Why was the Mansfield and Pinxton Railway created?

TITLE SLIDE

In this lesson we're going to find out why the railway was built to connect Pinxton and Mansfield. The main people who made the railway happen and the goods that were transported on the early trains.

SLIDE 2 EVIDENCE OF THE OLD MANSFIELD AND PINXTON RAILWAY

The Mansfield and Pinxton Railway was opened in 1819. The viaduct at the Mill Waters site is evidence that there was a railway here many years ago. The route has been altered over the years. It became part of the new Midland Railway in 1847 and converted to steam locomotives supporting coalfields in and around the Midlands. The line was also extended to take trains through East Kirby and onto Nottingham. The first formal passenger trains were introduced on the line in 1849. The line is now part of the Robin Hood line which runs into Nottingham, making it the oldest continuously running commercial railway in England. The viaduct is protected by law, so it is illegal to knock it down or change it in any way, as it is so important to the history of the site.





Why was the Mansfield and Pinxton Railway created?

SLIDE 3 ROADS AND CANAL TRANSPORT

Before the railway was developed goods such as coal, sandstone and limestone from the Mansfield quarries were transported by wagons pulled by horses along the roads.

The roads were just dirt tracks; they often flooded and were filled with boulders. Travel by stagecoach or wagon was difficult and dangerous. By the late 1700s improvements were being made, for example using broken stones for the surface and sloping them down from the centre of the track to allow water to drain. Tarmac was not invented until 1901 by Edgar Hooley; it was patented in 1902 and the first Tarmac road to be laid was Radcliffe Road, Nottingham.

Businesses transporting goods on the roads had to pay a toll (a charge) to get through turnpikes (long sticks which blocked a road until the fare was paid) which was expensive. The money collected went to the Turnpike Trusts to maintain the roads.

By the end of the 1700s canals (man-made rivers) were making it possible to transport goods to Nottingham, Derby, Leicester and beyond by allowing bigger loads of goods to be transported further afield.

KEY QUESTION:

Why was it possible to transport bigger loads and further distances by the canals? (Allow children to discuss before telling them.)

POSSIBLE ANSWERS:

- Canal boats (barges) can carry heavier loads than a horse or horse and cart.
- They take far less energy to move the loads than with carts so one horse can pull a canal boat along that has several times more weight than a cart.

In 1765, a wagon hauled by several horses was legally limited to carrying a load under six tonnes (equivalent to the weight of three giraffes), whereas a horse towing a barge could move thirty tonnes (equivalent to the weight of five elephants).

The Cromford Canal was created in 1789 to transport goods to and from Cromford to Nottingham. The nearest wharf for loading goods from Sutton-in-Ashfield was at Pinxton.

The Cromford Canal was built by William Jessop, one of Britain's leading civil engineers who worked on many canals, harbours and early railways. William's second son, Josias, later played an important role, as engineer responsible for the Mansfield to Pinxton Railway.

As local industries in and around Mansfield expanded, they needed other ways to transport their goods, but the terrain around Mansfield was unsuitable for building a new canal due to the many hills and overall height differences. They would have had to build 15 locks in just eight miles between the Cromford Canal at Pinxton and Mansfield. It was therefore agreed that a railway from Mansfield to the wharf at Pinxton (where the goods were loaded onto the barges), was needed.

A "canal lock" is a large chamber of water that lifts or lowers canal barges or boats between different levels of water to enable them to go up or down hill. However, this is a slow process and adds a lot of time and energy to the journey.



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SLIDE 4 WHAT IS A FREIGHT TRAIN?

When goods are transported on the railways it is known as freight.

When the steam engine was invented steam-powered trains took over as the main way to transport big and heavy loads across large distances. These became known as freight trains.

On 21 February 1804, the world's first steam-powered railway journey took place when Trevithick's unnamed steam locomotive hauled a train along the tramway of the Penydarren ironworks, near Merthyr Tydfil in South Wales.

The railways were also a quicker way of transporting mail and newspapers around the country.

The internal combustion engine was invented in 1879 and the first motor car was driven on a public road in 1894. By the 1920s road haulage had become big business although trains continued to transport heavy freight. Rail freight continues to carry more than £30bm of goods around Britain each year. Each freight train takes about 76 HGVs (lorries) off the roads, helping to ease congestion.

KEY QUESTION:

Why is it a good thing to use freight trains instead of lorries and vans on the roads? (Allow a discussion before summarising.)

POSSIBLE ANSWERS:

- Takes traffic off the road.
- Reduces harmful emissions.
- Faster when moving large loads.
- More economical.



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The answers are shown on slides 6-9.

SLIDE 6 LIMESTONE

Limestone is a hard sedimentary rock, composed mainly of calcium carbonate or dolomite (a mineral made of calcium magnesium carbonite).

Limestone is an excellent building material and is also used to make cement for brick laying or mixed with sand and gravel to make concrete.

The quarrying of limestone was a strong, but small, business mainly located on the west side of Mansfield, along Chesterfield Road with some works in Rock Valley and along what is now known as Quarry Lane.

The railway enabled the town to export limestone as far afield as London, where it was used in the lower levels of the Houses of Parliament and Trafalgar Square!

The stone went on a complicated journey to London, via the Mansfield and Pinxton Railway to Pinxton, down the Cromford and Erewash Canals to Long Eaton, and along the River Trent to Gainsborough where they were loaded and transported by sea to the Thames. This enabled the stone to be offloaded 'on site' at the Houses of Parliament!

Useful animation on different types of rocks on BBC Bitesize: What is a rock (Key Stage 2): www.bbc.co.uk/bitesize/topics/z9bbkqt/articles/zsgkdmn

SLIDE 7 SANDSTONE

Sandstone is a sedimentary rock composed of sand-size grains of mineral, rock, or organic material. The grains are cemented together with silica, calcium and magnesian carbonates.

TEACHER'S NOTES

Sandstone is hard wearing and durable making it a good building material. It can also be used to make fountains and statues as it can easily be carved.

There are even some houses in Mansfield which were carved out of the sandstone around 600 years ago. It is thought the dwellers (the people who lived there) created the homes to avoid paying rent. There was still somebody living in one of the rock houses as recent as 1905, but they are not safe to live in now. Here is an article in the Mansfield Chad about the Rock Houses: www.nottinghampost.com/ news/local-news/life-forgotten-rock-houses-mansfield-3811164

Local sandstone was used to build the Old Town Hall and Old Court building at the top of the marketplace in Mansfield.

The sandstone 'Mansfield White' (which is a variety of Magnesian Limestone) is one of the main building materials for Southwell Minster, which dates back to the 12th century.

A different type of sandstone called 'Mansfield Red', also a Magnesian Limestone is used on either side of the entrance of the Galleries of Justice in Nottingham, which used to be the Shire Hall and Gaol.

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SLIDE 8 MALT

Malting is a process in the making of beer. Malt is also used in biscuits, vinegar and bread.

The malting process involved germinating barley by steeping it in water, it is then allowed to rest (couching), then spread out on the floor to continue germinating – for up to two weeks – then it is shovelled into a kiln (an oven) and finally the kilned malt was stored in wooden barrels.

Many taverns brewed their own beer, and people made beer in their own homes but malting was generally done in a malt house in the town.

A survey of 1824 shows that there were 28 malt kilns in Mansfield along with nearly 20 brew houses, most of the latter being connected with one of the local inns or taverns.

Mansfield Brewery opened in 1855. It was one of the country's largest independent breweries.

The Old Maltings on Midworth Street in Mansfield is a Grade II listed building, which means it is protected by the law. It is one of twelve listed malt buildings across Nottinghamshire.

SLIDE 9 OTHER GOODS

Other goods were sand (moulding sand, quarried locally and of superior quality, containing no pebbles, which is why Mansfield supported so many foundries), timber and manure (over 10 tonnes of the latter per week).

Bones and manure were mostly classified together for the accounts. Early 1800s' Mansfield was a major farming community, producing barley for the malt industry. This meant a large amount of horses were still in use in the farming community. The railway company also employed the use of dozens of horses, with stables at Pinxton and Mansfield. The town was also a major coaching centre where many inns and hotels had stables.

Manure was used as fertiliser to help crops grow. Bones were used to make glue for furniture making and we do know of two glue factories, one in Sutton and one in Mansfield Woodhouse, so perhaps the bones were being imported rather than exported. Bones would have been collected from both slaughterhouses and private houses (by a rag and bone man). Bones were also ground down to produce bone-meal for fertiliser, which may be why manure and bones were classified together.



Why was the Mansfield and Pinxton Railway created?

SLIDE 10 WHAT GOODS WERE TRANSPORTED INTO THE AREA ON THE MANSFIELD TO PINXTON RAILWAY?

The answers are shown on slides 11-12.

SLIDE 11 COAL

The railway was no small venture. In 1834 there were almost 60 thousand tons of goods transported on the lines, both to and from Mansfield (although mostly into Mansfield).

Fifty thousand tons were coal and coke to Mansfield, mainly for use in the gasworks and the breweries. The first coals to the New Mansfield Gasworks were delivered on the Mansfield and Pinxton line in 1821.

There were also over 20 malthouses in Mansfield during the early 19th century, all wanting coal.

What is coal?

Coal is a sedimentary rock which is combustible. Rock strata are known as coal seams.

Coal is mostly carbon with variable amounts of other elements, mainly hydrogen, sulphur, oxygen, and nitrogen. Coal is formed when dead plant matter decays into peat and is converted into coal by the heat and pressure of deep burial over millions of years.

Coal has been used for centuries to make fires in people's homes.

Coal had been mined at Pinxton since Tudor times (16th century – over 500 years ago), but when the Cromford Canal was created in 1794 goods – including coal – could be transported further afield. More mines were created in the Pinxton area, as well as four lime kilns and a 'china works' producing quality pottery. In 1819 Pinxton became the terminus (last stop) for the new Mansfield and Pinxton Railway.

By the early 1800s there were quite a few mines around Nottinghamshire, namely at Beggarlee, Bilborough, Brinsley, Eastwood, Greasley, Skegby, Trowell and Wollaton. Instead of digging deep beneath the ground, new shallow pits were dug.

By the 1840s new technology meant that deeper mines could be dug. There was also a greater demand for coal as factories were converting to steam power (generated by coal being burned to heat up water).

Steam power also helped the mines by fuelling machinery that could dig deeper. These machines could be powered by poor-quality coal. So, the mines used their waste in it and sold their best coal.

The invention of steam power meant that trains became more powerful and could move large qualities of coal around more quickly.

KEY QUESTION:

Why did the mines use poor-quality coal?

POSSIBLE ANSWERS:

- Customers only wanted the best coal, but the mine owners couldn't afford to throw away the unwanted coal, so they used it themselves.
- The poorer coal emitted more smoke and fumes which was no good for home fires (it could cause chest problems as well as poison people) but the coal mines were not too close to houses, so they could use it.
- Good coal gave off more heat per ton of coal and was more efficient but the coal mines could use the poorer coal since there were no transport costs, so they could afford to burn larger quantities to get the same amount of energy as the better coal.



Why was the Mansfield and Pinxton Railway created?

SLIDE 11 (CONTINUED) COAL

Babbington Colliery at Cinderhill, Nottingham (sunk in 1841) was the first site where serious coal mining on an industrial scale took place in the county. Many more mines were opened between 1850 and the turn of the 20th century. There is a good map showing where these mines were in Nottinghamshire on the Nottingham Heritage Gateway website: www.nottsheritagegateway.org.uk/themes/ coal.htm

Nottinghamshire was a relatively new coalfield compared to the other mining areas in Britain, and most of the larger mines were opened and developed after 1900.

When coal is burned it produces carbon dioxide which contributes to global warming - also known as climate change. In 2016 many countries agreed to reduce how much coal they use and to start using more renewable energy sources, by signing the Paris Agreement.

SLIDE 12 IRON

Iron is one of the most common elements on Earth. Iron ores can be found in the earth and the base metal extracted using kilns or furnaces – this is known as the smelting process. Iron has been worked, or wrought, for millions of years.

After 1770, iron (and later, steel), replaced wood as the material for making industrial machines and tools.

By the turn of the 18th century ironworks were cropping up near coalfields, which usually had iron ore nearby.

When steam power was invented iron was needed to make the machinery and with further innovation iron became more in demand.

1825 has been called the start of the new Iron Age, as the iron industry experienced a massive stimulation from the heavy demand for railways, which needed iron rails, iron in the stock, bridges, tunnels and more. Meanwhile, civilian use increased, as everything which could be made of iron began to be in demand, even window frames. Britain became renowned for railway iron. After the initial high demand in Britain dropped, the country exported iron for railway construction abroad.²

The main iron producer of the area was the Butterley works at Codnor Park. They had obtained both their iron ore and coal from further down the Erewash valley for decades. In 1823, when new deep shaft coal mines were being opened in west Kirkby a new line was built directly from their works to the Mansfield and Pinxton Railway, which ran alongside the new mines. This enabled Butterley to not only get coal from these new mines but to transport their iron and steel products into Mansfield to serve the foundries and engineering factories. Butterley was owned by the Outram and Jessop families that you learnt about.

KEY QUESTION:

What impact did this have on the Butterley works?

POSSIBLE ANSWERS:

- Cheaper coal, due to less transport costs, kept their costs down and could be more competitive when selling their finished products.
- Cheaper transport costs and able to deliver much quicker to the emerging iron industries in Mansfield, again making them competitive.
- The same people who owned the iron works also owned the new mines, which meant cheaper coals to the iron business and more profits (from both coal and iron) for the owners.
- The more iron they could sell meant more employment for the local labour force.



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SLIDE 13 HOW WERE GOODS TRANSPORTED BEFORE THE RAILWAY?

Before the railways, goods were transported by wagons pulled by horses along the roads. At the beginning of the 1800s the main roads were little better than tracks; dry and dusty in the summer, wet, muddy and heavily rutted in the winter, sometimes almost impassable.

The main form of transport was the horse, with or without a wagon, or walking for the average person. In an effort to reduce the loads, and hence the weight of vehicles using the roads, in Georgian times (18th century) the tollbar companies dictated how many horses could be used per wagon by varying their toll charges accordingly.³

The birth of the canal system (man-made rivers) enabled goods to be transported longer distances. By 1790 there were canals linking the four main rivers in England with seaports: Severn, Mersey, Trent and Thames. From the Trent near Long Eaton, the Erewash Canal led northwards to Langley Mill.

SLIDE 14 THE CROMFORD CANAL

The Cromford Canal extended the Erewash canal north to Cromford, with a branch to Pinxton. It enabled coal to be transported from the Erewash and Derwent Valley and also served the lead smelters at Lea, limestone and gritstone quarries around Crich and Lea, and the ironworks at Alderwasley.

Permission to build the Cromford Canal was granted through an Act of Parliament, passed on 15th July 1789. William Jessop was appointed principal engineer, and Benjamin Outram became superintendent of works. It was fully open in August 1794.

A number of the people involved with the canal formed a company called the Butterley Company to mine for coal and iron ore under Butterley Hill, through which the canal was to pass in an almost 3,000-yard-long tunnel. The canal was successful and it was soon transporting around 300,000 tons per year of goods.

However, by the 1840s competition from the railways forced the canal company to charge less for transporting goods, known as 'tonnage rates' (the amount charged per ton per mile) so that toll income began to fall rapidly – from £12,086 in 1841 to £7,588 in 1850.

In the second half of the 19th century the railways became the preferred choice for transporting goods long distance although the canals still moved goods around locally. In August 1852 the canal was sold to the Manchester, Buxton, Matlock and Midlands Junction Railway for £103,500.

In 1889 the Butterley Tunnel collapsed and was not repaired until 1893. Some 180 boats a year then used it, until a second collapse in 1900 closed the tunnel for good. The canal was officially abandoned in 1944 and in the late 1960s British Waterways, who were by then responsible for the derelict canal, sold off sections to local businesses and the County Council.

You can walk the whole way down the route from Cromford to Langley Mill.⁴



³ The story of the Mansfield and Pinxton Railway, Kirkby Archaeological Society, 2020

⁴ www.birdswood.org/about/the-history-of-cromford-canal/

Why was the Mansfield and Pinxton Railway created?

SLIDE 15 A MAP OF THE CROMFORD CANAL

SLIDE 16 THE EARLY BRAKING SYSTEM

Construction of the Mansfield and Pinxton Railway began in 1817, starting at the Pinxton end because materials could easily be brought in via the Cromford canal.

The track was 13 kilometres long (8 miles) and took two years to build.

Poor people were employed from the district to work on the railway, and the proprietors viewed this as a way of helping the needy, as there was very little social support in those days.

Over 300 men worked on the railroad with around 30 working on the railway line at any one time, but not without incident.

It was opened on Easter Tuesday, 13th April 1819.

Wagons were pulled by horses from Mansfield to the top of the railway (The Summit) at Kirkby and then guided down the tracks by a driver on foot, slowing the wheels with a wooden stick used as a brake. A more advanced method of slowing the train down was by inserting a block of wood acting as a brake pad on the wheel – just like on a bike. Braking was dangerous; in the first method the driver had to jump off the cart to use the braking 'stick' whilst holding the horse reins so there was the risk of falling over and hurting himself. With the other method he might get his hand stuck in the wheels inserting the block of wood.

The railway had two tracks for going in both directions at the same time, with one side always going up and the other always going down.

The following incident on the Mansfield and Pinxton Railway was reported in the Midland Gazette, 1846:

"On Wednesday Mr Swann held an inquest at Kirkby, on the body of Samuel Dean, aged 45 years, who died in consequence of being run over by some wagons on the above line of rails, having slipped and fallen down while attempting to jump onto a wagon, while it and others behind it were being drawn by two horses which he was driving."

There were two ways of using a parking-brake: The first would be to leave the bar between the wheels but the second was to have a trailing bar hanging behind the wagon so if the wagon started to roll backwards then the bar would jam into the ground and stop it – a bar could be put onto each end of the wagon.

The upward tracks would be curved inwards – known as a camber – so that the carriages would glide more easily upwards.

For the first 13 years the railway was just used to carry freight. The first passengers were able to sit on basic seats to get from Pinxton to the market in Mansfield, on a Thursday.



Why was the Mansfield and Pinxton Railway created?

SLIDE 17 TWO EARLY RAILWAY DESIGNS - L PLATE AND EDGE RAIL

Crude cast iron rails were first used by Richard Reynolds in 1762 but it was William Jessop who invented the early flat topped and fish bellied edged rail in 1789. They were made out of cast iron in three-foot (0.9m) to six-foot (1.8m) lengths. The rails for the Mansfield and Pinxton line were exactly 36 inches long.

The side plates were cast onto the rail through which metal spikes secured the rail to padstones. The padstones on the Mansfield and Pinxton Railway were 10 inches by 16 inches and 10 inches deep.

In 1797 edge rails were cast with no built-in feet or fixing holes, these were mounted in cast iron brackets called 'chairs'. This system of rails and chairs became the norm for railways built after the beginning of the nineteenth century.

SLIDE 18 OTHER GOODS

The other popular design at the time was the L plate – designed by Benjamin Outram. The L-section plateway rails were bolted or spiked down to wooden cross ties (or sleepers) to keep them a constant distance apart. Plateways were initially used to transport goods short distances from mine or quarry to a nearby canal but some lines were up to thirty miles long.

KEY QUESTION:

What happens to wood after an extended period of time (such as the sleepers)?

ANSWER:

It rots and therefore becomes unsafe and has to be replaced.

Unfortunately, untreated wood had a tendency to rot and after about 1800 various people began using stone blocks laid in rows under each rail. There was nothing linking the two rails together, but the blocks were heavy enough to prevent the tracks moving. Generally, the L's faced outwards and the stone blocks were usually either square or roughly circular with a hole somewhere about the centre. A wooden plug was driven into the hole and the track was secured to this with a metal spike.

Outram and Jessop ran the Butterley Company together which produced iron products for industry. They seemed to have agreed to differ which sort of track was best for the railway and their firm produced both types of track depending on who was in charge of a particular project.

SLIDE 19 FISH-BELLIED EDGE RAILS

Fish bellied rail was not as common as the L shaped rails on minor tramways and wagonways feeding full-size railway loading points but it remained in use in some remote locations up to the 1940s mainly carrying horse-drawn or man-pushed mineral wagons.

From 1834 all replacement rails had to be at least 12 feet long. Padstones were still used but were now larger – 20 inches by 24 inches and 8 inches deep. Sleepers – supports adjoining one side of the track to the other – were only introduced when the line was upgraded to steam. They were designed to keep the tracks the same distance apart. They were made from wood and also, steel. Concrete sleepers are more common today and manufacturers are now experimenting with making sleepers out of recycled plastic.

SLIDE 20 WHAT THE EARLY RAILWAY LOOKED LIKE



Why was the Mansfield and Pinxton Railway created?

LEARNING ACTIVITIES

1. Class discussion

Work through the slides asking questions to prompt discussion. Some possible discussion prompts: What must it have been like taking your goods from one place to another on the old roads?

Answer:

Very dangerous and uncomfortable. The tolls also cost money which people might have resented paying for going short distances.

How did the invention of the railway help local businesses in the Mansfield area?

Answer:

Manufacturers could sell their goods outside the area and make more money. Coal could come into the area to help power the factories which had converted to steam. Mansfield stone, and other goods, were valuable commodities in construction and industry. Can you also remember that the lime powder created from burning the lime chippings from the lime quarries? This powder was used to scatter on acidic soils to neutralise them for better crops. Was the job of railway driver difficult or easy? Were any risks involved?

Answer:

Injury and deaths on the railway were quite common, like Samuel Dean, who presumably got crushed by one of his own wagons whilst trying to apply the brakes.

Was the railway a good thing for Cromford Canal?

Answer:

Yes and no. The canals and the railways worked hand in hand in the beginning. As the railway became more advanced the canals weren't needed as much.



Why was the Mansfield and Pinxton Railway created?

LEARNING ACTIVITIES

2. Mansfield and Pinxton Railway quiz

1. The Mansfield and Pinxton Railway line is now part of which line that goes from Mansfield into Nottingham?

Answer: The Robin Hood Line.

2. The canals transported goods further afield before the railway. What is the loading station at a canal called?

Answer: The wharf.

3. What does the word freight mean?

Answer: Freight is the name for goods which are transported on the train (and nowadays, via lorries too).

4. How were the trains powered on the railway when it was first invented?

Answer: Wagons were pulled up / down the tracks by horses.

5. Which important building in London is built with limestone transported from Mansfield on the railway?

Answer: The Houses of Parliament.

6. Malt produced in the Mansfield maltings was transported on the Mansfield and Pinxton Railway. What is malt and what is it used to make?

Answer: Malt is made from fermenting barley and then soaking it in water. It is used in beer, vinegar, biscuits and bread.

7. Which smelly commodity was transported on the early railway to help farmers grow their crops?

Answer: Manure.

8. i) What was the main mineral that was transported into Mansfield in the early 1800s?

Answer: Coal.

ii) What was it used for?

Answer: To help fuel the steam-powered machines in the factories.

9. How many men did it take to build the 13-kilometre-long Mansfield to Pinxton Railway line?

Answer: 300 men.

10. Which part of the railway did William Jessop invent?

Answer: The fish bellied rail track.



Why was the Mansfield and Pinxton Railway created?

LEARNING ACTIVITIES

3. Draw the different rail tracks (Key Stage 2)

Take a look at Handout 3 which shows the fish-bellied edge rail (used in Mansfield and Pinxton Railway).

You should include:

- Chairs
- Padstones
- Fish-bellied edge rail



