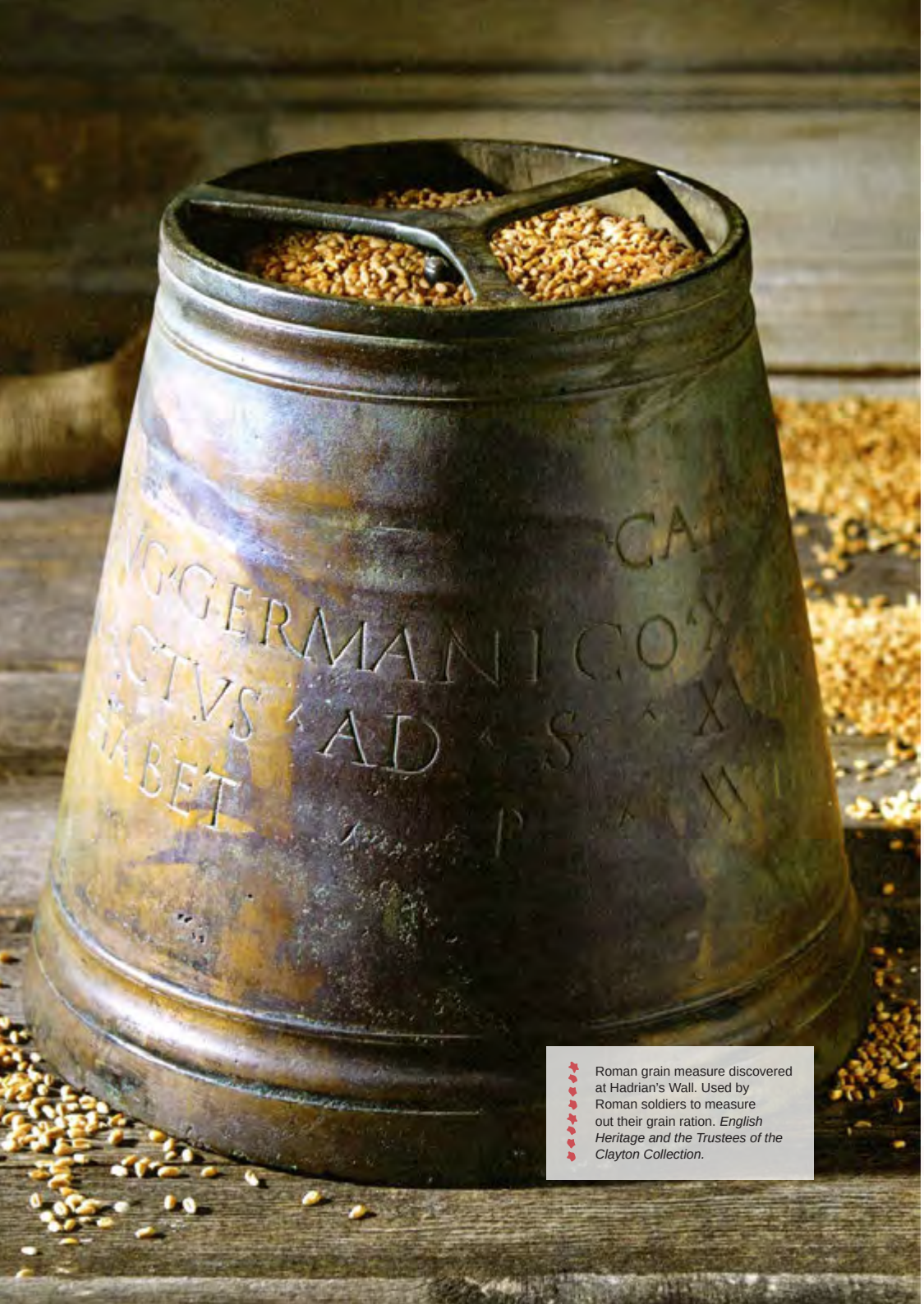
Mills Archive

PRESENTS

# FROM QUERN TO COMPUTER

A history of flour milling



Roman grain measure discovered at Hadrian's Wall. Used by Roman soldiers to measure out their grain ration. *English Heritage and the Trustees of the Clayton Collection.*

# Contents

Inspector of Weights and Measures carrying out a spot check on a loaf of bread from a horse drawn bread delivery van in Essex. *Cliff Featherstone. (Image showing Cliff's father)*

# Introduction

There are few sights and smells more appealing than that of a loaf of freshly baked bread. Any home baker will be familiar with a bag of flour, its powdery contents the foundation of many delicious bakes and meals. Today much of our awareness of flour and the products created from it starts, and ends, with the supermarket shelf.

But dig a little deeper. Bread has been a vital source of food for people for thousands of years. Bread is baked from flour. Flour is made by grinding or milling cereal grains, which are too hard for us to eat without being processed.

In this special edition of *Mill Memories* changes to corn milling technology will be explored, from animal, wind and water power to the modern day roller flour milling industry. From grain, to flour to our daily bread, this booklet will demonstrate how the stories of technological changes to flour milling, and the development of our society, are closely intertwined.

Want to know more? Visit our website at *millsarchive.org* to explore the history of flour milling, *From Quern to Computer*, in greater depth through our interactive timeline and extended written chapters.

Claire Wooldridge
Learning and Engagement Manager

Chesterton Windmill, Warwickshire. *Martin Watts*

# Cereals, flour and bread

Many of us eat bread every day. Bread is made from flour, the ground grains of cereal plants.

The word cereal comes from Ceres, the Roman goddess of agriculture. According to myth, it was Ceres who first taught humans how to plough, introducing them to grain and the art of grinding.

Cereal plants are **grasses**. Grasses are the plant family which provide the grain upon which the greater part of the world's population depends for its daily food requirements. A typical grain comprises three main parts: the endosperm, the starchy centre which is made into flour; the germ, the embryo of the new plant; and bran, the covering layers. Whole grains are rich in carbohydrates, vitamins, minerals, protein and fat. Refining flour to remove the bran and the germ produces white flour, rich in carbohydrates but lacking the other health benefits of whole grains.

The three main cereal crops are **corn (maize), rice and wheat**, accounting for about 90% of all cereal production. Other cereal crops are grown to suit certain climates, such as barley, oats and rye in cooler environments.

What about breakfast cereal? Cereal grains are ground down, or milled, to make flour. If the same grains are flaked and toasted, you've got breakfast cereal! Cornflakes, for example, are just toasted flakes of corn.

Adaptable and hardy, cereals have been a mainstay of our diet for thousands of years. Population growth triggers the need to produce more food. It is usually cereals (ground into flour) which meet this need.

Grown in woodland clearings (3500BC) and then on developing farms (1500BC); cereals, such as hardy spelt, quickly became the most significant part of our diet. More grain was processed than ever before during the Roman period. Watermills (such as that at Haltwhistle on Hadrian's Wall) helped to meet the growing need for flour from grain for food for the Roman army and the growing population of newly established towns.

By the late nineteenth century some 90% of wheat was imported. The Corn Laws designed to protect British grain producers by imposing tariffs on imported grain were repealed in 1846. The population of Britain had boomed during the Industrial Revolution (1750-1850) and Britain could no longer produce enough grain to provide food for the growing population. Much imported wheat was hard (which produced good quality flour and nutritious bread) and so lent itself to new industrial forms of milling such as roller milling rather than by traditional methods using millstones.

During the World Wars of the twentieth century, production and distribution of flour came under government control. By the start of the Second World War in 1939 there were only about 500 mills producing flour in the United Kingdom, of which half were small, independent businesses. The three largest companies, Ranks, Spillers and CWS, then produced two-thirds of the country's flour output.

According to recent figures released by nabim (the National Association of British and Irish Flour Millers) some five million tonnes of wheat are now milled in Britain each year. About 85% of this is grown in Britain. Barley is the second most grown cereal in Britain, grown mainly for animal food and malting.

CASE STUDY

## wicken windmill

Wicken Windmill (Grade II* listed) stands in the centre of the village of Wicken on the south side of the A1123, nine miles south east of Ely, Cambridgeshire. It is the only complete twelve sided smock mill in the country and is looked after by The Wicken Windmill Partnership.

Wicken Windmill was built in 1813 by master millwright Robert Hunt of Soham, Cambridgeshire, for John Martin of Wicken. The mill was built on a new site, and had cloth sails, two pairs of stones and a fantail. John How, farmer and miller, bought the mill in 1838. At some stage the mill was converted to broad shuttered sails built to Cubitt's 1803 patent.

Wicken Windmill, c. 1906. Woolard Barton (the miller) is pictured with flour scoop. *Dave Pearce.*


National Flour was introduced during government control of the milling industry in 1942. It was finally discontinued in 1956. *Martin Watts.*

Grinding with a saddle quern in South Africa, post card dated 1904. *Mills Archive Postcard and Art Collection.*

## querns

Cereal grains are too hard for us to eat. To make flour, cereal grains are crushed to break them open.

In earliest times this was achieved by breaking open the grain between two stones. (More on modern crushing of grain in *Roller Milling* later).

The first milling stones were hand-operated and are generally known as querns, a word derived from the Old English word cweorn. Most querns are made from locally available stone, hence 'quernstone', but other materials have also been used, such as sun-dried mud coated with bitumen or wood studded with pieces of iron.

The oldest and most continuously used milling tool is the **saddle quern**, so called from the shape of the lower stone. The saddle quern comprises of a flat or dished slab of stone and a hand-held upper stone which is rubbed to and fro across it. It was first used in the Near East and spread with the adoption of agriculture across Europe, reaching Britain in about 4000BC.





Using a saddle quern was hard work. It was generally worked on the ground, with the operator, usually a woman, kneeling behind it.

The **rotary quern** is comprised of two circular stones, the upper turned above the stationary lower one by means of a handle. First used in Britain around 400BC, it remained in use in Ireland and Scotland into the twentieth century. Comparatively easier to use than a saddle quern, it was also more efficient and could be used by two people working together.

Iron Age (1200BC-1BC) rotary querns were comprised of two thick, heavy stones, sometimes referred to as **beehive querns** from the distinctive shape of the upper stone.

The rotary quern was quite literally a revolution in milling technology. The principle of milling by turning one circular stone above another was to hold throughout the future development of milling with stones.

Rotary querns continued to be used in the home into the 16th and 17th centuries, mainly for grinding small amounts of malted grain for domestic consumption.

The final development of the rotary quern was a handmill in which a small pair of millstones were mounted on a timber frame, the upper stone being turned by a handle through a pair of gears.

By the 18th century rotary querns were going out of use across much of Britain, although they remained in daily use in the Northern and Western Isles of Scotland and in Ireland into the 20th century and, like the saddle quern, they are still used in some parts of the world today.

So this was all done by hand? Yes and you can imagine it must have been very hard work! Read on to discover how people harnessed natural animal, wind and water power to help them mill flour.

Rotary quern featured in educational display at Winchester City Mill. *Mildred Cookson.*

## Animal power

The earliest milling tools were worked by human effort, using specially selected stones or wooden artefacts to pound, crush and grind various raw materials, including cereal grains. The use of animal power for turning millstones marked a significant step forward in the mechanisation of the milling process. It enabled the use of larger millstones with a corresponding increase in efficiency and output.

Donkey crushing rice in China. *Mildred Cookson.*

Animals, such as horses or donkeys, were first used to turn millstones in Greece and Italy in the 4th century BC. The '**hour-glass**' or '**Pompeian**' mill, turned by a donkey, was probably the earliest form of powered mill to be used in Britain, introduced in the 1st century AD.

The Pompeian mill, usually made of volcanic stone, comprises two main components, the *meta* and the *catillus*. The meta looks like a basin and is a rounded cone set in a masonry base, called the podium, usually with a skirting around it on which the ground product was collected. The catillus takes the form of two hollow cones joined at their narrow end. The lower cone of the catillus fits over the meta and the upper acts as a hopper into which grain is put. The catillus was turned by a mule or donkey attached to the stone by a wooden bar, the animal walking in a tight circle around it. Some smaller versions were probably turned by slaves.

Animal power was also important in transporting flour and grain (as explained in the next chapter).

From documentary evidence it appears that animal-powered mills were never as numerous as water or windmills.

Cromer Windmill, Hertfordshire. *Robin Webb.*

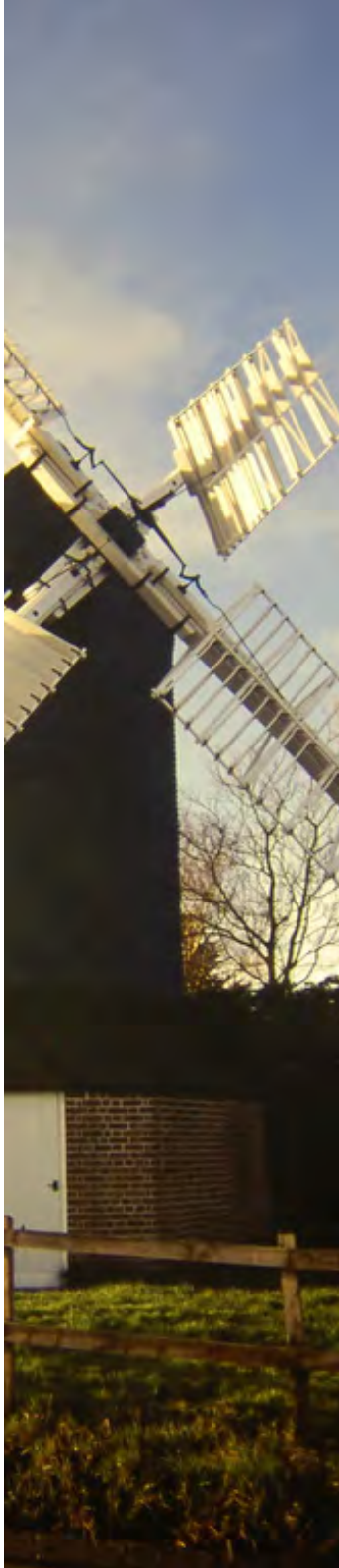
CASE STUDY

### Cromer Windmill

Cromer Windmill, Ardeley, is Grade II* listed and is Hertfordshire's sole surviving windmill. The current smock structure dates from the seventeenth century and is looked after by Hertfordshire Building Preservation Trust.

Mr F. B. Macrae lived in Ardeley between 1911 and 1916, and in a letter to the magazine *Hertfordshire Countryside* in May 1971, he wrote that:

"I well remember being warned not to go too near the sails when they were turning, and being told the cautionary tale of a tramp who had wandered too near the mill and had been picked up and tossed by them into a hedge. The shadows of the sails used to flicker across the road, and many horses had to be led by when the mill was working. Sometimes the driver would put his jacket over the horse's head."




Steam driven motor vehicle delivering grain. *The Miller, c. 1900.*

## transport

From earliest times grain would have had to be taken to the mill for grinding and the flour either taken back to the customer or collected by him.

Farmers, for example would use their animals, such as donkeys to carry the heavy sacks to and from the mill. This is shown very nicely on old medieval illustrations and illuminated manuscripts. As quantities increased, horses were required to pull carts.

In time, mills near rivers and canals benefited enormously as horses could be used to pull the great weight of a barge laden with grain. Sometimes up to 40 horses were used. No easy task negotiating the locks. The new generation of roller mills were often built next to rivers or canals and then where possible with a railway connection or spur to the mill for easy delivery.

Even later, large, sea going vessels carried huge quantities of wheat from foreign lands, arriving at ports such as London, Liverpool and Manchester to discharge their cargo into huge silos at the docksides awaiting customers' orders.

Steam, already being used in mills was also adapted to drive wagons. Millers would see the manufacturers' adverts for them in the milling journals, *The Miller* and *Milling*, so gradually they appeared more and more frequently on the roads over the country transporting grain and flour.

Animals were also used for transporting mill stones from quarries to the mills, a hazardous task as sometimes the half ton mill stone would run too fast for the donkey to keep up.





Grain being delivered by boat to Sonning Roller Flour Mill, Berkshire. *The Miller, c. 1900.*

## watermills

Watermills are driven by the power of running water acting on a waterwheel or water turbine.

A **waterwheel** is a wheel which is able to extract mechanical energy from water as it passes from a high level to a lower level. The wheel rotates, which then turns a series of shafts and gears which cause the upper millstone to rotate. Waterwheels can be positioned horizontally or vertically and can be rotated by catching water passing under them (**undershot**) or over them (**overshot**). Watermills can be situated on a stream or river, or can use the power of the tide (**tide mills**).

Based on the writings of classical authors, it is thought that both **horizontal** and **vertical** waterwheels originated in the eastern Mediterranean area in about 240 BC, the horizontal wheel being developed in Byzantium and the vertical waterwheel in Alexandria.

Overshot waterwheel at Bridge Mill, Bridgerule, Devon. *Sue Watts.*

In *De Architectura*, written about 25 BC, the Roman engineer Vitruvius described a vertical waterwheel, similar to a water-lifting wheel, which drove a pair of millstones through gearing. Although there are ambiguities, this is the earliest description of a water-powered corn mill.

A number of other vertical-wheeled mill remains have been found by archaeological excavation throughout Europe and from evidence gathered it appears that Roman waterwheels were relatively low powered, perhaps no more than 1½ to 2 horsepower (1.5kW) on average, capable of driving a single pair of millstones.

In 1907-8 the archaeologist F. Gerald Simpson identified the first Roman watermill to be found in Britain during excavations at Haltwhistle Burn Head, Northumberland, to the south of Hadrian's Wall. The mill was thought to date from the Roman period 3rd century AD.

The earliest Anglo-Saxon watermill in England dates to 692AD. An excavation at Ebbsfleet, near Northfleet, Kent, in 2002 revealed the remains of a watermill with two inclined wooden channels that directed water from a tidal pond onto horizontal waterwheels with scoop-shaped paddles.

The most recent discovery of a Roman watermill was made in the aftermath of the severe flooding suffered in the area around Cockermouth, Cumbria, in 2009, on the banks of the river Derwent. Stone foundations and fragments of a timber structure that supported a waterwheel were found, broadly dated from coin and pottery evidence to the 1st or 2nd century AD. The mill is thought to have been connected with the nearby Roman settlement at Papcastle.

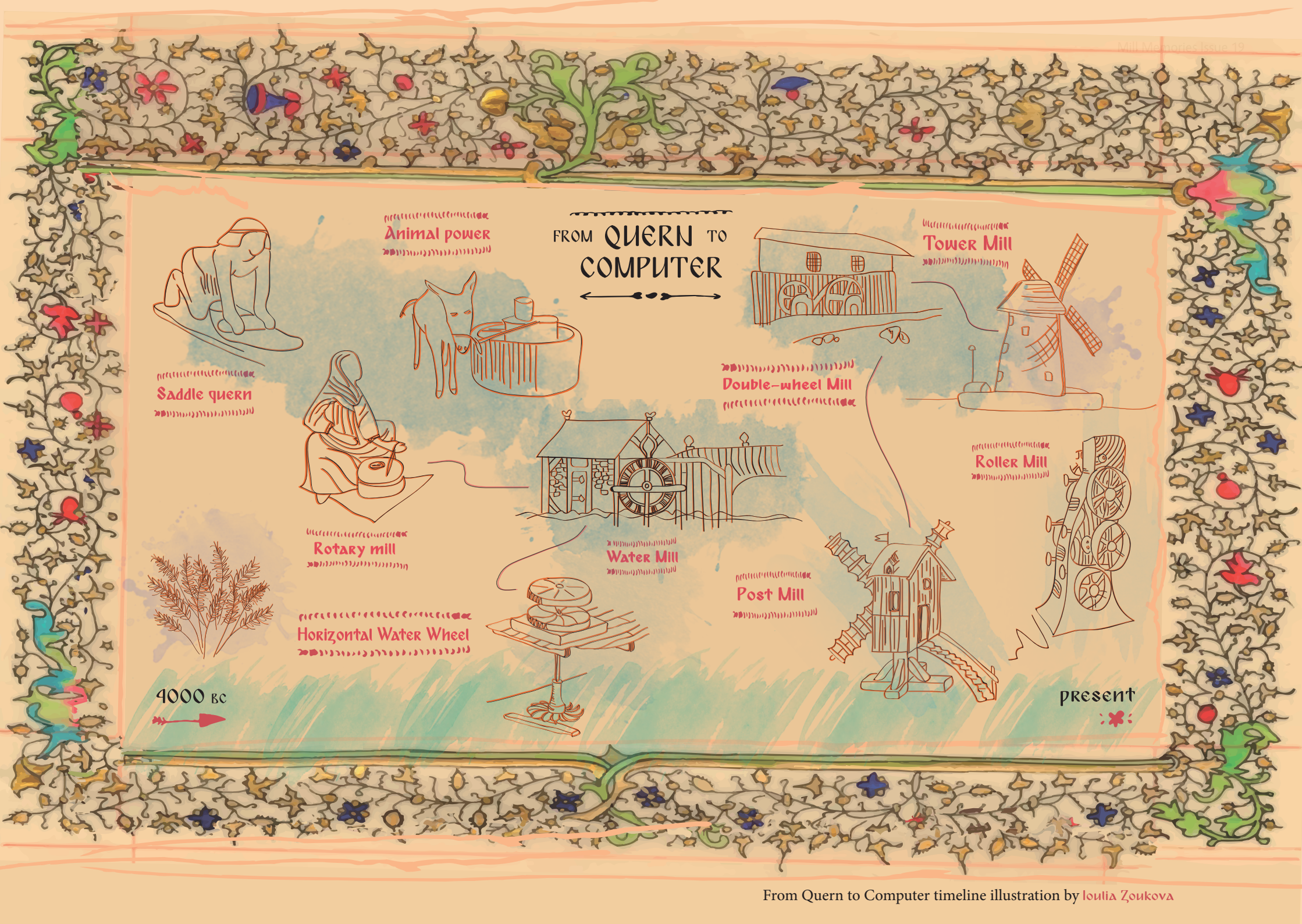
The Domesday Book recorded more than 6000 watermills.

CASE STUDY

### winchester city mill

Winchester City Mill is one of the oldest working watermills in the country. It is a rare surviving example of an urban working corn mill, powered by the fast-flowing River Itchen, which can be seen passing under the mill. The mill is owned and cared for by the National Trust.

A mill has existed on the site since the Saxon times, with early records from 932AD-989AD referring to a watermill at the site. The foundations of the building suggesting an earlier Roman mill. The mill was recorded in the 1086 Domesday Book as being one of the most profitable in the country.




From Quern to Computer timeline illustration by Ioulia Zoukova

Chillenden Post Mill, Kent. *Mills Archive (SPAB Collection).*

## windmills

Windmills are striking and recognisable structures. As with animal and water power, the development of wind power to grind corn to make flour shows how people have learned to harness natural resources available to them throughout history.

How do windmills work? **Sails** (the revolving arms of a windmill) are turned by the wind. The turning action of the sails is transmitted to turn the interior machinery.

The first windmill was built nearly one thousand years ago. The earliest definite reference to a windmill in England is in a survey of lands held by the Knights Templar at Weedley, East Yorkshire, in 1185. It was a post mill, generally considered to be the earliest form of windmill in England.

The earliest tower mill in England was perhaps the *molendini de petra* (windmill of stone) built at Dover Castle in 1294-5 at a cost of over £36, more than three times as much as that of a contemporary timber-built post mill.

Numbers of mills fluctuated over time in tandem with population changes. The devastation of the Black Death in the 1340s, or a series of bad harvests for example, could lead to a decline in the population. With fewer people, less flour is required to produce food. Thus a decrease in demand for flour could lead to a mill stopping production or going out of business

There are three main types of windmills: post, smock and tower. Post and smock mills were mainly built out of wood. Although stone or brick built tower mills more expensive to construct, they were stronger and easier to maintain in the long term.

**Post mills** are so called because the body of the mill (holding the millstones and associated machinery) sits on a timber post. The whole body of the mill with the sails is able to be turned into the wind.

**Smock mills** have a fixed body (unlike a post mill) with a movable cap (a movable rounded roof). The sails rotate with the cap. Smock mills get their name from their similarity to a countryman's white linen smock.

**Tower mills** were a development of smock mills and were built using brick or stone. They retained the movable cap. By using brick or stone, tower mills were more durable than post mills.

Can it be too windy for a windmill? Too much wind could certainly be unsafe for the mill and the miller. Tales of mills destroyed by fire or storms, alongside those of horrific mill accidents abound. Many of the mills mentioned in this booklet suffered significant storm or fire damage in their history.

Medieval windmills would usually be stopped by physically turning them until the sails were out of the wind, a method known as quartering. In England the earliest known documentary reference to a form of mechanical brake comes from a repair account for a windmill at Lawling, Essex in 1526.





CASE STUDY

### Green's Mill and Science Centre

Green's Mill and Science Centre in Nottinghamshire was built in 1807 and is a Grade II listed wind powered corn mill. It is one of the earliest examples of a brick tower mill to be built in Britain. Restored by Nottingham City Council, the windmill is run on behalf of the City by the Green's Windmill Trust.

In 1947 Green's Mill was destroyed by fire, with only the brickwork surviving. The cap fell off the top and crashed through the roof of the manager's living quarters that were built onto the side of the mill. Restoration began in the late 1970s, with the mill reopening to the public in 1985. The following year, grain was ground in the mill for the first time in over one hundred years.


Marsh-Mill-in-Wyre, Thornton Cleveleys. *Mildred Cookson.*

## Industrial Revolution

The years from 1750-1850 witnessed great social change as the advent of **industrialisation** progressively depleted rural populations with people moving to work in the new industries centred on towns and cities. Many such industries, particularly textile processing, competed for water power sites, resulting in a marked rise in the use of wind power for corn milling.

The utility of **wind power** was enhanced by a series of technical innovations towards the end of the eighteenth century: the invention and development of the **fantail** allowed windmills to be automatically turned into the wind; the introduction of **governors** meant that the meal they produced did not vary in quality with the changes in wind speed and a series of improvements to the design of windmill **sails** improved the ease of operation of the windmill, again improving output.

Slightly later than these advances, the pressure of competition for **water power** sites stimulated a similar series of improvements to make watermills more efficient. These focussed on various improvements in the design and construction of waterwheels. These changes culminated in the **Poncelet waterwheel** (1824) which was almost three times as efficient as an undershot wheel.

Waterwheel in action. *Mildred Cookson.*

This work was, however, overtaken, by the development of faster and even more efficient **water turbines**, which were widely introduced to drive the mill machinery.

Increased power, allowed the construction of larger watermills with **several floors**, providing room for cleaning, milling and dressing as well as storage. Often driven by a single waterwheel, these mills could simultaneously drive more than one set of mill stones as well as the ancillary machinery required for cleaning the grain and dressing the meal.

Improvements in the performance and output of millstones in the first half of the nineteenth century were followed in the late 1800s by the introduction of **grain cleaners** in mills. Earlier, the flour dressing machines had been introduced to sift the flour, increasing the

Heage in 2016. In 1850 Heage was refitted with four patent sails and a fantail. After storm damage in 1894, the four sails were replaced by six to give the mill more power. *Alan Gifford.*

supply of the white flour, which was increasingly in demand.

Alongside these developments, and essential for some of them, the introduction of **cast iron** elements in the machinery made a big difference. Initially employed for shafts and gearing, cast iron became an increasingly important structural component of mills. Engineers designed a variety of machines with specialised milling applications, but it was the eventual arrival of **steam power** that heralded the demise of the small country mill. No longer dependent on the availability of wind or water power, larger mills could now be constructed at ports and in towns, where a bigger issue was easy **transport** of large loads by canal, railway and eventually roads.

CASE STUDY

## Heage Windmill

Heage Windmill (Derbyshire) was built in the late eighteenth century and is Grade II* listed. It is built of coursed squared sandstone with ashlar dressings. It has 3 storey's with an ogee (onion shaped) cap. It is fitted with 6 sails and drives 2 pair of stones.

The first recorded reference to a windmill in Heage is an advertisement in the Derby Mercury of 16th June 1791: 'Heage windmill, to be erected'. Soon after, in 1798: 'To be let – complete smock mill with fantail, two pairs of stones, good dressing machine – made to plans approved by Mr Wass'.

In 1850 the two brothers Isaac and Joseph Shaw purchased the mill, trading as millers and grocers, and it is believed they updated the mill, fitting four patent sails (with shutters) and adding a fantail to turn the cap into the wind.

One of four governors on the Meal Floor that control the gap between the stones at Upminster Windmill. *Friends of Upminster Windmill Collection.*

CASE STUDY

## Upminster Windmill

Upminster Windmill (Essex) is a Grade II* listed corn mill built in the early nineteenth century. The four storey, eight sided smock is built on a single storey brick base. Upminster Windmill is run by the Upminster Preservation Trust and the Friends of Upminster Windmill.

The mill was built in 1803 by local farmer James Nokes. Business at the mill flourished, so much so a steam mill was added in 1811. The two mills then ran in tandem for 124 years. The addition of the steam mill increased capacity by 66% and made the site less reliant on wind power alone. At its peak, Upminster was processing one thousand bushels of wheat per week (a bushel is a measure of volume of grain; the weight will vary with the type of grain).

The 19th century saw other modifications to the mill to improve production. The sails were changed from common canvas sails to Cubitt Patent sails in the 1850s and a fourth pair of mill stones were added, making a total of six pairs with the steam mill. The milling process was automated as much as possible with conveyors, elevators and other mechanisms. This complex equipment has survived and can still be seen as it was once used.

Victoria Flour Roller Flour Mills, Grimsby, nineteenth century postcard. *Mildred Cookson.*

## Roller Milling

Roller flour milling is the crushing or grinding of grain using cylindrical **rollers** (rather than millstones). The rolls were usually made of porcelain or cast-iron. The mechanisation of the milling process in roller mills characterises the technological and economic progress seen during the Industrial Revolution (1750-1850). While a wind or watermill with one set of mill stones could produce around one tonne of flour per day, a roller mill could produce several hundred tonnes.

Experiments using pairs of metal rolls for grinding grain began in the 16th century. The first roller mills using rollers for grinding wheat into flour in Europe were built in Hungary and Switzerland in the 1820s.

By the 1870s the roller milling industry was beginning to gather momentum in Britain. The first combined roller and stone mills were soon followed by complete roller mills. The Albert Mills in Liverpool were adapted into complete roller mills in 1870 and soon began exporting roller-milled flour to America.

Roller mills look far more like a large factory or industrial building than a traditional wind or watermill. Often three to six storeys high, the basic roller mill unit comprises a pair of **chilled iron rolls set less than a grains width apart**. The lower roll runs more slowly than the upper, catching hold of the grain while the upper, faster roll cuts it. Grain is passed through the rolls, then sifted, graded and purified to separate the wholemeal and white flours which are produced.

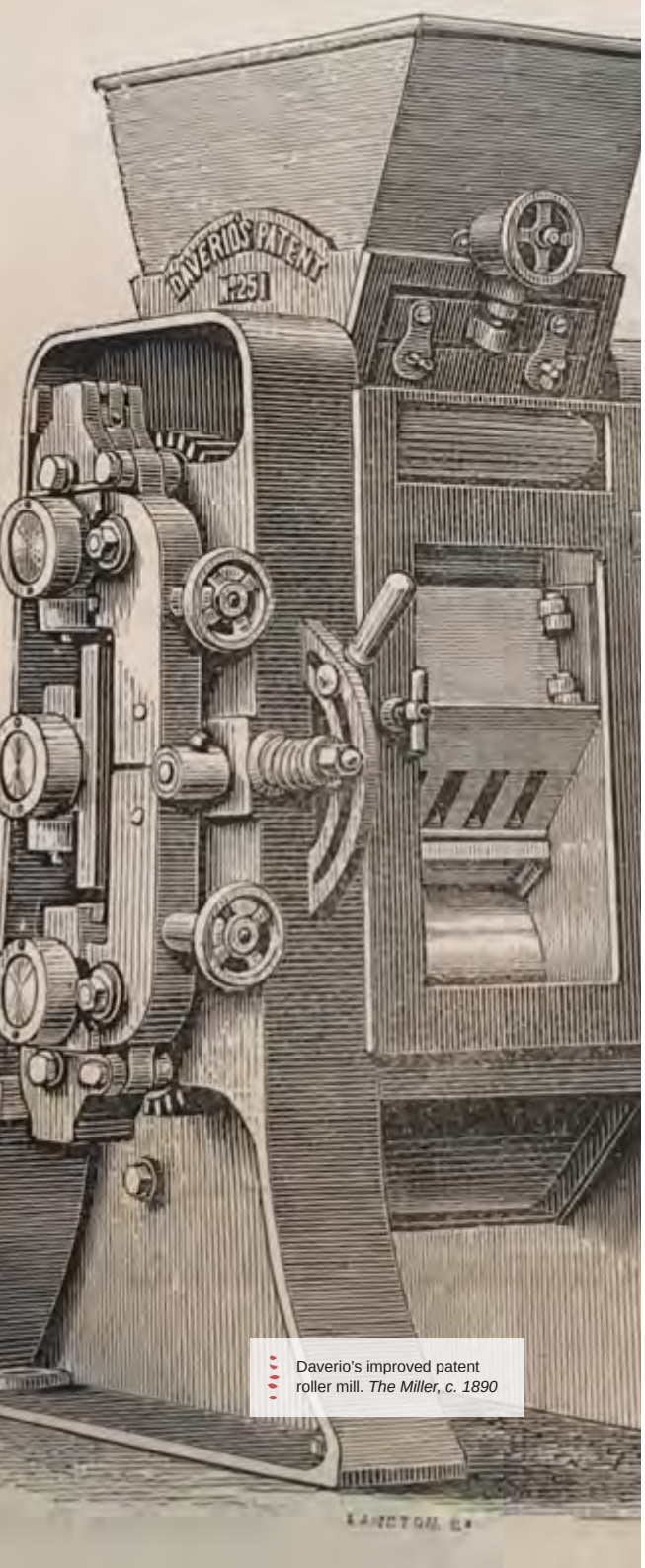
In the last quarter of the 19th century many milling businesses, large and small, turned to roller milling or faced going out of business. Where mills were likely to be built was changing, as large new mills were built at ports and on navigable rivers, canals and railways, well-placed to receive deliveries of imported wheat. Such changes were also facilitated by the use of **steam power**. At the New Phoenix Flour Mills, Newcastle, in about 1878, a new 35 sack an hour plant powered by two steam engines capable of developing 600 horsepower was built alongside the combined stone and roller mill, the old mill being turned into the wheat cleaning department.

In 1878 **The National Association of British and Irish Millers** (nabim) was formed for 'mutual advancement and protection' in the light of the 'great changes which are now in progress in the manufacture of flour, and in the machinery used for that purpose'.

These 'great changes', witnessed in the articles and advertisements in the trade magazines *The Miller* and *Milling*, were driven by two related factors: the growing demand for white bread and the increased importation of hard wheats from North America, Russia and also Australia and India, to meet demand. These hard wheats gave a good quality flour, naturally higher in gluten than native soft wheats, which enabled the production of well-risen white bread. The treatment and preparation of grain prior to milling was key to the quality of the milled product.

The triumph of roller milling over stone milling seemed well underway. Evidence suggests that though a large number of traditional mills survived, roller mills were providing a greater proportion of the nation's flour. A survey by NABIM in 1887 identified 8,814 flour mills in the United Kingdom, only 461 were complete roller mills, although these accounted for 65% of the country's total flour output.

The milling industry has come a long way from a hand-operated saddle quern serving a family or small group of people, to a fully automated, computer-controlled milling process that is capable of grinding some 320 tonnes of wheat a day. The principle of cereal grinding, however, of breaking open hard grains and refining the starchy centre to produce a usable food product, remains essentially the same.



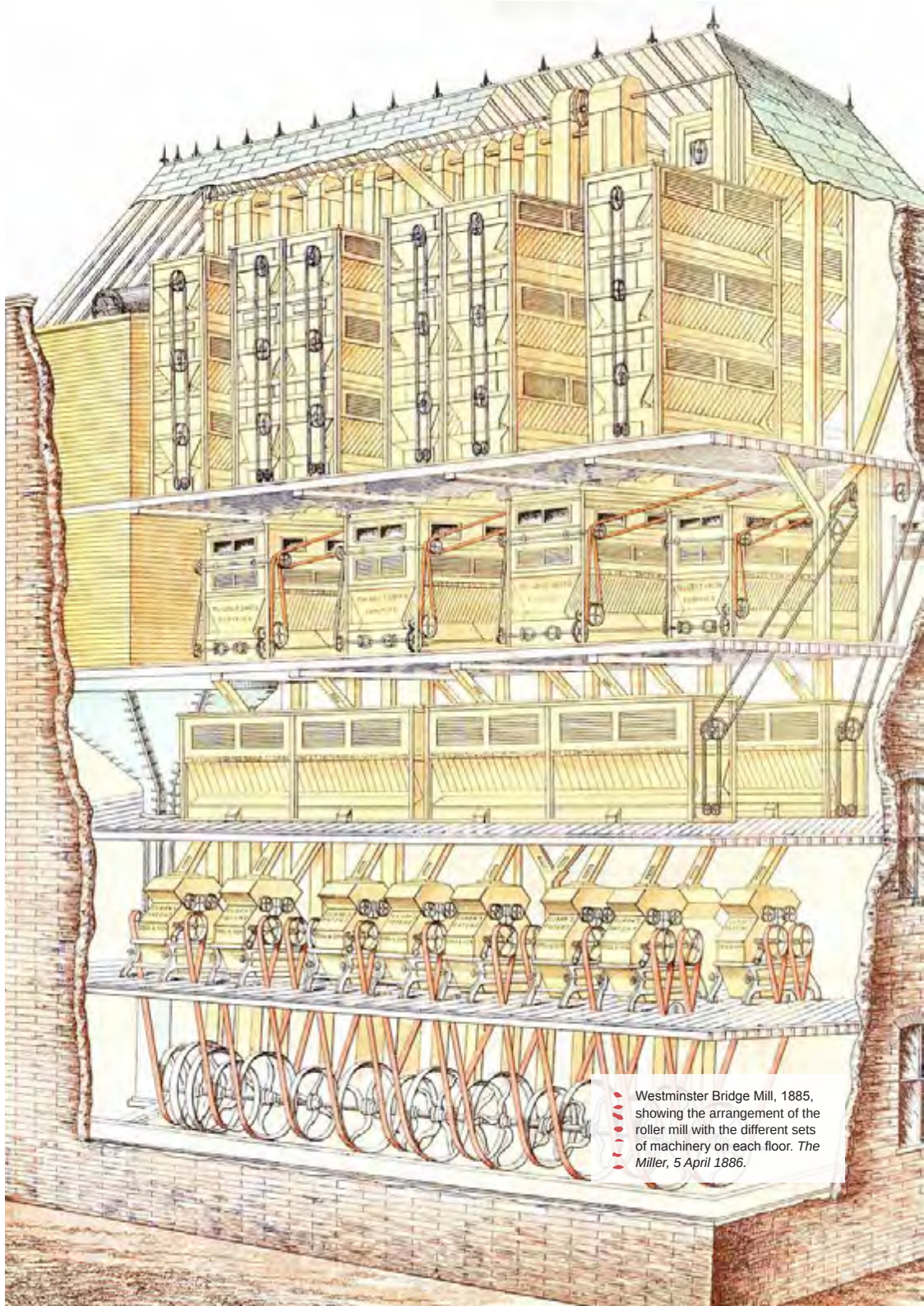

Daverio's improved patent roller mill. *The Miller, c. 1890*

CASE STUDY

## stotfold watermill

Stotfold Watermill, on the River Ivel in Bedfordshire, was rebuilt following a devastating fire in 1992. The Grade II listed building is looked after by the Stotfold Mill Preservation Trust.

In 1888 John Randall purchased Stotfold Watermill for £2,000, the first of 3 generations of Randall's to own and run the mill. In 1897-8, John upgraded the mill machinery, installing a 14 foot wide waterwheel and top quality Whitmore and Binyan hurst (timber or iron framework to support the millstones) thought to have been purchased from neighbouring Radwell Mill. John Randall's son Ebenezer Randall continued the expansion work, in 1902 building a roller mill alongside the original mill (powered by a steam engine).



Westminster Bridge Mill, 1885, showing the arrangement of the roller mill with the different sets of machinery on each floor. *The Miller, 5 April 1886.*

Rex Wailes relaxing, 1929. *Rex Wailes Collection.*

## mill protection and preservation

By the late nineteenth century roller mills had come to dominate the British corn milling industry.

Although roller mills were producing most of Britain's flour, a number of traditional mills survived. Public passion for wind and watermills led to twentieth century efforts to protect, preserve and celebrate traditional mills and milling.

**The Society for the Protection of Ancient Buildings** (SPAB) launched a campaign to save Britain's surviving windmills in 1929 and in 1931 a separate Windmill Committee was formed. With the engineer and windmill enthusiast Rex Wailes (1901-1986) as technical advisor, the Windmill Section of the SPAB extended its brief to include watermills in 1946. After WWII historic buildings could be **listed** to give them statutory protection. Woodbridge Tide Mill, Suffolk, for example, was listed Grade I in 1951.

Heritage organisations such as the **National Trust** and **Historic England** have numerous mills across Britain in their care. In the early 1930s a group of eccentric conservationists known as **Ferguson's Gang** acquired and restored Shalford Mill which they presented to the National Trust. Today the National Trust owns more than 50 mills, many of which have been restored and are open to the public.

Repair of mills, often large structures containing complicated machinery requires time, expertise and substantial funding. Since 1994 grant funding by the **Heritage Lottery Fund** (HLF) has enabled the repair of many mills including Cromer Windmill in Hertfordshire, Stotfold Mill, Bedfordshire and Eling Tide Mill near Southampton.

That mills can be repaired and kept running in good order is due to the valuable knowledge and understanding of **millwrights** and engineers. Millwrights were instrumental in the gradual change from millstone milling to roller flour milling in the late 1800s, while remaining essential to traditional mills still producing flour.

Today professional millwrights are assisted by volunteers to keep our mills open and working, such as the 450 wind and water mills open to the public across Britain on a daily basis or for special occasions such as the **National Mills Weekend** organised by the **SPAB Mills Section**, an annual festival of milling heritage held in May. Traditionally stone ground flour products are championed by the **Traditional Corn Millers' Guild** and the **Real Bread Campaign.**

The survival of our historic corn mills and the flour they produce is due to the dedicated organisations (at regional, national and

Saxtead Green Post Mill, Suffolk, was one of the first mills to be taken into guardianship by the Ancient Monuments Section of the Ministry of Works (now English Heritage/ Historic England). *F. W Gregory Collection.*

international levels) and individuals who run the mills and the millwrights that maintain them. Their enthusiasm, hard work and determination, often volunteering their time and expertise, keeps numerous mills across Britain in good working order and open for the public to enjoy.

CASE STUDY

## heckington windmill

Grade I listed Heckington Mill is situated between Sleaford and Boston in Lincolnshire. It is the only 8 sailed tower windmill standing in the UK and is believed to also be the only location in the UK where there have been windmills with 4, 5, 6, and 8 sails. The mill is now owned by Lincolnshire County Council, and operated and run on a voluntary basis by Heckington Windmill Trust.

Heckington closed as a commercial mill in 1946. The Friends of Heckington Windmill (later renamed as Heckington Windmill Trust) formed in 1982 and the mill was restored to working order over the next 5 years.

CASE STUDY

## high salvington windmill

High Salvington Windmill is a working post mill, cared for by The High Salvington Mill Trust. A feature of the mill is the rare and original compass-built tail wheel.

Overtime the condition of High Salvington Windmill deteriorated. In 1959 the mill was saved when it was purchased by Worthing Borough Council for £2250. The Council spent £5000 on repairs over the next ten years, including installing a set of four sort dummy sails. The High Salvington Windmill Trust was formed in 1976 to care for the mill. Grinding recommenced after a gap of some 90 years on 4th April 1991.

Two types of millstone are generally used to produce flour from grain in the UK, these are known as Derbyshire peak stones, or French Burr stones. Used in pairs, the lower stone remains stationary whilst the upper stone rotates. A pattern of grooves cut into the surfaces of both stones enables the grain to be cut to produce the right consistency of flour. *Mildred Cookson.*

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