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CONTENTS

FINANCE AND AMBITION ON THE EAST KENT RAILWAY

<i>Adrian Gray</i>		2
THE LANGUAGE OF RAILWAY HISTORY <i>John Marshall</i>		7
THE INFLUENCE OF A RAILWAY ON POPULATION AND		
INDUSTRY <i>P. S. Richards</i>		9
STAGGERED PLATFORMS <i>Harry Paar</i>		16
KILSBY TUNNEL <i>G. Y. Hemingway</i>		17
R. L. S. AFLOAT <i>M. I. Berrill</i>		27
CORRESPONDENCE		28
RECENT LITERATURE <i>Donald R. Steggles</i>		29

Finance and Ambition on the East Kent Railway

BY ADRIAN GRAY

The East Kent Railway (latterly London, Chatham and Dover) is often cited by historians as a classic case of a railway being vigorously promoted by contractors, but nominally under the control of local interests¹. From the very beginning the East Kent had a directorate consisting of some of the best known aristocratic names in the county, but it also became disastrously involved with a succession of contractors culminating with the infamous Peto & Betts; from which of these groups did the real stimulus behind the company come?

The East Kent emerged from a swarm of railway schemes that resulted from the South Eastern's decision to route its main line through central Kent rather than along the North Kent coast via Rochester and Faversham. Of these schemes, the 'Mid Kent & Dover' of 1850 was perhaps the most interesting because the proposed system of management and the ideas for raising capital reflected the scheme's roots in the local community. It was proposed to borrow £2 million at 4% on a guarantee of tolls and to pay the interest by a charge on the parish rates; since it was estimated that the railway would add 16.6% to the annual rateable value of the parishes through which it passed, it was presumed that the parishes would agree. The High Sheriff of Kent was responsible for arranging a conference of landowners at Maidstone, at which twenty 'trustees' from the county were appointed to manage the project². Unfortunately landowners could not agree on a route and the scheme foundered.

In 1851 a scheme was projected which was to have 32,000 £25 shares. London financiers agreed to subscribe for the majority of these if 3,000 shares were taken up within the county³. However, a combination of the county's poverty and apathy quashed this project. The 1850 and 1851 projects do reveal, however, the difficulties of uniting local interests, sufficient capital and a project that would satisfy both.

An Act was finally secured for the East Kent Railway in 1853, but it was immediately clear that the majority of the finance was to be provided through the contracting firm of Fox, Henderson & Co. Sir Charles Fox and his London financial associates agreed to take up 14,500 shares at £25 each if the remaining 5,000 were taken up within the county. This target was eventually reached, with subscriptions being taken out for £135,375 worth of shares by 334 Kent people by June 1853⁴.

There was thus a degree of local financial support, but it was necessary for several meetings to be held to drum up enthusiasm for the shares in the county. The *Railway Times*⁵ revealed the real state of the EKR's finances by listing eighteen people who provided £380,000 of the £700,000 capital. These included Mr. J. Sadleir MP, who later became deputy chairman but eventually forfeited many shares for arrears of payments, who subscribed for £50,000. A Liverpool banker was down for £7,500 and a Birmingham one for £25,000. T. R. Crampton, the contractor, was down for £12,500 whilst Fox himself subscribed for £31,875. Other people who stood to profit from the scheme also subscribed — the stock-brokers were down for £87,500 and the contractor for rails for £18,750; the latter was possibly paid with shares 'in advance.' It was also revealed at the

committee stage of the Bill that a clerk in Fox's office had signed for £40,000 — a highly traditional way of disguising the identity of the real subscribers!

This uneven state of affairs was not so obvious on the first EKR Board where Kent men predominated. But successive financial crises were to show that these men were rather less powerful than the London financiers. The Chairman was Lord Sondes of Lees Court, Faversham, who subscribed for £41,000 and thus accounted for a third of the 'Kent' capital. C. J. Hilton of Faversham (£5,050) was also a Director, and the other representatives of that town included Hon. S. R. Lushington (£5,050) of Norton Court and his son C. M. Lushington (£7,550) who lived in London but may be regarded as a local man. A total of £21,150 was held by four other Kent men on the Board, but their holdings were clearly overshadowed by the remaining directors who included Crampton, the Birmingham banker and three London men — one of whom was down for £25,000. Of the other 24 people who subscribed for at least £2,000, four were from Sittingbourne and one each from Faversham, Hollingbourne, Tunstall, Canterbury and Ashford; most of the other shareholders were from London apart from the group of Kent men with very small stakes⁶.

The distribution of shareholders within the county reflects the interests who had promoted the scheme initially. There was an obvious preponderance of subscribers from the Sittingbourne and Faversham area, but a lack of important subscribers from the Medway towns and only one from Canterbury. Agricultural interests around Faversham had suffered particularly badly from the advantage given to the Weald farmers by the South Eastern, but those around Rochester and Canterbury were served by or promised SER branches. The railway gave easier access to London for the market-orientated fruit produce as well as to the hop factors of the Borough; there was a reverse flow of manure from London stables to Kent farms⁷. The distribution of shareholders shows that local people were motivated by the chance to improve the prospects of their businesses rather than the chance of direct profit from railway investment — though this is what concerned capitalists like Fox, who were motivated by what they could pick off the EKR tree. 'Classic' local investors like Hilton, who wanted to get his cement from Faversham and Rochester to London, were outweighed by the London and northern interests.

The East Kent extension, from Canterbury to Dover, reflected the dominance of capitalists to an even greater degree. The average local subscription for this was a mere £100-12s-6d whereas ten outsiders put up £147,000 between them and Fox contributed £40,000⁸. This part of the EKR was particularly prone to a lack of local support — or, indeed, much support of any kind — and in March 1856 (nearly a year after it had been authorized) deposits had been paid on only 75% of the shares⁹.

1854 saw the outbreak of the Crimean War and this hit badly at the financial interests who were supporting the EKR. In the summer of 1855 the second call went unpaid on 20,937 EKR shares¹⁰ and many of these were eventually forfeited — as were those of Sadleir, who was briefly on the Board but died in 1856 having steadily fallen behind on his payments. With the financial world in chaos and despite his own insecurity, Fox was able to strengthen his hold on the EKR. The *Railway Times* commented in 1855: 'We do not see why Sir Charles Fox should not himself, publicly as well as practically, take the entire management into his own hands.' Fox eventually resolved his own problems by sharing the EKR contract with the firm of Morris, Burge and Crampton¹¹; shortly afterwards Crampton joined up with Peto and Betts to form the partner-

ship that was to dominate the LCDR until both contractors and railway succumbed to the 1866 crisis.

The years 1854–6 destroyed any security the EKR may have hoped to have, and drastic measures were taken to rescue the company from possible collapse. With a considerable shortfall on share payments (although, according to the EKR minutes, the Kent shareholders remained reliable throughout the crisis) the EKR obtained a special Act of Parliament so that it could use the £50,000 deposited in Chancery. But the principal way out was to borrow at rates as high as 6%. This situation inevitably increased the power of Fox and, latterly, Peto who had the necessary City connexions which the more rustic EKR Directors lacked.

Money was raised in two ways. Firstly, the forfeited shares were sold to Fox and his associates at an unhealthy discount — up to 50% in 1858 when the EKR had £210,920 worth of stock still on its hands¹². This practice was going on at least as early as 1855, when it was claimed some discounted shares had been sold to Fox's clerk; the EKR Secretary, Holroyd, denied this when questioned in 1860 — '... not to his clerk, to his managing partner¹³.' Since Fox was already being paid 15% of his contract fee for the main line in shares¹⁴ and £60,000¹⁵ for the Dover extension in stock then he must have been in a very powerful position by this time.

The second means of raising money was the wholesale issue of preference and debenture stock at rates of usually about 6%, according to the borrowing powers in a succession of Acts. Originally, Fox, Henderson & Co. had intended to lease the line, and thus until May 1856 they took the responsibility of paying the interest on the EKR debentures. It later transpired that the EKR had been paying the contractors more to allow for this and they were thus accused of paying interest out of capital¹⁶. This practice of 'turning over' became increasingly common on the LCDR in the difficult years up to 1866, and was associated with various attempts to keep the true state of affairs unknown. Debentures were commonly issued on the security of traffic receipts, but the LCDR had borrowed so much by 1862 that it could not meet the interest charges out of working profits. During 1862 interest payments due amounted to £205,028 whereas working profits were only £25,515 for the year. At this stage the LCDR had £700,000 ordinary stock against £4,339,000 preference stock and £1,445,199 debentures¹⁷.

By the early 1860s, of course, the LCDR was firmly involved with Sir Morton Peto in the various extension schemes that took it to the City and the West End. But why was so much of the LCDR's 'capital' in fact borrowed at high rates of interest? Clearly the reason must lie in the company's failure to attract ordinary shareholders, so that even in 1859 only 15,000 of the 28,000 ordinary shares were fully paid up¹⁸. LCDR ordinary shares remained at an abysmally low quotation on the Stock Exchange, ranging from 38 to 46 during the early 1860s; even at this discount there were few takers. The result of this inability to raise capital by conventional methods was that the company became increasingly reliant on its contractors and their financial associates in the City, who were able to find takers for preference and debenture stock — the irregularity connected with these transactions is part of the story of the 1866 crash and need not concern us now. Suffice it to say that rumours of undue profiteering persisted, one of the most extreme of which claimed that the LCDR was paying Peto at 14½% on the £40,000 western extension stock he had taken up¹⁹. The fact that the company had become so committed to Peto and his associates meant that the contractor had undue opportunities to influence the company although he only ever held the unofficial post of 'financial adviser'. The *Railway*

Times had a clear view of the LCDR's position: '... are they not in the clutches of the contractors, who compel them, year after year, with increase of liabilities, even while the capital of the original undertaking remains unsubscribed, and its works continue without prospect of ever being finished²⁰.'

Thus it is evident that by the early 1860s the LCDR was, to all intents and purposes, the plaything of London contractors and capitalists. The high rates of interest it was prepared to offer made it a firm favourite with some circles in the City, but high interest rates are commonly associated with high risks and the 1866 crash revealed that much had been lent on very little security. But what were the initial ambitions of this company, and was it really a local line that had been 'inflated' by contractors?

Reports of the early ambitions of the East Kent inevitably vary somewhat since the East Kent was initially anxious not to antagonize the South Eastern who it was to rely on for connexions to London. Although the 1853 Cardwell Committee reported against competitive railway schemes, it is certain that Dover had a great desire to see a route to London that was independent of the SER, and this town may have influenced the EKR Directors. A Dover resident complained bitterly, in 1860, of the way the SER had behaved during its monopoly years: '... it is notorious that in consequence of Folkestone being fostered by the South Eastern Company, being their own port, they have done everything they could to injure the Town of Dover in every shape and form²¹.' The variety of claims over the ambitions of the EKR can be understood from its secretary's claim that the Directors first discussed the proposal for an independent line west of Strood in 1853, whereas Lord Sondes thought the matter had not been seriously considered until 1857²².

As we have seen however, most of the local EKR shareholders (including the Chairman) were interested in providing a useful railway connexion to the area; only the town of Dover entertained strong feelings about the SER monopoly. Thus the East Kent trains initially ran over SER tracks from Strood to London Bridge; the 1853 Act included 'facility clauses' for this purpose. But in 1856 the EKR began to search for access to a London terminal independent of the SER and in 1858 secured an Act for its Strood to St. Mary Cray line that was constructed by Peto. The EKR was to claim that they did this because of the hostility of the SER and the inadequacy of the latter's North Kent line. But the hostilities did not really break out until 1858 when, in response to the EKR's western extension Act, the SER banned through bookings from Faversham and points east thereof whilst also demanding terminal charges for the use of Strood station²³. Plans were also being made to improve the capacity of the North Kent. There was therefore no practical reason for the EKR to seek an independent line, nor – as events were to show – was such a line even likely to be profitable. Ultimately the ambitions of the East Kent and their foundations lie beyond the realm of Parliamentary enquiries and documentation, for it seems that the matter was decided largely in the London circles inhabited by stockbrokers, lawyers and – above all – the contractors. Most of the 'filth' that came out as a result of the 1866 crash was to show that Peto came to occupy a position whereby he sold ideas for new lines to the Board, lent money at high rates to pay for them and was then, of course, engaged as the contractor. In this process he was carrying on in much the same way as Fox had done before him, Fox having been the real creator of the Dover extension.

The creation of a major railway company was clearly beyond the ambitions of the early promoters of the East Kent, but they were unable to resist the persuasive powers of contractors, lawyers and stockbrokers. The end result of this was

that the East Kent grew at a remarkable rate from the mid-1850s to 1866 when Peto's practice of financing it on the basis of paper guarantees became exposed. It therefore seems the case that, in terms of finance and ambitions, the East Kent really was a contractors' line.

Notes on sources:

The early history of the EKR and LCDR is confused by some very emotive writings, including an anonymous pamphlet of 1860 which sweepingly condemned the LCD with many falsified statistics and was found to have originated from the secretary of the SER. The *Railway Times* conducted a continuous campaign against the EKR, and is thus not an entirely reliable source. Nor are the EKR's records entirely reliable, especially on the matter of interest repayments.

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16. RAIL 1066 1818 p. 167.
17. LCDR half-yearly reports, June 1862 and December 1862.
18. *Railway Times*, 8 Jan. 1859.
19. *Railway Times*, 16 Feb. 1861.
20. *Railway Times*, 2 March 1861.
21. RAIL 1066 1816, p. 494.
22. RAIL 1066 1816, p. 143. The evidence for the 1860 Bill is particularly useful since the SER attempted to show that the LCDR's plans should not be authorized due to the company's financial instability.
23. EKR Board Minutes, 23 July 1858.

* * *

INVERNESS AND ABERDEEN.—The new line from Fochabers station to the town and seaport of Garmouth will be about six miles in length, and have a station for Fochabers near the Bridge of Spey, about half a mile from the town. The works are exceedingly light, and the railway will be a great convenience to the district. (*Railway Times* 22 November 1862).

The Language of Railway History

BY JOHN MARSHALL

Writers of railway history who have dealt with the major publishers will understand the importance of packing their work into the fewest and shortest words. Inflated costs of paper and printing have combined to make even small books expensive and have put large ones beyond the reach of the average purchaser. Publishers' narrower profit margins make the detailed substantial railway history no longer practicable. Hence the profusion of slim paper-backed histories of minor sections of railway which we find everywhere today. Among them is the occasional well written, researched and documented account; but too often they suffer from verbosity and tedious mannerisms.

In much writing on railways there is little attempt at economy; but an abundance of ugly forms. One finds a curious in-breeding of style suggesting that railway writers read nothing but other railway books and articles written in the same style. The writers seem to have little time for reading books of high literary merit, even those on railway subjects. I have wished sometimes that Shaw had written plays about railways, or that Trollope had centred his novels on the station instead of the cathedral close. Their influence could have been beneficial, after allowing for some odd opinions, or lack of technical knowledge.

A history of anything will naturally concern us with what happened earlier. Open almost any railway history and soon, even on the first page, you will meet the words 'prior to', used instead of the good old English word 'before'. Examples abound: '*Prior to* the opening of the railway'; '*Prior to* World War I'; immediately *prior to* withdrawal the engines worked ' Surely, 'Their last duties were ' does better for the last example.

Conversely, another word railway writers tend to avoid is 'after'. Instead of 'After closure to passengers' we may read: 'Subsequent to the withdrawal of the passenger service'. Fortunately this ugly assemblage has not achieved the popularity of 'prior to'.

Another good English word often avoided is 'because', replaced by 'on account of the fact that', or 'due to the fact that'. The incorrect use of 'due to' instead of 'owing to' or 'because of' is also frequent. 'The train arrived late *due to* engine failure'. The late arrival was due to engine failure. Certainly the train was 'due to' arrive at a particular time, but it arrived late 'because of' or 'owing to' engine failure.

A commonly misused word is 'Comprise'. Lack of knowledge that the whole comprises its parts leads to statements such as: 'The train was *comprised of* forty wagons and a brake van', instead of 'The train comprised', or 'The train consisted of ' Americans go a stage further and refer to the train as a 'consist', but we still await the acceptance of 'consist' as a noun in English. Another irritating form used in indexes is to list names of persons under the heading 'Personalities'. If we are concerned with qualities, then 'Characters' might serve better for some.

Unnecessary insertions are another form one meets. Among the most popular are those over-used four-letter words 'very' and 'duly'. One well-known railway writer is particularly fond of 'very', but it is common everywhere. We read of 'very fine engines', 'very good track', 'a very outstanding performance'. It is *very* easy to cut it out completely with *very* great improvement.

'Duly' pops up constantly. 'The Act was *duly* passed'; Mr. - - was *duly* appointed' In every place it can be *duly* omitted.

Superfluous words popular with locomotive historians are 'of them', generally used with 'a large, or small, number': 'Only a small number *of them* were successful' could be written 'Few were successful'. 'Of them' can always be omitted. Correctly, if somewhat pedantically, 'a number' is singular.

'Some' is used to indicate vagueness, frequently replacing 'about': '*some* twenty years later'. Where it is used to indicate 'not all': '*some* bridges had to be rebuilt'; '*some* sleepers had rotted', it would be of more value if the approximate number or proportion could be stated instead.

A curious form common in railway writing is the avoidance of 'long' as a dimension. Sizes will be given as '- - wide, - - high and - - in length'. If 'in length' then why not 'in width' and 'in height'?

Examples of long words where short ones would have served just as well are too numerous to quote, but the observant reader can enjoy finding them.

Arguments have raged for years about the split infinitive, but its use is so common today that it passes almost unnoticed, so perhaps we must learn 'to now accept' it in writing on railways.

Mis-used or over-used metaphors are less common, but railway historians are fond of 'The post was (*duly*) filled by Mr. - - '. Do we 'fill' a post, or a vacancy? Over-used metaphors, like 'bottle neck' tend to become clichés.

It is customary to blame the Americans for faults in our language. I can only say, as an enthusiastic reader of American railroad books and with a large number in my library, that I have found them well written. I could name several as models of fine literature.

The author must not, of course, compare his royalties with printer's wages, but he must pare his work to the bones if it is to find acceptance by a reputable publisher. Terse writing is so much easier and quicker to read and to understand that it is a technique worth acquiring.

These are a few observations made during many years as a reader of railway books and articles, and they are passed on to other members in the hope that they may be of interest or amusement, though it is realized that the worst offenders are the least likely to be members of the Railway & Canal Historical Society. Perhaps one of the other railway journals might have been a more suitable place for this.

The first step towards eliminating a habit is to become conscious of it. If this brief message makes someone conscious of a fault in writing then it has not been wasted.

* * *

Sleeping carriages were recommended by Mr Villiers Stuart, M.P. for Co. Waterford, between London and New Milford. It was agreed that the traffic would not justify the running of such carriages (GWR Superintendents Meeting at Reading, 19 October 1880.)

The Influence of a Railway on Growth of Population and Industry

BY P. S. RICHARDS

It has been shown elsewhere how railways have influenced the growth of population and the location of industry in north-east London*. This paper is an attempt to analyse these influences and their affects on the growth of a part of north-west London. Although many railways serve this part of London this survey will be concerned with only one railway line, a trunk line, which is part of the old London & Birmingham Railway. The terminus of the London & Birmingham Railway, which was built at Euston Grove in 1838 on an area of meadows and brickfields, is sited on London Clay just north of the Taplow Gravel Terrace which coincided with the northern limit of the then built-up area of London; thus the expense of compensating dispossessed property owners was avoided. However Euston station adjoined the New Road which gave access to the centre of London.

The railway out of Euston crosses the London Clay in a deep and steep-sided cutting and slightly curved retaining walls of Stafford blue bricks had to be built to resist inward pressure from the clay.

From Euston to Camden the line climbs up a very steep bank with a gradient of 1 in 72; this is the steepest part of the line between London and Birmingham and could hardly be avoided because of the great difference in height over a small area. Stationary engines and an endless rope were first used to haul the trains up such a steep gradient. The original terminus of the line was to have been Camden but an Act of Parliament passed in 1835, amending the Act of 1832 (which had sanctioned the construction of the line) authorized the extension of the line as far as Euston Grove. Lord Southampton, who owned this land, was responsible for the insertion of a clause whereby no steam engine should traverse his property. After 1844 engines of sufficient power were designed to haul trains up this steep incline and Lord Southampton's opposition was conveniently forgotten.

The London & Birmingham intended that Euston should be concerned with passengers and small parcels only; seven carriage sheds were erected just outside Euston for this purpose. A big goods depot was established at Camden Town where the company purchased some thirty-five acres of land. Here, on a great bank of clay rising up from Primrose Hill by the side of the Regent's Canal, a big coke yard and eighteen furnaces were built to convert the coal to coke for the use of their railway engines. This depot was well sited since, besides being adjacent to railway and canal, it was within easy reach of the Hampstead Road. Between 1840 and 1841 about twenty cottages were built by the company at Camden for their drivers. In 1841 cattle pens, which had been built at Camden some years earlier, had to be enlarged to deal with increased traffic. By 1844 it had become necessary to lay down extra lines to accommodate the traffic and merchandise that came to Camden goods station, and the following year the company obtained powers to build gas-works there. In 1846 the works at Camden were enlarged and to do this houses were demolished and in

*Rees: A growth map of north-east London during the railway age. *American Geographical Review*, 1945.

the following year at least thirty more houses were erected at Camden to house these displaced persons. All the road transport from Camden Depot was by horse-drawn vehicles and with the handling of greater quantities of merchandise additional stables had to be erected.

Elsewhere, between London and Watford, very few houses were built by the railway; one or two at each station for the staff and that was all. The other houses that were built first were erected near the railway stations but not at the company's instance. In 1838, when the railway was opened, the area between Camden and Watford was sparsely populated except for a few small towns and villages. Today apart from a few recreation grounds and allotments the area is almost entirely built over. In its early days the London & Birmingham Railway had no short distance passengers and did nothing to encourage them; in fact Robert Stephenson proudly stated that the average journey covered by people arriving at Euston was 94 miles. Whether Stephenson had in mind only the 112 miles of the London & Birmingham Railway, or whether he included journeys made on other railways he did not state; nevertheless the figure is a high one. He thought however that the company should be prepared to cater for short distance passengers if the need arose and suggested that additional land might be needed for stations at Kilburn, Harrow and Watford and that, even if a station were not going to be opened at all these places straight away, the company should purchase land as soon as possible. Stephenson thought that as the line passed over clay soil between London and Watford the surface would not promote settlement and at this time even Harrow and Watford were not much more than large villages.

However, Stephenson's ideas were proved wrong; the railway company built suburban stations and the population was attracted to them and from these nuclei gradually the whole area was populated and built over. Once those stations were built and residences erected near them the custom of first the wealthy and then the less wealthy people living in dormitory suburbs and travelling to work grew.

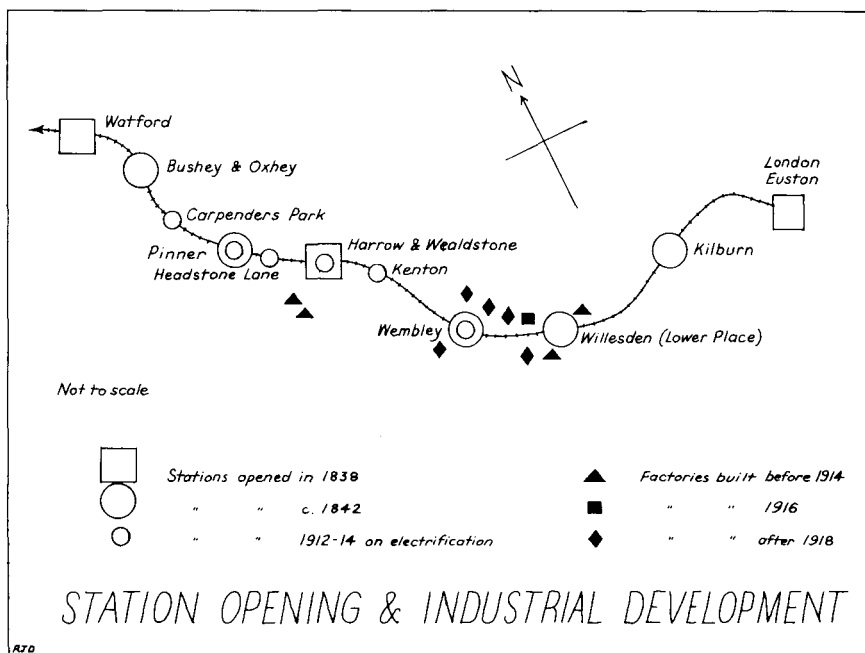
An analysis of the growth of population in the north-west of London near this railway line will now be made. When the railway was opened in 1838 there were stations at Euston Grove (the Metropolitan Terminus), Harrow and Watford. The station at Harrow was built about one mile from the town at Wealdstone and helped by the railway the population grew. It was a small dingy district in 1838 and in 1842 the Company planted the embankments and wasteland near here with shrubs in order to improve the appearance of the area and strengthen the embankments. Evidence that the town began to grow is proved by the fact that in 1844 additional platforms had to be built to deal with the increased traffic. Although by 1851 Harrow was a prosperous market town it had no staple manufactures. Some of the inhabitants were employed by the school and many others were engaged with supplying the school with goods. Harrow developed faster than places nearer London, and settlement was encouraged by the issue of free first-class season tickets in 1859, valid for eleven years, to every occupier of a new house valued at over £50. The settlement at Wealdstone that grew up in response to this generosity is today mainly a residential area with few industries.

Watford, an ancient market town on the road between London and Aylesbury, was the first main stopping place for all trains out of London; the station was opened in 1838 when the railway was opened and all trains stopped there and continued to do so for many years to refuel with coke and pick up water. There were several industries in Watford before the railway came: a silk factory, paper and corn mills on the River Colne. At this time the town consisted of one street,

a mile long, which was part of the main road. Two breweries, a turnery, coach works, gas works, and an iron foundry also existed and the town was actually about half a mile from the station. Soon after the line was opened the Company built cheap wooden sheds for carriages. Originally a platform was erected on one side of the line only but this proved inadequate and another platform, this time of brick, was erected. Since the first platform was only of wood this fact reflects the way the station had grown in importance in only a very short time. A contemporary writer, Groombridge, described Watford and its future in glowing terms; he wrote of the spirit of improvement and vast field of speculation opened up by the railway. He noted that buildings were springing up on all sides rapidly since the railway was opened; no doubt in a few years time the town would have a mile of length added to its thickly inhabited streets. Little did this writer realize how true his vision was and how he underestimated the growth of the place. Another contemporary account of Watford viewed the situation less favourably. The writer stated that if the primary object of the railway was the economy of time, Watford's inhabitants could not be congratulated on enjoying the discovery to the fullest extent for the station was some distance out of the town. Stephenson evidently realized the possibility that the place would benefit from the railway since he stated that the line should pass through Watford when he submitted his plans to the Board of Directors of the London & Birmingham Railway. Today Watford is a residential town and dormitory suburb for many of London's workers; it has sprawled out along every new road that has been built, and has changed rapidly since the days when its main thoroughfare was choked once every week by an important sheep and cattle market. All the area between the station and the original settlement has been built up, and today Watford is no longer a village situated at some distance from the metropolis but a part of the London conurbation.

In 1841 the station at Bushey was opened (renamed Bushey & Oxhey in 1912) and the population increased here considerably since the station was first opened. Between 1851 and 1861 the population increased from 3,159 to 4,543 and in their notes the Census Commissioners attribute this increase to the sale of land for building purposes and to railway communication with the metropolis. The houses were all built near the station. As other railways were built and stations opened nearby at Radlett and Elstree (on the Midland Railway) so the population increased even further. Previous to this Bushey had been a collection of scattered houses that passed for a village; by 1901 it was a residential suburb with two large schools and since 1945 a large London County Council Estate has been built there; but because there is very little industry in Bushey most of the residents of that estate travel from Carpenders Park Station to Watford.

In 1842 three more stations were opened: Lower Place Crossing (now Willesden), Sudbury (now Wembley and Sudbury) and Pinner (now Hatch End for Pinner). In 1840 the railway company received a request for a station to be built at the Lower Place Crossing; two years later a small one was built, but it proved inadequate and was replaced by another larger station in 1866. The first station was only a small wooden structure about half a mile north of the present one. In 1850 a contemporary account described how the line ran through rich meadows; it was a pleasantly undulating agricultural area on the London Clay with a few cappings of sand and gravel marking the higher ground. Round Willesden was a large expanse of flat unoccupied land which the railway company purchased cheaply and used for sidings. The name was commonly spelt 'Wilsdon' meaning the 'Hill of the Spring' and it was the London & Birmingham who adopted the present spelling. At first the railway had little effect on the



area; very few trains were run that stopped before Watford and as late as 1875 the parish was still essentially rural; although Kilburn was spreading and a small community at Harlesden was recognized as 'urban' in character. As local transport improved merchants and others built houses at Willesden Green and on the Brondesbury Ridge. The industrial and commercial development that took place in Central London, combined with the ease of travel by rail caused much of the residential population to leave the city and many speculative builders started to develop estates, and Willesden became a dormitory suburb for city workers. In the early days only the well-to-do lived here and in two distinct communities: Kilburn 12,000 and Harlesden 3,500. Harlesden could only be reached from Kilburn by a devious country road and bridle path. The local train service improved and more migrants went to Willesden and building was taking place everywhere. New housing estates were built and by 1939 except for limited areas of recreation grounds and parks the whole area was built over. The early settlement was within walking distance of the station; this reflected the lack of industry in Willesden. Later settlement was away from the station since the inhabitant could use trams and horse buses to get to the station. When industries were set up here after 1900 inhabitants could work locally and were not tied so close to the railway station. Today the population is gradually declining; 140,000 is the optimum population according to the Greater London Plan and Willesden is hoping to contribute people and industry to the new town of Hemel Hempstead (a few miles north of Watford). The population increased so rapidly in Willesden and today there is no room for further expansion.

Wembley's population increased consequent upon the coming of the railway and the opening of a station and the Commissioners who conducted the Census

in 1921 attributed the increase of population since 1911 to the area becoming a residential suburb. Today there is a large industrial estate in East Lane as well as the residential area. A station was opened at Pinner late in 1842 and it became almost entirely a residential area.

Since 1912 many more stations have been built; these are served by the electric trains that run from Euston and Broad Street Stations to Watford as well as trains from London's Underground system. The electric line does not exactly parallel the original line but alternates from one side to the other without any obvious reason. It would appear that where extra tracks had to be laid it was impossible to get adjoining land because it was heavily built over. The electric line deviates from the main line in Watford to provide an extra station in that town and a branch line still further improves the services there; thus some of the criticism that was levelled against the railway many years ago has been obviated. Flyover bridges were built so that the lines used by electric trains and steam trains did not have to cross each other on the level, thus eliminating a frequent source of accidents.

As already noted, the railways did little in their early days to encourage short-distance passengers. However in 1883 the Cheap Trains Act was passed and all lines were compelled to provide workman's facilities. This had the effect of considerably increasing local traffic. Today these electric lines and several others carry large numbers of passengers especially during the rush hours and an extension of electric lines has been envisaged. Most of the stations between London and Watford are concerned only with passenger traffic taking work-people to and from home and factory. At some of these stations there are goods yards where coal and builders' merchants have small depots. Coal, mainly for domestic use, has been brought into London by rail since 1845 and the London & Birmingham held the monopoly of coal transport into London by rail for many years. The amount of coal coming to London by rail increased rapidly and in five years nearly one quarter of the coal that was brought into London came by rail.

Linked with the coming of the railway and the growth of settlement is the coming of industry. After 1900 many factories were opened up adjacent to the railway line and used the railway to transport raw materials and finished goods. But as far back as 1855 the Royal Commercial Travellers' Schools moved from Wanstead (Essex) to Hatch End to a site adjoining the railway line where they are today; proximity to the station allowed pupils to reach the school fairly easily and even today most of the pupils arrive and depart by rail. A group of factories were established adjacent to the railway line before the 1914-18 war. Messrs. Hamiltons opened a brush factory at Wealdstone in 1898; they moved there from their previous site in Clerkenwell. This new site was chosen because of the cheapness of the land. Railways were used for the carriage of both raw materials and finished products. The possibility of the firm possessing its own sidings was envisaged but technical difficulties made this too expensive a proposition. Today the firm have their own fleet of road vehicles which is used extensively for transport within the British Isles. Railways are still used for the transport of goods to the docks for export. The cheapness and greater reliability of road transport in addition to the greater speed has caused the change-over from rail to road transport. Kodak's factory at Harrow was built about 1900; the railway may have influenced the original choice of site but today road vehicles are used entirely for the transport of raw materials and finished goods. McVitie and Prices opened a biscuit factory in Willesden in 1902. The presence of a large population meant labour would be available and in the metropolis a large market was at hand. The railway was used to bring in flour

and sugar beet from East Anglia and the same means of transport was used to take the biscuits all over England until 1920 when the firm changed over to road transport. Until 1930 coal was brought in by rail from South Wales to heat up the ovens but since that date electricity has been used. The British Thomson-Houston Company established their works at Willesden in 1910; originally they were intended for the manufacture of electric lamps but actually used for the making of switchgear. Technical improvements in lamp manufacture meant that the Rugby factory could cope with the increased demand. Although without its own siding and not adjacent to the railway line it is within very easy reach of the railway. Large quantities of raw materials come by rail; insulating materials from the potteries and steel from Corby, Sheffield and Scunthorpe. Although rail transport is still used for the transport of the finished goods road transport is becoming more and more important for this type of work.

During the 1914–1918 war factory development was almost at a standstill; only the power station at Stonebridge was opened. This is almost midway between Euston and Watford and supplies power for the electric trains and uses coal brought in by rail. The hotels' laundry of British Railways near Willesden uses rail transport to send and receive linen to and from all parts of the country.

After the war a cluster of factories grew up at East Lane, Wembley. British Oxygen Gases Ltd. opened their works there in 1918 to supply the growing demand for oxygen in the home counties. Although a siding passes through the factory site very little use is made of the railway. A few gas cylinders (made of solid drawn steel by the Chesterfield Steel Company – which last a long time since they can be filled and refilled over and over again) may be brought in by rail but the company takes in gases from the atmosphere, separates them out and delivers them in insulated vessels which are sent throughout south-east England by the company's own fleet of vehicles.

In 1920 the General Electric Company started their factory on the East Lane site. They took over two factories that had been used for aircraft manufacture during the 1914–1918 war. The nearness to London was the most important factor in the choice of this site; it also allowed room for expansion and much labour was available. The siding which ante-dates the factory is used by trains which bring in coal and silica for glass manufacture; some bulbs are sent away in special shock-proof wagons.

In 1925 H. J. Heinz Ltd. bought a site at Harlesden for a new factory because the one they had at Peckham was too small. Good communications, road, rail and canal, existed and the works were close to London with its large market and labour supply. Both road and rail transport are used, whichever is the more convenient, to bring in raw materials, supply finished goods to customers and keep local depots supplied with their products. The choice between road and rail transport depends largely on the comparative service and economy; the tendency is to use the road more and more. In 1926 Wrigley Products opened their factory in East Lane, Wembley; the presence of the railway had a bearing on the final selection of a site. The railway was used for the transport of finished products to the north of England but road transport was used for deliveries in the south of England. Until 1953 coal was brought by rail to the company's own siding, but latterly oil was delivered by road tanker. Eventually all the goods that were sent away by rail no longer used the company's private siding but British Railways took them to Camden Depot first. It would appear that for this factory proximity to the railway was only of advantage to the employee today. It is now closed altogether. In 1926 Messrs. Collars opened a laundry at Wembley; although fronting on to the railway it was also

on the North Circular Road and the company's own fleet of vehicles collect and deliver the garments for laundering.

An analysis of these facts reveals some interesting conclusions:

(1) Only the power station that supplies the railway with electricity for suburban services and the railway laundry depend entirely on the railway for the transport of raw materials.

(2) In general, the older factories used the railways for the transport of raw materials and finished products in the early days but tended to change to road transport.

(3) Long distance transport is by rail in some cases, but only from a central depot, not the local station.

(4) Only one of the two private sidings is still used.

(5) Suburban services are much used by the workpeople.

Since the railway was opened much settlement has taken place in the area between Euston and Watford; domestic residences front on to the railway in many places. The older houses are mainly south of Willesden and the newer ones north of Willesden. Until 1900 most of the inhabitants travelled by rail into central London to work and their houses were clustered near the stations. After 1900 factories began to be sited in this area because there was both an ample labour supply and a large market for consumer goods close at hand, and a railway line for speedy transport. The coming of the electric tram and later the omnibus meant that people no longer had to live within walking distance of the station. After the 1914–1918 war the railway began to lose its monopoly of transport and today most raw materials and finished products go by road. Bulky goods from long distances are still brought in by railway.

An area that was once given over to open fields was settled by people and industry and became part of the largest conurbation in the world. The railway in general, and this line in particular, aided the migration of people to this part of London and provides part of the mobility by which a metropolitan city, like London, can only exist.

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The writer is grateful for help with the writing of this article from Professor A. E. Moodie and Professor W. G. East.

Thanks are due to the managers of various concerns who kindly supplied details concerning the locations of the factories with which they are concerned.

Staggered Platforms

BY HARRY PAAR

Several aspects of railway station practice could bear further examination, and would be worth listing by 'collector'/historians, for example, private stations (provided by companies for the exclusive use of an individual, and not open to the public) and temporary railway terminus stations. One once quite common class was those stations, the platforms of which were not opposite one another, but were staggered. Our member Gordon Biddle has written (*Victorian Stations* p. 111) 'Staggered platforms were not uncommon on double lines, usually on opposite sides of a level crossing or sometimes a bridge. The South Eastern Railway was especially partial to them'.

The reasons for this platform arrangement do not appear to be clear-cut. The writer has discussed the question with several members, and the general view is that this was done to give the maximum facility on the road which frequently crossed the tracks on the level, between the up and down platforms, as the gates could be opened to the road as soon as a train in either direction had drawn into its platform, whereas if the platforms were opposite to each other, the gates had to be shut across the road as a train in one direction approached the platform, while it stood at it, and while it crossed the road in clearing the platform. Quite clearly the platform had, on both up and down lines, to be situated 'downstream' of the level crossing, to be effective.

This particular staggered arrangement, which we may call the conventional, is exemplified by Mow Cop, if I am correct in assuming that there was a level crossing between the adjacent ends of the platforms, as seems to be the case from a photograph of 1895 (in Dow, *G. North Staffordshire Album*, 1970, p. 40).

We may notice at this point that staggered platforms would not be needed where stations were situated in cuttings or on embankments, as in such cases the road would be carried over or under the line, but that such sites were best avoided if possible, due to the extra costs of excavation or piling entailed in providing space or support for the platforms. It may also be as well to note, obvious although it may be, that stations were normally built where there was a road adjacent, although there were exceptions, for example at certain junctions where the interchange was only between trains and not between train and road, and also in situations where, to take the line to a point adjacent to a road would have necessitated a major diversion from the optimum line of route.

Unfortunately for those with tidy minds, the conventional arrangement was not always adopted. Taking two further examples from the North Staffordshire Railway, Ford Green & Smallthorne appears to have had the platforms staggered the opposite way, i.e. 'upstream' of the level crossing and footbridge — the worst possible arrangement for road traffic, since the gates had to be closed for the maximum duration of time, for trains in both directions. Fenton Manor had conventional staggering, but there was an overbridge between them, possibly a case where an earlier level crossing had been thus eliminated.

In Essex, Ingatestone today has conventional staggered platforms, but there is no road crossing the line between them, nor any suggestion that there might once have been one — there is a level crossing near the London end of the up platform. On the Loughton (Essex) branch, a study of which first drew the writer's attention to the matter, the generally attributed logic is tested most severely, as may be seen by examining early O.S. plans of the line. From

Loughton Branch Junction the first station was Low Leyton (now Leyton), with opposed platforms. Leytonstone had staggered platforms, but they were in the 'Upstream' direction to the level crossing. Both Snaresbrook and George Lane (now South Woodford) had opposed platforms, situated south of the road crossings.

Woodford station presents an enigma, for although its platforms were staggered in the 'downstream' fashion, there was no level crossing between them, it was situated north of the down platform end. In spite of later extensions, the platforms at Woodford are still partially staggered. At Buckhurst Hill the platforms were staggered in the same 'upstream' fashion as at Leytonstone, and although the station has long since been rebuilt with opposed platforms the original short, low down line platform can still be seen, with station house adjacent, south of the level crossing site.

The Loughton line was opened in 1856. It is possible that the full significance of the staggered platforms in relation to the road crossings was not appreciated, and that the staggering was governed by suitability of land levels, but this seems unlikely, for the engineer was George Parker Bidder, the contractor was Thomas Brassey, and there appears to have been no reason why the conventional type of staggering, with its advantage to road traffic, should not have been adopted throughout.

Kilsby Tunnel

BY G. Y. HEMINGWAY

This contract for a tunnel 2,423 yds long, was let to Joseph Nowell and Sons of Dewsbury, and work began June 1835. Much has been written about the difficulties encountered, but this account is taken almost wholly from the reports of Robert Stephenson, Francis Forster (District Engineer) and Charles Lean (Resident Engineer, Kilsby) in the London & Birmingham Railway Minutes. [Contract 7F].

July 1835: Robert Stephenson wrote: 'I was induced to adopt two [ventilating] shafts, not merely on account of the great length of the tunnel, but also from a conviction that it would be found wet, which would, I conceived, render every possible expedient for assisting a thorough ventilation highly desirable'. He considered the unavoidable extra expense justified by 'the advantage which may be reasonably anticipated from the division of this tunnel (the longest on the line, and probably wet) into three portions, each of which I am of opinion may be

regarded as a distinct tunnel. I expect the ventilation of each portion will proceed independently, which is never the case when the shafts are so small as merely to answer the purpose of chimneys'. The provision of these 60 ft diameter shafts was approved by the Committee on 11 September. By August, four working shafts and one trial shaft were being sunk.

18.10.1835; Stephenson wrote: 'Previous to leaving Birmingham, I requested Nowell to proceed immediately to inquire about two second-hand engines for drainage for Kilsby. He has returned this morning with intelligence of two which I think are adapted, with some few alterations, to answer our purpose. Now it is of great consequence that not a moment should be lost in completing our arrangements respecting this matter. Mr. Nowell has had Mr. Capper to examine the engine at my suggestion'.

22.10.1835: Robert Stephenson reported: 'The best line through Kilsby Ridge is undoubtedly that which I originally examined, by Crick, but, the Union Canal having abandoned it on account of the quicksand, I consider it prudent to take that which we have adopted. In the borings already made on that line, symptoms of quicksand made their appearance, but I believe only to a partial extent. Under all circumstances, I believe this to be the only feasible deviation we can adopt and shall therefore, in conformity with your instructions received this morning, request Mr. Forster to commence thorough examination by borings'.

2.12.1835: Joseph Nowell, the Senior Partner of Nowell and Sons, was ill, for on this account he had failed to send in a statement of his labour-force on another contract.

(According to a statement by a relative, he had caught a chill owing to having gone out without his top-coat. It should be noted that this illness occurred before there was any trouble with water in the shafts).

22.12.1835: 'Mr. Forster informs me that he has forwarded to you a section showing the result of the borings on the Deviation Line over Kilsby Ridge. You will at once perceive that it is fully as objectionable as the present line in reference to Quicksand, and I would suggest that no further expenses should be incurred in procuring an Act of Parliament for the proposed deviation'.

28.12.1835: 'The works in the Kilsby Tunnel not interfered with by the quicksand are fast approaching to a condition which will enable the regular tunnelling to proceed. Two shafts in the sand are sunk to the level of the water and ready for the Engine. The Engine is in a state of forwardness. The house will be roofed in two or three days, and the boiler placed. The drift for assisting in the draining of the sand is completed for 200 yards, which is about half'.

30.12.1835: 'Nowell has been dangerously ill and is still very weak'.

6.1.1836: 'The Quicksand Engine was started on Monday and works well so far as I am able to judge from her motion while she has no load. The cold water cistern will be finished this evening I expect, and the reason why we shall not be able to commence operations then is that we have no head-gear for the pits or tubbing ready. I think we may reckon on beginning on the sand in one of the engine-pits on Monday next. Nowell's engine is at work, but has little to do yet. It will require headings to convey the water to the engine pit and a sump to hold it in case of accident to the engine'.

(None of this conveys any sense of alarm. It is clear that in October Stephenson foresaw the need for adequate pumps and that the water broke into No. 2 shaft at least by December; also that the engine was not erected in time to cope with this).

14.1.1836: 'Poor Nowell died in the middle of the night before last'. (His two sons, John Willans Nowell and Jonathan Willans Nowell, took over control of the firm).

10.2.1836: 'The tubbing in one of the engine shafts for the draining of the quicksand has been sunk 13 ft 6 ins below the general water-level, leaving, according to our borings, 5ft 6 ins to be sunk to the bottom of the sand. This I expected would have been done by last Saturday night, but on Friday the water came in on us in such quantities that the men could no longer remain in the pit, and since then, though we have been draining water without intermission at the rate of 80 gallons per minute we have not perceived it to abate until to-day. This increase of water I attribute to the recent heavy fall of snow, which raised the general level of the water through the sand 6 ins. The effect of the snow having gone off, the water stands to-day rather below its usual level, and in the engine pit, as it stands only 2 ft 6 ins above the level of the sand, I have directed the miners to proceed with the sinking of the tubbing. In the drift, the sand burst in on us again yesterday morning, notwithstanding I had taken the precaution of having a shield put up against the face of the pit. The No. 3 drift shaft is again cleared out, and I am having a heading from it to intersect the sand at a higher level to take off part of the column of sand first. I have also had the side of the shaft opened at the place where we passed through the sand in sinking, and the quantity of water which runs off is about sufficient to fill a 2 in pipe and has most likely assisted in relieving us from the snow water. The quantity of water which finds its way through the sand in the drift is surprisingly small, considering the force with which the sand comes in'.

11.2.1836: Progress was given as:—

No. 1 working shaft: Not begun.

No. 2 ditto: Sunk about 35 ft, standing, having met with sand and water, into which it was sunk 10 ft.

No. 3 ditto: Standing, having been sunk 71 ft into a bed of strong rock containing so much water as to overpower the gin.

No. 4 ditto: Sunk, and the tunnel excavated and bricked for a distance of 42 ft in all.

No. 5 ditto: Sunk, and the tunnel excavated for a distance of 33 ft in all. Operations at this shaft stopped by a fall on the fourth excavated length on 15 January.

No. 6 ditto: Sunk 72 ft and stopped by water. A heading at the N.W. end of the tunnel is in progress towards this shaft to drain it off.

N.B. Working shafts Nos. 1 and 2 are dependent on the drainage of the quicksand. Working shaft No. 3 will be drained by means of a heading now driving from an engine pit sunk by the contractor, in which a pumping engine has been erected and is now at work.

Ventilating shaft A: A 6 ft shaft has been sunk 40 ft deep.

Ventilating shaft B: A 6 ft shaft has been sunk 41 ft deep.

Another 6 ft shaft has been sunk upwards of 30 ft.

Two observatories have been erected for setting out the line of the tunnel.

Quicksand Hill. Six trial shafts or borings have been put down, sunk to the waterlevel and bored to the bottom of the sand. A drift has been driven from the low ground at the S.E. end, parallel to the line of the tunnel, for a distance of 320 yds into the hill, and an open cut at the S.E. end of the drift 190 yds in length. At the present face of the drift a bed of sand and water was met with, which ran suddenly in and filled the drift for a length of 90 yds. This is now nearly cleared out for the purpose of extending the drift forward into the sand.

Two engine shafts, 12 ft in diameter, have been sunk to the level of the water

in the sand, and between these shafts a 20 h.p. engine erected for the purpose of sinking through the sand with wooden cylinders. The sinking through the quicksand commenced in the engine shaft No. 2 on 28 January, and on 1 February the wooden cylinder had entered 3 ft 6 ins into the sand'.

25.2.1836: Robert Stephenson was of opinion that the two sons of the late Joseph Nowell would not be capable of carrying out the contract. They appeared anxious to be rid of it, and he stated that he would place no difficulties in the way of this.

12.3.1836: (Minute of 29.7.36) Nowell & Sons relinquished the contract, and Robert Stephenson undertook to complete the work by direct labour. On the 24th, Jonathan Willans Nowell wrote detailing the difficulties and expenses incurred, and this claim was satisfied during April.

6.4.1836: Robert Stephenson made proposals for the future conduct of the work:—

1. To lay a temporary line of railway along the surface for conveying materials etc.

2. To sink No. 1 Working Shaft about 4 chains from the S.E. end of the tunnel. 170 yds may be worked at this end clear of the quicksand. This shaft, being 64 ft deep to the bottom of the invert, may be worked by a gin.

3. To sink No. 2A Working Shaft near Nowell's pumping engine. This shaft, also, may be worked by a gin.

4. To sink Working Shafts Nos. 2B, 3A, 4A and 5A, which, with Nos. 4, 5 and 6 Shafts, at present in progress, will divide that part of the tunnel which is free from quicksand into lengths from 200 to 220 yds long, to be worked from each shaft. These Shafts should be worked by steam engines.

5. To sink No. 6A Working Shaft at the N.W. end of the tunnel. This Shaft, being 69 ft deep to the bottom of the invert, may be worked by a gin.

6. To determine the number of shafts to be sunk in the quicksand when the draining is nearly completed. The distance to be worked will be about 450 yds.

7. To erect a steam clay mill with kilns etc. sufficient to supply 30,000 bricks per diem: say total quantity of bricks required 20,000,000, then 10,000,000 to be made the first season, and supposing 6,000,000 may be obtained from the open cuttings at the two ends of the tunnel and the neighbouring brickyards, 4,000,000 will be required from tunnel clay, then average number of working days in the season, say $150 \times 30,000 = 4,500,000$.

The following materials and machines will be required:—

1. Rails sufficient to lay two miles of railway, with the requisite number of sleepers, chairs etc., the rails to weigh 35 lb. per yd, also from 50 to 60 waggons containing $1\frac{1}{2}$ yd.

2. Three gins to work Nos. 1, 2A and 6A shafts — two gins are already on the ground — also for sinking other shafts and taking out shaft-lengths two gins will be required, one being already on the ground.

3. Six 6 H.P. steam engines to work Nos. 2B, 3A, 4A, 5, 5A and 6 shafts, and one 10 H.P. steam engine to work No. 4 shaft and the mill to grind the tunnel clay. These engines should be calculated to work pumps with 6 in boring barrels, which, however, will not be required in all cases.

Proposed mode of conducting the operations.

1. That Mr. Lean be instructed to carry into effect the above propositions in lieu of a contractor, on the following plan — to make all sub-contracts for mining, brickwork, the making of bricks, and procuring all materials which he may deem requisite for conducting the operations subject to the approval of Mr. Forster,

to pay all wages, expenses and money due on sub-contract account, which, after being examined by Mr. Forster are to be sent to Mr. Stephenson and the Committee.

2. That one or more efficient clerks be appointed to keep accurate accounts of all disbursements and expenses.

3. That such arrangement be made with respect to the remission of cash to Mr. Lean as the Committee may deem best.'

12.4.1836: An order was placed with Mr. Capper for five engines, to be delivered at the rate of one per month. On the same day Charles Lean reported: 'If you can accelerate Capper in the manufacture of them I shall be glad. We are again almost driven out of No. 6 Shaft by the water, and without the engine we shall not be able to get in the shaft lengths'.

6.6.1836: Recommended that Mr. Lean's salary be increased to £400 p.a. from the time Nowell gave up the contract.

9.6.1836: 'The general level of the water in the quicksand is lowering on an average a little more than 1 in per day. The pump was started on 9 May, and the level of the water in No. 2 Shaft (where the level was being measured) has sunk since then by 2 ft 10 ins. During this time, the pump has been stopped unavoidably about three days'.

15.6.1836: 'The water has now sunk 4 ft below the general level and continues to lower as the pumping goes on. We are about to put another set of pumps into Shaft No. 2, and we have reason to suppose that they will greatly increase the rate of lowering. No. 1 engine, also, is being rapidly erected'.

22.6.1836: An engine breakdown caused an intermission of 4½ days in the pumping. 'During this time, the water has risen 7 ins in one shaft in which we ascertain the general level of the water and 2 ins in another at a greater distance from the shaft in which the pump is at work. Since the engine has been at work again, the water has lowered 1 in in the nearest shaft'.

29.6.1836: 'Since the last report, the water has sunk in one shaft 7 ins and in the other 4½ ins'.

6.7.1836: Water level lowered 6 ins. 'One of the 9 in lifts has been set to work in No. 2 engine pit, and we are proceeding with the sinking of the tubbing in that pit. Some delay will be occasioned in the erection of the 25 in engine in consequence of incorrect drawings'.

13.7.1836: Water level lowered 10 ins.

20.7.1836: Water level lowered 10 ins. 'The tubbing in No. 2 engine shaft is very near the bottom of the sand, and I expect it will be landed in a day or two. The 25 in engine was set to work on Saturday last, and we are busy putting in the pumps, some pieces of which are still wanting. It would be as well to stir Mr. Capper up a little to get them sent as soon as possible'.

28.7.1836: Water level lowered 11 ins. 'I expect the 18 in pumps will be at work in a week'.

Spares requested for 18 in, 10½ in and 9 in pumps, also for 20 H.P., 25 H.P. and 6 H.P. engines.

Present state of the works:—

'No. 1 Working Shaft sunk, 13¹/₃ yds of the tunnel completed, proceeding with regularity.

No. 2 ditto: sunk to quicksand, and can proceed with the drainage.

No. 2A ditto: sunk. The first length of tunnel nearly excavated.

B. Ventilating shaft: sunk 6 ft, but not bricked.

No. 2B Working Shaft: sunk 25 yds and standing, having met with water and waiting for an engine which is now erecting with pumps and will be completed in about a month.

No. 3 ditto: abandoned and filled up. Run in before Nowell left the contract, and not intended to be opened again.

No. 3A ditto: Sunk 32 yds to top of the tunnel, and waiting for the gin, which is nearly completed.

No. 4 ditto: sunk and 86 yds of tunnel completed, proceeding with great regularity.

A. Ventilating shaft: sunk and bricked 20 ft deep.

No. 5 Working Shaft: sunk, and 42 yds of tunnel completed. Proceeding with great regularity.

No. 5A Working Shaft: sunk 22 yds and waiting, in consequence of water, for an engine which is ordered and in progress.

No. 6A ditto: sunk, and first length of tunnel excavated, will shortly be in a regular working state.

No. 6 ditto: sunk and waiting for the completion of the Horseley engine, which will be at work by the end of the month.

The shafts are now either sunk or in a state of forwardness 220 yds apart over that portion of the tunnel not affected by the quicksand. The greatest length of tunnelling, therefore, to be executed in one direction is 110 yds, which at the rate of $1\frac{1}{2}$ yds per week may be completed in 74 weeks. To this should be added four months for completing some of the shafts in progress and preparing them for regular tunnelling.

The distances between the shafts to be sunk in the quicksand must be governed by the advances made in the draining. It is probable that the distances will not exceed 100 yds from shaft to shaft, thus leaving only 50 yds of tunnelling to be executed in one direction, being about half that allotted to the other part of the tunnel.

Notes of results observed in the course of pumping and sinking in the quicksand:—

○ No. 2 WORKING SHAFT

○ No. 1 PUMPING SHAFT

○ No. 2 PUMPING SHAFT

The diagram shows the line of tunnel in the quicksand and the relative positions of the three shafts by which the drainage has been attempted and its progress observed.

When one pump was put to work in No. 1 Pumping Shaft, the water immediately fell in No. 2 Working Shaft, but, No. 2 Pumping Shaft being nearer the pump than No. 2 Working Shaft, the water fell lower than in No. 2 Working Shaft. This is precisely what might have been anticipated and demonstrates in the most conclusive manner that the supply of water at this level to the quicksand is very moderate, and that the sand throughout is so open as to admit freely the passage of water.

From the commencement of pumping even on a small scale, we have been able to lower the general level of the water in the quicksand gradually, notwithstanding any falls of rain which have from time to time taken place. When we first attempted the drainage by drawing the water in buckets, a rapid thaw took place, with a considerable quantity of snow on the ground: in this instance the water rose in the shaft. Nothing of the kind has occurred since the pumps were worked: on the contrary, the general level of the water has lowered at the rate of 10 ins per week. Previously, when only one pump was worked, the fall was at the rate of 6 ins per week.

In No. 2 Pumping Shaft, we may conclude that the feeder of water is at its maximum, as the tub is now 2 ft in a bed of boulders, which forms so open a stratum that the water flows into the shaft with very great rapidity. There appears to be scarcely any resistance to the feeder of water entering the shaft. This rapid flow occurs only occasionally as the sinking progresses. An instance occurred a few days ago and drove the men from the shaft, but, notwithstanding this, the pumps continued to act and lowered the water in the shaft 6 ins in one day. This clearly indicates that these gushes of water have no permanent source of supply and must naturally be looked for, as new orifices for draining or increased surface of the percolation of the water may be obtained by sinking, especially in a stratum of gravel and boulders.

That local drainage by shafts will be effectual seems placed beyond any reasonable doubt by the complete sympathy existing between the levels of the water in shafts at a considerable distance from each other and by the simultaneous effect of one pump in different shafts. As an example, in sinking the two pumping shafts, the sinkers were compelled to work in them alternately, for the moment one shaft was sunk a few inches deeper than the other the water flowed into it and left the other in a fit state for sinking. It was in this manner that they were sunk to their present depths. Precisely the same thing has taken place within the last few days in No. 2 Working Shaft. The men were some time since driven out of the shaft by the rapid influx of water. The general level of the water having gone on lowering, it is now quite dry and fit for the sinking again to commence.

Looking back upon what has taken place, and carefully studying the results that have been observed, it certainly does appear to be proved that the drainage of the quicksand is quite within our reach.

From observing the very decided effect produced in the level of the water by the operation of one engine, we were led to under-estimate at first the real feeder of water, which has gone on increasing as the depth of the shafts has increased, not, however, to an extent beyond the compass of our present preparations'.

11.8.1836: Water level lowered 11 ins. 'The pumps have been delayed considerably during the time we have been setting the 25 ins engine to work. This engine began to pump last Tuesday evening and keeps the water down with ease. We shall commence sinking in the No. 1 Pumping Shaft to-morrow'.

18.8.1836: Water lowered 13 ins. 'The tubbing in No. 1 Pumping Shaft has been sunk 6 ft 3 ins since the 25 ins engine was set to work, and the tubbing in No. 2 Pumping Shaft has been sunk 13 ins in the last two days'.

1.9.1836: Water lowered 11 ins this week. 'The 25 ins engine has been standing 1½ days in consequence of the breaking of one of the wheels, during which time the water rose 3 ins.

8.9.1836: Water level lowered 15 ins. 'The tubbing in No. 1 Working Shaft was sunk to the bottom of the sand last Saturday, showing the depth of the sand at that place to be 29 ft 6 ins.

15.9.1836: Water lowered 5 ins. 'In consequence of the tubbing in No. 1 Pumping Shaft having been sunk through the sand, the water cannot find its way into the shaft fast enough to allow the engine to do full duty'.

22.9.1836: Water level lowered 2 ft 11 ins. 'We are at a loss how to account for this sudden sinking of the water. The engines have been at work regularly, but not pumping more than usual'.

29.9.1836: Water lowered 10 ins. 'We are now sinking below the quicksand in No. 1 Pumping Shaft'.

4.10.1836: 'I see no objection to Mr. Sales's proposal to convey the Kilsby water to the Grand Union Canal'.

5.10.1836: Water lowered 7 ins. 'The engines have been stopped about a day and a half this week, during which the water rose three inches'.

7.10.1836: 'Hitherto, the wet weather does not appear to have had much effect on the progress of draining. The intermediate pumping shaft will shortly be at work with a 14 in set of pumps. This will increase the surface for the filtration of the water and will doubtless expedite the drainage, though it must be remembered that this expedient is chiefly intended to compensate for the gradual loss of pressure from the head of water getting less every day.

I have ordered four working shafts to be sunk forthwith on the quicksand portion of the tunnel, at such distances from each other that if we commence regular tunnelling from them in six months from this time they will be completed at the same time or a little before the shafts on the sound portion of the tunnel.

The tunnelling from the latter is going on in a very satisfactory manner: the rate of progress will exceed what I reckoned upon".

13.10.1836: 'The water in the quicksand has lowered 5 ins since last report, and the tubbing in the No. 2 Pumping Shaft is sunk to the bottom of the sand'.

20.10.1836: Water lowered 3 ins. 'We are now about to drive headings into the sand, which will allow the water to drain into the pits'.

27.10.1836: Water lowered 4 ins. 'The water level has been very variable this week, having risen considerably above the measure of last Wednesday, but lowered again when the headings were opened into the sand'.

3.11.1836: Water lowered 5 ins.

10.11.1836: Water lowered 6 ins. 'We are proceeding with headings into the sand from both Nos. 1 and 2 Pumping Shafts. One of them, in No. 1 shaft is almost dry and quite at the bottom of the sand. Two of the working shafts in the quicksand are in progress'.

17.11.1836: Water level lowered 3 ins. 'In No. 1 Working Shaft we have sunk through the sand, and I expected to be able to proceed with the tunnel without much difficulty'.

24.11.1836: Water Lowered 4 ins.

1.12.1836: Water lowered 2 ins. 'We may now safely consider that the quicksand is drained'.

6.1.1837: 'The first length under the quicksand in No. 1A Shaft was keyed this morning at 5 o'clock'.

22.1.1837: State of progress:—

'No. 1 Working Shaft, 86½ yds of tunnel complete.

No. 1A ditto: 3¹/₃ yds complete. At this point, the tunnel is under the quicksand.

Nos. 1B, 1C, 1D and 2: sunk to the water-level, which is now nearly on a level with the top of the tunnel.

No. 2A: 37 yds of tunnel complete.

No. 2B: sunk to the top of the tunnel and has been standing for pumps for some time, the quantity of water being more than can be drawn with a bucket.

No. 3A: 30 yds of tunnel completed.

No. 4: 165 yds of tunnel completed.

No. 5: 77 yds of tunnel completed, and is standing for pumps, the water having burst in so suddenly as almost to overwhelm the works. [This will be the incident when several men are reported as having had narrow escapes].

No. 5A: 3½ yds of tunnel completed, and is wet.

No. 6: 14¼ yds of tunnel completed, and is wet.

No. 6A: 49 yds of tunnel completed, and is wet, making the total quantity of tunnel completed 465½ yds, exclusive of works in progress.

Ventilating Shaft A is sunk and bricked 70 ft, and the excavation is in progress nearly 10 ft deeper.

Ventilating Shaft B is sunk and bricked 15 ft.

In the Quicksand Hill:—

No. 1 Pumping Shaft is sunk to a depth sufficient to allow the pump below the bottom of the tunnel, and from it headings will be immediately set away to the working shafts.

No. 3 Pumping Shaft is sunk about 12 ft below the bottom of the sand and is in progress sinking.

No. 2 Pumping Shaft is sunk about 6 ft below the bottom of the sand. From it, several headings have been driven into the sand, and one is at present in progress under the sand towards No. 1 Working Shaft.

The greatest distance between any two shafts may be considered about 190 yds. Unless a very unexpected quantity of water should be found where at present no signs of it exist, we may reckon upon this distance being diminished at the rate of 2¼ yds per week, which places the opening from end to end at about 68, say 70 weeks. When we are fully supplied with miners and are free from water, the rate of diminution may be taken at 3 yds per week. There are two divisions in the tunnel which may probably affect the above calculations: upon these, we are proceeding to sink two shafts.

The drainage of the quicksand is now completed as far as is necessary for tunneling.'

3.2.1837: Robert Stephenson estimated that the whole line might be opened in the summer of 1838.

7.3.1837: 1,835 yds of tunnelling still to be done. If done at 28 yds per week average, and one month afterwards, estimated date of completion June 1838.

[Progress from this point seems to have been regular and uneventful, and Robert Stephenson's next full report is nearly a year later].

17.2.1838: 'The work is at present in a very satisfactory state, and the monthly progress as regular as can be expected considering the nature of the operations.

No more difficulty has recently occurred except the capricious appearance and disappearance of water in some of the shafts. The junction of the respective portions of the tunnel has consequently become rather uncertain, the actual rate of progress in tunnelling through the intermediate space falling short of what was estimated. To remove this source of contingency as much as possible it has been found necessary to sink additional shafts. The circumstances have necessarily caused the expense of prosecuting the work to be materially augmented and in addition it has been found absolutely indispensable to increase the prices of mining, timbering and brickwork formerly paid to the sub-contractors, which experience has proved to be altogether inadequate. In the quicksand especially, although effectually drained, the utmost caution in mining has been required, and an expenditure of timber unavoidably incurred which would appear excessive and lavish to anyone whose experience had been confined to ordinary tunnelling. The present plans of proceeding have been arrived at by close observation and mature reflection and cannot with safety or propriety be altered for the purpose of economizing. Several circumstances have occurred demonstrating that none of our precautions or expenses have exceeded what the magnitude of the difficulties attending the work imperatively demand'.

[Little further can be gleaned from the Minutes, but from other sources it appears that on 21 June 1838 Charles Lean set the last brick, with suitable ceremony and a silver trowel, and that on the 24th, the first train left Euston for Denbigh Hall. The tunnel had cost about £300,000, though the contract sum had been less than a third of that amount].

* * *

SOUTH EASTERN. — On Thursday two men appeared before the magistrates at Maidstone, charged with wilfully and maliciously destroying the fittings of a compartment of a first-class carriage, to the value of £8. The defendants were passengers from Charing-cross on Saturday night, and during the journey to Dover, they wrenched the whole of the internal fittings of the compartment down and threw them on to the line. At Folkestone the tickets were collected, and then the damage was discovered. This led to the apprehension of the offenders at Dover. What made the matter more serious was that a foot-warmer was found, having been marked by the wheel of a railway engine which it might have thrown off the line. The defendants treated the matter as a 'lark'. They are charged with misdemeanour, and are liable to five years penal servitude. (*Railway Times* 23 January 1869).

R.L.S. Afloat

Next morning, when we set forth on the Willebroek Canal [Brussels — Rupel], the rain began heavy and chill. The water of the canal stood at about the drinking temperature of tea; and under this cold aspersion, the surface was covered with steam The canal was busy enough. Every now and then we met or overtook a long string of boats, with great green tillers; high sterns with a window on either side of the rudder, and perhaps a jug or a flower-pot in one of the windows; a dinghy following behind; a woman busied about the day's dinner, and a handful of children. These barges were all tied one behind the other with tow ropes, to the number of twenty-five or thirty; and the line was headed and kept in motion by a steamer of strange construction. It had neither paddle-wheel nor screw; but by some gear not rightly comprehensible to the unmechanical mind, it fetched up over its bow a small bright chain which lay along the bottom of the canal, and paying it out again over the stern, dragged itself forward, link by link, with its whole retinue of loaded scows. Until one had found out the key to the enigma, there was something solemn and uncomfortable in the progress of one of these trains, as it moved gently along the water with nothing to mark its advance but an eddy alongside dying away into the wake.

Of all the creatures of commercial enterprise, a canal barge is by far the most delightful to consider. It may spread its sails, and then you see it sailing high above the tree-tops and the windmill, sailing on the aqueduct, sailing through the green corn-lands: the most picturesque of things amphibious. Or the horse plods along at a foot-pace as if there was no such thing as business in the world; and the man dreaming at the tiller sees the same spire on the horizon all day long. It is a mystery how things ever get to their destination at this rate; and to see the barges waiting their turn at a lock, affords a fine lesson of how easily the world may be taken. There should be many contented spirits on board, for such a life is both to travel and to stay at home.

The chimney smokes for dinner as you go along; the banks of the canal slowly unroll their scenery to contemplative eyes; the barge floats by great forests and through great cities with their public buildings and their lamps at night; and for the bargee, in his floating home, 'travelling abed', it is merely as if he were listening to another man's story or turning the leaves of a picture book in which he had no concern. He may take his afternoon walk in some foreign country on the banks of the canal, and then come home to dinner at his own fireside

I am sure I would rather be a bargee than occupy any position under Heaven that required attendance at an office. There are few callings, I should say, where a man gives up less of his liberty in return for regular meals. The bargee is on shipboard; he is master in his own ship; he can land whenever he will; he can never be kept beating off a lee-shore a whole frosty night when the sheets are as hard as iron; and so far as I can make out, time stands as nearly still with him as is compatible with the return of bedtime or the dinner-hour. It is not easy to see why a bargee should ever die.

— from Robert Louis Stevenson's *An Inland Voyage* (1878).

(From M. I. Berrill)

Correspondence

North London Railway trains to Stratford

Sir, — The service recently inaugurated between Camden Road and North Woolwich is to some extent a repetition of one started in 1854. In that year the Eastern Counties Railway constructed a branch to Hackney Wick Junction (later known as Victoria Park Junction) with the North London Railway.

The passenger service was provided by the NLR. A few additional carriages were attached to the rear of the Chalk Farm and Fenchurch Street trains and 'dropped' at the junction, then worked forward to Stratford (Low Level) and Stratford Bridge (later called Stratford Market) by the NLR. On the return journey the normal practice was to detach the engine of the main train, attach the Stratford carriages in front and work the train forward to Chalk Farm by the Stratford engine. In 1856 the first station at Victoria Park was opened. This was situated west of the junction, but the procedure was substantially the same until the end of December 1859 when through working ceased as stated below.

In 1866 the original station at Victoria Park was closed and a new station with four platforms was opened east of the junction.

The NLR was well patronized on Sundays in summer and on some other days. From 1855 to 1866 inclusive, on these days, some of the Stratford trains worked through to and from Chalk Farm independently.

Local trains to Stratford normally departed from the centre platform at Victoria Park and the fourth platform was used less and less. Apparently passengers had to cross on the level; the platform was removed in 1895.

Broad Street station was opened in 1865 and the entire NL services were revised. The through trains to and from Stratford ran for the last time in the summer of 1866. For a few years from November 1866 the Great Eastern and North London worked the local service alternate years, then GER entirely.

The first service to and from Stratford was eight trains a day on weekdays, six on Sundays, but soon increased to approximately hourly, then from 1870 half-hourly.

The NLR provided all the staff at Victoria Park but the Great Eastern provided its own tickets. Those issued by the NL ticket examiner at the barrier were marked 'BS' indicating 'Barrier series'. H. V. BORLEY

Clerkenwell Railway

Sir, — I notice on p. 160 of *The London & South Western Railway* (RA Williams, 1968) that tickets for the new Waterloo Station (July 1848) were printed in the basement on presses purchased from the Clerkenwell Railway. I do not recollect meeting this company before; was it one of those that succumbed to Railway Mania? What had it hoped to build? A. LEONARD

Boreham Private Station

Sir, — I must apologize for the error in the Ordnance Survey scale (*Journal*, September 1979, p. 115) pointed out to me by our Secretary. The word 'foot' at the top of page should have read 'mile' — literally a case of 'putting my foot in

it.' It may be of interest that soon after the article was written, Boreham received attention in a *Sunday Telegraph* Magazine of April 1979, in an account of Henry Ford's purchase of the Boreham House estate and its development on co-partnership lines. The article referred to Ford's first sight of the estate, when the up boat train in which he was travelling (in 1930) 'creaked to a stop at a deserted platform. It was Boreham Halt'. The writer, Diana Winsor, advised me that the reference to the halt was a result of local investigation, and that although there may not have been a platform there, it was still regarded locally as a halt because trains tend to slow up or stop at that point even now. Passing the site of the 'Halt' on 6 October last, I noticed that this apparent urge to stop at Boreham had been felt so strongly by a diesel locomotive that it had left the track and was heeled well over, on the up side. HARRY PAAR

(The Editor also apologizes for missing this error, but as his lack of mathematical knowledge is well known, he might not even have realized that there were not 25.344 inches to the foot)

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Please note the following errors in the article 'Claverton Pumping Station' (November *Journal* pp.141 to 153)

- p.143 line 6 of letter from Rennie: For powerful *read* powerfull.
- p.144, para 2 end line 4: *should read* year but in
- p.145, para 3 line 6: for 24 *read* 204.
- p.146, lower caption: for Newton *read* Newtown.
- p.150, para 4, line 3: for of *read* or.
- p.153, line 2-3 *should read* Central Technical Library.

A long article on Growing Pains of the North Staffordshire Railway, by Rex Christiansen, will appear in the July *Journal*. There is now enough material to enable this issue to be published.

Cover advertisements are required to help with the cost of producing the *Journal*. Charges are £15 *full* page and £10 *half* page. Remittance should be sent, with the copy, to Mr Pat McCarthy, 6 Carisbrooke Close, Wistaston, Crewe CW2 8JD. Any member who knows of a firm who might be willing to take advertisement space should get in touch with Mr McCarthy. Deadline date for *any* copy to be sent to the Editor is 10 April.

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