ANIMAL-POWERED MACHINERY IN THE BRISTOL REGION

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The intention of this preliminary survey is to bring attention to the wide and varying use of the power of animals to drive machinery, in the hope that further records and, more importantly, further remains of such machinery may come to notice and be recorded. The survey is concerned with the use of animals to provide power in a rotary sense, either by direct action or gear turning, and is not concerned with traction or draught work. The geographical confines are tentatively set to within the boundaries of the new county of Avon, with fringe areas of the Mendips and West Wiltshire.

In Medieval times horse power was used to drive corn mills, in particular for malt-milling, although none of these early mills are known to survive.(1) At Sherston, on the Gloucestershire/Wiltshire border a horse-mill worth 10s per annum is recorded in 1375(2), where there was also a windmill and three watermills. This indicates the need for power, because in 1349 it was recorded that two of the watermills were worth little because they could not grind in summer, so every available source of rotary power to work the mills on this particular manor was utilised.

From Roman times the use of the man-powered treadwheel was known for raising and lowering heavy goods and in the middle ages many ports had treadwheel cranes built on the waterside for loading and unloading vessels. The Great Crane of Bristol, designed by John Padmore and built in 1735, is probably the best known example of a local treadwheel crane,(3) Treadwheels were also used for raising building materials in the construction of large buildings, particularly cathedrals.(4) The mechanical advantage of the treadwheel is based on the principle of the wheel and axle, where a small force at the circumference is transformed into a large force near the centre, the rope or chain being wound around a drum which is an extension of the axle while the wheel is revolved. Men provided the motive power where a high degree of accuracy was required, but animal treadwheels are found, particularly for water raising.(5) A good example of a donkey wheel has been re-erected in the museum of the Agricultural College at Lackham, Lacock, and the wheel is of timber construction, 13 feet diameter by 4 feet wide, and formerly was used to raise water from a deep well at New Farm, Stratford Toney, near Salisbury. Other examples are known in Wiltshire, generally located on the edge of the chalk downs where the wells are, of necessity, deep. The treadwheel is an example of the direct application of animal power, and by the mid 18th century geared machinery was also in use to raise water. At Bristol Hotwell a pump designed by John Padmore was perhaps animal powered, for in 1786 John Smeaton was consulted about possible alterations to it, and in 1789 John Rennie was also approached about a horse-wheel for pumping there.(6)

From the late 15th century horse-powered water-pumps were in use in connection with coal mine workings in England, and by at least the early 18th century were in use on the North Somerset coalfield.(7) These continued in use into the 19th century, although they were generally superseded by water or steam power where a greater capacity was needed. Horse whims, used in England from the second half of the 16th century, for raising coal and also lowering and raising pit workers, were also recorded locally, and in the 1760's Charles Whittuck encouraged the use of these machines to increase production of the Kingswood collieries.(8) A good contemporary description of a horse whim at Mearn's Coal work, High Littleton was provided by William Smith in 1792,9) and a report and reconstructed sketch of a whim used at Ubley's Rakes, at a lead mine site on Mendip, is given in BIAS Joumal 4. (10)

Horse-power was also used in the brass industry to drive edge-runner stones to crush calamine ore before and after calcining. These plants would have been located on the Mendips at the point of extraction of the ore, and the Warmley works of William Champion included two horse mills in the 1761 inventory, most probably used for orecrushing, and again it is interesting to note that the Warmley works used every form of motive power available to increase its industrial output.(11) The direct-drive principle of the edge-runner stone, where the horse simply pulled or pushed the vertical roller round a circular platform or in a trough cut in a circular bedstone, probably originated in the cider mill, but was adapted to other purposes. Serrated edgerunners were used to crush oak bark for tanning, and examples of the stones survive at Woollard and Cheddar tannery sites. The horse-walk also survives at the former.

In the early 18th century one Harvey is referred to as being in business as a woadman in the neighbourhood of Mells, grinding the woad plant with a heavy, iron-ribbed roller turned by a horse. The woad, after being cut and bruised in the mill, was pressed and later rolled and dried before being sold to the dyer.(12) An interesting early reference in Bath records a 'dyyinge'howse, formerly called horse-mill' in the 15th century, and perhaps this former horse-mill was used to grind dye-stuffs for Bath's flourishing woollen trade of the later middle ages.(13)

In the 18th century when the textile industry of East Somerset and West Wiltshire was expanding rapidly, horses were used to drive machinery in the factories and Abbey Mill, at Bradford on Avon, one of the last major woollen factories to be built in the area, was built on or about the site of a factory which worked with two 4-horse wheels.(ia) In such factories the horses were used to turn an overhead gear wheel from which horizontal drives were taken off to the various machines. In the same period, horse-power was introduced into breweries, and in 1750 a combined horse engine was in use at the Dolemead Brewery in Bath, to grind and screen malt and to raise the liquor.(15)

The main use of animal power in agriculture was for many centuries in the fields, but cider or apple mills to pulp the

fruit for making cider were in use in England from the 13th century. Remains of cider mills, the stone base from 6 to 8 feet in diameter, with a vertical roller running in a cut trough, are still found in this area, but few survive with the timber upright and pivoted horizontal shaft to which the horse was harnessed. An interesting local feature appears to be that the horse's head was over the roller shaft, and the roller was therefore pushed and not pulled.(16) A restored example, complete with a stuffed horse, has been rebuilt at Blaise Castle House Folk Museum. In Somerset some examples survive of apple mills driven by a single horse turning an overhead wooden gear.(17) These mills worked at a greater speed than the direct action type. It is in agriculture that most remains of animal-powered machinery can be found, with the cider mill stones and the round-houses connected with the early threshing machine gears, a subject recently receiving much attention from agricultural historians.(18) The threshing machine was developed in the 18th century, and initially restricted to Scotland and the north of England. The horse-powered machine was the cheapest installation, costing about £70 in the 1790's, but in 1797 Billingsley records 'not a threshing machine in the whole county' (of Somerset), and advocates their introduction with a warning that there would be a 'lessening of in-door labour in the winter months'.(19) The machines spread into the south, however, in the early 19th century, probably because of pressure on man-power caused by the Napoleonic Wars. Where machines were introduced, particularly in Wiltshire, there was much trouble during the machine-breaking riots of 1830-2. Some 25 machines were broken in Gloucestershire and 97 in Wiltshire during this period.(20)

The slowness of adoption of the threshing machine in the West Country in some way must account for the lack of 'roundhouses', familiar as barn extensions in the north and north-east. These houses were obviously necessary to protect the wooden-built gears, as well as the horses, from the weather, but by the time the thresher was becoming adopted on farms in this area, the smaller, portable, iron out-door gear was available. These were produced by local ironfounders and engineers, and Barrett, Exall and Andrewes of Reading, who introduced a horse-powered threshing machine in about 1845, had several of their machines installed in this area by 1847. A 4-horse gear at Tormarton, two 2-horse gears at Cold Ashton, one at Hamswetl House, near Bath, and one at Oakhill are mentioned in their 1847 catalogue.(21) These gears were usually set up in the yard outside a barn which housed the thresher, and the horses, harnessed to horizontal arms, walked round in a circle, the drive being taken from the gear to the thresher by a horizontal iron shaft. Intermediate gears to step up the speed ratio were also available and from this type of gear, worked by one to four horses, almost any barn machine could be driven. On some local farms the circular track of the horse-walk, in the centre of which the gear was set up, survives, and some appear to be recorded on the 1st edition 25" OS maps, as at Claverton where circles are marked outside barns at Bassett's Farm and Manor Farm, although nothing appears on site.

Much work has still to be done in the field to determine locations and, if possible, remains of these gears, also the distribution of roundhouses. A preliminary and therefore ,brief list of roundhouses is appended.

A further agricultural use of rotary horse power which has local connections is the drainage plough. This worked on the principle of a horse-capstan, set up at the edge of a field and as the horses walked round the capstan, so a low framework which carried the ploughshare at the depth required was drawn towards it. Attached to the back of the share, as much as 4 feet below ground, was a string of drainage pipes which were drawn into position underground. An improved machine designed by J Fowler of Melksham and made by Fowler & Fry of Templegate, Bristol, was exhibited at an agricultural show in 1850 and reported on favourably.(22)

In larger kitchens in both town and country, a fascinating use of animal-power is found in the dog treadwheels which turned the roasting spit before the fire. In about 1700 'one Iron crane and Dog Wheel, three Fraggetts on Spit' is recorded in the lease of a large house in Temple Street, Bristol (23) and John Wood, writing on Bath in 1765(24) describes the specific breed of dog used to turn these wheels, appropriately known as 'Turnspits', and that Bath was 'Blessed with about three thousand in Number by some Computations'. While no wheels have apparently survived in any of the Bath kitchens, three wheels from Bristol kitchens are stored at Blaise Museum, and one remains in situ in the George Inn, Lacock, although the spit has gone. These wheels vary from about 2'-6" to 3'-9" in diameter, and are only about 8" wide internally, are of timber construction, and the drive to the spit was taken by cord from a pulley on the outer end of the axle.

A final bizarre use, or perhaps misuse, of animal energy is illustrated by the punitive treadwheels erected in prisons. At Grove Street Prison, Bath, a treadwheel installed in the late 1860's 'accommodated 24 prisoners, who are employed thereon six hours daily, and the ascent is about 11/2 miles'. This form of hard labour was evidently considered corrective by both the authorities and the inmates.(25)

ROUNDHOUSES IN THE BRISTOL REGION

MARSHFIELD, Castle Farm ST 772 744 Attached to a barn. Gear gone prior to 1900, but assumed for threshing machine. The house was originally partly open, and the roof was thatched.

SISTON, Common ST 665 745 Circular building which formerly, housed a cider mill.(26)

SOUTHSTOKE, Manor Farm ST 746 613 Adjoining the fine 16th century tithe barn. Built of Bath stone under a conical slated roof. A score mark on the main horizontal beam shows where the upright shaft of the gear rotated.

WRINGTON, Lye Cross ST 490 623 Built of rubble stone under a conical tiled roof and adjoining a barn. The house is polygonal on plan and the roof is of interesting and complex form.

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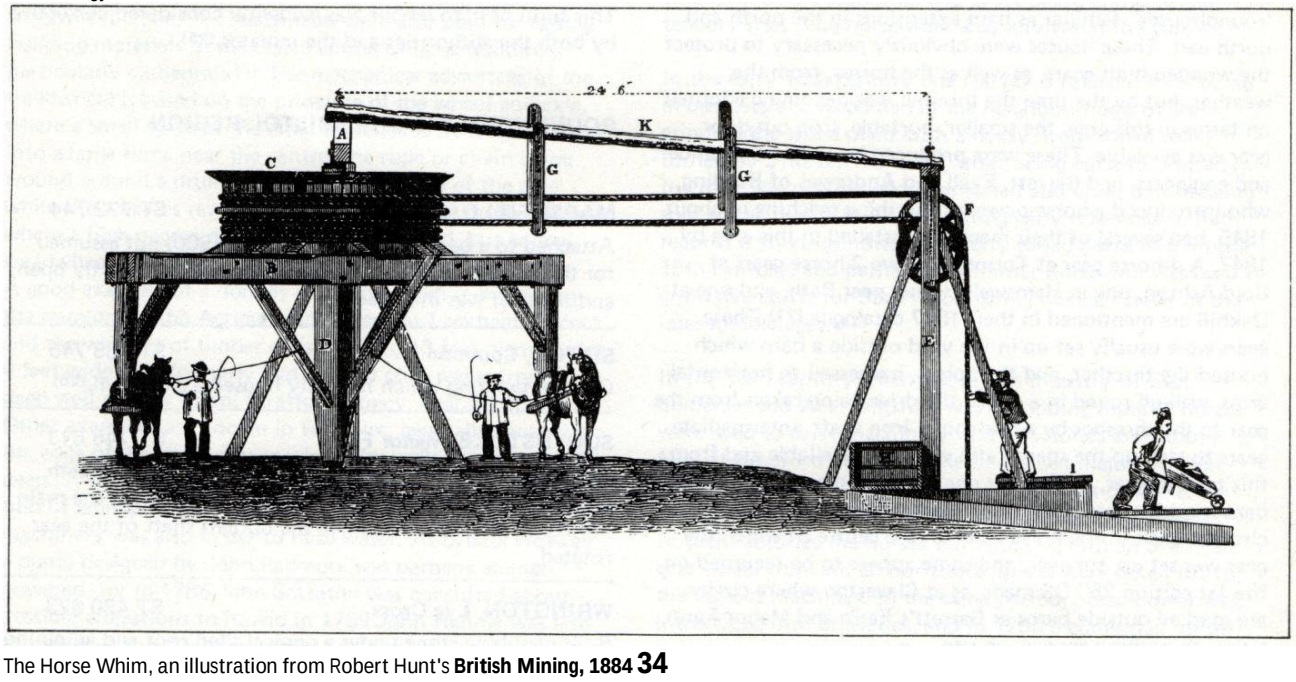

The Horse Whim, an illustration from Robert Hunt's **British Mining, 1884**