FORD END WATERMILL

IVINGHOE

BUCKINGHAMSHIRE

HISTORIC WATERMILL

Welcome to Ford End Watermill

Ford End is a small farm mill, which has produced flour and animal feed for centuries. Although clear evidence of its early existence on the site has not been found, a possible reference to it was made in a document of 1232. It was later suggested that, in 1346, the mill belonged to the Neyrnut Manor at nearby Pitstone Green and the 'Victoria County History of Buckinghamshire' referred to ownership of a mill in Ivinghoe during the 14th Century. There are further references in 16th century documents to a mill in Ivinghoe however these do not identify the site positively as that of the mill at Ford End. The oldest verifiable date for the mill is a parish record of 1616.

It is understood that the present mill building replaced an earlier one but when is not known. A reasonable assumption is that the mill building dates from the early years of the 18th century as it appears to have been well established by 1767. Documentation from that time records that Ford End was owned by a Mrs Judy Reddall and tenanted by Bernard Wilkes. In 1784, he was succeeded by William Heley who worked the farm and mill until 1798. In that year, the mill is mentioned in the 'Posse Comitatus', a survey prepared by the county as part of the precautionary preparations against possible French invasion during the Napoleonic Wars. The Buckinghamshire survey lists 97 watermills including one in Ivinghoe occupied by William Heley, who was 'grinding 16 sacks a week'. You will find the initials and date, **'W H 1795'**, painted on a board on the wall of the first floor of the mill building reinforcing this association.

From 1798, the mill was owned by George Griffin and then, in 1826, the mill was purchased by the Bridgewater (Ashridge) Estate. During the second half of the 19th Century, the main tenant was William Tompkins, known locally as 'Miller Tompkins'. On his death in 1886, he was succeeded by his second son Moses, whose own death in 1890 without issue brought the family tenancy to an end. In 1903, Charles Jellis was listed as the 'farmer and miller (water)' and he bought the farm and the mill from the Brownlow (formerly the Bridgewater) Estate in 1924. Five generations of the Jellis family have since owned Ford End and Paul Jellis farms here today (2013).

By 1963, however, the mill had fallen into such a poor state of repair that it was barely usable. In 1965, the Pitstone Local History Society came to an agreement with Arthur Jellis, Paul's grandfather, regarding the conservation of the mill and carried out major repairs to the waterwheel and **penstock*** (**sluice gate**) to enable the mill to become operational once more. Over the next eleven years, general repairs and renovations led to the mill being opened to the public on the August Bank holiday weekend of 1976. It was to be another fifteen years before, on the 24th June 1991, the mill machinery was sufficiently restored to enable the mill once more to produce flour. Visitors have been coming to the mill ever since exploring its machinery, experiencing its operation, and taking home its wholemeal flour.

* Milling terms highlighted in **bold** are described more fully in the Glossary at the end of the Guide

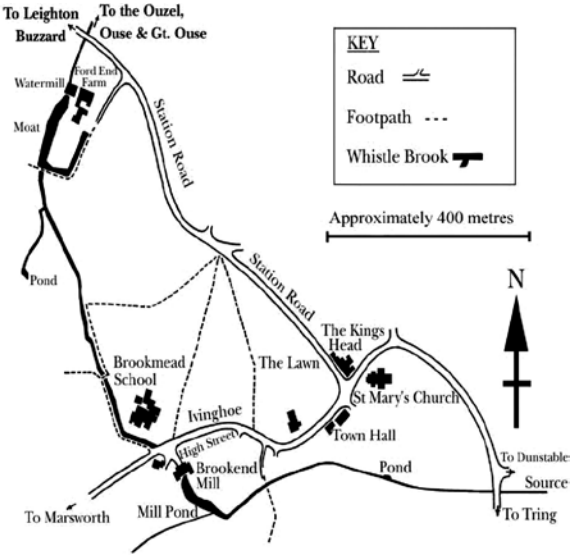
Guided Tour

We hope you enjoy your visit. Please take care when the mill's machinery is in operation and when ascending or descending stairs. As you will understand, no smoking is permitted inside the mill.

The Millpond

The tour begins outside the mill building. Cross the small bridge below the mill, walk up by the side of the building, past the waterwheel and finally climb the few steps to the summit. Here you will be rewarded with a view of the millpond.

The millpond was formed from the remains of what was once a rectangular moat, believed to have surrounded the original 13th century farmhouse. That farmhouse was replaced in the early 19th century by the present one built by the Bridgewater Estate. As well as offering a useful protective barrier, the moat would have more importantly provided an additional source of fresh food – fish, waterfowl, cress and fresh water mussels.



The water supply to the millpond is provided by the Whistle Brook, whose source is a spring from the underlying water-bearing chalk in the field south of the Dunstable Road (see map on Page 3). The small stream flows down under the Tring Road, crossing the field to the south of the village and forming the parish boundary between the parishes of Pitstone and Ivinghoe. After passing under Brookend Mill (formerly the Pitstone Watermill, now a house) and the Marsworth Road, the stream re-emerges to skirt Brookmead School, is joined by two small tributaries, and finally reaches the millpond at Ford End.

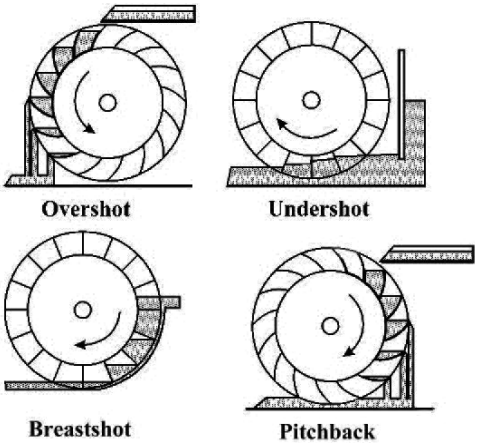
Excess water in the millpond flows over a bypass weir or "spillway" on the farm side of the pond, into a funnel like cavity, then along a 0.6 metre (2 feet) diameter underground brick lined culvert to rejoin the brook about 18m (20 yards) downstream of the mill. Beyond the mill, the Whistle Brook continues northwards for some 5 km (3 miles) to the site of the former Slaptonbury watermill near Slapton, where it joins the River Ouzel, which in turn flows into the Great Ouse at Newport Pagnell and thence to the Wash and the sea.

The Waterwheel

Leaving the millpond behind, descend the steps to the waterwheel. Ford End has an overshot wheel with cast iron axle and spokes. It is 3.3m (11 ft) in diameter and is 1.5m (5 ft) wide. Originally the 30 wheel buckets were formed by oak boards but these were replaced in 1985 by galvanised metal ones as the wooden boards rotted too quickly, through not being kept wet. The late eminent mill expert, Stanley Freese, recorded that the present wheel replaced a wooden one in about 1890.

There are four main types of waterwheel: the *overshot* in which the water enters the buckets at the top of the waterwheel as at Ford End; the *undershot* where water flows underneath the wheel which is more like a large paddle; the *breastshot* where the water enters the buckets at about the middle of the wheel; and the *pitchback* in which the water enters the buckets at the rear of the wheel beneath the **pentrough** (the trough which funnels water from the penstock (sluice gate) on to the waterwheel).

Overshot and pitchback wheels are more efficient than the other types because they are driven by the weight of the water (1 cubic metre (35 cubic feet) weighs 1 tonne (2205 lb)) and by the force or pressure of the water directed into the buckets by the pentrough. Both overshot and pitchback wheels require a good **head of water** that is the difference between the level of the water in the millpond and in the **tailrace** (channel to the stream below the mill). At Ford End, this is some 4.3m (14 ft).



The power transmitted by the wheel is determined by the discharge of water flowing on to it, that is, by flow (mass per unit time) and fall. The flow is controlled by the penstock, which is raised and lowered by a rack and pinion turned by a lever on the second floor (stone floor) within the mill. The higher the penstock is, the greater the discharge of water. The waterwheel at Ford End generates about 7460watts (10 horsepower).

The Sheepwash

The next stop on the tour is the sheepwash by the bridge below the waterwheel. Here, step back in time to the 18th Century and think about how the resourceful millers of the day improved their income.

Millers at that time needed to supplement their living from milling and dealing with animal feed and flour by diversifying into other activities. They had orchards providing apple wood which, when seasoned, was used for wooden cogs for their mills' wheels. They kept pigs which were fed with *sour* flour, unsuitable (dirty) grain and rotten apples - in some mills, pigsties have survived to this day. And with a readily available water supply they could also wash sheep brought to the mill by local farmers as was done here at Ford End. The washing made shearing much easier and a clean fleece commanded a better price at market. This was not sheep dipping, which has been a more recent process using chemicals.

On arrival the sheep were held in flocks in the area now used as the car park and when their turn came, they were moved down to the front of the mill and penned in the bricked area. They were then dropped, one at a time into a pool about 1.5m (5ft) deep created by placing boards across the tailrace between the two posts at either end of the wooden bridge below the mill. A farm hand suitably clad in sou'wester and oil skins, stood in the square cast iron box (or pulpit) pulling each sheep in turn towards him using a "T" shaped crook (take a look for the one still in the mill). Then, he dunked the sheep in the pool and most probably held it under the cascade of water pouring from the wooden chute protruding from the wheelhouse wall. When its fleece was clean, the sheep swam along the brick-lined channel until its feet touched the bottom and it could walk out into the field opposite the mill to dry out.

In his accounts ledger for 1915, the only surviving contemporary record of events at Ford End, the farmer and miller, Charles Jellis, recorded that between 15th and 24th May 1915, 600 (30 score) of F Warren's sheep were washed at a charge of 5p per 20 (one shilling per score). That was just over one halfpenny each. £1 in 1915 would be worth about £62.50p today and thus the price for washing sheep in today's prices would be around 16p each.

The photograph to the right, taken in 1939, shows that the water was conveyed from the mill pond to the sheepwash by an inclined narrow wooden trough running alongside the waterwheel. The trough protruded from a square hole to create the water cascade. It had its own small sluice gate to control the flow of the water and when the millpond was drained in March 2003 its position was discovered on the side of the pentrough.

Only the upright posts and the top cross strut of the sheepwash remain today and the level of the field opposite has been raised so that the brick-lined channel leads nowhere. However the pulpit survives and a replica chute has been fitted to the wheelhouse wall. The Society hopes to restore the sheepwash in the future.

The Mill Building

Take a look at the mill building after you have re-traced your steps across the bridge over the Whistle Brook. It has three floors – the ground floor called the meal floor; the first floor called the stone floor, and the second floor called the bin floor.

It's a very traditional building. The walls of the meal floor are constructed of local red brick interspersed with burnt glazed bricks. The upper storeys are constructed within a strong timber frame with heavy beams and joists. The beams supporting the bin floor are pitch pine. All the floor boards are metal tongued and grooved.

Many of the timbers have been either re-used from the mill or obtained from other buildings. Those in the back wall of the stone floor, which are thought to date from the 17th century, can be recognised by their shape, joints and peg and mortise holes. The two wooden upper storeys are weather boarded on the outside to protect against wind and rain.

Originally the mill had a common pitched roof with peg tiles – documentary evidence of the retiling of the mill in 1830 confirms this. Towards the end of the 19th century, possibly because of damage or deterioration, instead of retiling, the roof was "tinned", ie covered with galvanised corrugated iron. This method of roofing for farm buildings was in regular use by the 1860s. The mansard roof (a roof with two slopes with the lower one steeper than the upper) was constructed at the same time to give more space and headroom on the bin floor. Originally the water wheel was open, but it was enclosed later by the wheel-house built from yellow Foxen bricks made locally near Cheddington station. It too has a corrugated iron roof.

The external appearance of the mill has been much altered over the years to suit the needs of both miller and farmer. Adjacent to the mill, there used to be several barns, long since demolished, which were used for storage etc. The bricked-up doorway, which used to provide access to these barns, can be seen in the rear wall of the meal floor just below the stairs.

On the stone floor, there used to be a small square opening cut in the weather boarding just behind and above a **chaffcutter,** which was used to chop straw into short lengths for animal feed and bedding. The opening was to let out the noise of the chaffcutter when the shutters were closed during inclement weather. When the mill was "re-boarded" in the early 1980s, this opening was not reinstated.

The Meal Floor

You enter the mill at the meal floor so called as this is where the **meal** (the product of grinding before any further processing) was delivered from the millstones above for bagging via meal spouts (wooden chutes). You will be aware immediately of the main beams supporting the stone floor above. These are made of poplar, a wood much favoured in the middle of the 18th century and the fibrous nature of the beams can be readily seen.

It is on this floor that power from the waterwheel is delivered by its axle to the large **pit wheel**. As its name suggests, this wheel is placed over a pit because of its size. It is made of cast iron in two halves and is clamped on to the waterwheel axle. The pit wheel's cogs, which are made of wood, mesh with the iron teeth of the **wallower** mounted on the vertical wooden main shaft. As the wallower is a bevel gear-wheel, it converts the drive from the horizontal to the vertical and as it is smaller than the pit wheel, it means that the main shaft rotates faster than the pit wheel and in a clockwise direction. Above the wallower is the large cast iron **spur wheel,** again with wooden cogs, which transmit the drive up to the two iron **stone nuts**. These are lowered by a **jack ring** to engage with the spur wheel so that the drive can be passed to the **runner stones** (the rotating upper stones) for milling. The millstones at Ford End turn anti-clockwise. The diagram in the centre pages of this guide shows a section through the mill positioning the machinery described above.

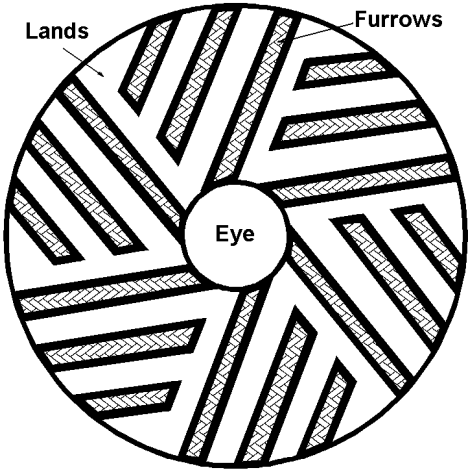
As with most contemporary mills, all the gears intermesh wooden cogs with iron teeth. There are several sound reasons for this. First, as the wooden cogs are detachable, they can be quickly and easily replaced when worn or broken, meaning little loss of milling time. In contrast, if iron teeth were broken, the miller would have had to have a complete new gear wheel cast. This would be very expensive not least as it would result in significant loss of milling time. Replacing one or two broken wooden cogs is a simple and inexpensive task that a miller could perform. Secondly, the smooth-wearing qualities of the wood minimises wear on the iron gears and so extends their life as well as contributing to the quiet and even running of the mill. Thirdly, by preventing sparking, the risk of fire, which is the miller's nightmare, is greatly reduced.

The preferred wood is well-seasoned apple or hornbeam although beech will suffice. There are examples of old and new wooden cogs on display in the mill. In some regions, the gearing was enclosed by wooden boards. Here, the boarding has been removed to allow the gearing to be observed. The covering boards are stored against the wall on the meal floor to the left of the gearing. Also on this floor, you will find the ends of the sack hoist rope and sack hoist chain for lifting sacks to the bin floor. You will have the opportunity to raise a sack yourself.

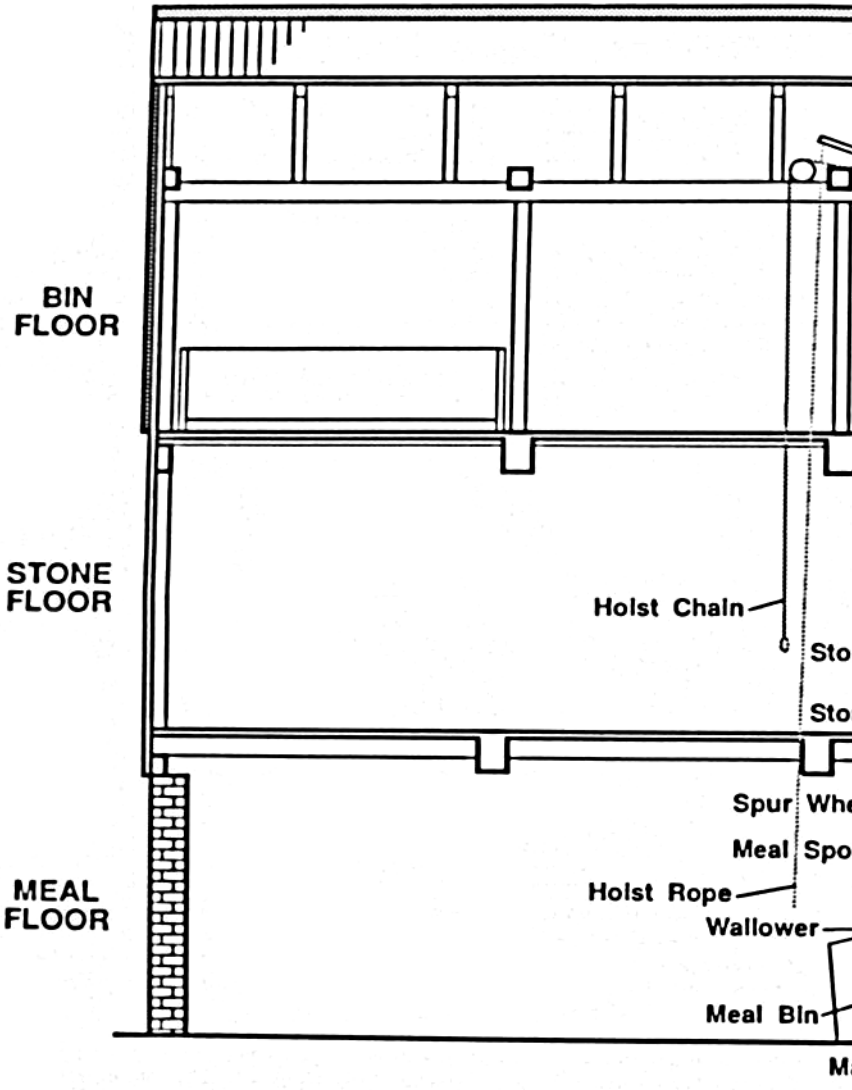
The Stone Floor

Take one of the two sets of stairs up to the stone floor, so named as this is where the millstones are. Please mind your head and bear in mind that when you come down again you will need to come down backwards for safety reasons.

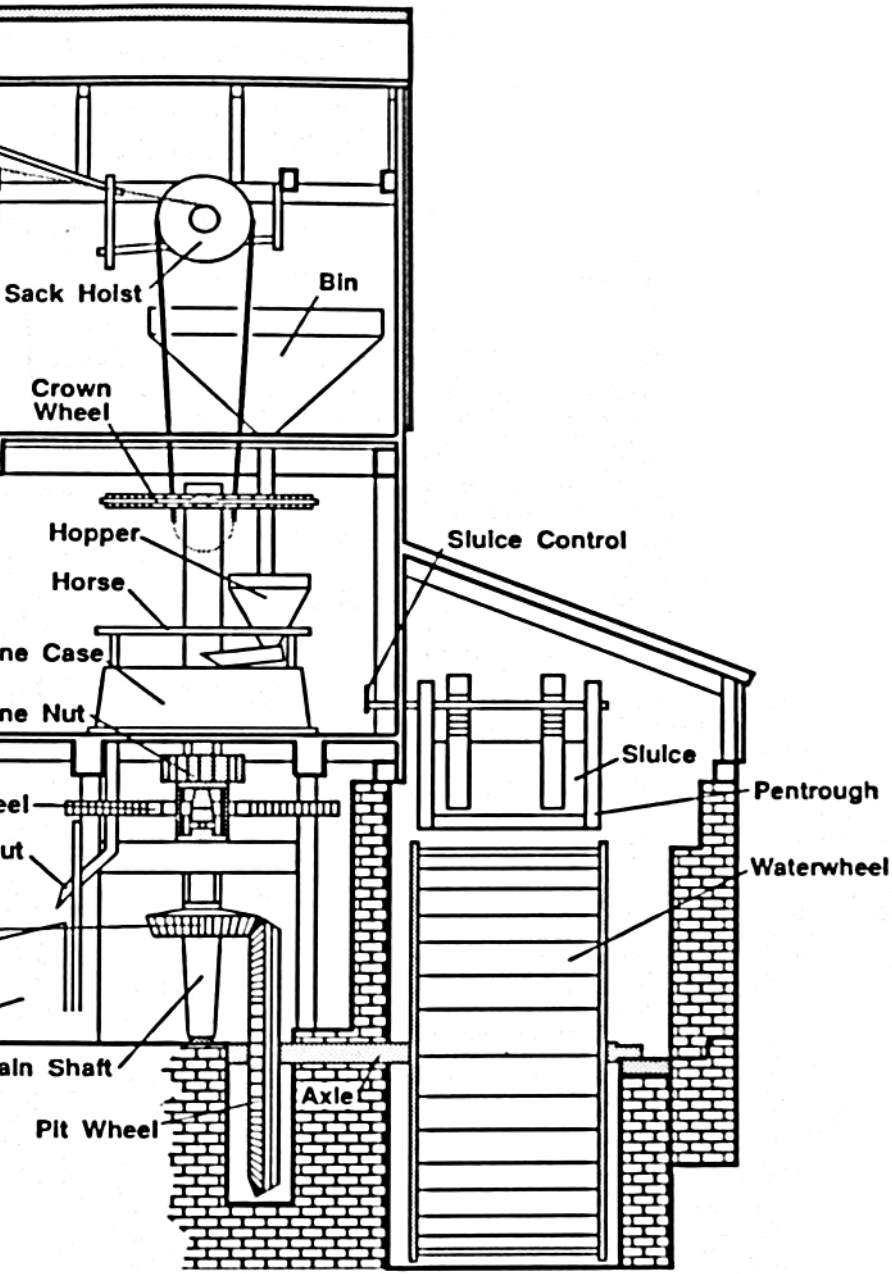
There are two sets of stones at Ford End. Facing the stones, the set to the left, which is no longer operational, was for animal feed. The set to the right, which is operational, is for flour. To make animal feed, the miller used the coarser **peak stones** of Millstone Grit, a coarse-grained sandstone quarried in the Peak District of Derbyshire. They were used to mill wheat for flour and oats or barley for feed until about the mid-1800s after which their use was generally restricted to animal feed.



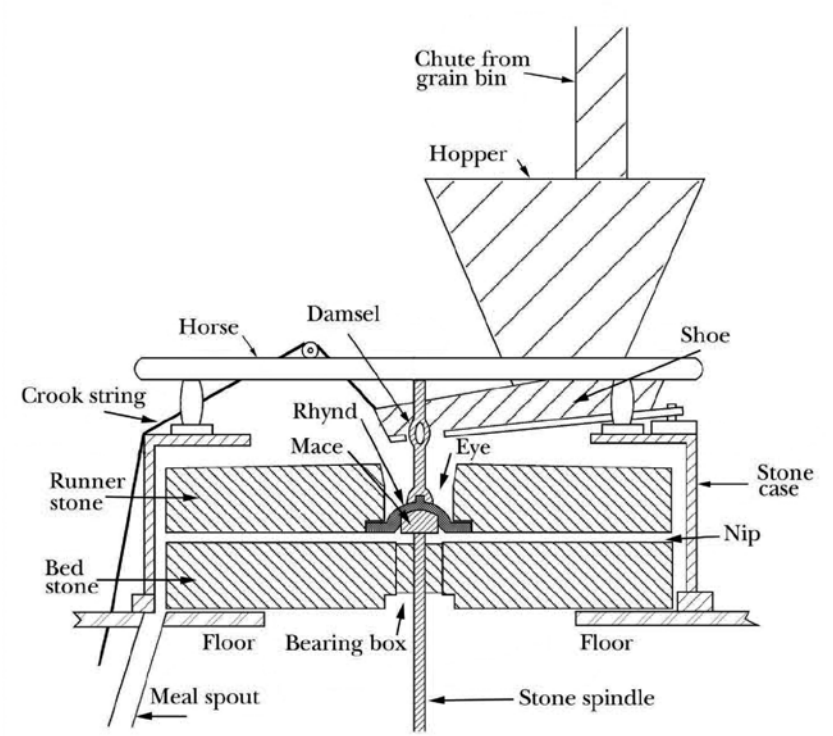
For the fine milling required for the production of flour much harder stones are required. At Ford End, **French burr stones** are used to produce flour. These are made up of shaped blocks of chert, a very hard form of quartz, formerly quarried near Paris. The blocks are bound together by iron strap hoops for greater security. Over time, the milling surfaces wear down and have to be “dressed”, that is re-cutting of the grooves (or furrows) to make them sharp and the grinding surfaces (or lands) to make them rough again. The degree of wear depends on the amount of usage and the miller would only have the stones dressed when he judged they were no longer milling efficiently. Dressing was usually carried out by a millwright but many millers were capable of undertaking it themselves. The pattern of the furrows cut into the grinding surface is shown in the diagram of a runner stone above. The **bed stone** (the lower stone, which remains stationary) has similar furrows and lands but has a smaller central hole through which the stone spindle passes.



SECTION THROUGH FORD END MILL


Sack Hoist
Bin
Crown Wheel
Hopper
Horse
Sluice Control
Sluice
Pentrough
Waterwheel
Axle
Pit Wheel

The stone resting against the front wall of the mill also shows this pattern of furrows. The non-milling surfaces were rough and irregular so were coated with plaster of Paris to make them level and smooth. This also improved balance and made cleaning easier. It is the plaster which can be seen on the top of the runner stone not the actual millstone. Both pairs of stones are enclosed in **stone cases,** sometimes called vats or tuns, to prevent meal and dust escaping.



The runner stone turns on the bed stone and the scissor-like action of the furrows slices the grain, which is then ground into **meal** as it passes between the grinding surfaces (lands) on its way to the edge of the bed stone. From here it falls to the floor inside the stone case and a sweep or paddle attached to the rotating runner stone sweeps the meal to a hole in the floor. This is the mouth of the meal spout, which takes the meal down to the ground floor where it is bagged and weighed.

Before setting the mill working, the miller would have filled the hopper above the stones by pulling out the slide in the chute allowing grain to flow into it from the bins on the floor above. Today, the hopper immediately above the stones is filled directly. The next task is to wind down the stone nut with the jack ring on the meal floor so that it meshes with the cogs of the spur wheel. This can only be done when the mill

waterwheel is stationary otherwise most of the wooden cogs would be badly damaged.

To start the waterwheel turning, the miller opens the sluice gate to allow the surge of water along the pentrough. This done, he hurries downstairs to begin milling. He quickly lowers the top runner stone, which had been resting just clear of the bedstone and when their surfaces close together the grain is trapped and ground into meal. Raising or lowering the runner stone increases, or decreases the gap between the stones, an operation called **tentering**. This gap (the **nip**), determines the fineness of the meal - the smaller the nip the finer the meal. Tentering is carried out by turning up or down the large nut on the threaded rod just beside the meal spout. This moves the **bridge tree** (an adjustable iron beam supporting the lower end of the **stone spindle**) which in turn raises or lowers the runner stone. This device enables the miller to make minute adjustments to the nip.

So that the miller can monitor the rate at which grain is being fed into the runner stone from his working position by the meal spout on the meal floor, he listens for the **damsel**. This is a vertical metal shaft, with four lobes, or arms forming a square at its middle, which protrudes from the eye of the runner stone and rotates with it. The damsel was so named, apparently, because of its incessant chattering! As the damsel rotates, its arms strike against the angled **shoe** below the hopper to jog the grains along so that they fall into the eye of the runner stone. The angle of the shoe can be adjusted from the floor below by the **crook string** to decrease, or increase the amount of grain being fed into the stones. The speed of the runner stone and the rate of grain being fed into the stone and the adjustment of the nip determine the quality of the meal.

To warn the miller when the grain in the hopper is running low, he relies upon a bell fixed to the **horse**, a wooden frame supporting the hopper. The bell is kept out of contact with the damsel by a strap held down by the weight of grain in the hopper. When the grain is low and the weight reduced the strap is released allowing the bell support to fall forward against the rotating damsel causing the bell to ring, so warning the miller that the hopper needs refilling.

At the top of the main shaft on the stone floor you will see the iron **crown wheel** with its wooden cogs. Its purpose is to transfer the drive, again through a right angle by means of an iron bevel gearwheel to the horizontal **lay shaft**, on which are mounted two pulleys for driving ancillary machinery.

One pulley drives the sack hoist and to set it in motion, the miller tightens the drive belt by pulling on the sack hoist rope, which passes through each floor. The sack hoist chain, which is secured to the winding drum on the bin floor, also passes through each floor to the ground floor. Here it is looped around the neck of the sack of grain which is then raised up through two sets of clapper or trap doors up to the bin floor. Releasing the rope slackens the belt and disconnects it from the drive allowing the sack to be emptied into the storage hoppers and bins.

The other pulley drove the chaffcutter**,** which is a relatively modern machine from 1922 with an ingenious safety device so designed that should the worker's fingers become caught in the spiked feed rollers, he could push the trip handle forwards to

reverse the feed rollers and so release his fingers. The idea seems to have been to prevent his already injured fingers being amputated by the rotating blades! However, the reversing action would injure them a second time.

There is also a hand driven **winnower** on the stone floor. The purpose of this machine was to clean the grain and consequently improve the **grist** (grain to be milled) by removing weed seeds, straw, dirt and other contaminants using a rotating fan (blower) and a series of vibrating sieves. The winnower was made by Kell Meats & Co. of Gloucester for manual operation using a handle. It came originally from Horton Manor near Slough and has been restored to working order. With re-positioning, this could be converted to be driven by a belt from the lay shaft pulley.

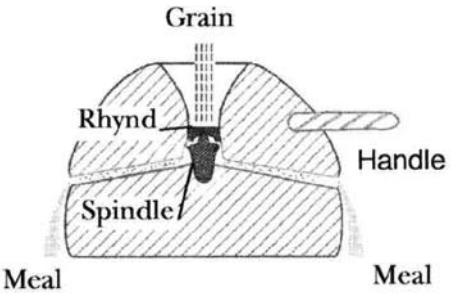
The Bin Floor

The final climb is up the stairs to the bin floor, where the grain is kept in large bins. This is where, in past centuries, grain in sacks hoisted from the ground floor was delivered for emptying into these bins. Grain from the bins fed down to the hoppers above the mill stones.

On this floor, you will also see a saddle stone and a rotary quern**.** These provide some insight to the ways used to make grain edible in earlier times. Ever since man first grew cereals such as wheat, oats and barley for food, he has had to break down the grain by grinding. One of the earliest methods was simply to pound the grain between two stones. From these, the pestle and mortar evolved, with the grain being pounded and rubbed by the pestle in the mortar. There followed the use of a flat stone, which became curved through usage, hence its name – saddle stone. The grain was placed on the stone and rubbed with a smaller stone called a muller. The saddle stone here on the bin floor is from the Iron Age some 2300 years ago. It was ploughed up in a field near Pitstone Green Farm. The rubbing action was a true grinding process, as opposed to the earlier methods of pounding which only crushed the grain.

The rotary quern was a marked improvement. It had two circular stones, a bottom one which was flat or slightly convex and a top one shaped like an up-turned bowl fitted with a wooden handle and with a hole, the **eye**, in its centre. Grain, dropped a little at a time into the eye, was ground by rotating the top stone with the handle. It emerged as meal at the edges of the stones.

Part of a Romano-British quern is displayed in the mill. It is made of Hertfordshire pudding-stone and was found in a well dating from the 2nd century AD on land below Pitstone Hill which became No. 2 Quarry serving the now closed cement works in Pitstone. The other quern is modern and was imported from India where such querns are still being made for village use.



This principle of grinding by feeding grain into the eye of a circular stone turning upon another is used in all stone mills such as Ford End - indeed power driven millstones are essentially little more than large, power driven querns. Water power has been used for more than 2000 years, the Greeks being credited with adapting it to milling cereals in the first century BC. The Romans also used grain watermills and introduced them into Britain. The Saxons are known to have had numerous watermills. The Domesday Survey in 1086 following the Norman conquest lists more than 5600, a figure meriting caution since an individual pair of stones may have been recorded as one mill. The Survey lists 137 watermills in Buckinghamshire.

From the 12th century onwards, the number of watermills increased significantly, most of them belonging to either a manor or a monastery. The dissolution of the monasteries in the 1530s, followed later by improvements in farming methods, by changes in the eating habits of an increasing population and by the development of better transportation, all contributed to the establishment in the late 18th century of the independent miller, who milled for a living. The heyday of the water driven stone mills lasted from the mid 18th century to the end of the l9th when they were largely superseded by the advent of steam and eventually by more efficient roller mills driven by water turbines or electric power and using spirally grooved steel rollers instead of mill stones. They were capable of producing large quantities of meal which, after purification became the fine white flour then much in demand, a demand which could not be satisfied by stone mills with their intermittent water supply.

Please re-trace your steps back down to the ground floor where your tour ends. You will be able to purchase the flour milled here. It is a popular purchase and a number of visitors come especially to buy it. As with the other merchandise on sale, all proceeds go to keeping this historic mill operational. Do ask any of the volunteers if you have any outstanding questions. They may not be able to answer all your queries but they will know someone who can. Have a safe journey home and . . . . do come again.

Gearing up - the mathematics

How quickly does the runner stone rotate? This can be calculated knowing the number of teeth on the relevant wheels and by estimating the speed of the waterwheel. The wheels, which carry power from the waterwheel to the runner stone, are the pit wheel, the wallower, the spur wheel and the stone nuts. The number of teeth on each of these gear wheels is, as follows:

Pit wheel – 92

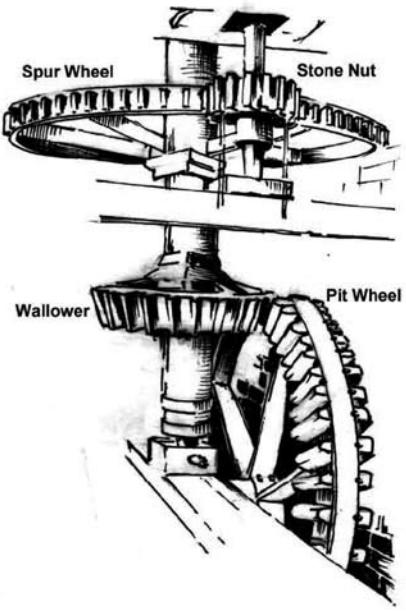
Wallower – 33

Spur wheel – 122

Stone nuts – 23.

For completion, you may be interested that the Crown Wheel has 73 teeth and the Lay Shaft bevel has 20. The gear-wheels alternate between large and small, by which means their speed is increased in direct proportion to the lesser number of teeth on each successive cog. So, the speed of the runner stone related to the speed of the waterwheel can be calculated as: 92/33 x 122/23 ie 14.8.

We can approximate this to 15 revolutions of the runner stone for each revolution of the waterwheel. Thus, if we estimate that the waterwheel is running at 6 revolutions per minute then the runner stone will be running at 90 rpm.



Glossary

Axle (or axle tree) - cast iron shaft on which the water wheel and pit wheel are mounted.

Bed stone - the lower fixed millstone.

Bridge tree - adjustable metal beam supporting the bottom of the stone spindle - used to vary the 'nip' when tentering.

Boards - metal (formerly wood) sheets forming the waterwheel buckets.

Buckets - enclosures or containers on the circumference of the wheel formed by the boards to trap and hold the water.

Chaffcutter - machine used to chop straw into short lengths for animal feed and bedding.

Crook string - cord by which the inclination of the shoe is adjusted.

Crown wheel - cast iron gear-wheel with wooden cogs at the top of the main shaft – drives the lay shaft

Damsel - rotating vertical metal bar, split into four to form a square at its middle, which agitates the shoe to ‘jog’ the grains into the eye of the runner stone

Eye - hole in the centre of the runner stone into which the grain falls from the shoe.

French burr stones - millstones made of interlocking blocks of chert - a form of quartz which used to be quarried near Paris. The blocks are held together by iron hoops and Plaster of Paris.

Grist - grain for grinding

Headrace - channel or millrace (including the leat or lade and pentrough) along which the water flows to the wheel.

Head of water - the difference between the upper water level (in the millpond) and the lower level (at the tailrace).

Horse - wooden frame on top of the stone case supporting the hopper and shoe; the 'low grain level' warning bell is attached to it.

Jack ring - metal ring below the stone nuts; raised and lowered by a handle on a threaded rod; disengages and engages the stone nut from the spur wheel.

Lay shaft - shafting with pulleys used to drive the chaffcutter and sack hoist; drive taken from the crown wheel through a bevel gear-wheel.

Meal - product from grinding, before any further processing.

Nip - the gap between the millstones, adjusted by tentering.

Peak stones - millstones of Millstone Grit (coarse-grained sandstone) quarried in the Peak District of Derbyshire.

Penstock - sluice gate fitted within the pentrough to control the flow of water.

Pentrough - trough carrying the water from the millpond to the top of the waterwheel.

Pit wheel - first gearwheel inside the mill, made of cast iron with wooden cogs and located over a pit - hence its name - and mounted on the same axle as the waterwheel.

Runner stone - upper millstone which rotates.

Shoe (or Slipper) - tapering, inclined wooden chute or tray which conducts the grain from the hopper into the eye of the stones.

Shrouds - circumferential outer casings on each side of the waterwheel; form the buckets with the boards.

Sluice (gate) - wooden gate within the pentrough which is raised or lowered to control the amount of water flowing on to the waterwheel by which the speed of the waterwheel and hence the runner stone is determined.

Spur wheel - cast iron wheel with wooden cogs; transfers the drive from the main shaft to the stone nuts.

Stone case - wooden casing enclosing the stones.

Stone nut - cast iron gear-wheel (pinion) which transfers the drive from the spur wheel to the stone spindle.

Stone spindle - vertical shaft supporting and driving the runner stone.

Stop planks - heavy boards placed across the entrance to the pentrough to stop the flow of water in case of emergency or problems with the pentrough or sluice gate.

Tailrace - channel along which water flows from below the waterwheel.

Tentering - adjusting the gap or 'nip' between the runner and bedstone.

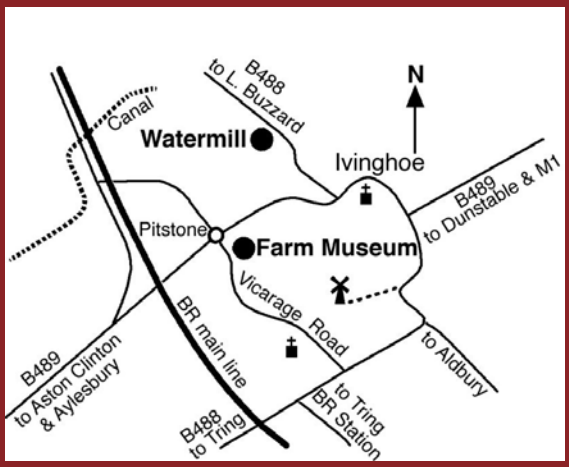
Wallower - cast iron bevel gear-wheel; transfers the drive from the pit wheel to the main vertical shaft.

Winnower - machine, hand or power driven; removes seeds, chaff and dirt from grain prior to milling.

Finding us again

Ford End Mill can be found at National Grid Reference: SP 941166 and the Postal Code is LU7 9EA.

The mill is on the outskirts of the village of Ivinghoe, on Station Road (the B488 to Leighton Buzzard), approximately 550 metres (600 yards) from the church. Ford End Farm is on the left, and access is through the first gate on the right inside the farm entrance. The mill is across the yard beyond the farm buildings. Free parking is available in the yard.



OPENING TIMES: The mill is normally open to the public between 2:00 and 5:00 (last entry 4:30pm) on certain Sundays and Bank Holiday afternoons from the beginning of spring to the end of September. Milling demonstrations are given regularly from early spring until September.

FACILITIES: There are no toilet facilities and whilst handicapped visitors are very welcome, access to the upper floors could be difficult.

PARTIES: School and other parties are most welcome by prior arrangement that can be made by telephoning 01296 660074. A society member will act as a guide if requested. Unaccompanied children cannot be admitted.