

## WATER WHEELS OF THE SHIRE BROOK VALLEY

By Mave Calvert

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### How a Water Wheel works

For many years, before the coming of steam and electricity, Sheffield's rivers and streams were used to generate the power necessary for its growing cutlery trade. In its heyday the Shire Brook fed five of these water wheels, which were used mostly for the manufacture of scythes and sickles. Just over a mile downstream from the source of the Shire Brook, at Normanton Springs, were the Upper and Lower Sickle wheels. Carr Forge and Rainbow Forge were in what is now the rangers' conservation area. Finally Cliff Wheel, the farthest water wheel downstream, was at Beighton, half a mile from the confluence with the River Rother.

A water wheel needed to be situated on a stream or river where there was an area suitable for building a dam at a higher level than the adjacent stream. The dam was filled by building a weir across the stream in order to divert some of the water. A narrow channel, known as a 'head goit' and controlled by a sluice gate or 'shuttle', would run from the stream into the dam. Some goits were open ditches, whereas others were underground brick-lined tunnels. The water wheel would have been situated at the head of the dam, which was the most downstream point. Water from the dam flowed into a wooden tank called a 'pentrough', also controlled by a shuttle. Water from the pentrough fell onto the water wheel making it turn and generating the power. The spent water from the wheel would then be taken back to the stream by means of another channel known as the 'tail-goit'. The point where the head goit left the

stream would need to be at a higher level than the dam and the point at which the tail goit returned to the stream would need to be at a lower level than the water wheel, otherwise the fall of water would not be sufficient to turn the wheel. In addition, there would often be an overflow channel for use if the dam needed to be drained.

The power generated by the water wheel would turn drive-shafts and belts in the adjacent workshops and these would power the tilt-hammers that were used to forge the scythes and sickles and the grindstones that were used to sharpen the forged scythes and sickles.

Water powered sites had several problems, especially where a stream fed several sites in a relatively short distance such as on the Shire Brook. In summer, droughts could mean there wasn't enough water in the dam to efficiently turn the wheel. In winter, heavy rainfall could mean there was too much water in the dam and stream so that the levels were affected and the wheel would not turn. Also moles could cause havoc by burrowing into the sides of dams causing leaks.

The equipment and raw materials had to be transported to the wheels and the finished goods had to be taken away. This was originally done by means of horse and cart down the narrow wooded bridleways that led to the wheels. Grindstones were moved by putting an axle through the middle of the stone, attaching ropes to horses and literally rolling the stone along.

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---

### How Scythes and Sickles are made

Before farm machines were invented, scythes and sickles were used by farm workers to harvest crops. A scythe is a long handled tool with a curved blade up to 60 inches in length. A sickle is a similar tool with a small handle and semi-circular blade with a serrated edge. A good mower could mow around an acre a day with his scythe or sickle. However, the scythe was a more efficient tool than the sickle.

Sheffield's craftsmen specialised in making either scythes or sickles and each was divided into the two distinct trades of forging or 'smithing', and grinding.

Scythes are manufactured by firstly being forged and then ground or sharpened. Working in the forge would be a forgerman or scythesmith and a lesser skilled man who was known as the 'heater'. It was the heater's job to ensure the hearth was at the correct temperature for forging. The forgerman would shape and plate the scythe by sandwiching a piece of steel between two pieces of iron, holding it in the hearth with long tongs until it reached the correct temperature and then hammering it to shape under the tilt-hammer. Prior to the invention of the tilt-hammer this had to be done entirely by hand.

The forged blades would then be taken to be ground or sharpened. Grinding was a different trade to forging and quite hazardous one as grinding wheels could break whilst in use,

which is what happened at Cliff Wheel in 1864. Scythes were ground wet to avoid getting them too hot so there was less dust and the scythe grinders were less prone to silicosis or 'grinders asthma' than grinders in the other cutlery trades. Once the scythe blades were ground they were then taken to another workshop to have their handles fitted and to be prepared for distribution to farmers and other customers.

Sickles were made by welding and forging in a similar way to scythes. After being shaped and roughly ground, the teeth would be cut by hammer and chisel and further grinding would take place. Finally, the sickle would be glazed and its handle would be attached.

The adoption of steam power from the 1850s meant that the forges and grinding hulls were no longer dependant upon waterpower and tied to the river valleys. In addition, as the industrial revolution progressed, more and more water was being drawn from Sheffield's rivers and streams for both industrial and domestic use so there was less water available to power the large amount of water wheels that had sprung up in the valleys. Eventually the scythe and sickle industry began to move into workshops in more accessible areas and the water wheels were gradually abandoned. Finally, as farming became more mechanised the demand for the scythe and the sickle was reduced and the industry is now virtually a thing of the past.

### The Upper and Lower Sickle Wheels

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The Upper and Lower sickle wheels, situated at Normanton Springs, were the farthest upstream on the Shire Brook (originally known as 'Der Brook' or 'Beighton Brook'). They were about a mile downstream from the brook's source. Upper Sickle wheel was situated on the southern side of the brook in the parish of Beighton and Lower Sickle wheel was situated on the northern side of the brook in the parish of Handsworth. The two wheels tended to be referred to and used as one water-powered site.

Upper Sickle wheel was situated on Birley Moor just to the east of Wheel Road (now known as Linley lane), slightly downstream from a fairly large reservoir. Upper Sickle had a double dam. One dam was on the Shire Brook itself and the other situated just to the south was fed by a head goit from the brook. Further downstream the tail goit from the second dam flowed back into the brook at the same place as the head goit to Lower Sickle's dam left the brook. The dams were smaller than those of the other three water wheels in the Shire Brook Valley. Lower Sickle was situated down stream from Upper Sickle in between where Normanton Springs Road now meets Dyke Vale Road and the A57.

Originally known as 'Birley Moor Wheel', the Upper Sickle wheel was built some time before 1745 when records show that the Staniforths were paying rent for it. In 1749 John Taylor of Hackenthorpe leased some land in the parish of Handsworth to erect a water wheel. This was what became Lower Sickle wheel. By 1762 both water wheels were in operation and Lower Sickle

wheel was referred to as either 'Middle Wheel' (probably because it was the middle of the three water wheels then existing along the Shire Brook) or 'Birley Moor Lower Wheel'. Later it became known as 'Nether Wheel' and the terrace of seven cottages built around 1840-1850 took the name 'Nether Wheel Row'. The cottages stood at a right angle to Lower Sickle's head goit overlooking the dam.

Improvements to the dams and goits took place between the Beighton enclosures in 1799 and the Handsworth enclosures in 1802. The main flow of the brook to the south of Upper Sickle's double dam was changed. The dams themselves were altered and the reservoir was enlarged. At the same time, one of the fields adjacent to the Shire Brook was also transferred from the parish of Beighton to the parish of Handsworth.

It was common for the operation of water wheels to be shared. Upper and Lower Sickle wheels were operated by the Hutton family, sicklesmiths of nearby Ridgeway in the parish of Eckington and the Staniforths, another local family big in scythe and sickle manufacture. John Taylor of Hackenthorpe also shared Lower Sickle until his death in 1757 when his nephew, George Inkersall took over from him. Both Upper and Lower Sickle wheels had been abandoned by 1890.

Today, there is a bridge over the Shire Brook at the site of Upper Sickle wheel. From here a path winds uphill to Normanton Springs, which takes its name from the many small springs feeding the brook. Not far upstream from this bridge, the Shire

## WATER WHEELS OF THE SHIRE BROOK VALLEY

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---

Brook's course is culverted beneath Linley Lane and beyond. The high embankment on the Normanton side is what remains of the retaining wall of the mill dam for the Upper Sickle wheel. Upper Sickle's buildings were situated in the roughly triangular area between the footbridge, Linley Lane and the Normanton Springs Road. At this bridge the water from the tail goit of Upper Sickle wheel joined the head goit leading to Lower Sickle wheel. The course of this water channel is now marked by a continuous hedge that runs alongside the path to where the terrace of stone cottages (Nether Wheel Row) once stood. The grassy area between the tall Lombardy poplar trees and the spreading Manchester poplar was once the mill dam for Lower Sickle Wheel. Part of the stone retaining wall for the headwaters of the dam can still be seen, as can the remains of the mill buildings in the tumbled undergrowth below it. The depth of the wall below the fall suggests that Lower Sickle's wheel may have been of the overshot type.

### **Carr Forge**

Carr Forge is the oldest water wheel site on the Shire Brook. There has been a cutlers' wheel here ever since Tudor times. It was originally a knife wheel but from the eighteenth century scythes were being produced here.

In the 1700s Carr Forge was referred to as 'Nether Wheel'. This can be quite confusing as Lower Sickle wheel later took the name of 'Nether Wheel'. On an 1819 map Carr Forge was known as 'William Inkersall's Scythe Wheel' and by the time of the 1851 census it had become 'Carr Forge'. The name 'Carr' most likely

came from an adjacent field that was also known as the 'Carr' meaning meadowland reclaimed from the bog.

In the mid to late sixteenth century a cutler named Christopher Chapman was renting the wheel from the Lord of the Manor. In 1726 a John Newbold was making scythes here. He paid ten shillings rent to the Lord of the Manor of Beighton.

Between 1738 and 1762 Carr Forge was not in use and it is thought that it underwent reconstruction during that time with changes to the dam, goits and buildings. Prior to then it is thought that the original dam may have been made simply by damming up the tributary stream that runs from Birley Spa, rather than taking water from the Shire Brook. From 1762 a head goit from the Shire Brook also supplied Carr Dam and a tail goit took the water back to the brook slightly farther downstream. Reconstruction of the goits took place again in the early 1800s when a new forge, Rainbow Forge, was built about half a mile downstream from Carr Forge. It was decided to use Carr Forge's tail goit to feed Rainbow's head goit and fill Rainbow Dam. The original tail goit being used as the overflow. The water did not return to the Shire Brook until it had turned the water wheel at Rainbow Forge and passed down Rainbow's long tail goit to rejoin the Shire Brook over half a mile downstream from Carr Forge.

From 1762 George Inkersall, who also operated Upper and Lower Sickle wheels, leased Carr Forge. After him came his son William Inkersall, who finally gave over the tenancy to the

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By Mave Calvert

---

Staniforths, who also had interests in all the other wheels along the Shire Brook, around 1819. The Staniforths continued as the tenants until 1879.

Employees of the Staniforths lived and worked at Carr Forge manufacturing scythes. From 1841 to 1853 a scythe maker and forger named John Moore lived there. He came from Belbroughton in North Worcestershire, which was another ancient seat of scythe manufacture. John Moore died on Christmas Day 1860 and his gravestone can be seen in the graveyard of the Woodhouse Wesleyan Chapel. By 1861 the cottages at Carr Forge were occupied by a scythe forger named William Price and his Scythe forger's Heater named William Richardson, both also came from North Worcestershire.

By 1871 there was a stream engine powering the tilt hammers at Carr Forge and the census showed both a scythe forger and a sickle grinder to be living there, indicating that both forging and grinding may have taken place here. By 1881 both a scythe smith and spade finisher were living here. In 1901 Carr Forge seems to have been used for coke drawing as a coke drawer named Richard Blackwell, and his worker John Massy, were there on the census.

In 1910 a land survey commissioned by Lloyd George showed Carr Forge to be still owned by Earl Manvers and leased to the Sheffield Coal Company.

Carr Forge was situated on the Beighton side of the Shire Brook approximately half a mile downstream from Lower Sickle wheel. It was approached by a bridleway from Birley Spa, the path of which can still be walked today. The dam can still be seen today and a stone bearing the inscription 'Carr Forge' marks the site. However, the dam that exists today is much smaller than the original dam. The water wheel and workshops were situated at the most downstream (westerly) tip of the dam. Stone posts that once held the sluice gates that controlled the flow of water can also still be seen. There were two 'L' shaped stone cottages, which housed the workers. They stood of the dam close to the mill buildings in an area now covered by hawthorn trees. They were said to be very damp and were demolished some time in the 1950s.

### **Rainbow Forge**

Rainbow Forge is situated about half a mile downstream from Carr Forge. It was the last water wheel to be built on the Shire Brook in approximately 1815. It was built on land belonging to George Shepherd of Hackenthorpe. It was originally known as 'Cow Wheel' as some of the fields in which it was built were called 'Cow Closes'. By 1819 it was referred to as 'New Sickle Wheel'.

There was a large narrow, curving dam some 120 yards long by 70 yards wide and 5 feet deep. The dam was fed by a goit that carried the used water from Carr Forge. The outline of this goit can be traced today near the path, first as an open ditch, then as

## WATER WHEELS OF THE SHIRE BROOK VALLEY

By Mave Calvert

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a short culvert and finally as a filled-in ditch until a brick-paved area carries the Hackenthorpe/Woodhouse path across it. Approximately 45 yards from here, in a clump of hawthorn trees, Rainbow's dam began to open out. Originally there was a long tail goit that took the spent water from Rainbow's water wheel and fed it back into the brook. This tail goit stretched almost as far as the 'Penny Loaf' copse. In 1819 a dispute arose between local landowners over this new water wheel. It resulted in a map being drawn up by W. Fairbank showing all five water wheels in the Shire Brook Valley. Comparison of this map and the first edition Ordnance Survey map of 1877 shows the long tail goit had gone and the dam now drained straight into the brook.

There were three dwellings as well as the wheelhouse and forge. Rainbow House, the forge manager's dwelling, was a detached stone house on the higher ground alongside the dam. There were also two stone cottages built right on the edge of the Shire Brook. The foundations of these cottages can still be distinguished today alongside the remains of the mill buildings near the stone bearing the inscription 'Rainbow Dam'. What appears to be a large grinding wheel can be seen at an angle beside the two massive stones of the wheel housing and beyond them is the stone base for the tilt hammer.

The Staniforths rented Rainbow Forge from the Lord of the Manor, Earl Manvers. From 1853 to 1864 a John Moore, son of John Moore of Carr Forge, was manufacturing scythes at Rainbow Forge for the Staniforths. The 1861 census shows him

and his family to be living at Rainbow House. The scythe-forgeman's heater, Thomas Rushton, and labourer, Joseph Grinsell, lived in the two cottages. By 1865 Rainbow Forge was known to be powered by both water and steam. In 1871 Rainbow Forge was being used for spade and shovel manufacture by the Skelton brothers. By 1881 the three dwellings were unoccupied and after then they were used to house workers associated with the East Birley Pit, which was sunk just across the brook from Rainbow in 1877. The Coal Company also took over the dam and used the water for the pit. In 1926 the dam burst and flooded the valley. Only the high retaining wall of the dam can be seen today. The dwellings were still occupied in the 1940s and were probably demolished in the 1950s at the same time as those at Carr Forge. From that time the dam gradually silted up.

A bridleway led from Rainbow Forge to the Staniforth works on Main Street Hackenthorpe and was used in the early days by the horses and carts to transport the raw materials and finished goods. However, as production increased with the introduction of steam power, Rainbow Forge started to suffer due to the lack of a local rail link and finally ceased production some time in the 1870s.

In 1910 a land survey commissioned by Lloyd George showed Rainbow Forge to be owned by James Hounsfield and leased by the Sheffield Coal Company. The area comprised of Rainbow House, the mill pond, two stone built cottages close to the old forge and gardens on the banks of the brook. The old forge was

## WATER WHEELS OF THE SHIRE BROOK VALLEY

By Mave Calvert

---

said to be disused and in ruins. The occupier of Rainbow Forge Cottage was listed as Fred Booth.

### Cliff Wheel

Also known as Cliff Dyke Wheel, this water wheel was built in approximately 1805 by the Hutton family who were sicklesmiths at nearby Ridgeway. It was the fourth water wheel to be built in the Shire Brook Valley and the one nearest to the confluence with the River Rother, about a mile downstream from what was later to become Rainbow Forge. Cliff Wheel was probably so named because one of the fields on the Beighton side of the brook where it was built was named Cliff Close. The stretch of the brook running along the edge of this field was probably known locally as Cliff Dyke.

The land on which Cliff Wheel was built was owned by Earl Manvers whose tenant at the time was George Dickenson of Beighton. Dickenson's rent was reduced to take into account the road that led to Cliff Wheel.

Comparison of the 1799 Beighton enclosure map and the 1819 Fairbanks map shows that the large dam at Cliff Wheel was created on the original course of the Shire Brook and a new stretch of brook was created following a relatively straight course on the northern (Woodhouse) side of the dam. The original brook then formed the goits flowing from and to the new stretch of water.

Initially the Huttons shared the operation of Cliff Wheel with the Staniforths but later the Staniforths became the sole operators. Various rentals in the Earl Manvers collection show rent being paid by both the Huttons (1832) and the Staniforths (1828 & 1862).

In 1864 a sickle grinder working for the Staniforths at Cliff Wheel was killed when his grindstone broke. Following this accident, the Staniforths wrote to Earl Manvers, threatening to end their tenancy due to the poor the state of repair of Cliff Wheel and its machinery. Presumably something was done about this as the Staniforths continued their tenancy until 1879.

In addition to being used by the Staniforths, Cliff Wheel was also used by their competitor, George Helliwell of Throstlenest farm, from 1865. He had scythes carried by horse and cart for grinding at Cliff Wheel prior to the shafts (handles) being fitted back at Throstlenest. Eventually the Staniforths absorbed Helliwell's business.

It is not known exactly when production ceased at Cliff Wheel but it is likely to have been around the time the Staniforth's tenancy ended and the East Birley pit was expanding.

Unfortunately nothing remains of Cliff Wheel today. Open cast mining and the construction of the A57 Mosborough Parkway have obliterated it. It was situated just to the west of what is now the roundabout where the A57 meets Beighton Road and the Trans-Pennine Trail.

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