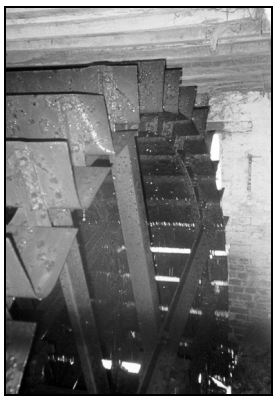
Headley Mill

Technical details[†]

The Mill is built astride the river facing S.E. with a pond of some 4 acres in front which provides the power to turn the breast shot Water Wheel (12 ft diameter x 7½ ft wide). The 'head,' which is the height between the pond level and the tail water, is approximately 7 ft. The flow is reliable and stable throughout all seasons, and is sufficient to drive a pair of Millstones perpetually.



The iron mill wheel in Headley Mill

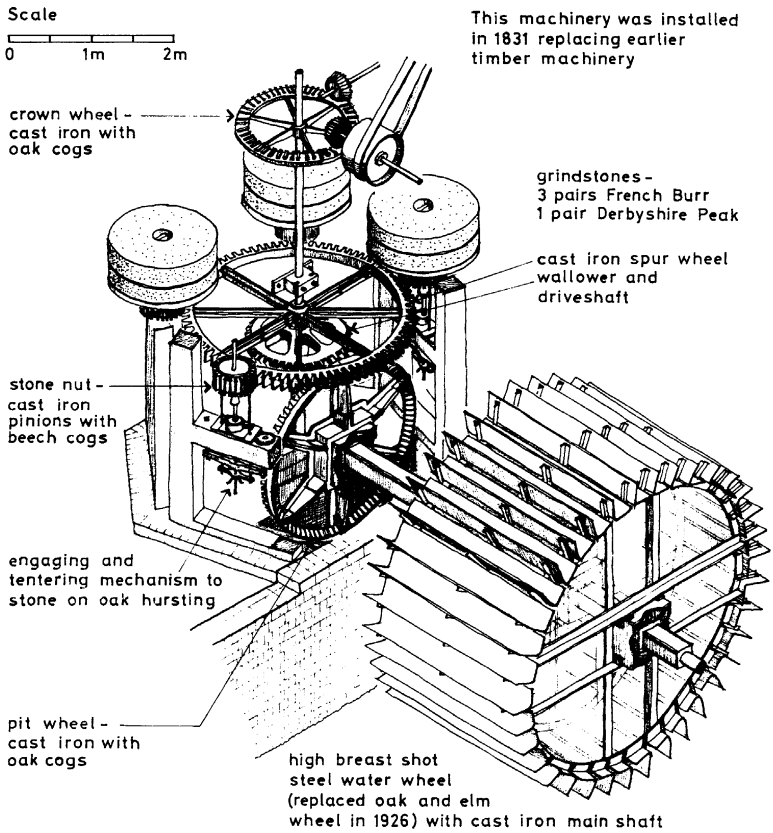
The Iron Water Wheel was installed by Coopers of Romsey in 1926 when the old wooden one (oak and elm) was scrapped because of old age, but the shaft (iron) was reused for the new Wheel.

Power is transmitted to the Mill Stones and ancillary machinery by way of the Pit Wheel, which is an Iron Wheel (9ft in diameter) with wooden (oak) teeth, driving the Wallower (iron) which drives the perpendicular shaft on which the Great Spur Wheel (Iron 8½ ft diameter) is mounted. This is a very fine piece of early iron casting. The Great Spur engages the Stone Nuts (teeth of Beechwood) which drives the Mill Stones on the first floor where two bevel gears driven by the crown wheel drive auxiliary machines, crushers, rollers, electric generator, and Sack Hoist.

There are 4 pairs of Mill stones - 3 pairs French Burr (best for wheat flour) and 1 pair Derby Peak (oats & barley). The stones are 48 inches in diameter and weigh about 1¼ tons, and the dressing is '3 furrows to a harp'. The Water Wheel will drive 2 pairs of Millstones at a time.

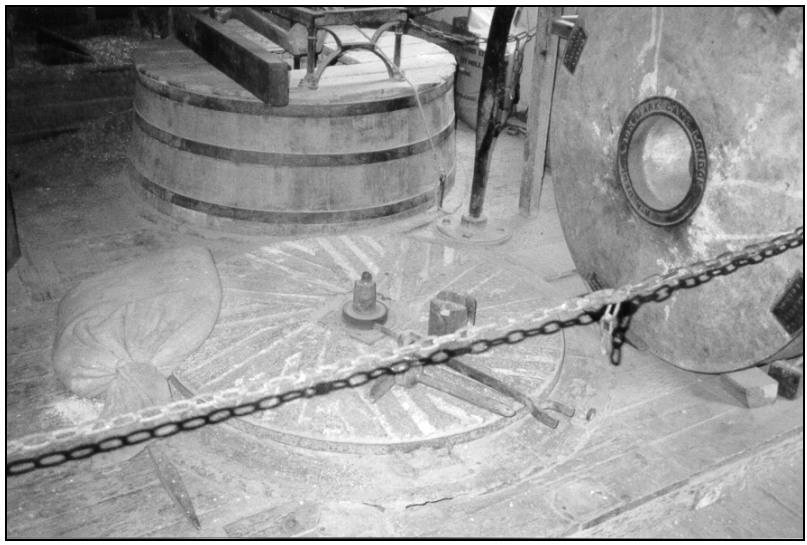
The output of flour from a pair of Millstones with a good head of water is about 4 cwt. per hour, and Cattlefood about 6 cwt. per hour. The fineness of the flour is decided by the Tentering lever which adjusts the gap between the 'Runner' and the bedstone. This can be done while the Millstone is running at full speed (120–150 rpm). The Wheat, after cleaning, is hoisted to the top of the Mill (Bin Floor) by hoist or elevator, and gravitates to the ground floor via the Millstones where it arrives as flour, and is conveyed to the centrifugals or dressers (by Armfields), and these machines decide the grade of flour i.e. 100% Wholemeal or 81% Plain Flour.

[†] Text taken from a pamphlet written by John & Peter Ellis in the 1970s

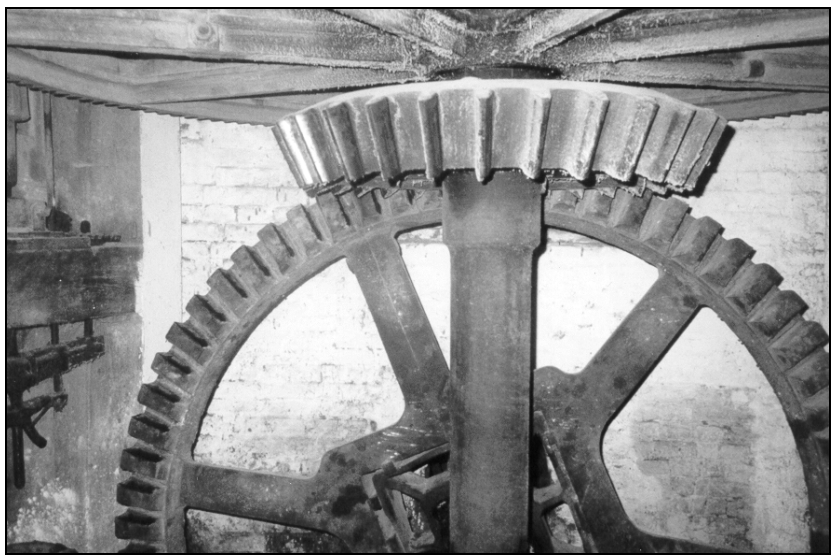


MILLING MACHINERY AT HEADLEY MILL HAMPSHIRE

Measured and drawn by D F Charter 1992



Forground: Bedstone (note 'dressing' pattern) with runner stone lifted
Background: A 'tun' containing stones enclosed in running position



Pit wheel and Wallower;
above them is the Spur Wheel

Maintenance: Gone are the days when professional Stone Dressers called regularly like the piano tuner, and we now have to dress our own Millstones[‡], fit our own bearings, shape new teeth, pack the necks, adjust the damsels, beat out the bosoms, and repair the skirts!

Ford at the rear of Headley Mill
showing the arched outflow from the mill wheel.

The advent of the Roller System about 1880 sounded the death knell for the Millstone method of flour production, and from thence forward the disappearance of the small country water flour mills, and the rise of the larger Steam and Electric Port Mills which today produce most of the flour from mainly imported wheats by about five giant companies. We use all English wheat, grown on our own farm, or within about a 20 mile radius of the Mill.

A hundred years ago our immediate countryside must have been humming with industry, for we have records of over 50 water mills working within 10 miles of Headley, and now according to a recent survey by the University of Southampton, Headley Mill is the last one still running in the whole of the county of Hampshire, and still carrying out by water power the task for which the Mill was built.

The broad oven where the villagers' bread was baked for so long is adjoining the house, but has not been used during this century.

[‡] For information on how this was done, see 'The Forgotten Arts' pp.136-138, John Seymour, Guild Publishing, 1985

Article written by Fay Foster in August 1990, following 75 years of ownership by the Ellis family

A rare glimpse of an historic watermill in action

And still the old cogs turn…

During the Sundays of June and July, the public has been able to take a tour round the last watermill in Hampshire that is still working commercially. The historic Headley Mill, owned by the Ellis family since 1914, was opened for the first time in ten years. John Ellis accompanied many visitors, giving them a fascinating account of the processes used to produce the wholemeal flour and animal feeds in which the company specialises.

According to the Woolmer Forest Rolls, there was a mill on the site in AD 978, and an architect recently verified that two beams in the centre of the present building date from the 12th century.

Few detailed records remain of Headley Mill in the intervening period, but there were known to be 54 watermills within ten miles of Headley.

During the resurgence of agriculture in Britain resulting from the Napoleonic wars, considerable sums were spent on improving the mills. The Bishop of Winchester owned the freehold of Headley Mill, which was apparently in a poor state when Sir Archibald MacDonald took it over in 1828. He must have thought it a worthwhile investment for, during his tenancy, a lot of money was paid out to put it in good condition.

Once Frederick John Ellis, the present owner's father, bought the property in 1914, the business at the mill became an established part of the local scene.

Today, 75 years later, ducks and geese swim contentedly on the millpond which, even in the present drought, shows no sign of shortage of water. The springs feeding the pond rise in the Haslemere basin, mainly from Blackdown but also in the area around Hammer and Marley Common. Further downstream a watercourse joins in at Waggoners Wells, so the flow is considerable by the time it reaches the millpond.

At the main sluice gate, there is a depth of seven feet. A wall of water flows into two tunnels under the road, creating a head which drives the giant waterwheel. Now made of steel and capable of turning at 14 revolutions a minute, the wheel was installed by John Ellis's father in 1926 replacing the previous wooden wheel which showed signs of wear. Since then, the only maintenance required has been greasing the bearings.

Close by is the central pit, or gearbox, which distributes power to the various machines. A vertical wheel with 83 wooden cogs is fixed to the waterwheel shaft; this in turn drives the vertical shaft which rises from the lower deck to the roof of the mill. Located at the top of the pit is the great spur wheel which drives the millstones. The power of the waterwheel can turn two pairs at a time, each set capable of producing six hundredweight of flour an hour.

Although since 1831 the central shaft has been of cast iron, it was formerly made of wood. The old timber is now utilised as props to shore up the second floor.

John Ellis, who does all his own servicing, maintains that every miller today has to be an engineer. "He can't just call outside engineers in every time things go wrong," he said. "He just has to get on with it."

For the specialist art of 'dressing' the millstone, a knowledge of geometry is essential. The pairs of millstones weighing 1½ tons apiece, carefully balanced just a razor blade thickness apart, are etched with a regular series of grooves. As the ridges and grooves keep the wheat moving and provide ventilation, correct alignment is vital. This is where the expertise of Peter Ellis comes in.

There are four pairs of stones at Headley Mill, three of them made of very hard granite known as burr. Mined near Paris, the same stone was used to build Chartres Cathedral. The other pair is made from Derbyshire Peak stone.

Close by is the quaintly-named 'damsel' machine. Many years ago, young girls had to sit alongside and scrape the grains into the eye of the millstones. Rumour has it they sometimes fell asleep while performing the task, so the enterprising miller invented a mechanical rocking device to do the job for them. The name still recalls the part played by the damsels of old.

Until 25 years ago the grain was delivered in individual sacks, up to 200 arriving per lorry load. Each sack was hung on a chain and manhandled up to the second floor. Although the old hoist still works well, nowadays everything arrives in bulk and is raised by electric elevator. Conveyors send the grain through cleaners and up to a holding bin at the top of the mill. Up to 60 tons of assorted grains can be stored in these bins.

Nowadays there are also several ancillary machines: a giant mixer with a two-ton capacity, and crushers and rollers which provide oats for racehorses and ponies, barley for cattle and sheep, and maize for poultry, pigeons and pheasants.

The wheat cleaner, over 100 years old, was exchanged for a new machine some years ago. However, this proved unsatisfactory for the job, so the old one was repaired and brought back into service with excellent results.

All the machinery at the Mill has been in use for decades, the only modern addition being the machine which sews up the top of paper sacks holding the flour.

The growing interest in healthy diet over the past few years is clearly seen in the extra demand for wholemeal flour at the Mill shop. For John and Peter Ellis, who lived at Headley Mill as children and now spend their working hours there, it must be pleasing to reflect that, while the old waterwheel keeps turning, business at the mill continues to flourish.

Types of Watermill[†]

The requirements of a mill site were an adequate supply of water and a firm riverbank on which to construct the mill itself. In addition, there was the consideration of land value which was higher where the land was suitable for agriculture.

The stream itself need not be large, as is shown by the siting of the three Barford mills where the flow of the stream is small. The important factors in determining the power the river can produce are the fall of water and its rate of flow. These could be controlled by damming and creating a pond and releasing the water as needed. During slack periods the pond would refill. The height of the dam would govern the density of mills on a particular stretch of river. Co-operation between operators of mills and watermeadows would have been necessary to prevent both flooding and water shortages.

Early medieval wheels were set directly in the stream and so were subject to little control. Later, it was discovered that setting the wheel in a channel fed by the river (the 'leat') enabled a greater degree of control to be exercised. Inflowing water (the 'mill race') could be regulated with sluice gates.

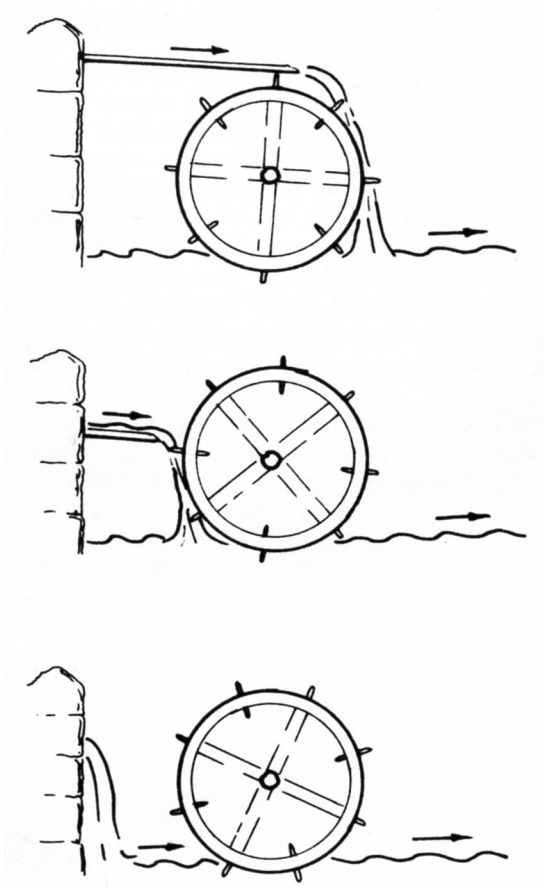
Various designs of wheel were developed, identified by position at which the water strikes the wheel. The most basic and least efficient is the undershot wheel, where the fall of water is no greater than that of the natural stream. Standford Corn Mill was a local example.

Much more efficient is the overshot wheel, where water strikes the wheel near the top and produces power by its fall, which was approximately equal to the height of the wheel. Such a wheel required only one quarter of the volume of water to produce the same amount of power as a similar undershot wheel. By the 18th century the best mills were generating 5–10 horse power. All three Barford mills were overshot.

Breast-shot wheels are essentially a variation of the overshot, the spent water forming the 'tail race'. Headley Mill uses a breast-shot wheel.

In the latter half of the 19th century turbines began to replace the less efficient water wheel, producing more power and occupying less space. This had happened at Passfield Mill by 1907 when Portals took it over.

[†] Copied from a section written by John Ellis in *The Southern Wey: a Guide*



Diagrams showing overshot, breast-shot and undershot water wheels. Headley Mill is breastshot.

Local Industries using Watermills

Over the centuries the power of the Southern River Wey and its tributaries has been harnessed for many different uses, including iron working, grain milling, paper making, the treatment of cloth ('fulling') and leather, braid making and sickle making.

Mills sometimes changed their function according to the necessities of the period. For example, over a period of centuries the Bramshott Mill at Passfield was first a corn mill, then an iron foundry, and finally a paper mill.

Some millers were also farmers who owned, or worked as tenants on, nearby watermeadows; and where there was multiple usage of the water, there was always potential for friction between millers and farmers over conflicting demands for water.

With the advent of steam power in the 18th and 19th centuries, and the arrival of rail transport creating new trade patterns, the local watermills could no longer compete and their decline was inevitable. Some, such as Headley Mill, survived in working order through to the 21st century, but these were the exception.

Corn Mills

The earliest mills were corn mills. Under the feudal system each tenant was obliged to take their corn to the Lord of the Manor who owned the local mill. With the decline of the manorial system, the mills passed into a variety of ownerships. Some corn mills extended their production to animal feedstuffs such as barley meal. The decline of corn mills was largely due to the importation of grain from abroad. In the late 19th century it became more economic to build large steam 'roller mills' at the ports.

The Iron Industry

The River Wey was on the fringes of the Wealden iron industry, whose centre of activity lay to the east.

The 16th century saw the developing iron industry rely increasingly on water to power the bellows for the furnace and the hammers for converting cast iron into wrought iron. Cannon balls and iron slag have been found at Passfield. Mill ponds for these mills were often referred to as 'hammer ponds.' By the late 1700s the industry was changing over from charcoal to coal for smelting and manufacture of iron was moving to the Midlands and the North.

Paper Making

Paper making needs a supply of water for the manufacturing process, so it was a logical step to harness the river for power as mechanisation was

adopted. The mills tended to be situated in the upper reaches of the river where the water supply was cleanest.

Paper was made from rags which were cut up, washed and pounded to pulp, originally by water-driven hammers and later in a rotating drum. The pulp was then boiled in a vat with water and other additives. The mixture was scooped in a tray with a fine mesh bottom, drained and inverted on a layer of felt. The resulting sheets were pressed, dried and hung on ropes suspended in drying lofts whose walls were rows of shutters sited to catch the breeze.

The peak period for local paper making was from about 1750 to 1850. With the introduction of paper machines which produced continuous rolls of paper that were dried on steam-heated cylinders, and using wood pulp rather than rags as the raw material, small country paper mills could not compete and went into decline. Some, such as Barford Lower Mill, were converted to flock manufacture where waste wool or cotton was processed for stuffing furniture and mattresses.

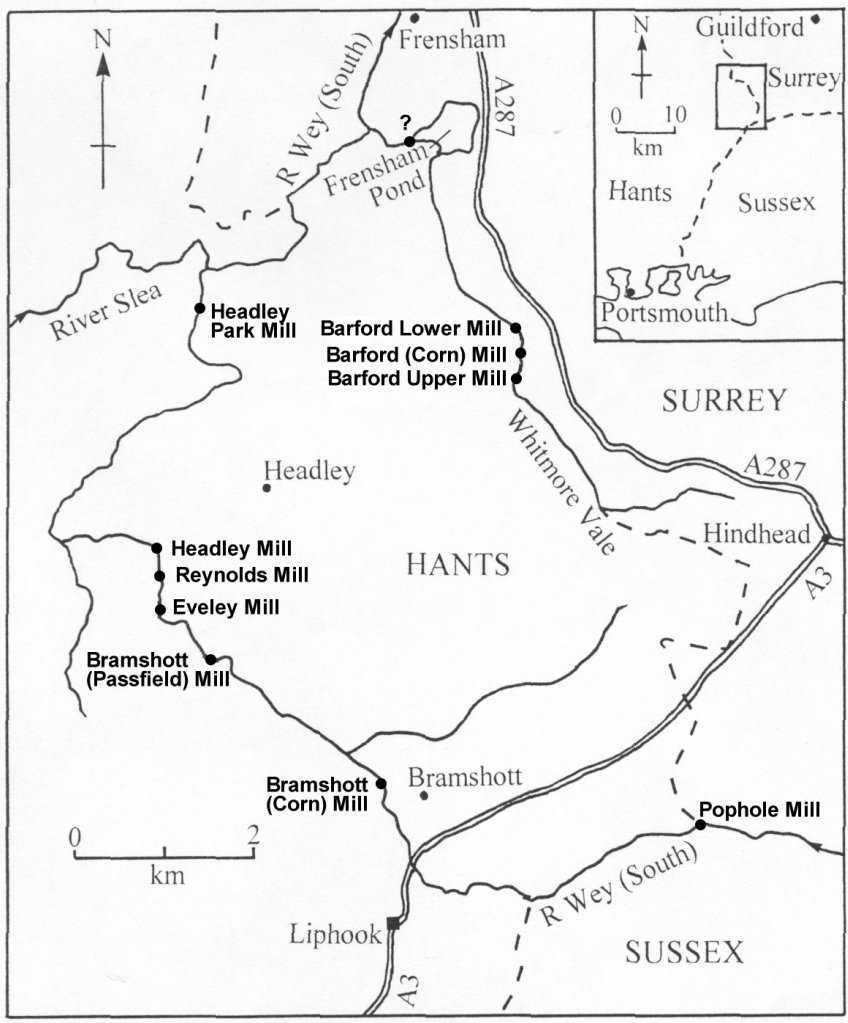
Cloth and Related Industries

Fulling was a process of washing woven cloth originally carried out by treading, but later by water-powered hammers. Lengths of 'home-spun' cloth were sent to the mill by the weavers for fulling or 'felting.' They were scoured to get rid of natural oils, then washed with soap and water, pounded with hammers in a suspension of fuller's earth, and rinsed. Fuller's earth was dug locally, as in Fuller's Vale in Headley, and there are several early mentions in the pipe rolls of fulling mills in Headley

Water power was also used to treat leather. Hides from local slaughter-houses were washed and 'dressed' using water-powered hammers.

The manufacture of braid was also carried out locally, certainly at Sickle Mill in Haslemere in the late 19th century, but possibly also at Barford Upper Mill in Napoleonic times.

Other Local Watermills



Map showing location of watermills in the Headley area
(based on one first published in the Journal of the British Association of Paper Historians, *April 2001)*

On the southern River Wey, downstream from Passfield:

Passfield Mill: *Also known as Bramshott Paper Mill (not to be confused with Bramshott Corn Mill which is further upstream – see map).*

Passfield Mill is in Bramshott parish and therefore not counted as one of the Headley mills. There was originally a corn mill on the site. In the 1580s the Hooke family established an iron forge here. In 1684, Henry Streater converted the mill from iron to paper, and in 1822 the Warrens took it over. In 1907 Portals made postal order paper there. It closed in 1927; the mill pond has been filled in and the site is now a light industrial estate. (Refs: The Southern Wey, a Guide & Alan Crocker)

Standford Paper Mill: *Once known as Eveley Mill.*

Probably an early fulling mill. Became a paper mill, possibly by 1739 (Ref: Shorter); taken over by Warren in 1842 and run in conjunction with their larger Passfield mill just over the parish boundary in Bramshott. It burnt down in 1878 and again in 1890. Its final use was in generating electricity. The mill pond is now overgrown, and a private house occupies the site of the mill with few original features remaining.

Plaque on wall of Standford Paper Mill dated 1808.
The initials "B, E.A" could refer to Edward Baker

Standford Corn Mill: *Probably once known as Reynolds Mill.*

Possibly a fulling mill before becoming a corn mill. It had a 10ft undershot wheel (see photograph). Converted into a private house in 1929.

Standford corn mill

Headley Mill: *The subject of this book.*

Headley Mill was until recently one of the last few watermills in the country to be working for its living. The present buildings date from several periods, the oldest part being the centre. The south-west end is considered to be 16th century. Major alterations took place in the 1790s. The wooden water wheel was replaced in 1926 by an iron wheel.

Headley Mill

Headley Park Mill: *Sometimes referred to as the 'pepper-pot' mill due to the hexagonal shape of its building.*

Headley Park was in the manor of Broxhead, and therefore this is probably the one mill in that manor referred to in the Domesday Book. Presumably it was the corn mill for the manor of Broxhead. Latterly it became part of the Headley Park estate. It produced flour until the 1890s, then had a dynamo installed and from 1904 until 1929 pumped water and generated electricity for Headley Park House and laundry. A fire in the 1960s destroyed its roof, since when it has fallen into disrepair.

Headley Park Mill – the 'pepper-pot' mill

Headley Park Mill and its wheel

On the Barford stream:

Barford Upper Mill:

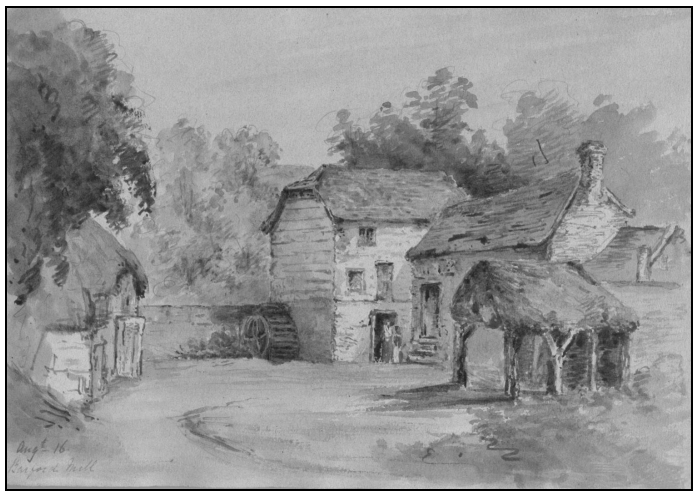
There is some difference of opinion as to the history of milling on this site. The Ellis family maintain that by tradition it was the site of one of the early fulling mills of Headley mentioned in pipe rolls; however, in the history of Churt and in papermaking circles, it is said to have been built in the 1730s (along with Barford Lower mill) specifically for paper making. We may never know the answer, but although no structure of the mill itself remains, there is still a very fine mill pond which can be visited, known locally as Power's Pond.

Power's Pond at the site of Barford Upper Mill

Barford Mill: *Also referred to as Barford Corn Mill.*

First mention of a mill at Barford in 1264 when 'Robert the miller' was granted land out of the waste on the Churt side of the stream – note that this would not have been counted as in Headley until 1343 when the mill was 'rebuilt and transferred to the west side of the stream' (Ref: pipe rolls) It was said to be milling flour up to 1930. Now it is a private house.

The painting below shows the overshot water wheel – unlike mills on the River Wey, all three of the Barford mills used overshot wheels due to the relatively small volume of water flowing in the Barford stream.



Watercolour painting of Barford Mill in 1832

Barford Mill pond

Barford Lower Mill:

In 1738, a mill house was built at site of Barford Lower Mill by 'a man called Pimm' (Ref: Alan Crocker). Richard Pym was elsewhere described as a paper manufacturer and he insured one of his mills as 'corn and paper' under one roof. By 1768 two paper mills shown at Barford on Rocque's map of Surrey – presumably one at the Upper and the other at the Lower mill. In 1816 when excise numbers were given to all paper mills, two were issued for the mills at Barford. In 1837 Warrens took over Barford Lower Mill and ran it with Standford as part of their paper business. By 1865 it no longer made paper, but it was re-equipped and in 1884 the miller is said to have had 50 employees and the 'largest waterwheel in Surrey'. The three-storey mill building remains as a private house.

Barford Lower Mill House in the 1970s

Mill at Frensham Great Pond?

Frensham ponds were created c.1200 as fish ponds for the Bishop of Winchester. In 1532, 'Richard Drake was granted a licence to build a mill at the head of Frensham Pond' and in 1547 he paid rent for it (Ref: pipe rolls) – but nothing further is known of the mill, its precise location or purpose.