The Magazine of the Mills Section of the
Society for the Protection of Ancient Buildings

no 163

April 2020

Mill News

Water as the Enemy
Water is the great enemy of windmills!
Read about it in Steve's storm report

Water as the Friend
The power of the river
Generating electricity at Sherborne watermill

Water as the Entertainer
A bolter turned into an organ
The ingenuity of the musical miller

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SPAB MILLS SECTION
37 Spital Square
London E1 6DY

Switchboard 0207 377 1644
Direct line 0207 456 0909
Email: **millsinfo@spab.org.uk**
Website: **www.spabmills.org.uk**

Administrator – Silvia McMenamin
0207 456 0909
Office Hours: Monday, Tuesday and Wednesday; 8.45 am – 4.45 pm.
Also on Twitter - @ukmills

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Copy should be sent to the editor at the Office or at **mcstonenut@gmail.com** and should if possible be typed, emailed, or on USB sticks. All photographs should be as high resolution as possible.

Photo prints should be clearly labelled on the back. We will make every effort to return items, but this is not always possible. The Editor's decision on any article is final.

Editor – Mildred Cookson
Layout and design – Ian Scotter

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Front Cover: Little Norton Watermill, Somerset, which received a Mill Repair Fund grant
Picture – Matt McKellar..
Back Cover: West Blatchington, taken by Alex Vincent, from his new publication to celebrate the anniversary of the windmill.

Editorial

It is with the greatest regret...

How chilling that phrase sounds. Writing at the start of the virus-induced lock-down, I can have no idea of how seriously Covid-19 will affect our members or the wider mill community. I can only hope that when the threat recedes we are not mourning the early demise of some of our friends.

Our first step, taken some weeks ago as the virus moved from Asia to Europe, was to cancel our March meeting. The committee and I were concerned this would disappoint a number of people, particularly as the attractive programme had been held over from our October meeting, which itself had to be cancelled.

I felt we had to take the decision early and face any criticism head-on as we might have been seen as scare-mongering. We took the decision because many of those attending were not as young as they used to be and the thought of them fighting their way through crowds on public transport on a Saturday morning was abhorrent.

In the event, of the 40 or so who had already registered, we had only one grudging comment. Without exception the remainder understood and in many cases were relieved and grateful that we had exercised our duty of care.

Now the situation has reached the level of Government instructions not to gather in groups of more than two, we need to ensure that we think of the safety of others as well as ourselves. This has obvious implications for mills opening during the summer, which need to protect their volunteers as well as any potential visitors. It is not surprising that National Trust and English Heritage sites are closing to the public. We have cancelled National Mills Weekend and today I read that Hollandsche Molen has cancelled their National Mill Days on the same weekend. It is inevitable this will happen in many other countries.

It seems obvious that this crisis will last well into the summer. From a common sense point of view, although the media suggest a peak around mid-May, even when things start to get better we should be careful how much we risk.

In that light, what can we do? As we must stay at home so much, we should be grateful for the internet. If you have not already tried it, have a look at the conversations taking place on Windmill Hoppers (a Facebook group at facebook.com/groups/windmillhoppers/). You can easily contribute by registering or just "lurk" and enjoy the very varied and sometimes lively discussions. Another asset at your fingertips is the Mills Archive site (millsarchive.org), which has more than 80,000 images and documents to look through as well as a lot of stimulating and educational content.

All this might seem too passive during the nice weather, but there are active things you can do that will benefit us all when society gets back to normal. Why not (to use a cliché) use the problem as an opportunity. You could look for gaps in the Mills Archive coverage; they have covered some parts of the country very well, but where are gaps they have not filled – and could you contribute? Similarly now is the time to write that Letter to the Editor of Mill News. I wait in expectation!

"If you can, fill the unforgiving minute with sixty seconds' worth of distance run...."

Mildred

The Value of Huntingdonshire Mills at Domesday

Graham Hackney

The relatively high value of the mills in Huntingdonshire, as recorded in the Domesday Survey, has often been raised as an anomaly in 'molinological' circles. It should be noted that at the time of the survey there were no windmills in England, and while some of the recorded mills may have been horse-mills, it is normally assumed that the great majority would have been watermills, many dating back to Saxon times. Data provided by the website 'Windmill World' shows the average value of a mill as £0.538 (for all English counties actually included in the survey), but Huntingdonshire stands out with an average value of £1.220.

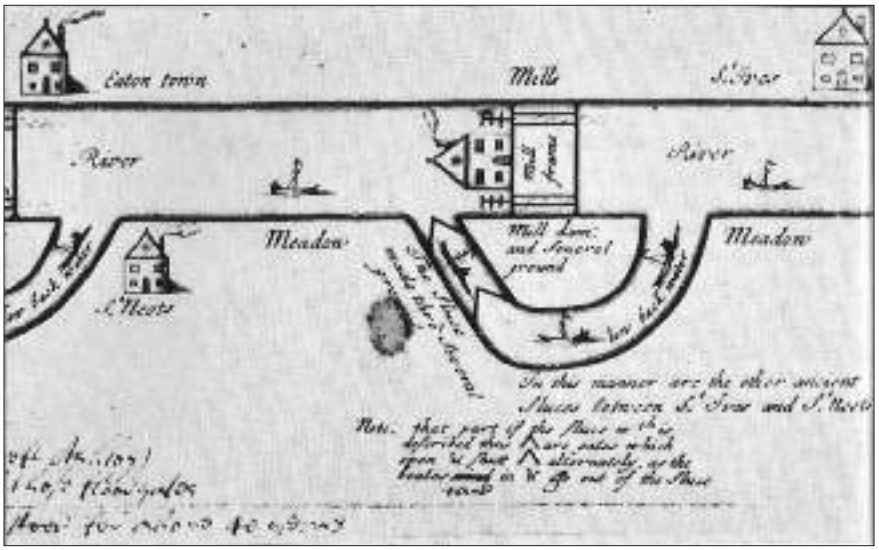
Domesday values of all Huntingdonshire mills are at Appendix 1. The total and average values quoted in this article are in 'decimalised' pounds.

Of these, Leighton Bromswold (3s), Spaldwick (2s), Broughton (£1 10s), Wistow (2s), Elton (two at £2), Water Newton (two at £1.51), Sibson (two entries both shown as 0.5 at 10s), Alwalton (two at £2), Upton (3s), Kimbolton (5s) and Catworth (2s) are *not* on the Great Ouse itself (being either on tributaries of the Ouse or the Nene drainage systems). By removing these four mills (worth in total £8.795) from the 36 listed here, the picture becomes even more marked. The remaining 22 mills *actually on* the Great Ouse had a total value of £35.148, and an average value of £1.598. This is almost three times the average for England! Those mills within the county but *not* on the Great Ouse only had an average value of £0.585, very close to the national average.

The explanation for this has never been clear. One obvious reason might be that mills in this part of England were *generally* higher in value than average. Looking at the three neighbouring counties this is partly true in that Cambridgeshire had an average of £0.726 and Bedfordshire an average of £0.753, but for Northamptonshire this was only £0.404; so, this is no explanation.

It may be useful to look at the locations of those 22 mills on the Great Ouse at Domesday. They actually only occurred at 12 recorded settlements, and the list of these settlements is very similar to the list of ancient watermills existing into the 20th century as recorded by Hugh Howes – see Appendix 2. So, we find mills in both lists at Godmanchester, Hemingford Grey, Brampton, Houghton and Offord Cluny/Buckden, and also at Eaton Socon (which had two mills in Bedfordshire Domesday as it was part of Beds until being absorbed into St Neots). Great Paxton features at Domesday, whereas Little Paxton did in the 20th century; likewise Eynesbury did at Domesday, whereas neighbouring St Neots did in the 19th century (a steam mill newly built in 1879). Huntindon, Hartford, Wyton and Hemingford Abbots had mills at Domesday, but not in the 19th century, and St Ives had a mill built by Potto Brown in the 19th century but not at Domesday. The picture is one of remarkable stability over a millennium, and might suggest these were the *only* suitable sites for mills.

Further evidence of this pattern over time can be found in Dorothy Summer's book 'The Great Ouse: The History of a River Navigation' (1973), where she discusses the various problem that watermills posed to navigation. Due to the



Detail of a 'map' of the upper Ouse c.1689 in the Cullum MSS at Bury St Edmunds, showing a typical 'sluice'.
Source –Summers, 1973.

The Value of Huntingdonshire Mills at Domesday – continued

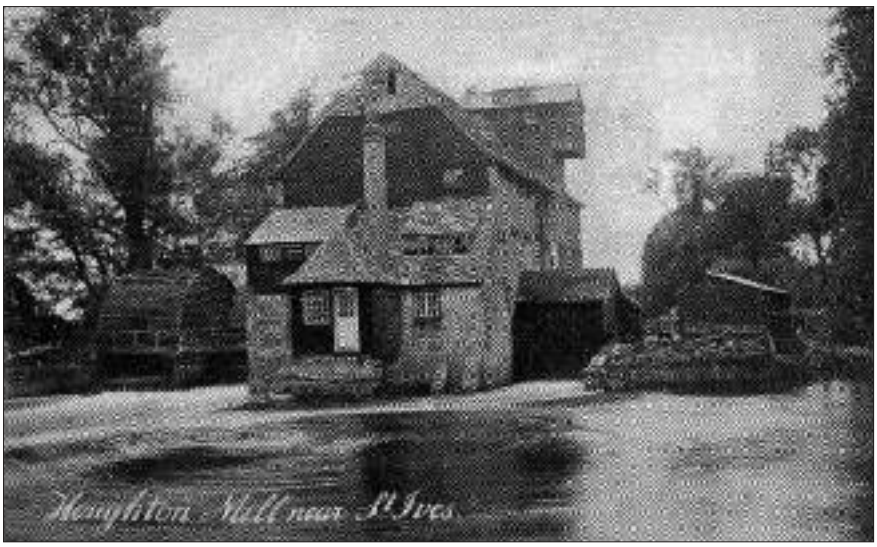
difficult conditions before the changes in the 17th century that accompanied the drainage of the Fens (e.g. the river was tidal right up to St Neots, terrible winter flooding, summer droughts etc), the only way to sustain a watermill was by building a dam. Apparently, between 1618 and 1689, "sluices" (i.e. locks) were built around these dams (she shows a lovely drawing of one from 1689) to allow boat traffic, at: Brampton, Eaton Socon, Godmanchester, Hemingford Grey, Houghton, St Neots and Offord. This list of seven mills is uncannily similar to Hugh Howes' list of mills (was St Neots and Little Paxton one or two mills?), So, except for purely 19th century foundations, the only mills on the Huntingdonshire stretch were basically the same from the 17th to the 20th centuries.

Of great significance is the fact that there were no ancient watermills on the Great Ouse downstream of Hemingford Grey in Huntingdonshire; settlements such as Holywell cum Needingworth and Bluntisham cum Earith relied on windmills during the medieval period and later. The same picture occurs as one follows the Great Ouse (or Old West River as it was then called after Earith) through Cambridgeshire, where Haddenham cum Aldreth and Stretham only had windmills, as did Ely (however, care has to be taken here as the course of the river changed over time).

The reason for this is the existence of the Fens. For the whole of the medieval period the area east of the Huntingdonshire/Cambridgeshire border experienced seasonal flooding. As the waters of the Welland, Nene and Great Ouse (draining the East Midlands) and the Witham (draining South Lincs) entered this area, at or around sea level, their already low gradient would have fallen further. The low-lying areas, held in common, were flooded all winter and only dried out sufficient for summer pasture in certain years. No watermill could work under such conditions, or even be built; (areas of higher ground in the Fens, such as the Isle of Ely, had no water courses suitable for mills either, and instead became the sites for very early windmills, from around 1220, as pioneered by the Bishop of Ely). This huge sink of water must have affected the Great Ouse in its course immediately upstream, and the stretch of flood meadows from Earith, through to the Hemingfords and on to Huntingdon is indeed one of the largest in England. Again this would make siting a watermill very difficult, and may explain the distribution pattern we see.

In conclusion, having fewer, *but perhaps larger and busier*, mills to serve the community over a large area where conditions were not conducive for their establishment could have been the reason for their high value at Domesday. This would perhaps conflict with the perceived wisdom that the unit of "a mill" in Domesday represents a single pair of stones, and extra pairs of stones were recorded as "2 mills", "3 mills" etc. However, something unusual was going on in these mills on the Great Ouse causing their taxable value to be so high.

Appendices overleaf >>



Hemingford and Houghton Watermills on the Great Ouse, from old postcards. Very large mills in the early 20th century but were they large at Domesday?
Pictures – Watlington Collection © Mills Archive Trust.

The Value of Huntingdonshire Mills at Domesday – continued

Appendix 1. Domesday value of Huntingdonshire mills

All places	150	:- with mills	25		
Mills	36	:- valued	36	:- not valued	0
Total value	£43.943	:- average value	£ 1.220		

Huntingdon 1 mill valued at £3
Hartford 2 mills valued at £4
Brampton 2 mills valued at £5
Godmanchester 3 mills valued at £5
Buckden 1 mill valued at £1 10s
Leighton Bromswold 1 mill valued at 3s
Spaldwick 1 mill valued at 2s
Broughton 1 mill valued at £1 10s
Wistow 1 mill valued at 2s
Houghton 1 mill valued at £1
Wyton 1 mill valued at 12s
Elton 2 mills valued at £2
Hemingford Abbots 1 mill valued at £0.533
Water Newton 2 mills valued at £1.51
Sibson 0.5 mills valued at 10s
Alwalton 2 mills valued at £2
Sibson 0.5 mills valued at 10s
Upton 1 mill valued at 3s
Kimbolton 1 mill valued at 5s
Offord Cluny 2 mills valued at £2 10s
Catworth 1 mill valued at 2s
Eynesbury 2 mills valued at £1 12s
Great Paxton 3 mills valued at £3 4s
Hemingford Grey 2 mills valued at £6
Eynesbury 1 mill valued at £1 3s.

Data from Windmill World website, extracted from work done by John Palmer and his team at the University of Hull, while creating the Domesday Explorer CD-ROM. Their raw data was used by Windmill World under a CC-BY-SA licence.

Appendix 2. List of watermills on the Huntingdonshire Great Ouse surviving into the 20th century, as recorded by Hugh Howes.

Brampton;
Eaton Socon;
Godmanchester;
Hemingford Grey; Houghton;
Little Paxton;
Offord cum Buckden.

Plus 19th-century foundations:

Paine's Steam Mill, St Neots;
Potto Brown's Steam Mills at St Ives and Godmanchester;
Brookside Mill, St Neots.

References

Howes H., (2020)
The Water and Steam Mills on Huntingdonshire's Great Ouse (in preparation).

Summers D., (1973)
The Great Ouse: The History of a River Navigation. David & Charles.

The Old Windmill
By Frank Went

Proudly, boldly, facing the storm,
Many a year she's stood;
And taken all weathers in right good form,
As only a windmill could:
For her heart is of stoutest British oak,
And her timbers are all good.

A pleasanter sight on a summer's day
I guess you have rarely found,
Than to see her dreamily grinding away
Then off with a dash and a bound;
While shadow and sun in the meadow at play
Mimic the sails going round.

And when old winter is here again,
The sky with clouds to blur,
What oh! For blizzard, and storm and rain,
On, on, with a swish and a whirr.
Her arms may bend but the storm is her friend,
'Tis the merriest time for her.

Ah! her's is a lesson , good brother Dust,
For us, and for everyone;
For battle the storms of life we must
Till its latest sand is run;
And the champion form is keep head to the storm,
And be ready for cloud or sun

Taken from The MILLER 1903

Storm Report

Steve Temple

"Watter is the great enemy of Windmills" – Chris Wilson. Well, there's a lot of truth in this much loved saying, but at best it only accounts in part for two of the recent events. Storm Ciara dealt blows to at least four mills, stripping sails off Ibstone and Bocking mills, braking the brakewheel at Soham Downfield and decapitating Burgh le Marsh. Of these, Chris's adage may well have applied to Ibstone and Bocking where it was known that the sails in question were decaying presumably from ingress of water, but the cases of Burgh le Marsh and Downfield were entirely caused by the wind itself. Or were they?

When an aircraft crashes, there is a serious and complex investigation into the causes with the single purpose of trying to prevent a recurrence. Often the findings of these investigations attribute multiple causes, many of which would have been insufficient in themselves. It is part of the philosophy of these investigations that they are not trying to apportion blame – though, of course, that is what the lawyers want them to do. Even in the many cases where pilot error is the primary cause, the investigations look behind these errors at, for example, training programmes and unclear flight procedure manuals.

It seems to me that we need this sort of approach when it comes to windmill accidents. The consequences are hardly in the same league, but to the owners and lovers of the mills they are tragedies and we should learn from them. They cost money – often unnecessarily and to the detriment of the many mills seeking funding for more mundane but very necessary work.

Background

I'm often driven by intellectual curiosity to see if I can explain difficult phenomena. Some years ago, I wanted to find out how much power my mill at Impington could have produced in its heyday. I built a model of the wind forces in Excel and eventually plotted a power diagram which related the power to the wind speed and the angle of the shutters. Last year, Jim Bailey of Heckington Mill described their tail winding event, and I immediately thought that it might be possible to model this in my spreadsheet – but I didn't take any action then. Also, I was reminded that my mill had once turned suddenly through 90° when I was out. It had a locked fan tail at the time and no sails, so I can only presume that it must have been moved by wind side forces on the fan itself.

On the Sunday of Ciara, Andrew Kite at Soham Downfield rang me to say that his brakewheel had been broken by the wind despite having been spragged to stop it turning. In fact, the sprag (an RSJ) had been bent! Later that day, I heard about Burgh le Marsh with the initial reports that it had been turned downwind and then the cap blown off.

So, I turned to my wind forces spreadsheet and have been working on it to try to explain what happened.

Anecdotal evidence

Jim, who was present in Heckington at the time of their tail winding, said that it sounded like a machine gun going off. He also said the fan tail was down for repairs, so that the mill was not winding automatically. This was also the case at Burgh le Marsh – the first press photos showed the fan on the ground beside the mill (having clearly not fallen from a great height). Later, at the Mills Section committee meeting I learnt that the fan had been down for repairs during the winter.

It may seem obvious that a mill without its fan is liable to tail winding, but in both the cases at Heckington and Burgh le Marsh, and in mine at Impington, the cap was restrained from winding by engagement with the fan gear train, and this was locked to prevent turning. This implies that the gears must have "jumped" (been forced out of engagement) and then bumped along the rack as the wind pushed the sails round. This would explain the sound that Jim described. But would the wind have been strong enough to do this?

At Soham, discussing it with Andrew, I realised that he had only spragged the brakewheel in one direction, against the natural rotation of the sails. I felt then that the torque produced with shutters open and the mill winding properly could not be sufficient to do so much damage, particularly bending a substantial and fairly short RSJ. I guessed that what had happened was that the sails had first turned a little backwards, away from the restraint of the RSJ, and then accelerated forwards, gaining sufficient momentum to smash the woodwork against the RSJ and bend it as well. An hour later, I watched my mill during the early stages of Ciara and could see that it was trying to turn in both directions as gusts hit it. The brake was on, but no other constraint – and the brake is not good at stopping the sails going the wrong way. I often observe that, in high winds, the sails will creep round gradually in the wrong direction. Following that observation, Andrew used ratchet straps to

Storm Report – continued

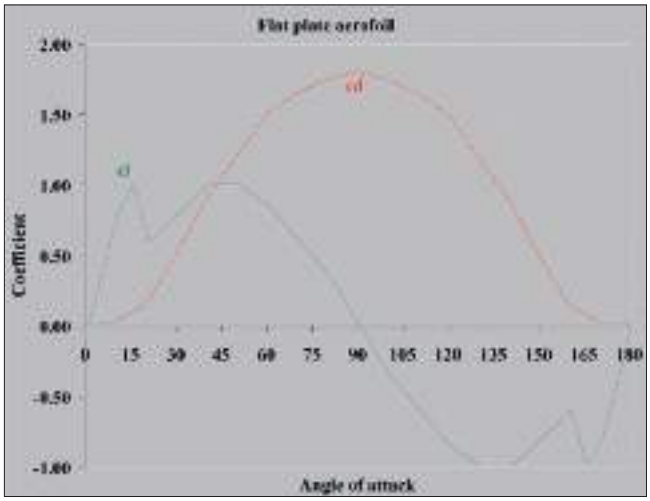
lock the brakewheel in place against rotations in both directions, and no further damage followed even at the height of Ciara over the remainder of the day.

I decided that I had to try to assess the scale of forces produced by the wind, particularly in gusty conditions.

Some Aerodynamics

Lift and Drag

The forces on a wing are analysed by calculating Lift (always perpendicular to the airflow) and Drag (along the airflow). A flat surface facing the airflow brings it to a full stop and exerts a pressure proportional to the density of the air and the velocity^2. The aerodynamics of an aerofoil can be described using a Lift Coefficient (*cl*) and a Drag Coefficient (cd) which give the proportion of this full stop pressure plotted against the angle of the flat surface to the airflow – the Angle of Attack (AoA). Usually this relationship is plotted for a limited range of AoA – up to the point where the wing "stalls" with a consequential reduction in lift and sharp increase in drag. I found a paper published by Sandia National Labs that plots the behaviour of a flat wing through a full range of AoA from 0 to 180°. Here it is:



This is what we need in order to describe the full wind forces on a mill when the wind comes from unexpected directions. Notice that the *cl* increases rapidly until the AoA reaches 15° when it drops suddenly. This is the point at which aeroplanes tend to give up and fall out of the sky. But windmills have to put up with every possibility! When the AoA is 90°, the plate is at right angles to the flow and there is only drag, no lift. This is the case for a tail winded mill with the shutters fully closed and it is the condition when the cap gets torn off. There after, as the angle increases, the lift works in the opposite direction – this can also happen to a windmill when the gusts overcome the shutters.

Using this data, the lift and drag forces on each shutter and other surfaces on the sails can be calculated once we know the AoA.

Gusts

If the wind were steady and the mill pointing into the wind, then there would be no side forces to cause the cap to turn down wind. What might initiate such a turning force would be a relative angle between the wind and the fore-aft axis of the mill. Obviously, this can arise if the mill is not winding properly, but it can also occur with a properly winding mill if the wind direction changes substantially and quickly.

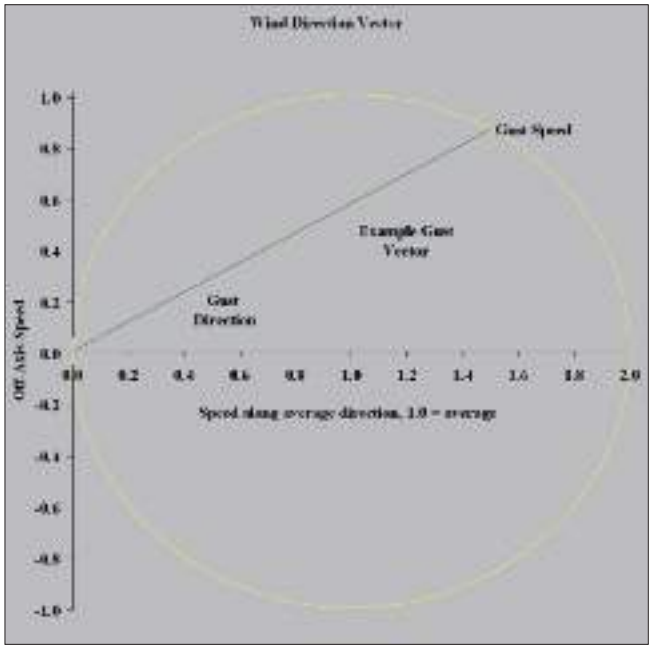
It is also not obvious as to what the nature of "gusts" is. In an airflow, any obstacle is likely to give rise to vortices: you can see this effect in the flow of a river – Leonardo da Vinci observed and drew it. Here is a picture of the flow behind an island in the Indian Ocean, showing a sequence of alternating vortices shedding from the island and extending as high as cloud level. Each vortex is many kilometers in diameter.

Such vortices have a rotational speed that just about matches the average speed and, standing at a point downstream, you would see a combination of the rotational speed and the average speed looking like the chart at the top of the next column.

The speed varies from zero (a lull) to twice the average, and the direction varies ±90° either side of the average. The orange line shows the envelope of the wind at any moment as the vortices roll by and the green line shows a typical resultant wind at the mill. Some weather forecasts give expected gust levels as a maximum speed, usually around twice the average speed, but don't quote the variation in direction. Gusts occur at all scales, from a few centimetres across (arising from trees and chimneys) to tens of kilometres (from hills and large terrain features and also from thermal activity).

In the results from the SPAB anemometer at Impington for storms Ciara and Dennis, the average and maximum speeds vary in the range quoted above as in the chart opposite.

Storm Report – continued



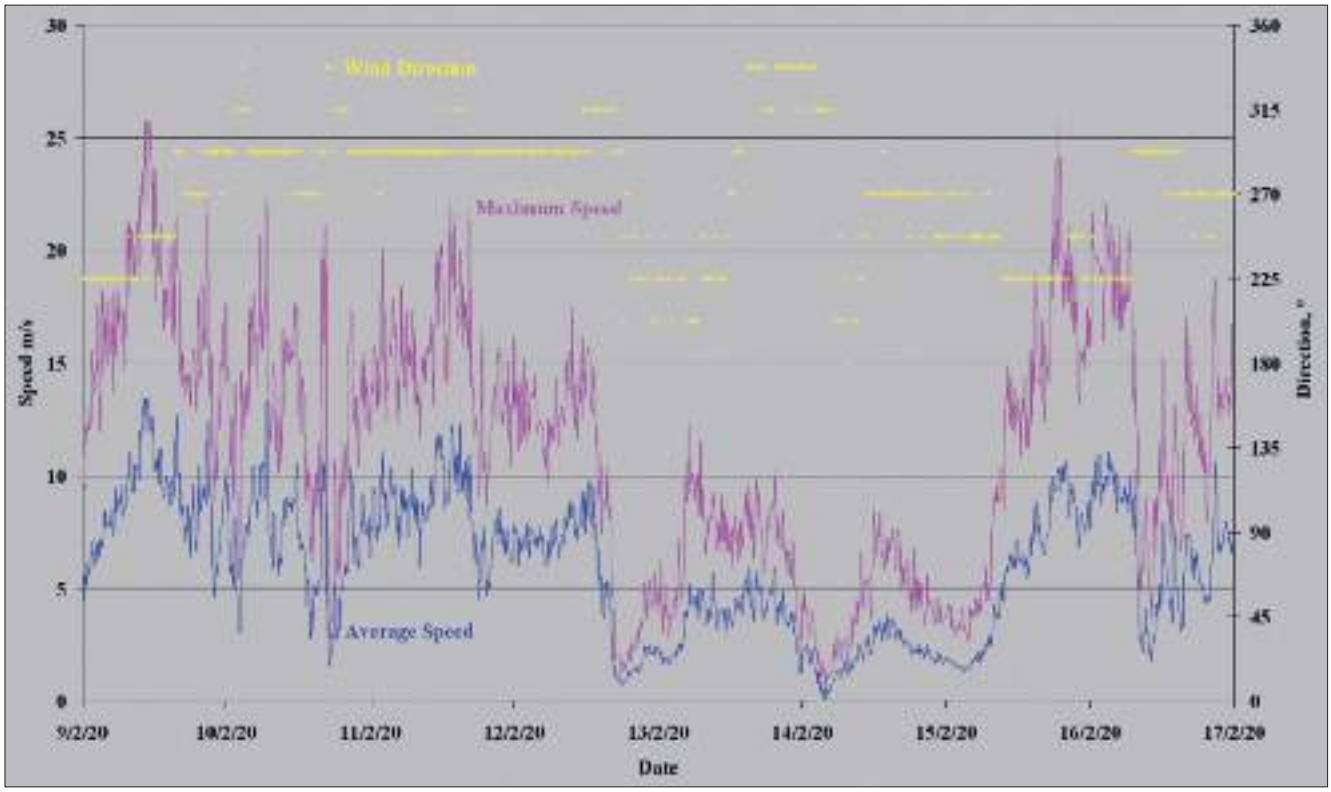
The wind directions vary less than predicted by the vortex model, but the anemometer only samples every 10 minutes, so that it doesn't capture short-duration gusts. Moreover, it only records the average wind direction, whereas it captures the maximum wind speed (the pink line) as well as the average (blue). Note that the maximum is usually twice the average, as predicted by the rolling vortices theory. The highest speed in both storms just reached 25 m/sec (with an average speed of 12.5 m/s), and this is the value I have used for analysis. I have assumed that the gust model of wind direction applies, too.

At a mill, even if it is winding properly, there will always be a difference between the wind direction and the pointing direction of the mill because the winding process takes time and requires there to be a difference in order to turn the fan. My mill takes about 40 seconds to align itself to a change in direction and during this time the wind direction will be at a large angle to the mill pointing direction. This then gives rise to off-axis lift and drag forces that produce a torque that will try to turn the cap. On the Lincolnshire mills, which all use a dead curb (no wheels or rollers), the angle of the wind must be greater to initiate a large enough winding torque to overcome the friction.

Some Mechanics

Modelling the forces on the sails of a mill is not easy: the geometry is complex, involving various different directions and distances in all three axes, and the wind flow varies in speed and direction in the horizontal plane. As the wind changes, the angle at which it meets the various surfaces changes, and we need to know what this angle is to give us the AoA and hence the lift and drag forces on each element using the flat plate aerofoil graph above). The drag direction is always aligned to the wind, but the lift is perpendicular to both the wind and the intersection of the wind plane and the surface.

Mathematically, the language which describes all this is called vector algebra: a vector has both direction and size and is defined by giving its "components" along the x, y and z axes. Once everything is defined by vectors, which can describe geometry, velocity, force or moments, the algebra can derive relative directions between two vectors and the size of the resultant combination. All this can be handled in a spreadsheet, ending up with the calculated total force and total moment due to sum of the lift and



drag on all the components. In particular, we want to calculate the vertical lift force (tending to tilt remove the cap), the horizontal force on the curb (affecting the meshing of gears and also stressing the tower) and the torque about the vertical axis (tending to rotate the cap). To look at the Downfield problem, we also need to calculate the torque around the windshaft.

Such results would then provide us with inputs to further calculations such as the bending moment on the sails (causing them to snap) and the forces on the gear teeth of the winding mechanism to see if the gears might jump.

Winding Arrangements

There are major differences between the final winding drives on the different mills.

On mine, the gear ring on the tower is horizontal, with the final drive pinion having a horizontal axis and the teeth meshing along a horizontal line. This means that the weight of the cap keeps the teeth in mesh, and it also means that errors in the circularity of the curb and the cap affect the length of tooth in mesh at different points around the circumference, with at least one inch variation. However, the depth of the tooth engagement is pretty well constant even if the curb is not completely flat. There is no vertical constraint on the cap, so that, if the lift force exceeds the weight of the cap, then it will blow off.

The Lincolnshire mills' winding system uses a vertical gear ring mounted on the inside of the tower. This means that any errors in circularity will affect the depth of meshing, and also that the principle force keeping the gears in mesh is due to the wind force fore-aft. There is a vertical restraint on the cap formed by a flange on the gear ring engaging with truck wheels which centre the cap and help to prevent it blowing off, so that the lift force necessary to remove the cap must exceed the weight by some amount in order to cause the cap to tip off.

In all cases, the horizontal forces due to the wind are resisted by the top of the tower, and are concentrated at points where the truck wheels come into contact. This puts potentially very high loads at these points, and they are the places where damage will start. The worst such place will be in the direction of the sum of the side force and the fore-aft force, and this point will move continuously during gusts – no point on the tower is safe!

Forces on Gears

Gear teeth are designed to make contact with each other at a "pressure angle" – usually 20°. However, two effects can increase this angle quite dramatically. First, because the tooth faces are curved, for gears which are partially out of mesh, this angle increases as the very tips of the gears come into contact. Second, the last gear in the winding train is often very small. Below is a picture of Sibsey mill, which only has 10 teeth on this last gear. Inevitably, the tips are pointing at 18° plus the pressure angle. Looking at this picture, I would estimate that the angle is of the order of 45°. This contact angle means that, if the gears are subject to an external force trying to overcome them in the turning direction, then there is also a force trying to separate them, and at 45° this disengaging force is equal to the applied force. In the case of a vertical curb on the inside of the mill, as at Heckington and Burgh le Marsh, this disengaging force acts to push apart the final gear shaft and the curb itself. In the case of a vertical curb on the outside of the tower as at the Great Mill at Haddenham, the disengaging force on the gears is added to the wind force, and in the case of horizontal teeth as at Impington, the disengaging force is opposed by the weight of the cap. At Heckington et al, the worst point of application of this force is at the junction of adjacent segments of the curb (rather like the gaps in the rail of an unwelded railway). Such a point can be seen in the picture below just to the right of the spur gear. At Haddenham, many of the segments are mobile (in the dentist's sense) and cannot resist this force to any great extent. Such is the size of the force that on several of the segments, the casting has cracked at the central bolt hole, leaving the two ends almost floating free. None of this bodes well for prevention of an unexpected tail winding event.

Once the total force applied to the mill is known, these different configurations each lead to a separate calculation for estimating whether the gears will jump and allow accidental winding of the cap.

Onset of Winding

To initiate winding of the mill that is approximately aligned to the wind direction, the gusts must produce enough torque to overcome the engagement of the winding gear with the curb and cause the teeth to jump. Once an initial movement has taken place, the now offset angle to the wind has to be added to the gust deviation – so that a similar gust will further turn the cap, and the catastrophe progresses. Thus, the all important question is whether the gustiness is able to start the process going, and that is what I aim to calculate.

Storm Report – continued

Some Geometry

The following sketch shows the geometry which I have used to calculate the forces. The shutters have been represented by two "sails" of the total area of the shutters, placed halfway along the bays on each side of the windshaft. The sail plane is perpendicular to the stock – implying that the shutters are constrained at an angle of 90° by the striking gear. This will be true even if the striking lever is not locked, because, for off-centre winds, the rotations of the shutters on each of the pair trying to follow the wind are in the same direction and therefore opposed by the fork irons which normally operate the shutters in opposite directions. In extremes, one of the fork irons may buckle, allowing the shutters to close. This happens on both Impington and Burwell for quite modest tail winds.

I have ignored the forces on the stocks and sail frames because these provide a total area that is only a small fraction of the shutter area. I have also ignored the weather of the sail because I am assuming that the shutters are perpendicular to the stocks, so that the twist does not affect the angle at which the wind intersects them. So, all shutters on one sail are at the same AoA to the wind for any condition of the combined wind direction and the sail angle to the horizontal.

Opposing pairs of sails like this can only produce forces centred on the poll end of the windshaft, but offset from the fore-aft centerline by the angle of the wind. In the case of Burgh le Marsh, which has five sails, asymmetric forces are produced, but the asymmetry will be quite small, so I have simplified the layout to symmetrical pairs.

At Impington I have four sails, so both pairs need to be calculated separately. When the sails are set at 0 and 90°, the horizontal sail will produce a side force (in the y direction) but no vertical force, and the upright sail will produce both a side force and a lifting force. With the sails at 45°, both pairs act equally to produce both a side force and a lift force on the cap. We only need to calculate for angles between 0 and 45° – all other cases are then represented.

Heckington has eight sails, four pairs, so only needs to be calculated for 0 to 22.5°

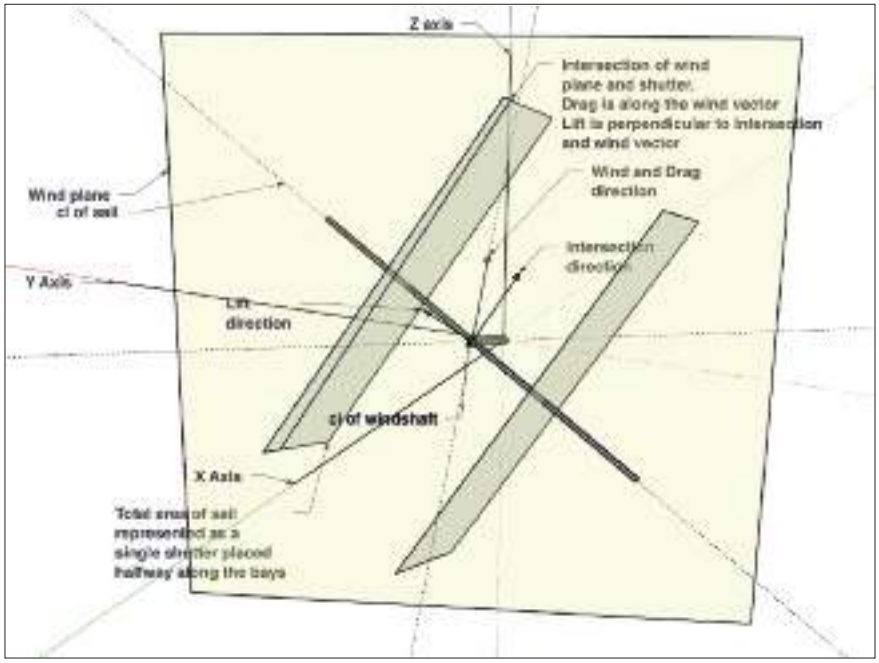
I have modelled Impington and Heckington, for simplicity, and using Impington data for aspects such as the weight of the cap, which I don't have for Heckington. Burgh le Marsh would be similar to Impington, but with the extra sail both smoothing out the fluctuations arising from different positions of the sails and with the additional out of balance force.

Calculation Results

Heckington and Burgh le Marsh Tail Winding

Using data for Heckington, the graph on the next page shows the winding torque applied to the sails for a range of gust angles and sail angles. This shows, among, other things, how complex the situation is – with substantial variation in the forces, sometimes in unexpected ways. However, it allows us to pick the worst cases and calculate the likelihood of any of the events described in the opening paragraphs.

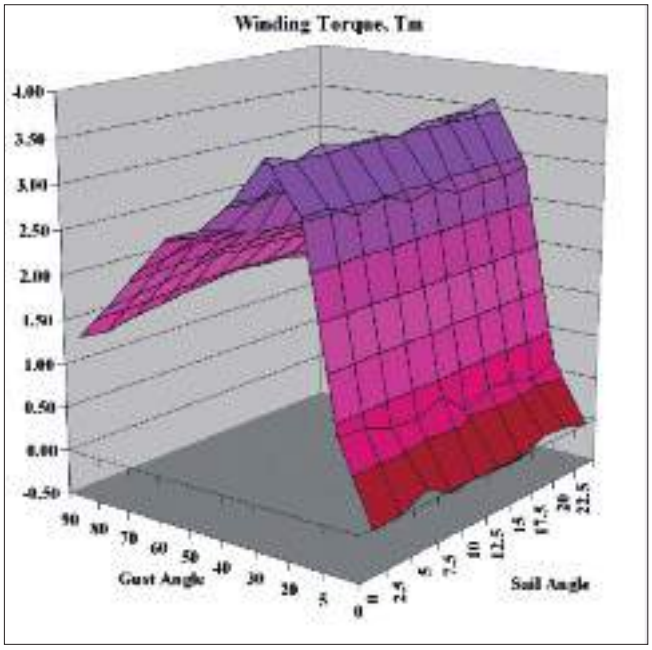
The eight sails give a fairly uniform set of moments as the sail angle varies from 0 – 22.5° when the next sail round is in the 0 position. There is little variation along this axis as a result of the large number of sails. The maximum winding torque occurs along the gust angle of 30° (corresponding to a net wind direction of 15°) and is around 3.5 tonne metres in magnitude – that's a pretty big winding force.



Notice that the winding torque reduces as the gust angle increases from about 30° where it peaks. This is the effect known as "quartering" the mill to minimise the forces. I think this is deceptive, because the gust velocity is reducing as the gust angle increases (see graph of gust vectors).

However, if the mill were set at 90° to the wind, then the side forces and hence turning moment would be due to the wind working at the maximum speed of twice its average – so the forces would be around four times greater than shown here.

The force applied tangentially to the winding gears and curb at the worst point is 1.07 T after allowing for the



friction forces on the curb. The radial separation force is the same, as described above.

While this is a substantial force, it is at least possible that it would not force the gears apart and allow accidental winding. However, it seems to me to be marginal – I am quite confident that the damaged curb at Haddenham would give way under such a force.

Noting that Impington has horizontally orientated gear teeth, the weight of the cap holding the final gear and curb together is considerably greater than the vertical separation force on the gears. Consequently, accidental tail winding of this type would be extremely unlikely to happen.

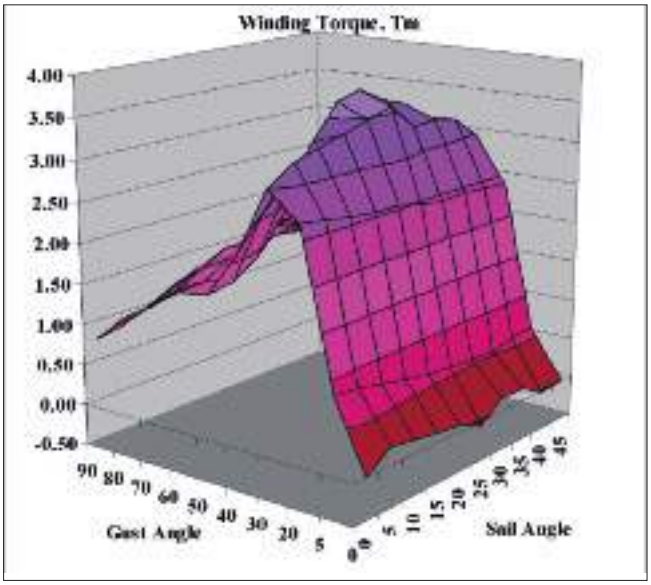
Value of the fantail

Of course, the fantail would normally wind the mill to re-align it during a gust, but, as stated above, this effect does not happen instantly, so we should assume that the accidental winding tendency would happen even with a working fantail in place. The balancing moment from the fantail obviously depends how far the fan is from the rear of the curb. In the case of Impington, there is a considerable overhang, so that the fantail can apply an opposing winding torque in the manner of a weather cock even when it's not turning itself: and this just about balances the torque due to the sails, so that even its passive presence would obviate the risk of tail winding. Please note that not all mills are as fortunate as mine in this respect.

Eight sails versus four sails

Next is the same graph as above using data for Impington with its parsimonious four sails.

It looks quite similar, with almost the same worst case of 3.7 Tm winding torque, but with more variation as the sail angle changes. It is noticeable both that the winding torque is reduced for the sail pairs at 0° and 90° – the St George's Cross position – where it is "only" 2 Tm and, also, that the worst case is when the sails are at 25° and 115°, both with gust angles of 45°. So, for four-sailed mills, it's safest to park them in the St George's cross position – but still not very safe!



Decapitating forces

At no point does the lift force on the sails exceed the total weight of the cap and sails on either Heckington or Impington. I always assumed that this would be the mechanism by which caps got torn off, but this is not shown by this analysis. This statement is true even if the mill is tail winded and the shutters forced closed.

However, for a tail winded mill the horizontal (sliding) forces peak at around 5 T, and even allowing for the friction between the cap and the curb, this leaves more than 4 T applied as a point load to the most loaded truck wheel. I think it very unlikely that a brick tower would survive this. Wooden structures are much more resilient and could well survive. At Impington, the truck wheels press against a continuous band of metal, so that the load is distributed locally and minimises the stress on joints in the woodwork. Where the truck wheels engage directly with the curb as at Heckington and Burgh le Marsh, at some point during a gust the forces will be applied to a weak point as described for Sibsey mill, and it would be unlikely that a bolt drilled down into the brick or even the brickwork itself would survive.

The cap will not tip off, but it will slide off the tower.

Stock Breaking

Looking at Ibstone's and Bocking's problems, the calculation gives us the individual forces on the sails and hence the moments trying to break the stocks at the canister. This bending moment amounts to about 3.8 Tm

when the gust is at 10° on the horizontal angled sails. This sounds a lot, but is well below the ultimate strength of the stock itself assuming it was in good condition. The stocks at Ibstone and Bocking must have been in quite a bad state for this to have broken them. At Ibstone, there were no clamps in place, which not only give additional strength, but also prevent complete collapse, saving both the sail itself and people on the ground.

Sail Turning

There is no sail rotating torque on the sails revealed by this analysis and I have to take into account the wind gradient from the ground upwards in order to explain why the sails turned so violently. The wind gradient results in the forces applied to the lower sails being significantly less than the upper ones. This in turn means that side forces are unequal above and below the wind shaft and create a turning torque on the sails in both directions depending on the gust direction. Applying this, for Impington, the maximum turning torque is about 5 Tm when the sails are at 45° and the gust offset is at 15°. Notice that this torque occurs independently of any torque caused by the twist in the sails.

The RSJ sprag at Downfield was placed at about a metre from the centre, so this is the force that would have been bending it. I am surprised by this result, but still feel that it is not enough to bend the beam itself. I think it more likely that, with the one-way sprag, the sails first turned backwards and then gathered momentum going forwards before impacting the beam with the clasp arm. The brake wheel will not withstand these forces.

Acknowledgeements

The wind data came from the SPAB's anemometer

Luke Bonwick supplied details of the various mills

Jim Bailey gave details of Heckington's tail winding event

The aerofoil lift and drag coefficients came from Sandia National Labs report SAND80-2114

The picture of vortices over the Indian Ocean came from the NASA / GSFC / Jeff Schmaltz / MODIS Land Rapid Response Team

Recommendations

Surprising and surprisingly large wind forces can arise from the effects of gusts in storms. Here are some recommendations coming out of this analysis.

It's obvious that the absence of the fantail at both Heckington and Burgh le Marsh was the primary cause of the accidental onset of winding, and meant that, once winding was initiated, there was nothing to stop it continuing until the sails had turned far enough to reverse the shutters. Even a moderate tail breeze will reverse shutters on both Impington and Burwell mills, buckling the push rods. Once this happens, the drag and lift forces multiply dramatically, and will both continue to wind the mill and eventually take the cap off. It is quite apparent from the above that**:**

- ***if it is absolutely necessary to remove the fantail for maintenance*, then the sail shutters must also be removed**.

For fantail maintenance such as changing blades or stocks:

- **remove and replace symmetrical pairs, leaving the rest of the fan in action the whole time.**

The Bocking and Ibstone sail losses resulted fundamentally from weakness in the stocks, which should have been inspected regularly and which would have been more secure with clamps – less damaging to the sails and less dangerous had the stocks still broken.

- **if your stocks are doubtful, remove the shutters even if you can't do anything else**;
- **put clamps on your stocks.**

From both of these events, the overwhelming conclusion must be that:

- **removing shutters when the functionality of the mill is compromised will save you a lot of money and reduce the risk to people.**

The turning tendency at Downfield in both directions can easily be seen even on a well locked mill. It is possible that a further piece of advice by Chris Wilson may be valuable: he always leaves his sails "idling" with the shutters open and the brake off during storms. This may reduce all the forces on the mill and I intend to investigate this much debated question in the future. However, if you prefer to prevent the sails from turning:

- **make sure your sails are secured equally in both directions. Do not rely on the brake.**

Sherborne Mill is now generating!

Harry Clarke

This article about Sherborne Mill first appeared in the Hampshire Mills Group Newsletter Number 128, Spring 2020, and is reproduced here with the kind permission of the newsletter's editor – Ruth Andrews – and the author.

[HMG Newsletter] Editor: We have previously reported on the construction of a new power generating wheel on a Domesday-recorded mill site in Sherborne St John just north of Basingstoke. We have now taken the opportunity to ask owner Harry Clarke to give us an update on his project.

Harry writes:

As a recap, our aim here on the historic site of Sherborne Mill has been to establish a power-generating waterwheel and incorporate it within a building that is sympathetic to the setting.

We have taken the construction slowly.

All necessary foundation work and retaining walls and wheel pit were built from April to December 2018.

With accreditation secured we then halted the wheel and lowered the mill head during the summer to allow the construction of the building to take place around it in safety. Although we had run the wheel for three months during 2019, the top 'soldier' brick course of the repaired leat walls had not been in place. This meant we had not been able to bring the water level in the mill head right up to full working height. This reduced flow meant that the maximum power we had seen in 2019 from the wheel was about 2.2Kw. Clearly there was more to come.

The main brickwork, roof framing and tiling took place between the same months of 2019. Today, the building stands as a dry shell and is to be fitted out during 2020. In order to catch the last of the Government's Feed-in-Tariff programme the wheel was necessarily installed as soon as the foundations would allow.

It produced electricity to the grid from 10 December 2018, securing its accreditation with 10 days to spare before the 31 March, 2019 deadline. This usefully secured us a feed-in rate of 8.26p per KwH (for the next 20 years on a deemed 75% feed-in proportion of our maximum rated capacity of 3.41kW).

Syrupy stuff

Over the New Year I therefore re-installed the electric synchronisation box (a HGP2 system supplied by Sustainable Control Systems), which had been kept away from the dusty site. I also serviced the wheel by re-greasing the taper roller bearings seated within the two plummer blocks in which the axle turns.

Finally, I changed the oil in the double epicyclic speed multiplier gearbox – 3 litres of fully synthetic EP220 with much the consistency of golden syrup.

Exciting times

On 2 January I gave it a go. The trick to getting the wheel to synchronise to the National Grid is one that my partner Devika and I are getting good at. Essentially, the wheel starts from rest with the stop-logs controlling water from the leat all in place. We slowly begin to start cracking open the water flow – usually by sticking a garden fork under the stop logs and levering them up.

Obviously the wheel starts to turn and with it the generator. There is however quite a lag in the process. In fact it takes about 45 seconds between adjusting the logs and the wheel settling down to a revised speed based on the adjusted flow. Once the wheel starts to turn at about 5rpm, the theory is that the self-excited generator starts producing a voltage. (As some will know, self-exciting generators rely on the iron cores on which the field windings are wound retaining some magnetism from the last time of operation.) When starting from rest, and so electrically dead, this residual magnetism nonetheless primes the creation of an initial voltage which then drives further electromagnetism via the field windings, and off it goes.

Anyway, we duly did this but got nothing. After much head-scratching, reading of manuals, and phone calls, it became clear that we had to 're-flash' the generator. This is required with any self-exciting generator that has been stationary too long and from which the residual magnetism has ebbed away. The process is pretty much as it sounds. Mains voltage is applied directly to the field windings, which, being made of thick copper, offer very little resistance. The instant current draw is huge, making the eponymous flash and blowing apart any fuses unwise enough to be in the way. Quietly, without mentioning it to the family and armed with insulated pliers, welding gloves and a mask, I set to. The results were threefold:

- Devika came rushing out wondering what had happened, all the household lights having dimmed;
- the 40amp generator trip popped;
- it worked!

Slightly tediously, however, the next day my laptop on which I am writing this, and which had been charging at the time in the house, wouldn't boot up. It subsequently required a £500 new motherboard. Yet another expensive mill-owning lesson learnt!

Synchronised spinning

Anyway, the next day, with the generator freshly re-magnetised we again slowly fed water to the wheel. Duly, at around 5rpm, the control box first began to register a rising voltage. The working speed of the wheel is a constant 8rpm – at which point the geared generator is rotating at exactly 1500rpm and producing a 50Hz sine wave. This is, of course, exactly the same shape and frequency as that produced by the National Grid.

By increasing the wheel speed slowly, the voltage rises further. Once it gets to 160V (the wheel speed being about 7.6rpm at this point), the control box display also starts, showing the frequency of the output sine wave. Typically it will begin at around 47.0Hz. The trick, at this point, is to cautiously and incrementally crack open the stop logs further so that the speed creeps up very slowly until the wheel is running at a speed which means the generator is producing as near as dammit 50Hz. At this point the clever electronics and fairly hefty capacitors in the control box somehow manage to buffer the two almost synchronous but inevitably out of phase sine waves (the one from our National Grid connection and the output from the wheel) so that they fall into both phase and frequency, then with a big 'kerchunk' of a monster relay and shudder from the wheel, the two are connected.

This was duly achieved. From this point, all need to be gentle with the stop logs evaporates. We simply remove them all, giving the water in the mill head an unobstructed path down the leat to the wheel. More water does NOT, however, make it go any faster. The National Grid has effectively got a grip on the wheel at this point and will not allow the generator, to which it is geared, to rotate at anything other than the speed which precisely supports a 50Hz sine wave. More water does, however, create more torque on the axle, more current and hence more power.

Satisfied with this, with the mill head up to working height for the first time ever and a steady 2.68kW showing on the output meter, we left the whole lot running nicely.

The spillway in the mill pond regulates the water flow with a clever sloping cill. The excess water runs off into the bypass channel, which can be seen on the right of the picture at the start of the article.

Ripping yarns

That night I awoke. Despite the gentle noise of the rain it was clear that something else louder was going wrong. Jumping up and to the window – our bedroom faces the wheel across a courtyard – I could see the wheel spinning fairly wildly and obviously without any restraining load. Having rushed about semi-naked outside in the dark for a while, pulling stop-logs from the control sluice and putting others back in the leat, I went into the generator room. Although the wheel is coupled to the gearbox and hence the generator, it is not done rigidly. Between the wheel and the gearbox is a 'Fennerflex 140' coupling which looks much like a wheelbarrow tyre.

One bead is gripped by a flange on the waterwheel shaft and the other by a flange on the gearbox input shaft. As a result, drive and torque are transmitted through the fabric-reinforced rubber of what would be the circumferential tread of the 'tyre'.

Anyway, the F140 had proved unequal to the task; despite being capable of handling 3kNm of constant torque and a 5kNm starting load, it had been ripped to literal shreds (see right) by the power increase caused by the overnight rain.

Stormy shakedown

Assuming it was bad luck, I ordered another rubber replacement. Later that day though, dusting off my torque tables, it became clear that our wheel, under load, was more than capable of exceeding 3kNm and in fact would probably operate around a constant 4.7kNm when the buckets were fully loaded with water.

Having ordered a new F140 tyre I fitted it, as a stopgap and at reduced power, only to find that it lasted less than 72 hours. The full solution – an F180 coupling (which is substantially bigger and, of course, another expensive mill-owning lesson) was inevitable. This was fitted on 20 January and while the thick rubber is looking a little strained when under full load, in the time since it is

Sherborne Mill is now generating – continued

bearing up well. Maximum registered load on the control box with this configuration has been 3.31kW which, as you would hope, is pretty much the same as the maximum rated capacity of 3.41kW which shows that all is well. With Storm Ciara having deluged our catchment and Dennis now on the way, it's certainly getting a good shakedown.

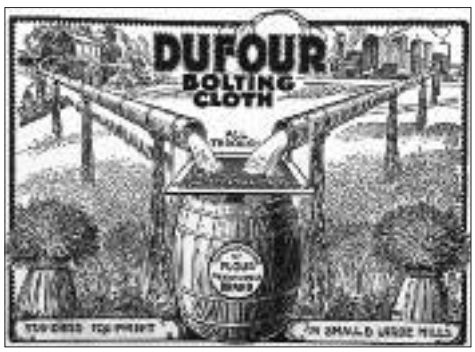
The Generation Game

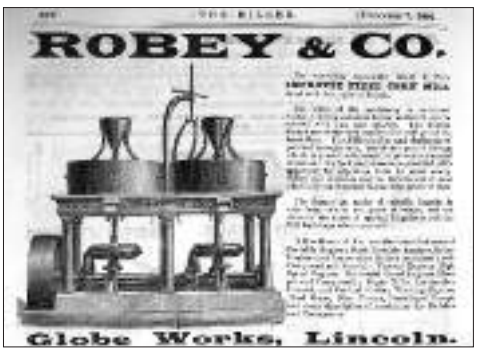
Although it might seem a bit wasteful not to have had the wheel running during the summer of 2019, I am quite pleased we didn't. Despite SSE, our energy supplier, assuring me that our Economy7 meter would be fine to cope with measuring the generated power – it wasn't. It didn't just fail to shut down the registers when we were feeding power back to the grid; worse still, it actually counted the exported power twice! Once as it went through the day-time register and again as it somehow flowed backwards through the night-time register. We are currently in dispute for about £600 (expensive lesson number three) but we may get somewhere, I hope.

This year though I have been keeping a close note of the wheel's generating performance and it's looking good. Taking the period in which the wheel was working continuously from 20 January when the F180 coupling was fitted to today (13 February) we have, on average, generated 58.8kWh every day and had to pay for only 1.8kWh (which is effectively only those odd times when our generation level is exceeded by the demands of the house). I suspect we are exporting about half of our generated power which, while good for society, seems a bit of a needless loss while we are still paying handsomely for petrol. Watch this space!

[HMG Newsletter] Editor: By the way, if anyone is thinking of installing hydroelectric generation, Harry is happy to share his knowledge and experiences.

All photographs by Keith Andrews





News from the Mills Section

Mills Section Event Calendar

2020

At this moment all events are cancelled but re-arranged dates will be published on our website and in the July edition of Mill News.

All mills will be closed during National Mills Weekend.

For further details and online booking, please visit www.spabmills.org.uk and click on 'Courses and events'.

To contact us, please email millsinfo@spab.org.uk or telephone 020 7456 0909 (Monday to Wednesday).

Letter to the editor

The occasional purchase of second-hand books online from an antiquarian dealer (not so costly these days) has its rewards. From an otherwise unmarked copy of *The Countryman at Work* (with a Memoir of the author by H J Massingham) by artist Thomas Hennell (published after Hennell's death in wartime by The Architectural Press in 1947), fell a typed note by SPAB Mills Section member, Rex Wailes. Content with the coincidence that this copy of the book came to an SPAB member, I was about to pass on the text of the note to you when news of Rex's Archive in your Winter Magazine beat me to it. The note sheds light on Hennell, Massingham, Rex and even Vincent Lines, Rex's choice to illustrate his own *The English Windmill* (1954). Members may like to place the text in their own copies of *The Countryman at Work*. I wonder if the Archive includes another copy of his note?

"Note on Massingham's Memoirs

Massingham did not know Hennell well; he relied on information from Mr & Mrs Delmar Banner, who did not know Hennell well either; nor did Hennell much care for Massingham or Banner.

The original draft of these memoirs were so inaccurate that I persuaded the publishers to get Massingham, whom I knew, to rewrite it with the help of various people who knew Hennell well; even so it is bad. As Hennell's oldest surviving intimate friend I ask you to read Vincent Lines memoirs which brings the man to life.

Rex Wailes"

I have not been able to locate Vincent Lines' Memoirs.

John Winstone
Wells

Mill Repair Fund Report

Silvia McMenamin

Previous applications, recently paid grants or grant payments in process

Oldland Windmill, West Sussex

A grant of £1,000 has recently been paid for casting of new shutter cranks.

Removing the sweeps at Oldland Windmill.

Wrickton Watermill, Shropshire

A grant of £1,000 has been offered for part payment of a new wheelshaft which has now been made and is awaiting fitting – see also page 19.

Marlston Watermill, Berkshire

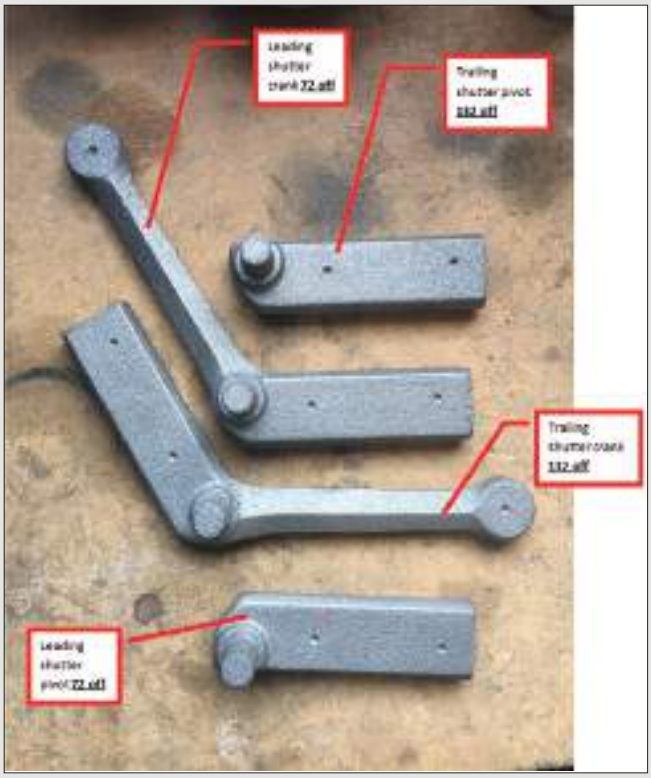
A grant of £550 has been offered for repairs to waterwheel, inflow sluice and milling equipment.

Little Norton Watermill, Somerset

A small country mill in South Somerset. They requested a grant from the Repair Fund for damming off the water feed from the mill pond to the waterwheel, dismantling, repairing and refitting the penstock, then removing the dam.

Oldland Windmill, comparison of shutter crank forms.

Wrickton Watermill, the new wheel shaft.



Oldland Windmill shutter crank names and numbers.

Please be vigilant

Mildred

It is not always the case that we can save a mill from conversion. This is usually because we have not heard, either from local councils or word of mouth by someone passing the site and seeing something unusual going on such as machinery being taken out etc.

Particularly vulnerable, and a worry, are the great many mills that are only Grade II or may not be listed at all, and this is another reason for us not hearing (even though demolition or partial demolition does need consent).

One such case came to light recently by machinery being offered on Facebook, but by the look of the photographs taken back in 1999 it appears the conversion had already happened. This Cornish mill is not listed. It is also sometimes the case that someone buys a property, where most of the machinery has already been removed.

In this particular case the owners will keep the waterwheel and are hoping to repair it. The rest of the machinery looks like going for scrap unless someone comes forward to re-use it.

The layshaft gear in July 1999.
Picture – Martin Bodman.

The mill in July 1999.
Picture – Martin Bodman.

The waterwheel in July 1999.
Picture – Martin Bodman.

Members can help us by being vigilant and looking in local papers or on local web sites for planning applications and letting the office know.

Please be vigilant – continued

Most planning applications for a mill conversion usually show that it would be most difficult for the mill to be put back to working condition. Once machinery has been taken out it usually ends up going for scrap or in some cases installed in another mill.

Sometimes interior machinery is not even shown on the drawings, giving the impression that nothing is under threat.

Sometimes, the primary gears, waterwheel and pit gear are to be kept within the conversion, but it is

the rest of the machinery that is often wanted out the way.

Machinery, if it is allowed to be taken out of the mill, should be carefully recorded before being removed from site and a record made of where it eventually ends up.

Permission has been given for me to use the images of the machinery for this short report.

Thanks to Martin Bodman for the exterior image, lay shaft gear and the waterwheel which he photographed in 1999.

If you have relevant expertise to offer, and would be willing and able to help with casework, please don't hesitate to contact the Mills Section – we'd love to hear from you.

Preparing for a new waterwheel shaft at Wrickton Mill

My workforce of three Midland Mills Group members, John Bedington, Mike Forbes and Dave Wadley, constructed a framework of scaffolding to keep the waterwheel and pitwheel stable and installed a baulk of timber, which would allow the old shaft to be correctly positioned for removal. They then removed the pairs of folding wedges between the shaft and the hubs. With a square shaft there have only ever been four pairs of wide wedges per hub which has made adjustment or their removal fairly simple. The old shaft was left resting on short lengths of scaffold pole ready to be pulled out.

By the next workday I had persuaded my son, son-in-law and grandson that they would benefit from the exercise of digging out the bank next to the wheel pit sufficiently for a the old shaft, nearly 12ft long, to be drawn clear of the wheel in one piece. Getting it out whole, rather than cutting it into sections with a chain saw, seemed important as the new shaft would go in via the same route. Initially the shaft came out easily but my estimate as to how much of the bank needed removing proved a little optimistic. However, sterling work with a mattock and spade soon solved that problem and the shaft was winched out clear of the wheel.

The existing gudgeons were needed for the new shaft so they had to be removed to be taken to David Empringham's workshop near High Wycombe before the new shaft could be prepared. The outer gudgeon levered off quite easily as that end of the old shaft had decayed badly. The one on the inner end seemed tighter so the chain saw came in handy after all. John Bedington agreed to take the gudgeons in his van and a few days later we endured a very rainy drive down the M40 to deliver them. It seemed to do nothing but rain ever since, culminating in a flood at Wrickton over the weekend 26 and 27 October. By now the new shaft was ready for delivery but that could be have been rather tricky as, although the flood water receded quite quickly, the mill yard remained too soft for a heavy vehicle. Eventually we settled on 25 November for delivery and, of course, it rained. The shaft arrived at about mid-day on the back of a Hiab (lorry with a crane) which was far too wide to get through the gate into the mill yard. That really didn't matter as the yard was still too soft for any other than the lightest vehicles. All the driver could do was crane the shaft over the wall by the gate onto some rollers and I quickly covered it up and went home.

It kept on raining through December, January and into February resulting in two more floods at Wrickton. The last one, during the night of 15 and 16 February, was the deepest and water actually entirely covered the shaft. Thank goodness it didn't float away! I now have a long wait for it to dry out sufficiently to complete wedging the gudgeons before it can be installed.

Of course, I am enormously grateful to my skilled workforce for their efforts to date and hope they will return to complete the job when we get a good run of dry days. Equally, the promise of very generous grants towards the cost of the new shaft from SPAB Mills Section and MMG has greatly lifted my spirits.

Tim Booth

Managing Health and Safety Risks in Traditional Mills: Follow-up to Conference

Thank you to everyone for either joining us in person, or joining on-line. We appreciate it was a very difficult decision to a) decide to go ahead with the conference and b) then for you all to decide if it was safe for you to attend given the changing advice and circumstances. I don't think any of us can recall a situation where government advice has changed so quickly.

A particular thanks to our speakers for their herculean efforts to join us, to the Heckington Mill team for their warm welcome and to Silvia McMenamin from the SPAB Mills Section for her help in managing the bookings for the event.

There were a number extremely valuable insights, points of learning and discussion that arose from the conference with some exciting next steps to develop and plan. More about all those in due course but some summary guidance is below.

Jon Cook

Health and Safety – brief guidance

Please note: Many more laws, regulations, and codes of practice apply, so consult https://www.hse.gov.uk/ and safety organizations' websites for further info.

Health and Safety at Work Act 1974 (HASAWA) requires you to:

- Take reasonable care for the health and safety of yourself and other people;
- Co-operate to enable the employer to fulfil its legal duty;
- Not interfere with or obstruct anything provided for health and safety;
- Take responsibility as an employer for:
  - Plant and safe systems of work;
  - Use, handling, storage and transportation of articles and substances;
  - Provision of information, instruction, training and necessary supervision;
  - Maintenance of the place of work, including keeping access and exit in a safe condition;
  - Mental health, including workplace stress;
  - Provision and maintenance of a safe working environment with adequate facilities and provision for dealing with emergencies.

You should:

- Appoint a competent person to manage H & S;
- Know how you will provide a safe working environment for everyone;
- Prepare an H & S Policy;
- Provide for first aid and plan for emergencies;
- Identify hazards, assess risks and manage them;
- Consult those you work with;
- Obtain the necessary insurances;
- Provide information and training;
- Maintain the necessary records;
- In some cases report accidents, illnesses and 'near-misses';
- Know the law and take advice over further possible requirements.

Civil Law: 'Duty of Care'

Under common law, voluntary organisations and individual volunteers have a duty of care to each other and others who may be affected by their activities. Where something goes wrong, individuals may, in some cases, sue for damages using the civil law if they are injured as a result of another person's negligence.

To be awarded damages the injured person must show that the defendant had a duty to take reasonable care towards them, that they have suffered the injury through a breach of that duty and that injury was a foreseeable result.

The originators of this guidance accept no liability for errors, omissions or outcomes.

Effect of the Coronavirus on flour production

The milling fraternity have been putting in great efforts to help their local communites cope with the problems raised by the virus. People are wanting flour to bake and make their own bread at this time.

From Heage Windmill:

> *"In view of the current situation and calls from numerous customers seeking flour it was decided on Friday that the following day would be a good 'milling day' – so we opened Saturday morning and milled, selling off what stock of flour we had. However demand caught up with stock so we ended up using freshly milled flour."* [See pictures right and below.]

Heckington Windmill have been milling Friday – Sunday to keep up with demand (picture right). Jim Bailey wrote:

> *"I've been rather quiet for a few days, we have been rushed off our feet meeting the extra demand for flour. We have been selling around four times our normal rate. With the sail mechanism still awaiting repair we have been relying on our Hurst frame for wholemeal and importing stone-ground white flour from another mill. However, as the week has progressed, more of our volunteers – the majority are over 70 – have decided they cannot sensibly continue to come to the mill, and after last night's broadcast we have regrettably decided to close the mill. I've spent today securing the buildings, as although we may need to do some occasional work in the mill, we will remain closed until government guidance changes."*

Swaffham Prior Windmill have been milling every hour the wind blows to keep up with demand from online orders.

I am sure this is the case for many of the Traditional Corn Millers and others round the country who produce flour for local consumption.

Mildred

Rex Wailes Collection Update

Nathanael Hodge

Since the Rex Wailes collection arrived at the Mills Archive (see *Mill News* 161, October 2019) we haven't been standing still. Staff and volunteers have been hard at work sorting, cataloguing and uncovering some of the gems of the collection.

Bearing the brunt of much of this work has been the Archive's most long-standing volunteer, Guy Boocock. Guy's spreadsheet listing already runs to over 600 entries – when complete, it will be available for the public to search on our online catalogue.

Volunteer Guy Boocock with Nathanael boxing records.

But we didn't want to wait for that before making some of the collection available online. So at the same time, other volunteers have been working through Rex's photographs. Many have already been digitised and can be viewed on our online catalogue: https://catalogue.millsarchive.org/images-3

Some of the highlights are shown opposite.

Much of the collection is in a poor condition due to having been stored for many years in sheds at the bottom of Rex's garden before rescue by Alan Stoyel. A grant from the National Manuscripts Conservation Trust will help fund conservation work on some of the most damaged large drawings. A recent training day at the Archive run by conservator Victoria Stevens saw volunteers try out some conservation techniques themselves.

Volunteers practising cleaning.

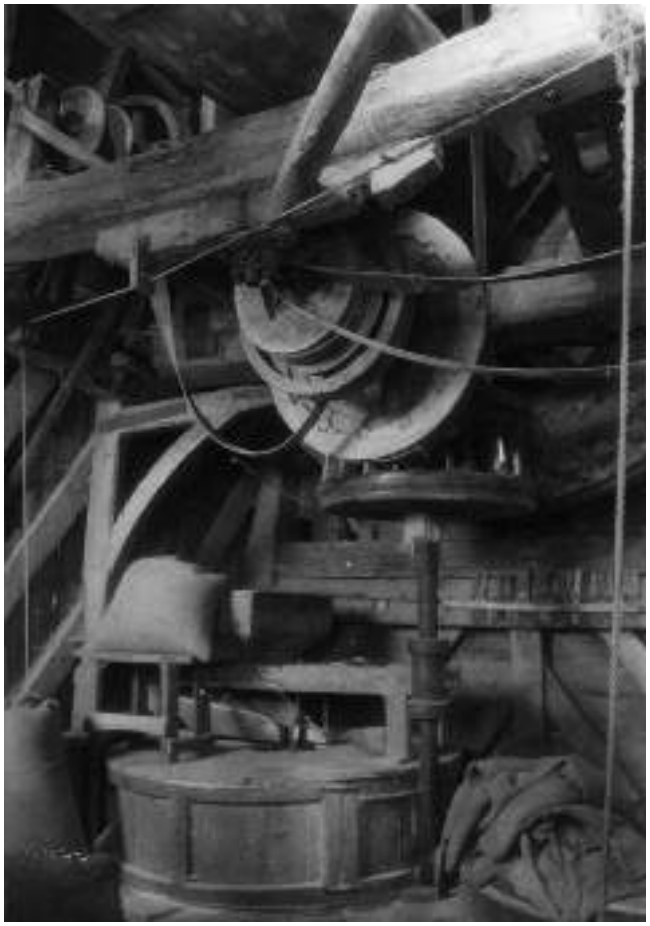
Since Mill News featured the appeal to help conserve the collection the amount raised so far has reached £15,000. This will go a long way in preserving this collection for future generations to enjoy.

A Thomas Hennell drawing before and after cleaning.

Rex Wailes Collection Update – continued

Restoration work on Union Mill, Cranbrook, 1958.

Restoring Mountnessing post mill, 1937



Interior of Moulin De l'Ingratitude, Boeschepe, Nord, France.

Millwrights at work at Burwell.
Picture – Douglas Gavin Reid

DVD Review

The English Windmill

A film by Martyn Taylor

Martyn contacted me back in July 2016 asking for permission to film at Heckington Windmill. We were fortunate that the wind was good on the day he arrived and he has captured our windmill turning on a beautiful sunny day. However, this DVD is not simply a collection of windmills filmed for posterity, it is much, much more.

On the DVD box cover Martyn introduces the content as:

"The English Windmill is the story of the windmill, from the earliest post mill to the later, iconic tower mills. Topics covered include the grinding stones, scientists and inventors who discovered and improved milling technology, and the industrialisation of milling itself. Also covered is the development of windmills for electricity generation and the role windmills play in our collective heritage. This video is a must for all windmill enthusiasts who care for the preservation of our technological past"

This is a very wide remit, so how has he achieved it? Firstly, the running time is 98 minutes, so be prepared to settle down for a long watch. By giving himself so much time, he has taken the opportunity to cover much of the history and development of the windmill in detail. Secondly, and this is a major strength of the film, he has researched the subject well, and the use of interviews interspersed with his narration and filming gives the viewer a detailed understanding of the windmill's development.

I particularly enjoyed the sections on how Smeaton influenced the design of the windmill, and the industry that built up around the quarrying and production of the French burr stone. I would recommend this DVD to both the casual mill enthusiast and for those of us who are involved in the operation, maintenance and preservation of these iconic pieces of our heritage.

Please contact Martyn directly if you are interested in having a copy: dzikimart@hotmail.com

Jim Bailey

A Musical Miller

Mildred

Taken from MILLING 23rd September 1892:

"Our cousins across the Atlantic exhibit their national originality in various ways. The latest we find is in the 'American Miller' of September of 1892.

In all ages, in every country, and in almost every trade and profession, men of genius have been found. The millers of America have contributed their share to the world's history, and some claim that not since Oliver Evans has there lived a miller so deserving of fame as the man called the Musical Miller.

In 1817, a German by the name of Bimeler founded a religious society of communists, which by enterprise and industry grew rich and built a village called Zoar, which in 1892 had a population of around 300. They started in a small way but soon had a furniture factory, a sawmill, planing mill, woollen mill, machine shop, foundry and one of the best equipped roller flour mills, to grind their own wheat, oats and rye, which could produce around 90 barrels capacity per day in the state of Ohio, the mill was situated overlooking the Tuscarawa River.

The flour mill was driven by one of the best water supplies in the Buckeye State, and was operated by Mr Peter Bimeler, a great grandson of the founder of the Society. Mr Bimeler was a mechanic and miller of ability as well as a musical genius. He conceived the idea of building an organ, and commenced the work in March 1891. So well did he succeed that in May 1892, the waters of the Tuscarawa were used to bring forth from Mr Bimeler's organ strains of music such as has probably never been heard to burst forth from the four walls of a mill. The interior of this organ, the pipes, wind-chest, bellows and swell-box were made from timber from an old bolting chest, and being so old and well-seasoned added greatly to the quality of tone.

It had two manuals and pedal bass of 27 notes, which was sufficient for the highest grade of music, the lower manual or great organ has five octaves, and the upper or swell organ has six, which was very convenient when practicing scales and arpeggios.

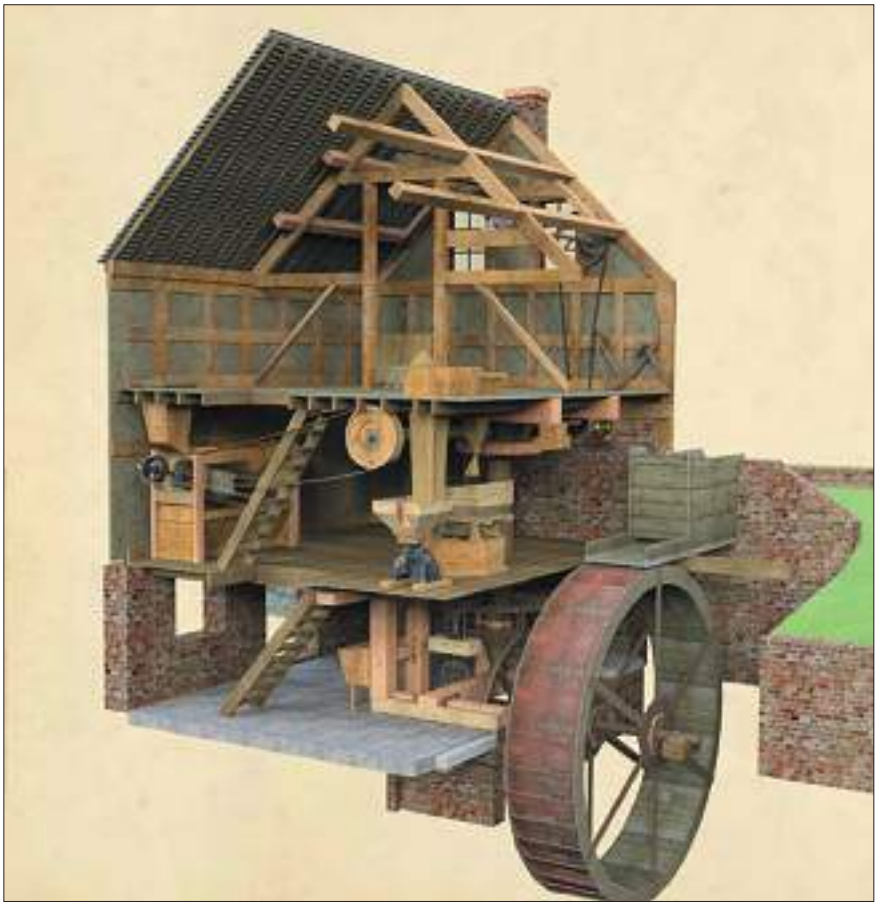
There were 61 wooden pipes and 219 reeds divided into four musical stops. The power for the bellows was furnished by a turbine under a 6ft head. The wheel was regulated by the discharge, by means of an ingeniously constructed valve right below the wheel. The rod that operated this valve was connected with the upper part of the bellows, and after the wheel was started the pressure of air in the bellows acted as a governor. The bellows were also provided with a lever which could be operated by hand if required. The case was made of cherry wood, grown on the Zoar farm. The organ was located adjoining the office on the first floor of the mill, and by means of a double door could be converted into a medium sized concert room.

Mr Bimeler's organ was tested by professors of music from Cleveland and other cities, and all proclaimed it an excellent instrument."

The organ stayed in the meeting room of the flour mill until 1930 when it was moved to Zoar Village House No.1 Museum and was still on display there in 2018.

Mills in the News

Clencher's Mill, Herefordshire



Clencher's Mill has recently reinstated a bolter to the mill. The following report is compiled from excerpts from the mill's blogs, by permission of Clencher's Mill.

Clencher's Mill is a watermill near the edge of the Eastnor Castle estate off the Glynch Brook at Ledbury in Herefordshire. It was bought in about 1700 and has medieval origins. It was modernised in 1812 and redundant after 1939.

In 2012, under the Higher Level Stewardship scheme, we accepted a grant managed by Natural England to help restore the machinery in Clencher's Mill. We had maintained the mill building and the machinery, including the water wheel dated 1820, that had luckily remained in situ as opposed to being removed for scrap. The mill had worked with water power until the 1920s, when the miller and the farmer, who farmed the land where the water entered the mill leat, had a row and the supply was cut. The machinery then was powered by a tractor until the 1940s.

Another repair after the wheel was the reinstatement of a bolter which the mill originally had. Most of the original mechanical equipment has survived and has been put back into working order with the help of a number of grants, but one vital machine was missing, namely the bolter, perhaps not unexpectedly given one alternative meaning for its name. When in place, its job is to separate the meal ie the ground wheat that comes out of the millstones and consists of flour and bran. Some mills just supplied

Mills in the News

wholemeal, but there is clear evidence that there had been a bolter at the mill as certain elements remained.

Rather than have a new one made, we looked for an old one. Alan Stoyel from the SPAB identified one at Wormbridge Mill, near Hereford, which had closed in about 1900. It was still in place and the owner, a good friend of ours, was happy to part with it as all the rest of the equipment had already been removed, probably for scrap. It did not quite fit through the door and needed quite a bit of wood replacing, which was undertaken by John Churchill of Burns & Churchill in Ledbury. It was also narrowed to fit.

We had the benefit of a visit by John Brandrick – expert in the matter of recording mill structures and machinery. His skills in the art of technical drawing are clearly evident in the images here which allow us to see in one view all aspects of the mill. John's work is of exceptional quality and more can be viewed on his very informative website at: https://milldrawings.com/

Mills in the News

Sibsey Trader Mill

The cap and windshaft have been removed from Sibsey Trader Mill by Suffolk Millwright – Tim Whiting and his team.

This marks the start of a project to rebuild the cap and sails of this beautiful six-sailed mill which is owned by English Heritage and run as a flour business by Ian Ansell.

Storm damage in January 2018 destroyed the fantail and the sails were removed two months later.

The first two photos (right) show the removal of the striking rod and spider on 21st January 2020 using a lorry-mounted 'hiab'. The six-armed spider casting is about 19½ inches (495mm) diameter.

The cap roof was cut off and lifted down to expose the windshaft and brake wheel.

The brake wheel and sail cross are separate castings securely fixed to the windshaft with metal keys. They were lifted down as one unit on 22nd January, the first time they had been at ground level since they were first installed in 1877.

The photos below show the brake wheel exposed to the elements and the castings lowered to ground level.

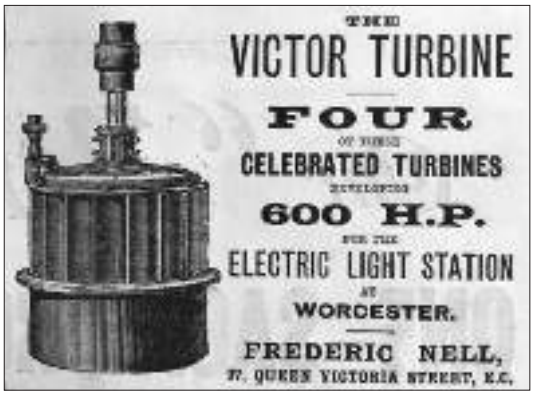
Mills in the News

With the heavy castings removed, the cap frame and fan stage were lifted off and placed on the lorry bed for transportation to Tim's workshop in East Suffolk.

Before the installation of a temporary flat roof, the cast-iron curb on which the cap rotates was removed. All six segments of the curb require repair, as does the brickwork that supports them.

The photographs below show the top of the tower with the cap removed and the curb ring being lowered to ground level.

All pictures by Suffolk Millwright/Tim Whiting



Mill Group News and Newsletters Review

Tom Derbyshire

This report is produced by Tom Derbyshire. Will all groups please send copies of publications to Tom at derbyshire.tom@gmail.com, or by post to him at 15 Kinderscout, Hemel Hempstead, Herts, HP3 8HW. The next copy date is 1 June 2020.

Hampshire Mills Group Newsletter No 128, Spring 2020

Alison Stott reported on the very enjoyable December meeting at Tubbs Hall Kings Worthy. Ruth gave a talk with pictures from the Lincolnshire HMG study tour, which was followed by Gilbert Yates's video interview of Richard Harvey reminiscing about his visits to Hockley. The video can be viewed at https://youtu.be/4QKhmdWvG9o.

Andy Fish announced details of the Nottinghamshire and Derbyshire Study tour on 14-17 May 2020.

Ashok Vaidya wrote an article about transferring Tony and Mary Yowards' mill records on to the computer to make them available for the Mills Archive website. So far Ashok has dealt with two binders from several boxes of information and in the process added 588 images to the database – 260 from Tony's database and 328 that he has scanned himself – a long and tedious process, which will eventually be for the benefit of anyone searching the Mills Archive catalogue.

A page was devoted to a photograph and description of storm damage to Burgh le Marsh windmill as a result of storm Ciara.

Harry Clarke gave an update on the progress of the construction of a new power generating wheel on the Domesday-recorded mill site in Sherborne St. John, just north of Basingstoke. The unit has been accredited securing a feed-in rate of 8.26p per KwH for the next 20 years on a deemed 75% feed-in proportion of the maximum rated capacity of 3.41kW.

They had to stop the waterwheel for several months in the summer to carry out essential building works and extra work on the wheel, then reinstalled the electric synchronisation box. They had a few issues when restarting the generator: the self-exciting generators rely on the iron cores retaining some magnetism, but because of the length of the closure all that had been lost, so they had to "reflash" the generator – the reflashing caused the household lights to dim, the 40-amp generator trip to pop and damaged the motherboard on Harry's laptop. Subsequently all systems started to work properly again, then the Fennerflex 140 coupling between the generator and the waterwheel decided to break down and ripped itself to shreds resulting in having to fit a replacement, which again failed, so eventually a stronger F180 coupling had to be fitted – the maximum registered load on the configuration is now 3.31kW and they are on average generating 58.8kWh every day and have only had to pay for 1.8kWh. If anyone is thinking of installing hydroelectric generation, Harry is happy to share his knowledge and experience – see full article on page 12.

Mariana Perry-Zoupanou showed an illustration of both sides of a postcard sent by a lady in 1935 from City Mill Winchester – the building looks much as it did then when it was a hikers' hostel.

Ruth Andrew reported on two Kent windmills and Keith on one in Warwickshire.

First Draper's Mill, Margate. Built in 1845 by John Holman, a Canterbury millwright, it is a four-storey smock mill with 26ft patent sails driving three pairs of stones, on a single-storey brick base with a gallery stage at first-floor level. It worked by wind until 1916, then by a 20hp gas engine until the 1930s. It was threatened with demolition in 1965 but saved by the formation of the Draper's Windmill Trust. In 1968 it was restored by the Kent Education committee and is now in the care of Kent County Council. Information on the mill can be viewed on draperswindmill.org.uk and Wikipedia.

The second mill in the report was Sarre Windmill. The mill is not working but is in good condition and weatherproof, with all its machinery. Again, it was built by John Holman in 1820. It was built with a single-storey brick base, which in 1856 was raised to 14ft. It was the first mill in Kent to have a steam engine installed for auxiliary power. It worked by wind until 1920 then by gas engine for a few more years. It ceased milling in the early 1930s and was used as an observation post in the Second World War. It remained semi-derelict until 1986, when restoration was started, and now works commercially again. The article was complemented by a series of good photographs.

Berkswell Windmill, Basall Common, north of Kenilworth. Built in 1826 on the site of an old post mill, it is brick built with a wooden boat-shaped cap and turned into the wind by an endless chain mechanism. In 1927 it was adapted to run via a diesel engine. It worked commercially until 1948. It was restored between 1973 and 1975 by Derek Ogden. The current owner bought it in 2006 and by 2013 it was restored to full working order.

Bradbourne Watermill. Angela Smith described a watermill article from Derbyshire Life. It is a self-catering venue costing £3,000 a week in high season. It was built in 1726, the wheel still turns and many remains of the machinery are visible in the bedrooms. It is available for let from English Country Cottages.

Andy Fish reported on a disaster in October 1919 in Levant Mine, Pendeen. In 1855 the mine was 1,600ft deep. Miners had a 60-minute climb down a ladder to get to work, so a Man engine was installed – a form of elevator to take men up and down the shaft. The disaster was the failure of this elevator, killing 31 men and injuring 12 – a metal bracket broke causing timbers and platforms to crash down the shaft. A poem, which was reproduced, was

written as part of an appeal for funds for the families left behind. As a complementary article, Ruth Andrews described a visit she made with Keith to the remains of the site now owned by the National Trust.

Margaret Rogers related a story about Lumley Mill, Emsworth. The mill was built by Lord Lumley in 1760. After 18 years, ownership passed to Richard Barwell then to Edward Tollervey in 1802. He built a large pseudo-Gothic house, outbuildings and stores in which he installed ovens to bake bread and biscuits. He also built pigsties because he had obtained a contract with the Admiralty to supply salt pork, bread, biscuits and flour. The mill burnt down in 1915 and all that remains now are the foundations. The mill house is currently for sale at £1. 5 million. Emsworth Corn Mills history booklet is available online at thespring.co.uk/heritage/local-history-booklets/.

A report on the progress of Upminster windmill from their newsletter was published with photographs. The replacement of the reefing gallery, restoration of the mill's cap (the curved shape of the roof will be achieved through lamination of several thin pieces of timber) and building of the sails, brake wheel and wallower was covered.

An article from BBC Hampshire News and Daily Echo reported on the demise of Solent Flour Mills, built by Joseph Rank (founder of Rank Hovis McDougall) in 1934. The building has been unused since Hovis production ended in 2018. Associated British Ports (ABP) have submitted plans to raze the six-storey building to "optimise the amount of ground level storage within the port". Local heritage campaigners and a city councillor are working with ABP to find an alternative solution to demolition.

Mariana Perry-Zoupanou reported on a 2019 visit to Whitchurch Silk Mill. She has attended many textile workshops there. The mill has introduced many ways to facilitate ease of access to visitors, including a new lift so wheelchair users can visit all areas. Architects have engineered the design of the mill, allowing visitors to have clear views of the people at work within. The mill can be run by water power or electricity (water-power working at about a third of the speed of electricity). There is now a great café and shop for visitors to this the oldest silk mill in the UK.

David Plunket explained that his research on historical tide mills still had some areas to complete – the coastline and estuaries of South Wales and the coastline and islands of West Scotland. He appealed to any members holidaying in these areas to pass on any knowledge gained in their visits to help him fill in some of the historical gaps. (He would be pleased to discuss with them beforehand.)

Midland Wind & Water Mills Group Newsletter No 125, December 2019

Report of annual general meeting – accounts, healthy subs to remain the same, membership of 150, very busy year, a need to try and attract younger members.

Mike Forbes gave a talk to the group in October 2019 about the history of Pentrefoelas Mill, a small village in Conwy. In 1987 a partnership between Colwyn Borough Council, Foelas Cyf, Clwyd County Council and Wales Tourist Board invested a large amount of money in developing the village as a Heritage Trail and Historic Working Village, to revitalise the local economy. Among other things, the mill was rebuilt to produce flour again. It has a 14ft diameter overshot wheel with two pairs of stones, one peak and one burr. Sadly, county boundaries changed in 1995 and Pentrefoelas came under the control of Conwy, which has no interest in maintaining the village project. The mill is intact and locked, and its future is unknown.

Susan Young reported on Hugh Howes' presentation in November on Milling Dynasties.

The talk focused on owners and mills of the Nene and Great Ouse catchments, which covers parts of Northamptonshire, Bedfordshire, Cambridgeshire and Hertfordshire. It talked about the shift in processes to commercially produce flour, more varieties of British flour and dramatic development to faster breadmaking, influenced by the Millers Mutual Association and the Government in the past 200 years, and covers many well-known milling names:

Heygates: Bugbrooke, Tring, Downham Market and Iklingham – wheat grown on their own land – the Downham Market mill being one of the first in the country to convert to roller milling.

Simmons: traded until 1964, when they were taken over by Rank Hovis McDougall Ltd. who closed the mill at the end of that year.

Westley Clark: developed in Blisworth, partnered with A.W. Clark, acquired Weston Favel Mill and converted to roller milling in 1894. In 1945 it was acquired by Rank Hovis McDougall who closed it down.

Whitworth: founded in 1896 at Irthlingborough. It is now the biggest milling company in the UK and accounts for over 25% of national flour production.

Rank Hovis McDougall: Joseph Rank (1854-1943) built large steam roller mills in the London docks, Gateshead, Cardiff, Birkenhead and Southampton. He merged with McDougall and Hovis in 1962 – now a reduced player in flour production, concentrating on food manufacture.

Weetabix: in 1932, the British and African Cereal Co. Ltd started production of Weetabix in Burton Latimer and changed to Weetabix Ltd in 1936. In 2003 it was sold to a US private-equity group.

Cadge & Coleman: Fletton mills date from 1850, with 10 set of stones. In 1884 these were replaced by Henry Simons roller mills. They had a further mill at Dogsthorpe, both taken over by Whitworth in 1936.

Brown & Goodman: using French burr stones in Houghton & Wyton. Steam powered mills were built at St. Ives and Godmanchester. However, competition from steam mills in the area ultimately contributed to the demise of Houghton Mill.

Addington and Jordan: started in 1926 at Eaton Socon – closed down in 1960.

Jordan's: Holme Mills in Biggleswade bought in 1855. It produced flour until 1972 when W. Jordan (Cereals) Ltd was formed. The business now operates as a subsidiary

(The Jordan's, Dorset & Ryvita Company) of Associated British Foods.

Millers Mutual Association: formed in 1929 through which flour output quotas were fixed and funds raised to buy out and close redundant mills, resulting in larger milling companies acquiring smaller milling concerns and taking over their quotas.

Emergency Food Reserves: government policy lasting until the 1970s regarding maintaining staple food supplies that could be affected by war, built 15 standard grain silos in inland locations equipped with drying, storage and milling facilities. The central tower housed a drying plant flanked by six pairs of silos with a capacity of 5,000 tons, two are located in Northamptonshire.

Susan Young reported on the group visit to Redditch Needle Museum in September. And a visit later to Bordesley Abbey remains. Needle manufacture closed in 1958 and was opened as a museum by the Queen in 1983 – in their heyday they produced 3.5 billion needles a year – 90% of the world's requirements.

News from the mills

Dunham Massey Sawmill: still has high visitor numbers, Dorothea restorations have given an estimated cost for refurbishment of all items. New information boards have been installed. There are plans to repair the stone-flagged roof in September 2020.

Heage Windmill: having learned that replacement of the two rotten sails would not be done for a least two years, the maintenance team led by David Land spent four months of intensive work to manufacture their own replacements. The mill will, as a result, end 2019 with a full set of six sails.

Hough Mill Swannington: Mark Temple gave a brief history of the mill from the 1870s. By 1940 all that remained was a brick shell. During the 1980s North West Leicestershire District Council purchased the empty shell from the then owners the Hough family. In 1994 Swannington Heritage Trust bought the mill and with an £80,000 grant from the Heritage Lottery Fund started to restore it. A further £80,000 grant from Grantscape enabled the temporary cap to be removed, and in 2009 put a newly constructed fantail and windshaft in place. Because no machinery or timberwork remained in the mill, everything had to be made from scratch or scavenged from remains of other mills. Volunteers manufactured a new brake wheel and wallower. In 2019 the mill was the unexpected recipient of a generous donation from a local family that paid for installation of new sails carried out by David Empringham. Hopefully, when the mill reopens next season, more visitors will be able to appreciate what a tremendous effort has been made by local volunteers over the past 25 years to rescue this wonderful old girl.

Mark Temple reported on the uncertain future for three of Lincolnshire's finest mills. Ellis Mill, Alford and Burgh le Marsh Mills.

Ellis Mill was closed as the result of a health and safety audit and funding has yet to be identified. The County Council's Executive decided that the Heritage service would begin working with third parties with a view to handing over responsibility for all three mills.

Splashy Mill: John Bedington reported on the state of the waterwheel at the mill. Currently it turns with difficulty – many of the bolts holding the arms of the wheel to the hubs and the rims are very loose, which may well have been the cause of a crack appearing on one of the rims and causing the turning difficulties. The bolts are stainless steel so John hopes that a tightening of the bolts will help solve the problems and appealed for some help with the job.

The River Rea Millstone: Roland Kedge of the Rea Valley Conservation Group reported part of a millstone in the river and asked the group if they could investigate. Tim, John and Allan pulled out the two halves of the stone from the river. On examination on the bank it was discovered that it had been made from "puddingstone", often used as a cheap alternative to French millstones – it was 4ft in diameter with a 9.5in eye and a thickness of 23in. Mr Kedge was well pleased with the group's efforts and donated £200 to the group's account.

Alan Gifford wrote an interesting account about millstones quarried on the seashore. He found an article by the late Gordon Tucker referring to millstones being quarried in Glenstocking, Kirkcudbrightshire. He also found a French website referring to a quarry south of the town of Dalbeattie giving instructions of how to get to a coastal quarry but, even after following the directions carefully, failed to find any potential millstone remains. Still persisting with his research, he found that there had been two millstone quarries in Balcary and Glenstocken. In September 2019 he travelled with son Ian and starting from the Balcary Hotel car park his son managed to find the location and came back with photographic proof of abandoned millstones and several locations where stones had been extracted – mission completed, they had located a coastal quarry.

Barry Job related an interesting story of how a member of the Bury St. Edmunds Model Engineering Society produced a photomontage showing the internal workings of each floor of Pakenham Windmill enclosed in the shell of the exterior of the mill. The completed photograph appeared on the front of The Model Engineer date 6 July, 1950.

In the December 2018 edition of this newsletter Stuart Mousedale discussed the possible origins of the word Fleam or Fleame, seeming to refer to either a headrace, a run-off from a mill or simply a water channel. Stuart thought it may be dialect used in Lancashire, Cheshire, Staffordshire or South Derbyshire and asked if anyone else had come across the word. He had two responses to his question, one from Martin Watts who quoted from the English Dialect Dictionary: "The watercourse or race of a mill, a mill stream" – examples from Northumberland, Durham, West Yorkshire, Leicestershire and Shropshire –and also gave an alternative spelling "fleem". A further email highlighted an example from south-east England "flemditch". Secondly Mike Beacham found an example from the English Place Name Society referring to Gloucestershire "le Fleme, with no mill connection but apparently referring to a ditch. Along the Welsh border

Mike said in some districts the race was referred to as the "force" and in others as the "flem" and even the "ffleame". Mike had also checked the shorter OED for the term "flume", which was defined as the "mill tail". Stuart thanked the contributors and said further examples would also be welcome.

New book *Mills of the Isles – Windmills of the Offshore Islands in the UK* by Nick Kelly and Peter Hill. Available for £10 via the Mills Archive.

Michael Beacham asks if anyone has information about "kelp mills" – please contact him if you have information at mchlbeacham.71@gmail.com.

Barry Whitehouse recommends you take a look at www.youtube.com/c/Mark Robinson555, then put in "Thailand steam rice milling machine" to reveal some interesting videos on rice milling.

The group have decided to donate £500 to the Mills Archive to go to the restoration of the Rex Wailes collection.

Sussex Mills Group Newsletter No 185, January 2020

Philip Hicks in his chairman's report mentioned Peter Hill's talk on West Blatchington Mill in the war, the archive Mills at War and Peter's book on the Mills of the Channel Islands co-written with Nick Kelly.

An obituary was written about Robin Wilson who had been a prominent figure at Coultershaw beam pump and an inspirational member of the Sussex Industrial Archaeology Society. In his editorial Justin Brice thanks contributors to Mill News and also Bob Bonnet and Robert Wilcock for their help with his Sussex windmill project, and reported on a newspaper article about the "Old Woman at Fairlight Mill".

News from the mills

Burton Watermill: over 600 people have seen flour milling in action. The Armfield mill dresser will hopefully be running for Mills Day and the Hopkinson roller mill (oat crusher) will be connected to the line shaft in the next few weeks. The restored 1929 Gilkes turbine is producing 32MWh of energy, which largely heats and powers the house.

Horsted Keynes Watermill: the current owner intends to upgrade the interior of the house and get the mill working again.

Jill Windmill: minor repairs and painting have been carried out on all four sweeps. Two will be refurbished in the spring. Much work has been done on the stairs, two new carriage wheels are being made and the story was well illustrated with Simon Potter's photographs of the work as it progressed.

Argos Hill Windmill: the Derbyshire peak stones are running well. Overgrown hedges are damaging the sweeps.

Lowfield Heath Windmill: the team has decided to apply for a wedding licence (cost £4,000) as part of securing upkeep funds – they are hoping to reap at least twice that per year

Windmill Hill Windmill: the re-cogging project was completed but could not be commissioned because a serious fault has been found with the sweeps, which will now need repairing. The buck has been completely cleaned thanks to an anonymous donation. A new pathway to the mill has been made and repairs to the steps completed. Over 1,000 visitors came to the mill in the year. Sadly, two staunch members of team have passed away this year: Rhys Clatworthy team leader and Martyn Bidgood, a willing and helpful volunteer.

Nutley Windmill: the head sickness has been cured. The sweeps, one pair of common and one pair of shuttered were removed during this process. The shuttered sweeps are being remade in the workshop (just 6in longer than the sweep). Because the mill is Grade II*, Scottish Douglas fir will be used for the new whip rather than the modern trend of laminated timber. Once completed a cherry-picker will be hired to re-fix all four sweeps.

Ratham Watermill: also featured on the front cover, it dates from the late 17th or early 18th century. The existing building is 19th century with a three-storey south wing and a two-storey east wing. It has an overshot waterwheel and three pairs of stones, all the machinery and a turbine are still intact. It may be restored in the future.

Peter James reported on a correction from the last issue regarding the group visit to Charlwood. The sentence "This post mill is believed to have been moved from Horsham Common to Lowfield Heath in 1738" should read "This post mill was erected in 1737/8, incorporating some parts from a post mill that previously stood on Horsham Common and was owned by the same milling family."

Simon Stevens presented a story outlining archaeological excavations on the site of the former Beacon Mill, a post mill built in the 1780s. There was a photograph of the mill in its working days, which was recorded as being one of the biggest in Sussex. It fell out of use in the late 1880s and the remains were burnt down in the 1940s. In the early 1970s nothing remained. The mill house constructed at the same time as the mill was once developed into a much larger building with substantial gardens, this too ended up being demolished in the 1990s and the site subsequently became a car park.

Archaeological work on the site began in November 2018 and continued into 2019. Excavation on the house was hampered by finding asbestos dumped on the site by builders, having partially got around this under the watchful gaze of an asbestos specialist, the fish pond with fountain and a few artefacts including a toilet bowl were found. On the mill site, masonry forming part of a drain around the roundhouse was found as well as foundations of the roundhouse and a surviving base of one of the cross-trees. The article was illustrated with pictures recording the dig.

Alex Vincent wrote about the history of the ancient windmills on Highdown Hill. Mills are marked on several maps including the Armada map of 1587 and may have existed on this site since the 12th century. There was a

windmill and a watermill in the manor of Ecclesden in 1324 and a mill pond still exists today. It is possible that two windmills stood on Highdown near each other in medieval times, one in the manor of Ecclesden and one in the manor of Goring. These medieval mills were smaller than later ones and are likely to have had sunken posts like others found in Sussex. Archaeologists are hoping to carry out excavations on Highdown in the near future.

Bob Bonnet reported on the most recent Mill News. He also talks about Staplehurst Smock Mill built on top of a brewery and Robertsbrige on the Darwell, which has a brewery powered by a waterwheel and asks if anyone else knows of another mill-related brewery in Sussex.

The back cover reports on a new DVD entitled "The English Windmill" made by Martyn Taylor. It is the story of the windmill from the earliest post mill to the later iconic tower mills and was six years in the making. The video is a must for all windmill enthusiasts. Email jillwindmill@hotmail.co.uk or download from the website at www.sussexmillsgroup.org.uk/publ.htm. Mills wanting bulk orders to contact sussexmillsgroup@btinternet.com for more information.

Welsh Mills Society Newsletter No 138, January 2020

The new Newsletter editor Dafydd Wiliam thanked past editor John Crompton for his support. He also asked members to send submissions to him now.

Atropaic markings within Welsh mills. Atropaic is a Greek word meaning to "ward off" or "turn away". It is used to describe patterns or burn marks that are thought to be deliberately created to protect the inhabitants from bad luck, curses and witchcraft. They are found in buildings from about the 16th century onwards when the belief in witchcraft was common, and often in "weak points" of buildings such as doorways, windows and chimney breasts – where evil was thought to be able to enter with ease. They are also found on furniture. They can take many forms, for example taper burns, which are caused by holding a lit taper or candle against a timber at 45 degrees – long enough to form a permanent scar – or compass-drawn designs as shown on the cover of this issue. Crossed lines forming grids, along with serpentine lines and unending knots, were thought to fascinate spirits to such an extent that it deterred them from entering. Included in the article were pictures illustrating atropaic markings at Linnet Mill, Llanrhystud Mill and St. Dogmaels Mill.

At St. Dogmaels there was also an engraving of a ship carved into the front door as well as another at Melin Ganol. Depictions of masted ships are common in medieval churches. Also, at Melin Ganol there were several "VV" symbols on the timber frame of the mill, which are thought to call for the blessing of the Virgin Mary, Virgin of Virgins. Dafydd asks other members to send him images of such marks so he can build a database of them.

The membership secretary asked if members could send in their email addresses to aid communication with them. Send to haineswalters@aol.com and reminded those who have not yet paid their subs to pay preferably by internet bank to Sort Code: 30-93-98 Account: 1284752.

News from the mills

Aberdaron Mill: the owner has plans to restore the two ancillary buildings and let them out to raise funds for restoration of the mill.

Report on the AGM in October 2019

The chairman listed mill-related events. Melin Hywel, Anglesey, badly deteriorated but now sold. Melin Llynon, Anglesey – in working order, the county council has offered it to rent, a local chef has re-opened it and hopes to get it running again. Pontdolgoch Sawmill now up for sale.

The society continues to be active in responding to government initiatives involving mills in Wales. Three members have been lost in the year.

Hilary Malaws gave the secretary's report, the society has responded to the government's consultation regarding the compulsory addition of folic acid to flour, indicating that it would be very difficult for small mills to comply.

The treasurer Tim Haines presented the accounts, which were very similar to last year and he urged everyone to pay by standing order. He also reminded members of the small reserve for the Mills Rescue Fund and asked them to contact the committee if they wished to access it.

The journal editor said she had two papers ready for Melin 36 and asked members for more articles. She is also working on an index for Melin and making them available on the website.

Existing officers were elected for another term.

John Crompton noted that he had completed work on ensuring that every water-powered cornmill recorded on Ordnance Survey mapping was listed on the Coflein database and urged members to look at the database and send him a note so he can include them there. He also reported on this year's work of the Mucky Mills Gang.

The chairman expressed his gratitude to Brian Malaws for his 24-year stint on the committee and presented him with a book. He also thanked John Crompton for all his efforts over the years and presented him with a framed drawing by Falcon Hildred. The meeting finished with a presentation by Anne Parry about the work done by Andrew and herself at Felin Ganol. After lunch members spent the afternoon visiting Felin Ganol.

Ian Ogley, the owner of Y Felin, Fach Uchaf, Cemaes, Montgomeryshire (recorded as Cwm Llinau Mill on Coflein) wrote about the mill's recent history, starting in 1951. His mother bought the mill and dad reroofed the main building, which contained the mill gear. There were two smaller conjoined buildings once used by a coffin maker and one as an animal shed. On the other side of the mill there was a corn-drying shed. The mill pond further up the property was channelled to a 12ft diameter overshot wheel. In 1986 it was decided to restore the mill to working order but the high cost of such a venture made the owner decide to turn it into a residence. In the late 1980s planning permission

was granted but the prevailing economic situation made the owner decide to delay the start of any work. In the early 1990s they asked to renew planning permission, but this was turned down because the County Sites and Monuments department had done a survey and their conclusion was that it had been a mill since the 17th century and was potentially medieval in origin. So the reasons for refusal were because the proposal would be tantamount to rebuilding, which would be contrary to the policies of the local planning authority, and it would disturb any surviving archaeological remains. They are left with a large pile of stones as the building has just about completely collapsed. At least one of Mr Ogley's sons is determined to reinstate the mill, but that is for the future.

Mills for sale

1. Glan-yr-ynys Mill at Llanpumpsaint Carmarthenshire
2. Pandy'r Capel near Corwen, Denbighshire
3. New Mill at Drefelin, Carmarthenshire
4. The Old Mill, Llancarfan, Glamorgan
5. Pontdolgoch Saw Mill
6. Ty Coch near Caersws, Powys
7. Croes Onnen Windmill, Holywell, Flintshire
8. Rhydowen Mill, Rhydowen, Llandysul Ceredigion
9. Rhosmaen Mill, Llandeilo

Twenty-five years ago

Two articles on French mills, relating the story of working under the watchful eye of the Gestapo and hiding RAF crew.

An article by Chairman Geralt talking about windmills in Brittany and a map showing several thousand windmills.

A recipe for Melin Bompren crumble and description of a wind- and watermill holiday in Crete.

The back cover had photographs of the interior of Melin Aberdaron from 2006.

Boost your support for Mills

We are very grateful to all our dedicated and enthusiastic supporters whose membership subscriptions and donations help us so much in our work. We would not have achieved so much over the years without you! If you're interested in ways to boost your support to the Section without it necessarily costing you a penny more, here are a few suggestions.

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Leave a Legacy

Remembering the Section in your Will can be a way of providing a far greater level of support to the protection of our milling heritage than you may be able to do during your lifetime. For a small but influential organisation like ours, legacies and bequests make a real difference. Leaving us a legacy can also be an easy and effective way of reducing the inheritance tax due on your estate. Whatever the size of your gift, we promise to put it to good use. If you would like to know more, please contact Kate Streeter (tel: 020 7377 1644, email development@spab.org.uk) or visit: www.spab.org.uk/get-involved/support-mills/mills-legacies.

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If you would like to know more about any of the above, please don't hesitate to get in touch with us (millsinfo@spab.org.uk or 020 7456 0909). We look forward to hearing from you.

Mill News no longer lists mills for sale that are converted. Only mills that have significant machinery will be advertised.

All mills for sale, however, will be put on our website for members to view.

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