid 1829–35" is a leather-bound ledger giving an approximately monthly record of disbursements under several headings which also lists the total payments made to major contractors and supplies. Table 1, which shows total expenditure in half-yearly periods, is derived from the monthly totals, and gives a guide to the overall progress of the works. A complete breakdown of costs will be a lengthy procedure, and the current paper concentrates solely on the role that iron played in the building operations.

Headings covering a limited number of specific items, such as iron aqueduct, have been extracted in full and are discussed as a whole. Expenditure on rail roads has been summed over successive half-years to emphasize peaks of activity – although bills paid do not necessarily bear a constant time relationship to materials delivered. A similar breakdown is not used for wagons, since the iron purchases are sporadic and not identifiable as for railway trucks. Only boats and their fittings described as being of iron are considered, so that some iron fittings may have been neglected. It is assumed that iron used in the excavations and for temporary bridges is included in the heading "Smiths Work", so again there are probably some omissions. Even so the amount of manufactured iron purchased by the canal company is considerably greater than might have been anticipated.

Railroads

Narrow gauge railways, presumably with hand- or horse-drawn wagons, evidently played a considerable role in reconstructing the Oxford canal, as can be inferred from Table 2.

Parkes & Otway of Capponfield Ironworks, Bilston, were the largest suppliers of rails, receiving £2272 7s 0d between October 1829 and June 1831. Rails from this foundry were some of the first items to be delivered, for no later than August 1829 J. Lowke was paid for two journeys to Stretton wharf. After mid-1831 little more is heard of Parkes & Otway, their place being taken by the Horseley Coal & Iron Company (of bridge fame) and W. Ward of Priestfield Ironworks, Bilston, who received orders totalling £749 6s 7d and £173 5s 9d respectively. A steady supplier of rails was G. Jones of Birmingham (probably the Phoenix Ironworks, Snow Hill) who received £1501 10s 6d in ten instalments. In March 1831 there was a single payment of £53 3s 7d to C. Dutton for

railway plates, which on the evidence of the ensuing haulage charge may have been delivered from London. Could this purchase have indicated that plate rails were given a trial? If so, they were evidently unsuccessful, as no more were bought.

The indicated cost of £4706 18s 10d is slightly more than the true cost of rails, as a few payments are entered as rails, axles, etc. Supposing that the cost of rails was £4500 it is possible to estimate the weight of rail purchased, and hence guess at the length of track involved. During the 1820s cast iron rail cost little more than £6 per ton in N.E. England[5], while cast iron tram plates were estimated to cost £8 per ton at Gloucester in the 1830s[6]. Assuming an average cost at the foundry of about £7 per ton the OCC must have bought about 650 tons of rail. Confirmation of the total tonnage of rails is provided by analyzing haulage charges, which suggest that about 28 boat loads of rail were fetched from the foundries. At 25 tons per load this would yield 700 tons, some of which would be taken up by axles, etc. Five or six tons of rails must have proved unsatisfactory, or else were returned as scrap after being broken, as J. Lowke was paid £2 6s 1½d in May 1830 for hauling return rails, etc. to foundry.

Although Telford made use of a 4ft gauge plateway in the construction of the Caledonian canal[7], it seems likely that the Oxford Canal railways were of narrow gauge, similar to those used in quarries. The rails in this case probably averaged between 20 and 25 lbs per yard, corresponding to about 50 yards of track per ton. Total purchases of rail would therefore provide for about 18 miles of track.

Almost £250 was spent on rails used to spike rails directly to wooden sleepers. H. Tyler initially supplied rails in amounts worth about £8, but as demand increased he was joined, and eventually supplanted by J. Blackham and J. Hawkswood, who were able to supply in much larger quantities. "Wagons and Barrows" is a heading distinct from "Railroads" under which rail wagons are not specifically identified. Very few wagons were purchased complete, the majority being made up as required using elm and ash planks. A total of £247 2s 7d was spent on iron, the largest single items being £67 13s 0d for nails and £64 17s 1d for bar iron, the latter probably used for axles. Wheels and axles as distinct items totalled only £24 12s 9d, but further quantities may be concealed in £26 11s 8d for castings and £57 5s 6d spent on iron for wagons.

The wagons must have had the simplest of bearings, judging by the large purchases of oil and grease. Some of these lubricants were obtained from London suppliers and were shipped by Pickfords; carriage of £1 10s 1d was charged on one consignment valued at £30 1s 8d.

Bridges and aqueducts

The former turnpike road from Rugby to Lutterworth, later the A426 and now merely a by-road, is spanned at Brownsover to the north of Rugby by a cast iron aqueduct not unlike those on the contemporary Birmingham & Liverpool Junction canal. This structure, whose designer is unknown, was cast by Parkes & Otway in 1830. A payment on account of £150 was made in April 1830, but the final instalment of £37 7s 10½d was not made until 1831, nine months after J. Lowke had been paid for bringing the castings from Capponfield. The bill for the aqueduct, itemized in Table 3, is given in the ledger in much greater detail than any other purchase.

Several months elapsed before the castings could be placed in position. In February 1831 £25 10s 2d was paid for Cheshire stone for the t(urnpike) r(oad) aqueduct, which was conveyed from Congleton by J. Lowke – who was to make several later journeys to that area fetching facing stone for the brick

aqueduct over the River Swift that is only a few yards beyond the turnpike road crossing. Another February payment was one of £14 10s 9½d for cutting and fixing the stone ready to receive ironwork; but not until May do we find fitting on plates, etc. Work then continued for several months, during which felt was put round the aqueduct, sal ammoniac (a flux or metal cleaner) was bought for joints, and drilling and fitting ironwork was recorded.

Work later transferred to the Swift aqueduct, which incorporated small amounts of iron. In May 1832 the Horseley Co. were paid £12 14s 5d for cast iron bannisters, and at the same time £5 15s 0d was spent on lead to fix railings. In October Horseley received £13 4s 5d for rails for Swift aqueduct, which may represent a further payment for what were earlier termed bannisters. An unexplained entry for December 1832 records Rowell & Sons, £2 13s 3d for blister steel for the Swift.

A second iron trunk aqueduct on the Oxford canal (OCC No. 18) is little known, since travellers by water or towpath fail to recognize its presence. The path beneath it merely connects two fields, and the trunk is almost hidden inside a low brick arch. In October 1832 the Horseley Company were paid £222 13s 6d for this iron aqueduct for the Shilton valley, no details being given. Delivery had probably taken place several months earlier, as payments during the previous June include £9 9s 4d for hauling from Horseley.

Probably the most elegant and best known of all cast iron canal bridges are those made at the Horseley iron works for carrying the towpath of the reconstructed Oxford canal over arms of the original waterway that remained in use. A bill of £419 12s 10d for three of these bridges was paid in October 1832, and one for £693 19s 8d (presumably for the remaining five) was settled in the following January. Payments for delivery are recorded in November and December 1832.

Although the canal company seems to have been responsible for all stages of the erection of aqueducts Horseley must have supervised at least some of the later work on the towpath bridges: in May 1833 they received £10 on account of fitting up, and in the following July they were paid £2 4s 0d for unloading bridge at Stretton (a delayed bill?). Further payments to individual contractors were made at dates up to August 1834, when G. W. H. Johnson received £10 16s 0d for working and grooving spring stones, probably at Braunston, which was the final major cut-off to be completed.

Cast Iron Guards

What guards were is unclear, and the OCC accounts clerk also became confused at times, for the word is sometimes mis-spelled and the entries included items, such as the £33 9s 0d paid to the Horseley Company in July 1833 for fitting railing at Newbold tunnel, which could not conveniently be included under other headings.

Horseley supplied guards valued at £774 15s 9d, with payments beginning in May 1832; haulage charges suggest that four fairly well-laden journeys were needed to transport this quantity of iron. In addition W. Ward received £188 3s 1d for three smaller consignments of guards the initial payment being made in November 1831. The total expenditure of £962 18s 10d probably represents more than 100 tons of iron.

Some guards must have been light castings as W. Turner received 19s for straightening, and they were fitted and fixed both for and on brickwork. Possibly this reference is to rubbing irons, used to protect the brickwork of bridges from towing ropes; but allowing as much as a hundredweight of iron per bridge would account for less than a tenth of the tonnage involved.

Further clues as to meaning are obtained from the contemporary bills paid ledger referring to day-by-day maintenance of the canal[8]. Guarding bridges is a frequent entry, at a cost of several pounds a time, sometimes called carpenters work and sometimes masons work. When a new gauging lock was built at Braunston in 1836 haulage charges for iron guards totalled £5 13s 3d, so that a substantial amount of material can be inferred. This type of guard was probably a means of protecting brickwork from damage by boats, and consisted of wooden piles and planks at the approaches to a bridge hole, or blocks of iron fastened to the brickwork near water level beneath a bridge arch or along the length of a lock. Cast iron is a notoriously brittle material with poor shock resistance, so that many iron guards probably soon cracked and were removed or replaced with wooden fenders.

Smiths Work

Most of the entries under this heading are labour costs described in very general terms. Purchases of forge equipment are also noted, including pairs of bellows – which needed frequent repair – and a patent weighing machine. The only forge mentioned by name, is one at Stretton, but others must surely have been required.

Considerable quantities of iron were obtained, though its form is not stated. Hadley & Page of Smethwick (referred to simply as E. Page after the middle of 1832) were paid £573 3s 10d, and G. Jones received £32 9s 11d. Small quantities of nails were bought, the total being £2 9s 6½d, and also small amounts of steel: the total was only £11 15s 0d, with the largest order costing £4 16s 0d.

Iron Boats

The canal itself provided the principal means of delivering building materials and shifting earth. A fleet of boats was required for these purposes, 38 of which were new iron boats paid for between 1831 and 1833. Although iron boats were expensive they were probably better able to endure hard knocks than were wooden boats, so saving on the services of J. Sephton (the owner of a boatyard near the north end of the canal), who was almost continually employed in repairing damaged boats.

Parks & Otway supplied 24 boats for £2686 18s 0d charging £16 per ton. The Horseley Company were more expensive, supplying 10 craft for £1382 5s 8d, at prices ranging from £16 6s 0d to £17 10s 0d per ton. Some Horseley boats were either surplus to requirements, or were in good enough condition to dispose of in 1835, as a pencilled note in the accounts states 9 to sell; some of these may have been included in the payment of £8 16s 0d to J. Ferguson in May 1835[8] for hauling 5 iron boats from Stretton to Horseley Iron Works.

W. Love supplied the four other boats for £507 11s 0d. Since the price per ton was the same as that charged by Parkes & Otway the boats may have been larger. They were possibly too wide to pass through locks, and had to be altered when required for general use; several payments are recorded in 1836 for taking in wide iron boats[8].

Charges for wooden boats seem to cover labour costs only, and itemized expenditure cannot be ascertained. Apart from £6 15s 0d for nails only £13 17s 10¾d is recorded on items of ironwork.

How Manufacturers Fared

£13,257 10s 1¼d out of a total cost of more than £171,000 can be readily identified as spent on iron in various forms (Table 4). Two firms: Parkes &

Otway, who received £5480 11s 3½d, and the Horseley Coal & Iron Company, who were paid £4302 1s 10d, plus small sums for fitting and supervisory work, shared the majority of these purchases. Horseley, first mentioned in the accounts early in 1832, seem to have taken over from Parkes & Otway, who began as main contractors, but were paid only for a single small order after the middle of 1831. It is probably significant that the final two references were to Parkes & Company, Otway having disappeared. In 1833 the Oxford canal letter book makes it clear that Parkes & Company were in arrears with their canal dues, and an 1835 directory records the Capponfield Ironworks as Bishton, Kempson, Jellicorse & Callum.

G. Jones, who supplied rails regularly, but in fairly small consignments, and also small amounts of iron for wagons, received £1560 12s 1d. The next largest accounts were those of Hadley & Page (later E. Page), whose iron for smiths work and wagons cost £630 9s 4d, W. Love, for four iron boats costing £507 11s 0d, and W. Ward, who provided small quantities of rails after supplies from Parkes & Otway had dried up, together with some guards, at a total cost of £123 5s 6d. The only other supplier to receive more than £100, was J. Blackham, a nailmaker, whose bills, mainly for rail nails, totalled £123 5s 6d. A final beneficiary worth mentioning is J. Lowke, a haulier who was employed whenever available. Transporting iron goods brought him more than £350 gross, and in addition he made several journeys from stone quarries in Cheshire and Staffordshire.

A point firmly emphasized through a study of the accounts is that in the 1830s steel was still a specialized material, produced and used only in small amounts. Five separate purchases were made, at a total cost of only £14 8s 3d.

By present day standards the sums spent on iron goods are far from large, though they must represent an enormous advance over those incurred when the canal was first built. Early navigations had accelerated the progress of the industrial revolution through their capacity for transporting large pieces of manufactured iron. For a few years their successors were able to benefit, before themselves being outpaced by the very progress that they had helped to create.

Footnote

Contemporary with the purchases discussed above was the introduction of iron lock gates, which were supplied by the Horseley Company. A pair of gates delivered at Napton top lock in March 1832, and paid for three months later, cost under £30 [8], but prices had increased drastically by 1840, when Hillmorton new locks were constructed.

Two iron towing path bridges over the Southern Oxford canal, in the Tunnel cutting near Fenny Compton, and over Isis lock at Oxford, were manufactured by Lloyd, Foster & Company of Old Park Ironworks, Wednesbury. A bill for £111 14s 1½d, which did not include the cost of patterns, was paid in August 1844[9].

Acknowledgement

I am very grateful to Mr. Hughes of Warwickshire County Record Office for drawing my attention to the "Bills paid" ledgers, and for his assistance generally, particularly concerning the significance of guards.

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[9] Warwickshire Record Office. OCC bills paid ledger 1844–61.

TABLE 1. HALF-YEARLY BREAKDOWN OF BILLS PAID FOR RECONSTRUCTING THE CANAL

Dates	*Total bills paid*
July–December 1829	£ 7368 12s 4¼d
January–June 1830	£ 13004 13s 6¼d
July–December 1830	£ 16485 17s 2¼d
January–June 1831	£ 19980 4s 2¾d
July–December 1831	£ 22337 2s 6¼d
January–June 1832	£ 26518 4s 1d
July–December 1832	£ 22467 11s 5½d
January–June 1833	£ 19741 3s 1d
July–December 1833	£ 12190 7s 10d
January–June 1834	£ 8241 9s 9¼d
July–December 1834	£ 2048 8s 1¾d
January–February 1835	£ 958 2s 1¼d
Total	£171341 16s 3½d

TABLE 2. HALF-YEARLY BREAKDOWN OF MAIN ITEMS UNDER HEADING RAIL ROADS

Dates	*Rails*	*Haulage*	*Sleepers*	*Sawing*	*Rail nails*
	£ s d	£ s d	£ s d	£ s d	£ s d
Jul–Dec 1829	794 9 4	75 9 8	–	8 5 0½	24 18 0
Jan–June 1830	1017 6 1	107 11 5½	276 9 5	25 8 7½	70 16 8¼
Jul–Dec 1830	951 14 6	21 15 3	134 14 6	2 15 11	27 6 4
Jan–June 1831	485 5 3	20 10 1	19 10 10	–	17 17 0
Jul–Dec 1831	739 3 6½	50 17 7½	55 12 5	–	40 3 10
Jan–June 1832	655 6 1	8 12 7½	–	4 6 3	68 0 8
Jul–Dec 1832	53 5 0½	–	16 5 10	–	–
Jan 1833	10 5 0	–	–	–	–
Total	£4706 18 10	£284 16 8½	£502 13 0	£40 15 10	£249 2 6¼

TABLE 3. ACCOUNT OF MESSRS. PARKES & OTWAY FOR IRON AQUEDUCT, SWIFT VALLEY

		T	C	Q	L				
19	bottom plates	10	12	2	0				
14	side plates	6	16	2	0				
16	towing path plates	9	4	0	0	@ £9 per ton.			
28	end plates	9	14	2	0				
8	circular girders	10	10	1	0				
		46	17	3	0	= £421	19	9	
968	short pins								
33	long pins	3	7	1	9	= £ 30	5	11	
	distance pieces								
	washers								
8	cornice pieces	2	0	2	22	= £ 18	16	10	
88	1 in. pins				285				
4	iron bars				153	= £ 16	15	4½	
116	bannister bars				1844				
					Total	= £487	7	10½	

TABLE 4. EXPENDITURE ON IRON REARRANGED UNDER HEADINGS

	£	s	d
Rails	4706	18	10
Boats & fittings	4590	12	6¾
Bridges, aqueducts, tunnel	1883	1	8½
Guards	962	18	10
Iron for smiths	605	13	9
Iron for waggons	173	7	0
Rail nails	259	2	6¼
Other nails	76	17	6½
Chain	8	17	4¼
Steel	14	8	3

MACCLESFIELD, BOLLINGTON & MARPLE.—This line was opened for passenger traffic on Monday. The line is single, about 11 miles in length, and joins the Manchester and Sheffield at Marple, affording a short route between Manchester and Sheffield and several other towns. There are four trains each way daily, and two on Sundays, and the line is worked by the Sheffield, which, with the North Staffordshire, contributed a large share of the capital. At present, owing to a difficulty with the London and North Western, the new line terminates at Macclesfield in a temporary station about fifty yards from the station of the latter company; but it is intended to effect a junction with the North Stafford below the station. (*Railway Times* 7 August 1869)

Nineteenth-century Hydro-electric Railways in the U.K.

BY D. G. TUCKER

We still have with us some Victorian water-powered railways in the shape of cliff tramways operated on the water-balance principle, but I believe we no longer have any railways using water power through the medium of electrical transmission. Of course, a good deal of hydro-electric power nowadays gets fed into the electricity grid system, and may thus contribute to electric traction; and there have been cases of hydro-electricity being mixed with thermally-generated electricity and contributing to the supply for electric tramways in the more distant past, as at Worcester after 1902. However, at the end of the nineteenth century there were at least five railways in the U.K. which used water power for electric traction, on an exclusive basis for at least part of the year. These were, in order of opening of the hydro-electric supply,

Portrush to Bushmills (Northern Ireland) – later extended to the Giant's Causeway

Bessbrook to Newry (Northern Ireland)

Carstairs Junction to Carstairs House (Scotland)

Greenside Lead Mine, near Ullswater (England)

Douglas to Ramsey (Isle of Man)

The object of this article is to draw attention to these systems as a group, to set them in their historical background, and to list some basic literature from which full information can be obtained.

During the nineteenth century the application of water power was greatly improved by the development of the water turbine, and during the same period the generation and use of electricity progressed from Volta's pile in 1800 to public supply in 1881. Simple electrical machines were made from the early 1830s, and in 1841–3 Robert Davidson experimented with a battery-powered electric locomotive which actually ran successfully on the Edinburgh & Glasgow Railway; it used simple axle-mounted magneto-electric rotary motors, but had little power or endurance.[1] In 1851 an American, Charles G. Page, demonstrated an electric battery locomotive on the Baltimore & Ohio Railroad; it used reciprocating electric engines analogous to a steam engine, and was not a success.[2] Nothing more of importance was done in electric traction until Siemens and Halske demonstrated a short electric railway at Berlin in 1879 in which a rotary electric motor on a small locomotive was supplied from a special centre rail with current return through the running rails. On 12 May 1881 the first commercial electric tramway was opened at Lichterfeld in Berlin; it had a length of 2 km, used the running rails as conductors with a voltage of 100, had an electric motor mounted under each car, driving the axles by pulleys and steel ropes, and had a steam-driven power station of 12 H.P.[3] Electric street tramways of the more familiar kind began with Sprague's tramway at Richmond, Virginia, in 1887.[4]

Water power was widely used in industry, and it is perhaps surprising that it does not appear to have been used for generating electricity until 1880. In November of that year it was reported[5] that an experiment had been tried at Turin in Italy in which water power had successfully been used to drive an electric railway in which the electricity had been transmitted by means of two parallel cables along the route. Unfortunately no further information on this important matter has yet been found.

In the U.K. the first application of hydro-electricity seems to have been to the illumination of Sir W. G. Armstrong's house, Cragside, at Rothbury in Northumberland, in December 1880;[6] and this was followed by the public lighting of Godalming in Surrey in September 1881, also using water power.[7] After that, with Swan's incandescent-filament lamp commercially available, public electricity supply began to develop, and among the numerous generating stations that had been built by the end of the century, about a dozen in Britain were water-powered, with some more in Ireland.[8] Hydro-electric development was, of course, much greater in America and in many countries in Europe because of their better supply of suitable rivers. Hydro-electricity was also used for numerous private and industrial applications, in the U.K. as elsewhere, and one early example in a remote place was in Mull in 1882.[9]

Against this background we can now consider the beginnings of the five hydro-electric railways.

The Portrush – Bushmills – Giant's Causeway tramway

The six-mile section of this line between Portrush and Bushmills was laid by the end of 1882 and inspected by the Board of Trade's Inspector on 12 January 1883. At this stage steam locomotives were being used, with electric traction on a purely experimental basis using steam-driven generators. The electrical design was in the hands of Siemens Bros. and Dr. John Hopkinson, and was set out in their paper in April[10]; they decided that an outside conductor rail carrying 225 volts would be suitable, in spite of the fact that the line ran beside a public road. A fatal accident in 1895 led to the replacement of this system by an overhead trolley system. The hydro-electric generating station was completed in September 1883.[11] It was on the river Bush near Bushmills, where natural falls provided a head of about 25 ft. Two 50 H.P. turbines were provided; this would have been ample as each tramcar was fitted with motors of about 4 H.P. The regular electric service opened on 5 November 1883.

Traffic was quite considerable, over 62,000 passengers being carried in 1887, and it was in this year that the 2-mile extension to the Giant's Causeway was opened, with additional generating capacity at the hydro station. Steam locomotives were also used on the line for goods and exceptional traffic.

The tramway continued in service until 1949, with the hydro-electric station functioning until the end. Its jubilee was noticed in 1933,[12] a short history with excellent illustrations was given by Lee[13] in 1936, and an account of the line after dismantling was given by Dickinson.[14] A full history of the line has been given (unfortunately without references) by McGuigan,[15] and he has included descriptions of the generating station and of its various stages of expansion.

The gauge of the line was the standard Irish narrow gauge of 3 ft. The electricity supply was supplemented from 1925 by an oil engined power plant of 132 H.P. at Portrush.

The Bessbrook & Newry tramway

This too was of 3 ft gauge, used a third rail system at 250 volts (but centrally-placed), and had John Hopkinson as its electrical designer, but there were some important differences from the Portrush line. Firstly, the Bessbrook & Newry tramway was essentially an industrial one, being constructed for a manufacturing firm primarily for its own use and being required to transport up to 200 tons of minerals and goods in addition to passengers (who were mainly its own employees).[16,17] Secondly, it had its own route independent of public roads. Thirdly, the goods wagons had flangeless wheels so that they could also be hauled

by horses on ordinary roads; these wheels ran on lighter rails laid outside and nearly an inch lower than the main tram rails, so that the latter acted as guides. Fourthly, the line was entirely dependent on water power, having no steam or other auxiliary power. Fifthly, the tramcars were of bogie type, with the leading bogie carrying an electric motor of about 20 H.P., and these cars (initially two in number) were used as locomotives as well as passenger carriers. There were reversal loops at each terminus. The line, connecting geographically but not physically with the main line at Newry, was just over 3 miles in length with maximum gradient 1 in 50. It was opened for traffic in October 1885, although the first sod had been cut as early as September 1883.[15]

The hydro-electric generating station was on the Camlough river at Millvale, where the tramway crossed it, about a mile from Bessbrook. The head was 28 ft and a single turbine of 62 H.P. was provided, with two dynamos.

Where the line crossed a public road, it was necessary to interrupt the third rail, and instead of relying on contact shoes at each end of the car to bridge the gap, as on the Portrush line, the gap was spanned by an overhead conductor which made contact with a transverse iron bar above the roof of the tramcar.

Hopkinson's paper of 1888 gave a very detailed description of the line and its equipment,[18] and a well-illustrated account was given by Frayle over 50 years later.[19]

The tramway had quite a long life, not closing until 10 January 1948.[20] An early tramcar from the line which incorporated one of the original motor-bogies of 1885 has been preserved in the Belfast Tramway Museum.[21]

The Carstairs House tramway

This small tramway, of 2 ft 6 in gauge and one and a quarter miles long, linked Carstairs House (grid reference NS 942 443) to Carstairs Junction, on the then Caledonian Railway; it was a private line, opened in May 1889, with one motor-car. Two more were obtained soon afterwards. There were two conductor rails, one at each side of the track.[22]

The hydro-electric generating station was at a waterfall some three miles from the house, equipped with a turbine and dynamo of about 16 kW rating. The generator voltage was kept at a value which maintained about 250 volts between the conductor rails. There was no earth connexion (!) The generator had also to supply the house lighting system. Batteries were used for storage of electricity, so that the system could be run for limited periods without the generator.

Electric traction ceased in 1905 after the electrocution of the owner; horses were then used until final closure in about 1935.[23]

An illustration of one of the electric cars is given by Brotchie.[24]

The Greenside Lead Mine tramway

This was an underground tramway in the Lucy level of this large mine, about one and a half miles long, and of gauge of about 2 ft. It was provided with electric traction in the shape of one small locomotive of 14 H.P., weighing 2½ tons, in about 1892, as part of a major modernization of the mine involving electric power started in 1890.[25] The lead industry at this time was in decline, but by this bold programme of electrification and other improvements the mine was able to survive another 70 years.[26,27] The electrical supply was generated by water power. In contrast with the systems already described, which had convenient falls on sizeable streams, this installation involved considerable

construction of watercourses up in the mountains and a length of pipeline.[28] The generating station itself was very much in the wilds of the mountains at grid reference NY 358 168. The initial equipment comprised one 100 H.P. reaction turbine and one dynamo, but in the early 1900s a Pelton wheel and another dynamo were added, and in 1911 the original turbine was replaced by a 300 H.P. Pelton wheel driving a high-voltage alternator. The head was about 400 ft.

The locomotive collected its current by means of two pairs of contact pulleys running on two bare phosphor-bronze conductors attached to the roof of the level (or tunnel). Seeing that the voltage was 250 volts, this seemed somewhat hazardous in a damp situation, but no accidents seem to have been reported. The locomotive was still running in 1921 according to an inventory of plant which is held in the Westmorland (now Cumbria) Record Office. Shaw[27] says it ran for 40 years; he also says it was of 30 H.P., but the inventory clearly says 14, as does Borlase.[25] Its normal train, according to the inventory, was 12 wagons. It was said to be able to haul this load of about 18 tons over the 1½ miles in about 20 minutes.

The Douglas to Ramsey tramway

This electric tramway was constructed in two sections; that from Douglas to Laxey, about 8 miles, was opened in July 1894,[29] and that from Laxey to Ramsey, about 10½ miles, in August 1898.[30] The electricity was thermally generated. However, as the winter traffic was light, it was thought that it would be a very substantial economy to provide water-generated electricity during perhaps seven months of the year when ample water was available in the Laxey river, the steam stations being started up only for the summer when the traffic was heavy and the water scarce. A hydro-electric generating station was therefore built at Laxey, very near the steam station there, from which it was remotely controlled. It was put into service at the end of 1899.[31],[32] Unfortunately it soon proved necessary to augment the water power from time to time during the winters as the river flow was not always adequate.

A head race or leat was built to take water from the river below the famous lead mine. It comprised 1300 ft of open channel and 820 ft of steel pipe-line of 3 ft diameter. After providing a head of about 40 ft for the turbines, the water was led to Laxey Harbour by a tail race of 624 ft. Because the intake water contained so much suspended matter from the mine washings, special settling tanks had to be provided in the head race. The two turbines were in the same casing, but either could be worked independently; the total power was 140 H.P. An 80 kW dynamo was provided, together with a 160-amp booster.

The tramway had three battery stations, and these were used continuously to help smooth the load fluctuations for the dynamos.

Like the two Irish lines, this line had John Hopkinson as its electrical advisor; it also had the same gauge of 3 ft. However, instead of a third rail it had an overhead conductor, with a contact bar on the roof of the tramcars somewhat as used for road crossings on the Bessbrook & Newry line.[33] This enabled it to work with a 500 volt supply. The contact bars were replaced by trolleys early in 1898.

In April 1935 the tramway went over to the public electricity supply, and the hydro-electric plant was used no more.

A recent book by Pearson[34] gives a detailed history of the line.

Discussion

It may well be asked why I should have grouped these five hydro-electric tramways together. Were they not just electric tramways, with hydro-electric supply as an incidental? I think the answer to this last question is 'No'. The first four would almost certainly not have been electric tramways at all if there had not been the possibility of getting cheap hydro-electric power. The availability of water power was the reason for their electrification. There was no doubt that in all cases the use of hydro-electric power was very much cheaper than thermal power of any kind. It was indeed the general nineteenth century experience in industry generally that water power was cheaper than steam. Public electricity-supply stations that used water power were able to generate electricity at a lower cost per unit than thermal stations at the end of the nineteenth century. The situation in Britain nowadays is quite different; with the massive capital costs of the civil engineering work required for a large hydro-electric scheme in Scotland or Wales, not to mention the long transmission lines required to take the electricity to where it is wanted, and present rates of interest, thermal generation is now cheaper than hydro-generation. But none of this applied before 1900; the civil engineering works were very modest, the power was used where it was generated, and interest rates were low.

The five lines were geographically and technically very diverse. They showed a marked degree of originality and innovation, and were in many ways pioneers.

References

What I have tried to do here is to list a careful selection of references, some contemporary with the opening of the lines, some more recent, to give a good detailed overall coverage (technical, operational, and photographic) for those who want to go deeply into the story of these lines. All are readily accessible in the larger reference libraries.

Contemporary reports were very numerous, and hundreds can be found by searching the indexes of the relevant journals; but these are needed only for specialized research, and cannot be listed here.

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MIDLAND.—The block system is to be brought into operation on this railway in a few days. (*Railway Times* 27 November 1869)

New Accessions to Record Offices, 1975

BY MAURICE BERRILL

This annual compilation of items of possible interest to members is extracted from *Accessions to Repositories and Reports added to the National Register of Archives* 1975, published by HMSO in February 1977 for the Royal Commission on Historical Manuscripts (102pp; price £2.25). Part I contains notes of accessions divided into four sections – A: National and Special Repositories (62); B: Local Repositories in England (97); C: Local Repositories in Wales (10); D: Local Repositories in Scotland (5); and, for the first time, E: Local Repositories in the Isle of Man (1). The total of 175 (stated in the Preface as 172) compares with 164 in the 1974 list (see *Journal*, vol. XXIII, no. 1, March 1977, pp.28–31). Part II entitled 'Reports added to the National Register of Archives' (April 1975 to March 1976) is not extracted in this present compilation.

A. National and Special Repositories

Durham University Library, Palace Green, Durham DH1 3RN
Three rough maps and a section with notes on a route in Cumberland (for a canal Carlisle-Newcastle?) perhaps by William Chapman, after 1812.

National Library of Scotland, Department of Manuscripts, George IV Bridge, Edinburgh EH1 1EW
Russel & Aitken, solicitors, Falkirk: misc papers incl some rel to Stirling Midland Junction Railway 1836–55.

B. Local Repositories: England

Bedfordshire County Record Office, County Hall, Bedford MK42 9AP
River Ivel Navigation: toll account book, corresp, reports and accounts 1754–1863.

Berkshire Record Office, Shire Hall, Reading RG1 3EE
Thames Conservancy (addnl): minutes and reports 1865–1974.

Cambridgeshire County Record Office, Shire Hall, Castle Hill, Cambridge CB3 0AP
Cam Commissioners minutes and papers 1707–1939.

Cheshire County Record Office, The Castle, Chester CH1 2DN
Manchester Ship Canal: diaries of engagements, survey notebooks and papers of William Robinson, marine superintendent, 1913–60.

Hampshire: Southampton City Record Office, Civic Centre, Southampton SO9 4XL
Redbridge Railway Works: plans of standard railway equipment 1928.
Petition to bring in bill for Navigation to link Thames and Itchen 1807–08.

Hereford and Worcester County Record Office, Shirehall, Worcester WR1 1TR
Broadway Carriage Works: account book, sketch book and note book 1834–1922.

Lancashire Record Office, Bow Lane, Preston PR1 8ND
British Rail (addnl): plans of lines and stations 1847–1955; Heysham Harbour papers 1901–09 and plans 1932.
British Waterways Canal Office, Lancaster: canal maintenance records 1841–1942, wages books 1901–31, wartime circulars 1914–18, canal agree-

ments with registers 1870–1948, corresp 1930–48.
Ribble Navigation Acts: minutes of evidence, plans and related papers, 19th cent.

Greater London Record Office (Middlesex Section), 1 Queen Anne's Gate Buildings, Dartmouth Street, London SW1H 9BS
London Transport: records of bus companies, underground railways, the London Passenger Transport Board, minutes, accounts, plans etc 1853–1965.

Greater Manchester: Bolton Metropolitan Borough Archives, Arts Department, Le Mans Crescent, Bolton BL1 1SA
Horwich area: plans of Locomotive Works, Newfield Colliery and Mort and Ainsworth estates 1861–1956.
Irwell Reservoirs Scheme: survey of industrial premises, water-wheels, steam engines on the River Irwell from Farnworth to Bacup and Crawshawbooth, plans and sections of waterfalls and proposed reservoirs 1832–33.
Turton and Entwistle Reservoir Commissioners: accounts, minutes, gauge books, legal papers 1831–66.

Greater Manchester: Wigan Record Office, Town Hall, Leigh WN7 2DY
Eccles, Tyldesley & Wigan Branch Railway: plans 19th-20th cent.

Merseyside County Archives, Merseyside County Museums, William Brown Street, Liverpool L3 8EN
Mersey Railway Co: records 1888–1947

Railway Signal Co, Liverpool: records 1886–1930.
Royal Rockferry Steam Co: records 1836–74.
Mersey Docks & Harbour Co and antecedents: records incl Corporation Dock Committee minutes and sub-committee minutes 1793–1857, Board and committee minutes and accounts 1858 to date, Mersey Pilotage records 1766 to date, charts and plans 1765 to date, leases and conveyances 1719 to date, legal and misc papers and accounts 1760 to date, agreements 1785 to date, registers of officers 1846 to date, charitable fund papers *c*1830 to date, plans and proceedings of Manchester, Bolton & Bury Canal & Railway Co *c*1832–35, Acts of Parliament esp rel to Manchester Ship Canal 1709 to date.
Vulcan Foundry Ltd, locomotive engineers, Newton-le-Willows: drawings, photographs etc 1833–1956.
Upper Mersey Navigation Commission: minute books 1876–1963, ledgers 1877–1955, dues received registers 1903–60, superintendents' reports 1912–47, log books of Commission's vessels 1921–58, misc corresp and papers 1860 to date, plans and charts 20th cent.

West Midlands: Birmingham Public Libraries, Reference Library, Archives Section, Birmingham B3 3HQ
W. H. Robins, surveyor: notebooks, engagement diaries, personal papers, railway notes, act and plans etc 19th–20th cent.

Somerset Record Office, Obridge Road, Taunton TA2 7PU
West Somerset Mineral Railway: minutes, accounts etc 1850–1925.

Tyne and Wear County Archives Department, 109 Pilgrim Street, Newcastle upon Tyne NE1 6QF
Brunton & North Shields Railway: corresp, estimates, reports and statements 1832–64.

Warwickshire County Record Office, Priory Park, Cape Road, Warwick CV34 4JS
Great Western Railway: plans for quadrupling parts of the track.

South Yorkshire: Doncaster Archives Department, 1 Priory Place, Doncaster
Thorne register of canal boats 1885–1957.

West Yorkshire: Bradford Central Library, Prince's Way, Bradford BD1 1NN
Diary of a missionary to the workmen on the Settle-Carlisle Railway 1870–75.

West Yorkshire: Leeds Archives Department, Chapeltown Road, Sheepscar, Leeds LS7 3AP
Hollis, Webb & Gale, estate agents, Leeds: maps of Aire Navigation, Leeds to Woodlesford 1832 and Temple Newsam 1857–1921.

C. Local Repositories: Wales

Clwyd Record Office, 46 Clwyd Street, Ruthin LL15 1HP
Robertson of Llantysilio Hall: business and estate letter-books of Henry Robertson, railway engineer, and Sir Henry Beyer Robertson 1845–1936; railway papers, incl Shrewsbury & Chester, Great Western and Wirral Railways 1852–1931.
C. Richards & Son, solicitors, Llangollen (addnl): reports and papers for Llangollen & Corwen, Vale of Llangollen, and Corwen & Bala Railway Cos, *c*1860–20th cent.

Dyfed Archives, County Record Office, County Hall, Carmarthen SA31 1JP
British Rail, Llanelli: letter-books, timetables and excursion notices 1870–1920.

Glamorgan Record Office, County Hall, Cathays Park, Cardiff CF1 3NE
Neath Canal (addnl): account books, parliamentary bills, share transfers and associated papers 1792–1930.
Neath Harbour (addnl): reports, accounts and parliamentary bills, *c*1844–1964.

Gwent County Record Office, County Hall, Cwmbran NP4 2XH
Monmouthshire & Brecon Canal: abstracts of tonnage, wharfage etc 1890–1919.

D. Local Repositories: Scotland

Nil of railway and canal interest.

E. Local Repositories: Isle of Man

Nil of railway and canal interest, though the Manx Museum, Douglas has received an original plan, 1854, of the Laxey Wheel by R. W. Casement, designer.

British Topography, 1881

"The Book of British Topography" by John P. Anderson.
W. Satchell & Co., London. 1881

BY HARRY PAAR

For those seeking background material to transport subjects *The Book of British Topography** of 472 pages provides a rich mine. Anderson worked in the Library of the British Museum, and this work is sub-titled "A classical catalogue of the topographical works in the library of the British Museum, relating to Great Britain and Ireland." County by county, the sources then available are carefully documented, under town headings where appropriate, for example under Cheltenham are listed nearly 40 guides, descriptions, historical accounts, etc.,

mostly dated before 1850, the earliest 1781. Under "General Topography" is a section on "Railways", which does not appear to add anything of magnitude to George Ottley's work of bibliography. A section on "Rivers, Canals, etc." lists various well-known general works, by John Phillips, John Cary, H. Skrine, Priestley, Allnutt and others. Under individual waterways there are entries for Avon, Axe, Calder, Dee, Don, Dove, Exe, Lea, Medway, Mersey, Orwell, Ouse, Ribble, Severn, Stour, Tamar, Thames, Tone, Trent, Tyne, Wharf, Witham, Wyre. Most have only one entry, but the Thames items run to over two pages. Items which appear likely to be of particular interest are as follows:

Smeaton, John. A single sheet from a survey of the river Calder from Wakefield to Brooksmouth and thence to Salter-Hebble Bridge . . . 1757.

Badeslade, T. Reasons humbly offer'd to the consideration of the publick, etc. [Concerning the River Dee]. Chester. [1735] fol. The New Cut Canal intended for improving the navigation of the City of Chester. [1736] fol.

Gawthrop, Hugh. The Mersey and the Ferries: their history and topography, with illustrations. Liverpool 1853.

Mylne, Robert. Report . . . . on the proposed improvement of the drainage and navigation of the River Ouze. 1792.

Mackenzie, M. An account of the River Stour, in Kent. Canterbury. 1775.

Lewis, F. C. The Scenery of the Rivers Tamar and Tavy in 47 subjects. 1823.

Hugo, Thomas. A Ramble by the Tone. Reprinted from the *Taunton Courier.* 1862 etc.

Congreve, Thomas. A scheme or proposal for making a navigable communication between the Rivers of Trent and Severn. 1717.

Greenwood, John. The Trent and Humber picturesque Steam-Packet companion. Second edition. Gainsborough. 1833. An account of the Great Flood in the River Tyne . . . . . December 30, 1815. Newcastle. 1816. The Report of Messrs. John Grundy, Langley Edwards, and John Smeaton, engineers, concerning the present ruinous state and condition of the River Witham. Lincoln 1761.

Jessop, W. The Report of W. Jessop, Engineer, on . . . . . making a navigable communication between the River Witham and the town of Horncastle. 1791. Horncastle.

Considerations on the idea of uniting the rivers Thames and Severn through Cirencester. London. 1782.

Jessop, W. Reports of the Engineers appointed by Commissioners of the Navigation of the Rivers Thames and Isis. 1791.

Allnutt, Z. Considerations on the best mode of improving the navigation of the River Thames from Richmond to Staines; illustrated with maps and plans. Henley. 1805.

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* By John P. Anderson. Pub. by W. Satchell & Co., London, 1881.

The Cromford and High Peak Railway in 1843

BY D. J. HODGKINS

Following the opening of the Macclesfield Canal and of the Cromford & High Peak Railway at the beginning of the 1830s[1], the Peak Forest Canal formed part of two routes from the Manchester area to the Midlands and London. Partly for this reason the Peak Forest was more prosperous in the 1830s than it had been before. The dividend reached £5 in 1836.[2] Its position was however soon threatened. The opening of the Grand Junction Railway and the completion of the London & Birmingham towards the end of the decade meant that the canal routes from the Manchester area to London, including that via the Peak Forest and Macclesfield Canals, were faced with fierce competition initiated by the Grand Junction which opened for goods traffic in January 1838. As early as 1839 the Peak Forest Canal Committee noted that the railway companies between Manchester and London were fixing rates on so reduced a scale as would greatly prejudice, if not entirely take away, the through fare traffic on the canals.[3] Traffic to the Nottingham area was similarly affected.

Moreover the challenge from the new railways followed a period of intense competition among the canals themselves for this traffic. The opening of the Macclesfield Canal, and the High Peak Railway, had resulted in a flurry of rate reductions including rates on the Trent & Mersey Canal. Later the Macclesfield, Peak Forest, and Trent & Mersey had combined to oppose successfully a projected canal, known as the Manchester & Birmingham Junction, supported by the Birmingham & Liverpool Junction, and Ellesmere & Chester Canals, which would have run from the Bridgewater Canal at Altrincham to Middlewich to join the Ellesmere & Chester there, so providing a shorter route from Manchester to the Potteries, Midlands and London than the Macclesfield.[4]

The competition from the railways coincided with a trade depression. The Annual Report of the Peak Forest Canal for 1840 noted with regret a large falling off in the amount of tonnage dues, which might be attributed to various causes, but more particularly to the depressed state of trade. It also noted that Scottish iron had to a certain extent superseded Staffordshire iron on the Manchester market.[5] Further competition was provided by the Manchester & Leeds Railway, completed from Manchester to Normanton in 1840, which was in the market for traffic between the East Midlands and Manchester which travelled via the Cromford Canal and High Peak Railway, or via the Grand Trunk, Trent & Mersey, and Macclesfield Canals.[6]

The Peak Forest Canal cut its rates and encouraged its allies, especially the Grand Junction, Coventry, and Oxford Canals on the route to London, to do the same. It sought to add to its capital resources and to replace its many short term debts, amounting to £36,800 in 1839, by raising £80,000 in shares or mortgages. The necessary Parliamentary Bill was however withdrawn in 1841, after opposition from, *inter alia*, quarry owners who thought that their interests would be adversely affected by the Peak Forest Canal, including Thomas Gisborne, who as described below was developing quarries on the line of the High Peak Railway.[7] The canal sought to extend its own limestone interests. It sought and obtained a reduction in the rent it paid the Duke of Devonshire for the limestone which it quarried.[8] But the annual report produced in May, 1843 stated that there had been a further decrease in revenue, the chief cause of which was railway

competition. Reductions in rates had not improved total revenue, particularly because of the depressed state of manufacturing and the general suspension of business in August 1842.[9]

It was in these circumstances that the Peak Forest Canal considered leasing the Cromford & High Peak Railway, which in effect formed the natural extension of the canal to the south-east across upland Derbyshire to link with the Cromford Canal and so with the East Midlands canal system. The CHPR was of course also suffering from the competition of the newer railways, although it had never prospered. It was the sad financial state of the CHPR which made a further Act of Parliament necessary in 1843[10] and which could have made an approach from the Peak Forest welcome. The relationship between the two concerns was not simple, because at one and the same time they were complementary, and competitive. The canal was heavily engaged in the conveyance of limestone, most of which it obtained from its own quarries at the head of its own tramway which ran down to the canal terminus at Bugsworth. Although the canal also carried limestone brought by the CHPR to the canal terminus at Whaley Bridge, profit gained from the carriage of this stone would not assist the canal's finances if it was at the expense of the stone which the canal company itself quarried. As far as through traffic in other goods was concerned the Peak Forest and CHPR were totally complementary.

It would seem that before specific enquiries were made late in 1843 about the CHPR with a view to leasing or purchasing it, the canal had been keeping a wary eye on the railway. This may have been because of a natural desire to secure its approaches to the south, but a powerful motive was concern about various practices of the railway company, by means of which they were thought to be competing unfairly with the canal in the limestone trade. Criticism centred on the arrangements made with Thomas Gisborne who owned the quarry at Harpur Hill, south of Buxton, on the line of the CHPR. (Gisborne was also the owner of land at Dove Holes in which the Peak Forest Canal Company had long quarried stone.) He had arranged with the CHPR a sliding scale of charges whereby he paid 7d a ton for the conveyance of stone to Whaley Bridge, if 22,000 tons were carried, 8d. per ton, if 17,000, and 10d. if only 11,000 tons a year were carried.[11]

A letter from James Meadows[12], the Peak Forest Canal's agent to G. W. Wood, M.P.,[13] dated 12 March 1843, commenting on the application by the CHPR to Parliament for a new Act, pointed out that the original Act for making the CHPR was one of the first to be obtained and of course was a very different one to those now in force, containing many loose provisions. The company charged various rates upon different parts of the line on the same articles. In particular they had been charging latterly ¼d or ½d per ton for limestone from near Buxton to Whaley. They had struck a bargain with Gisborne on these terms. Yet they were charging 1d per ton at the other end of the line. Partial charges bore hardly on the Peak Forest Canal which charged 1½d per ton per mile on its six mile railway. Meadows did not wish Wood to oppose the Bill. Lord Shaftesbury might wish, as usual, to insert a clause preventing partial charging, but this might not be easy because of the tolls levied for the stationary engines (i.e. at the inclined planes).[14]

At a meeting of the Peak Forest Canal Committee on 7 December 1843[15] Mr. Buckley said that he had made, at Meadows's request, some enquiries respecting the CHPR. He had seen Mr. Jessop and found that there was over £50,000 of debt, of which £40,000 was to the Butterley Company, £6,000 to Messrs Arkwright and £6,000 to Messrs Strutt, and from what he could gather from Jessop he believed that there would be no difficulties in letting the railway

provided the parties could agree upon terms. To assist the canal committee in their consideration of the possibility of leasing the CHPR, Meadows personally inspected the line. The report which he made to the canal committee at its meeting on 23 December 1843 is of considerable interest as a contemporary description of the CHPR. It is reproduced here in full[16]:

"In pursuance of the directions I received at the last meeting of the Committee to the effect that I should make a Report on the state of the Cromford & High Peak Railway and the traffic passing upon it.

I thought the best plan was to go over the line in the ordinary Goods Waggon by which means I could observe the practical working of it. Accordingly I started on the 14th instant by Wheatcrofts Waggon at Nine o'clock in the morning and I arrived at Cromford, a distance of 33 Miles at Five o'clock in the afternoon. It may perhaps be as well, as a preliminary, to give a description of the line.

It starts as you are aware at Whaley where there is an inclined Plane 180 yards long and rises 42 feet high. This plane is worked by the Engines of . . . Horse power.[17] It then proceeds half a Mile to the Shallcross Incline which rises 240 feet and is 817 yards long and has two Engines of 20 Horse power. From thence to the head of the River Goyt (2½ Miles) it is level. Here it ascends to the Summit by means of two Planes, the lower one rising 191 feet in 455 yards and the upper 266 feet in 660 yards. They each contain two Engines of 20 Horse power. From this place, it proceeds a distance of 12 miles past Buxton to Hurdlow on a level where the next Plane is, descending 168 feet in 850 yards and worked by two Engines of 10 Horse Power. Thence it passes on a level 12 Miles to the Hopton inclined Plane which falls 98 feet in 457 Yards. The Engines here are two of 10 Horse power – a further distance is traversed until we come to the Middleton Plane which is 708 Yards long and falls 253 feet and has two Engines of 20 Horse power. In another Mile we come to the last two inclined Planes which approach the Cromford Canal – the upper one is 711 Yards long and falls 261 feet, the lower one 580 Yards and descends 204 feet and there are four Engines of 20 Horse power.

It will thus be seen that the Railway is 33 Miles long and that there are 9 Inclined Planes with Engines of . . . Horse power.

With respect to the traffic the principal portion appears to be what Messrs Wheatcroft are carrying which is shown in the annexed table.[18] The kilns at Fernilee consume Limestone brought from near Harpur Hill. Also in the Neighbourhood there is every preparation for an extended business by Mr. Gisborne who has built four lime kilns. About 19 tons of coal per week is brought from Cromford to Ladmanlow (the Buxton station).

At Parsley Heys Wharf there are 14 tons per day, at . . . . . Wharf[19] 9 tons and at Longcliffe 14 tons brought from Cromford.

At the Middleton Inclined Plane Messrs Wheatcroft have made extensive preparations for getting limestone, and have some time since sent considerable quantities to Cromford but they have been slacker lately. The Railway seems to be in very good repair and very well attended to. There are two Locomotive Engines belonging to the Company, but Messrs Wheatcroft prefer using horses and the engines are not used except for the Company's own use.

From the annexed schedule[18] of Receipts and Payments it appears that the surplus revenue amounts to £1,817 per annum, but the last year's was a falling off and only amounted to £587, and from a careful analysis of the present trade for the last half year I have no reason to suppose it will be greater this year than last.[20]

They have a large stone trade this year which may continue for another two years. Mr. Gisborne will also commence Lime-burning in the Spring from which an increase in traffic may be derived."

Following this report there were a number of meetings at which the idea of a sale or a lease was pursued, but the parties never really got together and the Peak Forest Canal seem to have soon lost enthusiasm for this proposal. On 11 January 1844[21] a special meeting of the CHPR Committee was held to consider the proposal of the canal company to purchase or to lease the line and to appoint a deputation to meet them. The meeting was to have taken place at Horwich House of 22 January. Gisborne, John Wright of Derby and William Jessop were to represent the railway. But when the Peak Forest Committee met on 15 15 January[22] their clerk was requested to inform the CHPR that circumstances have occurred which oblige them to decline to meet Mr. Gisborne.

At a further meeting a week[23] later they considered a letter from Jessop and Meadows was asked to enquire of him whether the leading proprietors of the railway would recommend their company to grant to the canal a lease of the railway for a long term of years at an annual rent with an option to purchase at any time during the term at a given price, what amount of rent and purchase money they would expect to receive and whether they would be willing to apply to Parliament for the necessary powers.

It does not look as if either party took this further. The canal started dealing with Gisborne separately. Perhaps they decided that their main worries would disappear if they got a larger share in the rewards of the Harpur Hill lime kilns and quarries. The committee suggested a treaty with Gisborne whereby they would be placed in the hands of the canal for twenty years. He would also retire from the limestone trade on the railway to Dove Holes. The company would pay £2,000 on possession at Harpur Hill, and £500 per annum thereafter, and £200 per annum in respect of Dove Holes. Gisborne assumed that the canal was anxious to avoid a railway competing with them from Whaley and he was not unwilling to assist.[24] There were consultations with the Duke of Devonshire's agents from whom the company obtained a generally favourable reaction. Nevertheless they did not enter into an agreement of the kind suggested as there was no guarantee that they would not be outbid by some railway for the right to get stone in Lord Newburghe's estate, where Gisborne's rights were not exclusive. The idea was reconsidered later in the year, but it was decided not to enter into further negotiations in consequence of the proposed Buxton railway – presumably the development at which Gisborne had previously hinted.[25]

The CHPR did pursue the question of the reduction of rates on through traffic. On 5 September their committee at its quarterly meeting directed the Secretary John Leonard to see Meadows and Patterson – the Secretary of the Cromford Canal – on the subject of reducing the rates on the London and Manchester traffic and to require that they first reduce their rates to ½d per ton per mile and that what remains be reduced so as to make the whole amount to 2s. 6d. and be equally divided among the three undertakings. The rates then charged were 1s. 3d. by the PFC, 2s. 8d. by the CHPR, and 1s. 4d. by the Cromford Canal, for respectively 15, 33 and 14 miles carriage.[26] It is not clear whether equally meant literally 10d each or whether it was to be divided proportionally to the mileage. Perhaps it was none too clear at the time, as the CHPR committee later seems to have been unwilling to play, which suggested that they had previously gone too far. There were further discussions with Meadows and Patterson in 1845, but on a basis which seems incompatible with a division of 2s. 6d between the three companies. The CHPR was willing to reduce from 1½d to 1d per ton

at each of the inclined planes, and to charge ½d mileage, so making their total charge 2s. 1½d per ton. They insisted on the distinction between the plane charges and mileage – perhaps they had overlooked this the previous year. They refused to go below 2s. per ton. They regarded 1s. 9d. which was proposed at a meeting of the three agents as not being sufficiently remunerative.[27]

Meanwhile the proposed Buxton railway referred to above was developing. The preliminary meeting of the Manchester & Buxton Railway was held on 20 June 1844. It had close links with the Manchester & Birmingham Railway and relatively few local shareholders. Thomas Gisborne, his son T. G. Gisborne, and his father-in-law, F. D. P. Astley, were however allotted 25 shares each.[28] Thomas Gisborne was also on the first list of directors of the Manchester, Buxton, Matlock & Midlands Junction Railway which in 1845 took over and replaced the Manchester & Buxton project.[29] The new venture was interested in acquiring the Peak Forest Canal. On 8 September 1845 Henry Tootal, the Chairman, detailed to the committee certain recent proceedings connected with the Peak Forest Canal and expressed his belief that a renewed offer would be made by that company (i.e. presumably a statement of what terms they would find acceptable[30]). At the next meeting, on 1 November, Tootal reported that the negotiations with the Peak Forest had failed, as that company had abruptly concluded the sale of the canal to the Sheffield, Ashton-under-Lyne & Manchester Railway.[31] The purchase was in fact completed in March 1846 and the canal was formally incorporated in the railway company on 27 July[32]. Moreover on 1 July Meadows was appointed clerk and secretary of the railway. In 1848 he was briefly the first general manager of the Manchester, Sheffield & Lincolnshire Railway, as it then became.[33]

The CHPR remained independent for some years, no doubt aided by the fact that no other railway reached the Buxton area. When they did one of them, the London & North Western, leased the CHPR and later took it over completely.[34]

References

1. The Macclesfield Canal opened on 9 November 1831 (Charles Hadfield, *Canals of the West Midlands*, 1966, 211).
   The Cromford & High Peak Railway also opened in 1831 (A Rimmer, *The Cromford & High Peak Railway*, 1956, 6).
2. Public Record Office, British Transport Historical Records, Rail 856/4 Peak Forest Canal Committee Minutes 25 May 1836.
3. *Ibid* 30 January 1839.
4. The growth of competition on these routes and the rate cutting is summarized in Hadfield, op cit, especially 213–4 and 221, and in F. C. Mather, *After the Canal Duke*, 1970, 139–40.
5. PRO, Rail 856/4 PFC Minutes 4 June 1840.
6. Mather, loc cit.
7. PFC Minutes, especially meeting of 30 January 1839 for rates; 27 March 1840 for list of debts; 3 June 1841 for withdrawal of Bill where it is stated that Gisborne opposed the Bill on second Reading and after that he was very active in getting up an opposition. The Bill received a second reading on 26 February 1841 (Commons Journal, 1841 vol 96, 82) but was withdrawn in Committee.
8. PFC Minutes 30 March 1843 (PRO Rail 856/5).
9. *Ibid* 25 May 1843.

10. D. J. Hodgkins, Origins and Independent Years of the Cromford and High Peak Railway, *Journal of Transport History*, vol VI, 1963, 45–6, for the Act and the financial state of the CHPR.
11. The arrangement was agreed at a special general meeting of the CHPR on 8 September 1842 – PRO, British Transport Historical Records, Rail 144/5. It is also referred to in the minutes of the PFC for 7 December 1843 (856/5). Gisborne was also in the lime business. He had kilns at Bugsworth on land rented from the canal. He dealt in lime in Manchester and represented the Manchester dealers in talks with the canal. He was at this time building kilns at Harpur Hill which the canal may have seen as a threat to their traffic in stone. He was MP for a number of constituencies for most of the period from 1830–52.
12. James Meadows succeeded his father as agent to the PFC in 1825.
13. G. W. Wood, Liberal MP for Lancashire South 1832–5 and for Kendal from 1837 until his death on 3 October 1843. Director of the Old Quay Company. One of the founders of the *Manchester Guardian* – W. E. A. Axon, the *Annals of Manchester*, 1886, 223; D. Ayerst, *Guardian: Biography of a Newspaper*, 1971, 23.
14. Peak Forest Canal Records (PRO Rail 856/8) Sub-committee meeting of 23 December. The Act (1843 c xviii) contained no provision on this.
15. PFC Minutes of 7 December 1843 (PRO Rail 856/5).
16. Peak Forest Canal Records (PRO Rail 856/8).
17. Rimmer, op cit, 24 assumes that this incline was always worked by horses. It is relevant that there seems to be no record in the Butterley Company's accounts of an engine supplied for the Whaley Bridge incline (Derbyshire Record Office – D503, Butterley Co. Ltd Mss. Furnace Ledger D).
18. Not annexed.
19. Friden or Minninglow
20. Presumably this excluded all interest payments which in this period were being paid about 10 years in arrears. (Hodgkins, op cit, 47).
21. CHPR records (PRO Rail 144/5) meeting of 15 January 1844.
22. PFC Minutes of 15 January (PRO Rail 856/5).
23. *Ibid* 22 January 1844.
24. *Ibid* 22 February 1844.
25. *Ibid* 30 December 1844.
26. CHPR, loc cit, meeting of 5 Septemner 1844.
27. *Ibid* 14 May and 8 July 1845.
28. PRO Rail 459/1 Minutes of meeting of meeting of 20 June. List of share-holders dated 13 July 1844.
29. *The Times* 21 May 1845.
30. PRO Rail 459/2 Minutes of the committee of management of the Manchester Buxton, Matlock & Midlands Junction Railway, 8 September 1845.
31. *Ibid* 1 November 1845.
32. George Dow, *Great Central*, I, 1959, 81 and 115.
33. *Ibid*, 121.
34. Hodgkins, op cit, 54.

GREAT NORTHERN.—In the Court of Queen's Bench on Tuesday, a lady named Warren, a teacher of dancing, sued this company for compensation for injuries received at Spalding station. Her foot there caught in a hole in the waiting-room carpet, and she fell with such violence that she could no longer pursue her calling, and the jury awarded her £1,500. (*Railway Times* 3 July 1869)

David Singleton – An Appreciation

It is with regret that we record the death of David Singleton in September 1977, after a short illness, at the age of 38. He had joined the Society in 1968, and was well known in the north-west, where he had made his home since 1971; and his enthusiasm and activity in the causes of the Sankey Canal and the Liverpool & Manchester Railway will be known to members over a wider area. A Londoner by birth, David graduated with Honours in geography from the University of Exeter. A further year was spent in studying for a post-graduate Certificate of Education, during which he was able to turn his interest in transport to the production of a dissertation on the educational and recreational potential of the South Devon Railway, with its richness of Brunelian heritage.

In 1971, David became a lecturer in the geography department at the C. F. Mott College of Education, Liverpool. Here he was able to use his interest in the history and archaeology of transport in two practical ways: in the development of courses for student teachers of geography and environmental studies, and in the development of a new course in industrial archaeology. He was fascinated by the potential of the nearby Liverpool & Manchester Railway, and his book, *Liverpool & Manchester Railway:* a mile by mile guide to the world's first "modern" railway, was published by Dalesman Press in 1975. He was deeply interested too in the relics of the Sankey Canal. Numerous local societies and evening class groups, as well as college students and local teachers, have enjoyed and benefited from David's careful field investigation, his organization and leadership of field studies, and his willingness to discuss his interests and to communicate his enthusiasm. David leaves a wife and two young sons, and many friends and colleagues, whose lives have become the poorer through this loss.

JOHN CROMPTON

Correspondence

NER Historical Maps

Sir, – On page NE8 of *North Eastern Railway Historical Maps* there is a note to the effect that the line opened privately by the Ingleby Mining Company on 6 April 1858 was narrow gauge. I have corresponded with Mr. Cook to enquire if he knows of any irrefutable evidence that the original line from Battersby, as it was later called, was, in fact, narrow gauge. At the same time I sent Mr. Cook a typescript extract from the *Stockton & Hartlepool Mercury* of 10 April 1858 reporting the opening in some detail. The North Yorkshire & Cleveland Railway had only reached Battersby a few weeks earlier and the extension to Kildale was inspected by the same company of mine owners, railway and contractor's officials, after seeing the Ingleby line. The report gives no suggestion of 'narrow gauge' but twice refers to it as a 'branch railway' and once as a 'branch line'.

Hayes and Rutter, in *Rosedale Mines and Railway*, page 15, do indeed refer to 'a three mile narrow gauge line to Battersby' but quote no authority for the description and Mr. Cook now agrees that evidence seems to be lacking. That the original Mining Company *incline* was narrow gauge is not in doubt from site evidence when I explored the line in 1956. There was the remains of the tippler at the foot of the incline which was not, of course, on the alignment of the later standard gauge incline. There was also ample evidence of a standard gauge line

and sidings running to the tippler. The incline for the Rosedale Railway later crossed this line on the level just above the new incline foot and the two routes joined at the Battersby end of the incline foot sidings. The Ingleby mines continued in production until shortly after the new incline was brought into use and I have a notion, but cannot trace the authority, that facilities were provided for the Mining Company to load at, or near, the top of the new incline enabling abandonment of their own narrow gauge incline, the tippler and the standard gauge line thereto with its undesirable level crossing at the foot of the new incline.

Tomlinson, in his *North Eastern Railway* gives no suggestion of a narrow gauge line being replaced by a standard gauge one for the Rosedale Railway, and evidence to settle this matter, one way or the other, seems desirable.

DAVID GARNETT

NER Historical Maps

Sir, – It would appear that an error of positioning has occurred on Map NE 10 of the *North Eastern Railway – Historical Maps.* This concerns the siting of the Bridlington Harbour Branch. Evidence has been kindly supplied by a fellow member, Mr. A. E. Bennett of Norwich from the 25 in. Ordnance for 1893 (Survey of 1888/9). This clearly shows the branch, which was closed about 1866 and with the harbour end lifted prior to the survey, diverging from the northern end of the station and not from the south as drawn. It is interesting to note that the harbour section has the dubious distinction of being marked "Old Tramway". I am indebted to Mr. Bennett for bringing the error to my attention, and also for photostat copies of the evidence from Humberside Record Office.

R. A. COOK

Supplement to Ottley

Sir, – I have started on a supplement to my *Bibliography of British Railway History*, published by Allen & Unwin in 1966. (The date of publication, corrected in proof, appeared nevertheless as 1965 instead of 1966 in the final printing.) The work is now out of print but I learn from friends in the antiquarian book trade that there is still a steady demand for it. Although nothing has yet been signed and settled, plans are in progress for a large, well-established publisher to reprint the main work and to produce at the same time a supplement either for books published during the ten years 1965 to 1974, or from 1965 to 1977. In either case the supplement will also include pre-1966 items missed from the main work, and corrections. Into the reprint of the main work will be incorporated as many corrections as can be made without moving lines of print, such as wrong dates and spelling errors. For more substantial corrections and for noting subsequent editions of works described in the 1966 bibliography it will be possible, I hope, to have an asterisk or some other symbol in the margin to signify 'See the Supplement'.

Members who have copies of the original work and those who are familiar with it through usage of library copies will perhaps have read, on p.21, that the work progressed 'under the blessing of the Railway & Canal Historical Society' and that the compiling was made easier through the active co-operation of several of our members, named on the title-page. I have always regarded it as a co-operative effort and indeed the help of others more knowledgeable than myself on the subject was essential to me during the twelve years which were taken to bring

the work into print. I hope this same goodwill will be extended to the Supplement. Mr. Michael Robbins produced a most valuable critical analysis in the review he wrote for the July 1967 issue of the *Journal*, and I have since had letters from a large number of well-wishers, pointing out errors and omissions, including long lists, one of which, from Dr. Michael J. T. Lewis, has brought to my notice many passages in early works, some dating back to the 18th century relating to the use of wagonways in mines, and as feeders to canals.

It will not be necessary for members to write to me about books and pamphlets on railway history which have been published since 1964. The bulk of this material is not difficult to trace, painstaking though the process may be. I shall be very grateful indeed, however, for information relating to railway history which is hidden within non-railway books of any period, including 1965–77. As examples I may mention *The Drama of Money Making* by H. A. Meredith (1931). Chapter 13 of this work is entitled 'The Overend Gurney Crisis, 1866'. Then there is James Kirkup's *The Only Child: an autobiography of infancy.* (1957) which contains an account of a tram journey in South Shields in the 1920s.

Inevitably, there will be some duplication of corrections and omissions sent in, but there seems to be no way to avoid this. Perhaps the most glaring omission is of Vols. ii and iii of Sir John Clapham's Work, but Michael Robbins spotted this in his review. Sometimes, when the information given on a title page is insufficient to describe adequately the resources of a work, a note to the entry is desirable. This must be brief, but must also be worthwhile. Such notes drawing attention to the special features of a book which would otherwise not be apparent are, of course, of great benefit, and this kind of information would be especially appreciated.

I hope to be able to complete the work within two years from now but in order to do so, may I ask anyone who has something to tell me which will help to make the work more useful, to let me know within the next three months.

GEORGE OTTLEY

Iron boats on the canals

Sir, – It generally seems to be supposed that iron boats were a fairly late arrival on the canal scene. Thus HughMcKnight (*Shell Book of Inland Waterways*, page 131) says: "Until iron provided an alternative from about 1870, they (i.e. narrow boats) were normally built with oak sides and elm bottoms, with iron knees or ribs". And Robert J. Wilson (*Boatyards and Boatbuilding*, page 30) says: "From the mid-19th century a certain number of iron, and later steel, boats were built."

Yet Svedenstierna in his description of his "Tour" of Great Britain in 1802–3 writes: "On the canal close to the works lay several barges of 20 tons, built from iron plates, and of just the same form as the ordinary wooden barges, that is to say, flat bottomed, blunt at the stern and triangular forward. In general they lay higher in the water and glided more easily than the wooden ones, remained fairly watertight, and withstood powerful blows, but cost three to four times as much as a wooden barge."

Were the iron boats he saw near Wednesbury an experiment which failed?

PHILIP DANIELL

Two Whistles?

Sir, – Bette Meyrick's *Behind the Light* (Hutchinson, 1975), a sequel to *Behind the Steam*, recreates the lift of her Pembrokeshire grandfather, Pa Morgan and his

family, in the early years of this century. One passage mystifies me and I hope someone better acquainted than I with GWR practice can shed some light. It reads as follows: "I was delighted with our new home because spread out in a splendid panorama below our front window was Neyland Railway Yard and Shed, and what better view could you want than that? It was a hive of noisy steaming activity, always fascinating. The expresses and the goods, the empties and the Mails, the shunters and the tootling light engines – and all blowing their distinctive whistle codes according to which part of the Yard they wanted to go. Four and two crows to go to the turntable, five and a crow from Shed to the arrival platform, bare five for the Shed, Top End, six and two crows to the siding and it wasn't long before I knew every one, not to mention a few private whistle codes the drivers used which had absolutely nothing to do with GWR procedure at all!

"Whistle codes to let a wife know when to start to make the gravy or put the kettle on, because her driver husband would be coming up the hill in half an hour, or whistle codes to put his dinner back in the oven because he was working overtime! Private messages could always be picked out from the official ones because the men always used the brake whistle combined with the ordinary whistle, giving a two-tone effect, and each respective wife, who was lucky enough to live within earshot, knew the special combinations of high and low whistles chosen by her husband. I wouldn't mind betting there were one or two codes whose meanings were known only to the sender and receiver, and they weren't just to get the supper ready either!"

Did the GWR engines really have two whistles – a brake and an 'ordinary'? Was there a standard code of whistle soundings? Did any other Companies' engines have two whistles? Any other interesting information?

MAURICE BERRILL

The Research Index

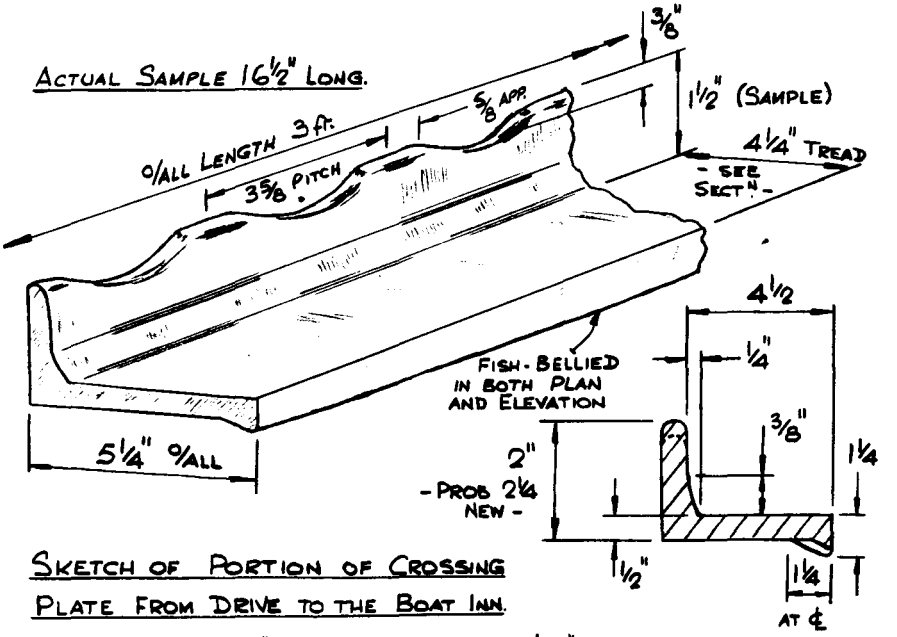
Sir, – The view of history so ably drawn by Harry Paar in the November *Journal* discloses what I suspect may be an untapped source of sources, i.e. members' lofts. Many members have recently registered their research interests. Those with similar interests will no doubt have made contact. However, it seems probable that many members have quantities of primary material, not always concerning a disclosed research interest, which they would be prepared to make available to members. May such members be invited to complete Research Index cards in respect of such material? I suggest the location be given merely as the member's name followed by the word 'Member'. My own few items will be 'carded' as soon as practicable. P. JUSTIN McCARTHY

The Hay Railway

Sir, – It is felt that some reply should be made to John van Laun's short article "Excavation on the Hay Railway" for the purpose of clarification and amplification. While being pleased to have positive proof that tie-bars were in fact used, it is felt that the deduced gauge of 3ft. 6¼in. can be largely discounted and that the gauge was 3ft. 6in. as quoted in the *Hay Railway* by C. R. Clinker; this being much the same as Brunel's often quoted gauge dimension of 7ft. 0¼in. being, in reality, 7ft. The reasoning behind this is that in 1958 a short section of track, with rails in situ, was unearthed using the most rudimentary tools, and with the owner's permission, on the private siding leading down to Broomfield (SO

184395). The rails here were merely of plain 'L' section cast iron — or "coagulated rust" as one of our works metallurgists prefers to term them in the present tense — spiked direct to stone blocks. The track and spikes were firm and the gauge was measured as 3ft. 6in. The time factor did not allow further work and the photographs taken before the earth was put back do not show the subject as well as was hoped. The one print in my possession, which would mean nothing to the eye by being reproduced, does not show evidence of any taper at the flange root and they were therefore probably very early pattern plates which had been used up in sidings. Memory may be fading of this work, but the plates may still be there to be unearthed again if Mr. van Laun and his willing helpers care to try another area.

One further point is that the drawing (Fig. 1) is inconsistent with the text. Despite the fact that the drawing is grossly out of scale, was it intended that the two lighter longitudinal bands represent the grooves? If so the plates must have had a tread width of some 10in. to 12in. which is obviously untrue. The appearance given by hatching seems to indicate a stepped tread rather than a grooved one. However, the text is obviously the correct information and from this it would appear to be most odd, but special plate. It would be interesting to hear whether this type has been found before. Could Mr. van Laun or Gordon Rattenbury possibly enlighten us? Could it be that the grooves were there to prevent slippage of a horse's hoofs on the tread of the more normal plate? Although not stated, it must be presumed that the grooves are away from the running surface.



SKETCH OF PORTION OF CROSSING PLATE FROM DRIVE TO THE BOAT INN.

- 3ft. O/ALL - 11 "TEETH" PER LENGTH - ½ "TOOTH EACH END -

An amplification of the plates used by the Hay Railway in the endorsed sketch shows the form of a crossing plate found by the Boat Inn (SO 26854730). This is undoubtedly from one of the two driveways to the inn, and the owner of the inn kindly gave me permission to retain the plate, again of cast iron. It is unfortunate that the plate is incomplete, and doubly so since the foot end is missing. There is little sign of wear on the tread, however, and it is thought that the plate may be a comparatively late one. The scalloping on the flange shows some sign of wear but the flange height of 1½in. (probably 1¾in. when new) verifies the usage of low flanged plates at some road crossings at least, even though of a completely different pattern. The earthworks where the plate was found revealed no others, although some may well be buried in the mound by the west driveway to the inn. The new bungalow being built by the earthworks has several stone blocks in its walling. R. A. COOK

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Article

Tintern's railway, by H. W. Paar. (*In* "Industrial Railway Record", Vol. 7 No. 72, August 1977, pp. 58–67)

Material for the July *Journal*, including small advertisements, must be with the Editor by 17 April, and camera-ready copy for cover advertisements by 23 May. Charges for small advertisements are as follows: Small – members 3p per word, non-members and commercial advertisers 6p per word. Minimum 50p. *Full* page cover £15, *half* page £10. Remittance should be sent, with the copy, until further notice to the Editor at Tuborg Halt, 34 Manor Avenue, Caterham CR3 6AN.

CANALS IN WALES by Ian L. Wright. Published May 1977. A volume of 120 magnificently reproduced Photographs from 1880 to the present day. Interpreted by extended captions. Introduction, 2 maps. 96 pages. Post free from D. Bradford Barton, Truro. £3.95.

CARADON AND LOOE: Canal, Railways, Mines. The first definitive history of the Liskeard & Caradon Railway, Liskeard & Looe Canal and Railway, and the mines and localities they served. Compiled almost entirely from original and contemporary sources by M. J. Messenger. Publication expected 31 March at £4 (hardback), £2.50 (card). Pre-publication orders £3.50 and £2 respectively. TWELVEHEADS PRESS, Chy-Mengleth, Twelveheads, TRURO, Cornwall.

Members sending material are asked to type *double spacing*. This is necessary for editorial purposes, and if re-typing is necessary, delay in publication could occur.

Published by the Railway & Canal Historical Society at Tuborg Halt, 34 Manor Avenue, Caterham, CR3 6AN and printed by Hobbs the Printers Ltd., Southampton.