

WATERMILLS OF SOUTH WALES

Interim Results from a Partly-completed Survey

David H. Jones

The place of Welsh mills in the national pattern has been known for some years, based on a survey in North- and Mid-Wales (1). The geographical conditions which influenced their design are not so different in South Wales, so it seemed reasonable to assume that the mills there were similar to those in the north. However, as there are significant differences between North and South Wales - cultural, linguistic, etc - it seemed likely that their mills might differ in style, even if their functional design was the same. In any case, the assumptions had to be checked, and a mill survey of South Wales was long overdue. It was one of the largest areas of Britain, outside Scotland, where the mills were almost completely unknown.

The area selected for this survey could be loosely described as 'Carmarthenshire and south Cardiganshire', but except for the deliberate exclusion of Pembrokeshire, administrative areas were ignored. Instead, the limits were set on National Grid lines, determined by the immediately available maps. Tracing mill sites in upland regions requires fairly large scale maps; the 1 : 25 000 is the minimum, and it was chosen for the economy as the total area was large - 2100 km² - and required many sheets.

The area finally chosen was as shown in Fig 1. Searching these maps revealed 181 probable sites (excluding the concentration of woollen mills Drefach-Felindre). The watermill index showed that 21 of these had so far been reported, together with a substantial number from Pembrokeshire (hence its exclusion from this survey). Those within this survey area had all been reported by the Royal Commission on Historic Monuments in Wales, and enquiries there showed that one of their main systematic survey projects was the industrial buildings in the South Wales coastal region. This work was dealing with the few mills remaining in this thoroughly urbanised district, which was therefore omitted from this survey. Other known surveys of parts of South Wales were judged to be too remote or too restricted to influence these plans (2, 3).

This year, 78 sites were visited, including four farm wheels not originally identified from the maps. The sites were deliberately chosen as scattered patches over as much of the survey area as possible, as this will still give a good overall view of the regional trends even if circumstances should prevent this survey being completed.

These 78 sites may be classified under condition as:

Traces only	12	Derelict	8
Conversions; no information	24	Complete	11
Conversions; some information	14	Working	5
Ruins; some information	4		

These categories are poorly defined, but give an adequate impression of the survival rate. As sources of information on mill design, the first and second categories offer none, the third and fourth provide some, and the rest are practically complete.

Applications

The uses of water power in this region were for corn mills, woollen mills, pandai, sawmills, and farm wheels. Two of the corn mill sites had at one time been iron forges, but nothing had survived from this period. No other applications have yet been found during this survey.

The corn mills were very numerous, and received most attention. Woollen mills were also common, but had been the subject of a previous study (4), so they were generally ignored. They tended to built in groups (42 in the village of Drefach-Felindre) and only isolated examples received any attention this time. Pandai had long been dis-used; only three empty buildings were noted, so many must have been demolished or absorbed into later woollen mills. Sawmills were surprisingly scarce. Only three were found, all associated with corn mills. Farm wheels were once very numerous, but few seem to remain, and they are extremely difficult to find. They were treated as peripheral to this study; any found accidentally were recorded, and local information followed up, but no attempt was made to trace them systematically.

Siting

Most of the survey area is drained by one of two rivers; the Teifi, flowing west into Cardigan Bay, and the Towi, flowing south-west into the Bristol Channel. The Afon Cothi, which joins the lower course of the Afon Towi, is the only tributary comparable in size to the main rivers.

As is usual in upland regions, these rivers do not power mills. Instead, the mills are sited on the small streams feeding them. Here the flow is adequate, if not always very constant, while the steep gradients enable a fall of 4 m or so to be concentrated at a mill site at a moderate cost in earthworks. The main rivers flood very easily and are too dangerous to use, unless controlled by massive and expensive structures.

The one apparent exception is Cenarth Mill (22/100), which stands on the bank of the Teifi beside a natural waterfall. At first sight it appears to be an obvious location for a mill, with a ready-made weir, but inspection shows it not to be what it seems. The mill is high above the normal river level, and the fall is hardly used. The head race is well above the normal level immediately above the fall - a level attained by a long leat tapping the river higher up.

Cenarth Mill operates with a small fall as the ample water supply drove an under-shot wheel, the only one seen during this survey. Otherwise it is like all the others; a leat tapping the natural watercourse and then following the contour of the bank until the natural course is far enough below it, where the mill is sited.

Farm Wheels

Only four intact examples were found, and in each case the machines the drove had been removed. They were all very similar; small iron overshot wheels placed in the open, with the drive taken from cog rings attached to the arms. The power was transmitted to the farm buildings by lengths of iron shaft joined by Hooke's couplings. Wheel diameters varied from 2.84 to 3.4 m, and widths from 0.61 to 0.77 m. They were lightly built, and generally cross-braced. One was fed by a cast iron trough, and the others were wood. Two wheels carried the makers name - 'Thomas Jones, Carmarthen' - and one of these was dated 1897.

Only one owner could give any information about the machines it had driven. He listed a thresher, a winnower, a sawbench, a grindstone and a butter churn, though not all were in use at the same period.

Corn Mills

In most respects the initial assumptions have been confirmed. The functional requirements of this region are similar to those of North Wales, but the mills are somehow 'different'. However, there have been a few surprises, and some of the differences seem to be due to something more than "style".

The most significant difference is probably in the kilns. They are just as universal adjunct to mills as they are in the north, and they are generally attached to the mill building. Internally, most had square vertical-sided brick stoves, topped by the kiln floor, standing in an open room. Generally only one side of the stove was against the wall. Often a narrow section of floor spanned the open section of the room, to facilitate loading the kiln floor.

The most striking difference is in the size. Nearly all are the same size - 1.8 m square. This is half the size used in North Wales, or in Northern England. This is the more remarkable when we remember that this means one quarter of the area. In a given time, they could only have done a quarter of the work.

This difference is too great to be without significance. The most likely explanation is that oatmeal is likely to form a smaller part of the output of these mills than it did for those further north. It would be worth seeking independent evidence for this.

These corn mills can be classified into five groups, which are best described by examples.

GB-22/104; Felin Newydd, Crug-y-Bar

National Grid: SN663385 Now working (1983)

This is typical of a very numerous class of mill in this region. It forms the end of a range of buildings which originally consisted of the kiln and the house. It is driven by an external overshot wheel fed by a leat from the Afon Annell.

Two pairs of stones are driven by spurwheel gear, but the upright shaft ends below the first floor. An oatmeal machine stands against one wall, driven by a belt from one stone spindle. A bevel pinion engaging the side of the pitwheel drives a pulley on a layshaft, with a belt to a countershaft set low on the first floor. Belts from this drive two wire machines through angle gears; one ordinary machine clothed as a flour dresser, and the other built as a grain cleaner, with a fan in its base.

An attic floor has been inserted into part of the roof, but it has very little area or headroom. Its only uses could have been storage of a few sacks, and providing easier access to the wire machine hoppers. The sack hoist is in the roof ridge; it is driven by a slack chain from the waterwheel shaft, tightened by lifting the bearing in a wooden slide. A second manual hoist is fitted in the opposite end of the attic, with its chain running over an external pulley above the doorway.

Except for the manual hoist, the incomplete mill at Felin Gwm Isaf (22/109) appears to be identical. Many other mills are broadly similar, although this type of grain cleaner has not been found elsewhere.

GB-22/205; Cleifion Mill, Sant Clêr

National Grid: SN286164 Complete, and under repair (1983)

A mill much nearer to English practice. It is freestanding, with an external backshot wheel at one end. The kiln is detached. The spurwheel gear drives two pairs of stones, with a crownwheel for the auxiliary drives. An attic floor well below eaves level gives good headroom, although one low collar beam restricts it unnecessarily at one point. The sack hoist, built entirely of cast iron, is in the attic and driven by a slack belt from a shaft from the crown wheel. It is fitted with a latch, which is released to engage the drive. The attic also contains rudimentary bins, feeding the stones and the flour dresser.

Other machines included a wire machine and a smutter (?) on the first floor, and

an oatmeal machine on the ground floor, but only fragments remain. All the plant is cast iron, except for a wooden upright shaft.

GB-22/095; Felin Wen, Abergwili

National Grid SN463214 Working (1983)

This mill was remodelled in the late 19th century by S Kelly of Cardigan. The overshot wheel drives three pairs of stones by a lineshaft, parallel and level with the waterwheel shaft. The oatmeal separator stands beyond the end of the lineshaft, with its fan driven from a countershaft geared to the end of the lineshaft and the sieve driven from a pulley on the stone spindle. A pinion driven from the top of the pitwheel provides belt drives to the flour dresser (a centrifugal) and the sack hoist. The hoist is a friction type, operated by forcing two wooden wheels together. An elevator raises meal to the centrifugal. An attic floor, set well below the eaves, carries small bins to feed the stones.

Two other mills - Felin Geri and Trewen Mill, both near Newcastle Emlyn - are almost identical, except for having only two pairs of stones.

GB-22/108; Felin Marlais, Brechfa

National Grid SN518312 Complete but disused (1983)

The only complete example among the five single-gearred mills so far found. The overshot wheel is fed by an inclined, enclosed wooden trough with a bypass trough behind the wheel. The stones are on a hurst, standing lower than the first floor. There is no attic floor. The hoist is in the roof ridge, driven by a slack chain from the waterwheel shaft. The 'miller' - only uses the attached sawmill, but remembers the corn mill working - declared that it only made oatmeal, and never ground wheat. Certainly there is no trace of a flour dresser. The oatmeal separator stood in front of the centre of the hurst; it was a rectangular box design, with a fan driven from a layshaft geared to the side of the pitwheel (a shaft later extended to drive the sawmill). The sieve was belt driven from the stone spindle. The gearing is cast iron, and designed as face gears. The stone nut can be disengaged by lifting it with two hooks hung from a forked lever. Until recently, the waterwheel shaft ran in stone bearings, which are still on site. The far end of the building contained the kiln, but this has been removed to make way for a joiner's workshop. A sawmill has been built behind the mill, under a lean-to roof, which was driven from the waterwheel via the layshaft.

The other four sites with this type of mill are:

GB-22/105	Felin Clettwr,	Grid SN477468
GB-22/106	Melin Castell Howell,	Grid SN440480
GB-22/107	Rhyddlan Mill,	Grid SN494431
GB-22/218	Rhydcwmerau Mill	Grid SN578389

Although it has been remodelled as a 2-pair spurwheel mill, GB-22/211 Abergorlech Mill shows clear signs of having once been a single-gearred mill, and still has the pitwheel from that period.

Felin Clettwr has had all the wheels removed quite recently. Melin Castell Howell is derelict but retains its gear and stones; it is dated 1802, cut into the hurst timbers. Rhyddlan Mill is a ruin and Rhydcwmerau Mill has been largely stripped, but in each case just enough remains to establish the gear type.

GB-22/075; Forge Cŷch

National Grid SN248410 Largely gutted (1983)

This is one of two mills with gearing arranged as in Fig 2. It has a low backshot wheel, made by W & T Thomas, Cardigan. The flour was a wire machine, and the kiln was in an attached lean-to. The attic floor contains hoppers to feed the stones and the wire machine. The mill is now too incomplete to determine any further details.

The other mill with this gear layout - GB-22/079, Pen-y-Bont, Trellech - is too ruinous, and too dangerous, to show more than the gear layout and the remains of a centrifugal flour dresser.

Conclusions

As yet, very little can be concluded, apart from the kilns, as already discussed. There is certainly some variety, particularly in gearing, but the material so far gathered seems insufficient to determine their distribution within a region as small as this. So, although this approach is likely to yield significant results, it must await further field work.

Two patterns of oatmeal separator have been found, both different from the designs used in the north. Each pattern is so standardised as to suggest the work of a maker specialising in such machines. None are named, but it might be worth searching records to see if this can be established.

Finally, there is the question of style. It certainly exists, and after this experience it is possible in many cases to place a mill as 'North Wales' or 'South Wales' on inspection, but by intuition rather than understanding. It is not yet possible to actually define the difference.

References

- 1) Jones, D H; The Water-powered Corn Mills of England, Wales & the Isle of Man; in Trans. 2nd Symposium on Molinology; Copenhagen, 1969
- 2) National Watermill Index
- 3) Coates, S D, & Tucker, D G; Watermills of the Monnow and Trothi; Monmouth
- 4) Jenkins, J G; The Welsh Woollen Industry; Cardiff, 1969.

Discussion

- Freedman These single-gearred mills were just the result of the survey so far?
- Jones Yes; there may be more waiting for me, but I don't expect to find many.
- Bryan Those of us who went on the West Midlands tour would know that some features you found are fairly common there too, such as latching hoists, a fair number of lineshafts, spur-gearred pitwheels. After all, it is only next region going eastwards from the one you were in.
- Jones Yes, it is, although these mills are certainly the work of local millwrights, and most of them came from from right over on the western side.
- Turner Did you encounter anything very old, or was it mostly 19th century?
- Jones I don't think there was anything very old; the oldest dated mill I saw was 1802 - no, I saw an older one, about 1780.

- Plunkett Weren't any of the single-gearred mills even older?
- Jones I think not. One of them was dated 1802, and they were all alike in their details.
- Jarvis But could that be an updating of the single gear of a previous machine generation?
- Jones I am sure they were. Whether they were completely rebuilt, or just rebuilt internally, I don't know. They all had cast iron wheels which appeared identical - probably off the same patterns. There was one other, at Abergorlech, which now has conventional spurwheel gear, but which clearly began as a single-gearred mill, because there were traces left from that period. First, the pitwheel was a face gear casting identical to those in the single-gearred mills. The wooden cogs had been specially shaped to run with a bevel wallower. Second, there was a ledge on the wall which had obviously supported the rear timber of the hurst, which was far below the present hurst. It was just above the wallower; just right for single gear. Obviously everything had been rasied, up to and including the roof.
- Plunkett So the age of the building, as opposed to the age of the mill, for which you quote 1802 as typical, could well be older in a number of instances, but you were unable to date them.
- Jones How do you date rubble masonry?
- Plunkett Very difficult. You really need other datable material round it. For example, I have been trying to work out something about the chronology of the masonry and brickwork at Eling Tide Mill, and the only real crossover point appears to be the start of the brickwork and the finish of the stone. It is like the stone bearings; when did the stone bearings finish and everyone turn over to metal ones?
- Jarvis But stone bearings never finished, did they?
- Bryan They are still common enough in Holland.
- Jarvis We still have two windmills in Somerset with stone bearings in them.
- Jones There is nothing very remarkable about stone bearings, except finding examples. When they disappeared in Britain, they did so very completely.
- Jarvis I wonder what the life of a stone bearing is? That could be the answer to the question. When they wore out after a certain date, they were replaced by metal.
- Plunkett It depends on the load on it. If you have a 75 mm steel shaft revolving in a stone bearing with a load of three tons or so, it is not going to last very long.
- Bryan The Dutch find them very troublesome, and they are always renewing them. They de-laminate; it picks up a piece of stone which makes a cavity under the shaft, and it starts to break up after that.
- Jones On the subject of stone; I found a millstone there which I had not noticed before. It was a conglomerate, almost certainly of Welsh origin. It was very common; nearly every mill had a pair. Indeed, the only types I saw

were burrs and this conglomerate.

Plunkett There was a burr-type quarry in this area, was there not?

Jones Yes, somewhere near Bridgend.

Plunkett That's it, on near Bridgend and another further north; near Usk, I believe.

Jones This is not a burr-type material; it has very large inclusions in it, like pebbles.

Plunkett I think we saw something like that on the mid-Wales tour.

Jones But it is the exception there; down here it is the norm.

Plunkett Then when they wanted good quality flour, they imported French burrs. Were they made up locally, or did they come from the big London importers?

Jones Most of them were not named. Of those that were, none were either local or London. Several were from Liverpool, including the names Thomas & Son, and Davies & Snead, while one pair was by Whitaker of Bristol.

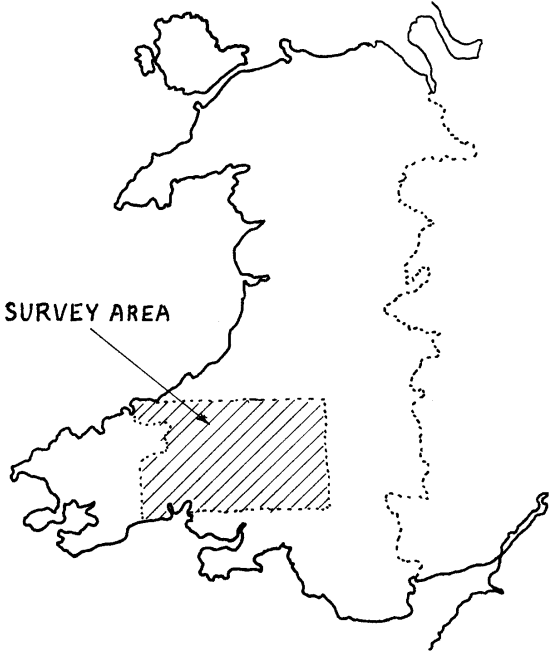


Fig.1

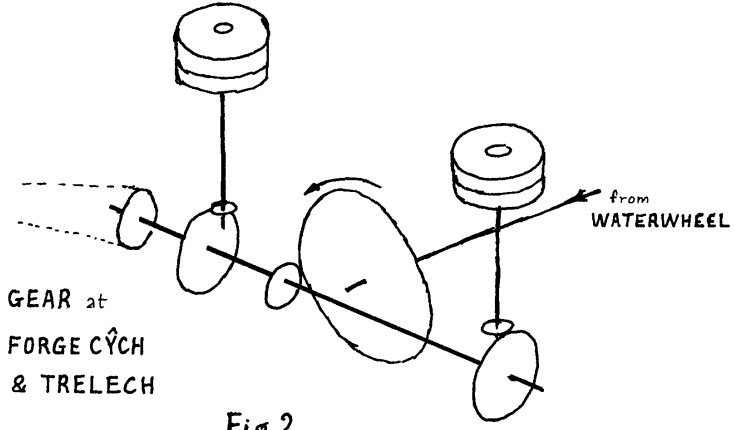


Fig.2