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'A Waterwheel by
Wm. Fairbairn at
Waltham Abbey'
Ken Major

A WATERWHEEL BY WILLIAM FAIRBAIRN AT THE ROYAL GUNPOWDER MILLS WALTHAM ABBEY

by Ken Major

Sir William Fairbairn in his book "Mills and Millwork" describes his work in powder mills and in this he states that he works at the Waltham Abbey Gunpowder Mills. The large waterwheel and grinding pans are described on page 530 of the 4th edition of 1878. The waterwheel which concerns us is not illustrated.

Sir William Fairbairn was responsible for the waterwheel and machinery in the press house in 1856. At this time he was part of the establishment. He had worked with Prince Albert in the Great Exhibition of 1851, on the Britannia Bridge across the Menai Straits and was commissioned to work at the Royal Gunpowder Mills at Waltham Abbey. Though the castings made by his firm were never signed we must accept that he created the waterwheel, pumps and powder press at Waltham Abbey.

What characterises the Fairbairn waterwheel at Waltham Abbey? The waterwheel is small being only 14ft (4.26m) diameter and 3ft 2inches (965mm) wide overall. The shrouds are a surprise being 14inches (355mm) deep. The 40 buckets of this wheel are supported by 'U'-shaped castings in the middle of their spans. This is a variant on the detail in "Mills and Millwork". The arms are very heavy and there are 10 in each face of the waterwheel. They are wedged to the hub where each arm is socketed and when in place held by a wedge in a vertical plane. The arms are 1 3/4 inches (45mm) diameter at the shroud and 2 3/4 inches (70mm) at the hub. The cylinder in the hub to receive the arm is 5 1/2 inches (130mm) diameter, and that is a single casting.

Sir William Fairbairn adopted the use of standard screw threads. He used a 2 1/2 inch (63mm) hexagonal nut throughout the work, to connect the arms to the shrouds, the plummer block to its base plate and the base plate to the brick supports.

Because there was powder in production Fairbairn used an excess of bronze bearings, in plummer blocks, in the rack and pinion of the hatch and in other positions. This was over the top as there was a traverse between the pump area and the press house.

An important example of the design skills of the Fairbairn millwrights' office and draughtsmen was the design of the hatch controls. Here the plummer

blocks are not supported horizontally but at an angle. The plummer blocks have oiling holes which are vertical!

We can conclude that we have an important and rare example of the Fairbairn waterwheel. Almost no Fairbairn waterwheels exist and this waterwheel of 1856 is a variant on the designs published in "Mills and Millwork" before that date. I hold that it is a Fairbairn waterwheel because of the description in "Mills and Millwork" particularly in the Powder Mills chapter.

J Kenneth Major

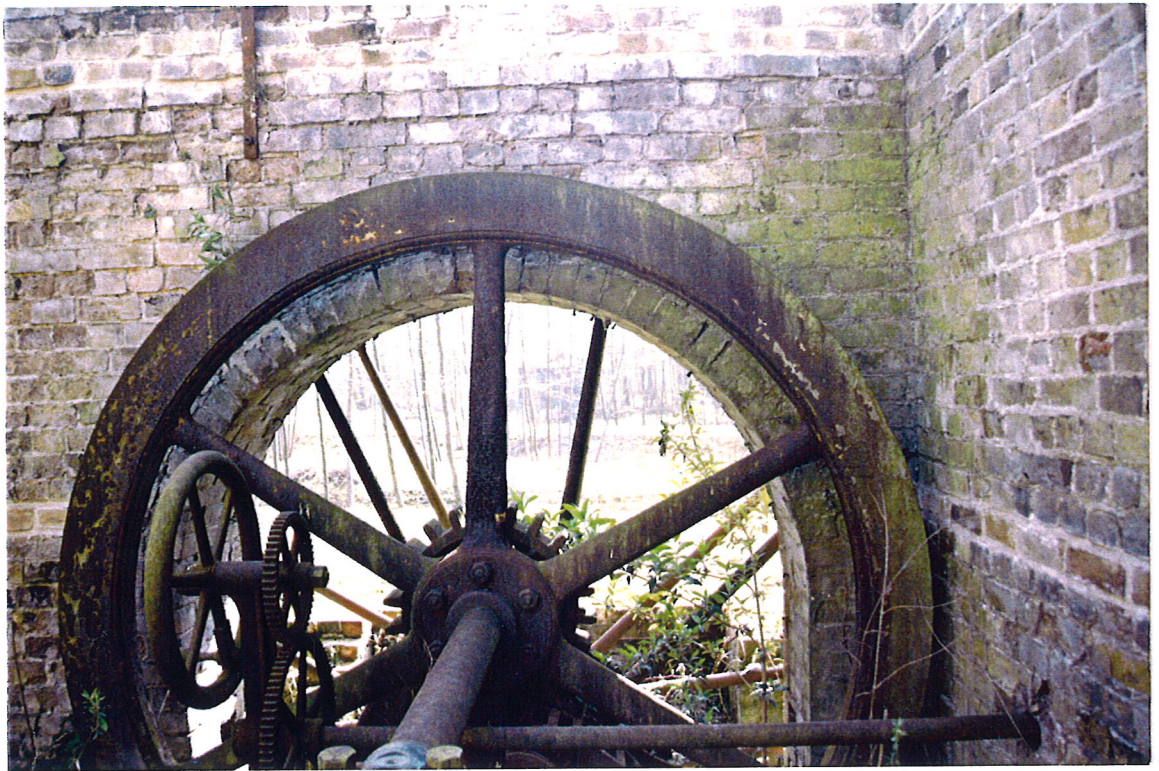
A paper to be presented to the Gunpowder and Explosives History Group on 7th May 2004.



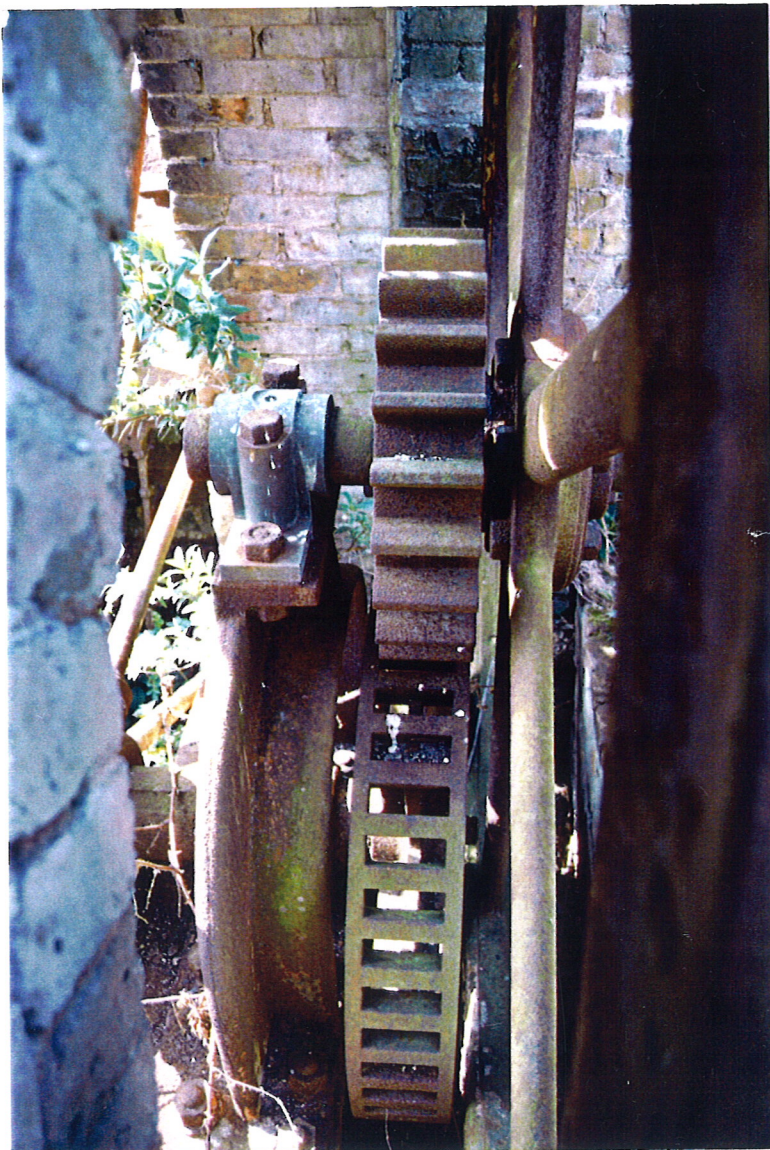
From left to right:- The waterwheel and pumphouse, the traverse and the press in the ruins of the press house.



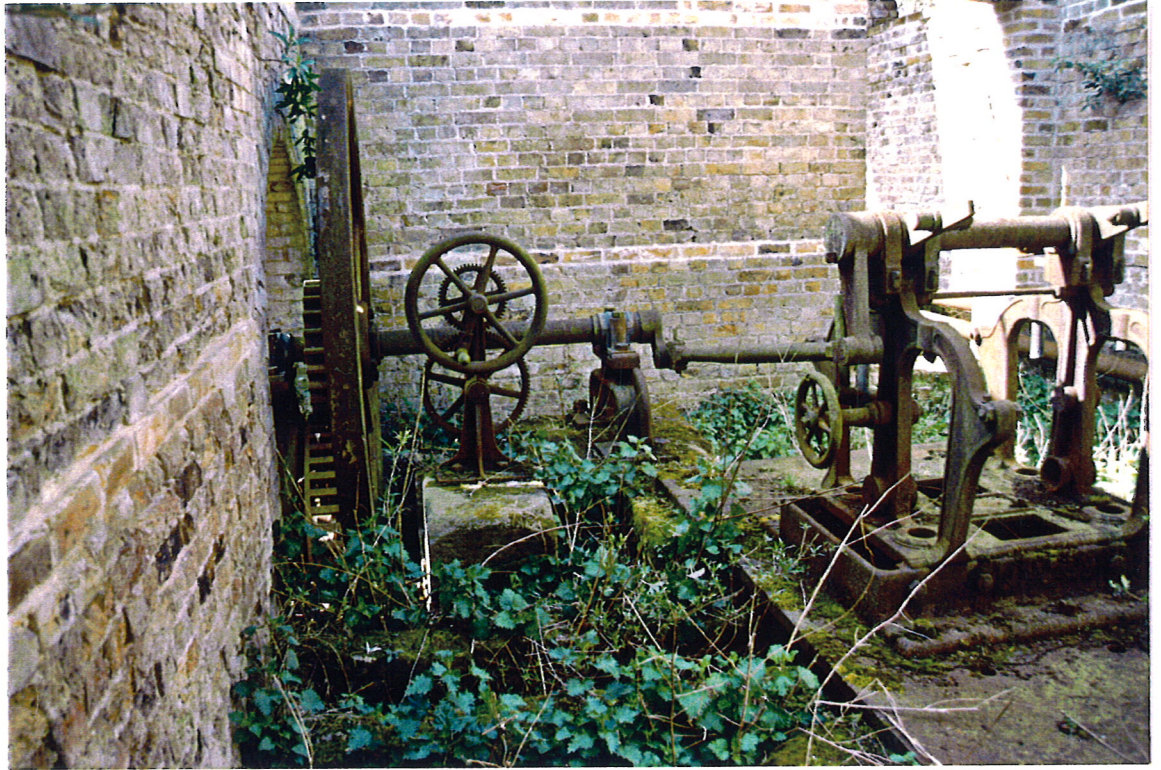
The waterwheel and pumphouse with the traverse beyond.
The Royal Gunpowder Mills Waltham Abbey.



The flywheel inside the pumphouse looking through to the waterwheel.



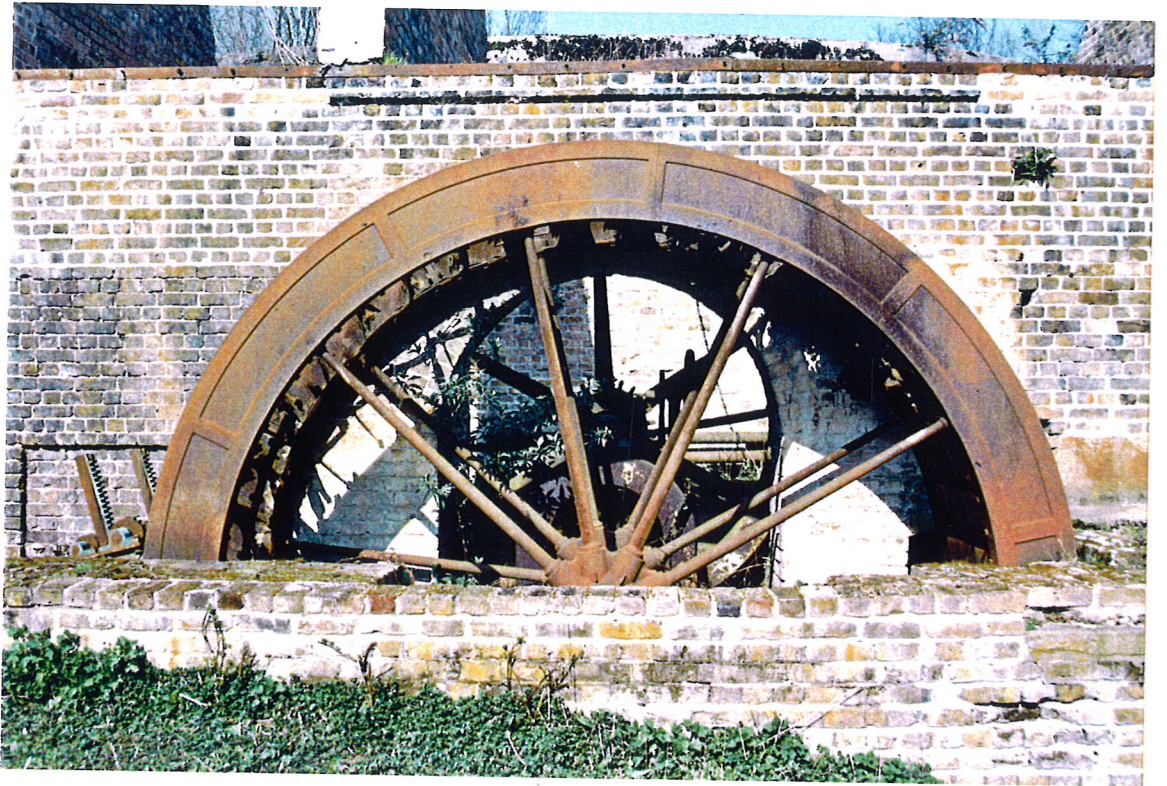
The drive gears between the waterwheel shaft and the flywheel shaft.



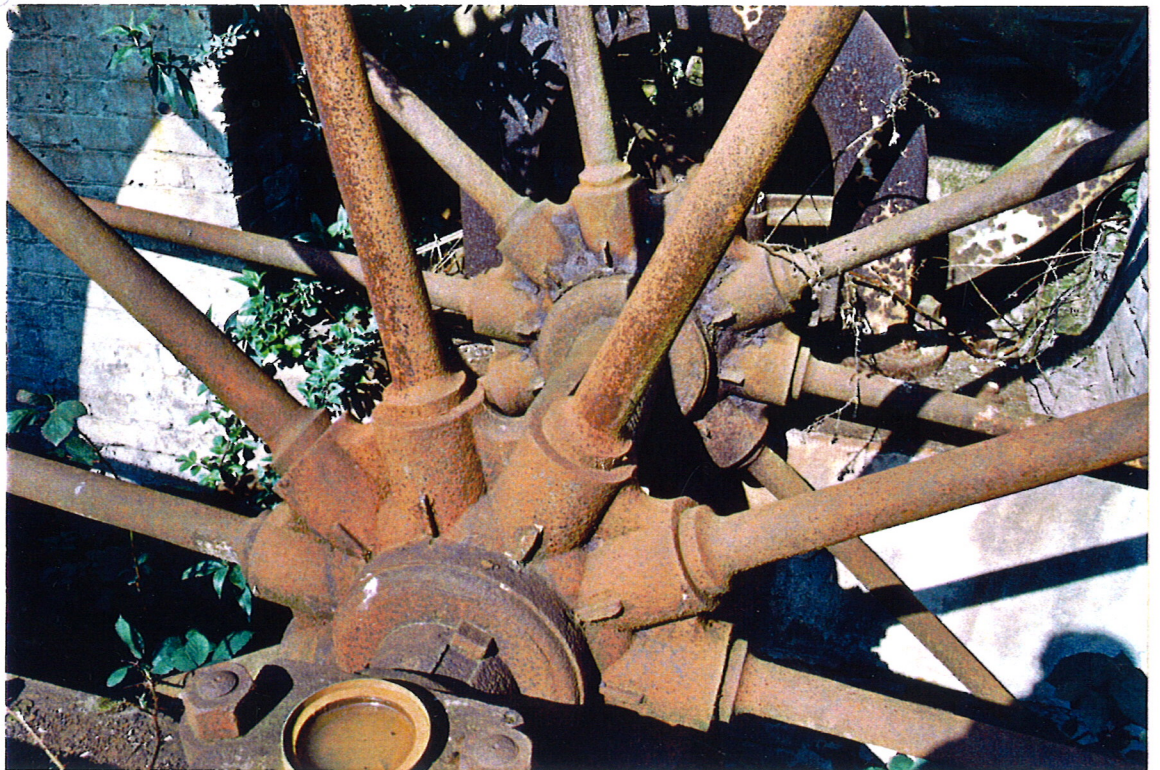
The inside of the pumphouse showing the linkage to the pumps from the waterwheel



The hatch controls. Note the plummer blocks with the oiling holes set vertically.



The waterwheel with the gears in the pumphouse beyond.



The hub of the waterwheel showing the sockets for the fixing of the arms. These are drawn up tight by wedging.