Mills and Machinery from Medieval to Colonial Times

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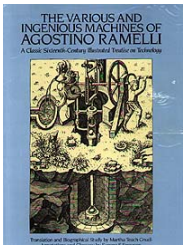
One of the most enduring legacies of the Middle Ages was the intensification of powered machinery in society. While most of the mechanical elements known to the Middle Ages were known to the Romans (with the likely exception of the crank), European innovators took great pride in elaborating on those mechanical components. By the 15th century, especially, Europeans began inventing new and fabulous machinery - Leonardo's flying machines are only one well-known example.

In this lesson, a number of images and documents from the transitional period from the Middle Ages to the American colonial experience illustrate the mechanical toolkit with which the settlers had to work.

AGOSTINO RAMELLI



Clockwork Mill and gristmill from 'Le diverse et artificiose machine,' trans. as *The Various and Ingenious Machines of Agostino Ramelli* by M.T. Gnudi and E.S. Ferguson (NY: Dover, 1994)

Background

Agostino Ramelli (c1531-c1600) came from Italy but ended up in the service of the armies of the Marquis de Marignan and of the Duc d'Anjou, who later became King Henry III of France. Late in life, his fame as an engineer inspired him to publish the most lavishly-illustrated technical book in history at the time, filled with "diverse and artificial" (that is, not natural but rather of the mind and hand of men) machinery including waterwheels, mills, pumps, cranes, sawmills, military bridges, and siege weapons. Although many of his machines are relatively impractical, they do demonstrate the attention to inventive detail in gearing and machinery that characterized the Renaissance Artist-Engineers (a group to which Leonardo da Vinci certainly belongs).

Implicit in most of his machines is waterpower, which by the latter Middle Ages had become the standard form of motive power for all industrial and agricultural mills. Although Ramelli is clearly interested in more than waterwheels, they can be used as a centralized power source to drive many parts of the machine.

See also the Smithsonian Institution's online exhibit about Ramelli.

Questions

1. For each of the three mills, explain how they function. Identify what all the parts do in the mill (we suggest having students be asked to identify the letter labels or else to break into teams to determine which parts for sub-components of the mill). Identify the millstones and the hopper, and then different types of gears, as well as the motive force.
2. For the first mill, with all the ropes, what other technologies use the kinds of machinery that Ramelli is using in his mill? (hint, think smaller)
3. For the second mill, what other ways could this mill be driven?
4. For the third mill, what is it designed to accomplish? How do the oblong gears (G and H) function? Would they work?
5. Have the students talk about the practicality of Ramelli's mills? Why is this or should this be a consideration? Can you think of modern technologies for which practicality is really not the primary concern?

NICHOLAS BLOY, ENGINEER

"The Severall Engines that Nicholas Bloy Engineer professeth," 1620, from Early English Books Online, STC 3138.5

Source Text

Get the Bloy text as a single-page PDF file.

Images

Background

Absolutely nothing is known about Bloy beyond this unique broadsheet. In the early 17th-century London, however, numerous men ("projectors" for they proposed all sorts of "projects") were known in and around the Elizabethan and Stuart courts. The most famous of these was Cornelius Drebble (1572-1634), a mathematician and engineer from Holland who attended the court of James I, inventing, among other things, a self-regulating oven, pumping engines for the City of London, clocks, a supposed perpetual motion machine, and even a 12-person submarine that could remain underwater for hours. Drebble seems to have actually constructed many of these machines, and other inventors at the time sought similar patronage. Some found support from the Marquis of Worcester, who seems to have patronized a sort of 'invention factory' in Vauxhall (just upriver from London). Whether these projectors ever delivered on their many ideas is unclear; it is clear, however, that the 17th century was a time ripe for invention.

Questions

1. Have students break up into teams and suggest what any of these inventions of Bloy's actually are. (There is a lot of room for speculation here.)
2. Are the machines designed for a certain industry or industries? Why?
3. Who would be interested in Bloy's set of 9 inventions?

4. Of what use would this sort of approach be to a colonial venture?

OLIVER EVANS

The Young Mill-Wright and Miller's Guide, 1795

See also the Pond Lilly Mill Restoration pages about Evans.

Images

Background

Oliver Evans is celebrated as one of the first great American engineers. Born in Delaware in 1755, Evans became an inventor in his early 20s, working on all sorts of mechanical problems like the carding of wool, dredging, steam engines, and especially mills. His great contribution to milling technology was that he figured out ways, using nothing but gears and belt drives, to automate fully a flour mill. According to his treatise, *The Young Mill-Wright and Miller's Guide* (1809), the mill would be powered by water (or steam) the farmer would unload his sacks of grain into the hopper at the door and the mill would move the grain through the millstones, automatically delivering flour to the waiting boats below. As Betsey McAndrew puts it, "Oliver Evans changed the daily routine of the miller by inventing elevators, conveyors, rolling screens or grain cleaners, and the hopper boy. He not only made the life of the miller easier, but he also started a trend of improving technology in milling and other industries."

Questions

1. Identify the flow of the grain from when it enters the mill via the wagon at the lower right to its exit as flour in barrels loaded onto the ship in the lower left. Trace the paths and identify the processes, if you can.
2. What is the advantage to a mill like Evans'?
3. To what need was Evans responding?