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Gray's Mill: Email from Ted Hazen, June 8, 2008

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From: "Theodore Hazen" To: awb02@sprynet.com
Subject: Re:
Date: Fri, 08 Jun 2001 18:01:00
X-OriginalArrivalTime: 08 Jun 2001 18:01:00.0569 (UTC)
Dear Anne,

Thanks for your letter. To try and answer your questions.

The first one. I don't know when star drills came into use. I think they were used by hand with a hammer. I would try and contact some sort of granite quarry works like the one in Vermont. There is also a stone tool company in Vermont they might know. Head races and tail races were not always lined with stone. Sometimes they were earthen and other times lined with vertical boards.

The second one. I know augers with pilot screws came at a certain date but I forget exactly when that date was. I forget the exact date they invented practical screw cutting machinery, but they would have cut screws before that by hand. So there may be separate dates for hand cut versus machine cut pilot screws. You could start by looking in Roy Underhill's books on woodworking and tools.

The third question. Originally it would have been hand hewed beams. Then pit saws, and up and down saw blades would have been used. Circular saws were a Shaker invention about 1820 to 1830. The thing is that standard vertical water wheels had problems generating the rpm to run circular saws. So steam powered saw mills with circular saws were the best solution. The first steam powered flour mill in the United States was constructed in Pittsburgh in 1805 and shortly after that a second was constructed in Kentucky. The book America's Wooden Age edited by Brooke Hindle has a chapter on just saw mills, so that should give you some ideas. Sorry there is not some sort of book that talks about this stuff that would be used in mill restoration, that is one of the problems.

Now if you would have asked me about linseed oil? The Romans had linseed oil. The first linseed oil mills were built in America in the 1600's. I remember this one person who was in charge of these historical building said, proved they would have used linseed oil on wood to preserve and protect it. I don't think the Romans had star drills.

The thing I don't understand is why this committee wants to build a working reproduction of the turbine years? Water turbines were developed in France in the 1840's. They were first constructed in the United States in Massachusetts. The most common water wheel used by American industry up until this time was the breast shot water wheel. The situation which a breast shot water wheel is used is also the same requirements as for a water turbine, as to the "fall" and the "amount of water." The thing about water turbines is that they work great when they are the size of a room and used in huge hydro sites, but their efficiency crashes when they are made smaller and used in mill applications. They require huge amounts of water and many mill sites had to install an auxiliary system of power for summer months or lower water periods. Generally you are talking about 3 to 10 thousand gallons of water per minute or more. With diminished water levels in most streams in the last

100 years, often where a water turbine once operated would not work today. Water turbines are very expensive to purchase and to restore or rebuild. To rebuild an old turbine may cost generally around 250 thousand dollars. To purchase a new one may cost around a million. Then there is the cost of creating the designs for the gear system to transfer the power. The foundry casting of gears is cheap but the high cost comes from the design and creation of foundry casting patterns. To design just two gears for pitch circles and all of the other information for gears, gear ratios and teeth it might cost around 26 to 30 thousand dollars plus that amount again for patterns. Water turbines the turbines go too fast for most milling machinery so the gear ratios power down or keep power at the same speeds. A vertical water wheel can only so many revolutions per minute because of the nature of its materials, so the gear ratios are powered up to get things to operate at the correct speeds. The big problem with water turbines besides operation is interpretation. They are hidden underneath the water and are unseen. So they are difficult to explain how they work.

So basically this committee got the idea or bug in their ear because a turbine and its power train system is made out of metal so they think it is modern and would be longer lasting than a restored or rebuilt wooden wheel and gear system? And of course they would perhaps think that technology would be available with out using expensive millwrights and craftsman with traditional skills. You would think the introduction of computers in this design process would make things cheaper but it is the opposite. Between you and me, generally if a mill is restored for the public and for school groups they tend to favor vertical water wheels because it is easier to see the connections, interpretation and to explain. It sounds like someone is pushing because they are into industrial equipment, motors, modern technology, etc. Sort of a strange twist for some reason.

There were village mills in New England, but the industrial revolution in New England was mainly about textile mills. New England had mills but it was not a flour or grain growing center. New England has rocky and poor soils for growing wheat. Traditionally the New Englanders did not like wheat, so the mills mainly ground corn, and rye, along with some buckwheat. The majority of the mills were in Pennsylvania and Virginia. In the land area that is now New York State there were some 28 thousand mills, 10 thousand mills were in the New York City and Long Island areas. The industrial revolution that occurred in the flour milling industry in the 1780 happened in Maryland and Delaware. Basically the Upper South is where it happened.

If the mill is a combination grist and saw mill then it would have been a custom mill that would have been operated seasonally. They would run the grist mill mainly at harvest time and operate the saw mill after the logs were cut in the dead of winter. The problem with these sort of operations was a dishonest miller had a ready supply of sawdust that he could steal more than his allowed toll and hide the difference by adding sawdust. So the mill more than likely was not a commercial milling operation, just a local grind flour and meal deal.

I have one question. Do you know if this 18th century Rhode Island mill

has been documented by HABS-HAER? I may have come across the mill on the Library of Congress HABS-HAER site. I am going to have to fire up my one storage hard drive and look at the Rhode Island mill file stuff that I may have saved.

Have you used the reference library at the Hagley Museum and Library in Greenville, Delaware?

I hope to hear from you again.

Thanks,
Ted

From: "Anne W. Baker" <awb02@sprynet.com>
To: trhazen
Date: Thu, 7 Jun 2001 21:38:44 -0400

Dear Ted Hazen,

First I want to thank you for posting your amazing site about mills. I can't believe the amount of important mill information you have offered to the public. It is exciting, informative and endless.

I am a relatively new person to mills. I have worked all my life with 17th Century New England house and only one 18th century Rhode Island mill in in 1980. Basically it was all intact so it didn't present too many problems. Now I have been hired by a non profit group to help them decide what to do with the remains of a derelict 1880 grist and saw mill. The mill site goes back to the late 1600's. The committee would like to build a working reproduction of its turbine years which I am against as it would destroy all the artifacts that still exist and belong to its history. I would prefer an interpretive/educational center that could explain the history of small village mills in southern New England, while leaving the derelict as a place to study the changes brought about by the industrial revolution.

Now having said all of that what I am really asking is where I can find out how to date some details associated with the mill.:

1. The existing tailrace is made with granite cut from a quarry. The stones were split with a star drill. Do you know where I can find out when star drills were first used and what was used before that?

2. The husk frame is a hewn, post and beam structure. However the augar bit that cut the mortises has a pilot screw. Where can I find out the date of augar bits with a pilot screw, or what came before star drills. Mercer is good, but doesn't answer this question.

3. The husk frame has gone through many changes. It as if reading the diaries from the all miller's who had worked there.

Some of the husk frame has been replaced with timbers that have up and down saw marks and some with circular saw marks. Where can I

find out an average cut off date for up-and-down saws or when did the circular saw get introduced. There must be a book out there that talks about all this stuff. So far, despite hours of looking I have had no luck.

Please let me know if there is a fee to answer these questions as I would be happy to comply.

Thanks.

Anne.

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