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MINE RAILWAYS
AN INTRODUCTION TO THEIR HISTORY AND DEVELOPMENT IN THE NORTH OF ENGLAND

by

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Paper read at N.C.M.R.S. Conference, Skipton, 4th Oct. 1969.

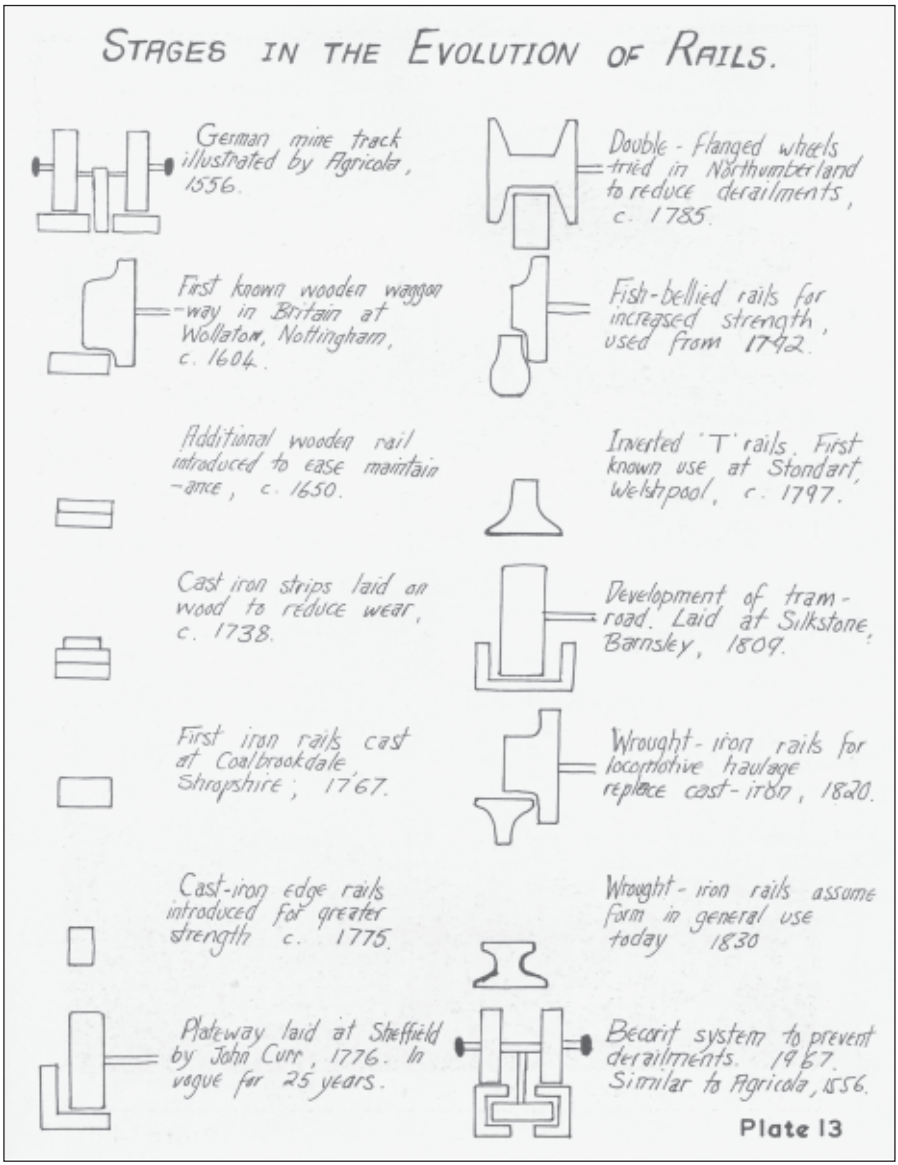
To those who have studied the lead mines of Craven, the most familiar mine railway is probably the one which ran from the dressing floors at Yarnbury to Mason's, Barrett's and Tonkin's shafts, and into the mines by way of the incline cut near Mason's shaft about 1827. Examination of the surviving trackbed shows that it was a typical mineral line of the period, having a gauge of 3ft 6ins and resting on stone blocks about 18 in by 12 in spaced at approximately one-yard intervals. The track was fish-bellied with a bullhead section, and the waggons were hauled by ponies.

Mine railways had been slowly evolving for at least 300 years when the Yarnbury line came to be built. The main developments were not so much in mines themselves but in carrying minerals from the mine exit to, initially, the nearest source of water-born transport.

An accepted definition of a railway is that it must consist of a wheel, a prepared track and a means of lateral constraint of motion. Railways may have evolved from sledges running on prepared tracks before the invention of the wheel, which itself probably evolved from rollers. It is known that in the pre-Christian civilisations of the eastern Mediterranean and Mesopotamia prepared rutways of a uniform gauge were in use, while a grooved road with passing loops was known to [77] classic Greece. These were the first examples of a disciplined way.

Not until about 1530 do we have documentary evidence of the existence of a railway. A German book published at this time, "The Origin of Common Mining law …", contains an illustration of a truck running on some kind of rails. A similar illustration appears in the 1550 edition of Sebastian Munster's "Cosmographia Universalis." Agricola's "De Re Metallica" (1556) shows a truck with a plain wheel lateral constraint being produced by an iron pin which ran in a groove formed between longitudinal planks. At this time trucks with a flanged wheel running on plain rails — with primitive points — were in use in German-worked gold mines in Transylvania, and in Alsace and Rumania.

Thus by the mid-16th century it had been realised that running wheels on wooden rails considerably reduced friction. It is also noteworthy that two opposite approaches which were to be the subject of great argument in



England in the late 18th and early 19th centuries had already become apparent — whether to run a plain wheel between flanged rails or flanged wheels on plain rails.

Although it seems that railways were introduced in Germany this is not certain; the proliferance of mining books published there at that time could

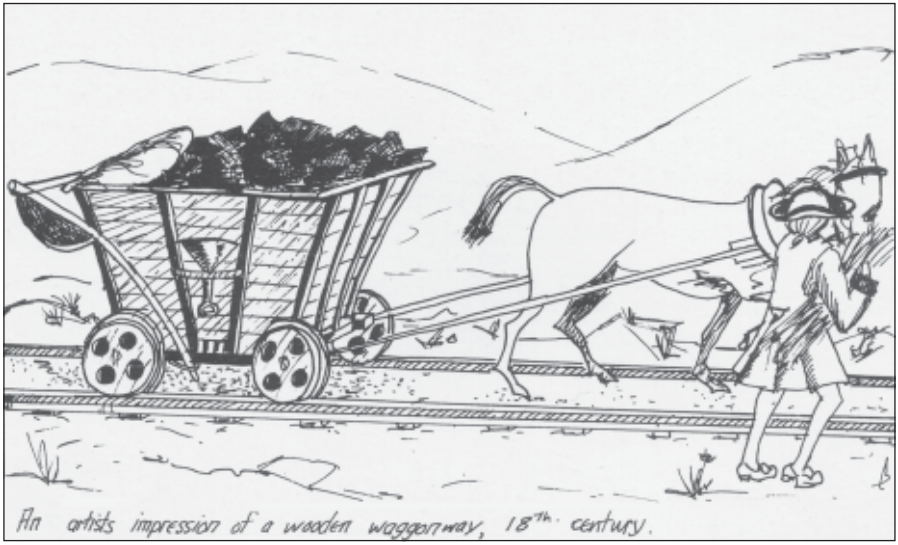
overshadow the inventions of nations less advanced in literature. Nor is there any proof that railways came to England from Germany, although it has been conveniently surmised that the idea was brought across the North Sea by German adventurers who opened up the copper mines at Keswick, and was then taken up by coal owners of the Tyne through the Earl of Northumberland who put forward a claim to these mines on the grounds of a prior grant. It is probable that there was a wooden waggonway on Tyneside by 1530.

Another probability is that a line running from Wood Hey for ½-mile to a coal pit near Prescot Hall, Lancashire, was opened about 1594. The first positive evidence of a waggonway in Britain is the construction of a line at Wollaton, near Nottingham, about 1604; this was in use by 1609, but the main developments continued to be in the North-East.

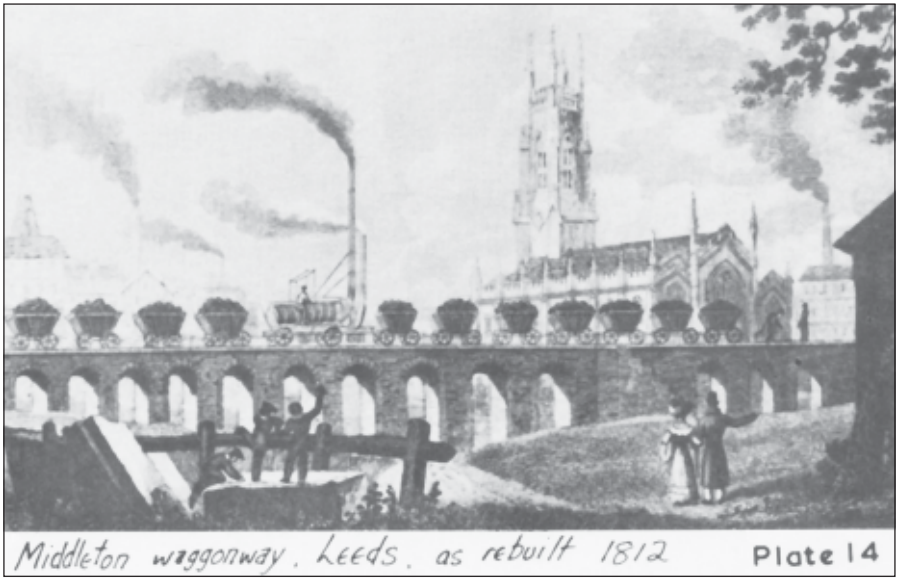
The Bebside Railway, opened about 1608, was built to carry coal from mines in the Cowpen, Bebside and Bedlington area to the river Blyth. By 1660 there were numerous waggonways near Wickham where the river Derwent joins the Tyne. These early lines were merely rectangular strips of wood laid end-to-end over roughly levelled ground and fastened by wooden pegs to wooden sleepers set about 15 ins apart. Oak, ash and beech wood was used, but gradually beech became the commonest material owing to its resistance to decay and insect attack. Rapid wear of the wooden rails led to the introduction of the “double [78] way” - a second length of wood pegged on top of the first which made maintenance easier and facilitated turning. Under this system oak, and later fir, was used for the lower “false rails”, and beech or occasionally sycamore for the upper rails.

Waggon ways taking coal down to the Wear, near Chester-le-Street, were probably built about 1693, while a major development occurred in this area in 1727. A group of local mining families joined forces to counter the excessive wayleaves being demanded by landowners and formed the Grand Allies. They built the Tanfield Lea Waggon Way, almost certainly the most advanced then constructed, which was regarded as one of the wonders of the district and was visited along with Hadrian’s Wall. Some 400 waggons a day passed over the line, Its main engineering feature was the Causey Arch of 102 ft span, which was erected at a reputed cost of £12,000 by Ralph Wood, an ordinary mason, who committed suicide because he thought it would collapse. Still standing and now the world’s oldest railway bridge, it has been scheduled as an ancient monument since 1935.

Early waggons were made entirely of wood and looked Very much like chariots for the front end was higher than the rear or the sides and the front wheels were larger than those at the rear. Iron tyres were reputedly invented at Sunderland in 1731, and soon the front wheels were made entirely of iron. Wooden rear wheels were retained for several decades, especially in the North-East. to provide better braking power.



An artists impression of a wooden waggonway, 18th century.



Middleton waggonway, Leeds, as rebuilt 1812 Plate 14

Strips of cast-iron were probably first placed on top of wooden rails at Whitehaven about 1738. They were initially only used on sharp curves to diminish friction and prevent wear. West Cumberland played an important part in the Industrial Revolution, using Newcomen engines to pump mines as early as 1715. Prior to 1725 a horse gin was used at a Whitehaven colliery to draw up tubs of water from workings under the sea by means of ropes running over wooden rollers and aided by descending empty waggons. This

was a pioneer example of the self-acting incline which did not find general application elsewhere until 1755. The Parker Waggonway at Whitehaven, opened on August 4th, 1738, in front of vast crowds of spectators, was the first in the area, and ran for ¾-mile from Arrowthwaite to the south side of the harbour. Waggonways were constructed at Seaton, near Workington, and possibly from Broughton Moor to Maryport about 1740, and coal staiths at Great Clifton for 2½-miles to Workington about 1750.

Iron rails were first cast at Coalbrookdale Iron Works, Shropshire, on November 13th, 1767, to use up some surplus iron pigs and were 5-ft long by 4-ins broad and 1¼-ins thick, They were probably laid on wooden sleepers, and after a period of successful experimental use cast-iron rail gradually began to replace wood. There was a trend [79] towards edge rails with a greater depth than width for additional strength.

The use of stone blocks instead of wooden sleepers is thought to have evolved in a curious way. About 1774 John Curr laid what was apparently a wooden waggon way from the Duke of Norfolk's collieries near Sheffield to the centre of the town. As his son later noted: "A riot ensued - the railway was torn up, the coal staith burnt, and the inventor, my father, reduced to the necessity of concealment in a wood, for three days and nights to escape the fury of the populace." When Curr came to rebuild the line in 1776 he was anxious to prevent burning and uprooting, and so used stone blocks which may have been first employed in Scotland in 1722.

The rebuilt line formed one of the earliest examples of a plateway or tramroad, a form of transport which is thought to have been first used in Britain by John Smeaton during the construction of the Eddystone lighthouse in 1756. Curr's line had cast-iron rails 3-ins broad and ½-in thick with a flange 2-ins high. Tramroads using waggons with flangeless Wheels became predominant for the next 25 years in the Midlands and the South, for they had more strength than edge rail and gave greater gauge tolerance.

The North generally remained faithful to edge rail, although a waggonway at Wylam was relaid as a plateway in 1808 and several plateways were built to take coal from pits in the Bradford area to Low Moor ironworks. The first waggonway in the North-East to be built of cast-iron was a line running from Lawson Main Colliery at Walker to the river Tyne; it was opened in 1797 and also formed the first known instance of rails being supported in chairs. Edge rails had by this time evolved into a fish-bellied form for maximum strength, and the practice of supporting such rails on chairs resting on stone blocks now became widespread.

Many developments took place around the end of the 18th century, especially in the North-East. Improvements to brakes reputedly effected at Shield Row Colliery, County Durham, in 1790 enabled a horse to take two waggons instead of one, a block being fitted to the outer as well as the inner side of

the brake so that it acted on both wheels. The “long brake” was invented at Pontop Pike Colliery in 1795; this enabled strings of waggons to be braked simultaneously by means of chains running forward from the rear waggon.

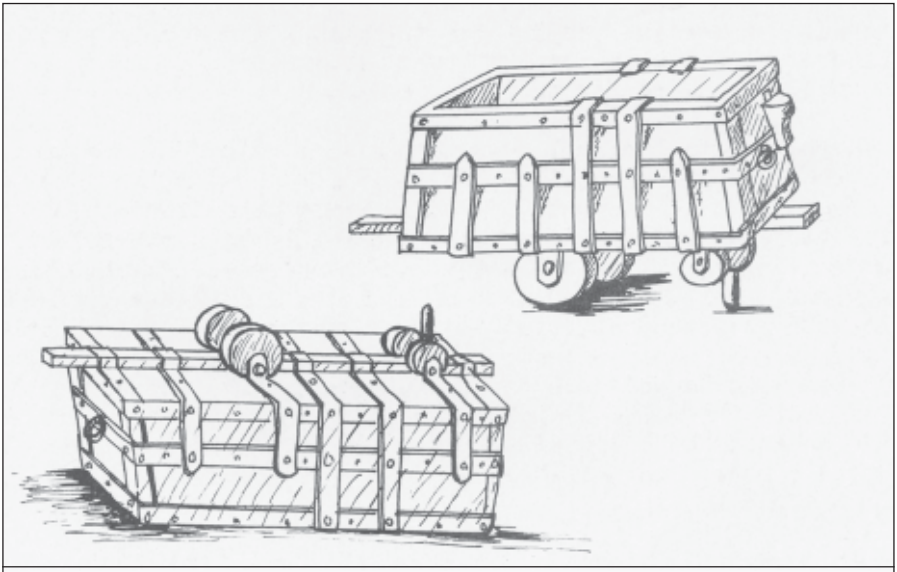
The Whingill waggonway built at Whitehaven about 1790 was probably the first to use the Losh rail — edge rails which were not square at the ends but were spliced to fit into one another. Many experiments with different rail sections took place at this time, a rail of an [80] inverted “T” shape being used at Stondart, Welshpool, about 1797. A compound rail way also invented for the simultaneous use of waggons with both flanged and flangeless wheels, while waggons with double flanges to minimise derailment were employed in Northumberland. At this time a wooden waggonway cost approximately £440 per mile excluding land, while the figure for an iron tramroad was £1,000 per mile.

The first railway of malleable iron was laid at Alloa in Clackmannanshire in 1785, and this form of track was used at Walbottle Colliery, near Newcastle, about 1805. Its first really successful application was on the 3½-mile long Tindale Fell Railway in the northeast corner of Cumberland, originally opened about 1775, which was re laid with malleable iron bars between 1808 and 1812.

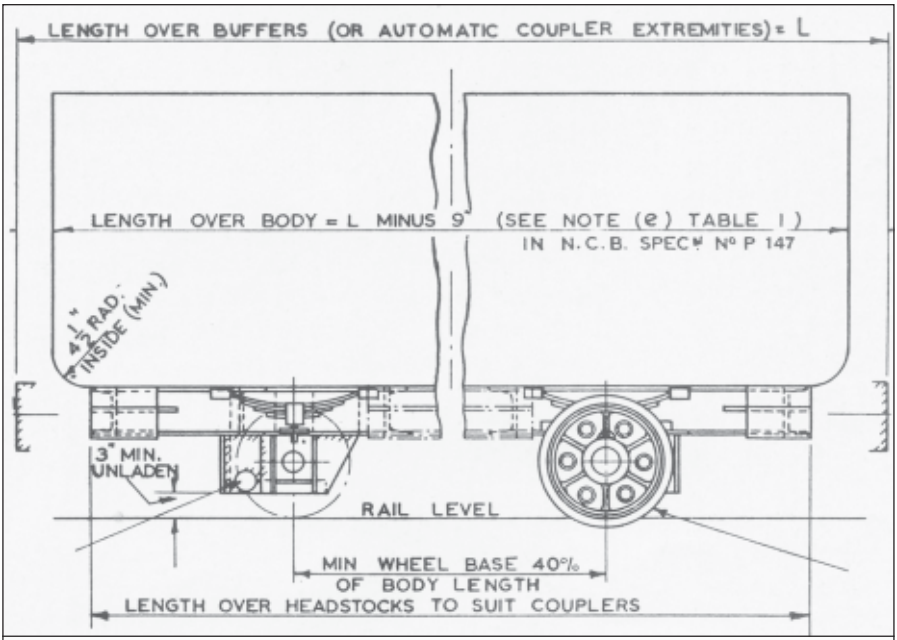
Coal drops began to be installed at Staithes from 1807, when William Chapman obtained a patent for a cradle which lowered waggons to the ship’s hold thus preventing breakage. They became a particular feature of the North-East, and the very last example at Seaham Harbour was on the point of demolition when it was saved for preservation in the proposed North-East open-air museum.

Changes in modes of haulage were foreshadowed in 1808 when the first fixed steam engine for hauling waggons was erected on Birtley Fell by the owners of Urpeth Colliery as part of a new waggonway to the Tyne. It began working on May 17th, 1809, and systems of rope haulage were gradually extended as they began to displace self-acting inclines. In 1821 a rope 1½-miles long was in use at Ouston Colliery, County Durham. Long lines were being worked by a series of stationary engines hauling trains of waggons at speeds up to 10 mph, and this system was being advocated as the standard for the future. It was particularly advanced in the North-East and at the Bowling and Low Moor ironworks, near Bradford. At Bowling the ropes often jumped the pulleys because of the many curves and had to be kicked back into position by brakesmen who frequently slipped; this was said to be the cause of the large number of one-legged men in the district.

There were several variations in haulage. Oxen were tried on the Wylam waggonway in 1811, while ponies and mules were used in the Forest of Dean. Bullocks were favoured by the Fentons, the coal kings of the West Riding, who built many lines in the area including an early waggonway from



A German mining truck of 1556.



Present day N.C.B. mining truck.

Plate 15

Greasbrough, near Rotherham, to the Don Navigation. It was constructed between 1756 and 1763, and in 1766 had wooden rails with an iron covering.

Early railway history in Yorkshire is obscure, but the first line may have been the Conisbrough stone tramroad near Sheffield. It was built out of blocks of limestone with a flange chiselled on the outside [81] of the blocks. A possible date for it is somewhere between 1745 and 1760. A more conventional waggonway was opened in 1755 from Thwaite Gate to Waterloo Colliery, near Leeds, while another early line was constructed at Flockton, near Horbury, about 1775 and now had the remains of what is probably the oldest railway tunnel in the world. An unusual line was the Silkstone Railway, opened in October, 1809, from the terminus of the Barnsley Canal to coal pits at Silkstone Cross two miles distant. It had double-flanged rails forming a trough section 4-ins wide, and was thus the tramroad equivalent of the double-flanged wheels used in Northumberland a decade earlier. Another peculiarity was that the stone sleeper blocks were not laid at right angles to the rails but diagonally; the reason for this is unknown.

It was in Yorkshire that the first railway to be built by Act of Parliament was laid down at Middleton near Leeds, the Act being dated June 9th, 1758. This line became the venue for a pioneer system of locomotive haulage which was to completely change railways. The first high pressure steam locomotive was made by Richard Trevithick, a Cornish engineer, and was steamed on the Penydarren tramroad in South Wales in 1804. It drew five waggons containing ten tons of iron and 70 persons a distance of nine miles at nearly 5 mph, but it was found difficult to secure adhesion on so light a track.

This problem was overcome by John Blenkinsop, the viewer of Middleton Colliery. To a Trevithick type engine he added a cog-wheel which worked into projecting semi-circular lugs cast on the side of normal edge rail. The Middleton line was re laid with this rack rail, and the first locomotive - built by Matthew Murray at the Round Foundry, Holbeck – was tried out on June 24th, 1812. Four locomotives were eventually at work on the line, and on one occasion 140 tons was hauled at 3½ mph. The many visitors to Middleton included Grand Duke Nicholas of Russia.

Several attempts were made to introduce locomotives working by ordinary adhesion, and one built by Thomas Swainson was tried at Whitehaven in 1812. But this, like many others, failed through breaking the light track. It was not until 1814 that George Stephenson's "Blucher", the first successful adhesion locomotive, was put to work at Killingworth Colliery, County Durham. Six years later John Birkinshaw of Bedlington Ironworks, near Morpeth, took out a patent for "T"-shaped rails, and these were used for a line laid by Stephenson at Bedlington Glebe Colliery. This line paved the way for the general introduction of locomotive haulage and public passenger railways. No longer was the word railway synonymous with mines.

The growth of a national railway network and locomotive haulage caused the demise of horse-drawn waggon ways and tramroads, although [82] examples of both survived into the 20th century. Tramroads, owing to their poor distribution of weight, were unsuited to locomotives. Waggon ways were converted into more substantial mineral lines. Proof that innovation did not come to an end is shown by St. John's Colliery Railway at Newland, near Normanton, which used special 12-wheel double bogie trucks to transport "Tom Puddings" — the trailer barges used on the Aire & Calder Navigation - from the canal to the mine and vice versa. Similarly, at the Duke of Bridgewater's mines at Worsley, near Manchester, coal boats were let down a l50-yd long underground inclined plane on trucks running on plate rails.

An excellent example of late 19th century mine railways was provided by the Weardale Lead Company, established 1883, which constructed a 2ft 6 ins gauge line from Grove Rake, a lonely industrial community in the Rookhope valley, to cleaning plants at Rispey via Wolfs Cleugh lead mine. The ore was then transferred to horses and carts for the last ¾-mile to the Lintzgarth smelt mill, and after processing the lead was taken out by the Weardale Iron Company's line which climbed from Rookhope to an altitude of 1,670-ft near Bolt's law by a tremendous incline 2,000 yards long. The narrow gauge line closed about 1909, although another line of 1ft 10ins gauge was laid from Bolts Burn mine, near Rookhope, to Lintzgarth smelt mill in 1913 and had a short but very active life of ten years.

During the twentieth century with its immense technological advances transport has become the cinderella of the mining industry. Evolution of both track and modes of haulage has been slow. Steam locomotives are still used at National Coal Board surface installations, although the increasing expense of repairs and the Clean Air Act is now causing their decline. Diesel and battery locomotives have largely taken over underground, but ponies will not be completely phased out until 1970. Standardisation of equipment has been slow, and locomotives of at least twenty different gauges are in use underground.

Change would at last seem to be on its way. The Easington High Speed Manrider is a recent installation on the Durham coast, where the workings are already four miles out under the sea and are progressing further. To give as long a working shift at the coalface as possible a seven-car articulated train hauled by two 100 h.p. locomotives giving a top speed of 18 mph has been introduced. Emergency brakes clamp on to the track so that the train can stop in less than 100 ft even at full load and full speed on the steepest down gradient of 1 in 15. Overhead monorail track, which was first suggested in 1823, is now being used in short life "gate roads".

A similar application is being found for special tracks developed in Germany, and manufactured in Britain following a demonstration given [83] to National Coal Board officials at Ilkeston, Derbyshire, in 1967. The vehicles

are trapped to a trough shaped track to prevent derailment by a large pin with a circular cog at the end. A metal trough has been developed from wooden planks and a cog added to a pin, but otherwise the similarity to the truck illustrated by Agricola in 1556 is unmistakable.

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