Water Power

In the days prior to electricity, power to drive gears, belts or other devices that converted energy of one sort into energy of another sort, was supplied by animals, humans, wind or water. The hilly uplands of Litchfield County provided ample amounts of water power, hence the proliferation of mills throughout the region. The thin soils and rocky terrain, plus the relatively short growing season made agricultural endeavor risky at best, hence the emphasis on manufacturing.

Locally, the 18th and 19th century's mills, forges and tanneries were powered by three basic types of water wheel; the overshot, undershot and breast. Because of the topography, the most common type around these parts was the overshot wheel. In the case of the overshot, the water was let into the buckets at the top of the wheel; in the undershot, at the bottom; and with the breast wheel having its intake somewhere in between. The overshot required a relatively high waterfall onto a large and expensive wheel. The undershot wheel was less efficient and, generally speaking, was used only when the fall was small, say four to six feet, and there was plenty of water. Most tide mills had undershot wheels, and were located along the coast and the lower reaches of the rivers emptying into Long Island Sound. The later part of the 18th century, when Colebrook and the surrounding towns were being carved from the virgin forest, breast and overshot wheels increased in popularity, owing partly to the increased efficiency in situations where two or more mills had, as they often did, to share the stream flow of a single dam. Often two mills would be built at a single dam, one on either side of the stream. This situation did not occur in Colebrook as far as we know. This was due partly to the relatively small, steep-sided streams, and partly because of the sparse population. Colebrook River was the only local that actually had dams that could easily have provided mill sites on either side of the river, but in all known cases, there was only one mill to one dam.

If, as was often the case in Colebrook, one side was too rugged, a short canal might be dug on the more favorable side and one mill placed downstream from the other. If a stream was particularly well-suited for providing power, such as the Blackberry River from Norfolk Center to West Norfolk, there could be a half-dozen mills or more drawing from one or two dams.

Milling tended to be a seasonal profession due to the cold winters experienced in Southern New England; the wheels would ice up and become completely inoperable early in the winter season and would remain so until March or April. The only way around this situation was to do what Richard Smith did with his forge on Still River in southeastern Colebrook, and that was to enclose the wheels and install stoves. Initially there were four enclosed wheels, and after the forge was destroyed by fire in 1781, it was immediately rebuilt with five enclosed wheels, which provided the ability to produce a large amount of product at one facility.

Although we do not know the exact type of wheels employed at Smith's forge, in all probability two types, the overshot and undershot existed. The reasoning is that the overall drop from the intake above the dam to the base of the foundation at the edge of Still River is 12 feet 4 inches. As the dimensions of the forge building did not exceed 40 feet, the water was brought to either side of the forge by wooden flumes, which would have employed first an overshot wheel and then an undershot wheel between the first wheel and the bank of the stream, where the water returned to its source.

The most commonly found mills in Colebrook were the sawmill, grist mill, cider mill and fulling mill. There was also a large cotton mill on the West Branch of the Farmington River and several forges in three different locations around town, all of which employed water wheels for the power required to operate their equipment. These mills were so constructed that each wheel turned in its own stone-lined enclosure called a wheelpit, and each wheelpit was linked to the river by a channel called a raceway. The portion of the raceway that delivered water to the wheel was called the headrace; the portion that returned it to the river was called the tailrace.

Some sawmills employed two different types of wheels, both of which fell generally into the category of an undershot wheel. The first, called a flutter wheel, operated the up-and-down blade while driving the log into the blade. This looked somewhat like the propulsion wheel on a stern-wheeler river boat. This apparently was not a speedy process, as we have written accounts of children riding the logs as they were being pulled into the saw. Considering the protection now afforded children these days, I can just imagine the howls of protest that would arise if such activity were attempted today! The second wheel was a tub wheel. It powered the machinery that withdrew the log once it had a board cut from it. Both of these were driven by the force of the water striking against the blades. In a fulling mill, woolen cloth woven by local families was pounded by wooden hammers to clean and thicken it. The hammers were powered by an undershot wheel. This would have been much larger than the flutter wheel, which was also turned by the force of the water flowing under it and striking its blades.

Grist mills ground corn and other grains for the area's farmers. They were powered by a large overshot wheel. Instead of having blades, the perimeter of the overshot wheel was constructed with a continuous row of wooden troughs called buckets. Water from the headrace poured over the top of the wheel and into the buckets. The weight of the water in the buckets turned the wheel.

When the equipment in a mill couldn't be run directly from the shaft of the water wheel, a system of gears, additional shafts, pulleys and belts called a power train was required. In a grist mill, the shaft of the wheel extended beyond the wheelpit and into the space below the first floor. A flat wooden wheel called a crown wheel was attached to this extension. A circle of wooden cogs projected from one side of the crown wheel near its rim. They meshed with and turned a cylindrical, wooden, cage-like structure called a lantern pinion. This gear revolved on a vertical shaft that was connected through two additional gears and a smaller shaft to the upper millstone. Because the diameter of the lantern pinion was only one quarter that of the circle of cogs, it turned four times for each revolution of the crown wheel. By going from larger to smaller gears in this way the millstone could be turned over a hundred times every minute while the water wheel turned only seven.