

RESTORATION OF THE GRAIN CLEANER AT FELINGANOL WATERMILL, LLANRHYSTUD, SPRING 2016

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The grain cleaner at Felinganol is a Eureka model which was manufactured by S. Howes and Co, Silver Creek, New York, a company that is still in existence today. They were originally referred to as Eureka Brush machines and there is a considerable amount of information about the history of this and similar grain cleaning machines on the web which I will not reproduce here. For example this website http://www.lousweb.com/Castle%20Valley%20Mill/eureka_brush_machine.htm describes a similar machine. The basic principles of operation are still applied in modern cleaners and involve a powerful fan, shaking sieves, a revolving drum with vanes and beaters and an ingenious system of air draughts. Again, detailed information and operators manuals can be downloaded from the web but we are more concerned here with the history and operation of our particular machine at Felinganol. Ours is a variant which has the shaft running horizontally rather than vertically. The configuration of the machine could be varied depending on requirements.

The old mill buildings at Felinganol underwent significant modifications as milling requirements changed over the years. The early mill building and what is now the grain store were originally separate but at some time in the mid 19th century they were joined to provide a continuous floor at the level of the grain loft where a circular saw was installed. Downstairs, the grain cleaner was positioned in a rather cramped location

just behind the entrance door. A dynamo and battery room occupied the rear of the area and a tunnel ran from the grain cleaner's fan to the outside wall where the chaff would have been discharged into the waterwheel pit. All the above machinery was belt-driven from an Armstead turbine which was located just behind the waterwheel. It is difficult to work out the exact sequence of these installations but we have receipts for a second hand turbine in 1901 which was acquired from the Rhandirmwyn lead mines in Carmarthenshire. The whole area between the original mill buildings has a rather unplanned and scrappy aspect compared to the rest of the mill. At that period there was extensive use of home-made building blocks, similar to modern breeze blocks but made with lime mortar. The material for these blocks, a form of limecrete, was used to reconstruct the waterwheel pit and to make a shelter for the turbine. The blocks were also used to raise the height of the grain store roof and for the walling between the two old buildings. To complicate the sequence further there is a small set of grindstones behind the cleaner which is driven by a series of shafts from the crown wheel on the mainshaft and not from the turbine. The same drive was also used to power a chaff-cutter in the old workshop area. It seems natural to assume that the grain cleaner took over the duties from the winnower on the ground floor as the belt drive to the latter was easily relocated to the 1st floor. The ceiling of the area has been heavily reinforced with beams at close spacing to take the weight of the circular saw upstairs. The hopper for the cleaner is situated in the grain loft and the spout for the cleaned grain emerges in the basement, so the whole operation covers the full height of the mill.

When we arrived at the mill in 2006 the grain cleaner was in a rather sorry state with rot in the woodwork and considerable rust in the metalwork. We bought some galvanised sheet with a view to restoration at some point but as we had no immediate need to clean grain, other priorities soon emerged and the cleaner remained out of action for several years. However, when we started buying grain from farmers who didn't necessarily have access to cleaning facilities there was more urgency to restore our cleaner and my good friend Dave Mead and I set about this rather daunting task in March 2016.

Restoration was essentially a complete strip down of the machine, replacing rusty metal with good metal and rotten wood with new. The original wood was largely some variety of American maple and this had lasted well in some places. In others, rat damage and damp had taken its toll. I should have mentioned that rodents would have had easy access to the interior of the machine via the chaff tunnel. There was no evidence of any mechanism or barrier to prevent this problem. It must simply have been accepted as part of the natural order of life. One of our earliest jobs in the mill was to seal off this tunnel and now that it is working again we have installed a mesh screen in the outside wall so that the draught from the fan is unimpeded whilst preventing furry invasions.

The main shaft of the cleaner was remarkably clean and still bore the name of the man who presumably assembled it and more significantly, the date – 1898 (Plate 1). This, of course, does not necessarily mean that the cleaner arrived at the mill in that year but it does fit in well with our assumption that these major modifications to the mill took place in the last half of

the 19th century with the grain cleaner and dynamo being later additions c. 1900. The awkward location of the cleaner suggests that there was not much choice as to where to put it.

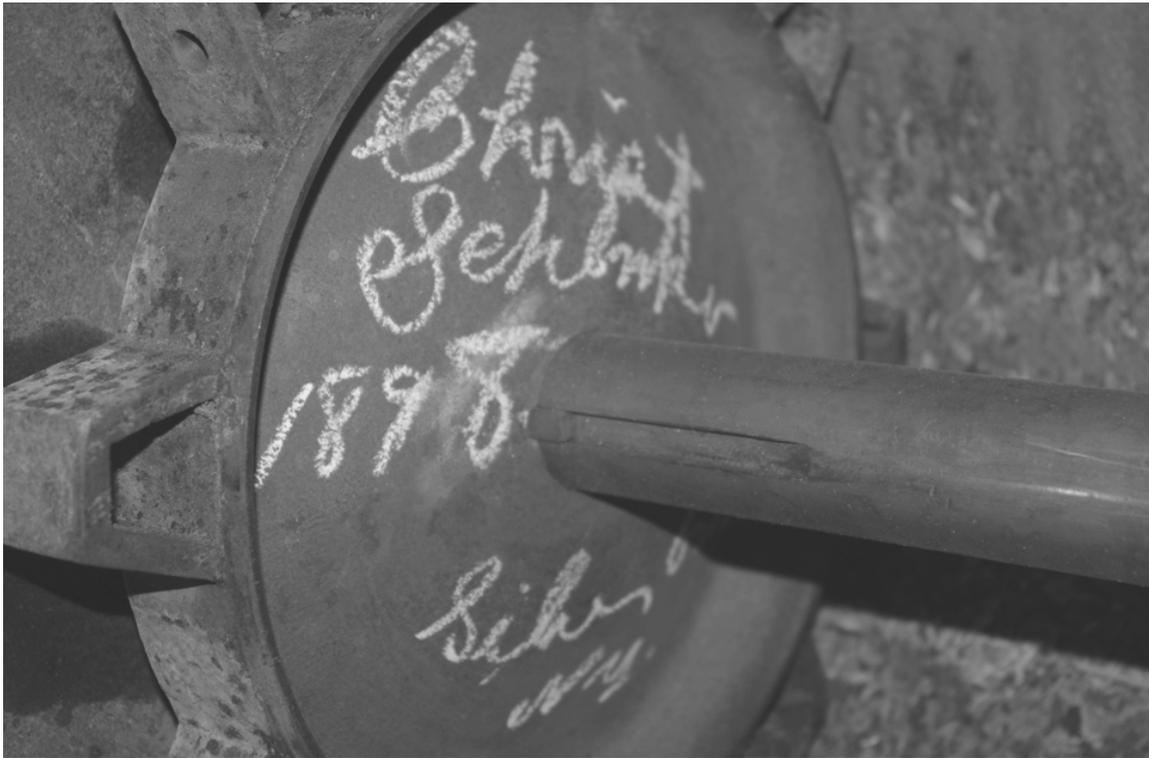


PLATE 1 Main shaft of the cleaner

A new housing was made from galvanised sheet and new fan blades were installed as the old ones were badly corroded.

Plate 5 shows the two channels of the plenum chamber. The wood here was worth preserving so we simply cleaned it up and renewed the metal covering. We used panel pins as in the original except that the new ones were stainless.



PLATE 2 Condition of the fan housing before repair



PLATE 3 Removing the corroded drum from the 'smutter'



PLATE 4 The replacement drum with one of the cast iron vanes ready for bolting into position



PLATE 5 The two channels of the plenum chamber



PLATE 6 Restored plenum chamber

Plate 6 shows the lever with “Shut” stencilled next to it. This was supposed to vary the draught and presumably control what debris fell down the shute. In our experience only a modest amount of chaff appears at this point in the process, the bulk of what comes off in the smutting chamber gets sucked out through the fan and out through the chaff tunnel. A good deal is separated at the sieving stage before it reaches any air draught. The aperture visible on the right connected to another duct and received any airborne debris from the final fall of cleaned grain down the output shute.

The remainder of the restoration was relatively straightforward and involved the making of a new screen for which we used stainless mesh and sapele hardwood for durability. We probably need to make a couple more to allow for different mesh sizes although to date we are getting very good results with two screens with large holes and one with small for weed seeds. The machine seems to be very effective at removing small weed seeds such as Fat Hen which appear to be quite common in wheat and although quite nutritious, have to be extracted before milling.

The mechanics of the cleaner required little attention beyond re-shimming of the bearings. We replaced the sheep’s-wool in the bearing blocks and this along with a fairly heavy bearing oil seems seem to provide an adequate lubrication mechanism. There was evidently some slight flexibility in the wood frame of the cleaner since the feet had to be very carefully levelled for the heavy main shaft to run accurately on its bearings. The original leather belt was good for a few more years of service although in the interests of safety we fabricated a guard for

this. We also made an additional inspection hatch in the chaff tunnel for ease of cleaning.

As stated earlier, this machine was originally driven by belt from the water turbine which is still in situ although in need of restoration. We hope to turn our attention to this in the near future. In the meantime we have resorted to running the cleaner on a three phase motor with an inverter to provide variation of speed. Originally there was a handle on a shaft running to the turbine area which had a chain link to a valve on the turbine. This would vary the speed and of course would affect any device connected, be it saw bench, dynamo or grain cleaner. Above the battery room at the rear is a governor which we assume was primarily intended to guarantee a stable electricity supply. How it was connected to the drive from the turbine is not clear.

Our need for a functional grain cleaner has become much greater over the last year when our supplier of bagged, cleaned organic grain stopped trading. We had made the mistake of relying too much on one supplier and had to look for others as a matter of some urgency. Having the cleaner has now made it possible for us to source grain from farmers who can provide it ex-combine but who do not necessarily have good cleaning kit of their own. Over the last few months we have used the cleaner to process several tons of grain. Initially we ran it rather cautiously at about 250 rpm on the main shaft but there is writing on the machine itself which says it can process between 10 and 15 bushels per hour. The speed of cleaning also depends on how dirty the grain is since the machine may need to be stopped in order to clear the sieves and also the chaff

tunnel if that becomes congested. Recently we have felt more confident in running the machine rather faster with an increased feed rate and have found that we can comfortably clean half a tonne in a day.



PLATE 7 Restored grain cleaner

The black plastic tray is an improvisation to collect the material from the three sieving screens. The spout of the feed hopper can be seen at the top of the picture. In operation a container would normally be placed under the flaps from the two spouts on the bottom right. These are supposed to vent automatically when enough material has gathered behind the flap to push it open.

Thanks are due to Dave Mead for his invaluable assistance in this restoration.