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## WICKEN CORN WINDMILL



*Photo Dave Pearce*

## MILLING MANUAL

by

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# WICKEN CORN WINDMILL: Milling Manual

Procedures for grinding stoneground wholemeal at Wicken Windmill, and for producing white flour using the wire machine.

## START-UP PROCEDURE

*With the sails stopped:*

### Outside

Check that the mill is not tail winded.

If it is, proceed to Fan Stage, and turn the cap by hand (see below).

It is likely that the cap can be put back to automatic winding after it has been turned through a quite small angle.

### Meal Floor (1)

If it is intended to grind meal, put the Stone Nut(s) in mesh with the Spur Gear.

If it is intended to run the Wire Machine, put the plywood bevel in mesh with the drive ring on the underside of the Spur Gear. Check that there is meal in the wire machine hopper.

### Stone Floor

Check that the wooden wedges holding the Upright Shaft's steady bearing are tight – this bearing is housed just below the ceiling of the Stone Floor.

If the stones are to be run, check manually that grain will feed adequately into the shoe(s), and that it will shake down into the eye of the stone. [For these checks, work the shoe from side to side, as though it was being shaken by the damsel.]

### Bin Floor

If the stones are to be run, check the appropriate bins have enough grain.

### Cap

1. Check the brass bucket, which catches rainwater which drives in along the windshaft striking rod hole. If necessary empty the bucket.<sup>a</sup>
2. Release Shutter Catch.
3. Remove Bird Gate.
4. Drop Brake Rope.
5. Undo Brake Wheel Sprag.
6. Grease windshaft Neck Bearing as necessary
7. Oil Tail Bearing as necessary
8. Remove Squirrel Gate (if in place)

Open porch doors, and step carefully on to the Fan Stage. NB it might be necessary to duck under the Rocking Lever. In light winds the rocking lever can be partially lowered (by leaning on it), thereby making easy access to the Fan Stage.

*Hand Winding.*

If the cap requires hand winding, **tie the fantail.**

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<sup>a</sup> In continuous driving rain or during snow melt the bucket can fill rapidly, perhaps in 2 or 3 days.

Two opposite fan blades are fitted with a steel ring at the rim. Bring one of the rings to the bottom of the fan. Nylon rope can be passed through the ring and looped round the transom immediately below the lowest fan blade. Tie tightly, but use a knot which can be untied rapidly and easily.

Raise the sliding square which is half way up the Fantail Upright Shaft, and hold the square in its upper position by the locating nail.

The cap can now be turned by hand, using the crank in the upright shaft. This requires vigorous effort.

*Put the Fantail back in gear as soon as possible.*

Remember to replace the locating nail in the sliding square – to ensure the square cannot lift during operation.

9. Lower the Striking Chain using the striking chain rope (the rope is stored in the porch)
10. Tie the top end of the striking chain rope to the fan stage fence rail.
11. Descend to the Bin Floor, and stow the cap access ladder.

### **Outside, Ground Level, Rear of Mill**

Unhook the striking chain rope. Hang the small weight from it to prevent the rope being taken by the wind. (A weight is kept just inside the mill door for this purpose.)

#### *Brake*

Take the brake off. (Steady pull on the brake rope until end of travel. Then gently let rope rise, which allows the brake lever pin to move safely into the brake hook.)

*NB To put the brake on.* Short, sharp pull on the brake rope. Then allow the rope to rise through your hands *in a controlled way*, so that the brake goes on without snatching.

Note. If the brake is off the bottom end of the brake rope will be close to the ground. If it's on, the bottom end of the brake rope will be well above the ground.

It's theoretically possible for the brake pin to lodge on the point of the brake hook. The brake is then off, but *unstable*. Vibration will lead the brake pin to jump to a stable position, either with the brake suddenly fully off or fully on. This is dangerous, and has happened at Thelnetham Mill. *If in doubt apply the brake.*

#### *Putting the power on*

Set the striking chain to the desired position: rocking lever down for maximum power, up for minimum power.

Attach one or both of the yellow striking weights using the 'S' hook, to hold the rocking lever in the desired position.

### **Meal Floor (2)**

If the stones are running, check that meal is being produced satisfactorily.

If need be, check that meal is feeding to the Wire Machine satisfactorily.

*NB It the mill is working, do not allow visitors to explore the interior unaccompanied.*

## GRINDING WHOLEMEAL

*Before putting a pair of millstones into operation:*

### Stone Floor

1. Check there is grain in the hopper.
2. Remove any loose wheat grains which are sitting on the top of the runner stone.

### Meal Floor

3. Open the inspection hatch in the meal chute.

Remove any flour moths, flies, wheat grains etc.

If any of the above are present, the first few minutes (less than 5 minutes) worth of grindings should be fed into a 'rubbish sack', and thrown away.

Otherwise fit an empty sack to the bottom of the meal chute.

You can usually use a 2<sup>nd</sup> hand sack which has previously been used for organic cereal or for meal or flour. Give the sack a good emptying out via the loading door. If there is any doubt that loose wheat grains have been got rid of, the eventual sack of meal must be put through the white flour machine!

Either pair of wind driven stones: The sack is held in place using an old trouser belt kept nearby for the purpose. Stand the sack on the wooden stool, approx 6" tall.

*With the Sails reliably stopped, and the brake on:*

### Meal Floor

4. Put the Stone Nut in gear:

Climb the ladder to gain access to the Stone Nut.

Attach the Rigger Hooks to the stone nut, at diametrically opposite locations.

Arrangements are different for the 2 stone nuts.

*Eastern Stones*

The hooks attach circumferentially, around the wooden cogs.

*Western Stones*

The hooks attach radially, around the stone nut casting's rim, between cogs.

Check by eye that the Stone Nut cogs line up with the Spur Gear, so that in principle the Stone Nut will drop into gear when is lowered.

If the cogs don't line up, rotate the Spur Gear till they do.

If neither stone nut is in gear it's usually possible to turn the Spur Gear sufficiently by hand (mind the grease on the Spur Gear cogs!). This can be done because of the play in the gears between the sails and the stone nut.

If the Spur Gear can't be turned sufficiently (or at all) by hand, push the sails round *forwards* a short distance using the Sail Pusher (kept in the ceiling of the ground floor). To do this have the sail shutters held open by a Striking Weight, then take the brake off, and pull (or push) the sails round.

NB The Spur Gear cogs move about 1 inch for every 6 inch rotation of the sail tips.

Undo the rigger rope, and from near the top of the access ladder pull the rope downwards vertically to take the weight of the Stone Nut. Use the rope to lift the Nut slightly, so that the rods which hold the nut up out of mesh can be slid out horizontally. Lower the nut gently on the rope, on to the splines on the coned section of the Stone Spindle, and allow it to drop fully into mesh with the Spur Gear cogs.

## *Start up*

### 5. **Outside**

Consider the wind conditions, now and expected.

*'If I start the mill, can I stop it?'*

All being well, take the brake off.

Pull the rear half of the Striking Chain downwards, to close the sail shutters and start the mill.

Hang one or two of the yellow striking weights from the shackle on the striking chain – the shackle which will be near the lowest point of the chain loop.

In a stiff wind one striking weight is usually sufficient when driving one pair of stones. This will allow the shutters to part open in gusts, and the weight will gradually close the shutters again when the gust has passed.

Two weights tend to be used either when there is only a moderate wind, and the shutters need to be firmly shut to maximise the power generated, or when both pairs of stones are being operated.

### 6. **Meal Floor**

Open the inspection hatch in the meal chute to make sure that good meal is being produced. If so, pull the metal slider open to allow meal to drop into the meal sack.

NB1 *Do not adjust the milling controls (tentering gear and twist peg) without considerable thought and discussion. **If you do, note carefully on paper how much adjustment you have made.***

NB2 With the windmill in normal operation, it can take several minutes for any adjustment to make a tangible difference to the quality of the meal.

### 7. **Stone Floor**

Check that all is well: that grain is being fed steadily into the eye of the stone.

### 8. **Bin Floor**

If the bins are in use, check that wheat is feeding down towards the hopper.

Listen to the gears: if there is undue creaking from the wallower it is likely that the waller to upright shaft wedges are working loose. *Stop the mill.* Align any wedges which are very loose by hand. Standing on top of the Wallower, hammer the wedges home using a club hammer. (One is usually kept either on the Bin Floor or in the cap porch.)

### 9. **Steady Milling**

All being well, milling will now proceed steadily, remember to change the meal sacks as they fill!

## 10. 'A few wrinkles'

### *Meal or grain showers*

It is not uncommon on the Meal Floor to experience grain showering gently down from the western stones. This may be accompanied by squeaking from the glut box (the stone spindle bearing set in the bedstone).

Usually this is the result of the wooden grease wedge working slightly loose. (The glut box carries 3 bearing pads – 2 of phosphor bronze and a wooden one, the grease wedge.)

The grease wedge is used to feed grease to the bearing surfaces: it can be removed from underneath for recharging with grease. If not regularly tightened on its retaining screw, the grease wedge is likely to become so loose that wheat grains can escape from the eye of the stone, and work their way downwards through the glut box to the Meal Floor. Under these circumstances, and with the mill safely stopped, remove the special grease wedge retaining 'nut' on the underside of the bedstone glut box. Slide the wedge out vertically downwards. Clean off old grease etc, charge with new grease, and replace the wedge. Re-fit the nut, and tighten. Run the mill for a few minutes, then stop the sails, and tighten the wedge firmly.

### *Difference in Performance of the 2 sets of stones.*

The Eastern Stones are dressed more coarsely than the Western Stones. They tend to grind meal more rapidly, and although the two products can be seen to be different, they seem to be of similar overall quality.

### *The Sweeper*

Each set of stones is equipped with a sweeper, attached to the rim of the runner. The sweeper pushes the meal around the inside of the stone vat, to move it to the outfall chute. *Check occasionally (once per month say) that the screws holding the sweeper in place are tight, and that the sweeper is in reasonable condition.*

### *The Outfall Magnet*

Each pair of stones has a powerful magnet at the top of the meal outfall chute. This is to catch any magnetic material in the meal. NB This is usually in the form of fine particles, which are considered to have come into the mill with the grain. *Clean the magnet every few months.*

### *Squeaking, Meal Floor*

This is often due to lack of lubrication on the Stone Nut/Spur Gear cogs.

Use an old paint brush to apply a light coat of 'brown' grease to the working flank of the stone nut cogs. (This can be done *with care* with the stone nut turning slowly.)

## **DRESSING WHOLEMEAL TO PRODUCE WHITE FLOUR**

*Using the Wire Machine*

To start the wire machine first stop the mill!

The wire machine is started by putting the plywood bevel in the hursting 'in the ceiling' above the Meal Floor into mesh with the gear ring on the underside of the Spur Gear. This is done by pulling down on the rigger rope adjacent to the plywood bevel – the bevel may need to be rotated by hand to get the cogs to mesh.

Load up the feed hopper on the meal floor with wholemeal. When the machine is running the meal might need stirring up from time to time: sometimes it bridges over in the hopper and stops flowing. Under these circumstances an alternative is to load the hopper with alternate layers of wholemeal and semolina (the 3<sup>rd</sup> grade of flour from the wire machine), taking advantage of the fact that semolina flows much more readily than wholemeal.

The machine divides wholemeal into 4 grades: Finest White (or No 1), No.2, Semolina (or No 3), and Bran. These emerge from the chutes beneath the machine, in order from right to left as you face the machine.

*It's imperative to clean the wire machine of flour moth all through the summer and early autumn. They collect particularly in the brushes, and in nooks in the flour chutes.*

*Once the machine is clean, it's best to run any flour in which moth have been found through the machine again.*

Otherwise the machine is quite reliable: Wrinkles are:

- Empty the flour hoppers beneath the machine quite frequently: at least sufficiently often that they don't fill above the door line!
- A small fraction of flour being fed into the sieving drum does not make it into the drum. This flour is collected in a small plastic tub at the 'entry end' of the machine. This tends to be very fine flour, but practice is to empty this bin periodically into the Wire Machine hopper, to be fed through again.
- Leave the lids on the flour tubs for as much time as possible – to prevent impurities and insects getting into the flour.
- If the 2<sup>nd</sup> grade of flour suddenly becomes browner, this generally means there is a hole in the sieving mesh. Stop the machine, empty it of flour and dismantle to extract the drum halves.
- On rare occasions the long belt works its way off the pulleys. *Stop the mill* before attempting to replace the belt.
- The long belt continues to stretch slowly. It is kept tight by the tension arm at the bottom. If this arm bottoms out too much advise the millwrights.
- Occasionally wedges work loose on the layshaft carrying the plywood bevel and the large pulley. If operation becomes loud stop the mill and tap the wedges home.

## SHUTDOWN PROCEDURE

### Outside, Rear of Mill

- 1 Remove Striking Weight
- 2 Pull Striking Chain to open shutters
- 3 Gently apply brake, preferably when the sails have stopped
- 4 Attach hauling rope to Striking Chain
- 5 Store Striking Weights in the mill basement.

### Cap, Rear

- 6 Put on Striking Rod Catch
- 7 **If the Fantail has been disconnected during the day, make sure that it is coupled up to the Winding Gear.**  
Make sure that the locating nail is in place, to prevent any accidental uncoupling at the Sliding Square on the Upright Shaft.
- 8 Haul up the Striking Chain, hook over bracket on Fan Post, tie on.
- 9 Remove hauling rope
- 10 Close Porch Doors
- 11 Store hauling rope in Porch

### Cap, Front

- 12 Apply Sprags to Brake Wheel  
[If they won't fit:
  - a) The sails can be ratcheted round clockwise by working the Brake Lever up and down.
  - b) Otherwise go down to the ground, take brake off and pole the sails round, and back to the Cap to fit the Sprags.]

### Before leaving the cap

- 13 Make sure the brake is on.
- 14 Haul up Brake Rope, and wrap around holder
- 15 Fit 'bird gate' so that the brake rope hole in the cap roof is blocked.

### On the way down

- 16 Disconnect electricity cable from Cap
- 17 Make sure windows are shut.
- 18 Though it is general practice to take the stone nuts out of mesh, this is not necessary at Wicken if the mill is to be worked again in the next few days.

*Do not adjust the tentering on shutting down.*

At Wicken Mill the governors are set to take most of the load off the stones when they are stationary. However if the grain is damp, or gets damp in the stones, there is a danger that the meal in the stones will set hard, and act as a very effective brake. If there is any likelihood of such circumstances the **stone nuts must be taken out of gear.**<sup>b</sup>

- 19 Take drive to auxiliary machines out of mesh, at the Spur Gear.

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<sup>b</sup> On no account may the stones be 'screwed down' on shut down.  
NB At other windmills it is practice to take the stones out of gear at the end of each working day/work session.



### **Locking Up**

- 20 If there is a danger of frost:
  - a) Turn off water at stop cock
  - b) Switch off electricity supply to Mess Room immersion heater at wall switch
  - c) Drain down immersion heater
  - d) Open drain cocks on water pipes
- 21 Throughout the year:

Screw off tension on bandsaw blade, and put wooden ‘indicator’ flap to ‘Tension Off’
- 22 Lock padlock on back gate
- 23 Lock up caravan and minor shed doors, and hang key ring in base of mill
- 24 Lock windmill door
- 25 Set security buttons, above Mess Room door.
- 26 Switch off Mains at Switch Boxes (Single and 3-phase). Do not touch security lamp switches.
- 27 As an additional safety factor, switch Mill Isolator to off.
- 28 Lock Mess Room door.

### **Finally, before leaving the site.**

- 29 Walk around the base of the mill. This may remind you of any omissions, and may show up technical problems.
- 30 Shut the gate!

### **Risks**

This milling manual effectively draws attention to many of the risks involved in operating the windmill. In addition I would emphasise the need to take care on the mill ladders – always face into the ladder whether going up or down.

When operating the hoist, make sure that any visitors are aware and standing clear of the sack traps and hoist machinery. Make sure that the top hoist operator is aware that a sack is ready to come up, usually by starting the sack on its way. If the top operator does not take over, stop the sack at or before Meal Floor level.



Checking the eastern Stone Spindle for verticality using the Trammel