3 Transport before Steam (Continued)

3.2 Land Transport

(i) Roads

(ii) Tramways

(i) Roads

Very ancient, even in Britain. The Bronze and Iron Age people had their tracks along the ridges, above the forest - "ridgways" - still traceable.

The Romans were great road engineers. The engineers were a respected class of society and standards were very high throughout the vast Empire. There were 29 great military roads centred on Rome - "all roads lead to Rome". The whole system included just on 53,000 miles of properly constructed roads. (N.B. Roman mile $\simeq$ English mile). They had a road book - the "Itinerarium Antonini" - compiled around AD200.
(N.B. Roman mile = 1000 double paces $\simeq$ 5000 ft. So was in decimal system!)
There were 5 classes of Roman road:-

Via: $\sim$ 14ft wide, i.e. double-carriageway
Actus: $\sim$ 7ft wide, i.e. single carriageway
Iter: $\sim$ 5ft wide, for horses and pedestrians, i.e. bridle-way
Semita: $\sim$ 2ft 6 ins. wide, i.e. footpath
Callais: mountain road for shepherds.

For the main roads at least, the principle of construction was as follows, with local variations to suit local material available:-

5 layers starting with pavimentum, firm dry earth well rammed, replacing any loose top soil. Then the statumen, a layer of small squared stones, either dry or with mortar. Then the rudus, a concrete of broken stone and lime, 1:2 ratio. Then the nucleus, a rather thicker and this time curved layer of some sort of concrete or permanent hard layer (e.g. using iron slag). Finally the summum dorsum, the wearing surface or pavement, comprising fitted stones, flagstones or sometimes more concrete of gravel and lime. Drainage trenches cut on each side

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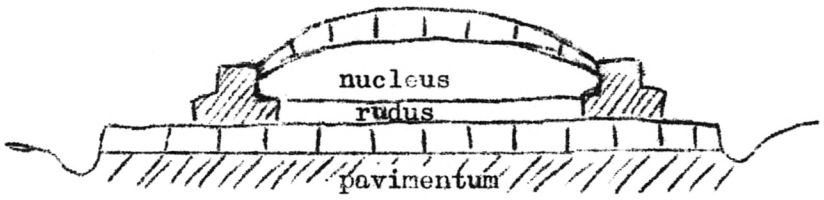

These roads were so well made that many exist to this day and form the foundation for modern roads. Their basic principle is the same as that of Telford and McAdam - firm dry soil, kept dry, can take any load, so all that is necessary is to have watertight and drained superstructure.

The Roman road system of Britain is shown on the map.

After the Romans withdrew from Britain, the roads were of course used by the natives, and by the Saxon, Danish and Norman invaders; but they were not maintained and gradually deteriorated. A secondary road system to meet local needs in a feudal state grew up - not built by engineers, no proper principles, not surveyed - just tracks going round fields and hills - and these formed the basis of most of our present local and many of our main roads to-day. During the dark ages and up to about the 16th century there was little wheeled traffic, but carriages and carts came in around 1500.

From the Norman invasion (1066) to the Dissolution of the Monasteries (1536 AD) the roads were better kept for military, then ecclesiastical, purposes. But in Stuart times they were appalling again. No real improvement until the first Turnpike Act 1663, making the users pay. Unpopular for a long time; nevertheless eventually successful, and by 1848 there were 30,000 miles of turnpike road in Britain.

The new techniques of road construction were basically those of the Romans, but the detailed processes differed. The French were ahead of us, with Tresaguet c1764 building a 3-layer road. In England, blind John Metcalfe set up new standards in the same period, but our main road engineers were Thos.Telford (active on roads around 1790-1820) and John Loudon McAdam (active around 1815-1830). Telford built expensive, excellent roads; McAdam much cheaper, thus

3 layers of 2 inch stones, each pounded well and 4" thick.

Passing of traffic with iron tyres created small stones and dust which quickly filled top layer and made it impervious.

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Most of Telford's roads have survived, but it is doubtful if any of McAdam's have.

Portland cement was developed early in the 19th century and had a big influence on road building in many ways. Much used for concrete roads in latter half of 19th century, nowadays for bridges, &c.

Tar and asphalt came into use in 1830's.

Traffic

Earliest traffic after Roman era was pack animals, and these carried most of merchandise and material for industrial processes throughout the dark ages and up to perhaps 1800 - and much later in some instances. It was the expense of pack animals and the hopelessness of the roads which led to the development of tramways in the 17th, 18th and early 19th centuries.

Road vehicles

This is a big subject which I have'nt studied properly. Just want to mention one or two traditional items.

(a) Carts for farm use. See Sturt. Handmade entirely up to beginning of 20th century, probable that designs unchanged over many centuries. My father-in-law bought a fine new 2-wheeled farm cart, hand made by a local (Lincs.) firm, about 15 years ago. Doubtful if a new one could now be bought.

(b) Passenger carriages. Shocking road surfaces necessitated very soft springing. Body usually slung from wheeled frame.

Coaching Traffic

Developed fast in Britain once passable roads were available. Reached a high peak in the 1820's. For example:- Edward Sherman ran a very extensive coaching service from "The Bull and Mouth" (origin of name unknown) in St. Martins-le-Grand, London. At the peak he had over 50 mail and stage coaches leaving his yard every 24 hours. They went chiefly to the north and north-west, e.g. "The Wonder", London-Shrewsbury, introduced 1825, 154 miles in

14¾ hours, with 80 mins stops, av. 11½ mph; and "The Manchester Telegraph", 186 m in 18½ hrs, dep.Ldn. 5.0 a.m., arr. Mchr. 11.30 p.m. Other destinations included Aberdeen, Aberystwyth, Birmingham, Carlisle, Exeter, Hereford, Holyhead, Leeds, Newcastle on Tyne, Worcester, York, etc.

Another coach operator was W.J. Chaplin operating from "The Swan with Two Necks".

In the early 1830's competition among coach operators was cutthroat, low fares, risky driving and accidents, but speed never substantially above 10-12 mph.

Coaching traffic started to die as railways opened. London-Birmingham traffic died 1838, Ldn.-Manch.1842.

Sherman was obstinate: stuck to coaches, and finally failed.

Chaplin got on railway bandwaggon, and was Chairman of Ldn. & Sth. Western Rly.Co. 1843-52 and 1854-58.

Reference

H.W. Hart, "Sherman and the Bull and Mouth", J.Transport Hist., 5,May 1961,p.12.

LONDON'S OMNIBUSES

Hackney coach monopoly done away with in 1832.

Thereafter omnibuses (horse-drawn) could pick up passengers in central London.

1855: London General Omnibus Co. formed.

1856: L.G.O.C. had 810 vehicles. Suppressed competition successfully until 1881, when London Load Car Co. started. Tramway competition (also horse-drawn) in late 1860's. Railways were also competitors, but around 1850 more people went to work by bus (and also by boat!) than by train. Then railways gained, but by the last quarter of 19th cent, buses were again in ascendancy - still horse-drawn!

Electric trams and electric railways towards the end of the century eventually ousted the horse 'bus. Motor buses introduced early in the present century.

Reference

T.C. Barker: "Passenger transport in 19th cent London", J.Transport Hist., 6, May 1964, p.166.

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(ii) Tramways and other guided transport

Less important over all history than roads, but during their period were vitally important in getting materials and goods moved at the beginning of the Industrial Revolution. (Discuss their association with canals and rivers).

In Britain, just over 1500 miles of tramway known.

Evolution was as follows:-

Abt. 1603 crude wooden rails for carts across fields called "Rayleway". 1st near Nottingham.

By 1650 numerous wooden waggonways around northern Durham and the Tyne.

By 1693 waggonways introduced to the area of the R. Wear in Durham

By 1697 " " " " " South Wales (Melyn Works,Neath)

By 1750 dozens of wooden waggonways everywhere.

Ballasted up to top of sleepers to make smooth path for horses

Wagons, waggons, or chaldrons were 4 - wheeled with (usually) inside flanges and perhaps a brake.

Later a second rail was pegged above first so that

(a) rails could be replaced when worn without disturbing sleepers.

(b) ballast could be raised 4" above sleepers to prevent horses wearing through sleepers.

Occasionally iron strips nailed to wood to provide better surface especially on curves and grades. First report 1738.

1767 Possibly the first iron rails laid, at Coalbrookdale: still wooden sleepers. Edge-rails came into use generally - short pieces of cast iron bar (4 ft).

1792 Fish-bellied edge rail (usually attributed to Wm.Jessop at Loughboro)

1802 Stone sleeper blocks replacing wooden sleepers (Monmouthshire).

By the end of 18th century, flanged rails were replacing edge rails generally though edge-rails never completely displaced. Smeaton may have made the first flanged rails in connection with his works for the building of the Eddystone Lighthouse in 1756, and John Curr claimed to have built a "plateway" in Sheffield in 1776. Waggons or trams had

unflanged wheels.

These rails were stronger than edge rails and could be laid on stone sleepers without chairs - single hole in block, plugged with oak, rail ends spiked down. Lots of these sleepers still discoverable around the country, esp. Forest of Dean.

One of the most extensive tramway systems was the Severn & Wye, opened in 1809-10 to open up the Forest of Dean (subject of a special lecture). This had 3'6" gauge although 4'2" was more usual. This system, like many, offered track for the use (under toll) of anyone who had waggons. The tramway Co. did not, in general, own the wagons or horses.

Wrought-iron rails first appeared in 1808 (edge-rails) and they were used on the Stockton & Darlington Railway (the first loco rly) in 1825. Did not get used on S & W until the 1850's, and the use of chairs on stone sleepers came in about then. The S & W rails were still flanged, and were only converted to edge-rails when the tramways were converted in the 1870's to modern railways.

Horse traction continued on tramways until at least 1943 when the last of the S & W branches was closed.

But locomotives (steam!) were developed at the end of the 18th century. In 1800 Richard Trevithick (a Cornishman) designed a locomotive and tested it on a road near Camborne in 1801. He built a number of locos for tramways, but the track of the time (cast-iron) could not stand up to them. The famous demonstration in Euston Sq. took place in 1808. Public not ready for steam traction and Trevithick gave up.

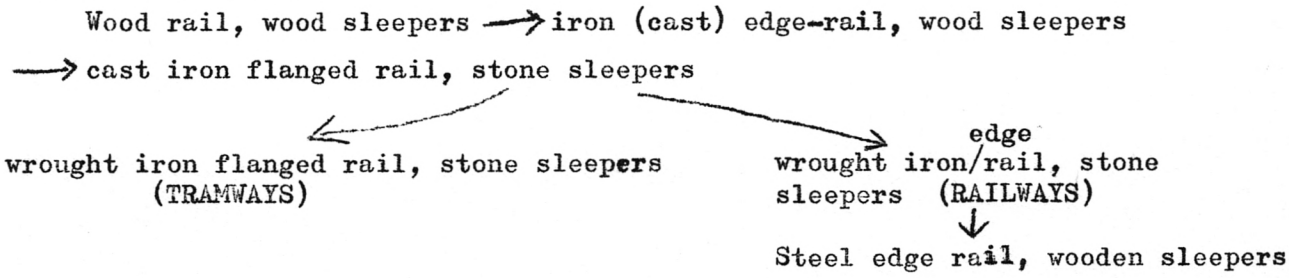
1811-13 John Blenkinsop built his locos for the Middleton Rly.(Leeds area) and got light weight coupled with good drive by using rack rail. But this cannot be regarded as a significant development, as no-one followed it up.

Wm. Hedley and Tim Hackworth built the "Wylam Dilly" - 1815 and ran it successfully at Wylam.

The real drive came with George Stephenson, a colliery engineer at Killingworth near Newcastle, who got interested in steam locos and built the "Blucher" in 1814. By luck or judgment, S became associated with an industrialist, Wm.Losh, and they produced many locos.

The Stockton and Darlington Rly, with which S was associated at the important stages, was planned as a tramway in 1817. Edward Pease was the driving force in planning, and he got acquainted with S and was persuaded to try steam locos. S appointed engineer for the line, and had son Robert as assistant. They used Birkinshaw's wrought-iron edge-rail for the main line at £15 per ton, but cast-iron rail in loops at £6.15.0d. per ton. Steam locomotives "Locomotion" and "Experiment" built and used. Successful. Line was a "public"railway, i.e. anyone's wagons and carriages could use it. Carried passengers. Started the railway era. Henceforward, railways and tramways became different in character.

Summary of evolution



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4 Meccano Magazine, Aug.1930, p.594, article on the Bennie Railplane

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8 Chambers Encyclopedia, 1950 Edition, Vol.XI, p.501, article on "Unorthodox Railways".

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2 "Science in Modern Life, (pre-1930), Vol VI

3 Encyclopedia Brittanica, 13th edition, article on "Conveyors".

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6 Railway Magazine, Nov.1932, p.365 (passenger ropeways)

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