

# The Pioneering Markfield to Bardon Wire Tramway

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A new and unusual mode of transport was started in Leicestershire on 13th February 1869. It was known as a wire tramway, the first installation of its type in the world, and was constructed to carry granite from a quarry in Markfield to Bardon Hill station, a distance of just over three miles. Its primary purpose was to demonstrate the concept of an overhead conveyor system which incorporated a continuously moving wire cable, and enabled heavy materials to be transported in load-bearing carriers. For most of its length it ran alongside the Leicester to Ashby turnpike road creating what must have been an amazing sight for those who travelled along this stretch of road at that time.

Over the next few years the concept was developed rapidly in this country, and also in America where it was used in the gold and silver mines and was to lead to the development of the San Francisco cable cars. Much later came the most recognisable example, the ski-lift.

So why was Markfield chosen for a pioneering piece of machinery, what did it involve and what became of it?

The use of a wire cable in constant motion and powered by an engine was a new concept. Transportation using stationary ropes from which loads were slung – often from pulleys – and moved along by gravity or pulling with separate ropes, had been used for centuries for crossing valleys and rivers, and also in building construction. Crude systems devised for moving loads hung from endless ropes which circulated between horizontal pulleys had also been frequently tried (1). By contrast, the wire cable system was designed to transport loads over long distances, in all weathers and was especially useful on hilly terrain. It was also quicker and cheaper than constructing a railway, and after the initial outlay, far cheaper to operate. It also had many advantages over common contemporary transport methods such as pack animals, drawing by oxen, or – as was being used between Markfield and Bardon – horse and cart.

The inventor of the wire tramway was Charles Hodgson, a mining and civil engineer from Ireland. He was living in Richmond, Surrey when he secured the patent rights for his designs in July 1868. (2) In the following Autumn, he successfully proved his ideas in practical tests at a gravel pit in Richmond, overcoming the particular problem of getting

the hanging loads past the cable supports and round bends. He then proceeded to market his invention, enlisting the help of an experienced businessman, William Munton Bullivant, along with fellow engineer, William Thomas Henney Carrington, both of whom were based in London. Together these three entrepreneurs set up the Wire Tramway Company late in 1868.

The small quarry they chose for their first enterprise at Markfield was known as Hill Hole. It was purchased by partners Joseph Ellis and Breedon Everard in 1852, who prior to this, had opened several depots at railway wharves to sell coal and farm commodities but also to sell broken granite to turnpike trusts for road metalling. It was the success of the sale of broken granite which led to the start of the Markfield Hill Hole quarry (3), to be followed in 1857 by a much larger quarry at Bardon Hill. When Joseph Ellis died, his two sons, James and Joseph Henry, joined Breedon Everard in partnership to run the quarries. James Ellis was a very enterprising partner who designed and patented many modifications to one of the first ever crushing engines installed at Bardon Hill. (4)

Breedon Everard had a middle son, the ambitious John Breedon Everard. John did not enter the partnership immediately, being articulated instead to the civil and mining engineers Brown & Jeffcock for four years. He then worked as assistant resident engineer under William Barlow on the construction of St Pancras station. He was there for three years until its opening in 1868, and was responsible for overseeing the building of its foundations, tunnels, great roof and connecting railways. (5) Although returning on occasions to complete outstanding work at the station, he started his own very successful practice as a civil and mining engineer in Millstone Lane, Leicester.

It is possible the contact between the Wire Tramway Company and Ellis & Everard came from the forward-thinking James Ellis who had heard about the new design and contacted the designer or, more likely, that one of the proprietors of the Wire Tramway Company came into contact with John Breedon Everard whilst he was working in London, through their mutual interest in civil engineering. As it turned out, J. B. Everard was engaged to coordinate the installation of the wire tramway, this being one of his first jobs in his new practice. (6)

Despite being an original and initially successful, albeit short-lived system, very little has been written about Markfield's early wire tramway. J. B. Everard's autobiography mentions his connection with its installation but little further, and its existence is recalled in the book *Markfield into the Millennium*, (7) The tramway also featured in the 19th February 1869 edition of *The Engineer*, a leading publication at the time whose circulation reached the English-speaking countries of the world, as well as in other professional and trade journals. Whilst there are also technical books that detail the subsequent developments of the machine and acknowledge Hodgson's first installation, (8) the most useful sources of further information discovered to date are in contemporary press reports.

The *Leicester Chronicle* of 16th January 1869 was the first to briefly mention the tramway during construction, whilst the first articles appeared in the London press starting with *The Morning Post* of 15th February 1869. The next day, *The Standard* set the scene of the inaugural day:

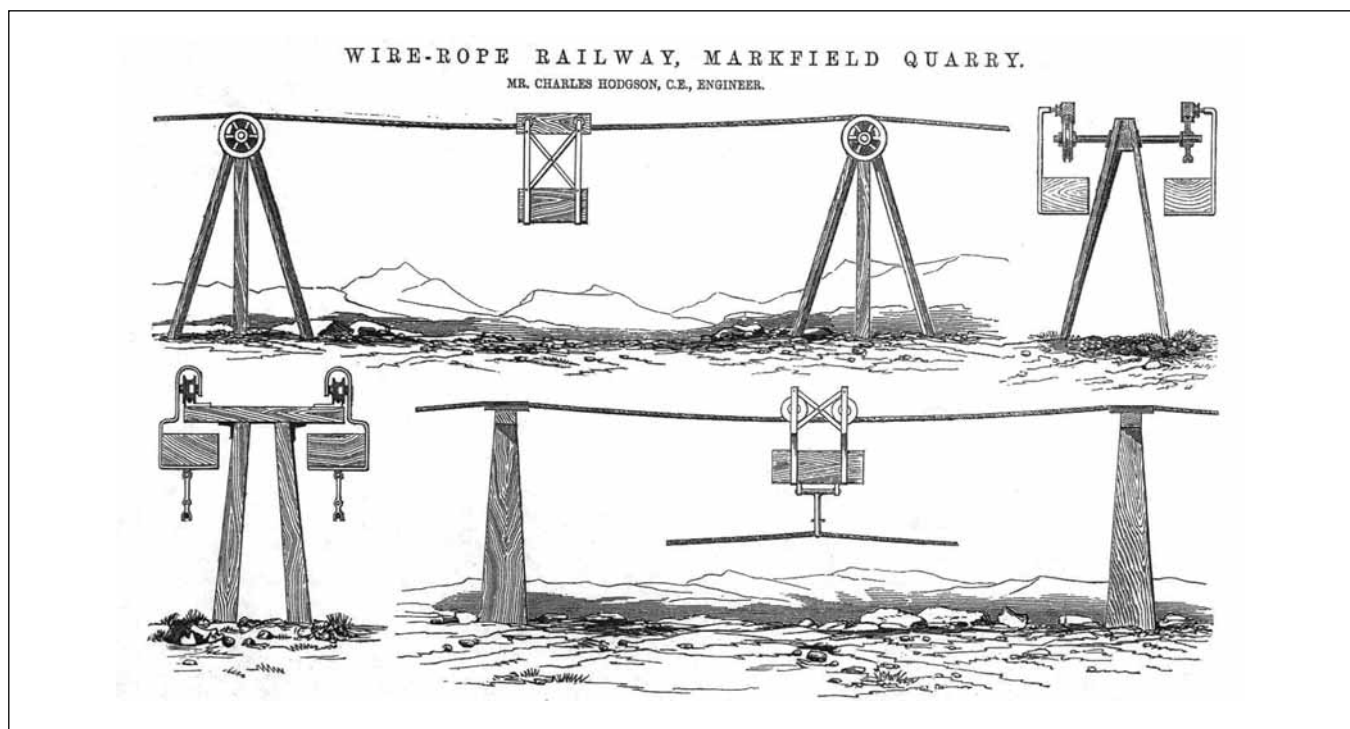
On Saturday [13th February] a party of engineers and representatives of the press started from the St Pancras station by the ten o'clock Midland express for Leicester to see the novel system of wire rope transport practically at work. ... the distance from the town to the wire rope is about eight miles by carriage so that a visit can be comfortably made, with plenty of time for inspection, within the day.

Clearly the Wire Tramway Company was out to publicise their product as much as possible, and coincident with the opening, small adverts were placed in national newspapers inviting enquiries for their new system. As well as reports of the opening in the London and Leicester press, (9) the news also reached the major provincial papers, and after a few weeks there was even mention in very minor papers in America, Australia and New Zealand.

Most of the reports gave some technical details of the tramway, along with many facts and figures. The more salient ones are as follows.

The cable was half-an-inch in diameter, spliced at intervals to form a continuous loop nearly six and a half miles long. It ran on pulley wheels 15 inches diameter which were supported in pairs on the top of about 120 wooden trestles. The load-bearing half of the cable – travelling from Markfield to Bardon – ran over the pulleys on one side of the trestles, and the return half on the opposite side. The trestles were spaced at intervals of approximately 150 feet but this varied according to the rise and fall of the land and position of the bends. The maximum spacing was 600 feet.

The trestles were three-legged as shown in the diagram below, and sunk into the ground. Given the experimental nature of the system, it is doubtful that the trestles had any substantial foundations, which, along with subsequent disturbance of the ground for road and other works, reduce



Sketches which accompanied an article about the Markfield wire tramway in *The Engineer*, 19th February 1869, at the time of its opening. The top sketch shows the single moving cable design, and the bottom sketch, the principle of transporting loads hung from a fixed cable using a powered endless cable. (With acknowledgement to *Grace's Guide*, <http://www.gracesguide.co.uk/File:lm1869EnV27-p132.jpg>)

the likelihood of finding evidence of their position today. The trestles varied in height between 14 and 40 feet, presumably at the higher levels when a clear passage was required underneath or to prevent fraudulent removal of the carriers.

At either end of the tramway, the cable ran around large horizontal wheels, with one adjustable to tension the cable, and the other providing the driving force. The power was taken from a 16 horsepower portable steam engine, most likely sited on quarry land at the higher, Markfield end rather than by at the Bardon end which was by Bardon station. The driving wheel was an adaption of a Fowler's 'clip drum', the type being used beneath traction engines at that time for driving the first cable-hauled ploughing systems.

The carriers for the goods being transported, comprised wooden boxes suspended from metal arms which were shaped to clear the supporting pulleys, and to allow the centre of gravity of each box to hang directly beneath the cable. The top of each arm was attached to a hardwood block which had a v-groove on the underside allowing it to sit on the cable and still pass over the pulleys. The blocks also had a pair of small grooved wheels attached at their side. These could automatically run onto rails and lift the blocks clear of the cable for a short distance when negotiating bends, or, at the ends of the tramway, they would run onto longer rails to prevent the carriers running round the horizontal wheels. From these end rails, the carriers were lifted off manually for emptying or filling.

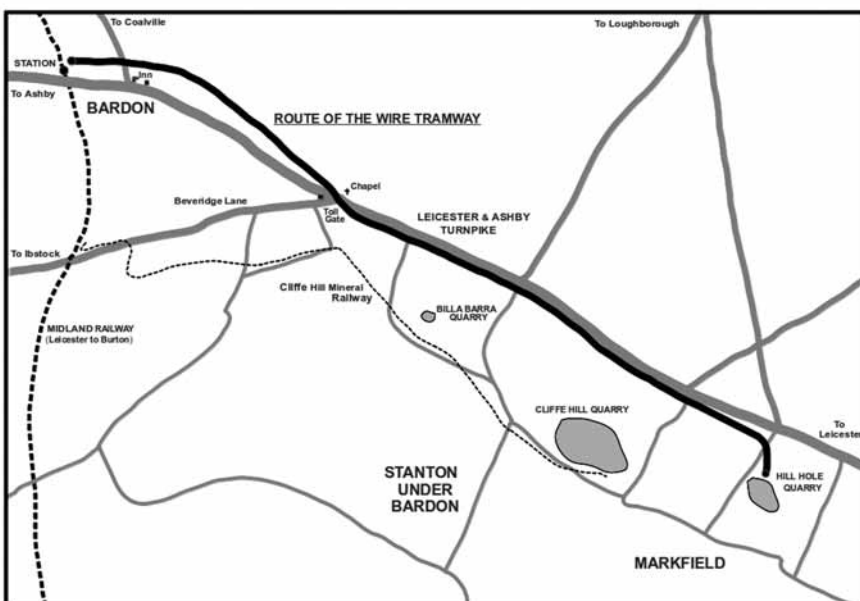
There were up to 250 carriers on the cable at a time. They were in constant motion and travelled at 4-6 miles per hour. With each box having a capacity of just over 1 cubic foot and holding approximately 1 hundredweight, it allowed over 10 tons of granite an hour to be delivered – or approximately 100 tons per day – which was well within the requirements of the quarry.

For the route which the tramway took there are only brief details as shown in an account in the *Leicester Advertiser* of 20th February 1869:

The line commences at Markfield Quarry, and passing over some grass land, turns round an angle post, and then runs along one side of the high road for about two miles. It then crosses the road, proceeds a short distance down the other side, and passes over the fields, to Messrs. Ellis and Everard's works, against the Bardon station, where the stone is delivered.

Because there is no mention of the line passing over a road soon after crossing the grass land near to the quarry, it appears that having turned the corner it then ran for two miles along the south side of the high road (i.e. the Ashby turnpike, known as Shaw Lane). This would have taken the line near to the Beveridge Lane turn where it crossed over the main road. This was the position of a toll gate and on seeing the carriers passing overhead, travellers waiting at the gate may well have thought it a cunning way to avoid paying tolls! The line would then have run over land rented by Ellis & Everard as part of the Bardon Quarry site, and on past the site of St Peter's church (which was yet to be built). The probable route was then behind Bardon Hill House, home of Breedon Everard, and the Birch Tree Inn (now near the Bardon Road roundabout on the A511) before crossing the narrow lane to Coalville. (10) After another quarter of a mile it reached the rail head near to Bardon Hill station where a siding was reserved for the broken Markfield granite and granite setts for distribution by rail.

Except for some minor mishaps on the inaugural day, all the newspaper reports gave very good reviews, and said that the many people who witnessed the event could see a successful future for the system. On the way back, the invited guests were taken to Leicester and dined at the Bell Hotel, before the London contingent made their way to the railway station.



The conjectured route of the Markfield to Bardon wire tramway. The line of the tramway is shown by the black line running alongside the Leicester and Ashby Turnpike Road.

Advantages of running the tramway at the side of the road included easy access for installation and maintenance. It also avoided payment to landowners had the line run over open fields, which would have been a shorter route. Approval had been required, however, to run the tramway by the road, (although apparently parliamentary approval had not been necessary at this point), and according to the press reports, this was given by the 'local public authorities', who, from later sources, appear to have been the trustees overseeing the Leicester to Ashby turnpike, and possibly the parish councils. (11) In gaining approval, the strong relationship between the turnpike trustees and Ellis & Everard would most certainly have helped, with the quarry company supplying broken granite to the turnpike trustees who in turn were responsible for the maintenance of the road at the side of the tramway. Although the trustees may have lost the tolls from the granite once it went by overhead tramway, this income would have been off-set by greatly reduced road maintenance costs, with fewer heavy conventional carts on the road.

With a relatively cheap transport system in place, which according to the *Daily News* of 22nd June 1869 was 'a complete success', and which had led to similar machines being sold abroad, it seems reasonable to expect that the tramway would have had a longer life (even if periodically requiring up-to-date modifications).

Nothing about the length of time it ran, however, can be found in the local press, although possible evidence for its demise can be found in a detailed report of a visit to the Markfield quarry by the British Association in May 1870 and which does not mention the tramway. (12) Had the tramway been in operation, surely it would have been noted? This suggests that the installation lasted for less than a year and three months.

Presenting better clues to its duration, are the advertisements which the Wire Tramway Company placed in the national press. Firstly, in June 1869 they were offering to build, at their own expense, an example of their patent system for demonstration purposes to anyone having goods to carry from one to ten miles. Quite possibly this was because the future of the Leicestershire installation was already uncertain, and an alternative show-piece was needed. Secondly, the Company's small, almost weekly, advertisements for the tramways, which initially quoted that 'three miles can be seen in operation' – this almost certainly referring to the Markfield to Bardon wire tramway – dropped this claim after 9th August 1869, suggesting that the Markfield system was closed from then on.

So why was the system so short-lived? In J. B. Everard's autobiographical notes, he says that the opposition was too great for the tramway to become permanent, but that is all. (13) A fuller answer though, is revealed (with much more)

in the unlikely source of the *Nelson Evening Mail* of New Zealand on 20th November 1871. (14) It can be found in a report about a model of the tramway which was on show at an exhibition in London. (15):

The first experimental line of wire-tramway was erected in Leicestershire, in April [sic] 1869, on a length of three miles, and was used in transporting stone to the railway. It would have been permanently employed, but that the turnpike trustees beside whose road it ran were unable to give definitive authority for its remaining without act of Parliament, which would cost twice as much as the construction of the line; it was therefore shipped to the New Zealand quartz diggings. Another heavier line was immediately afterwards fixed near Ashby-de-la-Zouch at Messrs. Ensor's fire-brick works, and has for the last two years given complete satisfaction ...

Several interesting points arise from this snippet. Firstly, that the trustees had to go back on their initial approval. (16) This could have been due to requiring an Act of Parliament for the tramway to continue, or the result of complaints to the Justices of the Peace to whom the trustees were answerable. Complaints and concerns about the operation can easily be envisaged from fears of the cable snapping to loads falling off the cable onto the road.

Such opposition, combined with the expense of seeking a private Act of Parliament – which may well have been rejected – would have provided sufficient cause for the project to be abandoned. Unfortunately there are no records remaining of the Quarter Sessions of the Justices of the Peace or of the Turnpike Trustees meetings, nor of any further reports in the local press to verify what happened and when. The quarry would have resorted back to the use of horses and carts until powered road transport became available, and would have paid toll fees for use of the turnpike road until 1874 when the Ashby Road Turnpike Trust was ended.

It is also interesting to note from the newspaper article that this was not the end of the system completely. The components from the tramway were shipped out to New Zealand for use in the quartz mines, in the Thames area of New Zealand where traces of gold had been found causing a mini gold rush.

Despite any difficulties with the initial operation, the Wire Tramway Company's various publicity ploys did have some success with orders completed in several countries on the continent, in the antipodes and the Americas. There were only a few in Britain, with a further Leicestershire example being constructed at Ensor's brickworks at Woodville near Ashby-de-la-Zouch. This overhead installation was completed as early as October 1869, the brickworks' owner,

no doubt, having seen the pioneering tramway at Bardon which was only 9 miles away. At the same time, the owner was also patenting ideas for brick-making machinery. (17)

In the United States, the very first installation – in Nevada – is featured in a publication about a silver mine. (18) The tramway was ordered so that silver ore could be transported during the winter months when snow blocked the roads. The Wire Tramway Company's agent arranged for shipping the tons of wire and equipment (including telegraphic apparatus) to San Francisco via Cape Horn, and then overland to the mines, arriving on site himself to supervise the installation. The machine worked well until the freezing snows came and created unforeseen problems with the wire. The agent then had to make the long return journey to resolve the situation.

Among the enquiries made about the system, one came from Ceylon for transporting coffee and rice. The proposed tramway was to be 60 miles long and formed from 12 separate machines, with loads automatically transferred from one section to another. As part of the preparation for this, a tramway was built especially for trial and exhibition purposes. This was five miles long and built on the Sussex Downs, passing over the Brighton racecourse. It was installed about a year after the opening of the Markfield tramway, and incorporated the latest developments including metal carriers with a single pivoting attachment to engage steeper inclines, thicker wire and trestles made of iron. It was open to the public – much to the delight of small boys who were prone to hang from the moving carriers – and was on show during the first nine months of 1870. J. B. Everard was employed in the installation of both this trial line and in the development of the Ceylon project. (19)



Advertisement from the Glasgow Herald 3rd May 1872, showing the extent of the markets which the Wire Tramway Company was aiming at, just three years after the opening of the Markfield line.

Other instances of the wire tramway quickly emerged in America following various articles in a wide range of newspapers and journals during 1869. First to seize on the idea was Andrew Smith Hallidie, an immigrant from England who had set up a wire cable manufacturing business with his father in San Francisco. Not only was he able to supply the components more readily in America than

Hodgson, but as early as February 1870 he was already patenting improvements to the design. Smith Hallidie's first installation was in 1872, and thereafter, his business almost monopolised erection of the aerial tramways (as they became known) that served the gold and silver mines in the west. (20)

Hallidie also applied the idea of moving loads by using a continuously running cable, to powering trams running on rails. He was keen to do this after seeing horses struggling to haul trams up the steep San Francisco hills. He developed the idea by running the cable underground, with a device for the driver of the tram (or cable car) to operate that gripped the moving cable through a groove in the road and hauled the tram along. The driver would then release the device when stopping. Progress was rapid and the first San Francisco cable car was running by August 1873. (21) The system still operates today.

Another important development of the system was one in which the load was supported on a static continuous cable, with the carriers being moved along by a separate, constantly running lighter cable. Although more expensive, this meant that much heavier loads could be transported. This arrangement was developed by the Bleichert brothers in Germany in 1874, although it had been foreseen by Hodgson and was even outlined in the articles about his single line system which appeared in the original reports in the press in February 1869.

The carrying of passengers was also mooted as early as 1869 with the following ambitious and novel suggestion:

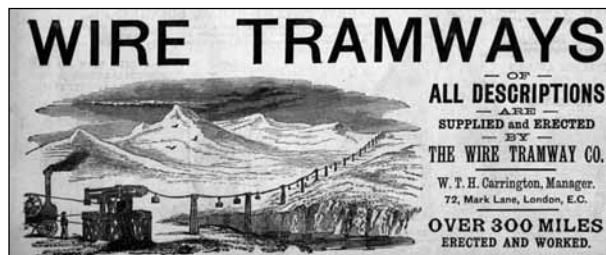
... leading engineers have been discussing the possibility of constructing a stout wire tramway between Dover and Calais, which should be supported from a line of pillars sunk in mid-ocean, and along which passengers could be conveyed. The cost would be comparatively small, and suspensory trains could, it is argued, be despatched across the Channel without difficulty or danger. (22)

Whilst a channel crossing of this nature is clearly a far-fetched idea to us today, chair lifts and suspended cable cars did eventually make an appearance, becoming popular especially in scenic mountainous areas and ski resorts in the early twentieth century, a further important development of the continuously moving wire system.

Ellis & Everard continued haulage by road, turning to steam-powered vehicles at their Bardon Hill quarry, and probably the same at Hill Hole, Markfield. Whilst a narrow-gauge railway was later successfully employed at the much larger Cliffe Hill quarry less than a mile away from Hill Hole, (23) the size of the latter would not have warranted such expense. When Hill Hole closed in c1920,

granite production became concentrated at Bardon Hill where J. B. Everard continued as one of the partners. The company flourished, and is known today as Pick Everard, a leading national independent engineering and architectural consultancy which has retained its links with Leicestershire, with its headquarters in Leicester.

As for the Wire Tramway Company, this was taken over by one of its first proprietors, W. M. Bullivant, who successfully ran it alongside his own cable manufacturing concern. Its inventor, Charles Hodgson, went to live in America. He died in London in 1901.



Advertisement for the Wire Tramway Company, December 1889, depicting the type of terrain to which a wire tramway is well-suited. (With acknowledgement to Grace's Guide, [http://www.gracesguide.co.uk/Wire\\_Tramway\\_Co.](http://www.gracesguide.co.uk/Wire_Tramway_Co.))

Although making only a fleeting appearance, and not representing a world-shattering event such as the railway world's Rainhill Trials, the Ratby to Bardon wire tramway was a first. It played a small but important part in the development of this unusual form of transport, which, although not seen so much in this country, continues to serve many industrial operations and thousands of leisure resorts throughout the world. Next time, when being transported suspended from a cable at a ski resort or in a cable car over the Thames, spare a thought for the pioneering line that once ran alongside the Ashby turnpike through the Leicestershire countryside!

#### References and Notes:

1. The most notable of the ancient ropeways was built by Adam Wiebe at Danzig in 1644, being recorded on an engraving. More recently, examples of a stationary cable system came into use locally and known as 'Blondins' (after the tightrope walker). They were stretched over quarries and travelling winches hung from them which could descend into the pit to bring stone to the surface. Ian P. Peaty, *Mountsorrel and its Associated Quarry Railways*, (Irwell Press, 2012).
2. Hodgson's family had run mining companies in Ireland, and also owned peat processing plants for which Hodgson had already patented machinery. D. Collins, *A Valley Remembers Glann*, (Kilcummin Parish, Our Lady of the Valley, 2011), pp. 42-4. (PDF accessed online.)
3. For a short time Breedon Everard had previously worked a small granite quarry, then known as Billa Barra,

one-and-a-half miles west of Markfield.

4. A. Moore, *Ellis of Leicester; a Quaker Family's Vocation*, (Laurel House Publishing, 2003).
5. J. B. Everard, *Memoranda on the Life of John Breedon Everard*, (Record Office for Leicestershire, Leicester and Rutland (ROLLR), nd), ref: L920 EVE.
6. Some sources have inadvertently attributed the design as well as the installation of the tramway to J. B. Everard.
7. Various Authors, *Markfield into the Millennium*, (Leicestershire Libraries & Information Services and Markfield Local History Group, 1999).
8. A. J. Wallis-Taylor, *Aerial or Wire Rope-ways*, (Lockwood, 1911); R. A. Trennert, *Riding the High Wire*, (University Press of Colorado, 2001) are suggested for further reading.
9. *Leicester Guardian*, 17th February 1869; *Leicester Journal*, 19th February 1869; *Leicester Advertiser*, 20th February 1869; and *Leicester Chronicle*, 20th February 1869.
10. The main road to Ashby ran through Hugglescote at that time and not Coalville.
11. An indication that permission for the tramway would have been required from the Turnpike Trustees is that in a similar situation, according to a surviving letter of 4th January 1871, (ROLLR, QS106/2/1/3) permission was given by the Leicester and Welford Turnpike Trustees for the General Post Office to erect posts for telegraph wires alongside their road.
12. *Leicester Chronicle*, 28th May 1870.
13. J. B. Everard, op. cit.
14. Web site accessed: <http://paperspast.natlib.govt.nz>
15. As part of the company's publicity, a model of the tramway, about 100 yards long, was exhibited at shows throughout the country.
16. E. Bainbridge, 'On the mode of conveying minerals by wire tramway', *Transactions of the North of England Institute of Mining & Mechanical Engineers*, 20 (1870-71), p.4. The Act of Parliament was required by the trustees because the tramway passed over the high road. (PDF accessed online.)
17. Patents 3504 and 3570, *The London Gazette*, 24th December 1872, p.6444.
18. W. Turrentine Jackson, *Treasure Hill: Portrait of a Silver Mining Camp*, (University of Nevada Press, 1963 and 1989).
19. J. B. Everard, op. cit.
20. R. A. Trennert, op. cit.
21. There were already other forms of rail traffic hauled by cables, but these were winched along by cables wound round a powered drum and were unsuitable for the streets of San Francisco.
22. *Daily News*, 22 June 1869.
23. This line was opened in 1897 and ran across country to a siding in Beveridge Lane adjacent to the main-line railway. M. H. Billington, *The Cliffe Hill Mineral Railway*, (Turntable Enterprises, 1974; Plateway Press, 1997).