Combe Mill

Tour of the Mill – Story Lines

Combe Mill Story Lines

Introduction

This document has been put together to assist those involved with developing displays and ways of better interpreting the Mill.

One visit to Combe Mill merely whets the appetite and this document aims to fill in the gaps that will still be left even after a second, third and fourth visit.

Please feel free to suggest improvements to this document – it is a work in hand.

Visitors can purchase a Combe Mill Souvenir Brochure that is illustrated with photographs and diagrams of the main exhibits. The Souvenir Brochure does not contain the same level of detail as contained here.

This document continues to benefit from feedback from the many other volunteers who are contributing their own 'story lines' and embellishments.

Tony Simmons – Version 8
March 2016

Combe Mill Story Lines

Overview

Combe Mill is one of the buildings that comprised Combe Yard, which was the maintenance depot that served Blenheim Estates for many years.

Combe Yard was home to carpenters, stone masons, painters, plasterers, waggoners, glaziers, blacksmiths, sawyers, plasterers, foresters and so on. From about 1850 it was served by its own railway siding that ran parallel with what is now Combe Halt. The siding was eventually removed in 1953.

The building we now call Combe Mill is the only one that has not been converted into office accommodation and it remains in the condition that it would have been in the 1950s when electricity arrived in the area. The arrival of electricity was a turning point in the life of Combe Mill. The metal staircase at the south end of the building is a recent addition and replaced a wooden one built by members in the 1980s

There has been a watermill at Combe since the days of the Domesday Book census in 1086 and records refer to its occupants as 'millers' right up to the mid 1800s. We assume that water power derived from the river Evenlode was used to grind corn to make flour and cattle feed.

According to the Victoria County History, Combe Mill came into the ownership of the Dukes of Marlborough in 1766 after the end of building Blenheim Palace (1722). Records show that in 1778 Combe Mill was leased to a John Hudson and the Hudson family were there into the mid-1800s.

We do know that the railway between Oxford, Worcester and Wolverhampton (know locally as the 'Old Worse and Worse') came through nearby in the late 1840s and we had thought for many years that in about 1852 the steam beam engine and Cornish steam-raising boiler were installed. However, recent research in the Blenheim archive has revealed that the present Cornish boiler was purchased new in 1887. They were undoubtedly transported to site by rail and once installed, the front part of the mill that contains the engine room and Foreman's Office was built around the engine. The join line between the front and the main, and older, building can clearly be seen on the south east side.

By 1851 the census returns listed local occupants as being sawyers and Combe Mill was a saw mill taking trees from the Blenheim forests and cutting them down to manageable planks for use on the estate.

The beam engine was used when the state of the river prevented the waterwheel from powering the line shafting. From the line shafting leather belts took the power to the various woodworking machines and the blower in the forge inside the Mill. The belts also ran into the undercroft of the sawmill to drive line shafts. On the floor above a rack saw would have been installed and the belts to drive it passed between the large oak floor beams to the line shafts below. Before the undercroft was scrapped and backfilled with concrete in 2008, one could still see the brick columns that supported the oak beams and the stairs that were used to get underneath the floor to maintain the belts and clear away the sawdust.

In about 1912 the beam engine failed and was 'abandoned' in the engine room until it was 'rediscovered' in the late 1960s when proposals were made to scrap it. The Oxfordshire

Museum service became involved and made a survey of the Mill although they no longer can produce any of the photographic evidence. [The Society does have copies of the photos however that can be seen at the Overview section of our website.]

Arising from this survey a number of volunteers undertook to restore the beam engine and steam-raising boiler. The chimney stack had to be rebuilt and the date stone was laid on 16 July 1972. The Cornish boiler was first steamed on 15 September 1972 along with the beam engine although a problem with its air pump meant that led to the discovery of a significant crack in the air pump manifold on 23 November 1972 that was probably the cause of the engine being taken out of service in 1912. The first 'public' steaming was in the following 3 March 1973 when the local press and television were invited along. Around this time the Oxford Museum Service funding lapsed and the volunteers decided to form a society that led to the Combe Mill Society constitution being formally adopted on 29 May 1975. The first public steaming for which an entry charge was made was on 24 May 1975.

The Mill was saved from closure and conversion into offices in 2003 when the assignment of Grade II* listing protected the contents of the building.

In 2011 the Combe Mill Society were awarded a Heritage Lottery Grant to conserve and improve the Mill. About £500K of the grant was used to fix the structure and fabric of the building. This involved repairing the timber wall plates and rafters, removing old slates from a quarter of the roof and replacing with matching tiles. Repairing all timber window frames and fitting coated steel, opening, windows which matched the building. The entire electrical power and lighting systems were replaced; a platform lift was installed to improve access to upper floors; an air-source heating system was installed and a riverside Tea Room built. Other grant money was spend in improving interpretation in the form of high quality display panels, audio/visual display units showing talking-head films and animated explanations of machinery.

Specific

The following sections relate where relevant to the numbered points on the two floor layout diagrams.

<u>Combe Yard</u>

The yard housed all the various trade's needs to maintain an 11,400 acre country estate, see earlier in the overview section of this document.

Within the Mill building we show the work of sawyers, blacksmiths, carpenters, turners, wheelwrights, farriers and pattern makers.

In later years the Estate ran its timber business and traded as Blenheim Sawmills until business finally ceased around 2000. Investment was made during the 1990s when modern timber treatment equipment was installed which increased the life of an item threefold and the business focused on fencing products.

Blenheim still sell Christmas trees from the site each year.

The two cottages next to the Mill are rented out by the Estate and were the home of sawyers and clerks of the work in years past. Census returns tell us more about these people and can be viewed in the Foreman's Office.

Further up the lane in the direction of the Palace Grounds was the Estate brick yard. We have an example of one of these bricks and mould used to make them. We understand that remains of the brick kilns can still be found in the land on the left when approaching the tee junction to East End.

Our card model of the Mill buildings can be used to describe the history of the Mill and to give visitors an orientation of what they will see during their visit.

As from Spring 2016, it is possible to run the line shafting at a low speed, using an electric motor, which drives the woodworking machinery, whetstone and corn mill so that visitors appreciate better what went on in the upper and lower floors.

[1] Engine Room

The engine room was built around the beam engine and boiler after they were installed. A unique feature of Combe Mill is the proximity of the boiler to the beam engine so that one person could run both. The front door that visitors now enter was only created in the 1970s and before then the only access to the room was through a passage by the boiler to the next door cottages or the narrow doorway from the forge workshop. No wonder the engine lay undiscovered for so long.

In front of the engine room is a square fuel store, or bunker, in which coal would be kept after being transferred from the rail wagons that delivered it. The 'fireman' who worked the Cornish boiler got at the coal by raising the vertical counterbalanced door next to the fire grate. Coal would be brought from the wagon in the railway siding to the bunker in a hand pushed trolley on rails. A cut-out figure of James Smart stands in front of the boiler.

The 'fireman', as the person who stoked the boiler was called, had to keep an eye on the level of water in the boiler. Until May 1972 when volunteers fitted a 'modern' sight glass level gauge, the only way to check the water level was by opening in turn the brass try-cocks on the boiler front. If steam came out of the bottom cock the level was too low, if water rather than steam came out of the top one, then the water level was too high. If the fireman forgot to check the water level and it got so low as to uncover the top if the fire tube, then a thermal plug in the roof of the fire tube would melt and the water would quench the fire – the steam would also probably have scalded the 'fireman' as it escaped into the stoking area.

There is a working model of the beam engine made by Adrian Hill on the viewing platform that dynamically shows the working parts on days when the engine is not in steam.

On the wall opposite the firing position of the Cornish boiler is a push button operated audio/visual display that visitors can use to watch short films about workers and machinery in the Mill.

In this area people can learn about:

- The temperatures at which water will boil at differing pressures [1]
- how steam was raised by boiling water
- dangers of pressurised steam
- working conditions of the firemen and engine driver
- the amount of coal used to run the engine for an hour [2]
- how a steam beam engine works
- how the arced movement of the beam was straightened using a parallel motion linkage
- how straight line motion is changed into rotary motion
- how a piston works
- how a plunger pump works
- how a slide valve can be used to switch steam from top to bottom of the piston
- how spinning bob weights are used to regulate engine speed – the governor
- how an eccentric is used so that the engine can run itself
- how condensing steam can create a vacuum
- how gears and belts are used to transmit power and about gear ratios
- how water from the hot well can be pumped into the boiler to top up the water level to conserve energy.

The detailed cut-away drawings on the walls of the engine room can be examined in support of this explanation.

[2] Three small Steam Engines

Opposite the miniature corn mill in the workshop is a group of small steam engines that illustrate the development of steam power following on from the beam engine. The engines are run on steaming days.

The green Bradford horizontal engine originally came from the laundry of Haydock Lodge where it drove the washing machinery.

The red engine is of vertical format and made by Sissons and the white engine was made by Reader.

Also working is a high pressure water pump made by Weir Pumps that was used to feed a steam boiler. It is now used to circulate water from the beam engine cold well through a shell and tube condenser to cool the exhaust steam from our various small steam engines.

[1] At atmospheric pressure water boils at 100degC (201 degF). When the pressure reaches 20 psi (pound/sq inch) or 1.38bar which is what the Cornish boiler operated at, the boiling point becomes elevated to 109 degC (228 degF). When new the boiler probably operated at 100 psi (6.89bar) and the boiling point would have been 164 degC (328degF).

[2] Originally the boiler would have burnt coal arriving by rail wagon in the front yard but until 2003 Society members had access to scrap wood which was usually in the form of 'pointings' from the fence post manufacture. A weekend of steaming would get through a full fuel bunker of wood which is about 8cubic metres of wood.

Here people can learn about:

- various types of steam engine
- how the cross-head slide took over from the beam and parallel motion of the beam engine.

[3] Whetstone

Driven by the line shafting is the original whetstone that was used for sharpening edge tools. The large diameter stone runs in a water bath to keep the tools cool and to lubricate and improve the cutting action.

Here people can learn about:

- how tools were sharpened
- the use of the water drain plug to remove water during frosty times.

[4] Corn Mill

Opposite the small steam engines is a small corn or oats grinding mill that was used to produce flour and animal feed. The upper grind stone is driven via a set of gears by a belt driven from the line shafting. Only occasional demonstrations of grinding grain are made of this mill although it runs from the line shafting on each steaming day.

People can learn about:

- how a grindstone mill works and how the clearance was adjusted to suit the grade of flour required
- how the stones are 'sharpened' (dressed) using a 'bill'.

[5] Blacksmiths' Forge

The blacksmiths' forge comprises a double hearth made by A Handyside & Co at which volunteers and visitors can try their hand at making metal objects. This forge is a very rare working instance of those made by A Handyside.

During our Steaming Events when the forge is alight, and since skill levels vary, the public are given instruction on how to make a simple iron poker. More advanced visitors can make a toasting fork which takes more time to make. Our volunteer blacksmiths are always developing other simple designs to try out.

The forge would have been blown using a hand operated bellows – there is one for each hearth. The left hand roof-hung bellows is the original at the forge made by Alldays & Onions (which firm also used to make motorcycles) and can be pumped by hand. The second bellows made by the same firm is a more recognisable round floor-standing bellows that came from a local amateur blacksmith (Mr Ted Brain of Kingham). Both bellows were made by Allday and Onions. We usually run the forge using an electrically driven blower that frees up the blacksmith although this original blower can also be driven by a belt from the line shafting.

To minimise smoke and dust there used to be a fan in the hood of the forge that sucks fumes up the chimney. This was removed during the HLF funded conservation project and the height of the forge chimney increased to improve the draught. This modification works well.

The Handyside forge hood is rare and believed to be the only remaining working example from the Derby based company known for casting letter boxes still to be found around Oxford.

At the forge people can learn about:

- different types of ferrous materials
- the colour at different temperatures of hot metal
- the ease of working hot metal as it softens
- how selective cooling of a work piece with water can be used to make clever shapes
- how air blown into the hearth is important to make the fire hot
- how metal can be twisted
- how metal can be hardened by quenching in water, oil or shoddy[3]
- the use of the anvil and the fullers and formers.

[6] Line Shafting

The use of line shafting was the only way that power could be transferred to the various machines throughout the Mill. Pulleys are mounted on the overhead line shafting and on the driven machines. Leather belts wrap the pulleys and drive the machines – the ratio of the diameters of the pulleys determines the relative speed of the machine to the line shaft speed.

The shafting runs at about ninety revolutions per minute. There is a diagram in the waterwheel room that shows the various gear and pulley diameters comprising the line shafting system.

Before the days of electricity, machines had to be located near to the line shafts.

Power had to be produced to turn the line shafts and the main source of power was originally from the waterwheel and, later, with the beam engine in reserve.

Line shafting runs the entire length of the forge workshop and belts run upstairs to another smaller line shaft in the pattern shop that provides power to the bandsaw and lathe.

The downstairs line shafting provides power to the whetstone and the animal feed mill and is also able to drive the forge air blower.

People can learn about:

- transmission of power using shafts, gears and belts
- constraints on using power before arrival of electricity and the use of electric motors
- pulleys and gears – direction changes - speed and torque amplification, drive ratios
- belts – materials selection, joining belts, keeping them on the pulleys

[3] The term ‘shoddy’ refers to the chippings from horses hooves produced by a farrier.

- shaft bearings, couplings and lubrication
- stopping and starting machines (fast and loose pulley systems).

[7] Drilling Machines

There are several hand-powered drilling machines in the Mill. Next to the small feed mill in the workshop is a large floor-standing machine that would have been powered from the line shafting. This belt-driven drilling machine was made by F. Pratt & Co of Halifax, probably in the late 1800s. Mounted on the wall opposite to the forge is another drilling machine that was worked by hand. This is kept padlocked for safety but visitors can ask to use it. As the drill is turned the drill bit is advanced into the work piece to keep pressure on the cutting edge.

Here people can learn:

- how holes can be made using a drill bit without electrical power
- the fact the work had to be taken to the tool before modern power drills existed
- that metal (drill bit and work piece) gets hot because of the pressure/work applied to cutting action to make the hole and the use of cutting fluid.

[8] Gear Room, Pitwheel and Cottage Water Supply

Next to the forge is the gear room with its pitwheel reached down a couple of steps on your left before leaving the building.

The largest wooden toothed gear is fixed to the end of the wooden waterwheel shaft. Because of its size it is housed in a pit and known as the pit-gear. This pit fills with water during times of flood.

At head height is a lay-shaft with a small metal gear that engages with the pit-gear and, at the other end, another large wooden toothed gear. This latter gear engages with a metal gear that can be fitted to the end of the line shafting. This final metal gear is retained on a short stub shaft when not engaged with the line shaft.

The two next door cottages housed Estate workers including the chief sawyer or foreman. Their water supply was once provided by a bronze pump fixed in the gear room and operated from one of the waterwheel gear shafts. The water was pumped straight out of the river. Evidence was found that the water was chlorinated at one time before going to the cottages.

There are local underground ironstone springs that were used by the residents for drinking water and other springs can be seen in the Mill tail race.

In this area people can learn about:

- how our ancestors did not rely on having piped water from a mains utility supply
- how a pump works.

[9] Waterwheel

The energy of a flowing river is captured at Combe Mill using a waterwheel. Jeff Broxholme grew up as a boy next door to the Mill when his father was Chief Sawyer. He remembers his father organising the replacement of the wooden shaft in the mid-1930s. He recalls that the wooden shaft was sawn at the Heythrop Park Sawmills and how the off-cut was used as a chopping block in his Mother's kitchen. It was Jeff as a grown-up who took the lead in rebuilding the Mill chimney the date stone on which shows it was capped out in 1972.

The river Evenlode fed the head race and used to run straight through the Mill and under the waterwheel to the river via the tail race that still exists. All that remains of the head race is a small pond in front of the waterwheel into which we are able to pump water from the river that now flows a few yards to the south.

The illustration in the outdoor display, in front of the Mill, shows the original line of the river. The river head race was filled in during the mid 1970s to make room for an enlarged yard in which timber could be stacked.

[A local lady is reported to have told a volunteer that she remembers seeing adverts around 1965 asking for the assistance of local people to provide filling material.]

The power from the waterwheel is harnessed by a set of gears in the adjacent gear room. The gears increase the speed of rotation by about tenfold so that the line shafting rotates at the speed needed by the machinery. The large gears have wooden teeth set in a cast iron rim and these engage with smaller cast iron spur gears.

It is usual for these wooden teeth to be made from Hornbeam or fruitwood if they run dry. For wet running gears, such as the pitwheel, oak is recommended but here at the Mill the members in 2004 decided to use Hornbeam for these too and they are now gradually breaking and being replaced by oak teeth paid for with money raised by the Tooth Fairy campaign.

The amount of water reaching the wheel, and hence the power delivered, could be controlled from the gear room, or remotely from inside the old sawmill, by the sawyer by raising or lowering the sluice. The flow of river water was managed by a side sluice just upstream of the Mill that could divert excess water. Excess water further back near to the bend in the river overflowed a 'lasher' which is a fixed weir sideways to the river flow. What is now the course of the river was originally the overflow from the main course.

On the wall opposite the waterwheel is a push button operated audio/visual display that visitors can use to watch short films about workers and machinery in the Mill.

In this area people can learn about:

- the power of a river as a free source of energy
- capturing the power using the waterwheel buckets each holding 10 gallons of water[4]
- managing the river flow
- harnessing the power of the wheel using gears

[4] A gallon of water (4.546l) weighs 10lb (4.53Kg)

- ratio of gear speeds
- the reason for using wooden gear teeth[5]

[Note – wooden teeth are used for several reasons. Their use removes the risk of sparks that might result in explosions of dust, they run relatively quietly and in they act as a mechanical 'fuse' in the event of an overload in the drive system. We do not lubricate the gearing.]

[10] Stationary Engine and water pumps

Within the headrace fenced area a Lister petrol engine is used to drive water pumps such as would have been used in local farms. These small stationary engines were the work horses of the farmer for many years.

People can learn about:

- how machines were used before electricity was available to power motors.

[11] Farrier's Tools

This area displays many blacksmithing and farriery tools.

Our farriery collection includes several designs of horse shoe, two types of 'frogs', and various farriers' tools. Two pony hooves help to illustrate the craft, but more importantly how thin the hoof wall is for the horse shoe nails to be driven into.

In this area people can learn about:

- horse shoes and the nails that held them
- the makeup of a horse's hoof
- the use of 'frogs' with horse shoes
- the use of 'frost' nails
- the use of a 'twitch'
- the use of a traveller by a blacksmith.

[12] Trade Catalogues

In the Foreman's Office we have several old trade catalogues

People can enjoy:

- seeing the designs of items they might find in Blenheim Palace and other country houses
- note the prices charged at the time.

[5] Wooden teeth are used for a variety of reasons – quiet running; to provide a mechanical 'fuse' in case machinery jams or to stop sparks in the case of flour mills.

[13] Country Trade and Domestic Artefacts

A cabinet contains a variety of country domestic and craft tools and artefacts that carry labels that explain their name and purpose together with information about their provenance where known.

In this area people can learn about:

- objects that grand-parents once used
- objects that parents remember their parents having
- objects that children can only wonder what they were used for.

[14] Carpentry

We have a good collection of wooden joinery and carpentry tools in particular moulding planes. These are used to demonstrate how different shaped mouldings were applied to woodwork such as on architraves around doorways, skirting boards, dado rails and even linen-fold mouldings in panelled rooms.

In this area people can learn about:

- different species of wood and their properties and grain flow
- the skill of keeping edge tools sharp
- ways of holding the work piece
- the types of decoration that were added to wooden features of furniture and buildings.

[15] Model Engines

Several working model engines are run on steaming days. There are hot air engines, gas engine and steam engine models together with those brought in from time to time by volunteers.

One of these 'model' engines is actually a proper Stirling Cycle hot air engine that was found at Wheatley Windmill and restored to working condition by Wilfred Foreman and Tony Dyer.

There is a working model of the beam engine in the Engine Room that was made by Adrian Hill.

Here people can:

- enjoy the skills of the model maker
- learn about different sources of power.

[16] Electric Batteries

On a window sill are three very old dry batteries dating from the early 1900s. It is known that the eighth duke was an early adopter of technology and it is possible these batteries

were used at the Palace in the telephone system he had installed. There is still detectable a small voltage when zero current is drawn.

In the book *Woodstock and the Royal Park* is a report of a 1908 fire in the church tower at Combe. Doug Margetts, who was only five at the time, remembers seeing the horse-drawn fire engine emptying the village pond[6] in its attempt to extinguish the fire. The book speculates that the brigade was probably called out by a telephone message from Combe Mill over the new telephone system just installed at the Palace. Our records at the Mill list a Mr Margetts as an employee at the Mill at that time – presumably Doug Margett's father.

Here people can:

- see how much technical development has achieved in shrinking the size of 1.5v batteries.

[17] Fretsaw

We have a working treadle-operated fretsaw which dates from the late 1800s and visitors can see how intricate shapes were cut for jigsaw puzzles and other fancy furniture decorations.

In this area people can learn about:

- the use of a jigsaw and toy making.

[Please do not use the treadle fretsaw unless you have been trained to do so or it will sustain damage.]

[18] Wheelwrighting

Parts for cartwheels were made at the Mill and we have examples of these parts and the templates and tools used to make them.

The original band saw **[19]** was used to cut timber and make the felloes to form the rim of a cart/trap wheel. It is driven by a belt from the overhead line shafting and has a 'fast and loose' device to control its stopping and starting. We have several old curved templates that were used to mark out the shapes of felloes.

The original wood-turning lathe **[20]** is also powered from the line shafting and was used to turn round objects from sections of wood. The hubs or naves of cartwheels were made on it as were everyday items like wooden bowls, decorative finials for curtain rails, newel posts for staircases and so on. The lathe has a fast and loose mechanism and speed change gearing.

[6]. *In the 18th century there was a large village pond south-west of the green. It was reduced in size by encroachment in the 19th century and apparently became a shallow pool liable to dry out. It survived in the earlier 20th century, but was later drained.20th century, but was later drained.* From Victoria County History

There is also an old treadle lathe **[21]** that was once used to make wheel hubs. This treadle lathe was given to Society member Robin Long in the 1980s as scrap wood to burn in the Cornish boiler but was carefully restored to working condition. It was used by Clive Dore at his Leafield works to turn wagon wheel spokes and naves (hubs). The works is no longer there having been built on for housing. The lathe is of the type used in the late 18th century until the early 19th century when steam engines and line shafting came along and enabled power to be harnessed to belt driven machinery.

The spokes for cartwheels had their ends shaped to fit into holes in the felloes and we have the hand tools used to make these round outer ends, or dowels.

We also have a hand-operated mortising machine **[22]** made by F W Reynolds that is used to make rectangular holes such as those in the wheel hub to take the inner end of the spokes. The mortising machine was acquired from Cogges Manor Farm museum in 2010.

We can show how a 'traveller' was used to measure the circumference of the wheel and then transfer the 'measurement' to the iron strip that the blacksmith would cut and join by means of hot hammer welding to form the rim or tyre for the wheel. There is a full size cartwheel on display to show the various parts and also a model wooden wheel made by Ron Rutherford that can be taken apart and re-assembled.

Thanks to retired wheelwright Ted Fox we also have a demonstration cartwheel, a wooden hub and several types of spoke that can be used to explain how the various parts of a wheel fit together. Ted also donated some of his specialist tools. We have access to several models of horse drawn vehicles made by a volunteer (Ron Rutherford) to illustrate the types of transport the cartwheels were used on.

In this area people can learn about:

- how human power was replaced by mechanical power
- how a cartwheel was made up of different parts (felloes, naïve and spokes)
- the properties of the different woods suited for each part (ash, elm and oak)
- the machines and tools that were used to cut and shape the parts
- how the tyre would have been measured, hammer welded, heated up and shrunk onto to the wheel.

[23] Pattern Making

Cast iron items for the Estate such as window frames, fire grates, fire bars, drain covers, gears and pulleys were made by the casting process. Patterns of the required objects were made of wood and from these patterns moulds would be made in green sand. The molten metal would then have been poured into the mould to produce the finished article. The moulding and casting process was done somewhere else and cash book records show that Lucy's in Oxford were used for this. Pattern making is a skilled job because allowance has to be made for shrinkage of the metal as it cools and the likelihood of distortion of the final piece as it cools.

We have examples of both small and large patterns and castings. Visiting groups can ask to make castings under supervision in lead-free pewter using our modern electric furnace.

Craftsmen also once created plaster and papier mâché mouldings to decorate ceilings in the Palace. Unfortunately the examples that once existed were thrown away when they deteriorated because of damp.

In this area people can learn about:

- making a shape for a pattern
- making a 'negative' copy of the shape to be a mould
- using the casting process to make many copies of the pattern
- different melting points of materials [7]
- different ways of making a mould
- why the spokes of cast iron pulley wheels are curved to ensure they remain in compression under load.

Casting

Also in this area one can see items belonging to a collection donated by the Banbury family of Woodstock. George Banbury was an agricultural engineer and inventor who had a great interest in helping the third world to become self sufficient in making tools. With the availability of scrap aluminium after the Second World War, he was inspired to develop a simple furnace design that could be made locally out of a metal dustbin and basic metalwork. George obtained his supply of aluminium, brass and steel by dismantling old Morris Minors and Austin Seven cars that he would dismantle in his yard and melt down to form ingots which he sold to cover the cost of developing his inventions of hand-powered farm machinery for use in Nigeria. He produced a series of moulds from which to cast the various types of hand tools that he designed. The prototype furnace no longer exists but the moulds can be seen together with examples of aluminium tools produced using them. We are unsure whether the furnace design, the moulds and aluminium ingots were ever deployed overseas.

[24] Metal Working

The metal working area has been created to show how our collection of metal turning lathes would have been driven by belts. Not originally objects discovered at the Mill, these machines would have arrived in the mid nineteen hundreds had the workshop still been operating.

[25] Historic Clocks

We have a collection of five working historic tower clocks. They date from between 1550 and 1850 and have been acquired mostly on loan from local churches.

[7] Melting point of Aluminium is 660degC; of Copper is 1085 degC and of Wrought Iron is about 1500degC

Each clock has its own little piece of story line and the collection is used to illustrate the advances in timekeeping through the centuries.

We also display an astrological clock made from Meccano and donated to us by the family of the maker.

The display is illustrated by a prototype timeline showing the history of timekeeping.

In this area people can learn about:

- weight driven clocks
- developments in the clockmakers' skills
- different types of escapement
- how pendulums are used to keep time
- how gravity was used to power the clocks rather than springs
- how the gears were used to power the hands and strike the hours
- how the escapement released the power second by second to run the clock.

[26] Tinkering (Exploration) Area

The tinkering area is either side of the top of the stairs. Here visitors can enjoy the various puzzles and projects using the various resources available.

Dressing up clothes are available for visiting schools.

Within the Tinkering Area there is a large display board of 'guess what they are?' objects. There is one 'rogue' item included in the display.

[27] Foreman's Office

The Foreman's Office once also housed the workshop stores. From here, the Foreman could supervise his workers by watching through the office windows that looked into the Pattern Shop and the Sawmill. He could also look out into the Yard and watch goings on with the railway siding. The 3-D illustrations show what these views would have been like.

From his office the Foreman (or Chief Sawyer or Clerk of the Works as he was variously known) organised work for his men around the Estate.

We have original day books from around 1880 to the 1920s that record what the men did on a day-to-day basis and we also have cash books showing various transactions. Some of the transactions can possibly be matched by Palace records.

An entry in the 1929 day book shows the pay cut everyone experienced during the depression.

One of the people who occupied the office was Edward Nash about whom we know a fair amount including his photograph and some correspondence. We also know quite a bit about Archie Dunkley who succeeded Edward Nash as Clerk of the Works.

On the wall above the fireplace is a push button operated audio/visual display that visitors can use to watch short films about workers and machinery in the Mill.

In the office people can learn about:

- the working life of a foreman
- what workers were paid and their working hours
- the sorts of work done in Combe Yard
- the railway and its siding
- old trade catalogues – historic designs and prices
- history of the Yard and the Mill over the years
- timeline of Combe Mill
- lists of tradesmen with links to local census returns.

[aa] Shoe and boot making

We have a collection of shoe and bootmakers' tools but they are not currently on display.

The collection was donated by the Jack Gibbard family from Great Tew but we know little about the original owner. The major part of the collection was donated to the Oxfordshire Museum Service.

Work is needed to identify and interpret the collection.

[28] Tea Room

The riverside Tea Room is open on steaming days where refreshments are served. The room is also available to hire for business or family social events, such as children's parties. There is an indoors WC and an Access Toilet with baby change which is reached from the outside.

[29] Boiler house

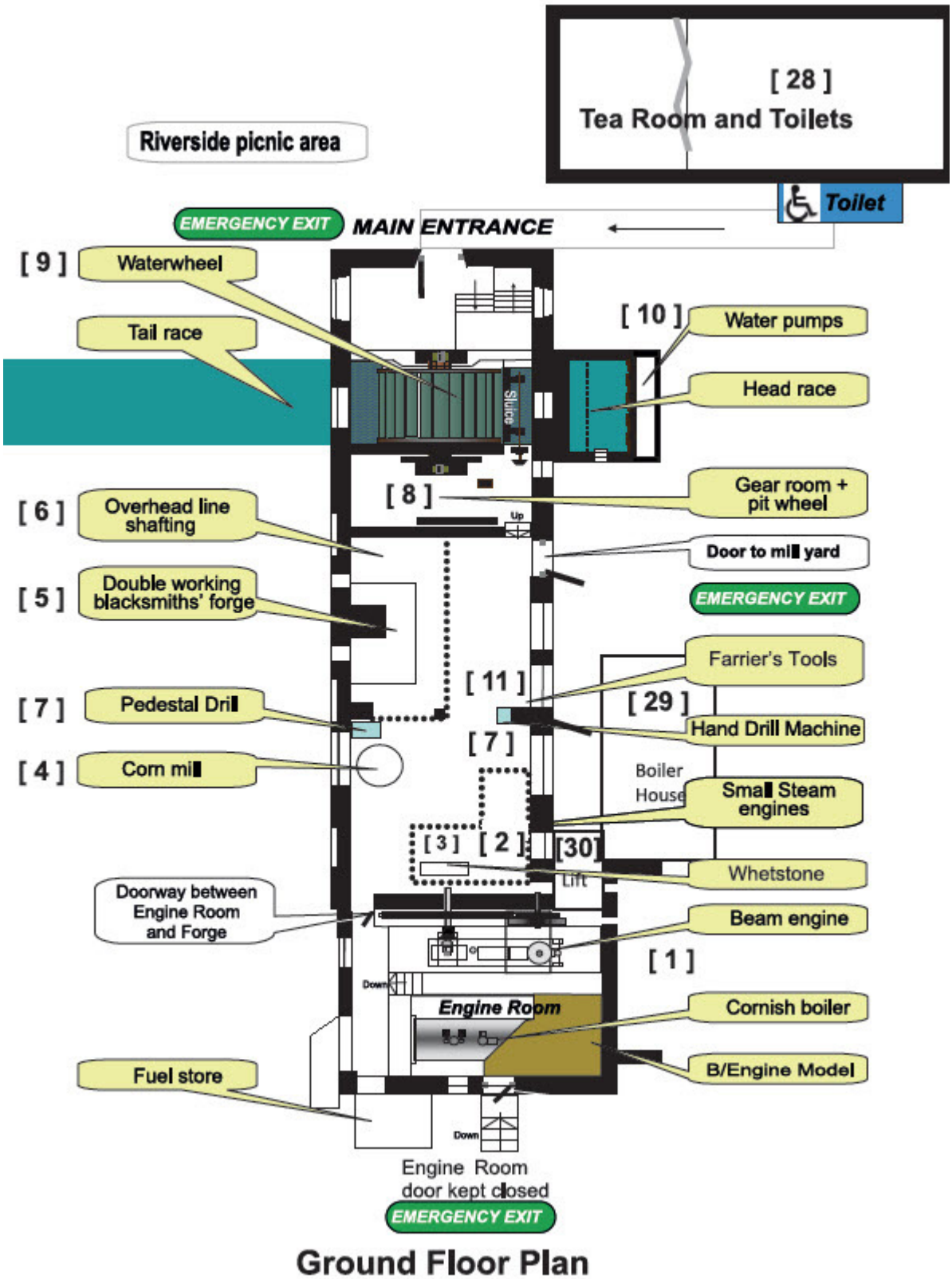
In the corner between Combe Mill and the old sawmill is the boiler house which contains an oil fired boiler which provides steam for our working exhibits. Visitors can be shown inside the boiler house when closely supervised by a volunteer competent in boiler operations.

[30] Platform Lift

A corridor between the boiler house and the Mill permits access to the platform lift by which visitors can reach either of the two upper floors.

Retail Sales

The location for the sale of Mill related products and souvenirs changes from time to time.



Ground Floor Plan

Combe Mill Story Lines