

THE WATER MILLS OF HAMPSHIRE.

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I have taken as the subject of my Presidential address this year, one which at first sight may seem to many of you somewhat commonplace—the water mills—many of them very ancient—which form such a picturesque feature on the rivers and streams of our county. For these mills have had a very important bearing on the social development and life of the people, for the reason that their presence has from a very remote past determined the positions of settled communities, not only of our villages, but of the towns themselves. For it must be remembered that in early days communications over even short distances were bad and not infrequently entirely interrupted. Consequently, the corn upon which the food of the people so largely depended had to be ground into flour close to where it was grown, otherwise bread would have been unobtainable even when the stackyards were full.

It was, then, the availability of water power sufficient to actuate a water wheel that was so essential a feature for every settlement. It is true that at a later date the windmill provided a substitute for water power—this was not however, till the XIIth century at the earliest, and in Hampshire wind mills were comparatively little used. We have record of but few, and of these as far as I know none remain in use at the present day.

Few to-day stop to think what a great part the water mill plays, or rather I should say has played, in our rural economy. Because the water mill is becoming almost a thing of the past, and before it passes entirely out of the industrial system of our countryside it is worthy of some notice not only by the historian, but also of the antiquary.

Bearing in mind the great importance of the water mill in the economic history of the country, it is of great interest to determine when and by whom the water mill was introduced into this country. For clearly it was not invented here, and its advent to our streams must have marked one industrial epoch comparable to the introduction of the steam engine in the XVIIIth century.

It is well established that no trace of a water mill belonging to the period of the Roman occupation of Britain has ever been discovered. Throughout this period hand mills or querns were generally in use, although one or two examples of larger millstones adapted to be turned by animal power have been found in London and elsewhere.

The place of origin of the water mill for grinding corn is very uncertain. What evidence there is points to its use at a very early

period in Persia and Central Asia—and it may well have originated there.

The earliest type of water mill was a very primitive affair. It consisted of a pole or shaft to the lower end of which were fixed wooden boards or vanes at right angles to the circumference of the pole, in the form of paddles. This end of the pole was immersed in the stream over which a frame was built and through which the pole passed. To the upper end of the pole a mill stone was fixed and this stone rested on a lower stone fixed to the frame. The action of the stream acting on the paddles caused the upper stone to revolve rapidly. The corn to be ground was fed to the upper stone by a hopper suspended to a roof or cover which was built over the mill, the whole structure being of quite small dimensions. This mill depended on a swift current of water descending from a considerable elevation, and was useless in a sluggish stream, and the mill stones being only of the size of those of the ordinary hand mill, its output was not very large.

But for small communities in hilly countries it saved much labour. It seems to have been known in Pontus on the Black Sea at least as early as the 3rd century B.C. and from there its use spread to the Danube Valley and northwards to Scandinavia from which it reached Scotland, and as we shall see later, Ireland. It still persists in use among the Carpathian Mountains, and is well known to the tribes on the Himalayan borders of India, and in the Shetlands and Western Isles of Scotland where it was known as the Norse mill, it has only disappeared in recent years.

A very interesting description of this type of mill as used to-day among the Hanzas on the North West frontier of India appears in the current volume of *Antiquity*.

There was another form of water wheel mill not perhaps of so great antiquity as the mill we have just considered, which developed in a low lying country where the rivers were great in volume but slow in current. And it is from this form that our modern mills driven by a vertical wheel, only part of which is immersed in the water, is derived.

It is supposed to have been adapted from the great wheels used for irrigation in Mesopotamia from a very remote period.

These wheels were fitted with a series of buckets on their circumference, which were filled as the lower part of the wheel met the current, and which discharged their contents into a channel constructed at right angles to the river bank. Here we see the beginning of the undershot water wheel—and it only required the invention of a system of gear wheels to convert the slow revolutions of the main wheel to a much larger and horizontal gear wheel attached to an upright shaft which carried the mill stone which could thus be made to rotate with sufficient rapidity on the lower

stone to perform the operation of grinding corn. When this adaptation of the irrigation wheel to the corn mill took place, we do not know—it must have been some centuries before our era.

Both these types of water mills, that with the small horizontal wheel and that with the large vertical wheel were known to Roman engineers at the end of the Republican period, probably as the result of the conquest of the regions in Asia where they were in use by the Roman armies. But it is a very remarkable fact that although the Romans were aware of the use and the principles of construction of a water mill, they seem to have made little use of such machines till quite the later years of the Empire.

In the first century B.C. Vitruvius in his treatise on mechanics gives a full account of a vertical water wheel mill such as we use to-day. He describes the paddle wheel immersed in the stream whose revolutions were by means of wooden gearings made to rotate a vertical axle to which the upper mill stone was attached.

At Pompeii, where water mills might have been expected to be found if they were in use, no trace of one has been found and that in spite of the ample water power afforded by the Sarno river. On the other hand, numerous examples of other mills for grinding corn have been uncovered—the larger mill stones being fitted so as to be turned by animals, the smaller by slaves. It would seem as if the miller and baker were the same person—the mills being found in the bakeries, pointing to the fact that corn was ground only as it was required for bread making, and slave labour was plentiful and cheap and little considered until Christianity brought some alleviation to the lot of the slave and the severity of his toil especially in grinding corn. But apart from any question of humanity, by the 4th century owing to the cessation of wars of conquest slaves had become scarce, and consequently their price had increased enormously. Consequently any labour saving device was sought for—and so the water mill became in demand as a substitute for the hand mill. Palladius writing in the middle of the century on estate management recommends the use of the water supply of the baths to drive a corn mill, so as to save the labour of men and animals.

But it was not until the end of the century that public water mills were established in Rome itself. It is at the beginning of the 5th century that we have mention of public water mills at Rome in a legal edict passed for their special protection, and from the way they are referred to in the edict they were clearly a novelty. Up to this period Roman Law had no provisions dealing with water mills, itself sufficient evidence of their lack of use.

It was in the reign of Arcadius and Honorius when the Empire was breaking up as a consequence of the barbarian invasions, and Britain already evacuated, that water mills were installed on the

Janiculum Hill in Rome using the water of Trajan's aqueduct, in former days one of the chief sources of Rome's public water supply. They were situated in the same region as the public bakeries, and remained in use until Rome was besieged by the Goths about a century later in 536. The Goths, we are told, cut off the aqueduct supplying the mills, hoping to so starve out the population of the city. However, Belisarius the Byzantine general who was defending Rome, was equal to the occasion, and it is related as a remarkable feat that he installed floating mills on the Tiber, two boats being moored side by side under the arches of the Aelian Bridge with a water wheel suspended on its axis between them, which was turned by the force of the current rushing through the bridge. This is the first definite mention of the use of a vertical water wheel such as we know to-day. Belisarius, who belonged to the Eastern Empire at Constantinople had, previously to being employed in defending Italy against the Goths, seen much service in Persia where, under the Sassanid dynasty great developments of water power for mills had taken place, and no doubt he had seen these water wheels for driving mills attached to boats in use there. They still remain in use in Armenia and in parts of Asia Minor and in Medieval Europe were not uncommon, probably introduced by the Crusaders.

Considering then at how late a date the water mill was in use in Rome itself, it is not surprising that it never reached Roman Britain. But if Roman Britain did not adopt the water mill, the small horizontal mill had reached Scotland and Ireland at least two centuries before the end of the Roman period.

We have a definite date for its introduction in Ireland contained in a life of King Cormac, who lived in the middle of the 3rd century, preserved among a collection of Irish annals written in the 9th century. The story runs as follows as translated by Professor Rolleston:

"During the reign of Cormac it happened that some of the lords of Ulster made a raid upon the Picts in Alba and brought home many captives. Among them was a Pictish maiden named Kiernit, daughter of a king of that nation, who was strangely beautiful, and for that the Ulstermen bore her as a gift to King Cormac. And Cormac gave her as a household slave to his wife Eithne, who set her to grinding corn with a hard quern as women in Erin were wont to do.

One day as Cormac was in the palace he saw Kiernit labouring at her task and weeping, for the toil was heavy and she was unused to it. Then Cormac was moved with compassion for the women that ground corn throughout Ireland, and he sent to Alba for artificers to come over and set up a mill, for up to then there were no mills in Ireland. Now there was in Tara, and there

is to this day, a well of water called the Pearly for the purity and brightness of the water that sprang from it, and it ran in a stream down the hillside, as it still runs, but now only in a slender trickle. Over this stream Cormac bade them build the first mill there was in Ireland and the bright water turned the wheel merrily round, and the women at Tara toiled at the quern no more."

The mill thus erected at Tara was clearly of what is called the horizontal type. It is erected over the stream, which running down the hillside had gained considerable velocity, and so turned the wheel merrily round.

And this supposition is confirmed by the finding on several occasions, deep down in Irish peat bogs of parts of the oak frames of early horizontal mills and one or two instances of the actual wheel and stone.*

The Tara mill, as introduced into Ireland in the 3rd century, is clearly the primitive mill which seems at a very early date to have reached Northern Europe from the region of the Black Sea, and its description as erected by the workmen from Alba, by which probably we must understand the Western Islands of Scotland, corresponds closely to the type of mill which still persists in many remote parts of the Hebrides and the Faroes, where the advantage claimed for it over the modern type of water mill is its low cost of construction and maintenance.

Senchus Mor, the Irish Legal Code which is claimed to belong to the early Christian period in Ireland, enumerates the various parts of this type of mill with the addition of a pond and mill rail, the earliest mention we have of impounding water so as to ensure more regular use of the mill when the stream was low.

The practice of impounding water was no doubt derived from the larger mills of England and Northern Europe, and soon throughout Ireland caused the small mills to disappear.

Whether the small horizontal mill was ever used in England is very doubtful. We have no evidence pointing to its use and the unsuitability of most of the rivers and streams at least in Central and Southern England would of itself have precluded its introduction. The conditions which govern the use of water power to-day for driving a mill wheel must have equally applied in Saxon England. Of these the most important is creation of a sufficient head of water by increasing the water level either by constructing a weir across the stream from bank to bank, or by diverting part of the flow of the stream at a point at a higher level up-stream and impounding it in a reservoir or a mill pond above the level of the mill wheel and from which a channel allows the water to reach the wheel.

* *Pro. R.I.A.* v. 24, 1902-4.

A further and most important advantage arises from impounding water above a mill and that is that the mill can be worked irrespective of the seasonal flow of the stream.

Where or by whom the practice of impounding water above a mill arose it is impossible to say, but by the 8th century it seems to have been a recognised system on all streams where the normal current was not sufficiently rapid to exert the necessary force on a wheel, and this applies to the great majority of our English waterways. Apart from a few very doubtful references to mills in Anglo-Saxon charters prior to the beginning of the 9th century, our records of mills after that date contain a mention of a mill-pond and mill-stream.

But it is only when we come to Domesday that we are on firm ground. So great had been the development of the water mill in the last two centuries of Saxon England that we find enumerated in the Survey no less than 7,500 mills, and of these rather over 300 (318) are recorded in the County of Hampshire.

It is true that little more than their assessed value is given, but we can at least draw from this some idea of their size and importance. The great majority are worth about 10/- a year, some more, some in exceptional cases much less.

And when we consider that an annual value of 10/- is roughly the value of half a hide or 50 acres of Hampshire land at that period—about £55 of our present money—we may conclude that they were profitable undertakings, and the land which the mills occupy occasionally mentioned shows them to have been no mere sheds over the stream such as accommodated the early horizontal mill. Some too, pay part of their rent in eels, testimony to the mill weir where they were caught.

We are left in no doubt that the Domesday mill was of the type with the large vertical wheel, which we know to-day. Almost from its very inception its simple mechanism was complete. As Saxons of Domesday worked it, so essentially it has remained to the present day. Consequently, our surviving water mills are links not only with England of Domesday, but of Saxon England as well. Surely, few other features in the country have so continuous and unbroken history.

To-day, when most of the wheat from which our flour is made is imported from abroad and ground, not by stones but by steel rollers in the vast mills that have grown up at the ports where the cargoes are discharged, the day of our village mills is numbered, and most of them have ceased to work. Is it too much to hope that some at least may be preserved as monuments of an economic past which played so great a part in the life and welfare of our people?