HISTORIC CONTEXT EVALUATION
FOR MILLS IN TENNESSEE

A Study Conducted for the
Tennessee Department of Transportation
through the University of Tennessee Transportation Center

Project Number RES1039
Contract Number CUT 063

by

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May 2002

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ACKNOWLEDGEMENTS

The author wishes to acknowledge the encouragement and assistance of several people during the course of research, compilation, and writing of this report. First, I am grateful to the Tennessee Department of Transportation and the University of Tennessee Transportation Center for the receipt of this grant and the opportunity to study old mills in the state. My thanks are also extended to my infinitely patient wife Janie for her confidence in my ability to complete this project, and her gentle pushes when needed. Also, I thank Loretta Lautzenheiser, president of Coastal Carolina Research, Inc., for her help in archaeologically interpreting the mill sites we visited, and revising sections of the report, and for the help of her staff in compiling much of the statistical data. My friend Walter Clement has been an invaluable source of information and early documents dealing with antique machinery of all types, especially his first love, steam engines. He has also contributed much volunteer time to proofreading this report and helping Janie at Falls Mill when I was at home or in the field working on this project. In addition, I thank my friend Leilani Hammock Moss for her early help in sifting through the seemingly endless Census of Manufactures schedules and compiling much of the mill-related data found therein. I also acknowledge the input of the county historians who took the time to respond to my letters of inquiry concerning old mills in their respective counties. I sincerely appreciate the time Ron Dawson, co-owner of "Tennessee's Oldest Business," the Dungan-St. John Mill in Washington County, took to furnish history of his enterprise and information on the old mills of his area. I also thank him for the print of the Dungan-St. John Mill and permission to reproduce it in this report. The staff members of the Tennessee State Library and Archives were especially helpful in pointing me toward valuable archival materials. My thanks are also extended to the Board of Directors of the Society for the Preservation of Old Mills (SPOOM), on which I serve, for their support in this effort and their permission to reproduce several figures from the ancient milling texts they have reprinted for sale by the Society. Finally, I thank Sheila Brown, CEO, and my friends and co-workers at QuantiTech, Inc., in Huntsville, Alabama, for their patience and support in helping me complete this project and copy the report. I hope my work will prove helpful to future mill investigators.

John N. Lovett, Jr., May, 2002

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INTRODUCTION

Tennessee, though not an extremely old state, possesses a rich history of settlement and technological development. Throughout its existence, the state has witnessed the genesis, operation, and demise of thousands of mills and factories, representing somewhat distinct phases of industrial evolution. The focus of this study is twofold. First, the historical development of mills and mill-related industries in Tennessee is highlighted, with an emphasis on periods of activity and statistics. Second, the surviving mills and mill sites in the state are discussed, with the aim of providing criteria for qualification as historic sites. This includes the presentation of a classification system for mills and a field survey form and handbook to aid in assessment of the candidate site.

To this end, the study has been narrowed to primarily include the three most prevalent "mills" encountered historically in Tennessee – the grain mill, the sawmill, and the textile mill. Of course there were many other industries in the state that could be classified as mills, most of which employed the same types of power sources as the three above. With the exception of the iron furnaces and forges, these manufacturing establishments were sparse in comparison with the mills producing grain, lumber, and textile products.

In addition, the study has focused on four historical periods of mill construction and operation, the first three of which cover approximately forty-year intervals of the state's development. These have been termed the Pioneer Period (1777 – 1820), the Pre-Civil War Period of Early Industrialization (1820 – 1860), and the Late Industrial Period (1860 – 1900). The fourth period has been called the Modern Period (post 1900). Although each of these periods exhibits definitive phases of milling history, it must be recognized that many overlaps and anachronisms exist throughout the state's 200+ year history. For example, numerous "pioneer" mills continued to thrive until the Civil War, primarily in isolated areas such as the Smoky Mountain region. In fact, some continued after the war, and family mills possessing pioneer characteristics were built even as late as 1934 (see page 219). Power sources and machinery for the most part changed with technological improvements, but again much equipment continued to be used decades after its supposed obsolescence. This is particularly true of water wheels and millstones.

Tennessee is fortunate to have over 150 extant mills, most of which were grain mills, representing more or less the periods above. However, of these mills remaining, many are in disrepair and endangered. Also, practically all are in the eastern two-thirds of the state (the western portion, although historically heavily populated with mills, is today almost devoid of extant representatives). Only a very few are operable, and Falls Mill in Franklin County is the only one producing grain products by water power on a commercial basis with a wide distribution. No early up-and-down sawmills remain, and very little sawmill equipment prior to 1900 is known to exist in the state. Virtually all the nineteenth century textile mills are gone. A few buildings remain, notably Gettys Mill in McMinn County, Falls Mill in Franklin County, and Great Falls Cotton Mill in Warren County. Falls Mill is the only textile factory in the state with a full complement of (unrestored) nineteenth century woolen machinery (although not original to the building). It is very likely that over the next twenty years, as many as half of Tennessee's remaining mill structures will be destroyed from neglect, development, and vandalism. Therefore, this study is timely in that the state's milling heritage may be documented and preserved while so much physical as well as archival evidence remains.

There were four primary sources of information utilized for this study. Archival data from census and courthouse records was gathered. Also, visits were made to existing mills and mill sites throughout the state, for the purpose of studying and photographing typical structures and equipment and assessing archaeological features. Numerous historic books, catalogs, and documents were reviewed. Finally, the author drew upon his own eighteen-year experience as an historic mill owner, operator, millwright, and mill restorer for much of the material presented herein. In order to clarify the narrative, 155 photographs and figures have been incorporated throughout.

CHAPTER 1

SOME HIGHLIGHTS IN THE HISTORY OF MILLING

Reduction of Grains. In its broadest modern definition, a "mill" is simply a factory in which products are manufactured. The earliest mills, however, were associated with grain grinding, and evolved from hand methods employed for thousands of years. In fact, evidence of the reduction of wild grass seeds to a more edible and digestible form may be traced to the upper Paleolithic cultures in the Aurignacian region of France some 75,000 years ago. A small upper stone was rubbed back and forth across the grain, which was placed on a lower flat stone. This technique developed over many millennia until rotary motion was applied to the stones. They were turned by hand, in the case of querns or hand mills (Figure 1), by animals (Figure 2), then by water and later wind power. Water powered mills have been known for 2,000 years, and the basic power sources and transmission devices found in those earliest mills may still be seen today in surviving examples throughout the United States and the world.

Figure 1. Hand powered rotary quern

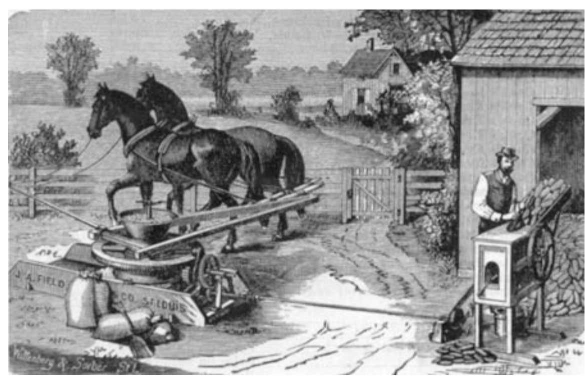


Figure 2. Horse powered corn sheller and grinding mill

The first known description of a water powered mill for grinding grain is attributed to the Roman architect Vitruvius about 19 B.C. In his writings, he describes an undershot or paddle wheel driving a gear train, which in turn drives a set of small millstones. This is also the first known practical application of gearing to power heavy machinery. This type of water driven mechanism featured direct driven millstones, utilizing a vertical shaft mounted on the lower end to a primitive turbine, and on the upper to the stones themselves (Figure 3) (Storck 1952). A similar type also survives in a few examples in the United States in the form of a "tub" mill (see Figure 41), located mainly in mountainous areas with swift-flowing streams.

Figure 3. Primitive turbine with millstones directly connected.

Whatever the design for transmitting power to the millstones, the important element of history is the growth of mills as centers of commerce, activity, and community functions. Their immeasurable importance in removing the individual labor of reducing grain by hand methods has led historians to consider mills as one of the primary nuclei about which rural and later major communities evolved. Since the early mills were most commonly associated with a source of water power, their functions were not long limited to simply the milling of grains. They became sawmills, textile mills, and factories for the production of a wide range of goods, including paper, iron, gunpowder, paint, snuff, tanbark, cider, molasses, crushed ore, oil, and mustard (Reynolds 1983).

After Jamestown, Virginia, was settled in 1607, sawmills were probably more urgently needed than grist mills, since sawing lumber by hand was quite laborious. The first grist windmill did not appear until 1621, but by 1649 the colony was well supplied with four windmills, five water mills, and numerous horse mills. These early mills were primarily community grain mills operating on a toll system, whereby a portion of the grain brought in for milling or the milled product was kept as payment for services. The mill owner was free to use this for his own needs or sell it. The term “grist mill” has come to be associated with small community mills of this type. The later large “merchant” mills appearing during and after the eighteenth century bought grain and milled it for sale or export. Both grist and merchant mills employed millstones for grinding. These were most often native monolithic stones brought from granite or conglomerate quarries, or French buhrstones imported and commonly assembled in segments cemented and banded together (Figure 4). Different techniques and, in many cases, different sets of millstones were employed for producing either corn meal or flour. Flour was familiar to the European settlers, since wheat and rye had been cultivated in their homelands for centuries. Corn, however, was unknown to the earliest colonists. Native Americans had grown maize in the Northeast for several generations prior to the arrival of the colonists, but its cultivation history in the Southwest was ancient. Squanto and other Native Americans friendly with European settlers taught the newcomers how to plant and grow maize or corn, and the crop quickly became a staple (Storck 1952).

Figure 4. Monolithic native granite millstone on left; segmented French buhrstone on right. Both stones have trammels in place for checking shaft perpendicularity to bedstone.

Logs to Lumber. Saw milling also grew in importance during this settlement period. The English were accustomed to frame houses (log construction was brought to the New World much later by the Scandinavians and Germans). Before water was harnessed for sawing, pit saws were in common use (Figure 5). They required a great deal of strength, endurance, and accuracy to produce a usable plank, so it was natural that the process was a prime candidate for mechanization. The first sawmills employed the same principles as pit saws, using a reciprocating, vertically mounted straight saw blade powered off a type of small undershot water wheel called a flutter wheel. The log carriage return was accomplished by linkage from a small turbine-type wheel (Evans 1850). These "up-and-down" sawmills were quite common and widespread until circular saws were introduced shortly before the Civil War period (Figure 6). A few up-and-down sawmills continued to operate through the nineteenth century, but by the early twentieth century virtually all were gone.

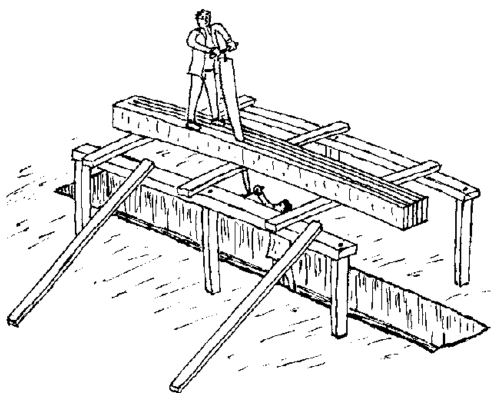


Figure 5. Pit sawing.

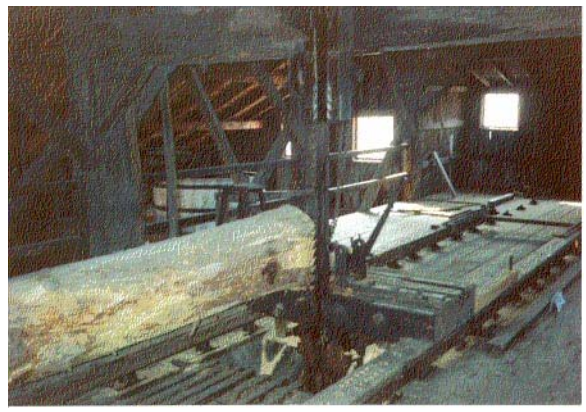


Figure 6. Surviving up-and-down sawmill.

These primitive sawmills could produce fairly consistent rough-sawn lumber and timbers, but most of the finish work such as planing was done by hand. The early nineteenth century witnessed the rapid development of powered lumber finishing equipment, such as planers, molding machines, jointers, and cutoff saws, and many lumber finishing mills were erected.

Textiles. Water power also was the key to the development of the textile industry in the United States. The Industrial Revolution in England began in the eighteenth century with textile manufacture. The most tedious step in the production of cloth was the carding process, by which hand "combs" were used to straighten and orient cotton or wool fibers to prepare for spinning into yarn or thread. Naturally this was the first step to be mechanized in the 1760's, with the invention of powered rotary drum carding machines. Not long after this, the spinning, then weaving processes were mechanized. In order to force dependence of the colonists on England's woven goods, the mother country banned the exportation to the colonies of any textile machinery or technical knowledge of the process. Samuel Slater, it is said, apprenticed in an English cotton mill, memorized the construction and operation of the machinery, and came to the United States, where in 1793 he directed construction of America's first textile mill in Pawtucket, Rhode Island (it still survives – see Figure 7). Not long after this event textile machinery manufacture and mill erection spread throughout the expanding United States (*Homespun to Factory Made*, 1977).

Figure 7. Samuel Slater's cotton mill and dam in Pawtucket, Rhode Island.

Manufactories of any magnitude had to be located on rivers and streams to provide adequate power until the introduction of steam engines in the late eighteenth century (Reynolds 1983). By the early nineteenth century, these prime movers had become well established in the Northeast, and were finding application in the South by the 1820's and 1830's. Water power continued to dominate until after the Civil War, then began a steady decline in importance. With the introduction of internal combustion engines and electrical power beginning primarily in the 1880's and 1890's, even steam engine use eventually diminished.

Evolution of Grain Milling. Perhaps the most prevalent types of mills historically were grain mills, followed by sawmills and textile mills. Since most surviving mills and mill sites were associated with grain milling, it is important to understand some major advances in this industry in the United States between the late eighteenth century and twentieth century. Prior to 1785, virtually all grain mills employed stones powered by water for the reduction of grain, and many also used bolting (sifting) devices for separating the finer flour or meal from the bran or coarser ground product. Most processes other than the actual grinding, from unloading the grain, through moving the milled products from stones to bolters, to bagging, were performed by operatives who were required to lift and carry bulky material with aid of few if any transporting devices (Figure 8). This required several employees in addition to the miller and slowed the entire process dramatically. In fact, most millwrights to that time had not perceived that the power train which drove the millstones could also be harnessed to turn bolters, cleaners, and other machinery within the mill. Those peripheral but integral steps were performed manually.

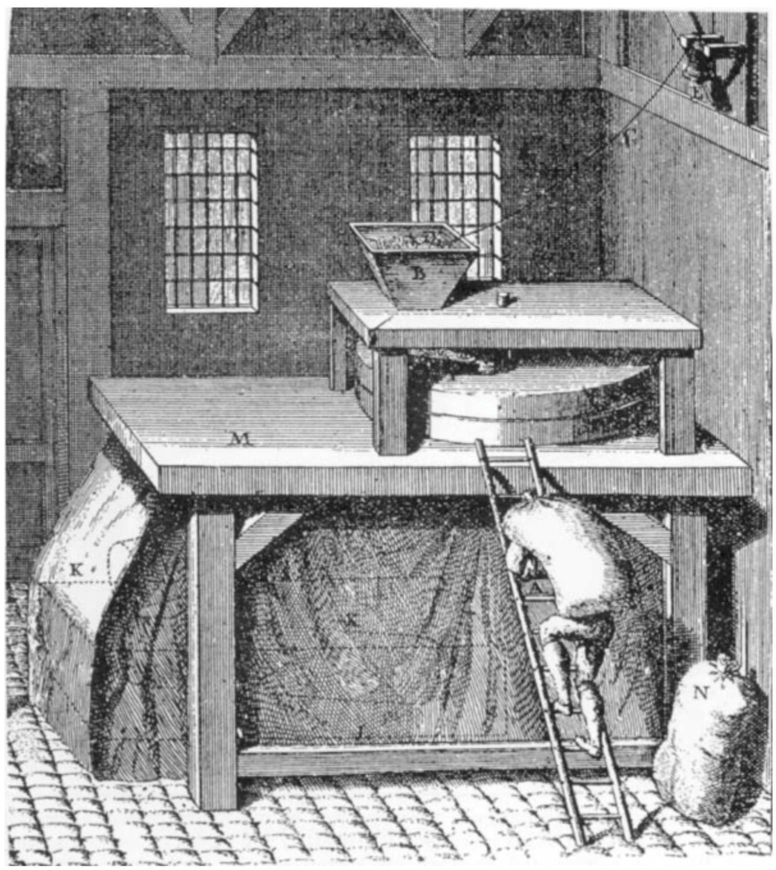


Figure 8. Typical milling operation prior to automation.

The most significant step in milling since the application of water power was the automation and mechanization of the entire milling process. This was conceived and accomplished by Oliver Evans, a great American inventive genius and practical engineer whose name is little known today. Oliver Evans (Figure 9) was born near Newport, Delaware, in 1755, and was apprenticed to a wheelwright. Although he was unfamiliar at the time with milling techniques, he contracted with two of his brothers in 1782 to build a mill near Wilmington. It was during the design of this mill that Evans conceived the notion of applying the power that drove the millstones to perform all operations then

Figure 9. Engineer and inventor Oliver Evans.

accomplished by manual labor. By 1785 the mill with his improvements was in full running order and considered a curiosity of the time. Although Evans did not invent many of the devices he utilized, he applied them for the first time to grain milling. These included the elevator with small cups on a continuous belt to carry grain upward and the screw conveyor that moved products horizontally. His mill, when kept maintained in good running order, could be operated successfully by only one individual. Thomas Jefferson was licensed in 1808 to use Evans' system, but like many of Evans' contemporaries, later denounced the engineer's methods and inventiveness. The system was therefore slow to be adopted. Evans' most famous written work, now considered a classic by technology historians, is *The Young Mill-wright and Miller's Guide*, first published in 1795 and issued through 13 editions, the last in 1850, 31 years after Evans' death. In addition to his advances in milling, Evans developed his own steam engine design, and lived to see his engines power several milling establishments (Evans 1850).

During the period when Evans' improvements began to find favor among millers and millwrights, a process of producing flour known as the American or flat-grind system was in use. In this system, wheat passed between the millstones only once for grinding. The stones were set very close together and were run fast with a heavy feed. The meal exited the stones in a damp and hot state, with the bran broken into fine bits, which would clog the bolting cloths if not cooled first. In the pre-Evans mills, this flour was spread across the mill floor, cooled, and then transported to the bolting hoppers for sifting out the bran and "middlings," or coarse particles of flour. Young boys were usually employed to move the flour from stones to floor to bolter. Evans' invention of the "hopper-boy," a mechanical device for collecting, cooling, and conveying the flour automatically to the bolters, was at the time a great labor-saving innovation.

However, after the mid-nineteenth century, this old process had been for the most part abandoned in favor of what was called the New Process of high grinding. The main purpose was to produce purer flour that could command a higher market price. The basic elements of the New Process were the use of a primary set of millstones set wider apart to accomplish the first reduction, a middlings purifier (perfected in the 1870's but introduced several years earlier) to separate via sifting and fanning the bran from the middlings, and a second set of millstones to regrind the purified middlings and obtain more flour. This method of high grinding thereby reduced the overheating and destruction of nutrient value in the flour. On the other hand, the separation of the bran and whole grain to produce fine white flour demanded by the public somewhat offset the advantages of reduced heat, nutritionally speaking. The flour from the first grind of the wheat was called the baker's or clear flour, and the second yield was called "patent" flour. Often these were blended after the second grinding and sold as "straight" flour (Dedrick 1924).

The next major development in grain milling was the introduction of the Hungarian or roller process for flour. Although steel rollers had been employed on a limited basis to crush wheat as early as the 1830's in Europe, they had not been entirely successful until iron production techniques were improved. By the 1860's and 1870's, roller milling developed rapidly in Budapest, Hungary. The process interested Charles Pillsbury and other American mill owners to the extent that they traveled to Hungary to study the methods. Not long after, roller mills were being manufactured in America with a myriad of improved and newly patented designs and materials. They found favor in the larger milling establishments, which had the capital necessary to invest in the dozens of machines needed for the entire flour production process. Millstones for flour grinding gradually lost out in part because they were so laborious to sharpen, or “dress.” During this period, particularly the 1880’s and 1890’s, large three and four-story structures were erected to house the roller equipment. The earlier large merchant mills disposed of their stones and adapted their structures to the new roller process, but many in rural areas kept one set of millstones for custom and corn grinding (Storck 1952).

The last significant phase in grain milling occurred in the twentieth century. During the first half, many small milling establishments survived with niche and local markets, particularly among country stores in their immediate localities. A few kept their old horizontal millstones turning, although there seems to be evidence that the knowledge and desire to maintain the stones properly declined. Also, beginning as early as the 1870’s, but not reaching primary importance until after 1900, was the invention and distribution of the vertical stone buhr mill (Figure 10). These little mills were easier to

Figure 10. Vertical stone buhr mill of the early twentieth century.

move, operate, and maintain, ran faster, and could be powered by a small engine or motor. They appealed to the country stores particularly, and the store owners would buy them to perform custom grinding for the local community. This cut into the markets of the old water mills, and began their more precipitous decline. In addition, with larger power units available in the form of massive steam engines and electric motors, better transportation methods, increased demand, and improved yields and farming techniques, mills became quite large. Because of their size and market command, they could buy cheaper grain in larger quantities than their small competitors, and eventually took over. By the 1950's small water powered milling operations were all but extinct, and the country stores on which they depended were closing as large grocery chains captured the public's fascination and business.

Today, a low-key and peculiar trend is developing. A small but growing percentage of the public is becoming aware of the nutritional advantages of whole grain, stone ground mill products (Figure 11). This development has allowed a very few of the traditional water mills to hang on, catering to mail-order customers, specialty bakeries, and health-food stores.

Figure 11. Types of water powered stone ground flour and meal products.

CHAPTER 2

HISTORICAL DEVELOPMENT OF MILLS IN TENNESSEE

The Pioneer Period (1777 – 1820)

Mechanization of Grain Grinding. Prior to statehood in 1796, Tennessee was a part of North Carolina. Hunters, trappers, and adventurers prowled portions of the state before 1775, particularly the eastern and north-central areas. There is little evidence, however, of permanent settlement until the establishment of Washington County in 1777. This was Tennessee's earliest county, but at that time still part of North Carolina. The county covered most of modern-day East Tennessee. During this early settlement period, the pioneer family's time was spent clearing a small patch of land for crops, erecting shelter (often in the form of log cabins), and securing game for food (Arnow 1960). Grain grinding was typically accomplished by hand methods, and later by horse powered mills (Goodspeed 1887). The hand mills of the time were of various designs. Some were basically the mortar and pestle stones used by Native Americans for thousands of years. Other more labor saving devices were utilized. For example, a tree trunk or stump was hollowed, and a spring-pole pestle adapted to pound and pulverize the grain (Figure 12). A variation was to use a tree trunk as a counterweight to help raise the pestle (Figure 13). Sometimes, even a small stream of water was employed to automatically raise a lever, then drop the pestle as the water cup tipped and emptied. This water lever was

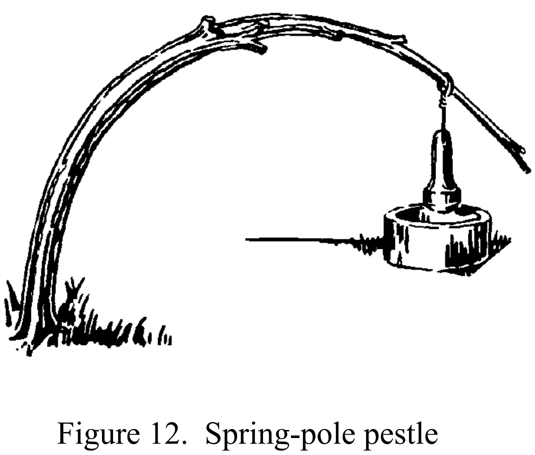


Figure 12. Spring-pole pestle

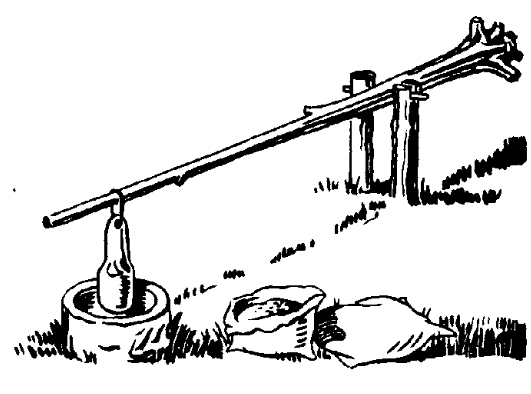


Figure 13. Counterbalanced pole pestle.

commonly called the "Lazy Jim" (Figure 14) (Storck 1952). It was not long before animal power was adapted to remove much of the human effort required to reduce grain. In later years, ingenious devices were invented to transmit animal power to perform work, such as geared multiple sweeps and treadmills (Figure 15). The earliest horse mills, as they were commonly called, were simpler. They consisted of a fixed lower stone and an upper stone turned via a vertical shaft attached to a sweep pole (Figure 16). Such horse mills date to Roman times. Most likely the stones used were quarried nearby and finished by the owner. There is evidence that these mills served a relatively large area until water mills could be erected (Goodspeed 1887).

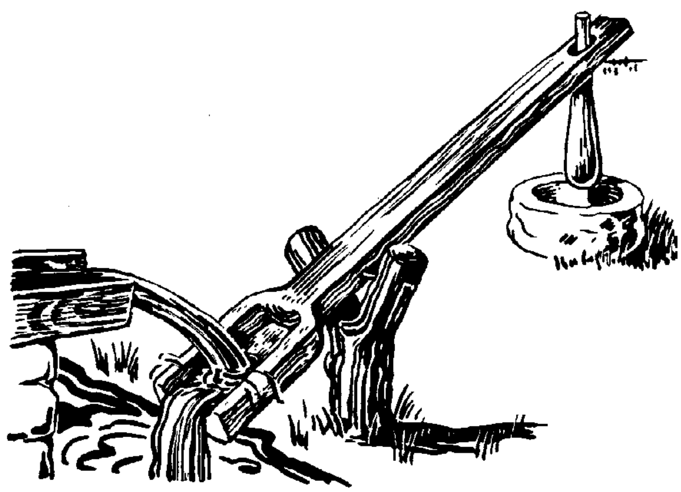


Figure 14. The water lever, or "Lazy Jim" pestle.

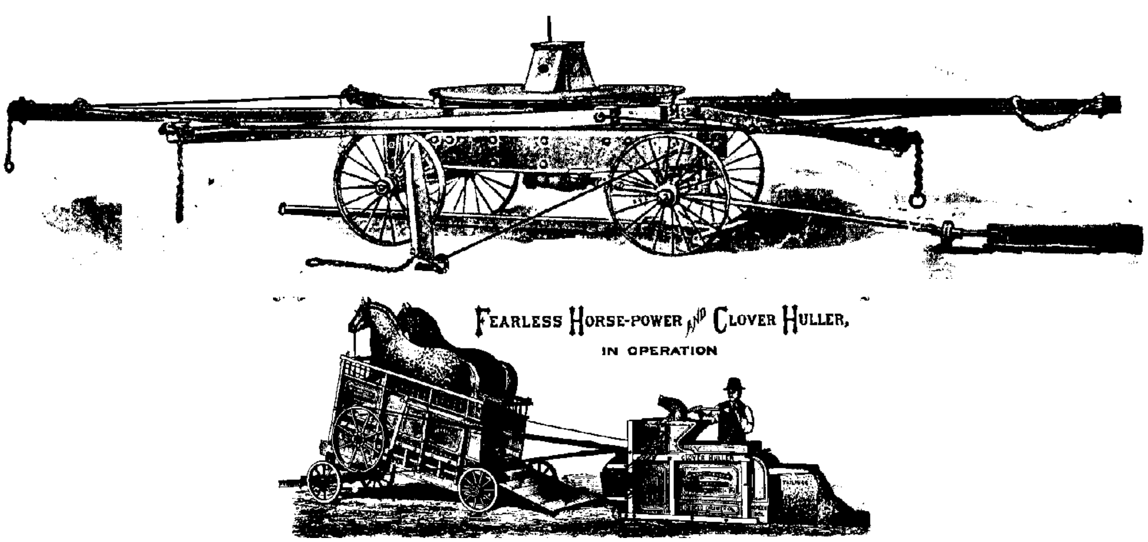


Figure 15. Portable multi-horse powered geared sweep and treadmill.

Figure 16. Sweep powered hourglass mills, also turned by slaves in Roman times.

Water is Harnessed for Power. As population increased in Tennessee during the 1770's, the need for more efficient milling techniques, both for grain and lumber, became evident. Men with mechanical knowledge or millwright experience began to build small water powered mills at convenient locations along streams. Since dams were difficult to construct, particularly on larger creeks and rivers, many of the earliest mills utilized water diversions. The diversion was commonly a log placed across the stream, with a channel cut just above one end of the log to allow the water to flow toward the mill (Figure 17). Sometimes a gate was installed so the water flow could be controlled. A ditch or wooden trough, called the millrace or flume, conveyed water to the power source

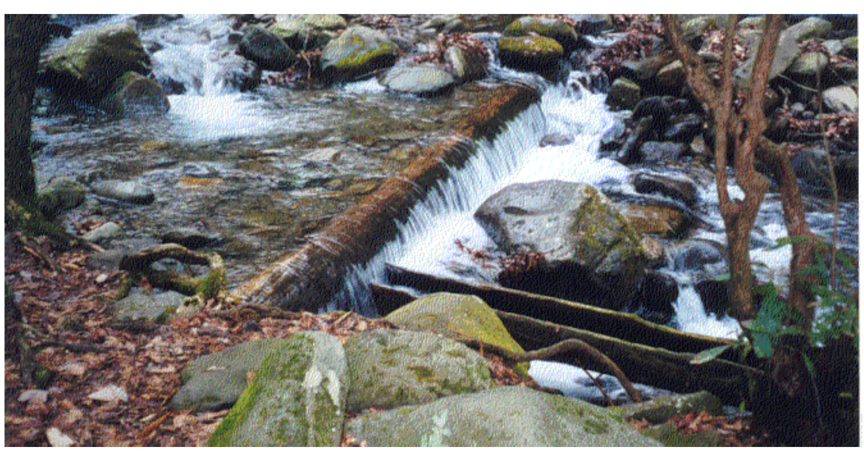


Figure 17. Log water diversion and beginning of wooden trough flume to mill.

at the mill. This power source might be a tub wheel (primitive turbine), overshot, breast, or undershot wheel (Figure 18). A flutter wheel, resembling a small undershot or paddle wheel, was usually used to power the saw of an up-and-down sawmill, but was not used with a grist mill.

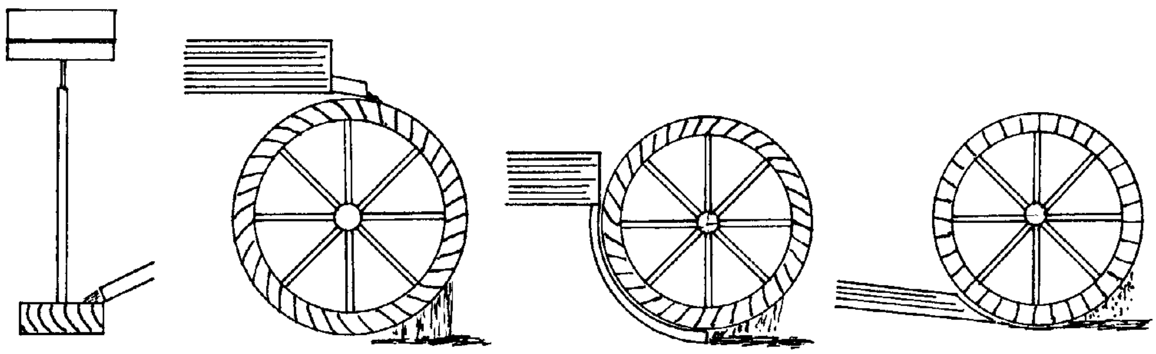


Figure 18. Water wheel designs: (left to right) tub wheel, overshot, breast, undershot

Physical Context of Mills. In locating a mill, certain physical and terrain features were important, and recognized by early land surveyors. If a stream was observed to fall significantly over a short distance, the surveyor would designate the location as a potential "mill seat" (Figure 19). These properties became highly desirable, and soon

Figure 19. The mill seat, or upper falls, at Falls Mill in Franklin County, Tennessee.

mill seat legislation was passed to require permits for the development of these water powers. These laws were deemed necessary to provide riparian rights, or the rights to the river banks, to the mill owner and to avoid upstream flooding of neighbors' lands after the erection of a dam, and subsequent lawsuits (*General Assembly of Tennessee* 1833).

The number of mills along a stream was limited by the fall of the stream. Overshot water wheels, while generally the most efficient type, were usually not practical if they were under 10 feet in diameter. Therefore to maintain a suitable fall, the frequency of mills along the same stream was usually no more than one every one-half mile or so in mountainous areas, with less frequency in flat terrain. Location was also governed by the ownership of land, since many of those with the means to build and operate mills possessed large tracts of land up and down the creeks.

Another desirable feature for mill location was a reliable water source. Many of the smaller streams would suffer reduced flow in late summer when the corn was being harvested. This was a hindrance to operation, since the power of the water wheel depended upon not only the fall or "head" of water available, but also the flow. This could be partially overcome by a large millpond created above a dam (Figure 20). The

Figure 20. Millpond and dam at Ketner's Mill in Marion County, Tennessee.

pond could supply enough water, if designed properly, to run the mill for an extended period beyond that provided by the regular flow of the creek. Then the pond could be allowed to refill, and the mill again operated. Although this provided sporadic service, it was better than total shutdown. The land above the dam location had to be amenable to the filling of a pond, so needed a natural trough to avoid widespread flooding of land.

In fact, flooding was probably the chief cause of mill damage and destruction (Figure 21). If the site was ideal, it would allow the mill to perch upon a bluff high enough above the flood waters to escape damage (Figure 22). This was rarely possible, however, so mill buildings were often set on high wooden or rock piers for protection in the more

Figure 21. Ketner's Mill in Marion County during flood conditions in January, 1984.

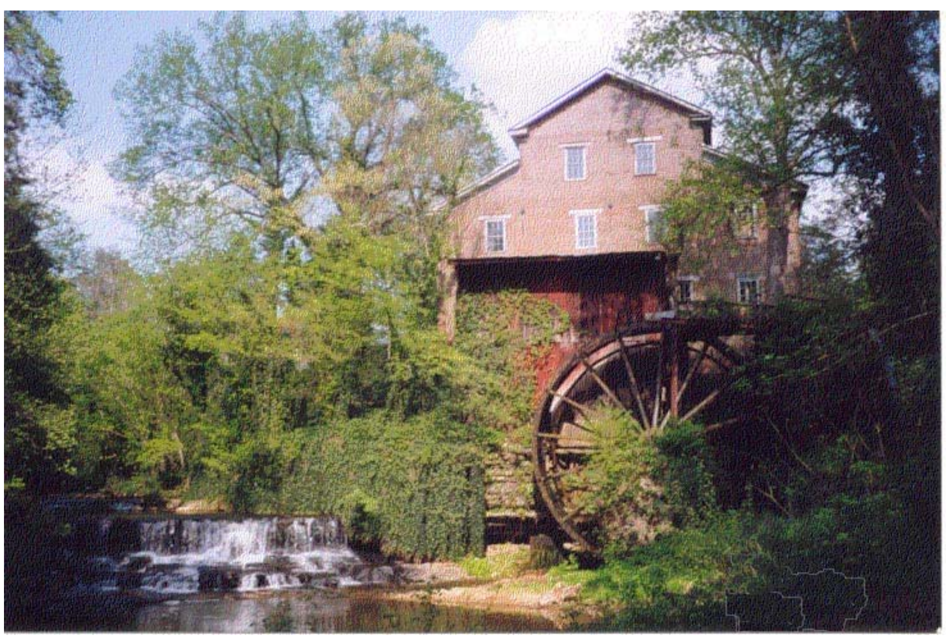


Figure 22. Falls Mill is spared from floods by its position high on a natural bluff.

flood-prone areas (Figure 23). They were also located downstream as far as practical from a dam, since the power of flood waters roaring over the dam, or failure of the dam itself, could cause severe destruction and erosion nearby. Another reason for location further downstream was to take advantage of any additional natural fall of the stream below the dam, as every foot translated into enhanced power. (In later years, when water turbines became popular for powering mills, the buildings began to be located next to the dams more often, to avoid the construction of large millraces necessary to convey the vast amounts of water to the turbine.)

Figure 23. Lower Mill in Hamilton County, Tennessee, situated on high rock piers.

Appurtenances Needed for Powering Mills. The pioneer mills could rarely be located on a major river due to the difficulty and expense of building the dam. The river would have to be partially or totally diverted during low water by use of a temporary or "coffer" dam in order to lay the foundations for the permanent dam. Dam construction was understood by some millwrights, stone masons, and carpenters during the state's early settlement. However, since the need for mills was great in this period, time was usually of the essence in getting the mill and appurtenant structures constructed. Consequently, small dams or diversions were the common practice. It is probably safe to assume that most of these dams were of wooden construction, but in areas of abundant and convenient rock deposits, a masonry dam might be preferred for more permanency.

Wooden dams were built by first attaching heavy hewn wooden timbers or logs known as mud sills to the creek bed. The timbers spanned the entire stream perpendicular to its course and were attached by drilling holes into the creek bed and through the timbers and driving in wooden pegs. They were critical for holding the dam in place, especially in floods, as were the dam abutments, or ends of the structure connecting into the stream banks. A mud sill is often the only remains of a wooden dam. The timber used was usually either white oak or walnut, both known for their ability to retain integrity if constantly submerged. In East Tennessee hemlock also possessed this characteristic. Probably American chestnut, now virtually extinct, was also used. Next the main structure of the dam was attached by notching or by mortise, tenon, and peg construction. Various designs were employed, including the simple log dam and the hollow frame (Figure 24).

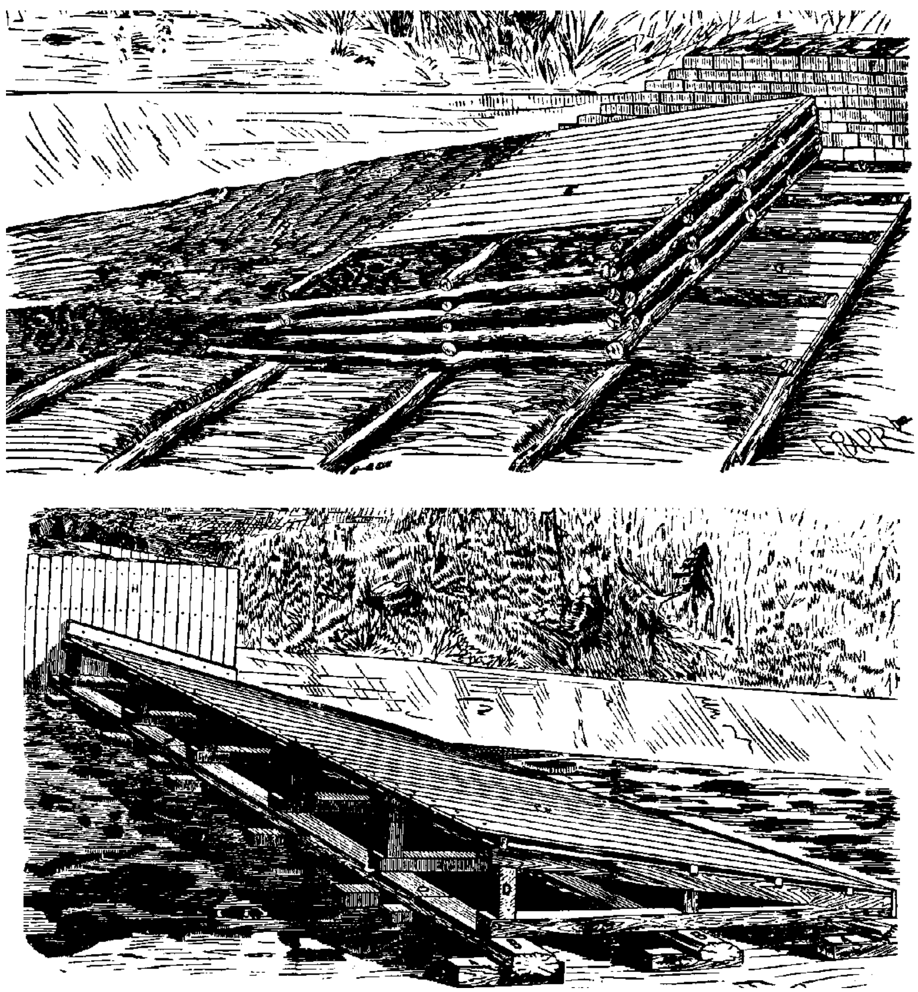


Figure 24. Typical wooden dam designs.

Planking was sometimes applied to the back of the dam, where it was battered or slanted upstream, but planking was hard to produce prior to powered sawmills. Commonly the inside structure of the dam was filled with rock, gravel, and mud to increase weight, reduce leakage, and provide stability (Figure 25). Drain holes with removable plugs were

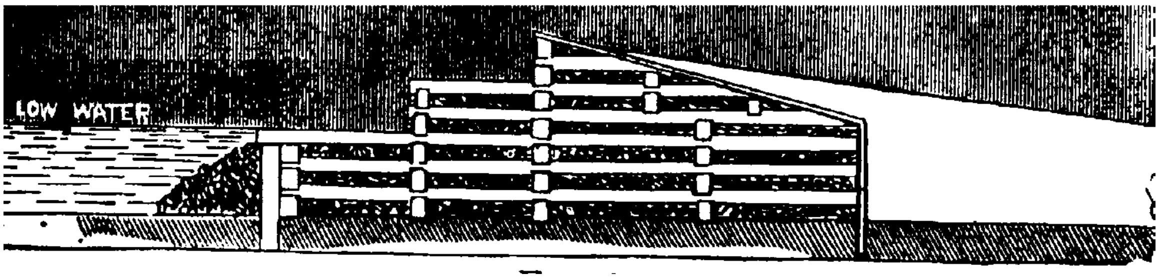


Figure 25. Rock-filled timber dam.

sometimes provided in wooden dams, and almost always in masonry ones, to allow the pond to be drained periodically to remove silt or repair the dam (Figure 26). Silting of the pond was a serious and frequent problem, especially in sandy and high erosion areas. This could fill the pond quickly and reduce the stored water, or pondage, in times of drought. Some ponds had to be flushed out several times per year to prevent buildup.

Figure 26. Masonry dam showing high drain hole in the center of the photograph.

In more sophisticated dam construction, spillways with flood gates might be employed to relieve pressure on the dam structure during floods (Figure 27). Another method to

Figure 27. Flood gates (closed) at Ketner's Mill dam in Marion County, Tennessee.

achieve this automatically, without having to anticipate a flood, was the use of flash boards. These were stacked planks on top of the dam, resting against upright rods (Figure 28). In times of normal stream flow, the pressure of the water would hold them fast against the rods. When the water level rose, however, it would lift the planks out and wash them away, thereby effectively dropping the height of the dam so that flood water could pass over it with less destructive force. When the water went down, the planks could be replaced much cheaper than the dam.

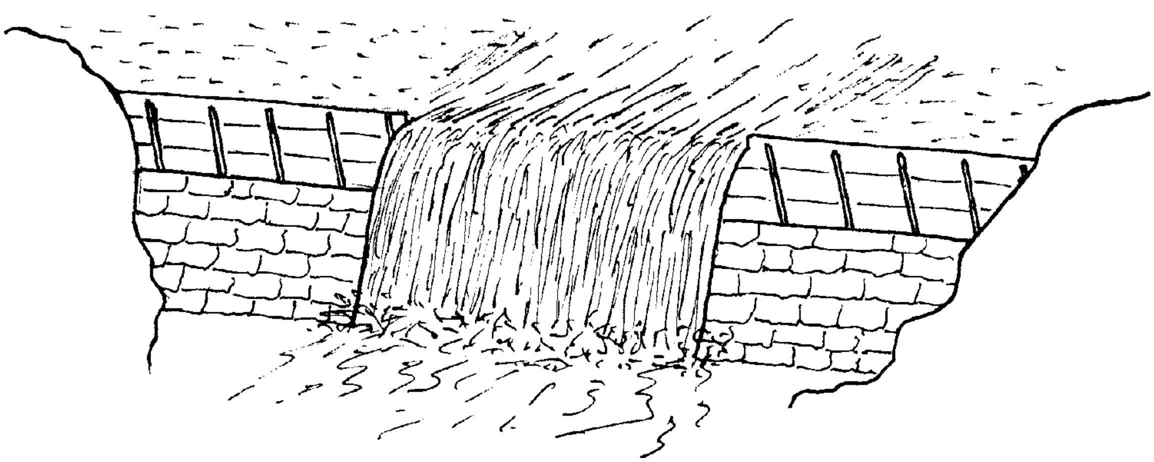


Figure 28. Dam showing flash boards.

Millraces were either dug or constructed as elevated wooden flumes (Figure 29),

Figure 29. Examples of dug and elevated millraces, Falls Mill and Evins Mill.

running from one end of the dam to the water wheel. For the smaller tub wheels, the flume was often simply a connected series of hollowed logs (Figure 30). Similar woods

Figure 30. Flume of hollowed logs leading to the tub wheel at Ogle Mill.

were used as in dam construction. A manually raised gate, called the head gate, was usually placed where the water was diverted into the race at the dam (Figure 31). The

Figure 31. The head gate at Falls Mill in Franklin County, Tennessee.

level and flow of water in the race could be regulated by the amount of opening at the head gate. At the power source was the wheel gate (Figure 32), which was used to control the amount of water over or onto the wheel, thereby determining the speed and power of

Figure 32. The wheel gate at Falls Mill in Franklin County, Tennessee.

the wheel. Sometimes, spillway holes with plugs were incorporated into the race to aid in draining it and provide safety in case the head gate overflowed into the race in high water (Figure 33). The race had to be so constructed to allow sufficient water to reach the wheel. Constrictions in the width would reduce the effective head of water. Some effort

Figure 33. Spillway plug at Falls Mill in Franklin County, Tennessee.

was usually made to drop the level of the race about an inch every hundred feet or so, although this was not necessary unless the race was unusually long. It was also not necessary for the bottom of the race to be perfectly level, as long as silting was not excessive. Water would always seek the level of the millpond when it arrived in the race above the water wheel. (For this reason, later installations would sometimes utilize an inverted siphon, or pipe leading from the top of the dam down along the natural terrain, then back up to the top of the water wheel, thus avoiding the need for an elevated flume.) As the water was let onto the wheel, however, the head would naturally drop several inches in the race, so provision had to be made for this by allowing a couple of feet of static head above the top of an overshot water wheel.

After the wheel received the water into its buckets and rotated almost halfway around, the water would discharge below the wheel and run back into the creek. The path of the returning water was called the tailrace (Figure 34).

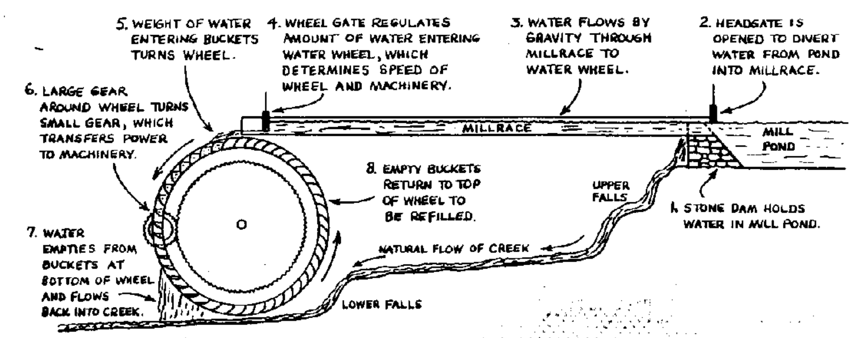


Figure 34. Drawing of water wheel showing tailrace path (left) back into creek.

The Mill Structure. The construction of the pioneer mill building probably followed closely the methods used in log cabin erection. Since sawmills were scarce and pit sawing methods laborious, the earliest small mills were primarily of hewn log construction (Figure 35). There were exceptions, however, where lumber or masonry materials were obtainable. Certain design provisions had to be carefully considered, including the location of the power source, the drive mechanism, the millstones, and the wagon access for unloading grain. In addition, a strong supporting timber framework, later called a Hurst frame (Figure 36), had to be planned and constructed to hold up the

Figure 35. Ogle Tub Mill in Great Smoky Mountain National Park.

Figure 36. A set of typical horizontal millstones showing support (Hurst) frame.

millstones, which could weigh more than 5,000 pounds in one concentrated area. And the whole building had to withstand the vibration from the transmission of power through shafts and gearing to the millstones. These stones, for convenience, were often placed on an elevated platform to allow collection of the milled product, usually corn meal, in a bin or meal box under the spout (Figure 37). The inside of a typical early Tennessee grist mill, providing toll grinding for the settlers in the immediate area (say a two to three-mile radius), was sometimes as small as 12 by 12 feet, had one set of millstones used almost

Figure 37. Primitive millstones, platform, and meal box inside Ogle Tub Mill.

exclusively for corn grinding, a meal bin and scoop, perhaps a small workbench or table, a set of scales or measuring device for determining the toll, and various tools here and there peculiar to the care of millstones. According to some early oral histories, the miller would sometimes leave the mill as grinding progressed to tend to other farm chores, although this was not an intelligent practice except with tub wheel powered mills, which sometimes operated very slowly.

The Tub Wheel Mill. The easiest and quickest mill to erect was driven by a primitive turbine known from ancient times, but referred to as a tub wheel in pioneer America. Some tub wheels were designed so that the rotating portion, or runner, was placed in a wooden tub to minimize water loss or splashing around the wheel vanes. Apparently, in the more primitive installations, such as those surviving in Great Smoky Mountain National Park, the tub was abandoned and the wheel consisted only of the vaned runner with a vertical wooden shaft directly connected to the millstones (Figure 38). These runners were usually hacked out of a solid portion of a tree trunk, using axes, hand augers, and chisels. The entire construction process is illustrated in the second volume of the *Foxfire* series (Wigginton 1973). The stream, if swift, could be diverted to the tub wheel with a log thrown across, and the flume could be constructed of hollowed or hewn timbers. The building logs could be hewn out and erected in about a week, us-

Figure 38. Tub wheel at Ogle Tub Mill in Great Smoky Mountain National Park.

ing only a standard axe, a broad axe, and possibly a slick (large chisel for notching), and the puncheons (hewn planks) for the floor could be finished with a foot adze (Figure 39).

Figure 39. Hewing tools: Double bit axe, broadaxe, auger, foot adze, slick.

The entire structure and power source could be completed in two to three weeks if the family was industrious and knowledgeable. The millstones were another matter. If the mill owner was a millwright, he could conceivably quarry and finish his own stones and build or procure the necessary wooden and metal parts required. This situation was undoubtedly rare. For one thing, the proper millstone rock, or “grit” as it was called, was not common in the state. There were a few outcroppings known to have been quarried very early in the nineteenth century and possibly late in the eighteenth. These were located in present-day Claiborne, Knox, Trousdale, and Coffee counties (Killebrew 1874), as well as a quarry in Williamson County. There were earlier quarries in nearby Virginia, Kentucky, and the Carolinas, and it is possible many of these early stones came from those quarries. The quarrying, furrowing, balancing, and sharpening (dressing) of millstones was a highly skilled art, usually performed by different classes of craftsmen. The quarryman was responsible for cutting the stone from the mountain, rounding and flattening it, and cutting the eye, or center hole. Sometimes he would also cut the mortise for the rynd, or yoke, on which the drive shaft balanced, and the balance pots, if provided. He would also sometimes balance the runner stone and band the stones to protect them. Stones were of course delivered in pairs of the same (and usually standard) diameters. The bedstone was normally the thinner of the two, and can be identified when out of context by the round hole through the center and the relatively light weight. The heavy runner stone, which rotated above the bedstone, was usually much thicker and characterized by the rynd mortise cut in the center of the stone (Figure 40). The stones were skidded from the quarry to heavy wagons and transported to the customer

Figure 40. Bedstone on left, and runner stone showing rynd mortise. The furrow patterns on these two stones are mismatched.

(Hockensmith 1999). A skilled millwright then took over, furrowing the stones according to his knowledge or the miller's preference, then dressing the grinding faces, or lands. Wooden hoops or tuns would be built to house the stones, as well as the other necessary wooden parts, including the corn feeding shoe, the damsel or rattle staff which shook the shoe, the hopper and hopper stand, the spout, and the shoe adjusting knob. A skilled blacksmith or the millwright made the shaft, the rynd, the tentering screw and crank for adjusting the runner stone, the bridgetree pot, on which the shaft rested underneath (sometimes in primitive tub mills this was a pine knot bearing), and any other metal parts necessary, such as bands for the wooden portion of the shaft (Figure 41). The parts were then assembled, the bedstone leveled and trammed (made perpendicular) with the

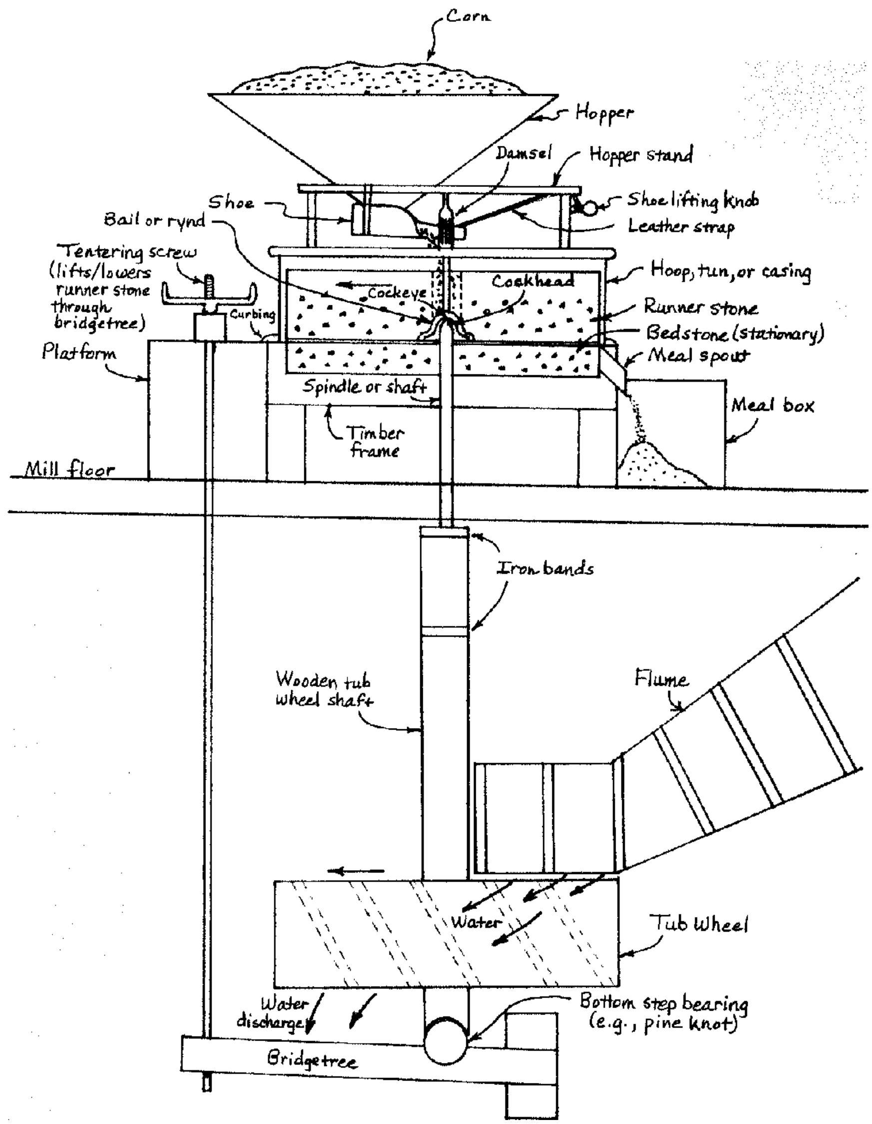


Figure 41. A tub wheel driven mill with various parts labeled.

shaft (Figure 42), and the runner stone turned and the running balance achieved. If the mill owner could afford it, complete millstone sets were manufactured in New England and could be shipped down to a point where wagon transport could take over. When merchant mills for flour production began to be erected in Tennessee late in the eighteenth century, many millers preferred millstones imported from France for grinding wheat. This rock was known as French buhr, a hard silica stone characterized by a pockmarked appearance and usually cemented and banded in segments, as opposed to native monolithic millstones of granite and conglomerate varieties. French buhr, however, was a luxury to the pioneer mill builder.

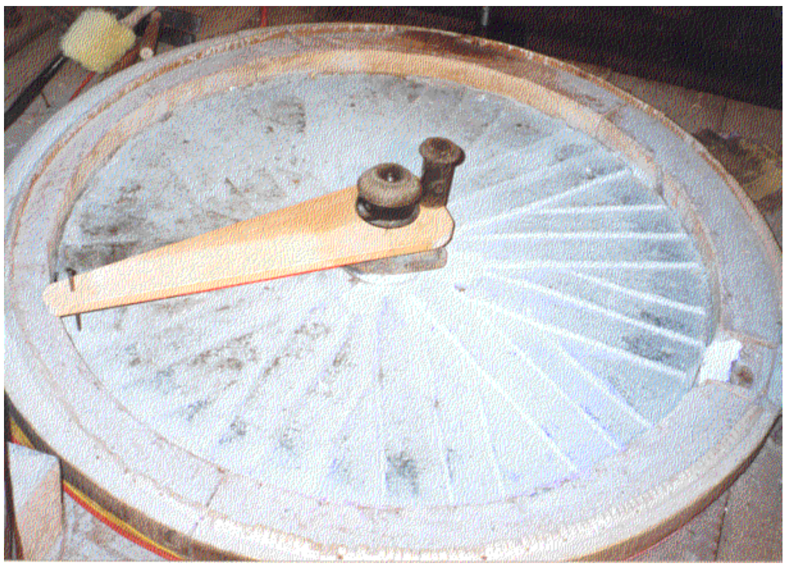


Figure 42. Tramming the millstone shaft with a wooden device called a trammel.

The Overshot Mill. A more versatile, powerful, and efficient mill could be built using an overshot water wheel rather than a tub wheel (Figure 43). Its construction required considerably more skill and time. The water wheel was normally built by standard methods that developed over centuries and were known to millwrights. White oak was again the wood of preference. Not only did it possess strength and durability under wet conditions, but it was also more flexible than most other wood varieties, a distinct advantage under constant force and movement. Arguably the most important component of water wheel construction was the axle. It bore the weight of the wheel and carried the spokes and journals. It had to be designed very carefully. A white oak log of at least two-foot diameter, with straight grain and no knots, was selected. The log was cut to a length that would allow the water wheel to be positioned (usually) on the outside of

Figure 43. Overshot water wheel of John Cable Mill, Great Smoky Mountains.

the building, and a large wooden gear mounted inside the building. The log was dressed with hand tools such as axes and adzes, commonly finished to at least 18 inches in diameter (depending on the size of the wheel) and hexagonal or octagonal, depending on the number of spokes (Figure 44). The ends would be rounded and later receive iron

Figure 44. An 18-inch octagonal white oak water wheel axle showing gudgeon mortises.

bands (Figure 45). Into the ends of the axle were cut two deep mortises at right angles.

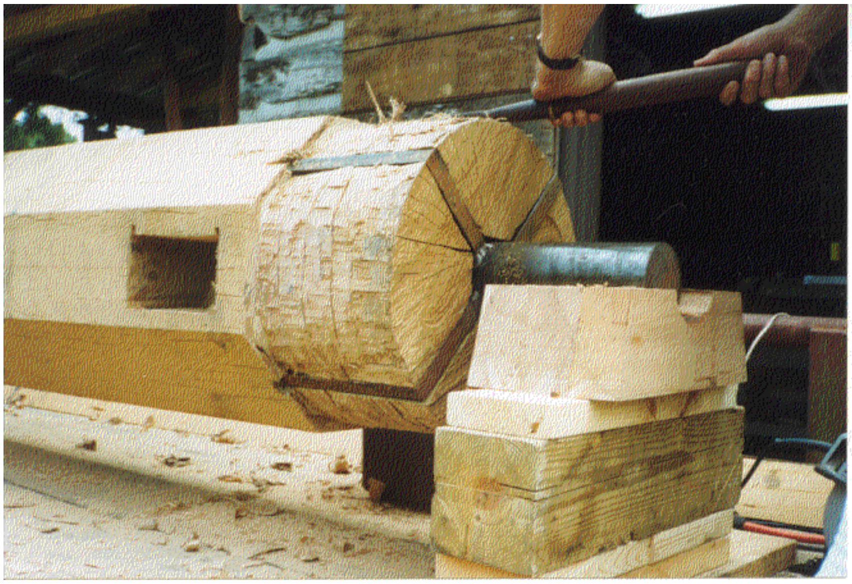


Figure 45. Rounding the ends of the wooden axle to receive the iron bands.

These would receive a forged or cast iron winged gudgeon, which was a cross with a round journal forge welded or cast to it (Figure 46). The wings would slide into the timber mortises, and the journal would protrude so it could turn in wooden bearings atop stone or wood piers. Then iron bands were forged, heated, and slipped onto the ends of

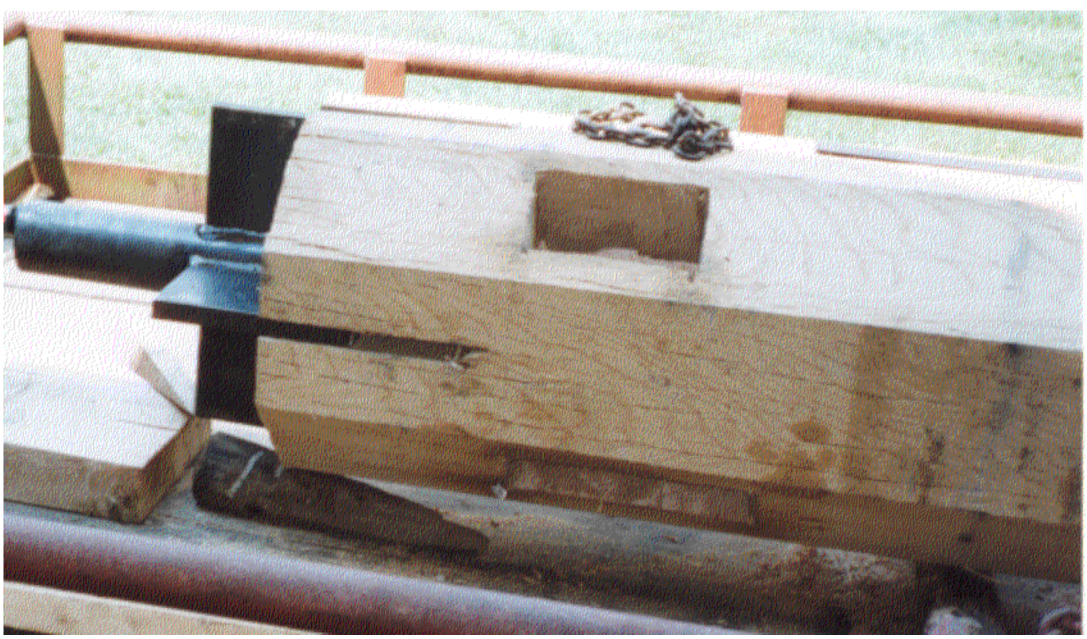


Figure 46. Inserting the iron gudgeon into the end of the water wheel axle.

the timber axle to secure the gudgeons (Figure 47). As the axle continued to shrink over time, particularly the dryer end inside the mill, wooden wedges were driven under the

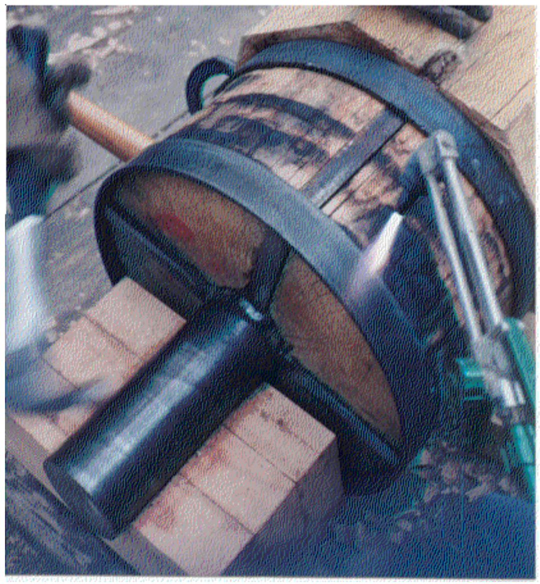


Figure 47. Securing the gudgeon by shrink fitting iron bands onto the axle.

bands and around the gudgeon wings to keep them tight. The gudgeons had to be inserted precisely into the centers of and parallel to the axle, or the entire water wheel would pitch and wobble, wearing out the bearings in a short time. Next, the spoke mortises were cut into the axle (Figure 48). Sometimes this was done after the axle was already in place in the bearings, but usually before. Then the axle was ready to receive the spokes and the structure of the wheel.

Figure 48. Spoke mortises in the water wheel axle.

The wooden water wheel components consisted of the spokes, the cants (circular rim sections), the buckets (usually straight), and the sole plates (which covered the bottoms of the buckets and formed the inside face of the wheel) (Figure 49). These could all be hewn but required some precision, since the wheel had to operate as balanced as possible. Sometimes the wheel structure was built on a stand known as a truckle, which supported the center and outside rims (Evans 1850). Because of the weight and size involved, the wheel was constructed in sections, fit together until true, numbered, then knocked down to be taken to the mill site for final assembly. All pieces were typically mortised and pegged together.

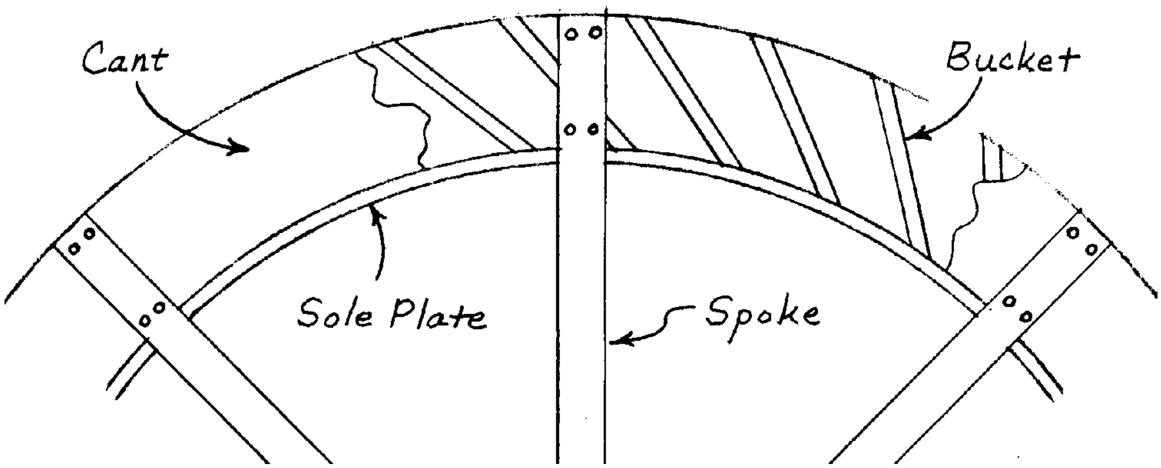


Figure 49. Section of a wooden water wheel with principal parts labeled.

The cants were the most difficult sections to make, because they were sawed in a circular pattern. For this reason, very wide planks had to be used to achieve much distance around the periphery of the wheel, due to the loss of material when cutting out the circular pieces. Consequently, a water wheel had numerous cants. The sawing was probably done with a felloe saw, having a narrow blade and used to cut the felloes or circular sections of wagon wheels. Sometimes the cants were rabbeted or slotted on their inside faces to receive the buckets, which could be slid into place after the main structure of the wheel was up, and pegged through the cants. The buckets were easy to make from flat planks, but were usually beveled on both the inside and outside edges (Figure 50).

Figure 50. A bucket and sole plate, showing why the edges of the buckets are beveled.

The inside bevel was designed to fit tightly against the sole plate and minimize leaking between buckets. It had to be cut according to the angle in which the bucket was inserted. This angle was such that the bucket could hold water until almost to the bottom of its rotational arc, thereby maximizing the power of the wheel. The outside bevel matched the curvature of the wheel and somewhat facilitated the entry of water from the flume at the top of the wheel. The sole plates were simply flat planks spanning bucket to bucket on the inside face of the wheel. They were pegged to the rim or cant sections and sometimes to the buckets as well and served to hold the water in the wheel buckets.

Spokes of the overshot water wheel were usually straight timbers, from 4x4 dimensions up, depending on the size of the wheel. They were of a length equal to the finished diameter of the water wheel. A minimum of six spokes was required on each side of a small water wheel, and eight were more common (Figure 51). As the wheel became larger, more spokes were utilized. The wooden water wheel built at Falls Mill in Franklin County about 1887 and used until 1906 was thirty feet in diameter and five feet wide and had 14 spokes on each side (Figure 52). This was an unusually large wheel for wooden construction. Most were 16 feet in diameter or less.

The spokes were attached to the wooden axle in an interesting and clever way. First, mortise holes were cut completely through the axle on each face of its (say) eight bevels.

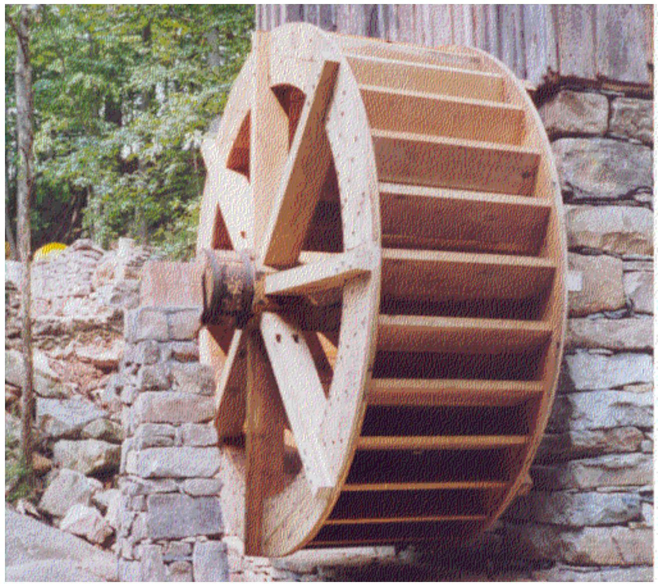


Figure 51. A 10-foot diameter wooden water wheel with eight spokes.

Figure 52. The 30-foot wooden water wheel at Falls Mill, 1887-1906.

These holes were the same dimension as the thickness of the spoke, but were twice as wide as the spoke's width. These weakened the integrity of the axle considerably, and this was the main reason for such a large diameter axle. The spokes were then laid out on the ground and marked for slots to be cut in their centers and partway across their thickness. With the axle in place in the mill, each spoke was slid into its mortise hole until its slot fell directly in the center of the axle (Figure 53). Then another spoke was

Figure 53. Installing the spokes into the mortise holes in the axle.

inserted past this first one (the reason for the oversize mortise holes) until its slot overlapped the slot of the first spoke. It was then pushed onto the first spoke so that the slots locked into place. This step was repeated until all spokes were locked into the axle. Then wooden wedges were driven into the axle mortises to take up the extra space of the holes (Figure 54). Thereby the spokes were in the same position relative to the rim sections of the wheel, and could not move. Their outside ends were often rabbeted or slotted so the rim sections could nest from one spoke to the next for pegging into place.

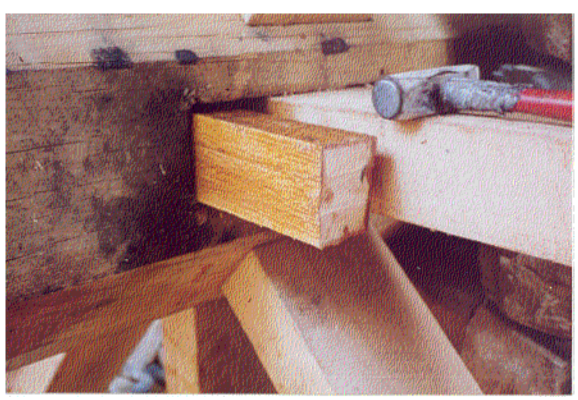


Figure 54. Wedges were driven into the axle mortises to secure the spokes.

With the axle and spokes ready, it was time to begin attaching the cant or rim sections, which had been carefully fit and marked. For smaller wheels, sometimes an entire segment consisting of cants, buckets, and sole plates was pre-assembled and attached as a unit (Figure 55) to two pairs of spokes (one pair on each side of the wheel). The cants

Figure 55. Attaching sections of a wooden water wheel built in two parts.

were sometimes lap jointed and pegged, other times butt jointed and fitted with pegged splines. The lap jointing method was easier, since it involved no mortises.

The wheel might be tested at this point to see if it turned true and did not "lope," or run erratically, too badly. Wooden wheels, however, were notorious for getting out of balance after they became waterlogged.

Although the wheel could be made by a carpenter with some experience and a guidebook such as Oliver Evans' *Young Mill-wright and Miller's Guide* (available by 1795), it required a great deal of skill to make the wooden gears for an overshot mill. These were typically designed and built by a millwright. Due to the slow rotation of an overshot water wheel (roughly 12 revolutions per minute [rpm] for wheels of 12-foot diameter and 4 to 5 for wheels twice that size), it was necessary to "gear up" the speed to achieve the required rotation of the horizontal millstones (typically 125-160 rpm). Wooden gears with wooden cogs were used, but it was impossible to step the speed up that dramatically with only two gears – the mesh required was too severe. Therefore, virtually all overshot mills were "double-geared," or incorporated two pairs of meshing gears. A large or "bull" gear was attached to the water wheel axle inside and under the mill building. This gear was called the "greater cog gear," and was assembled in cants similar to the water wheel, with spokes mortised into the axle. Around one face of the gear were mortised cogs, usually of hard maple, of a tapered design to serve as the gear teeth (Figure 56). These meshed with a "lantern" gear called the "wallower," attached to

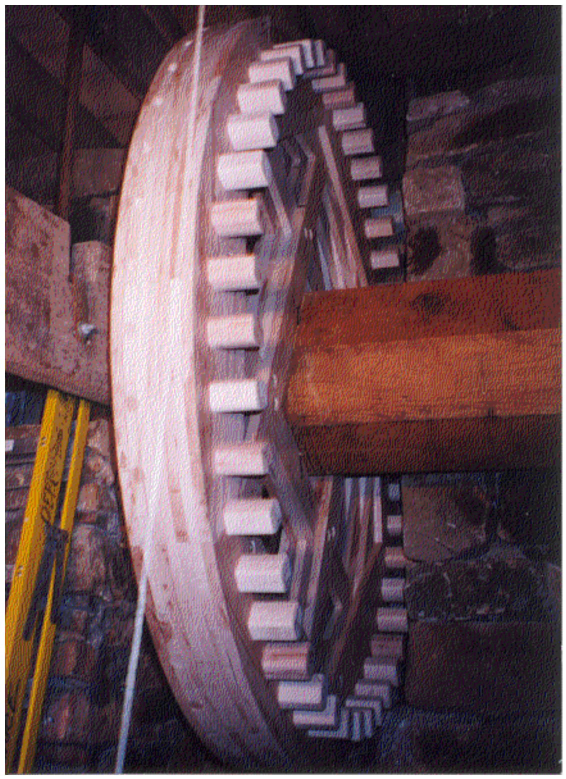


Figure 56. Greater cog gear attached to water wheel axle.

one end of a second shaft running at right angles to the main water wheel axle (Figure 57). This jackshaft carried not only the wallower but the second, or "lesser," cog gear as well (Figure 58). The wallower consisted of top and bottom round wooden sections connected with several "rounds," or heavy dowels of maple, driven by the cogs of the large gear. The pitch and spacing of the cogs and rounds had to be extremely precise, or the gears would bump and vibrate and could disintegrate. It was recommended that the number of cogs should not be divisible evenly by the number of rounds to avoid excessive wear, so in effect a "hunting tooth" was incorporated to keep the same set of

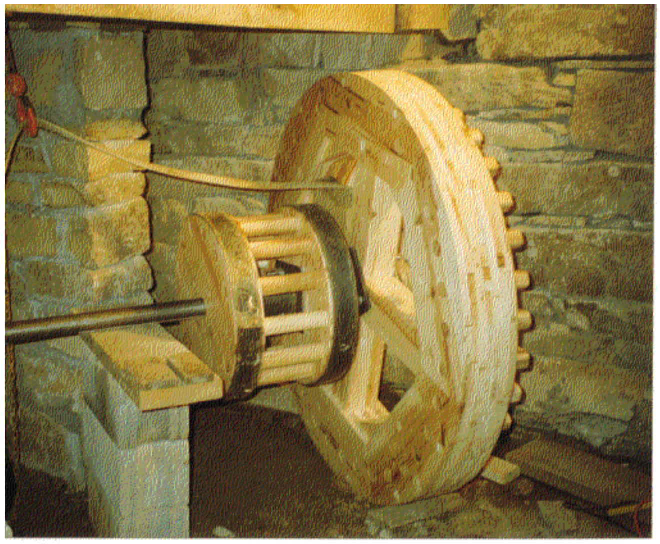


Figure 57. Wallower and lesser cog gear shaft before installation.

cogs from meshing with the same round on each rotation. These cogs could be lubricated with mutton tallow, and if designed properly, would run very smoothly and quietly with only a low "clackety-clackety" sound.

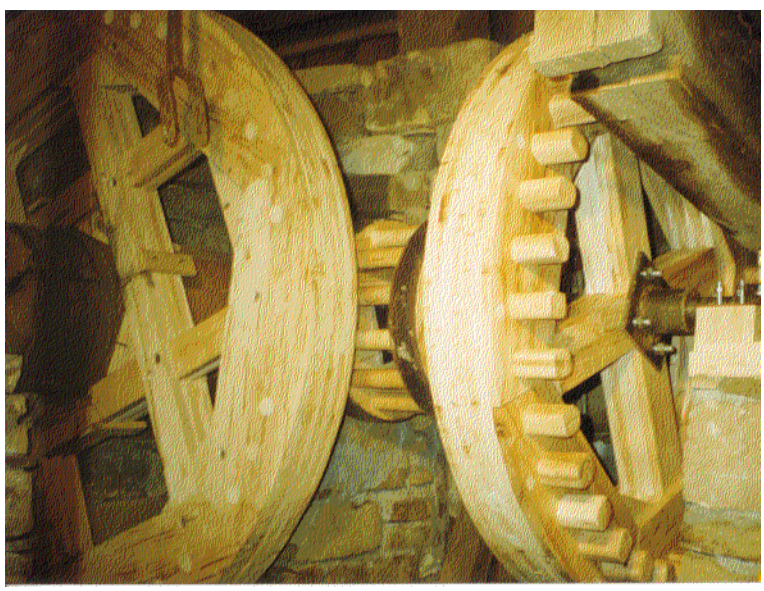


Figure 58. Lesser cog gear shaft in place, with wallower meshing with greater cog gear.

On the other end of the jackshaft was attached the lesser cog gear in a manner similar to the larger one. It drove a vertical shaft connected directly to the runner of the millstones via a second lantern gear called the "trundle." The lower end of the trundle shaft rotated in a step bearing mounted to a lever called the "bridgetree." This bridgetree was allowed to move up and down slightly by another lever attached to one end, and a metal rod extending vertically into the mill next to the stones (Figure 59). By lifting or lowering this rod, thereby lifting or lowering the runner stone relative to the bedstone, the miller could control the texture of the milled product. If the mill ran dry, the runner could be lifted clear of the bedstone to avoid their contact, which should never be allowed due to the abrasion and destruction of the grinding surfaces.

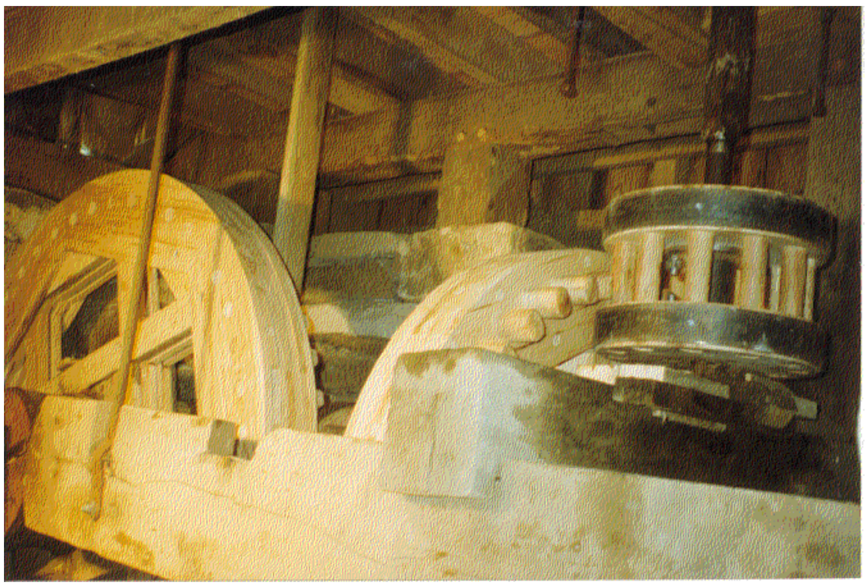


Figure 59. The trundle gear, which through the lesser cog gear turned the millstone shaft. Also shown are the bridgetree timber under the trundle, the wooden bridgetree lever, and the iron rod (on left) which extended vertically through the floor above to a hand screw.

The millwright had to design the sizes of the gears to accommodate the number of cogs and rounds necessary to provide the required speed step-up to the stones. If the water wheel was to rotate at 10 rpm and the stones at 140 rpm, the 14:1 ratio could be achieved in two stages with the two pairs of gears. With 66 cogs in the greater cog gear and 23 rounds in the wallower, the jackshaft would be turned about 29 rpm from the 10 rpm water wheel shaft. This meant the lesser cog gear would also be turned about 29 rpm, so if it had 49 cogs and its trundle had 10 rounds, this approximate 5:1 ratio would produce the required 140 rpm for the millstones. The millwright had to keep in mind that his gears and shafts had to be located in a confined space, but be accurately positioned to provide for the inside water wheel shaft pier, the two piers for the jackshaft, and the Hurst frame and support for the bridgetree bearing under the millstones. Access for maintenance and lubrication also had to be provided.

If the water wheel was operated daily and kept wet, it would last much longer than if allowed to dry out between runs. For most small pioneer mills, operation was sporadic, so the life of a wooden water wheel was rarely over 15 years, even when built from the most durable materials. Despite precise design, wooden cogs would also wear and required replacement periodically. When the maintenance of the millstones was factored in, the mill owner was faced with the almost never-ending task of adjusting, lubricating, and replacing parts of the mill machinery.

Other Water Wheels. The history of the overshot water wheel may be traced back more than one thousand years. A variation of the overshot wheel appearing after 1750 was the breast wheel, whose construction was essentially the same. The breast wheel could operate on a lower head of water than an overshot wheel of the same diameter, but could not supply as great a horsepower. A flume was led to the wheel as with the overshot variety, but the water met the wheel at a point between the top and center axle. At the end of the flume, and constructed very close to the outside perimeter of the wheel, was the breast. This was a wooden chute that followed the curvature of the wheel to the bottom. At that point it opened into the tailrace (Figure 60). The theory was that this breast helped hold water in the buckets of the wheel and reduced early discharge, thereby

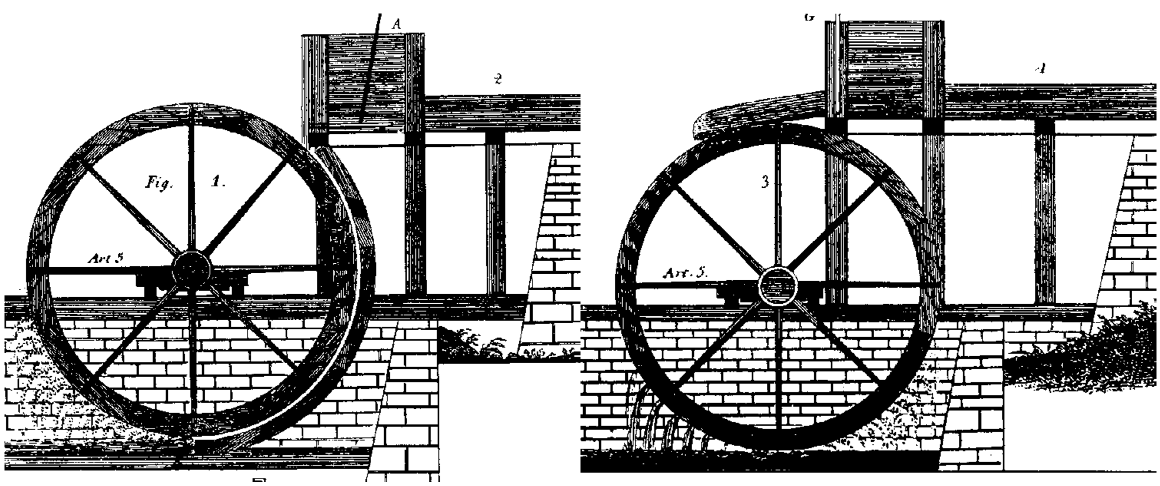


Figure 60. Contrasting the high breast wheel (left) with the overshot wheel (right). Notice that rotation is clockwise for the breast wheel, counterclockwise for the overshot.

recovering a portion of the power lost through this design versus the overshot wheel (Reynolds 1983). The construction of the breast was difficult, so as more efficient iron and steel wheels were manufactured after the Civil War, the breast was eliminated and the wheel came to be known as a "pitchback" wheel. The term referred to the rotational direction of the wheel – although designed and installed as an overshot wheel, since the water fed into the buckets below the top, the wheel turned in the opposite direction as an overshot would.

A less common but ancient variety of water wheel was the undershot wheel, usually associated with flat terrain. It was basically a paddle wheel (Figure 61). It was easier to construct than an overshot or breast wheel, and required no sole plates or angled buckets. It was rotated by the velocity of the water traveling under it, usually channeled by a simple flume and often requiring a diversion instead of a dam. Although it was capable of turning faster than an overshot or breast wheel, it was less efficient, due to the fact that its power calculation had a negligible head of water as a factor. Wooden overshot wheels were estimated to be 50-70% efficient, meaning that the power output at the axle was 50-70% that of the water feeding the wheel. The loss was due to friction and leakage. Later steel wheels were much more efficient, one manufacturer claiming above 90% (Fitz 1928). Wooden breast and pitchback wheels were less efficient than overshot, their efficiency depending upon how far up the wheel the water entered. The undershot wheel, on the other hand, was at best only around 30% efficient, so a large wheel and plenty of flow was necessary to provide enough power to turn a set of millstones (Mead 1915).

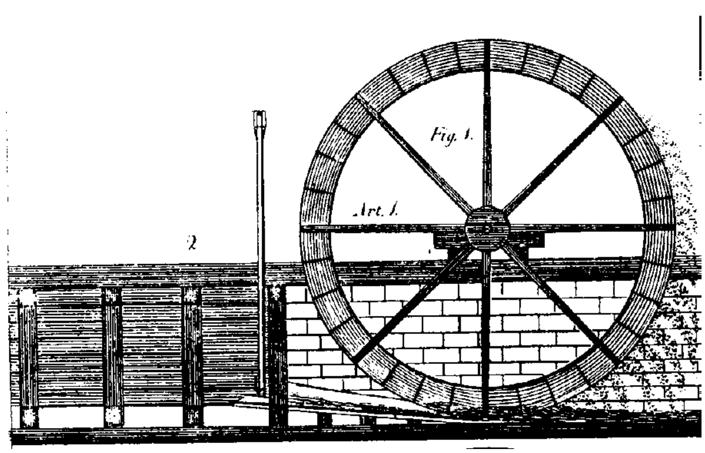


Figure 61. Undershot water wheel showing unique bucket design.

Other water engine designs were developed in later years, but not associated with the Pioneer Period in Tennessee. These included the Poncelet, Sagebian, and Pelton wheels. The first two designs emerged in France during the period 1820-1850. The Poncelet wheel incorporated curved steel buckets for the first time, and the Sagebian modified the incline of the buckets of an undershot wheel. Both were attempts to allow water to enter the wheel without impact and leave without velocity (Reynolds 1983). These wheels were more popular in Europe than America. The Pelton wheel, however, was an American design, and will be discussed in greater detail later (see pages 115-116).

Grist vs. Merchant Mills. The earliest mills in Tennessee were established to grind the grain (usually corn) grown by the owner and perhaps some neighbors whose grain was tolled for payment. It was not long, however, before larger merchant mills were constructed. These mills would also produce wheat flour, and would purchase the grain locally, then sell the milled products. Some also operated on a deposit system, whereby wheat (primarily) was deposited by customers in a warehouse or in bins within the mill, then ground as needed for the customers' use. The larger mill owner could either charge a flat rate for this "custom grinding," or could toll it as the smaller operators. It is interesting to note that the responses from several Tennessee mill owners in the 1820 Census of Manufactures indicate a depressed demand for wheat flour, so apparently even at this time, corn meal was by far the most consumed milled product.

As mentioned previously, Oliver Evans had conceived an automated grain handling and flour milling system and presented it in *The Young Mill-wright and Miller's Guide* beginning in 1795. Although it was somewhat slow to be adopted due in part to the complexity of the machinery required, it did find its way into early merchant mills beginning in New England. If Tennessee followed the trend of other states, merchant mill owners even in the Pioneer Period may have adopted Evans' system, although there is yet no authoritative proof. Very few remnants of Evans' machinery survive anywhere in the country. Most mills, in order to compete, had to change with the times, so the owners typically discarded antiquated machinery and replaced it when affordable with "modern" innovations. Therefore, it is not surprising that evidence of the Evans system is not known to exist in Tennessee.

Dungan-St. John Milling Company in the Watauga Valley of Washington County is believed to be the oldest surviving original mill structure in the state, and also has the distinction of being the longest continuously operating business in the state (since 1778). The original building, although surrounded by later additions, was fairly large for its day, so may have been considered a merchant mill. It was powered by an overshot water wheel (Figure 62). Probably the next oldest merchant mill recently standing, though in a

Figure 62. Artist's conception of the original Jeremiah Dungan Mill in Washington County, Tennessee. This structure still stands, without the water wheel, though completely surrounded by additions from later years.

state of extreme deterioration, was the Massengill Mill in Grainger County. The structure appeared original except for the addition of a later water wheel (now gone), and was believed to date to the 1790's (Figure 63). It is interesting to note that this was one of the few mills in Tennessee that employed an enclosed water wheel (i.e., under a portion of the building) (Figure 64). This was some advantage in icy weather. The large stone dam is still essentially intact. This mill has been recently dismantled and moved.

No complete original survivors of the smaller pioneer mills are known in Tennessee, although a few representative examples of wooden gearing, structures, and wheels exist.

Figure 63. Massengill Mill in Grainger County, Tennessee, before its move.

Figure 64. Original enclosed wheel room at Massengill Mill, showing tailrace arch.

Probably the best three of these are located in Great Smoky Mountain National Park, although the earliest dates only from the 1880's. These are the two tub mills located on the Roaring Fork/Cherokee Orchard Trail. The Noah "Bud" Ogle Tub Mill is of log construction and, although the tub wheel has been allowed to deteriorate somewhat, is no doubt the best representative in the state of a primitive pioneer grist mill in a remote setting (Figure 65). How much of the original structure and wheel are seen today is not

Figure 65. The Noah "Bud" Ogle Tub Mill in Great Smoky Mountain National Park.

clear. The John Cable Mill in Cades Cove is a relatively good example of a pioneer overshot mill (Figure 66), but the gearing is iron and of later (1880's) origin. The entire structure was rebuilt by the Park Service in the 1940's, utilizing a few remaining iron parts of the original mill. The wooden gearing and mill parts salvaged in the Tennessee State Museum and in the Museum of Appalachia came from two early pioneer mills, but of course are out of original context.

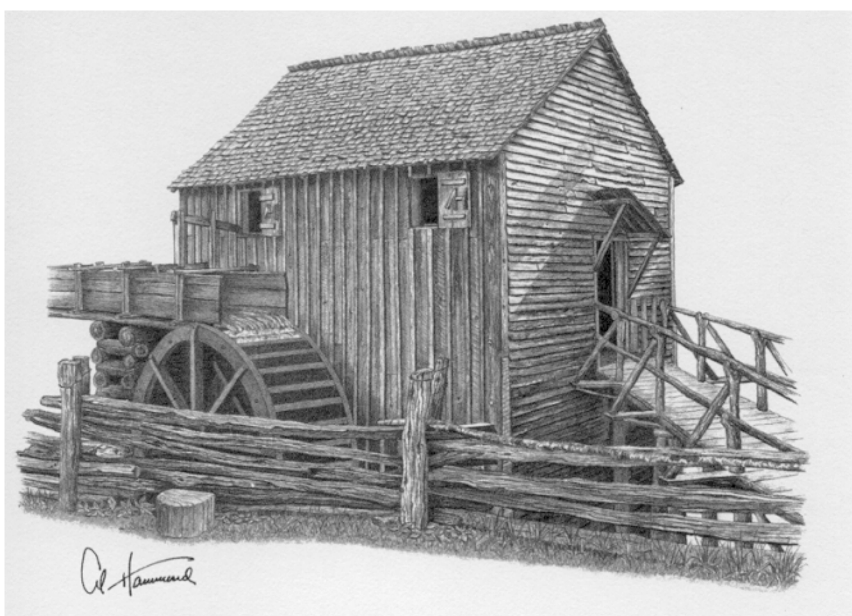


Figure 66. The John Cable Mill, Cades Cove, Great Smoky Mountain National Park, a reconstruction of an 1880's mill as depicted by artist Al Hammond.

The Up-and-down Sawmill. Sawmills were the next most prevalent type of mill in pioneer Tennessee. As was stated earlier, hewing logs and pit sawing by hand were both laborious processes, so it was natural that powered sawmills were quick to be constructed. Their design, construction, and operation were considerably different and more complicated than grist mills. The basic construction techniques had been known in the original colonies for over 150 years prior to the settlement of Tennessee. In addition, Oliver Evans' classical work *The Young Mill-wright and Miller's Guide*, originally published in 1795, gave descriptions and illustrations of the sawmill. It should again be mentioned that these early sawmills operated quite differently from later circular sawmills. The saw blade used was straight and very similar to the pit saw, somewhat resembling the hand-operated crosscut saw better known today. It was commonly mounted in a frame called the sash (hence the specific name "sash saw"), and worked up and down, the sash traveling in "ways," or fender posts. Other types of up-and-down saws were gang saws (with multiple blades) and the later "muley" saws. The term "up-and-down" saw is the most general in describing these various designs (Ashby 2001).

The water power devices for the typical "up-and-down" sawmill were peculiar to that type of mill. The reciprocating motion of the sash and blade was transmitted via a crank and arm (the "pitman" arm, a term carried over from the role of the sawyer in the pit during the old pit sawing days), the crank mounted to a flutter wheel. The flutter wheel was a cross between the breast and undershot wheel. It was relatively small, and water was fed to it through a gate and breast, behind which was usually a water box or penstock of at least six-foot depth, providing head pressure and velocity. It was constructed with paddles, and capable of providing around 100 strokes per minute to the saw. In an up-and-down sawmill, there were three distinct movements required for sawing. One was of course the stroke of the saw blade. Another was the advance of the log carriage into the blade on each stroke. The third was the return of the carriage and log after completion of a cut. The first two movements were accomplished by the flutter wheel. The third required, in Evans' design, a second water engine in the form of a tub wheel. The tub wheel was only engaged by the operator at the end of the sawing step, to return the carriage, so did not turn continuously. Referring to Figure 67, modified from Oliver Evans' book, the following describes the operation of an up-and-down sawmill:

A log is rolled up to the sawmill by use of the cant hook. The windlass and crank at the front of the mill are used to drag the log onto the headblocks of the log carriage, where it is secured by iron dogs. The sluice is drawn from the penstock, or water box, at the forebay, putting the flutter wheel in motion. The crank attached to the shaft of the flutter wheel then causes the pitman arm to move the saw blade up and down in the fender posts.

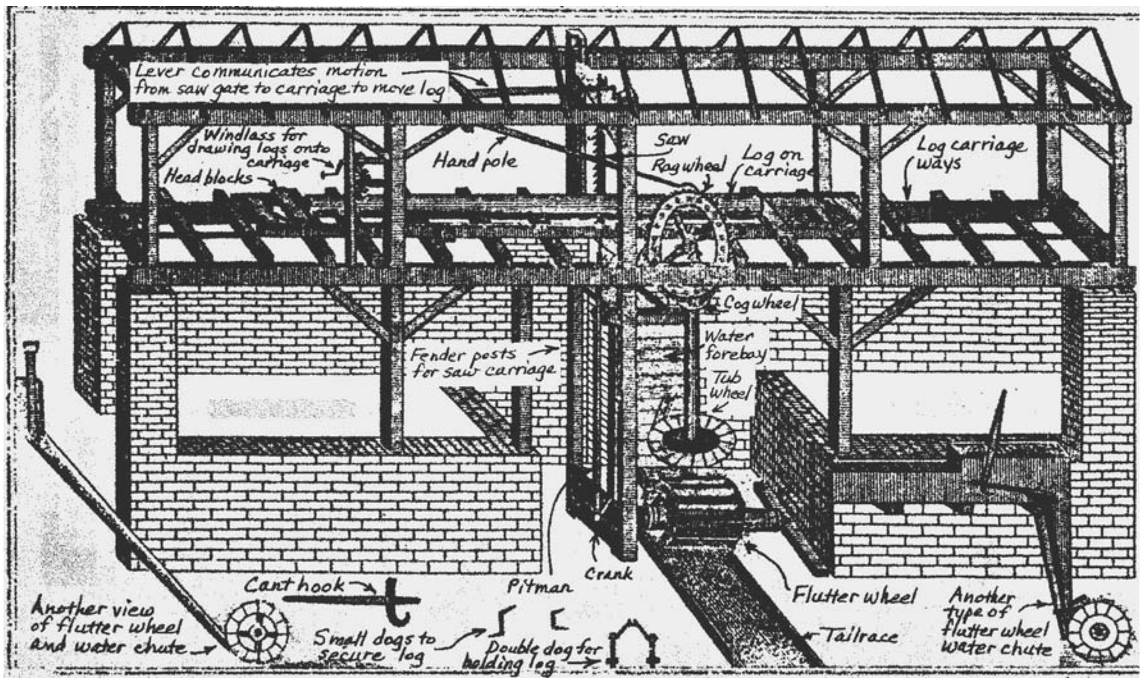


Figure 67. The up-and-down sawmill design of Oliver Evans.

As the blade carriage moves up and down, it communicates motion through the lever and hand pole to the rag wheel. The iron hand on the end of the hand pole pushes the rag wheel forward cog by cog, which in turn advances the log carriage on its ways for each stroke of the saw. The saw only cuts on the down stroke. The up stroke allows the log to move forward slightly for the next down stroke. When the blade is nearly to the end of the log, a trigger is thrown (not shown), causing the sluice gate to drop automatically and the saw to cease operation. Immediately the saw miller draws water onto the tub wheel, which gently runs the log and carriage back for the next cut.

It is worth mentioning that not all up-and-down sawmills operated exactly this way. Some later ones were powered entirely by one water turbine or a steam engine (Figure

68). Others of a later design eliminated the sash altogether and employed mostly metal parts. These represented the type known as “muley” saw (Ashby 2001).

Unfortunately, out of the hundreds of up-and-down sawmills operating in Tennessee prior to 1850, none remain. In fact, there are fewer than 20 known to survive nationwide. The system was very slow, and when circular saws became available shortly before the Civil War, they rapidly replaced this method. In addition, an advantage of later designs was portability. They could be operated by steam engines that could be moved from site to site to minimize the difficult task of transporting logs to the mill. The water powered up-and-down sawmill was of course locked into one location.

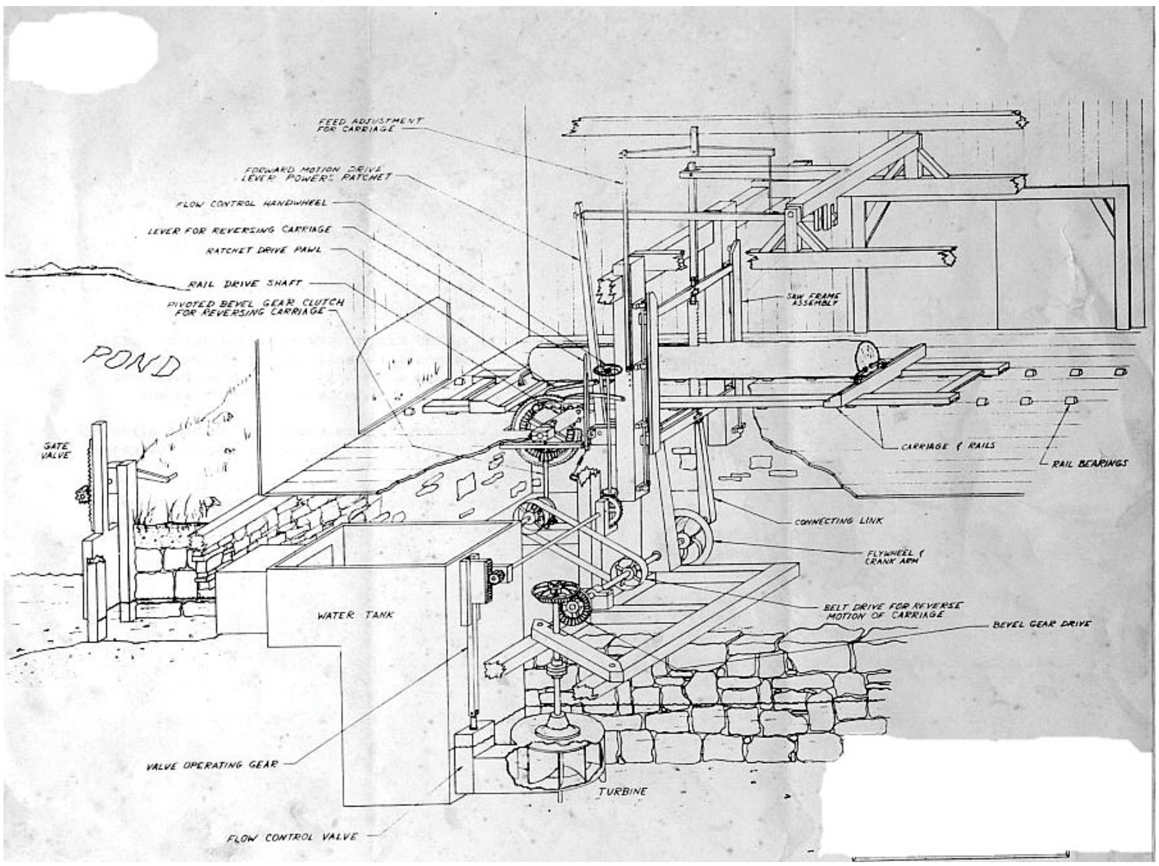


Figure 68. Ledyard up-and-down sawmill powered by turbine, Ledyard, Connecticut.

Textile Beginnings. Also appearing in a few early mills in the state was textile machinery, usually in the form of wool carding machines. During early settlement, most clothing was made at home by hand methods. Wool and flax, and later cotton, were used for this purpose. Taking wool as an example, the sheep were first sheared and the wool washed and hand picked to remove burrs and trash. Then it was carded. Carding was a combing process performed commonly by children using a pair of paddles with curved steel teeth. By placing clumps of wool on the paddles and combing it with the teeth opposed (but not touching), the wool fibers were disentangled and oriented longitudinally so they could be spun into yarn or thread (Figure 69). The resulting wool rolls were removed from the combs and readied for the spinning wheel (Figure 70). The wheel was either a treadle type of European design (for flax or wool) or a “walking” wheel, associated with colonial America and having the distinctive large hand-turned wheel and spike-like spindle. Spun wool was then wound onto a reel (Figure 71) or a weasel, then

Figure 69. Hand carding cotton.

Figure 70. Treadle spinning wheel.

transferred to the warping frame (Figure 72). This consisted of a rectangular wooden framework with pegs, allowing multiple strands of yarn to be led back and forth around the pegs until the desired length was obtained for weaving. The whole bundle of multiple threads was then carefully knotted to prevent tangling and transferred to the hand loom. It was attached to a large beam (the warp beam) at the rear of the loom, then threaded individually through the string heddle eyes, in the pattern in which it would be woven. Then the shuttle was loaded with a bobbin of yarn, and by treadling the loom in a certain sequence and passing the shuttle back and forth, woven cloth was produced (Figure 73).

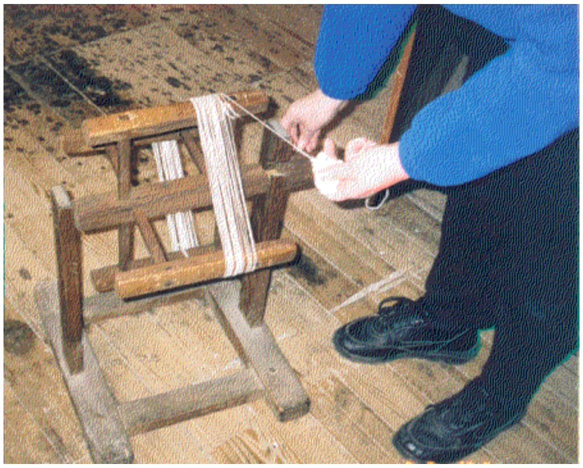


Figure 71. Winding the yarn on the reel.

Figure 72. Measuring yarn for the warp.

Figure 73. Using a hand loom to weave cloth.

The most time-consuming portion of this process was carding, so it was natural that this was the first to be mechanized. This occurred in England during the Industrial Revolution, and manufactured carding machines were in use by the 1760's. Export of these and other textile equipment and knowledge to the colonies was forbidden by England, to force purchase of English goods. However, the technology surreptitiously found its way over, so by the time of the 1820 Census of Manufactures, there were several carding machines operating in Tennessee mills. Carding was usually a sideline to milling grain, because it was typically done in the spring after the sheep shearing. Again it was performed on a custom basis. The early carding machines were often "double" wool cards, having two main cylinders and associated rollers for the combing. The machines were mostly of wood construction, with brass bearings and a few other metal parts, including some of the cylinders. The carding cloth (consisting of leather strips with the steel teeth inserted - "filleting" was the technical term) had to be produced on specialized machines, and was expensive and difficult to attach properly to the cylinders. The only Tennessee mill with a double wool carding machine from the pioneer era is Ketner's Mill in Marion County (Figure 74). There are only two other cards of this type known to survive nationwide, although several still exist in Canada.

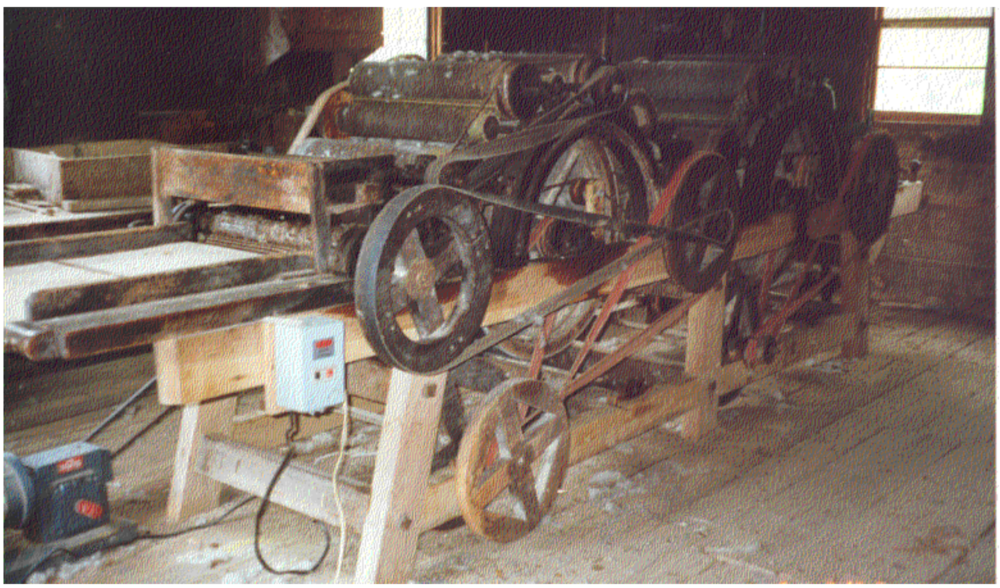


Figure 74. Early nineteenth century carding machine at Ketner's Mill in Marion County.

Spinning was the next step to be mechanized. A few Tennessee mills were spinning prior to 1830. The earliest mechanized spinning machine was the jenny, invented by an English mechanic named James Hargreaves in 1770 to spin cotton (Figure 75). This primitive machine was replaced by the spinning jack in American factories as early as the 1820's, a semi-automatic machine requiring a skilled operator and considerable floor space. The machine was eventually made entirely automatic and called the spinning mule. During the same period of mule use, ring spinners were developed and proved easier to operate and maintain, so most mills converted.

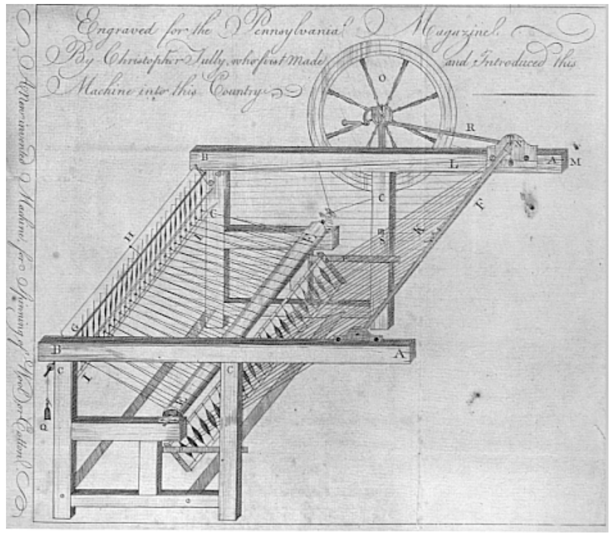


Figure 75. A spinning jenny, similar to that of James Hargreaves.

Power weaving was the last process to be performed by machines. Power looms first appeared in the United States in New England in 1815 (Figure 76), but were somewhat slow to find their way into Tennessee. Most weaving was still done at home. The 1850 Census of Manufactures lists Tennessee factories producing some cloth, but the earliest use of power looms in the state is not known. These early textile mills will be discussed later (Merrimack Valley Textile Museum 1977).

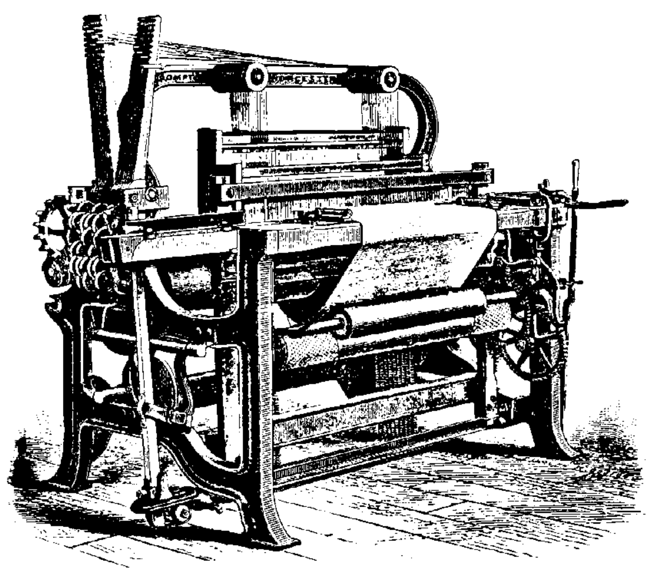


Figure 76. A Crompton power loom of 1876, capable of weaving 4 colors.

Conclusion. Grain milling, saw milling, and carding were the principal "mill-related" industries in Tennessee during the Pioneer Period. However, it should be noted that many other water, hand, and animal powered operations existed in the state between 1777-1820, notably an active iron industry. In addition, there were distilleries, tanneries, cotton gins, rope factories, wagon and buggy shops, brickyards, furniture shops, powder mills, and paper manufactories, not to mention the "individual" crafts of blacksmithing, pottery making, woodworking, etc. (1820 Tennessee Census of Manufactures).

The Pre-Civil War Period of Early Industrialization (1820 – 1860)

The 1820 Census of Manufactures for Tennessee, although incomplete, provides a glimpse of the pioneer industries of that time, including the power sources and machinery utilized, the raw materials consumed, the goods and services produced, the number of workers, and the income. Water power played a major role, and the great majority of establishments providing products for sale were powered by overshot water wheels. During the next period, however, this began to change, as two new power sources became increasingly popular – the water turbine and the steam engine.

The Water Turbine. Although primitive tub wheels had been known for hundreds of years, the design and manufacture of the practical water turbine, whose runner or wheel was fully encased, was not realized until the early nineteenth century, beginning in France with the efforts of Koechlin, Fourneyron, and Jonval. This type turbine was introduced into the United States by Ellwood Morris of Pennsylvania about 1842 (Hunter 1979), so "modern" water turbines were not associated with the settlement or Pioneer Period in Tennessee (1777-1820). The turbine in its later form was perfected and popularized by Uriah Boyden, who in 1844 designed a 75-horsepower unit for a textile mill in Lowell, Massachusetts. Through the efforts of Boyden and James B. Francis (1849), the French Fourneyron turbine became the leading type of water wheel in use in New England for many years. Francis later produced his own design that still bears his name, and after 1855 several inventors patented slight modifications. These included Swain, Leffel, and McCormick, to mention only a few.

Turbines superceded water wheels for manufacturing purposes by 1870. As turbine manufacturers emerged to take advantage of the new technology, it became evident that turbines had some distinct advantages over water wheels. Turbines took up less space and were easier to install. They ran submerged and could be designed for great variations in head of water (16 inches to over 600 feet) and flow, so could be built for much greater capacities than water wheels. The fall of water means the natural fall or drop in the course of a stream. The head is the vertical distance between the surface of the water at the dam down to the surface of the water where the wheel or turbine is located (Leffel n.d.). A turbine could continue to run efficiently (normally a maximum of about 82%) under changes in head. Because of its relatively high speed, it could often be used without the gearing and loss of power associated with water wheels. Turbines were also less affected by ice (Mead 1915). Possibly the major appeal was the lower cost of the turbine, especially compared to a large metal water wheel (Reynolds 1983).

It is not known when the earliest turbine was installed in a Tennessee mill, but an early and primitive example survives at Ketner's Mill in Marion County (Figure 77). Clyde Ketner, a fourth-generation miller and millwright, stated before his death that this turbine operated at Ketner's Mill prior to the Civil War and possibly as early as the 1850's. It should be noted that, in archaeological excavations at Brainerd Mission Mill near Chattanooga in 1978-79, a primitive "turbine" was discovered. Its design more closely resembled a tub wheel than a "modern" turbine, but the vanes were forged iron imbedded into a heavy (vertical) wooden shaft and it was believed to have run submerged (Figure 78). If this was true, it was more closely akin to a turbine than a tub wheel. This device was believed to date to the early 1820's (Lautzenheiser 1986).

With the turbine a wider range of water power sites could be developed. For example, a site having low head but considerable flow was a poor location for an overshot wheel, but perfectly suited for a turbine. Typically, a dam was constructed with a gating system at one end, where water could be channeled into a water box called the penstock. The early penstocks were constructed of heavy wooden timbers. They had to be two-tiered. The turbine sat on the upper floor and discharged through a draft tube into the lower chamber, where it emerged through the tailrace into the creek (Figure 79).

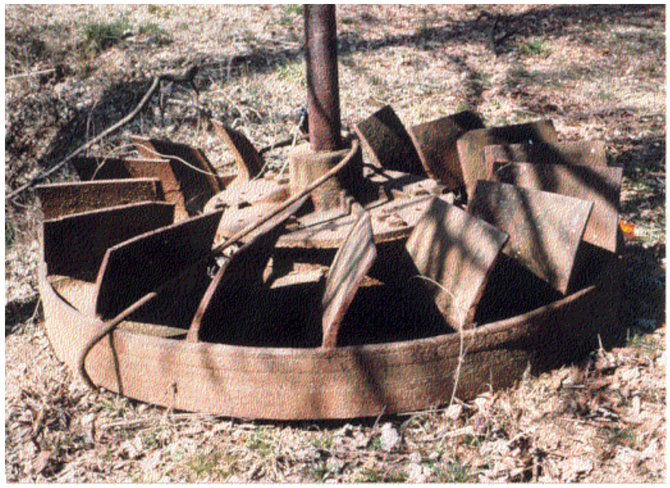


Figure 77. The large pre-Civil War turbine at Ketner's Mill in Marion County.

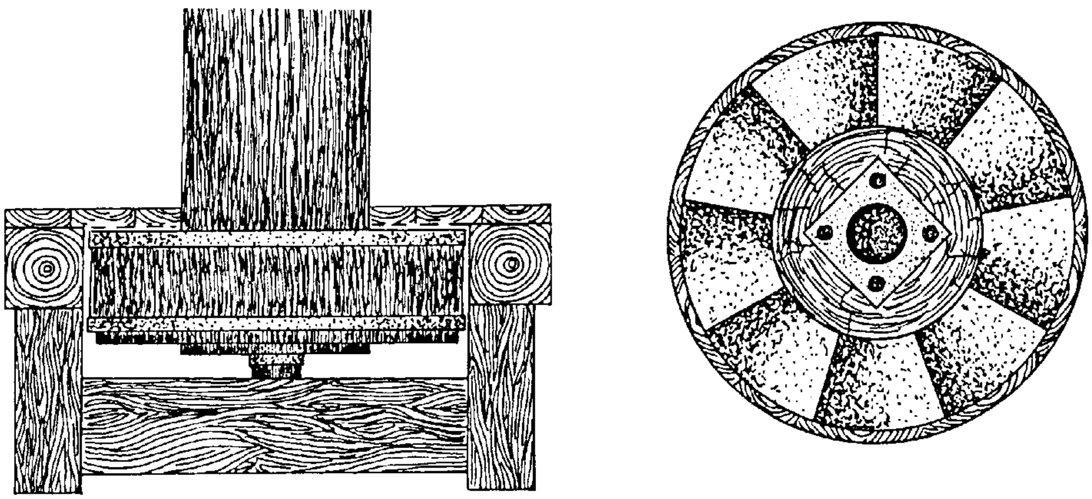


Figure 78. Artist's reconstruction of the Brainerd Mission Mill turbine.

The penstock could also be built of stone, and was later almost exclusively constructed of concrete. The turbine and penstock could be located either outside or under the mill structure. Power was normally transmitted via a vertical shaft from the turbine to a large bevel gear. This gear meshed with a second gear at right angles to it, and entered the mill or basement horizontally (Figure 80). One of the gears usually had wooden cogs or teeth, causing the gears to run quietly. It was fairly easy to replace the teeth as they wore, rather than having to replace entire cast iron gears. Pulleys were attached to this main horizontal line shaft, from which flat belts ran to power other jackshafts and machinery.

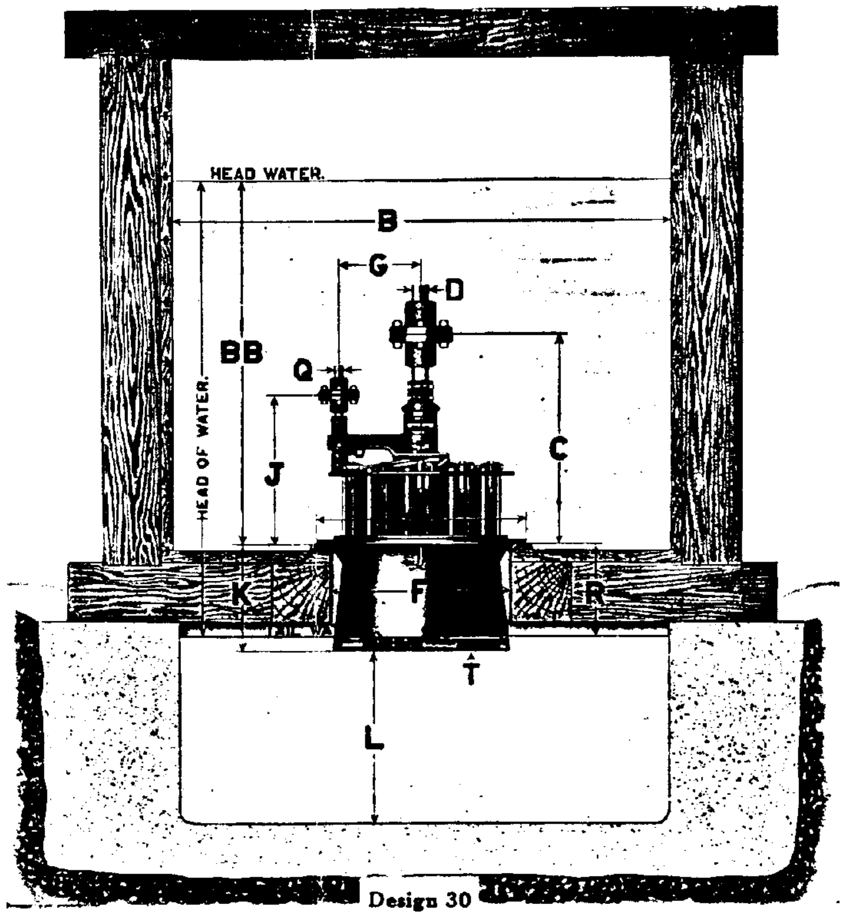


Figure 79. A Leffel turbine showing penstock, or water box, and tailrace.

When ready to operate, water was admitted into the penstock from the headgate at the dam, and rose to the pond level. The turbine was supplied with a means of admitting water into its runner (the portion inside the casing that turned) via a linkage to the inside of the mill. Three designs were patented for the common style of turbine known as the reaction wheel. In the cylinder gate, an entire outer case was lifted by rack and pinion gears attached to the top of the turbine (Figure 81), thereby allowing water to flow through slots in the casing and strike the runner blades (there were other less common modifications). The register gate system rotated the cylinder instead of lifting it, and there were register holes in this outer casing that lined up with those that admitted water to the

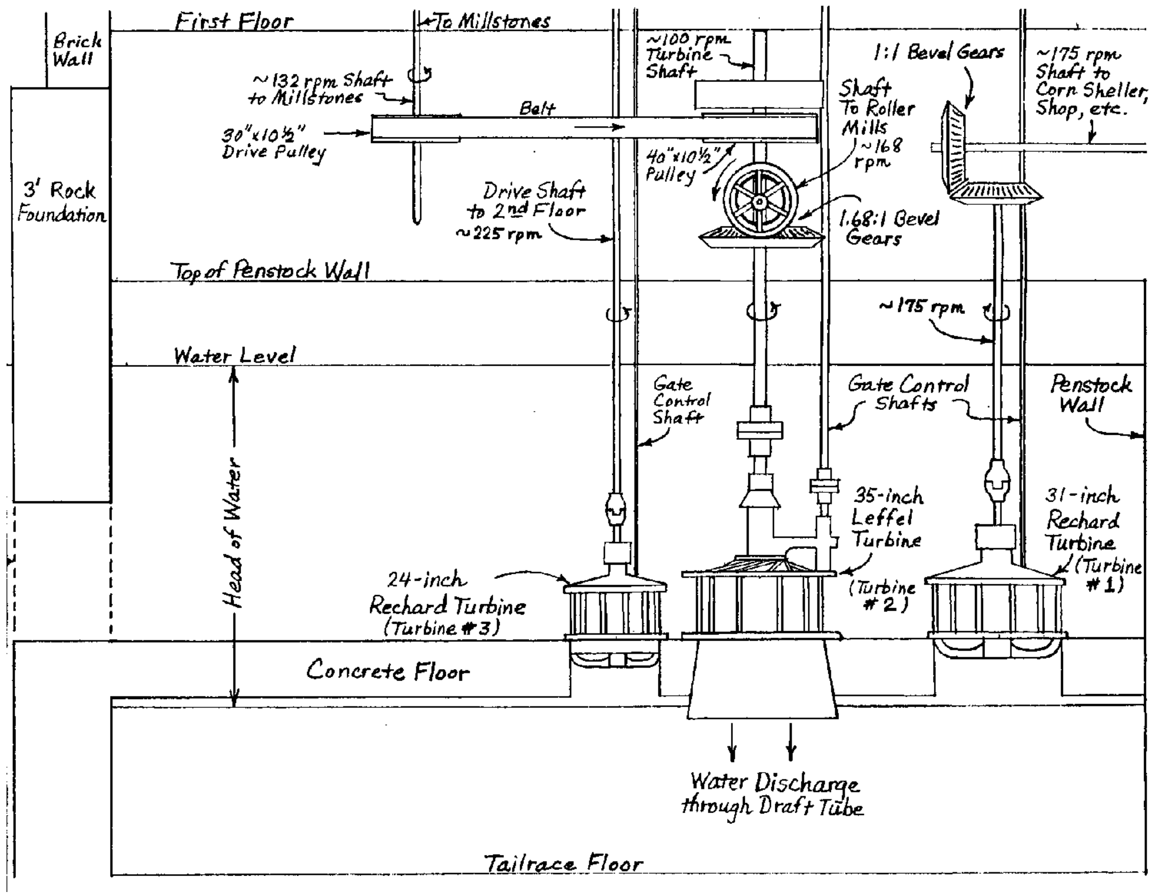


Figure 80. A typical three-turbine installation showing bevel gears, line shafts, belts, and pulleys for driving mill machinery. This is actually from Freeman Mill in North Carolina, but is representative of many Tennessee turbine powered mills.

runner (Figure 82). The third design was the wicket gate, used by James Leffel and Company of Springfield, Ohio, the largest and longest-lived manufacturer of water turbines. In this design, swivel gates around the perimeter of the turbine casing are attached to rods on top of the casing, the opposite ends of these rods being attached to an iron ring around the center shaft. By rotating the ring, pins would engage and pull the rods, thereby opening or closing the gates and admitting more or less water to the runner. These turbines are the easiest to recognize, since the top rod configuration gives the appearance of a spider or octopus (Figure 83).

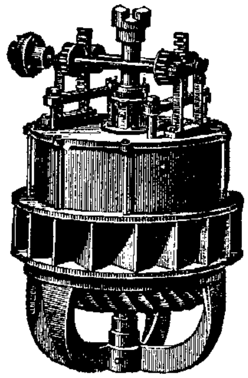


Figure 81. Turbine with cylinder gate.

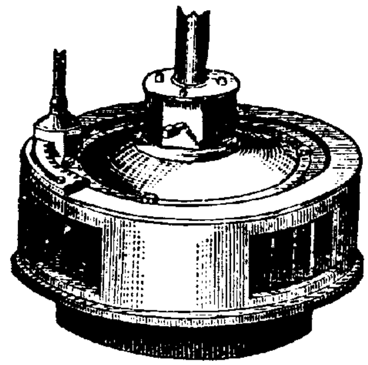


Figure 82. Turbine with register gate.

The speed and power of the turbine could be controlled to an extent by the amount of gate opening, much like the old water wheel. As heavy milling machinery was engaged, the turbine would slow down a bit, so the operator compensated by opening the gates slightly until stability was reached. It was not long before companies like Woodward began manufacturing turbine governors which utilized flyballs and complicated mechanisms to keep the turbine speed constant (Figure 84). This became especially important in later years in hydroelectric installations.

The principal disadvantages of turbines over water wheels were debris and cavitation. The turbines would suck in any kind of trash that came through the penstock, including

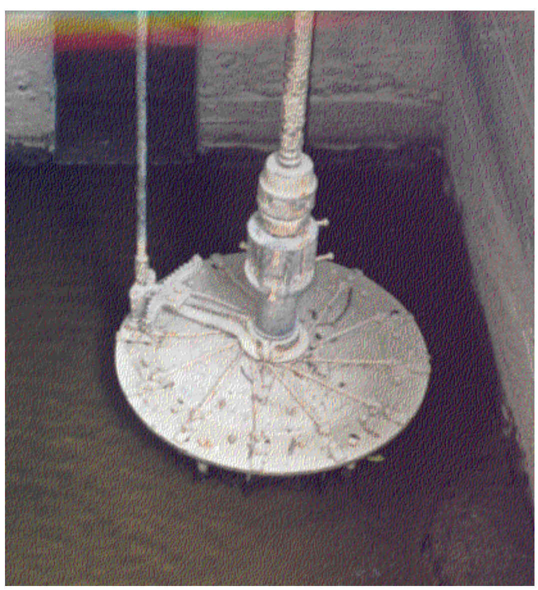


Figure 83. A pre-1913 Leffel turbine with wicket gate design, showing link rods to gates and gate control rod going upward into mill, also drive shaft and upper bearing case.

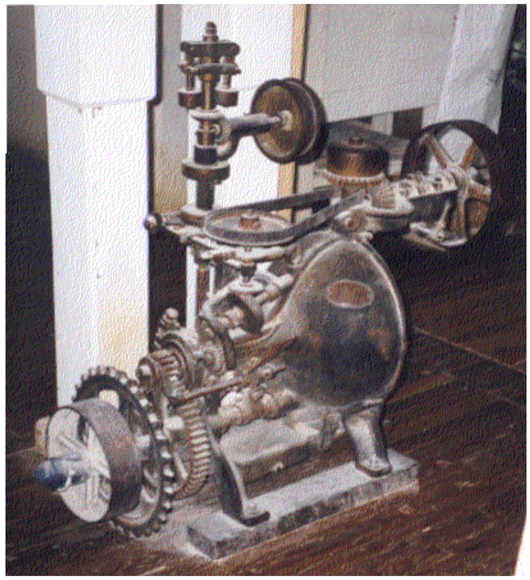


Figure 84. A 1923 Woodward mechanical (flyball) water turbine speed governor.

sticks, rocks, sand, snakes, fish, and walnuts. These were of no matter to the water wheel - they would simply enter a bucket and be dumped out at the bottom. But more than one old turbine miller had a tale to tell of the catfish that stopped his turbine or twisted off its shaft. To reduce this possibility, most mill owners installed trash racks ahead of the headgate. The trash rack was usually constructed of vertical wooden slats spaced about one-half to one inch apart, and battered or sloped upstream (Figure 85). No cross pieces were attached so that a rake could be used to clean the rack each day. This alleviated most of the debris trouble until a hole developed or the rack was destroyed by a flood-borne log. Still, the penstock had to be drained often and the turbine gates cleaned, because even a small stick lodged in a gate could keep the miller from stopping the turbine without running out to close the headgate. Cavitation was more serious. It was a result of a basic design flaw with the reaction turbine which, practically speaking, was unavoidable. The term defines an erosion of the runner blades resulting from the impact of turbulent air bubbles as the water surges through the turbine. It is not, as most believed, due to sediment. After a long period, the runner had to be replaced, and this was the most expensive portion of the turbine.

Figure 85. The turbine trash rack at Ketner's Mill in Marion County, Tennessee.

Another interesting feature of almost all turbines is the fact that they ran on wooden bearings. The lower bearing was rounded on top, and the entire weight of the runner and shaft turned on it. The bottom of the shaft was cupped to fit this bearing. The upper wooden bearing was usually made in three or four pieces at the top of the turbine, and these were fitted with adjusting bolts to take up wear. The wood used for many years was lignum vitae, a Central American wood of great density and hardness. It had a natural oil, and when kept wet, was self-lubricating. It was therefore very important to keep the turbines submerged even when not in use, to extend the life of the bearings. Turbines and bearings could sometimes run fifty years or more with basic maintenance and cleaning (Figure 86).

Still another peculiarity with turbines was the fact that they could run efficiently if located far above the tailrace level, by use of an appropriate draft tube (discharge cylinder). The draft tube was critical to the operation of the device. It was a flared tube attached to the bottom of the turbine casing below the runner. It supported the bridgetree, which held the lower lignum vitae bearing. The lower end of the draft tube had to be submerged a couple of inches into the waters of the tailrace (or a specially designed sluice) to provide a hydraulic seal. As long as this requirement was met, the turbine could actually be placed well above the tailrace without a significant loss in efficiency. Of course the draft tube had to be much longer than normally supplied from the factory.

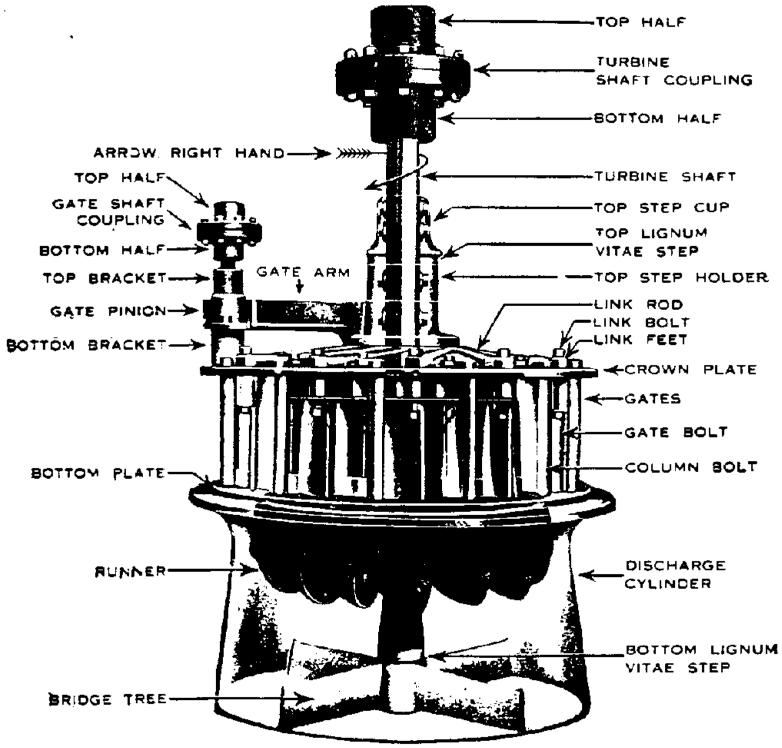


Figure 86. A Leffel turbine with all parts labeled (this is a post-1913 design).

The pre-Civil War turbines were more common in New England than in the South. In fact, in 1855 James Francis reported that the turbine had begun to replace the breast wheel in Lowell, Massachusetts, the most important water power center in the U.S. (Reynolds 1983). The primary heyday of the turbine in Tennessee was the period of Reconstruction, but its use before the Civil War cannot be neglected.

The Steam Engine. In fact, the steam engine's development preceded that of the water turbine by decades. It had been perfected in England during the first half of the eighteenth century by Thomas Savery, James Watt, Thomas Newcomen, and others. The earliest of these engines was of a type known as "beam engine," and used primarily for pumping water from mines. The more familiar reciprocating engine with flywheel came along later, and was better suited for powering mills and factories (Figure 87). Again, it is not known for certain when the first steam engine came into use in Tennessee, but six are listed in Eastin Morris' *Tennessee Gazetteer* of 1834. Four of these were powering grist and saw mills, one was running an iron rolling mill, and one was a "high-pressure" engine used for pumping water for the city of Nashville. It is interesting to note that four of the six were located in Nashville, one in Carthage (Smith County), and one in Dover (Stewart County). All these locations are on major rivers, so it is probable that the widespread use of steam engines was limited by the difficulty in transporting their heavy parts until rail lines were established, mainly in the 1850's.

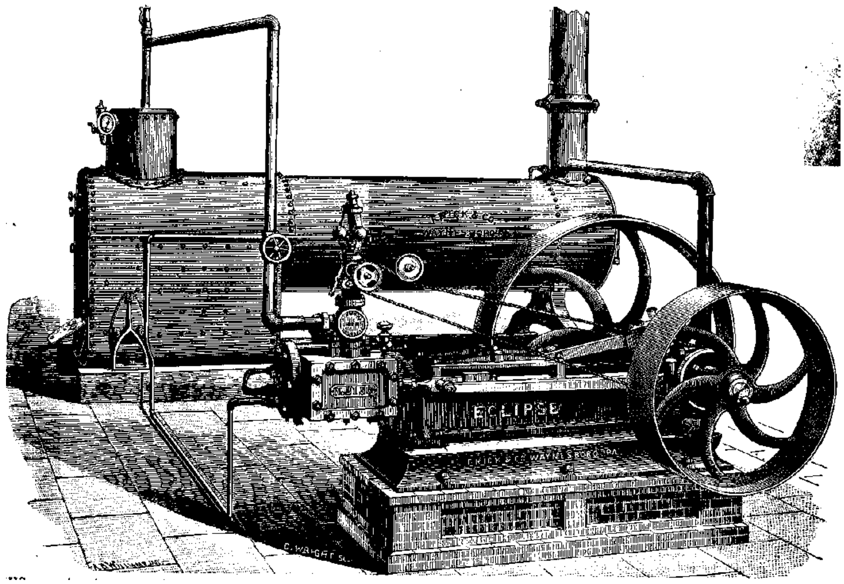


Figure 87. A typical stationary steam engine and boiler sold by the Frick Company of Waynesboro, Pennsylvania, in the second half of the nineteenth century.

Steam engines required boilers to produce the steam for operation. During the early industrial period, these were locomotive-type boilers as used on steamboats and railroad engines (again see Figure 87). Fuel was usually wood, and sometimes coal. Even though the steam engine was not limited to location as much as the water powered mill, its boiler still needed a ready water source for replenishment. It sometimes took an hour to get up enough steam to begin operation, but once going, the steam engine provided a smooth, quiet, powerful, and consistent power source. In the usual setup, the boiler room was separated from the manufacturing area due to heat and danger from explosion. Steam was piped into the cylinder of the engine, and the spent steam exhausted outside. The piston and connecting rod transferred reciprocating motion to a large rotating flywheel, which often doubled as the main drive pulley for the machinery. A large flat leather belt ran from the flywheel to a smaller pulley on the main line shaft through the building (Figure

88). Separate machines then ran from belts and pulleys along this and secondary shafts, as in the water powered factories. The trick to keeping the steam engine efficient was the maintenance of boiler pressure to the cylinder. Therefore, a fireman kept vigilance on the pressure gage and stoked the firebox accordingly. The engineer was in charge of the maintenance and operation of the engine itself.

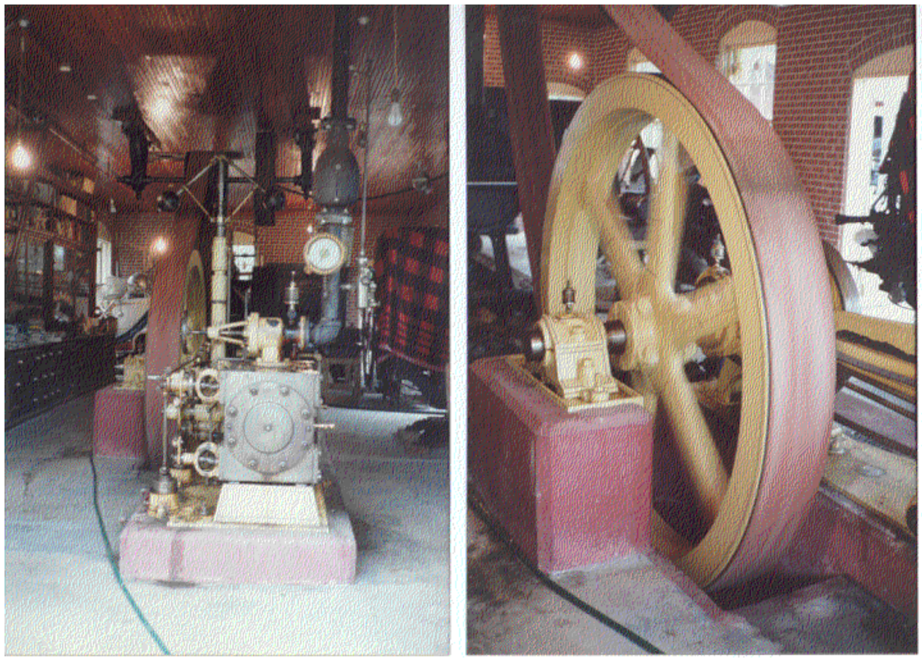


Figure 88. Two views of a restored and operating stationary steam engine, showing typical flat belt drive off the flywheel to a smaller pulley on an overhead line shaft.

The number of steam powered establishments in Tennessee in 1860 is unknown, but by 1870 the horsepower provided by steam engines almost equaled that produced by water wheels (including turbines) (Ninth Census 1872). This number continued to increase due to several reasons. As the state became more populated, milling establishments and factories necessarily grew in capacity and number to meet the demand for consumer goods. But at the same time, water power sites were diminishing, particularly those large enough to support the bigger mills. In addition, regulations governing new dam construction were becoming more restrictive (*General Assembly of Tennessee* 1857-58). As technology within the iron and machining industries improved, so better quality castings and machined parts guaranteed more reliable steam engines and boilers. And after the Civil War period, steam engines and boilers began to be combined as one unit and placed on skids or wheels for easier portability. This proved to be especially advantageous for saw milling (Figure 89).

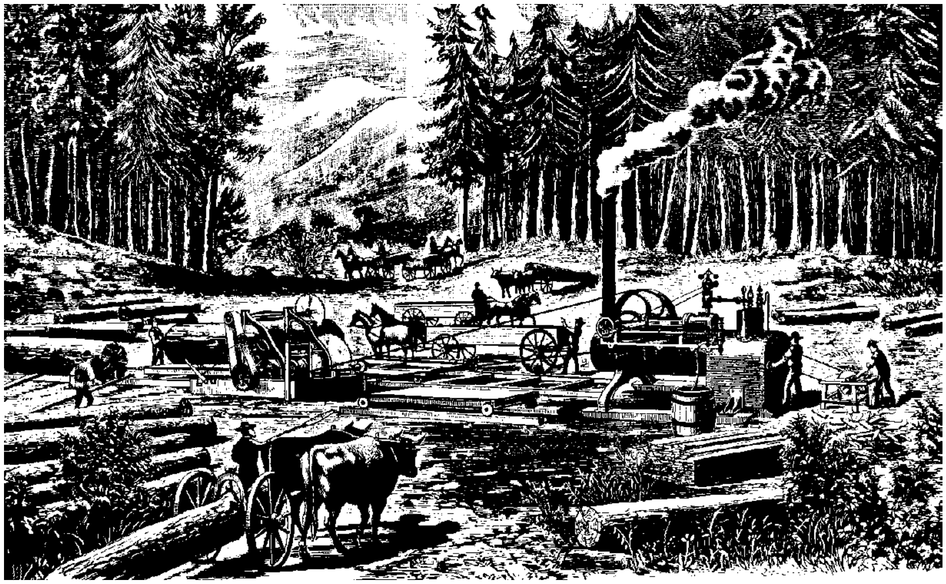


Figure 89. Portable Case sawmill and skid-mounted steam engine of 1882.

Grain Milling in the Early Industrialization Period. Between 1820 and 1860, Tennessee's population more than doubled, from 422,771 to 1,109,801 (Ninth Census 1872). Cities were expanding, and although the focus was still primarily agrarian, the number of people self-reliant was decreasing. Transportation was improving during the period also. Railroads had appeared in parts of the state in the 1840's, and by the next decade their construction was well under way. This provided the opportunity for merchant mills to increase their distribution area, and some large ones were built.

By this time, Oliver Evans' improved system of grain handling and milling had become widely accepted (Figure 90). Most mills of any size had efficient methods of unloading grain. Typically, the grain arrived by wagon or boat, and later by rail. Wagons were often built with a dump bed, and were driven to the mill and onto a wagon scale. After weighing, they dumped their loads into a bin with an inclined bottom, where the grain slid down to the bottom of an elevator (called the boot). Metal cups on a continuous belt would pick up the grain and carry it to the cleaners on an upper floor. After cleaning, the grain would be again transported by elevator and auger to storage bins above the millstones. In the smaller mills, grain was still handled in bags, usually weighing 100

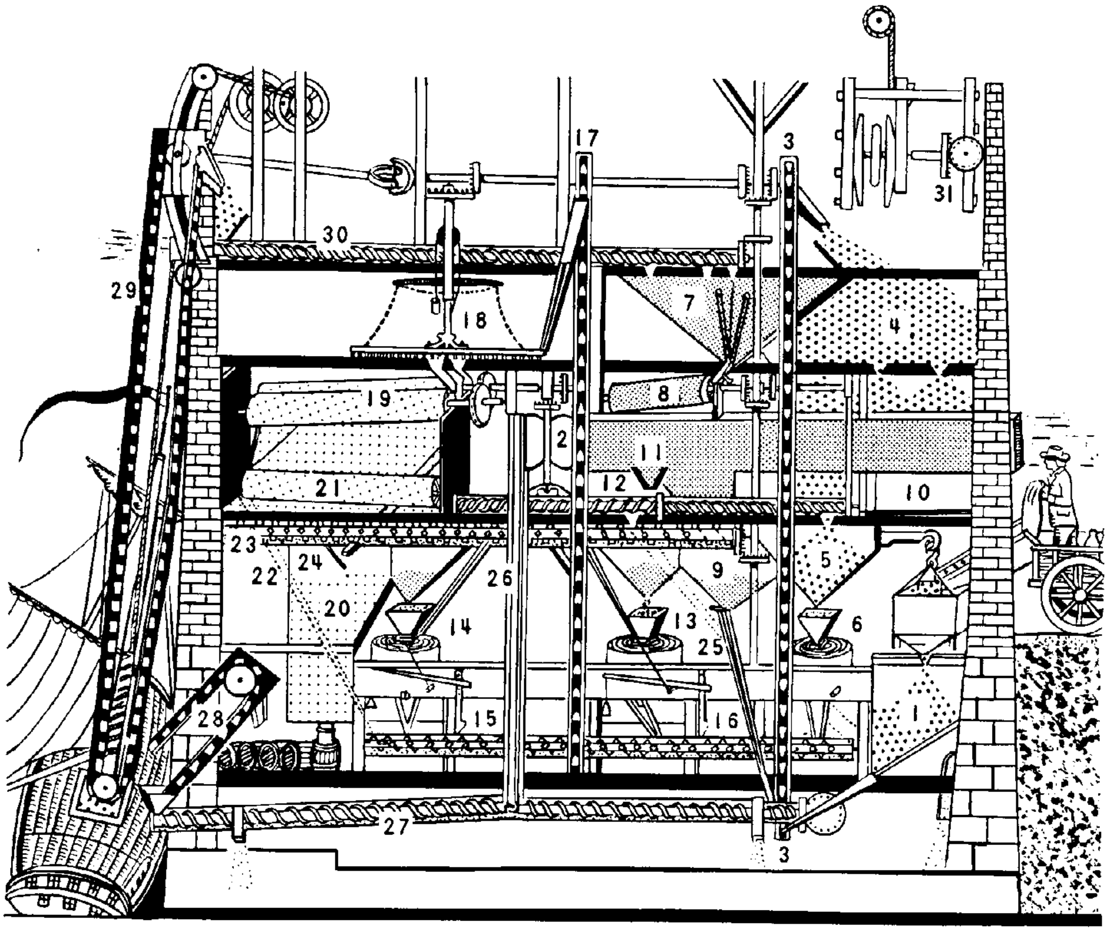


Figure 90. An Evans system mill designed by noted millwright Thomas Ellicott, to receive grain from ship (left) or wagon. Numbered items are as follows: 1: receiving bin; 2: fan for aspirating grain; 3, 17, 28, and 29: elevators; 4: grain garner; 5, 6: hopper and stones; 7: grain bin over rolling screen 8; 9, 10, 11, 12, 25: treatment of stock from rolling screen; 13, 14: grinding stones; 15, 16: conveyors for ground stock; 18: hopper-boy; 19-24: bolters, packing-chest, and middlings devices; 26: air passage; 27, 30: conveyors; 29: elevator for unloading ships, with the top shown from a 90° angle at 31.

pounds. But by this time, the elevator had for the most part eliminated the need for manually carrying the big sacks upstairs to the cleaners.

All mills during this era utilized millstones for grinding. Quarries were active, and manufacturers of stone buhr mills were increasing. Many French buhr stones continued to be imported, for many millers believed them superior for wheat grinding. However, good quality native stones of granite or conglomerate were being quarried in almost every state east of the Mississippi River, particularly in New York and Maryland. Sizes ranged from 2-foot diameter (occasionally smaller) to 6-foot diameter, depending on the preference of the customer and the power available. Sizes eventually reached some degree of standardization, although this was not universal. Typical sizes were diameters of 24, 30, 36, 42, 48, 52, 60, and 72 inches. A pair of 72-inch granite millstones might easily weigh 5,000 pounds, so since these were so difficult to lift and transport, they were rarely used. The most common sizes became the 42 and 48-inch diameters.

As discussed earlier, the accepted technique for grinding wheat during this time was known as the American, or flat-grind system (later known as Old Process), whereby the grain passed through the millstones only once (Figure 91). Because they were set to run very close, the flour emerged in a hot state with powdery endosperm and much finely broken bran. This was graham flour, or finely milled whole wheat flour. There was a desire during this time to eliminate as much of the bran as possible to produce a whiter product. This marked the beginning of a movement which has had profound nutritional effects upon the population. During the early part of the nineteenth century, research was finally being conducted to determine the effects of the components of wheat flour on digestion. It was believed that the endosperm of the wheat berry was the only digestible portion, and that the bran was an undesirable component. Whole wheat flour came to be somewhat associated with the poorer classes, whereas white flour was highly prized, nicer to look at, and easier to bake with. As a result, millers were striving to turn out the most desirable product for the consumer. But by flat grinding, they didn't realize they were destroying much of the nutritional value of the wheat and removing the valuable fiber content.

A typical pre-Civil War Tennessee merchant mill would have a set of millstones devoted to corn grinding and two or three sets (sometimes more) for wheat grinding. In the 1820 Census of Manufactures, one mill owner in Jefferson County stated that he had 11 sets of millstones, but this was unusual. Many smaller Old Process mills had only one set of stones, as in Figure 91. After the flour emerged from the stones, it was picked up by elevators and carried to one of the upper floors. Here it was cooled before it could pass through the bolters, or sifters. Cooling was done either by spreading the flour on the floor, or by use of Evans' "hopper-boy," as described earlier. When the cooled flour passed to the bolters, the bran and "shorts" were separated and sold for animal feed.

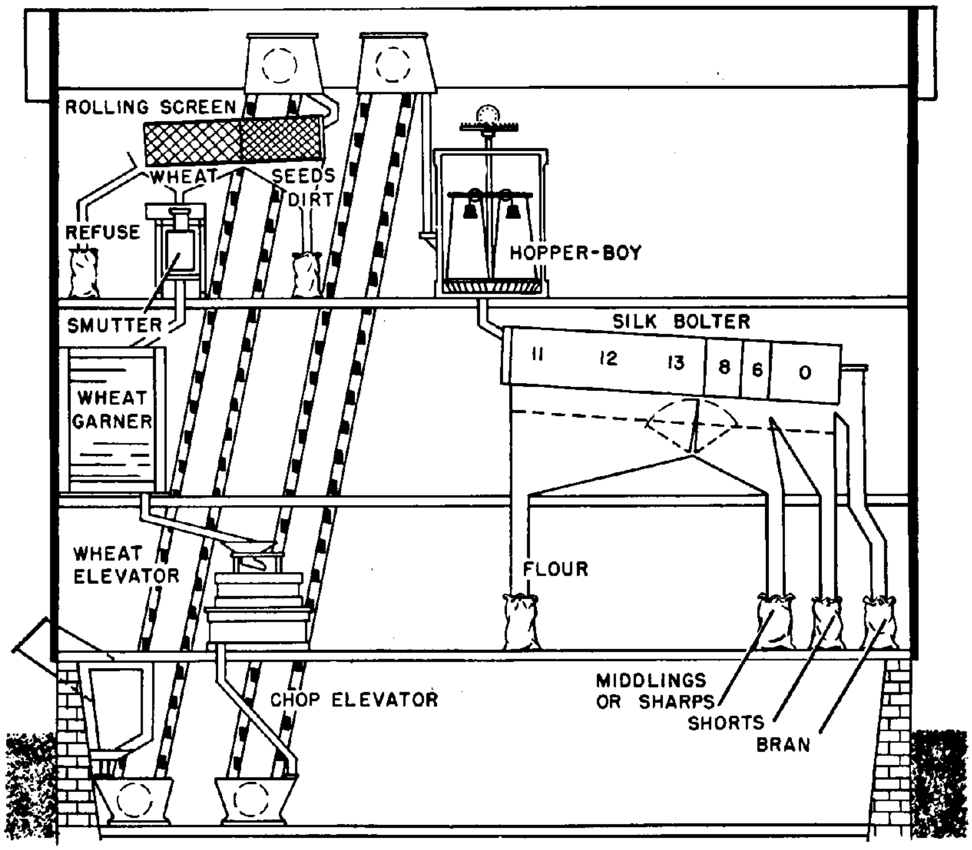
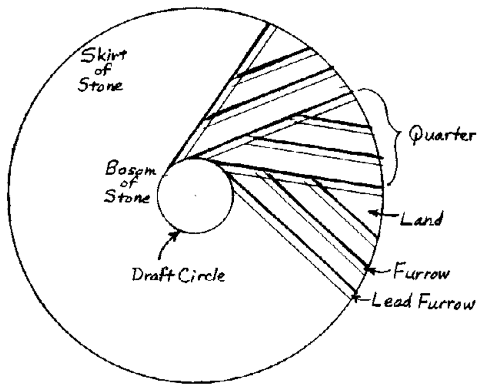


Figure 91. An early nineteenth century American or "Old Process" mill with machinery labeled. Wheat entered a basement receiving bin (left) and was transported by elevator to a rolling screen and smutter, or receiving separator, on the upper floor, where it was cleaned. It then passed into the garnering bin above the millstones. The stones were set close, and the hot flour emerging was again elevated to the hopper-boy for cooling. It then passed into a bolting reel having various grades of cloth (shown by numbers) for separation. The middlings were often reground with the next wheat batch, but shorts and bran were commonly used for animal feed.

Sometimes more than one separation of the flour was made, and the rough flour or middlings was reground on the same or a second set of millstones, but this was not common until later.

Because of the flat grinding system, millstones dulled quickly. The grinding process would remove minute amounts of the cutting surface on the lands, or flat areas of the millstones, and the flour would build up a glaze over the surfaces. For flat grinding, the lands were made as large as possible, and the furrows were narrow (Figure 92). The quality of the stones themselves determined to a large degree how long they would hold up before sharpening, or dressing, was required. As stated, many millers believed French buhr was best due to its hardness and the natural pockets in the stone, which (it was thought) stayed continually sharp as the stone face wore. It was actually the hardest rock in the world ever used for millstones, based on the Rockwell hardness scale. But some grades of granite, such as Balfour pink, were almost as hard (Meadows 1999). No matter, however, with the American grinding system, dressing stones was a frequent (sometimes weekly), tedious, and dangerous affair. If it were not performed regularly, more friction would be produced by the stones, the flour would be further heated, and more endosperm destruction would occur.



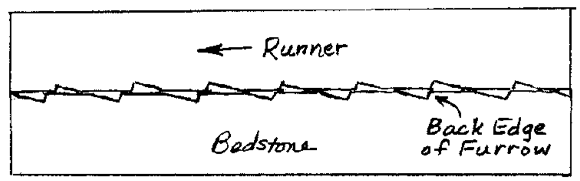


Figure 92. On left, a portion of the grinding face of a millstone furrowed with a "three-quarter dress" and designed for clockwise rotation of the runner stone, with features labeled. When the faces of both runner and bedstone are turned upright, their furrow patterns appear identical. When grinding, they are reversed. The drawing on the right represents the shearing action as the runner rotates in a clockwise direction as viewed from above.

Stone dressing was an art passed from master to apprentice, and some were able to achieve a high degree of skill. First, the upper (runner) stone had to be lifted from the bedstone and swung clear. By the early industrialization period in Tennessee, a wooden crane was almost universally used for this purpose. The crane was permanently mounted next to the stones. Sometimes each set had its own crane, sometimes one was used to service two sets of stones, by being centrally placed. The crane consisted of a vertical post which pivoted in a top and bottom plate. From the upper portion of the post, a horizontal wooden arm protruded to a point just past the center of the millstones. The arm was mortised and pegged through the post, and supported on its outer end with a diagonal brace. Most of the cranes were supplied by the millstone manufacturer and built of oak or heart (longleaf) pine. On the end of the arm and directly above the center of the stones was a hole through which an iron worm screw was inserted. The screw had a hand crank on the upper end and a hook on the lower, on which a set of iron lifting bails was hung. The bails resembled a giant set of ice tongs, and could be secured by pins into two holes, one on each side of the runner stone (Figure 93).

Figure 93. The crane, lifting screw, crank, and bails secured to the runner stone. The runner has been lifted off the bedstone, turned over, and swung clear for dressing.

To begin the lifting procedure, the wooden hopper, hopper stand, and hoop were lifted off the stones and set aside. The crane was swung around until the arm and screw were directly over the runner. Then the bail pins were inserted into the holes. Next, the crank was turned with great effort, until the runner stone was lifted clear of the drive iron which engaged it. The stone could then be turned round and round while securing the crank, thereby allowing the screw to crawl up and further lift the stone clear of the shaft. Once clear, the crane and millstone were carefully swung off the bedstone. This was probably the most dangerous part of the lifting process, and the wooden crane would typically pop and groan under the strain. It was next necessary to turn the runner stone over while suspended in the bails. If the holes were not bored in the side of the stone at the balance points, this procedure was extremely difficult and required up to four men. In most cases, with proper placement of the holes, one man could easily accomplish the task. The runner was then cranked down to the platform on which it would be dressed.

If the miller or millwright was experienced, he would dress his own stones. If not, itinerant millstone dressers traveled the countryside for this purpose. Since down time at the merchant mills translated to lost revenue, it was vital to accomplish the job as quickly as possible. Likely the dressers would begin at the end of the work day and proceed through the night, working under oil lamps, so the millstones would be ready again by the next day. With only one person working, a set of 48-inch stones might take 24 hours or more to dress, if the furrows had to be re-sharpened as well as the lands, so it is probable that crews of at least two did the work, one on each stone. Just a "freshening-up" of the lands could be done quicker. The entire process was performed with hand-held picks having chisel heads (Figure 94). These were either furrowing picks or lighter dressing picks. Furrows were laid out on the stones originally to accommodate the type of grain milled and the preferences of the miller. Various designs were in common use, including the quarter-dress (probably the most common), the straight or union dress, and the sickle dress (Figure 95). Furrows emanated from a point tangent to an imaginary "draft" circle at the center of the stone and proceeded to the outer edge (refer back to Figure 92). A rough rule of thumb was to make their depth at the edge a little less than the thickness of the grain being milled, then deepen it slightly as it moved in. Therefore, furrows for corn grinding were typically deeper than for wheat. The furrows were also inclined across their width, having a back edge and a feather edge. When the runner stone was placed back over the bedstone, these furrows resembled shears, and in fact had a shearing or slicing effect as the grain passed through (again see Figure 92). They were designed to move the grain spirally out as it was reduced by the shearing of the furrows and the grinding of the lands, or flat surfaces between the furrows. There was much debate among millers for centuries over the proper design and function of the furrows, and as milling techniques changed, so did the furrow patterns.

Figure 94. Typical mill picks for dressing stones, and the technique shown on the right.

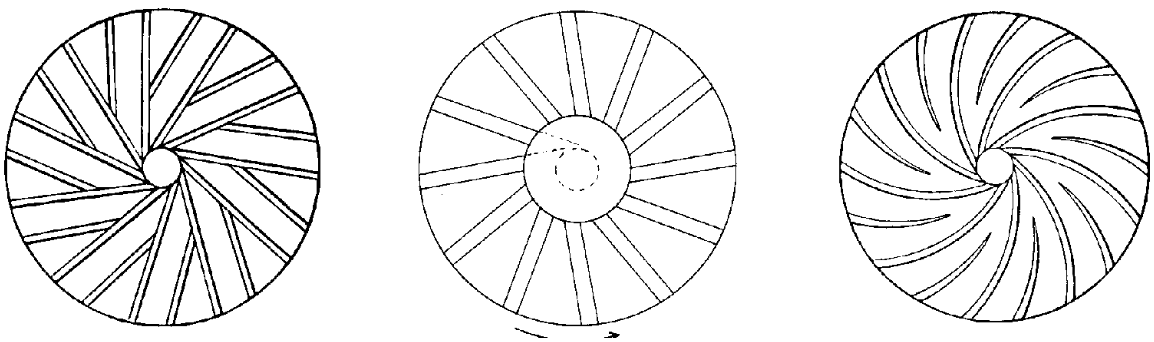


Figure 95. Three typical millstone furrow patterns, left to right: quarter dress, straight or union dress (in this case for counter-clockwise rotation), and less common sickle dress.

Normally, the furrows would not wear down as the lands, so they would only require an extensive picking about every third or fourth dressing. This was done with the heavy furrowing pick, beginning with sharp blows, then refining these as the proper width and incline were finished. The lands were pecked more gently with a lighter pick. On wheat stones, sometimes intricate cracking lines were incorporated across the lands, running parallel to the furrows. Some stone dressers were so experienced they could produce more than 50 cracking lines to the inch, and they would appear as continuous lines across the entire land, even though the head of the pick was at most 1-1/2 inches wide. In order to accomplish this intricate work, it was necessary that the picks be kept quite sharp. The harder the stone, the quicker they would dull from the blows, so it was prudent to have several heads available. They had to be re-sharpened and tempered by a knowledgeable blacksmith, or they would chip and dull in a short time. Gloves were rarely worn by stone dressers, so over a long period, steel flecks would imbed in their hands. It is said the expression “to test a man’s mettle” derived from the practice of the mill owner checking the stone dresser’s hands for metal to evaluate his experience with his craft. Another condition known as “miller’s thumb” was said to be a numbing of the thumb after many years of steel impregnation and gripping the pick. Eye protection was probably not used, either. As the picking proceeded, not only metal but pieces of stone would fly off, so the dresser’s eyes were in constant danger. Another problem with sharpening a round stone was that it was virtually impossible to find a comfortable position in which to work, particularly on the bedstone. The accepted position was to recline with one shoulder resting on a sack of bran, the face almost level with the mill pick. This was thought to afford more control over the blows. The whole process required more patience, tenacity, and skill than strength.

Periodically during the dressing, a dye or paint staff of wood was passed over the face of each stone to check for high spots. The dye staff was trued against a heavy iron proof staff, which carried a bubble and doubled as a level for the bedstone (Figure 96). Dye was powdered red oxide or chalk, sometimes mixed with water and painted onto the staff, sometimes used dry. High spots which appeared were again worked down with the pick until an even distribution of dye was obtained around the outer six inches or so of the stone’s perimeter (Figure 97). This area was called the skirt and accomplished the finish grinding. The inner portion, or bosom, was usually slightly dished or concave to allow the grain to enter more freely from the center hole and produce a gradual reduction as it moved on its spiral path outward. The finished lands would feel like coarse sandpaper to the touch, although some of the sharpness would be scoured away after the first few bushels were ground (this first grinding was discarded by the prudent miller). The stones would then settle down and grind consistently for some time, until another dressing was required. This could usually be foretold by the temperature with which the meal or flour emerged from the spout – the hotter it was, the duller were the stones.

Other requirements were necessary for a set of millstones to operate properly besides appropriate dress. First, the shaft had to be trammed, or placed in alignment with the bedstone. This was accomplished using a homemade wooden trammel, designed to slip

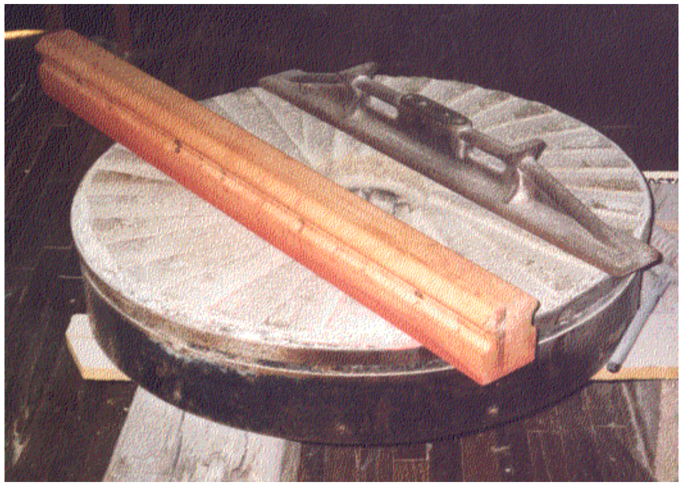


Figure 96. A 48-inch dye staff (left) and 36-inch proof staff. The lengths of these tools were determined by the diameters of the stones they were to service.

Figure 97. “Staffing” the runner stone with the dye, or paint, staff. Notice the presence of dye on the outer six inches or so of the face of the stone, which is desirable.

over the top of the shaft and rotate with it (Figure 98). At the tip of the trammel was inserted a nail or quill, which hung down and barely touched the face of the bedstone at its outer perimeter. If the shaft was “in tram,” or perfectly perpendicular to the face of the bedstone, the trammel quill would just scratch the face as the shaft was rotated slowly. If the quill rose and fell, it was necessary to go into the basement under the stones and move the bottom of the shaft. This was accomplished by wedges or, on later mills, by tramming screws which could shift the whole tram pot, bearing, and shaft slightly one way or another. The quill method was repeated until satisfactory results were obtained.

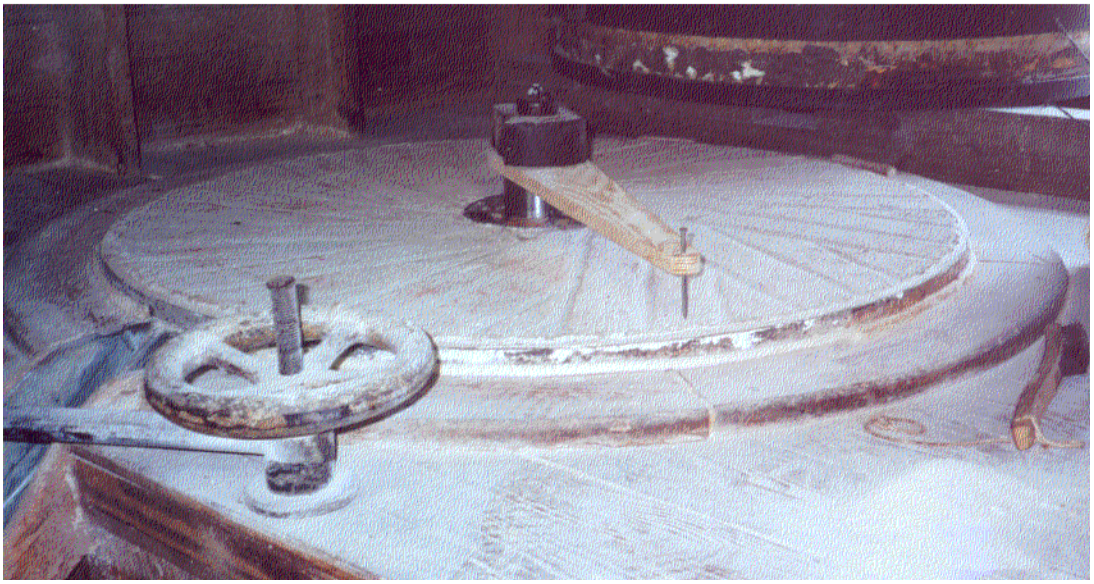


Figure 98. Tramming the bedstone, with the trammel in place over the shaft, and the nail scratching around the perimeter of the stone. The hand wheel at the lower left is used to lift or lower the runner stone, once it is set in place on the shaft.

Second, and very importantly, the runner had to be balanced. If it was not, it would rotate unevenly and bump and wear excessively. In the worst case, it could fly apart, and some millers were killed by bursting millstones. When the runner was placed back onto the shaft after dressing, the static or standing balance was checked. If the stone was lifted a quarter inch or so above the bedstone and tipped on one side, it should rock back to a level position if statically balanced. The more critical, however, was the running balance. The mill power was engaged and the runner allowed to spin slowly. By observation or the use of pencil markings, the millwright could determine if the stone was running true. If not, means were provided to balance it. Typically, only the grinding side of a millstone was finished; the other side was left rough and covered with a smooth layer of plaster. This could be gouged and molten lead or other weights placed in the hole on the light side. (In removing old plaster for restoration on some millstones, the author has found numerous buried railroad spikes, plow points, bolts, rocks, and assorted other weights employed for balancing.) On later millstones, the manufacturers provided balance pots around the edge of the runner. They were usually four in number and could be filled with weights such as lead shot and covered. In more sophisticated designs, adjustable weights which could be screwed up or down were provided (Figure 99).

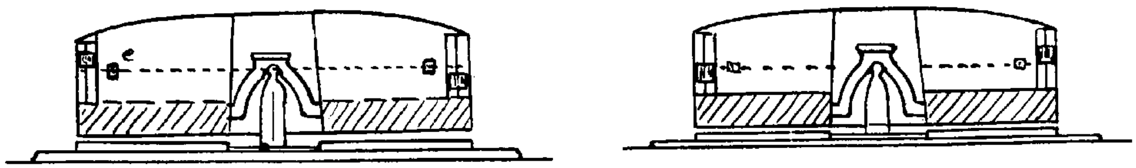


Figure 99. The runner stone on the left is out of balance, so the adjustable weights in the balance pots on the perimeter of the stone are moved to restore running balance (right).

After all adjustments were made and the runner was turning correctly, the wooden parts were reassembled. The hoop or tun, the hopper stand, the hopper, the shoe, and the damsel or rattle staff were all designed to slip, nest, or peg into place without bolts or screws. The lifting screw and bails were usually left on the crane, and its arm was rotated out of the way and left until needed again. The mill was now ready to grind (Figure 100).

Figure 100. A complete set of millstones with bags of corn standing by.

The miller would fill the hopper by hand or by releasing a sliding valve in a drop chute from an upstairs grain storage bin. The power source would be accelerated and the shoe lowered to begin dribbling the grain into the center of the stones (Figure 101). The feed was adjusted depending upon the type of grain, moisture content, and power available. As grain began to make its way from center to outer edge of the stones, the meal or flour would encounter the inside of the hoop and build up. Eventually it would begin to drop out the spout in the front of the hoop (Figure 102). Some stones were equipped with a scraper, or flat piece of metal, mounted to the iron band of the rotating runner, which helped keep the product pushed to the spout and relieved clogging. The miller would listen to the "song of the damsel" to know whether he was running at the proper speed and feed. This was the bumping of the rattle staff as its rotating lugs encountered the shoe. As the meal or flour fell from the spout, it was either collected in a bin and scooped out for bagging, or picked up by elevator and carried upstairs to be bolted. The bolted product would fall back to another bagging bin, and the bran sifted off would typically be dropped into the tailrace or collected for animal feed.

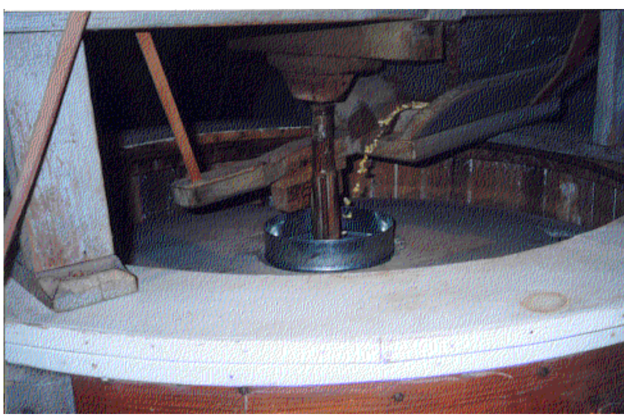


Figure 101. As the "damsel" bumps the shoe, corn is fed into the stones.

Figure 102. Meal emerges from spout. Note tentering screw and crank.

From this point, the milling became more or less automatic and continuous, until the grain supply ran low or the collection bin filled up. The miller had to be vigilant and never allow the stones to run dry and rub against one another. In some cases, their grinding surfaces could be destroyed in less than a minute, requiring the laborious task of dressing once again.

Saw Milling in the Early Industrialization Period. The up-and-down sawmill continued to be utilized throughout this period, although circular saws became known before the Civil War (the first was actually invented in 1777). An 1856 ad offered for sale a steam engine, boiler, and circular saw mill then located on the Big Harpeth River in Dickson County (*Nashville Union and American* 1856). Circular sawmills operated much faster than straight saws, so gained popularity quickly and almost completely supplanted the old up-and-down saws. Another advantage was their portability. Because of the complex mechanism required to support an up-and-down sawmill, and the usual requirement of a water source for power, they were not typically movable. Hence, logs had to be brought, sometimes with great effort, to the mill. With the development of smaller and more portable steam engines, however, a circular sawmill could be set up at the logging site, and moved as needed. Since this later type of sawmill is primarily associated with the post-Civil War period, a detailed description of its characteristics and operation will be presented in the next time period's discussion.

In addition to the rough-sawn lumber produced during this era, finishing mills continued to be erected in increasing numbers to meet the demand for planed lumber, siding, and decorative trim or moldings for residential and commercial construction. There were significant developments in machinery to meet these needs. Laborious hand planing methods were superceded by rotary planers and molding machines. Drill presses, table saws, band saws, jointers, mortising machines, cutoff saws, and many other types of specialty equipment were introduced (Figure 103).

Textile Factories of the Early Industrialization Period. Technology was rapidly developing in the textile industry, as a result of the Industrial Revolution which began in England. Numerous patents for improved machinery and devices were granted before the Civil War. Although the basic processes remained as outlined in the Pioneer Period, the means for accomplishing these tasks became more efficient and less labor intensive. For example, mechanized pickers were introduced to remove the burrs and trash from wool and cotton (Figure 104), and improvements to the cotton gin were perfected. The gin, in fact, moved from a small, slave or animal powered device to a set of machines powered by sweeps, water wheels, or steam engines. Automatic feeders for carding machines were also introduced, saving operatives the chore of constantly standing before

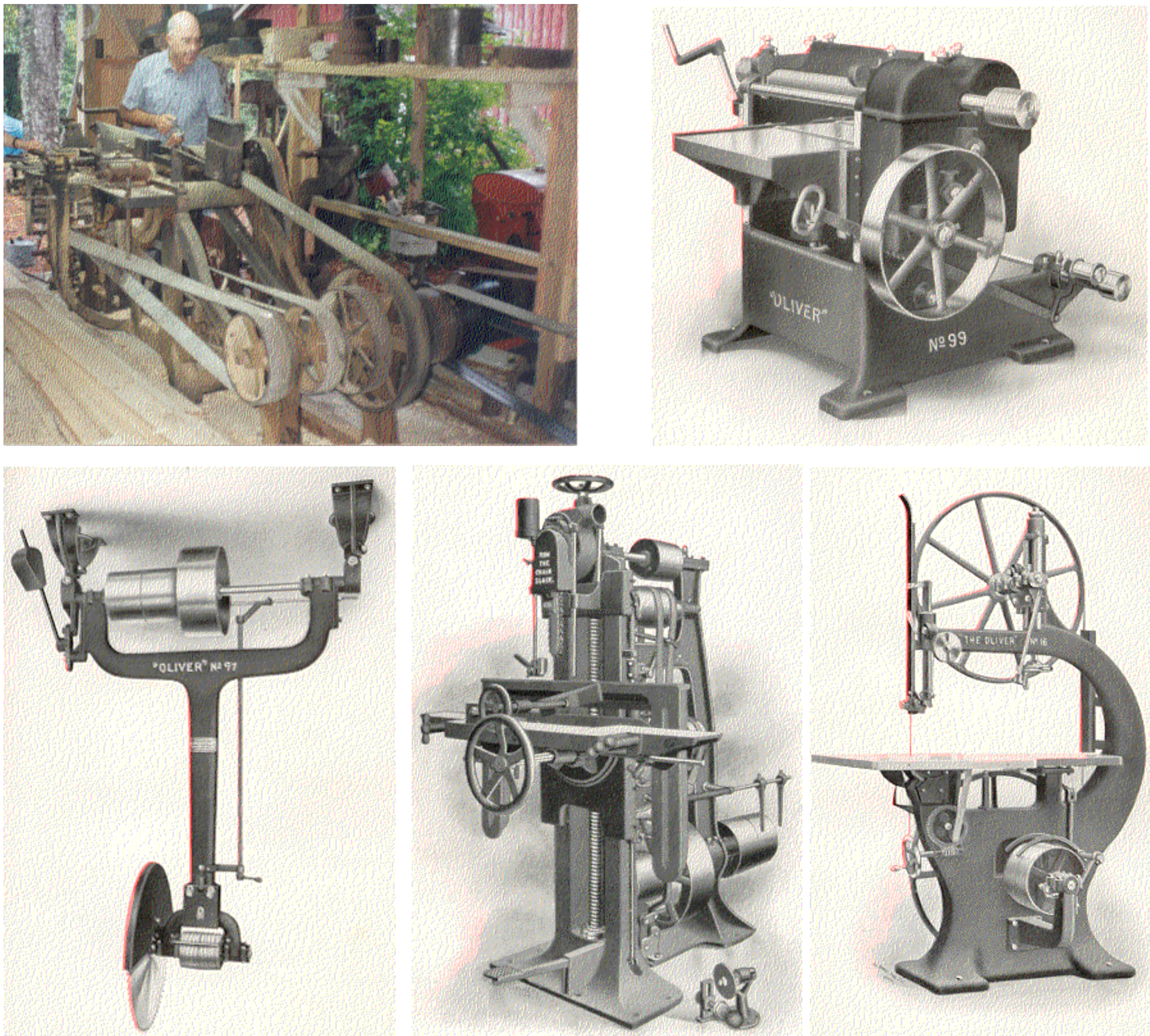


Figure 103. Flat belt driven woodworking machinery, clockwise from top left: molding machine, planer, band saw, chain mortising machine, swinging cutoff saw.

the machine to keep it supplied with wool or cotton (Figure 105). Perhaps one of the greatest advances was the perfection of the automatic spinning mule (Figure 106), which eventually supplanted the earlier semi-automatic jacks. Jacks, however, were the most prevalent spinning machines in American factories prior to the Civil War. Power looms also began to be equipped with devices that allowed greater pattern variation in weaving, including pattern chains and shuttle boxes that could accommodate multiple shuttles and thread colors (Figure 107). By 1860, the typical Tennessee textile factory employed multiple carding machines, spinning devices, and power looms. Many also had dyeing and finishing facilities. Often the structure that housed these operations was multi-storied and heavily timbered to support the great weight of the machinery. A floor was commonly devoted to each of the major steps in the textile process (carding, spinning, weaving, and finishing) (Figure 108) (*Homespun to Factory Made* 1977).

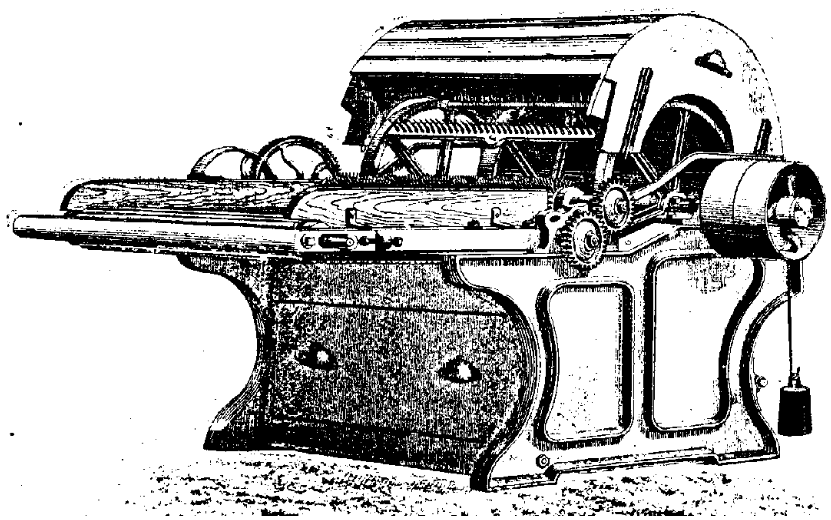


Figure 104. A typical wool picker of the mid-nineteenth century.

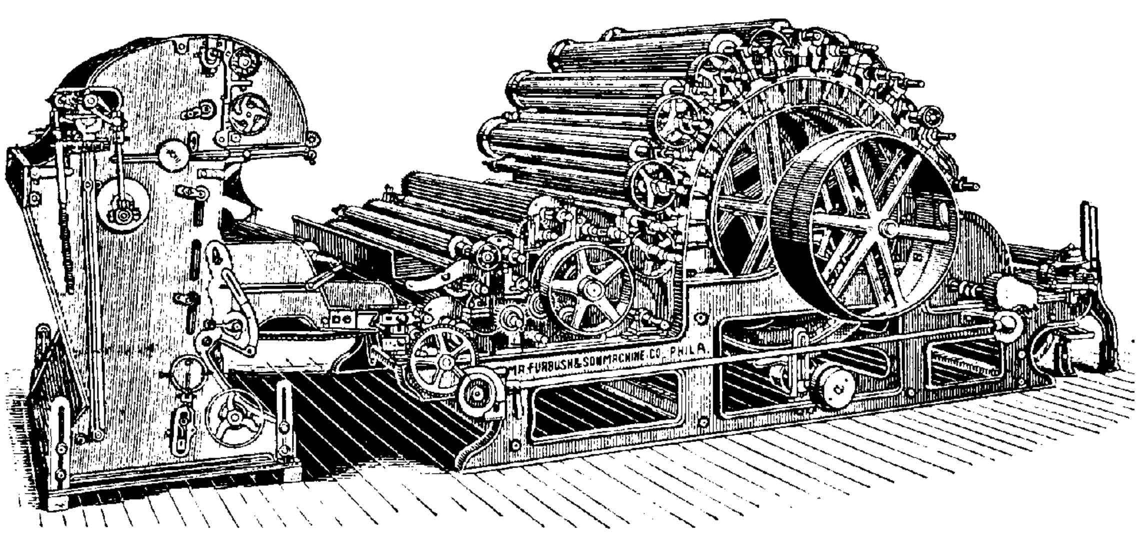


Figure 105. Automatic Bramwell wool feeder (left) for a Davis and Furber carding machine, from a catalog of circa 1897.

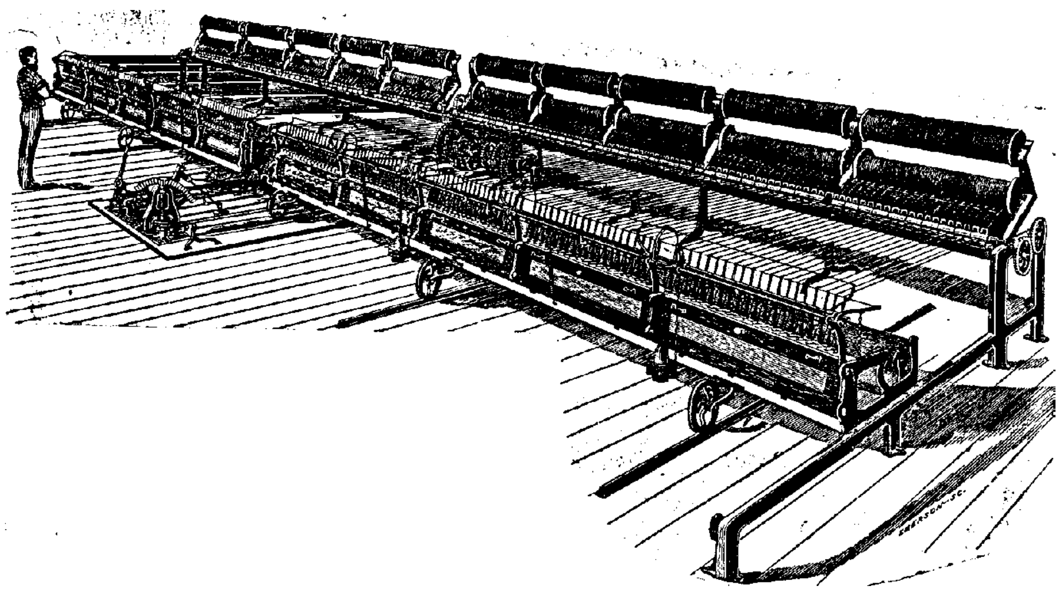


Figure 106. An 1881 Johnson and Bassett automatic spinning mule.

Some of the pre-Civil War textile mills in Tennessee produced only carded wool for home spinning and weaving, and yarns and threads of cotton. The earlier textile factory at Falls Mill was a good example. It was housed in a large timber and frame building, which survived after the present brick and timber structure was completed in 1873, being finally torn down by the owners in 1881. Many of the other textile factories in the state were destroyed during the Civil War. Evidence suggests that three in Franklin County alone were burned. Most were producing goods to support the Confederacy. Unfortunately, no examples from the pre-war period are known to survive in the state, and very few built prior to 1900 exist (1873 Falls Mill is the earliest) (Lovett 2000).

These early textile factories employed, as a rule, female and child operatives, with males as overseers in the various departments of carding, spinning, and weaving. A female's hands were smaller and more dexterous, and thereby suited for the textile process. Children were quick and could dart in and out of the spinning machines and tie up broken threads. They could also keep the machines supplied. Men were typically more knowledgeable about the mechanical aspects of the machinery, and could keep it maintained (*Homespun to Factory Made* 1977).

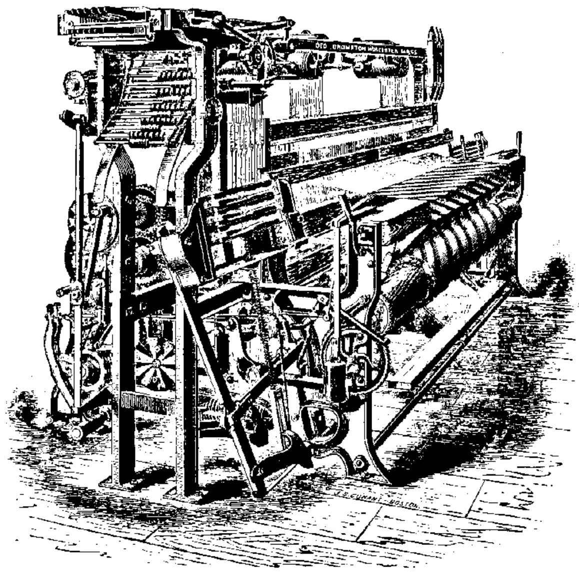


Figure 107. A fancy broad loom of the Crompton Loom Works from 1876, capable of a wide variety of weaving patterns and colors.

Work in these factories was harsh and dangerous. Noise, particularly in the power weaving area, was deafening. Lint floated in the air and was breathed constantly. The "kiss-of-death" shuttles on the power looms required the operative to suck the thread through a small hole to thread the shuttle, thereby transmitting disease, particularly tuberculosis, among workers. The spinning jacks and mules had movable carriages, sometimes over 60 feet long, behind which workers had to crawl to tie up broken threads as the machine continued to operate. But perhaps the most dangerous machine was the card. Its steel-toothed rollers were designed to pull anything into the machine that became caught, be it wool, cotton, shirt sleeves, fingers, or hands. Once started in, there was usually no stopping the machine quickly enough to save the worker's fingers or hand. In addition, these textile machines had unguarded gears and flapping belts, which provided a constant menace to the workers (*Homespun to Factory Made* 1977).

The factory systems in those early times were different than today. The factories did most of their processing for wool in the spring and summer, and for cotton in the fall. The workday was typically from sunup to sundown, about twelve hours per day, six days per week. However, the factory might not be open year-round (Lovett 2000).

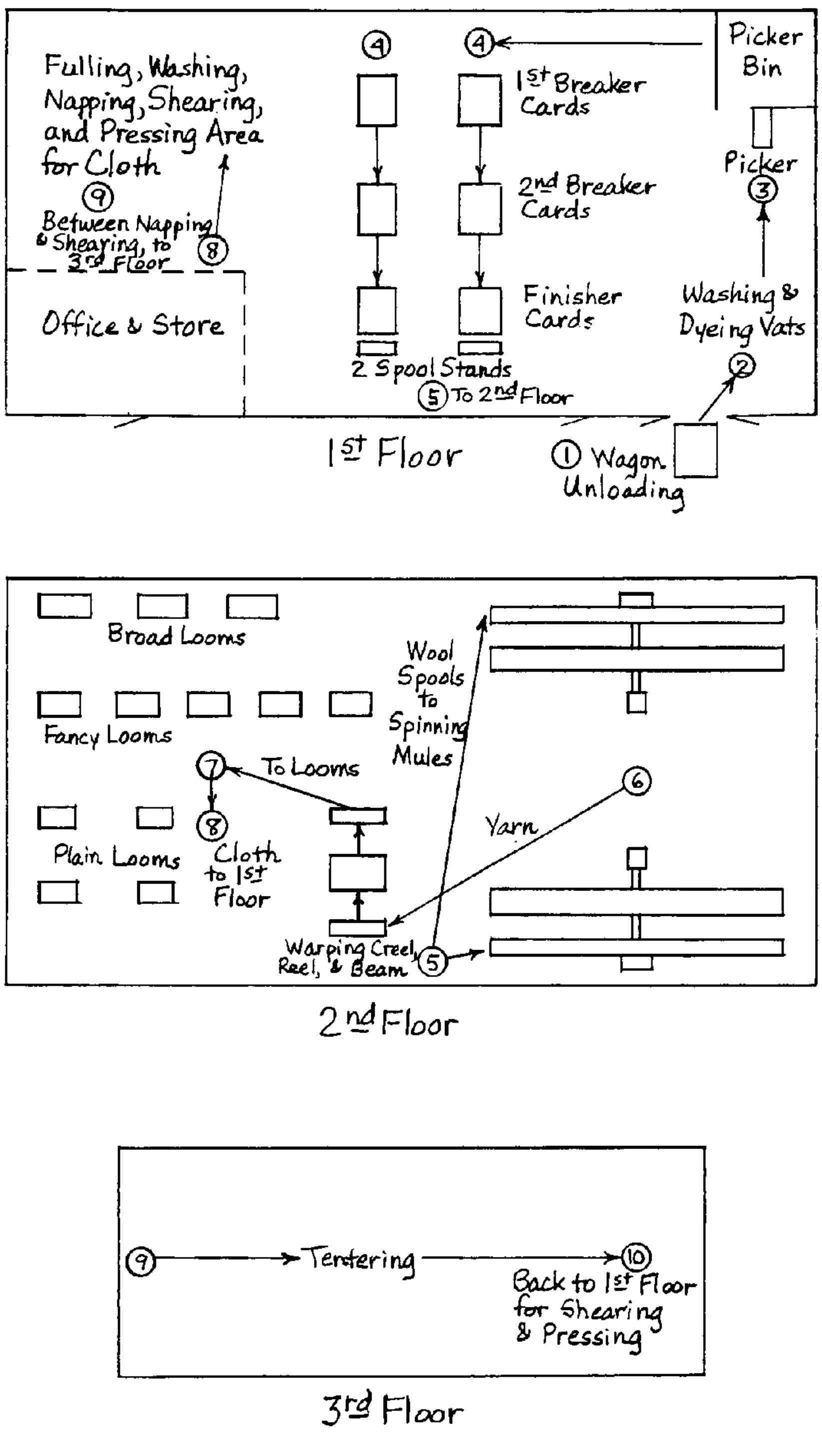


Figure 108. A representative three-story woolen textile mill, showing location of machinery and processing areas, and sequence of flow of materials.

In most cases, textile production serviced a more or less localized market, although after 1850 when many railroads came to Tennessee, shipping was faster. Prior to that time, any large-scale shipment of goods had to be by boat. For some factories located away from navigable rivers, this could only be accomplished on smaller streams in times of high water. Overland transport prior to rails was by stage or wagon, and the bulk of goods shipped was of course severely limited by the capacity of the wheeled vehicle and its horses, mules, or oxen. Travel was very slow, roads were primitive, and bridges were scarce.

Power Transmission Equipment. Virtually all manufactured machines during this time were designed for flat belt drives, since this system was almost universal in factories, mills, and shops of the period. Often the drives were equipped with two pulleys, one a “loose” or idling pulley, the other the drive pulley. While the machine was not in use, the belt could be kept running around the loose pulley, which simply spun on the drive shaft but did not power the machine. When ready to run, the operator would shift the belt to the driving pulley by a wooden shifting lever or similar device. Later, clutches with wooden friction blocks were utilized for the same purpose. More primitive systems required the operator to throw the belt on or off the pulley while the belt was in motion. It was pulled onto the running pulley by hand (Figure 109), preferably at a low idling speed, and usually pushed off with a stick. Care had to be exercised, particularly with

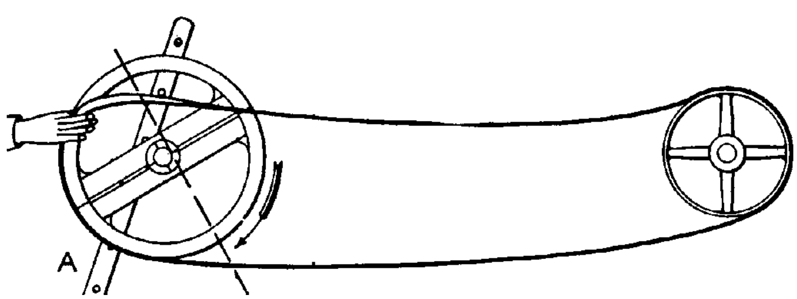


Figure 109. Pulling a flat belt onto a rotating pulley by hand.

larger belts and pulleys, to avoid pinching the fingers between the belt and pulley face, or getting caught up in the belt. Most belts used for these purposes were leather, until rubber belts became available for outdoor use. A whole technology developed around belt applications, including splicing methods (gluing or lacing), slippage, crowning, wooden versus metal pulleys, power transmitted, pulley ratios for speed requirements, idling or tensioning pulleys, quarter-turn belts, and crossed belts (Figure 110). Ingenious methods

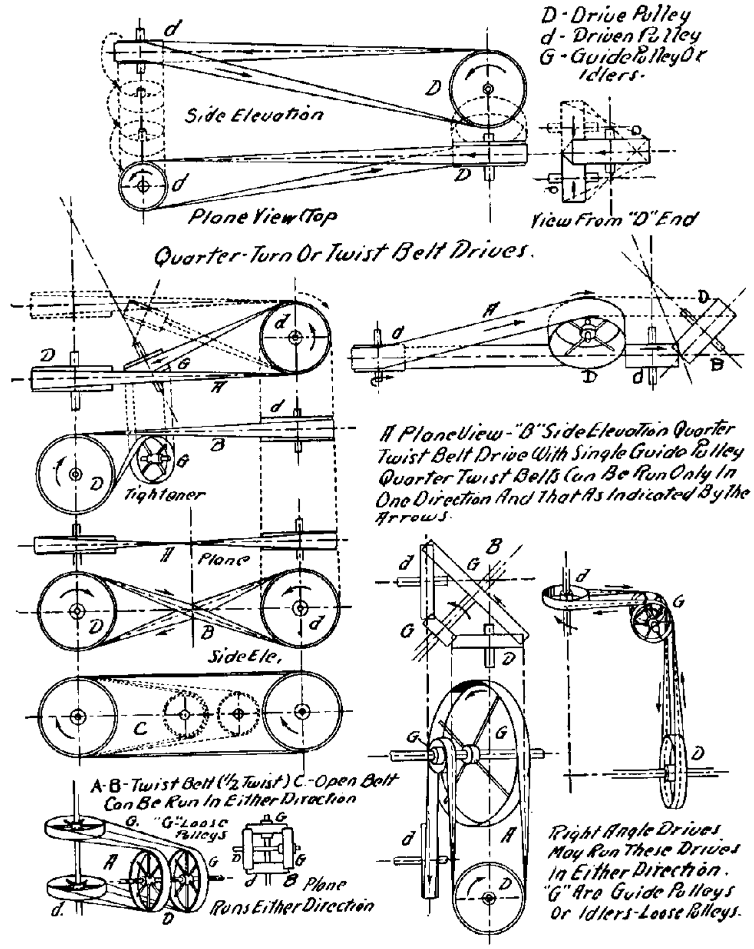


Figure 110. Various methods for transmitting power and changing planes and rotational directions of pulleys, utilizing flat belts and idling pulleys.

for running belts in situations where the planes of the pulleys changed were conceived. For example, in many water turbine mills, the drive pulley would be mounted in a horizontal plane on the top of the turbine shaft, which was normally vertical. Most of the pulleys on the machinery, however, were vertical, so a quarter-turn belt was required to run from the horizontal turbine pulley to the vertical pulley of a jackshaft. Specific requirements had to be met for positioning these two pulleys, or the belt would not track and could run off. Also, the strain on the belt had to be considered when splicing. In cases where the machine had to run in a direction opposite the main power shaft, full-turn or crossed belts were employed. Wooden pulleys, usually manufactured from laminate sections, were said to be better power transmitters than steel or cast iron pulleys. In any case, however, the pulley was crowned, or made slightly higher around the center face, to keep the belt tracking to the center. The only exception was on loose pulleys or those used to carry shifting belts (*Machinery's Handbook* 1959).

The production of leather power transmission belts was also a specialized craft. Belts had to be uniform in width and thickness, and had to be lap spliced and glued so they could be made in long lengths. Most final splicing was done in the mill, after careful measurements were taken. Stitching patterns were known for connecting belt ends, and glues were also employed. Stretching and dry cracking had to be considered, as well as which side to run next to the pulley face (the grain or hair side was recommended).

In some early mills of this period, pulleys (if used at all) were "home-made" and mounted on wooden shafts constructed similar to water wheel shafts, except on a smaller scale (Figure 111). However, as iron and steel production progressed, shafts of steel carried most pulleys in the larger mills and factories by the time of the Civil War. These shafts ran in wooden or babbitt bearings. Hard maple was used extensively for bearings (Figure 112), but as these wore, other hard, local woods such as oak, osage orange, and locust were substituted. Babbitt is a metal consisting, originally, of a mixture of tin, copper, and antimony. It pours at about 800 degrees Fahrenheit, and could be molded

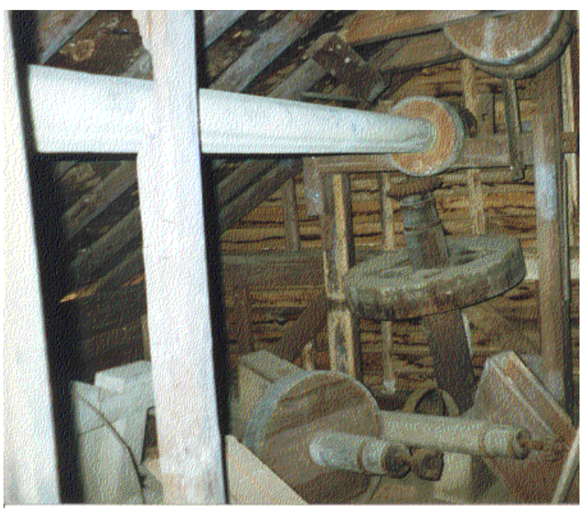


Figure 111. Wooden shafts and pulleys in a pre-Civil War mill (Selma, AL)

Figure 112. A hard maple shaft bearing, with cap removed.

around a shaft to form a long-lived and exceptional bearing surface. It could even conform to worn shafts. Most bearings of this type were two-piece cast iron, having a lower base and a removable cap. To pour the lower base, the shaft or a piece of the same diameter was positioned slightly above the base of the bearing box. Then a special clay was used to dam each end. The babbitt metal was heated to its pouring temperature and poured into the mold quickly (Figure 113). It hardened in a short time and could be scraped out and finished with oil slots. The bearing cap was then placed over the base and shimmed up slightly with wooden or metal shims, dammed as before, and poured through the top oil hole. The cap was then removed, the oil hole drilled back out, and the bearing made ready to function. It usually was supported in a ceiling or wall hanger or bracket of metal, sometimes having adjusting screws to help true the bearing up with the line shaft. As the babbitt wore, the shims were removed so the cap could be kept snug around the rotating shaft. If kept frequently lubricated, these bearings could last more than fifty years without re-pouring. Later a lower grade of lead-based babbitt became available. It could be used successfully under most conditions, except those of high speed and/or heavy weight. Most shafting was solid rolled steel, so was heavy. As standardization of sizing became common, most shafts were finished to 1/16-inch less than an even diameter. For example, what would appear to be a 2-1/2-inch diameter shaft was more often 2-7/16

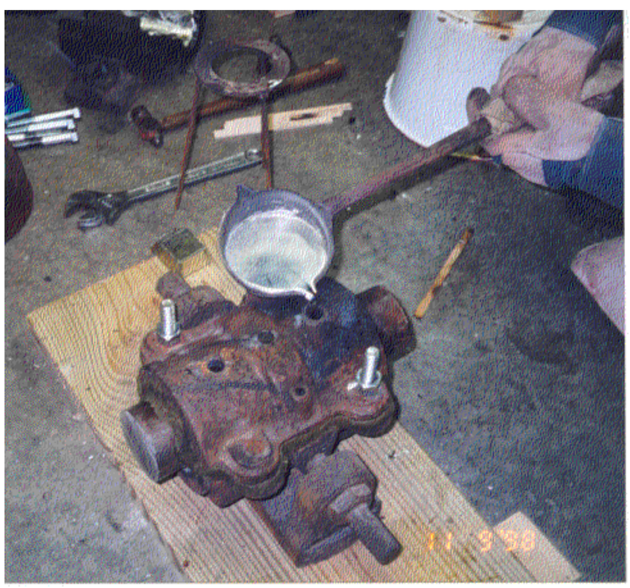


Figure 113. Pouring a babbitt bearing. The base has been poured, the cap dammed and positioned, and the molten metal is poured through one of the oil holes.

inches. Pulleys were attached to these shafts with wooden compression fittings and bolts (particularly in the case of split, or two-piece pulleys), or keys and set screws.

Rotational speeds in those days were very slow compared to today's machinery, and there were limits to which pulleys and belts were subject. For example, in Falls Mill today, the water wheel rotates at a maximum of about three revolutions per minute. A 28-foot segment gear around the perimeter of the wheel meshes with a 28-inch pinion gear, so steps the speed up about 13 times. On the other end of the pinion gear shaft is an eight-foot pulley, which belts to a two-foot pulley on the main line shaft inside the mill. This is another 4 to 1 speed increase, so now the main line shaft can rotate at about 13 x 4 = 52 times the speed of the water wheel, or around 156 revolutions per minute (rpm). Machinery belts from this main shaft and countershafts. The fastest machine in most pre-Civil War grain mills was the cleaner. Cleaners in later mills were rated at about 900 revolutions per minute on their drive shafts. Millstones turned a maximum of 200 rpm, and usually slower. Elevators ran about 40 rpm, and bolters or sifters from 20 to 50 rpm. Consequently, most of the bearing wear was due to weight and not speed. Speed in up-and-down sawmills was also slow, but circular saws ran much faster, so required superior bearings. Textile machinery was relatively slow, also. The carding machines ran about 80 rpm, the carriage of a spinning mule made 4 travels back and forth per minute, and the power looms ran about 75 picks (shuttle throws) per minute. Looms increased in speed considerably in later years.

With improved technology in casting processes, large gears could be fabricated, so some of these began to be utilized toward the end of the early industrial period (Figure 114). Many other cast parts were produced for machinery, also. The foundry process re-

Figure 114. Large bevel gears transmitting power from the turbine to mill machinery, located at Ketner's Mill in Marion County, Tennessee. The lower gear has wooden cogs.

quired the building of a wooden pattern for any cast part, usually made of white pine or mahogany (for stability). The pattern maker was a specialized craftsman. He had to fashion intricate shapes from wood, allow for metal shrinkage by oversizing the pattern, and produce a pattern which could be feasibly molded and pulled from the mold according to casting practices of the day. A foundry stored and protected its patterns as if they were gold (Figure 115) (*Machinery's Handbook* 1959).

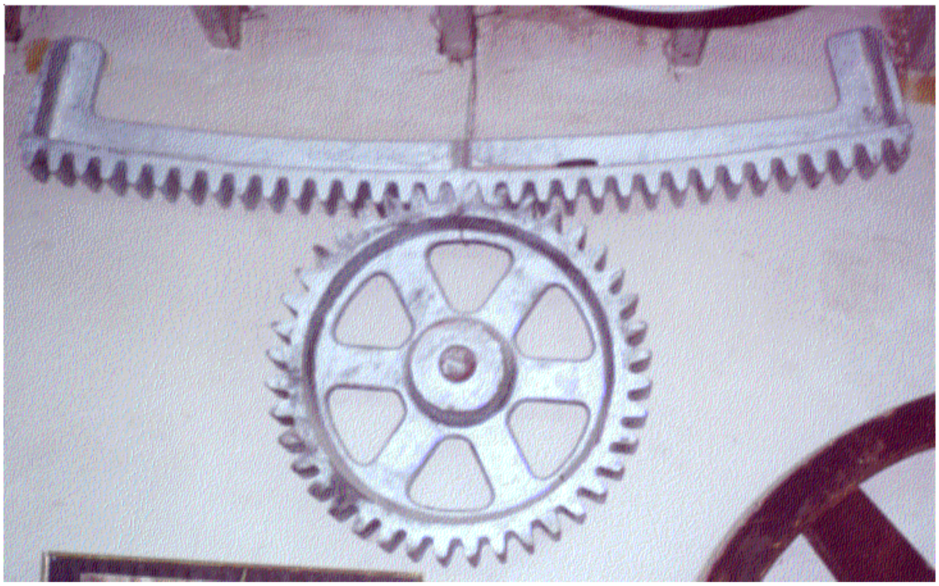


Figure 115. The segment gear and pinion patterns for the water wheel at Falls Mill in Franklin County, Tennessee.

Conclusion. By 1860, mills and factories had progressed from small-scale operations limited to water power locations and localized markets, to large structures with power source options and greater labor requirements. Milling communities had become established around many of these locations. Many aspects of manual operation, such as carrying grain sacks, feeding textile machines, and handling logs, had been mechanized to a degree. Inventions and patents were becoming more numerous, as improvements in the production of metals and interchangeable parts developed. And the population was increasing, demanding more consumer goods such as flour, lumber, and textiles. Though Tennessee's economy was still primarily agrarian, manufacturing was becoming more important. However, the Civil War destroyed much of the progress achieved to this point in Tennessee's industry.

The Late Industrial Period (1860 – 1900)

Civil War and Reconstruction. There are many accounts of the effects of the Civil War on the economy and culture of the South. Suffice it to say that Tennessee industry took a devastating blow during the conflict, from 1861 – 1865. Many businesses were destroyed by Union troops, and others were purposely burned by Confederates to keep them from being taken over. Mills and textile factories suffered widespread destruction, and it is safe to state that few large-scale manufacturers survived the war unscathed. Grain mills were targeted by Northern troops in order to "starve out" the enemy. Textile mills were burned if they were found to be supporting the Confederate cause. There are a few accounts where the structures were left alone, but the machinery was rendered unusable (see DeKalb County in Chapter 4).

The period of rebuilding was slow. Capital was in short supply, so large factories could sometimes only be constructed with "carpetbagger" funds. Falls Mill may be taken as an example. Before the Civil War, Azariah David operated a textile factory on Beans Creek in Franklin County, Tennessee, which he had purchased from an Englishman named Robinson Teasdale in 1856. About a mile from this location was Hunt's Factory, another textile mill operated by George W. Hunt with the assistance of Robert Newton Mann. The factories apparently operated independently at that time. In 1864, Union troops burned David's factory but spared Hunt's, which by this time was owned by the Criddle family. David soon became a partner with Mann, with the intention of buying out Hunt's Factory, which they accomplished in 1867. Shortly thereafter, they began plans on the present Falls Mill structure, which they completed in 1873. Due to economic conditions, marketing difficulties, and possibly internal conflict, they never prospered and were forced to sell in litigation the property in 1884. The factory operated marginally as a textile mill thereafter until around 1900, which seems to be the final (approximate) date for most of the small-scale textile operations in Tennessee. The only other textile factory to rebuild after the Civil War in Franklin County was the Butterworth Factory in Owl Hollow, and it too suffered later fires and economic collapse (Lovett 2000).

New Technologies in Grain Milling. Probably the most notable technological change during this period occurred in the flour milling arena. This industry, in the decades following 1860, became large-scale and highly mechanized, due to several developments. The most noted of these were the invention and perfection of the purifier and the roller mill process for wheat. Until that time, millers were faced with the difficulty of separating the components of the wheat berry, and the struggle was taken up in earnest during this period. As noted earlier, it was desirable in those days to separate the digestible floury endosperm from the germ and bran, with the goal of producing a purer white flour more salable and possessing better baking qualities. The purifier developed basically into a separating device having sieves and fan blowers (called aspirators) which could accomplish the desired separation. When coupled with the Hungarian or roller process for reducing flour, described earlier, large capacity milling could be achieved. Mills were rated on the amount of barrels of flour they could produce in a day. Thus, a merchant mill shipping in barrels might be a 100-barrel mill, each barrel containing the standard 196 pounds of flour (Dedrick 1924).

During the transition period from stones to rollers, large mills incorporated what came to be known as the "New Process" for flour production, utilizing three or more sets of millstones. Whereas in the Old Process, the order of the day was to grind heavy and pass the wheat only once through the stones, in the New Process the stones were set higher, and the wheat was gradually reduced through a series of grindings and separations. A typical New Process mill utilizing millstones is illustrated in Figure 116. Note the proliferation of equipment, including not only the stones and the purifier, but the requisite elevators, bolters, and cleaners.

Referring to Figure 116, the New Process operated as follows: Wheat was brought from the fields to the mill in bulk in wagons, or in bags, usually weighing 100 pounds each. The wheat had been threshed by hand or by some of the early mechanical methods. It still, however, contained some degree of field trash, foreign seeds, husks, and other material which needed to be separated. Therefore, after the wheat was unloaded into a receiving bin (1 in Figure 116), it traveled by elevator to the receiving separator (2), which had at least two shaker screens operating from an eccentric and a fan. The top screen was perforated so that any trash larger than the wheat berries would not pass through, but rather tail off the machine to a scrap bin or collecting area. The wheat would be shaken through this top screen, falling onto the lower screen. This time the holes were smaller than the wheat, so the wheat would tail off, and the seeds and particles smaller than the wheat berries would fall through as scrap. Before leaving the machine, the wheat fell through a wooden air leg, where it was subjected to a blast from the fan, removing

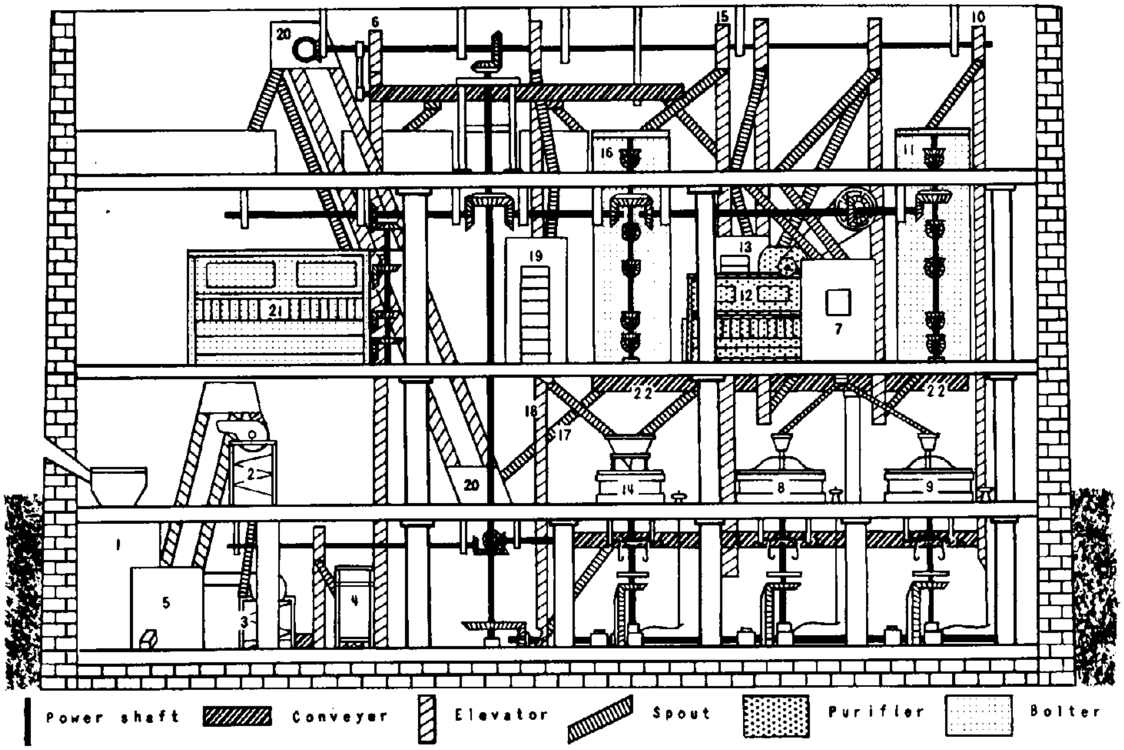


Figure 116. A New Process mill using millstones and purifier, with capacity about 100 barrels of flour per day. Following the numbered sequence, 1: receiving bin; 2: receiving separator; 3: milling separator; 4: scourer, or smutter; 5: dust room; 6: elevator for clean grain; 7: wheat bin or garner over millstones 8 and 9; 10: elevator for products of first flour grinding; 11: bolting chest; 12: purifier; 13: middlings garner over middlings stone 14; 15: elevator for ground middlings; 16: middlings bolting chest; 17 and 18: spout and elevator for carrying tailings and rejected materials to 19: second middlings bin; 20: elevator also connected with spout 17, for conveying these materials to reel 21; 22: conveyor for carrying flour from chests 11 and 16 by way of elevator 20 to a flour bin on the top floor.

the lightweight chaff and dust. Invariably, the grain passed through these machines so quickly that an incomplete cleaning was the best that could be achieved. For this reason, the wheat passed through a second cleaner, called the milling separator (3), which more thoroughly separated the trash. The wheat berry still wore a small whisker and sometimes acquired a smut if not harvested at the right time or dried properly, so the final cleaning was accomplished in a scourer or smutter (4). This machine had a rotating drum with slits and a strong blast fan. The wheat was fed into the drum, where it was subjected to violent thrashing about. The result was that the whisker and smut were removed and the wheat polished, the fan carrying off the material forced through the slits in the drum. The clean grain was ready to grind (in later mills it might also be washed), so was carried by elevator (6) to the top floor, then dumped over to a collection bin or garner above the millstones (7).

The wheat could, at the discretion of the miller, be directed into either or both of the millstones (8 and 9) by operating valves in the drop chutes from the garnering bin. After the initial grinding, the coarse flour (sometimes called "meal," not to be confused with corn meal), then fell to an auger or conveyor, where it was carried to an elevator boot (10), and up to the first bolting chest (11). After passing through hexagonal scalping and grading reels, the graded middlings could be conveyed back up by elevator to the middlings purifier (12), where further bolting refinement took place, separating the so-called digestible portion of the wheat berry from the bran and germ. Once through the purifier, the middlings were ready to pass into the middlings stone (14), where a second grinding was accomplished. Middlings ending in the second middlings bin (19) could also be fed into these stones. The product was again elevated to the final bolting chest (16) and the fine light flour separated. Tailings from the various bolting processes ended their journey in a bolting reel (21), where the last vestiges of fine flour were removed. The flour was carried to a collecting bin on an upper floor (from elevator 20), where it could be passed through packers or baggers (not shown) and prepared for sale.

Three interesting points should be noted about this New Process. First, the millstones employed were smaller than in Old Process mills. The Old Process stones were as large as five feet in diameter (sometimes even larger) and were run fast (say 15 bushels per hour) and tight, overheating the flour as discussed earlier. The New Process stones were typically 42 to 48 inches in diameter, with the middlings stone commonly 36 inches. They were dressed with more furrow and less land surface to produce as many middlings as possible. They were fed slower (say 8 bushels per hour) and run higher. Some were even equipped with ventilating fans to remove moisture as the wheat passed between the stones (Dedrick 1924).

The second point is that mills of this era contained large numbers of elevators and bolters, depending on the number of stones they were running. Sometimes entire floors were taken up by bolters alone. These were tall and long box-like machines, which had to accommodate reels long enough to make the proper separations of products. They required constant maintenance on the reels, and were notorious as breeding places for weevils and other flour and grain pests, if not kept in almost continuous use.

The third observation is that in the early days of New Process milling, white flour as we know today could only be achieved by natural aging. No bleaching equipment or chemicals were yet available. In most cases, the mill owner had no incentive to wait several weeks for his flour to whiten, so it was sold as produced. It had the same characteristics as baking flour today, depending on the variety of wheat, but was a bit darker. Wheat basically came in two types – hard and soft. The hard wheat was grown in the upper Midwest and produced a high-gluten baking flour. The soft wheat could be grown successfully in the South, but had a lower gluten content. Therefore, it produced a heavier bread, but could be used well for pastries.

The millstone miller practiced an art in keeping his stones maintained and running properly. However, he was faced with the contradictory requirement of grinding high to maximize middlings, yet realizing to clean the bran from the flour he must grind low. This problem set the stage for the roller process of milling flour, which incorporated gradual reduction, a multiplication of processes and equipment, and finer adjustments.

The basic elements of the roller process were essentially the same, except steel roller mills were substituted for the stones. They ran at higher speeds and could process greater quantities per unit time. Some nutritionists believed (and still argue) that this reduction is a crushing rather than slicing process (as in the case of millstones), and thereby destroys not only much of the fiber and nutritional value, but adulterates the product through high speeds and overheating as well. It must be realized, however, that most mill owners in those days were more interested in profits than in nutrition. To compete, they were basically forced to switch to rollers. However, as mentioned before, this was welcome to most, as the dressing of millstones was so laborious.

The first roller mill thought to have been installed in Tennessee was in 1881 at C.C. Shelton's Mill in Chattanooga (Goodspeed 1887). Some had appeared a few years earlier in the Midwest and North. The limitation to the mill owner was the cost of the new machinery. The roller process required so many expensive machines that its introduction was limited to those with the necessary capital. As a result, a decline began in the smaller milling operations. The period witnessed an emergence of new, large-scale mills of several stories. In some cases, older merchant mills were able to add stories or additions to accommodate the new equipment. The few stone grinding operations which hung on began to depend to a large extent on small local markets and custom work, and became marginally profitable. Larger mills could buy cheaper grain in bulk quantities and process much more. The old mills soon became only quaint reminders of an era not so distant.

The side elevation of a typical steam powered roller process mill, covering 52 x 142 feet on five levels, is illustrated in Figure 117. This is a 250-barrel mill, and is representative of the majority of "large-scale" Tennessee roller mills of the last two decades of the nineteenth century. Several interesting points may be noted about this layout. First, it utilizes a manila rope drive system rather than flat belt for its main power takeoff (shown to the left), although flat belts are still employed for the machinery. This system required grooved pulleys and pre-dated the V belt. It came into wider use during the 1890's. Grain cleaning and scouring are performed on the fourth floor to the left, and wheat drops below to a stock hopper prior to entry into the battery of roller mills on the second floor. It is noteworthy that the wheat passes through a steamer where moisture is added prior to grinding, in order to "temper" the wheat and facilitate the reduction process. As each reduction is performed by the roller mills, the products are discharged to elevator boots on the first floor (actually a basement), then carried to the fifth floor elevator heads. From here they are directed to the large sizing sifter on the fourth floor, to the purifiers on the third floor, and eventually are transported to packers in the warehouse area (not shown). Also note the large dust collector to the right on the fourth floor. Its most important function was to reduce the hazard of flour dust explosion and fire, which destroyed numerous mills.

It should be pointed out that many smaller-scale flour mills existed in the state during the same time period. Often these would be older mill structures modified to accommodate the newer machinery. They would typically have a set of millstones still on hand for custom corn grinding, probably grinders for animal feed, and from two to four roller stands for flour (the average was three). They primarily depended upon localized markets for their sales, whereas the larger mills shipped their flour by rail or boat.

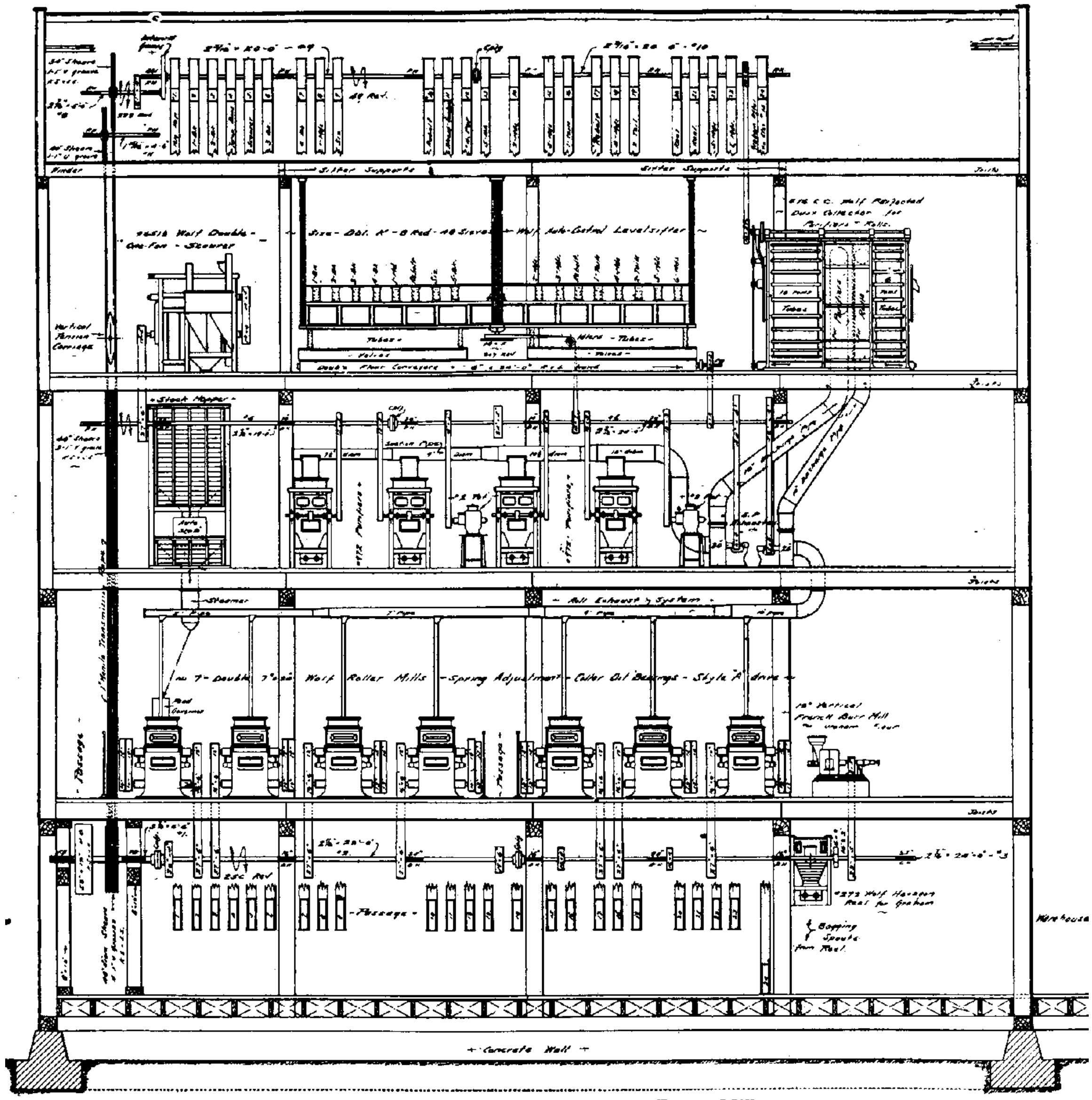


Figure 117. Sectional side elevation of a 250-barrel flour mill, utilizing roller stands, purifiers, and sifters. During the last two decades of the nineteenth century, this would be a representative milling establishment, although considered small by later standards.

Typical machines from the late 1890's roller milling period are illustrated in Figures 118 - 127. These were manufactured and/or sold by the Great Western Manufacturing Company of Leavenworth, Kansas, and Kansas City, Missouri, but are representative of most machinery utilized for these purposes. Many dozens of companies produced their own versions, with slight modifications to avoid patent infringement.

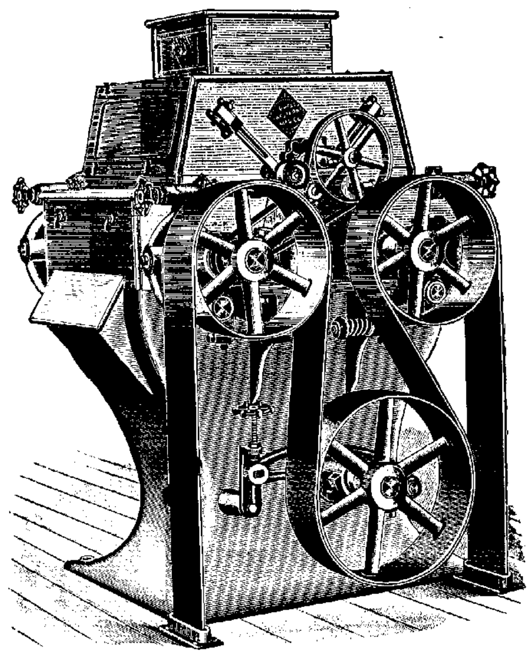


Figure 118. A double roller mill utilizing 6-inch steel rolls.

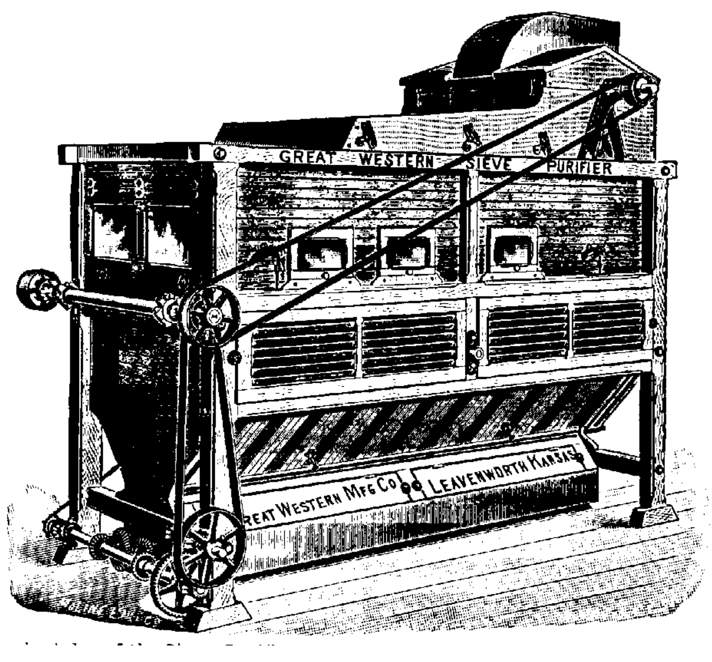


Figure 119. A sieve purifier.

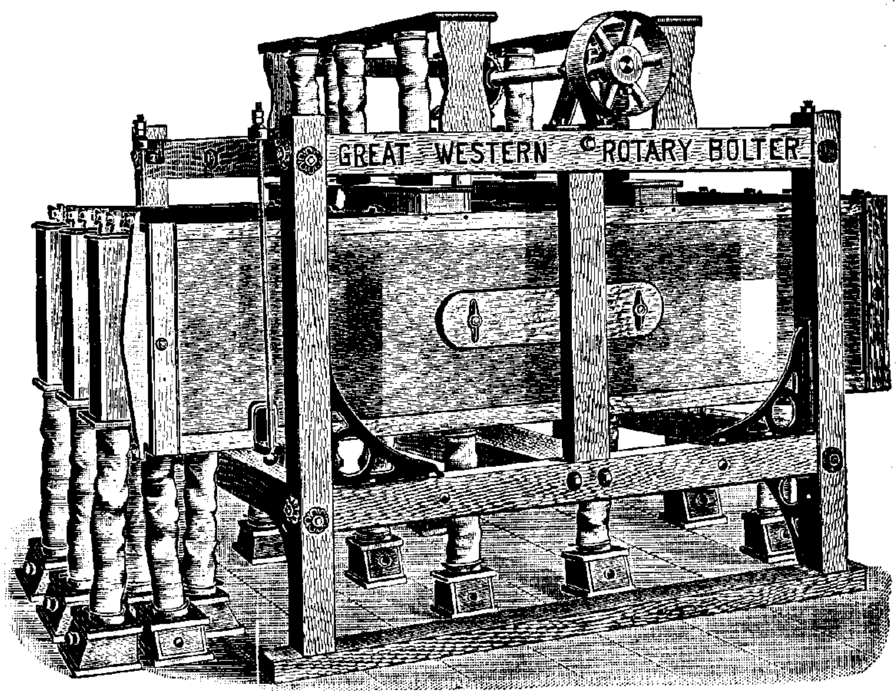


Figure 120. A rotary bolter, or sifter. Many of these machines were designed to hang from the ceiling by gangs of wooden dowels, and operated from an eccentric drive.

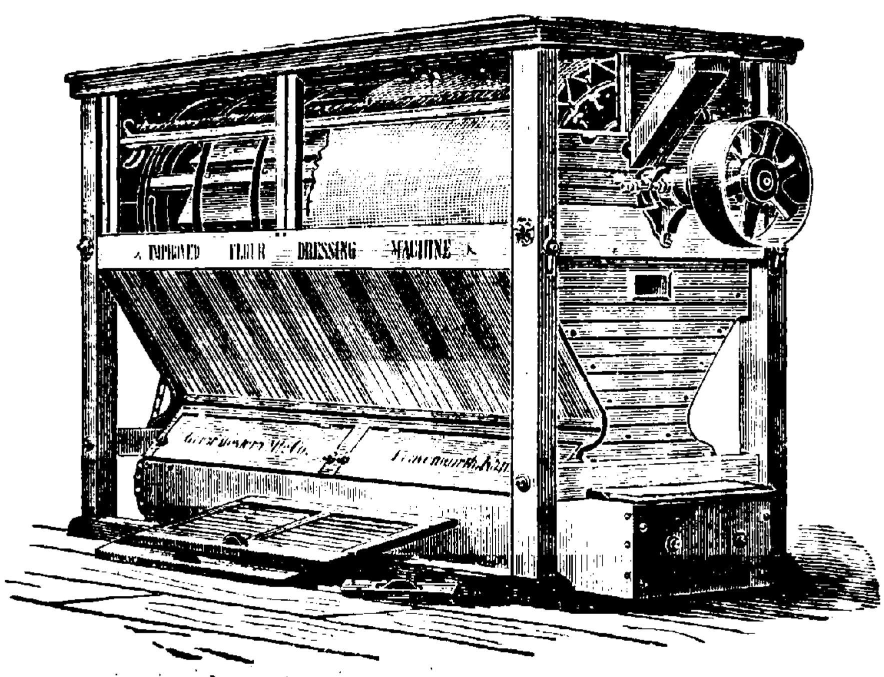


Figure 121. Another flour bolter or sifter, this called a reel-type flour dresser.

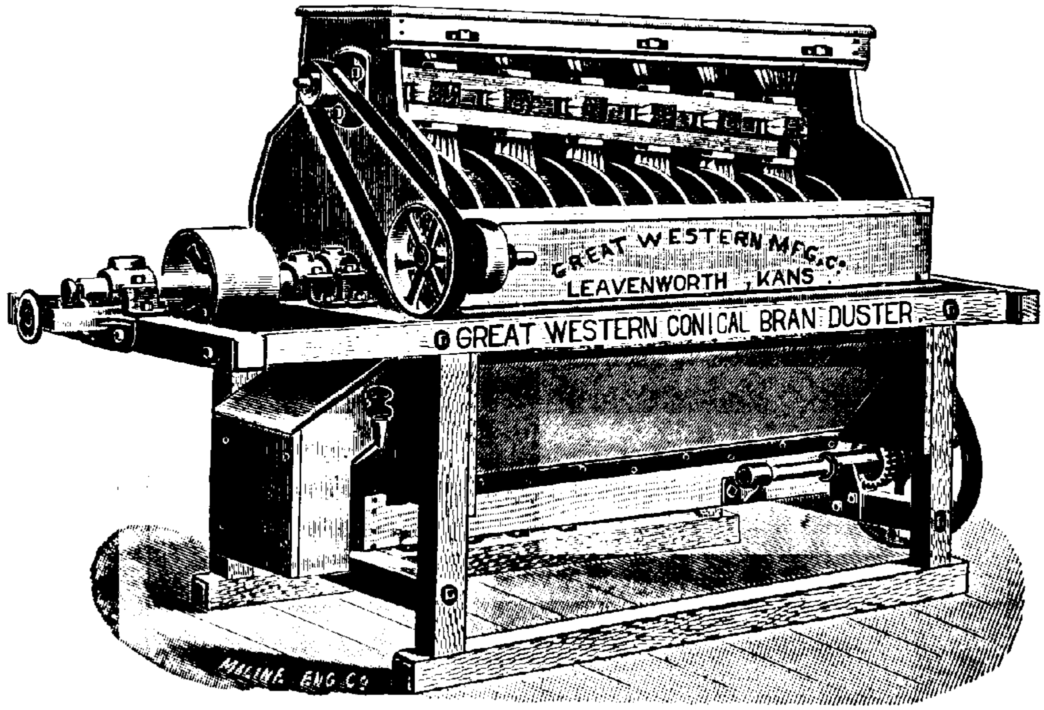


Figure 122. Conical bran duster, for removing the last vestiges of flour from bran.

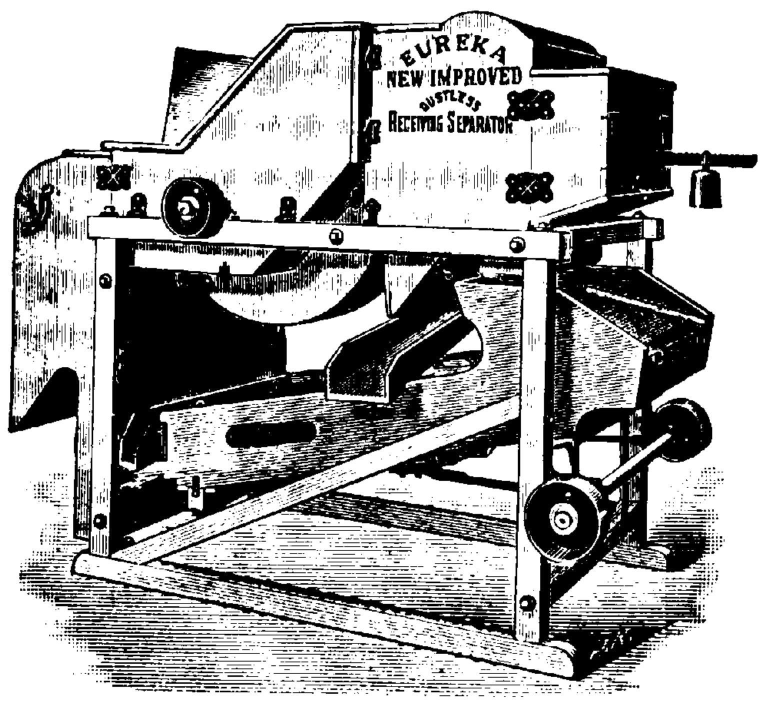


Figure 123. Eureka double receiving separator, for the initial cleaning of the wheat (or corn, with a change of screens).

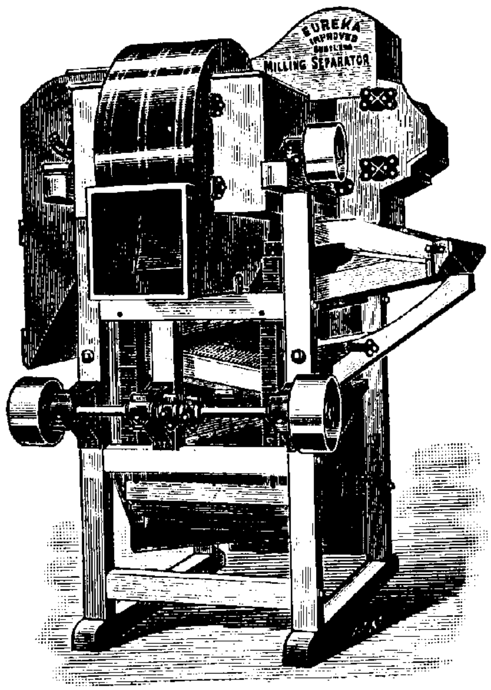


Figure 124. Eureka milling separator, for the final cleaning of the grain.

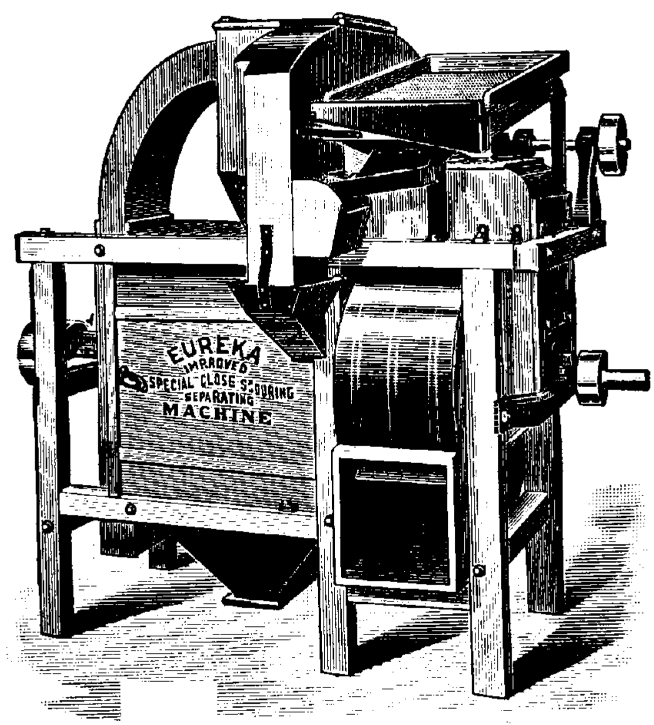


Figure 125. Eureka scourer, for scouring and polishing the wheat. This one has a horizontal drum, but others had vertical drums.

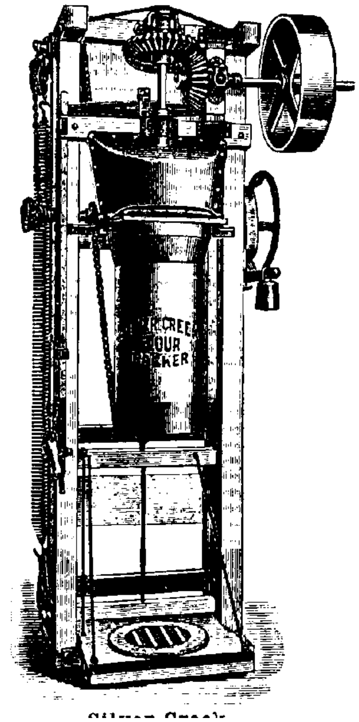


Figure 126. Silver Creek flour packer, designed to automatically fill flour bags to a preset weight.

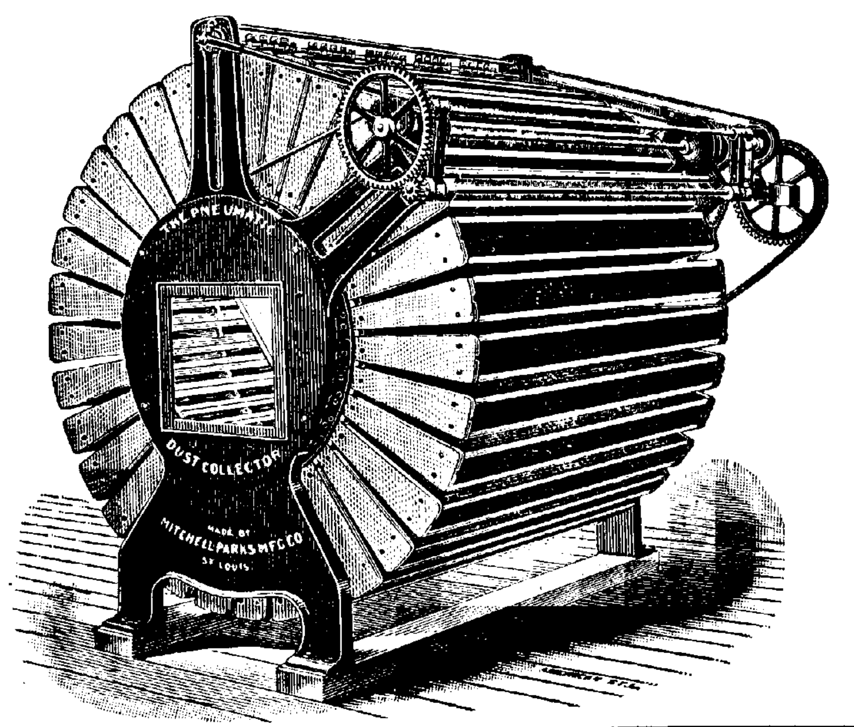


Figure 127. Pneumatic dust collector. Another design was a boxlike device with vertical tubes, similar to that illustrated in Figure 117.

It should be mentioned that a visit to an abandoned mill will often turn up a device which is difficult to identify. This is due to the fact that many specialized machines were built by a myriad of manufacturers. For example, a few mills would process oats, alfalfa, buckwheat, barley, rye, or other more unusual grains. There were available to these enterprising millers strange devices such as gravel separators, cockle machines, oat hullers and clippers, oat rollers, buckwheat hullers, and the like. Even corn grinding frequently required such machinery as shellers (from hand-cranked to wagon-mounted), corn scourers, and special bolters or grits separators. In addition to the wheat equipment discussed and illustrated above, one occasionally discovers degerminators, moisture meters, wheat washers, and other offbeat devices. Most of the equipment of this period utilized much wood in its construction, and companies were in such heated competition for business that they almost universally affixed their names to their equipment, and also frequently identified the use of the machine in sweeping black ink stencils. A good cleaning or stripping will often reveal this stenciling, which was quite durable.

Different Processes in the Same Mill. It is often difficult to look at an existing old mill and tell the period of construction or transition in machinery. In most cases, if the structure is determined to have been built prior to the 1880's, it would have been originally equipped with stones and probably converted to roller mills, as most were. Sometimes one set of stones was kept for custom corn grinding. (Incidentally, corn as well as wheat could be milled on rollers, but they were normally restricted only to wheat.) Almost any large mill built after the early 1880's would have been constructed to accommodate the roller process. If the mill was quite early, as for example Massengill Mill, it probably witnessed all three periods of milling technology – the Old Process, New Process with stones, and Roller Process. Machinery would have been sold or scrapped, line shafts relocated, perhaps turbines or steam engines substituted for water wheels, all in the name of progress and profits. However, this causes perplexity for the historian or archaeologist studying the site. It is often confusing as to where earlier machinery may have been located, or even what power sources were used. Frequently an old timer in the area will swear there was a water wheel on the mill, when common sense, terrain considerations, and historical period support only a turbine. Also, in abandoned mills, the salable machinery was usually disposed of when the mill was closed.

Therefore, it is not uncommon to visit an old mill and find a set of millstones (which were not as desirable in the late nineteenth century), cleaners, and sifters, but no roller stands. This is because the roller mills could be sold at the time, but the other equipment was not in demand. Also, the location of the machinery in the mill could restrict its disposal. That is the reason some old mills still contain machinery on their upper floors but very little on the first floor – it could be moved out easier.

The most perplexing mills are those that underwent distinct phases of manufacturing. In these cases, only archival research can usually shed light on the products and time periods. Falls Mill is probably the best example in Tennessee of this situation. The current structure was built in 1873 as a textile factory, became a full-time cotton gin about 1907, was converted to a woodworking shop in 1946, and was restored as a grain mill in 1969. There was even known to have been a sawmill at the site in its early period. The mill has always been powered by a water wheel (except for a brief period when a diesel engine was used to power the cotton gin), but represents four distinct and (primarily) non-concurrent phases of production. Probably the nearest example in the state is Hurricane Mills in Humphreys County, which has witnessed woolen production, grain milling, and saw milling, but in this case to some degree concurrently.

The Circular Saw Wins Out. Sawmills during the late nineteenth century almost exclusively utilized circular blades. Although many water powered sawmills functioned (almost always by turbine power), the steam engine became increasingly popular as a power source. It had distinct advantages. First, it was not restricted necessarily to a water power location, although the boiler had to have a source for water replenishment. Second, it could be made portable. In fact, during the 1870's, steam engines and their boilers were mounted on skids or wheels for teams of horses to move. Shortly thereafter, self-propelled traction engines were built (Figure 128). They could tow the sawmill parts to remote locations for setup. Third, the steam engine provided a smooth, quiet, steady source of power with its own governor to pick up the engine speed when a sawing load was applied. In the case of water turbines, they sometimes had to be manually governed by opening and closing the gates slightly (later water turbine governors were patented). A typical steam powered sawmill of the late nineteenth century is shown in Figure 129. This mill belonged to the author's great-great grandfather.

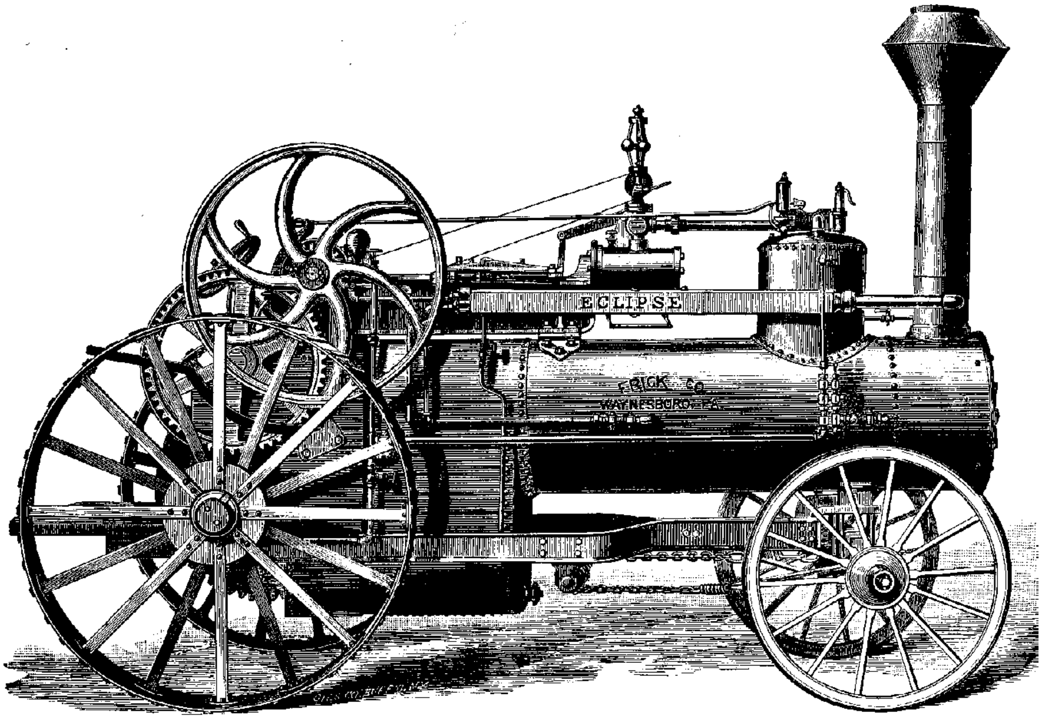


Figure 128. A Frick traction (self-propelled) steam engine of 1888.

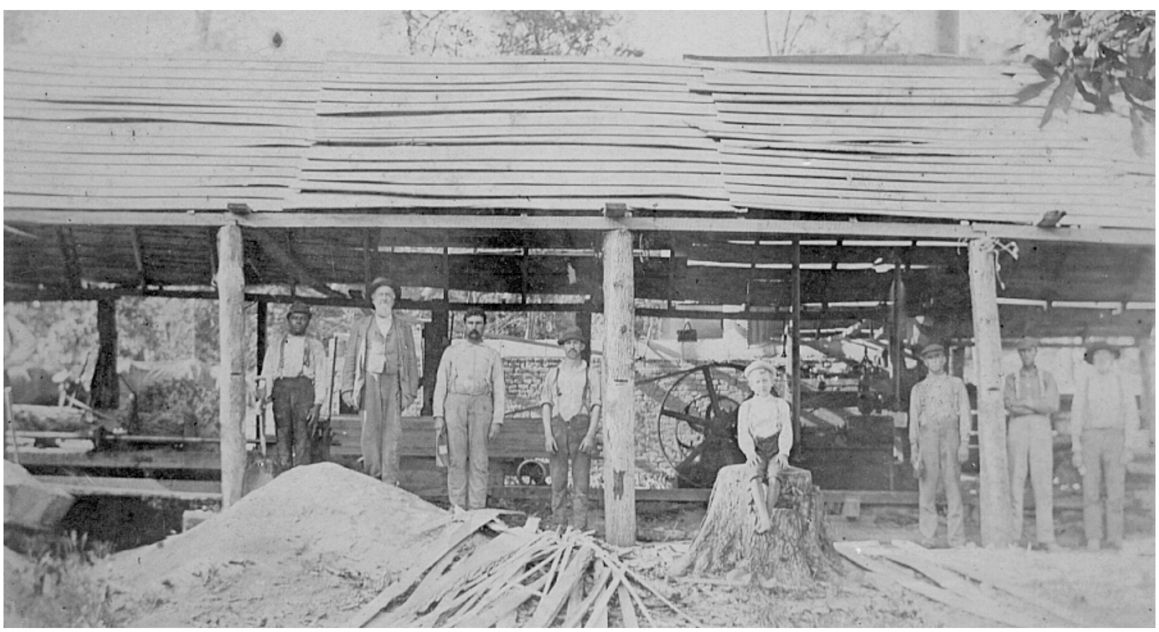


Figure 129. Calvin Sweeney's steam sawmill in Henry County, Tennessee, ca. 1900.
Mr. Sweeney is second from left. The stationary steam engine is in the right background.

The small "one-man" or pony sawmills of today are essentially the same as those of the late nineteenth century. They consist of a log carriage running on a set of ways to move the log along through the saw, and dogs to hold the log in place as lumber slabs are removed. A setting allows various thicknesses of lumber to be produced. Until automatic log turners were patented, the logs were flipped manually after the log carriage returned. The large (commonly 54-inch diameter) circular saw blade was mounted next to the log carriage and turned by a flat belt pulley on its shaft. The power source was usually directly belted to this pulley. The blade was unguarded, and the lumber stacker worked in very close proximity. The sawyer operated a set of control levers for engaging the log carriage and returning it (Figure 130). Contrary to popular belief, the noise was not significant if the blade was sharp. The operation was inherently dangerous from several standpoints. Rolling and handling large logs was done with cant hooks and manual labor.

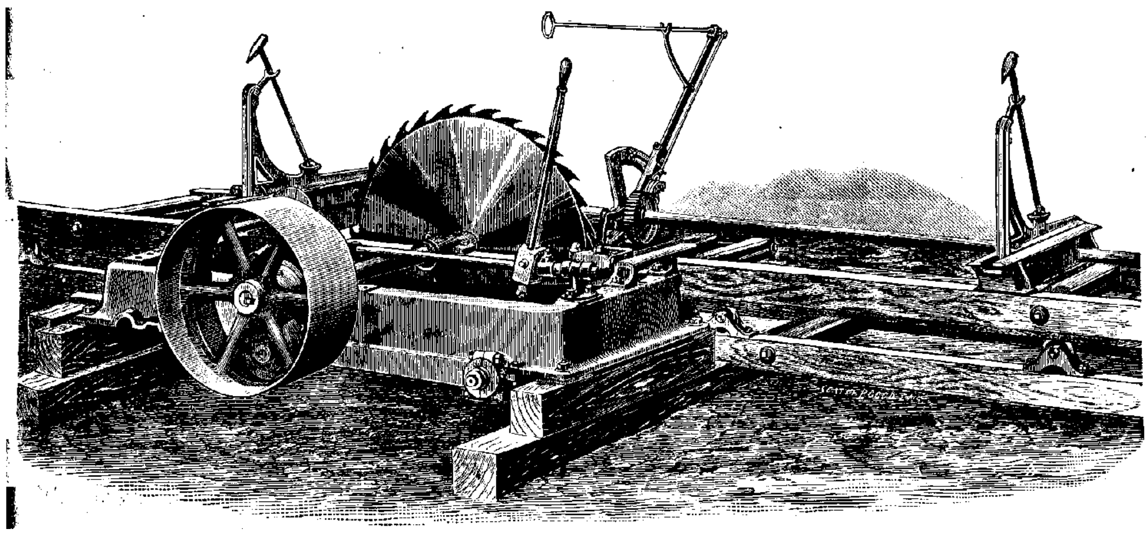


Figure 130. The Frick Company's pony sawmill of 1888.

The presence of steel embedded in a log, in the form of a nail, railroad spike, or wire, could cause considerable damage to the saw blade and endanger the workers as well. The drive belt was exposed and near the sawyer. If a steam engine was employed, its boiler required constant vigilance to prevent explosion. And of course the most dangerous part of the machinery was the spinning blade itself. A sawyer at Readyville Mill in Cannon County was reportedly killed when he fell onto the blade, and only the most careful lumberman of the period retained all his fingers, hands, and arms.

In areas where very large trees were logged, two sawing setups could be utilized. One was a band saw, or continuous blade, which could accommodate very large diameters.

The other consisted of two circular blades mounted one on top of the other, running very close together. This allowed up to double the log size of the single blade (Figure 131).

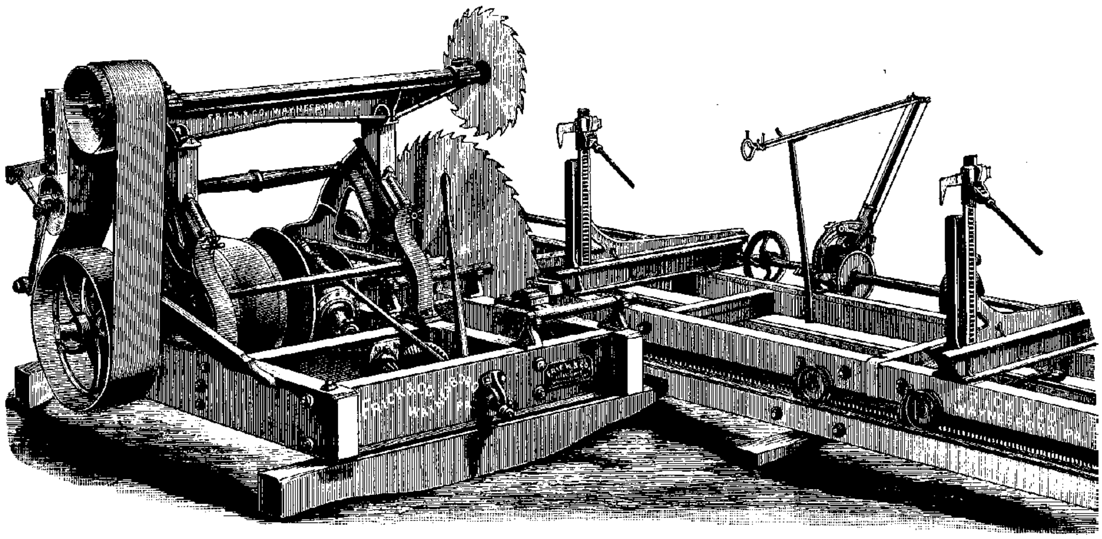


Figure 131. The Frick Company's double circular sawmill of 1888.

Textile Manufacture Becomes Machine Driven. Textile factories in Tennessee during the Late Industrial Period varied in scale from small operations employing 12 to 25 workers to large-scale production facilities with worker housing, commissaries, schools, and churches. Although the carding processes remained basically the same, ring spinning frames began to emerge as alternatives for the massive mules that had been so difficult to keep operating properly. Power loom technology also advanced, providing wider capabilities for patterns and widths. However, there is evidence that the Tennessee textile industry in the three decades after the Civil War was not prosperous. This was due to several conditions. First, the devastation of the war, lack of capital, and loss of much of the male labor force slowed reconstruction. In addition, social changes were taking place, and the textile industry was recognized as a prime example of abuse of the workforce, particularly women and children. Hours were quite long, conditions were harsh, work was dangerous, and pay was low. There was also much competition from the larger New England textile mills. Finding markets for Southern textile goods was apparently not easy. An example comes from letters written by H.R. Moore in the 1880's to prospective customers for the yarn and thread produced at Falls Mill in Franklin County. He served as secretary for Fall Mills Manufacturing Company at that time, and sent inquiries throughout the eastern half of the U.S. From the record of financial strife of the enterprise, much of this effort was apparently unsuccessful. In fact, evidence supports the fact that most of the smaller textile factories in Tennessee closed their doors around 1900. The machinery in these mills was scrapped or sold, so that no *in situ* original textile machinery is known to survive in the state, except for the early wool carding machine at Ketner's Mill in Marion County. However, Falls Mill, the earliest known surviving textile structure in Tennessee, contains a complete complement of woolen machinery built between 1866 and 1883, moved from an old factory in Kentucky. This equipment may be taken as representative of the period. It includes a James Smith (manufacturer) wool picker (Figure 132) used to remove trash and burrs from the wool after it had been washed (and also to blend wool occasionally). The wool was then re-oiled and passed through the two carding machines, where it was combed and the fibers oriented longitudinally for spinning preparation. The first machine is an 1860's Furbush and Gage breaker card, complete with early Bramwell feed (Figure 133). The wool emerged from this machine in a continuous roll and passed along rollers in the ceiling to the Apperly feed on the second, or finisher, card. This card is an 1866 Davis and Furber, with what was known as a rubbing motion attachment on the rear (Figure 134). The rub allowed wool rolls to emerge in 72 continuous strands. They were then automatically wound onto large spools for transfer to the spinning mule.

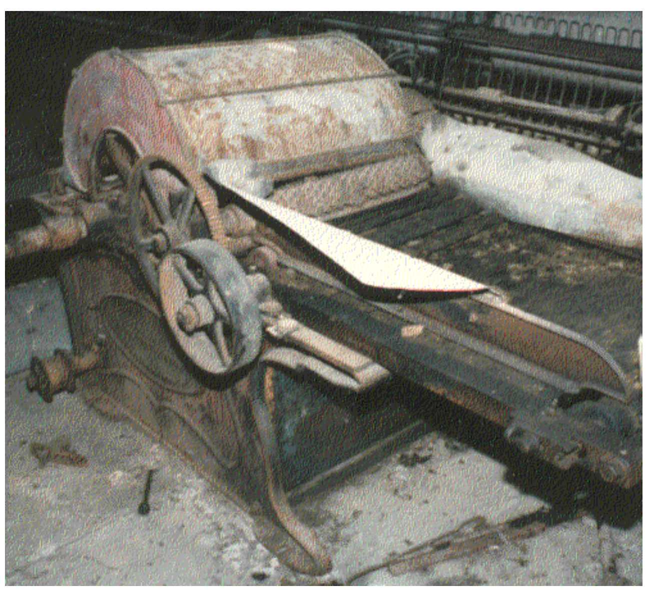


Figure 132. Wool picker, before relocation to Falls Mill in Franklin County, Tennessee.

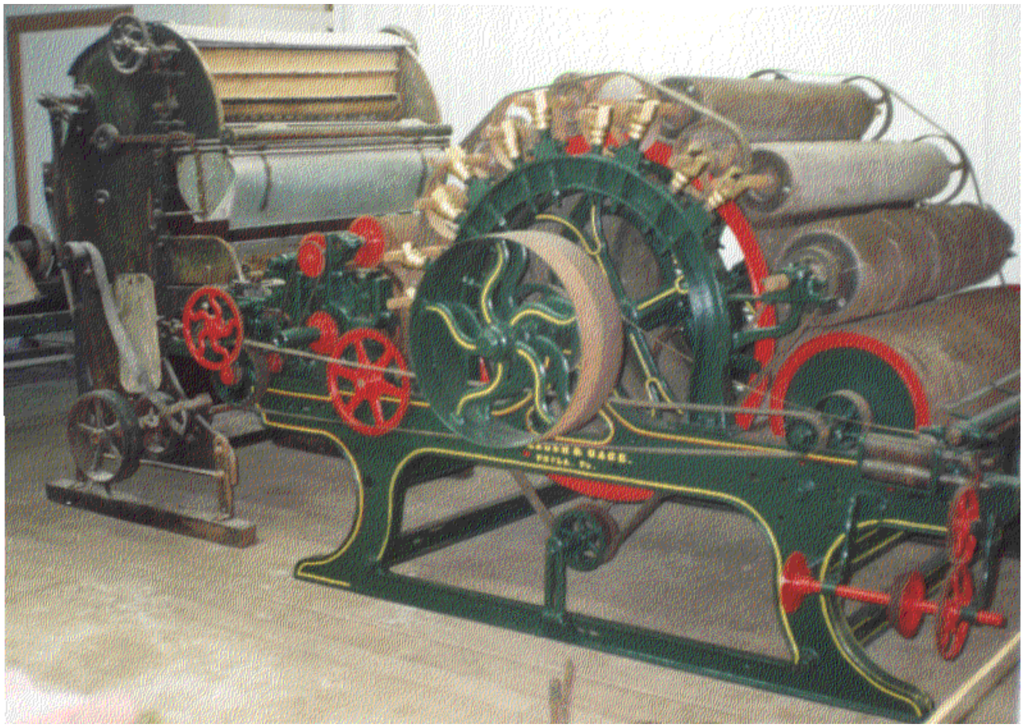


Figure 133. The ca. 1866 Furbush and Gage breaker carding machine and Bramwell feed after partial restoration at Falls Mill in Franklin County, Tennessee.

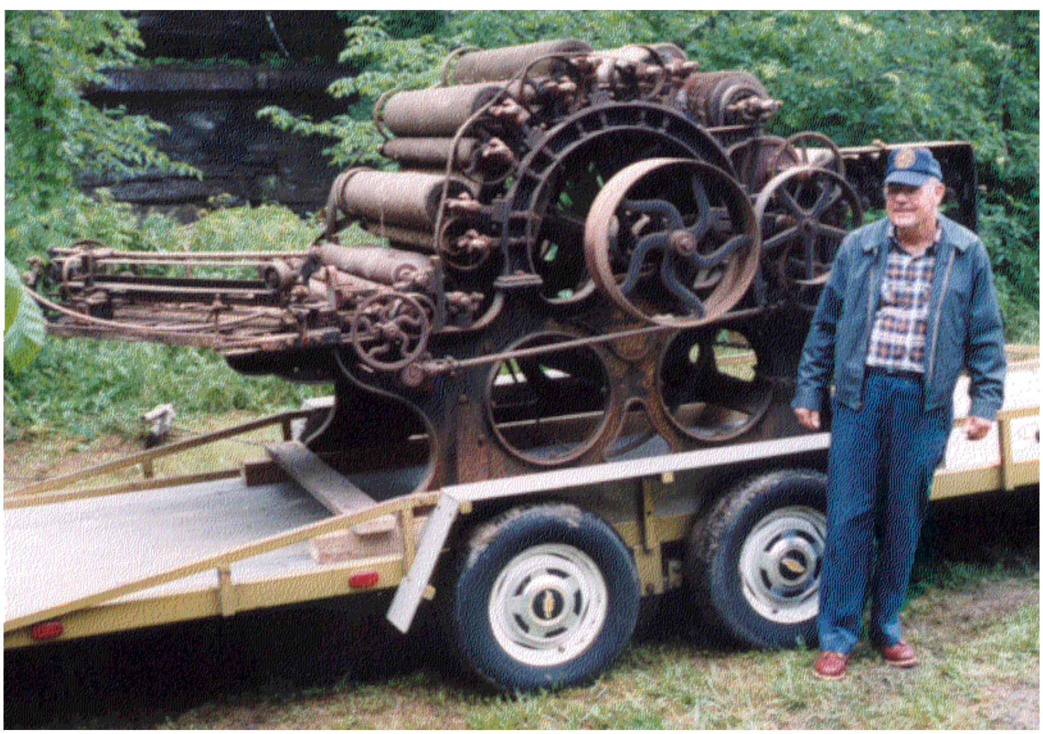


Figure 134. The 1866 Davis and Furber finisher carding machine ready for transport to Falls Mill in Franklin County, Tennessee. Apperly feed is shown on the left.

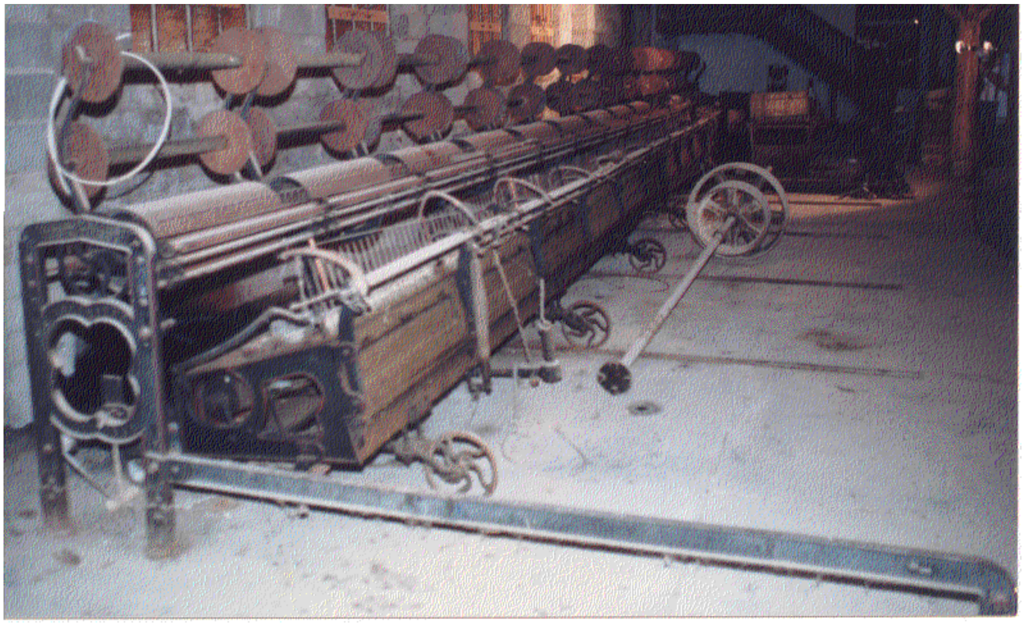


Figure 135. The 1883 Johnson and Bassett spinning mule before dismantling and relocation to Falls Mill in Franklin County, Tennessee.

The mule is an 1883 Johnson and Bassett, and is thought to be the oldest automatic mule left in existence (Figure 135). The machine is 61 feet long, and was capable of spinning 360 spindles of yarn simultaneously. It spun on the same principle as a spinning wheel. A moving carriage imparted pull to the strands of yarn, while rotating spindles provided the necessary twisting. After an outward cycle of the carriage, the motion was reversed and the spun yarn wound onto the bobbins. When the carriage reached the back position, it was ready to pay out more wool and begin again. This back and forth movement continued until the bobbins were completely wound with yarn.

The next step in the process was to remove the bobbins from the spinning mule. This was called "doffing." At this point the yarn might be dyed various colors. Some of the bobbins were saved for insertion into the shuttles of the power looms. Most were transferred to a creel, where they were off-wound onto a large cylinder called the reel (Figure 136). The function of the reel was to measure equal lengths of yarn and allow large numbers of strands to be wound onto the same cylinder. In this respect, it worked as a warping frame. Once measured, the yarn was then off-wound onto the warping beams for the power looms, much as it would be on a hand loom. The next step was never mechanized. It involved threading the individual warp threads through the appropriate

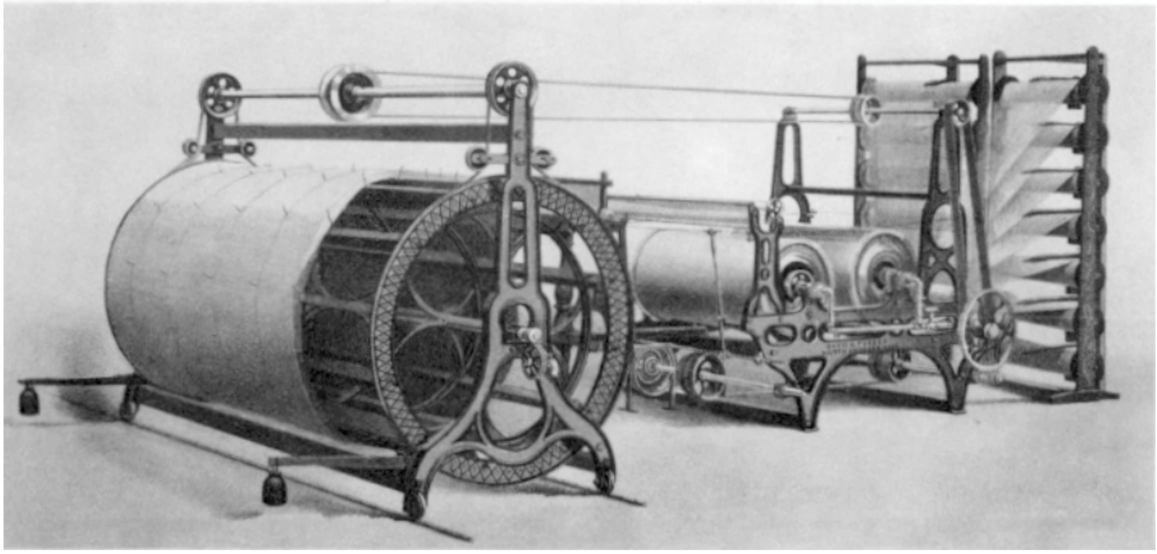


Figure 136. Right to left, the creel, warp dresser, and reel of the Davis and Furber Company of North Andover, Massachusetts, ca. 1860's.

heddles and reels of the power loom (a process called "drawing in") and tying them off to the cloth, or take-up, beam, in the front of the loom (Figure 137). The shuttles were then loaded with the appropriate colored bobbins of yarn, and the pattern chain on the loom was programmed for the weaving pattern desired. As the friction clutches on the power

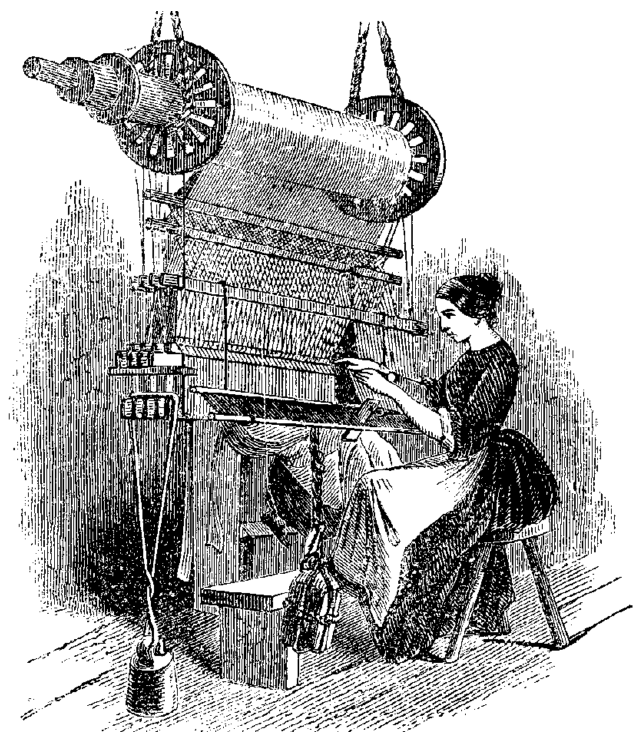


Figure 137. Drawing in the warp threads prior to loading on the power loom.

looms were engaged, levers operating off cams would throw the shuttles back and forth, as harnesses lifted and lowered the heddles and their warp threads, thereby creating the pattern (Figure 138). As cloth was produced, a ratchet and pawl advanced the cloth beam and kept the cloth wrapped. The looms had sensors which shut them off automatically when the shuttles ran out of yarn, or when a shuttle misfired. Operatives tended several looms and watched for broken warp threads, which had to be tied up quickly.

The factory might have finishing operations for the cloth, which included fulling and napping. Some mills had their own stores, and others shipped products to markets in various parts of the U.S. or abroad. These practices continued among the small Tennessee textile factories throughout most of the nineteenth century.

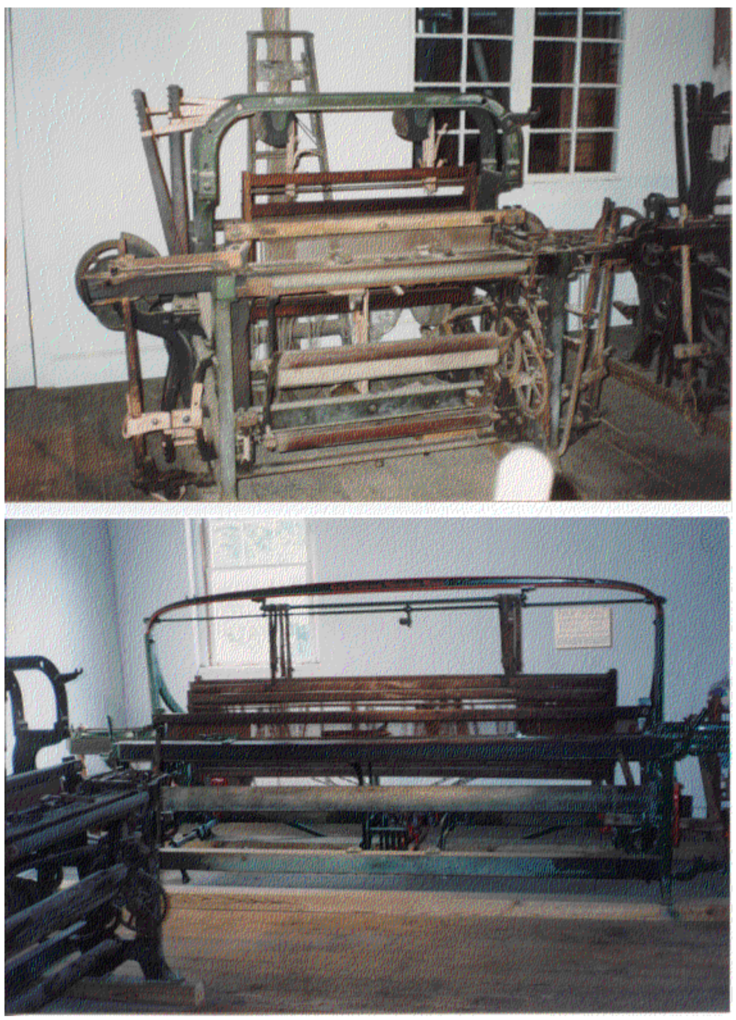


Figure 138. Crompton power looms of the 1870's at Falls Mill in Franklin County, Tennessee. The upper photograph shows a small plain loom set up to weave a tweed pattern. The lower loom is a three-shuttle broad loom used for weaving blankets.

New Power Sources Emerge. The end of the nineteenth century witnessed the emergence of two new power sources which would have profound effects upon culture, technology, and manufacturing. These were the internal combustion engine and the electric motor. The early internal combustion engine, though noisy and cantankerous, was smaller and more portable than the steam engine (Figure 139). It could be adapted to a wide variety of uses in the factory, on the farm, and in the automobile. Likewise, the electric motor began to find wider application as power grids were established. In areas where electricity was slow to find its way, water or steam powered mills and factories often installed their own generators, turning them with the prime mover and operating machinery from smaller motors (Figure 140). Electric lighting was also utilized. In most of these plants, however, the system of line shafts and flat belt pulleys continued to be employed, using the internal combustion engine or electric motor to drive the shafts. For this reason, some engines and motors were built quite large and heavy. It was not until after 1900, for the most part, that machines began to be equipped with their own motors, and the V-belt began to supercede the flat belt.

Figure 139. A very cantankerous 1916 Witte 6 horsepower, one-cylinder gasoline engine, restored by the author and used to power an early Williams stone buhr mill.

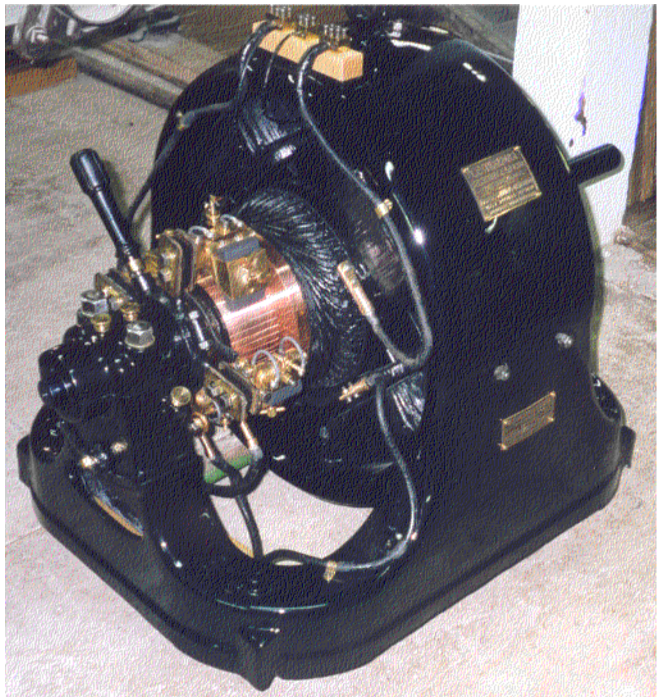


Figure 140. A restored 1903 Westinghouse direct current generator used to produce electricity at Ely's Mill in Gatlinburg, Tennessee, between 1935 and 1965, now on display at Falls Mill in Franklin County, Tennessee.

Even in the field of water power devices, innovations and new patents were emerging. One of the most notable was the introduction in 1878 of the Pelton wheel. Like so many other early inventions, its story is steeped in legend. Supposedly, Lester Allen Pelton of Camptonville, California, conceived the idea of a split bucket design for his wheel after watching a neighbor's cow stick its nose into a stream of water from a garden hose. Due to the ridge between the cow's nostrils, the water divided itself into two streams as it bounced off the nose. Pelton applied this phenomenon to his design of a metal cup, and the Pelton wheel took its place in the history of technology. The wheel found wide application in the gold mining districts of the West, where mountain streams with dramatic falls provided the high heads of water necessary to spin the wheel efficiently at a rapid speed. The Pelton Water Wheel Company was established with offices in San Francisco and New York, for the purpose of manufacturing and marketing the new device. The unusual wheel found its way east in applications for mill power and early hydroelectric plants. The only known old mill in Tennessee with an *in situ* Pelton wheel is Babb's Mill in Greene County, although it hasn't operated in many years. The Ocoee hydroelectric plant in southeastern Tennessee also utilizes a much larger Pelton wheel (Figure 141).

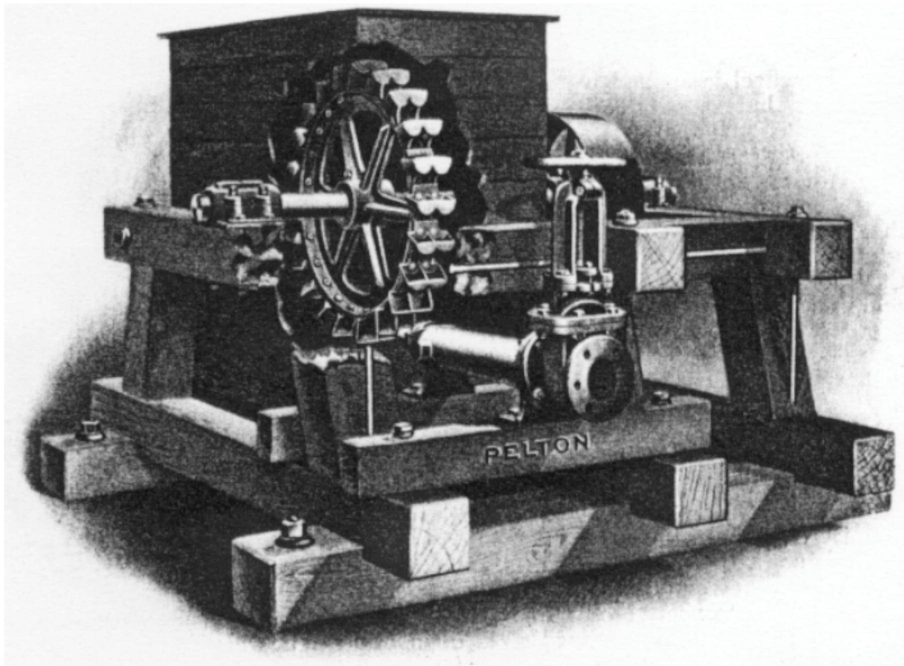


Figure 141. The Pelton Water Wheel Company's standard wheel, showing nozzle for propelling water at high velocity and head, runner with unique cup design, and drive pulley on right for taking power. These wheels were sold in standard sizes from 18 to 48-inch runner diameters, for use with water heads up to 1,100 feet.

Conclusion. By 1900, the roller process for flour production was well established, and very large milling concerns were taking over the market. The same was true in the textile industry. As most of the small textile mills closed, production became more concentrated in the larger Tennessee factories and the huge operations of New England, later moving South to the Carolinas and Georgia. Even lumber operations were becoming large, as corporations bought vast timber tracts in the South and West to exploit. Sawmill towns began to replace the small "wildcat" mills of the remote forests. With the low cost and portability of the new electric motors and internal combustion engines, many factories were converting their power sources and scrapping their earlier water wheels and steam engines. Although the steam engine, as well as the water turbine, would hold their own in certain applications well into the twentieth century, the water wheel of ancient times took its place beside the horse as a power source whose time was over, except to those romantics who cherished a simpler and slower time.

The Modern Period (Post-1900)

As milling progressed into the twentieth century, additional changes and innovations influenced grain, lumber, and textile industries, although the basic processes remained much the same (and so do today). One significant advance was the production of self-rising flour and corn meal in the grain products industry. The addition of baking powder, baking soda, and salt into large batch mixers, could produce significant quantities of meal and flour that was easier for the home baker to use. In the decades that followed, many would not even recall how to use plain meal. In addition, the bleaching of flour by chemical methods gained wide use among millers. The natural coloring matter in flour is due to fat and carotin, or basically oil, and imparts a yellowish tint, apparently distasteful in appearance to early bakers. Therefore, the flour industry sought various methods to rapidly bleach the flour, rather than wait several weeks for it to whiten naturally. In the process of natural bleaching, nitrogen peroxide in the air is the bleaching agent. Early techniques tried to utilize this knowledge, or find other bleaching agents that worked equally well. Possibly the strangest method developed for this application was the Alsop Process, introduced about 1906. Pure atmospheric air was drawn through an electric arc and the resulting gas (nitrogen peroxide) was brought into contact with the flour, almost immediately rendering the yellowish oil transparent and whitening the flour. The old Alsop machines looked somewhat like electric motors, and were called “ozone machines” by many of their users (Figure 142). Several years ago one was still mounted in the

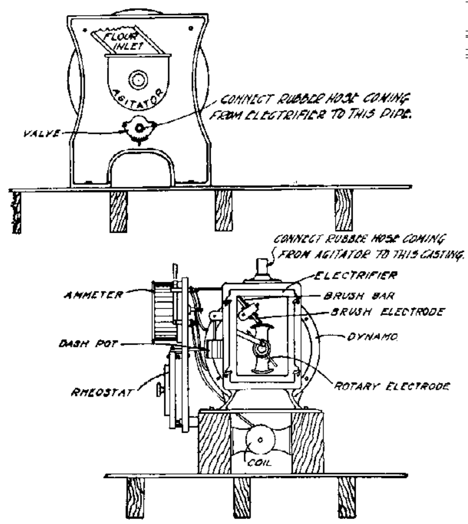


Figure 142. Alsop Rotary Electrifier, showing agitator where flour enters and electrifier which produces the bleaching agent.

ceiling on the second floor of the Readyville Mill in Cannon County, Tennessee. These machines were inherently dangerous, because flour dust exposed to an open spark can be highly explosive. Other somewhat similar devices became available which produced agene gas. Later a supposedly harmless chemical reagent containing benzoyl peroxide in granulated form was simply mixed in a certain proportion with the flour to achieve the same bleaching effects (Dedrick 1924).

Due to the proliferation of equipment and accompanying expense necessary to set up a roller process flour mill, effort was undertaken in the early 1900's to simplify this situation. The Anglo American Mill Company of Owensboro, Kentucky, introduced in 1909 what came to be known as the "Midget Marvel" flour mill (Figure 143). This machine combined the grinding, reduction, and bolting processes into one compact (but weighty) unit. It utilized steel rollers and bolting silks, and was a nightmare of whirling belts, chains, gears, and pulleys, spewing dust and noise in every direction. However, despite the machine's frequent mechanical problems, it found favor among a significant proportion of the milling community. By 1928, the company boasted that it was the world's largest builder of flour mills (*Consolidated Grain Milling Catalogs* 1927-28).

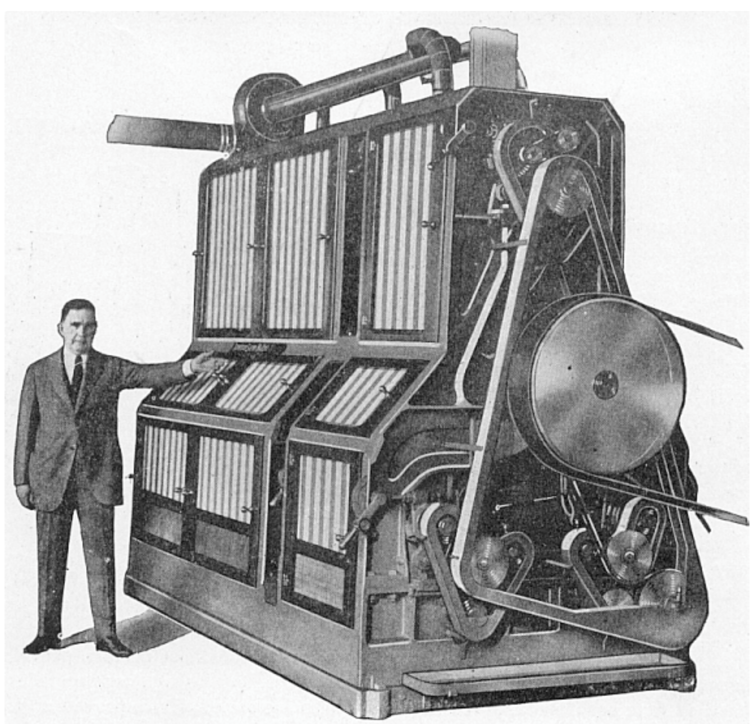


Figure 143. The much maligned but widely used Midget Marvel flour mill.

Despite the fact that roller mills had almost exclusively taken over the grinding process for flour, stone buhr mills continued to find favor among the corn millers of the South, even through the first half of the twentieth century. For this reason, several manufacturers of these ancient machines continued to thrive. Notably among these were the Nordyke and Marmon Company of Richmond, Indiana (acquired by Allis-Chalmers in 1926); Sprout, Waldron, and Company of Muncy, Pennsylvania; The Wolf Company of Chambersburg, Pennsylvania; the R.D. Cole Company of Newnan, Georgia; and the Meadows Mill Company of North Wilkesboro, North Carolina. Most old horizontal stone buhr mills encountered in Tennessee are of Nordyke and Marmon or Cole manufacture. The great majority of smaller vertical stone buhr mills are of Meadows manufacture, even those bearing Sears, Roebuck, and Company plates. Most of the stones used for these various mills were either French buhr (imported), or native granite or conglomerate stones from the Esopus quarries in New York or the Brush Mountain quarries in Virginia. Meadows, the only one of these companies still in production, utilizes stones from North Carolina quarries. It is of note that several manufacturers, including Munson and even Nordyke and Marmon, during this period built what were known as "under-runner" buhr mills. In these mills, the lower rather than upper stone turned. R.D. Cole was probably the last producer of traditional upper-runner, horizontal stone buhr mills. It is believed they built these units into the 1950's, and continued to refurbish old mills until about 1960. Since they were in Georgia, and also built an easily maintained, superior product, their mills found wide distribution in Tennessee and the other Southern states. Many are still in operation in small mills and mill museums throughout the region.

Several large companies contracted with mill owners during this period to install a complete complement of milling machinery, usually of the roller mill type. Relative to Tennessee, the most notable of these was the W.J. Savage Company of Knoxville, in business throughout most of the twentieth century. Savage roller mills and all peripheral flour milling machinery were common sites in mills around the South. Savage also manufactured wood and steel water wheels, and was the principal competitor with Fitz Water Wheel Company of Hanover, Pennsylvania, for many years. A few Savage wheels still survive in Tennessee (e.g., the Virtue Creek Mill in Knox County and the French

Mill in Jefferson County) (Figure 144). Savage roller mills may still be seen in Ketner's Mill in Marion County, Tennessee, among others.

Figure 144. Savage Company water wheel on the Virtue Creek Mill in Knox County, Tennessee. This wheel is unusual in that it has two pinion gear drives off the same wheel.

Despite inroads by Savage in the South, the Fitz Water Wheel Company and James Leffel turbine manufacturers dominated the water engine business in the twentieth century, and were intensely competitive. Fitz closed about 1966, and Leffel discontinued their water turbine production several years ago. Some manufacturers of steam engines continued production into the 1950's, but by that time, most plants had converted to electrical power. The old line shaft power transmission systems slowly declined, as new machines came equipped with individual motors.

Increasing population and the growth of agribusiness caused milling companies to grow enormous in size and production capacity, and a few came to dominate the flour industry. Similar trends were true in the textile field. Large corporations placed intense pressure on smaller firms, and many were forced to close. The cotton and manmade fiber textile manufacturers also became dominant, the only holdout for some smaller mills being in woolen production. And of course, this situation can even be seen in the forest products industry. A few large enterprises such as Georgia-Pacific and International Paper have risen to dominance. However, the small sawmills continue to thrive in Tennessee and other states. Their operation is much the same as it was six generations ago, technologically speaking, although computer controls and automation have now taken over much of the sawyer's skills.

This march toward automation has influenced greatly the grain and textile industries as well. The operators in modern grain mills never touch the products from incoming grain to outgoing packaged flour. The grinding, separating, and packing steps are fully enclosed, and products are moved by air systems rather than cup elevators. Gluing or heat-sealing machines close the bags in a fraction of the time the miller of old could hand-tie them with the well-known "miller's knot" (a clove hitch), or stitch the big flour bags by hand with two needles.

Despite these great advances and the domination of large companies, several relatively small milling operations continued to be established and to survive in Tennessee well into the twentieth century. Even as late as the 1950's and beyond, numerous towns and cities had their own milling establishments. During the Depression, some small family mills were erected. A notable survivor is Enochs' Mill in Humphreys County, built in 1934 of logs and still operable. In addition, many country stores bought engines or motors and small vertical stone buhr mills, and ground corn meal for the neighborhood. The end of the twentieth century, however, witnessed the demise of most small grain milling operations. Grain prices remained quite low, and large mills could buy enormous quantities much cheaper than small mills. Consequently, the big milling companies could afford to buy their way into chain groceries and offer very low prices on flour and corn meal. It was virtually impossible for the little mills to compete, so most were forced to close. The last three known to the author to end business were the Spaulding Milling Company in Manchester, Pond Creek Milling Company in Loudon, and Ketner's Mill in Marion County (primarily due to the death of Clyde Ketner). Most of these operations depended on individually owned stores to carry their products, and these have also been forced out of business for the most part by huge chains. The author's own mill, Falls Mill in Franklin County, is probably the only small privately-owned mill in the state known to produce flour and meal products for wide distribution. Most of this business is in niche markets and mail order, and is marginally profitable at best. It should be noted, however, that a few former grist and flour mills have kept afloat by switching to feed milling and specialty products. A couple of examples are the Dungan-St. John Mill in Washington County and Kingsport Milling Company of that city. Other mills have changed their character entirely, surviving as bed and breakfast accommodations (e.g., Ledford Mill in Moore County and Cortner Mill in Bedford County), retreat centers (e.g., Evins' Mill in DeKalb County), private residences (e.g., Cedar Bluff Mill in Franklin County, Bashor Mill in Washington County, Riverdale Mill in Knox County, and Richland Mill in Grainger County), non-mill related museums (e.g., Hurricane Mills in Humphreys County), warehouses, stores, and barns. Several are in parks (e.g., Rice Mill in Norris Dam State Park, four mills in the Great Smoky Mountain National Park, Alvin C. York Grist Mill in Fentress County, Hurricane Mills on Loretta Lynn's Ranch and David Crockett Mill in David Crockett State Park). The Marathon Village Textile Mill complex in Nashville was being developed as artists' studios. Ketner's Mill in Marion County hosts a large arts and crafts show each October. Falls Mill in Franklin County is head-quarters for the non-profit Museum of Power and Industry, Inc., is open year-round, and hosts numerous school and tour groups. Most of the remaining mills in the state are privately owned, and only a very few are in a condition to be entered. Many are listed in the National Register of Historic Places (see Appendix B), but the majority have been allowed to deteriorate markedly.

Conclusion. This chapter has divided the mill history of Tennessee into four periods. Since overlaps in technology occurred among these periods, successive sections of the chapter, each relating to a distinct period, have become shorter in length. The importance of the four time periods will become more evident in Chapter 7, when National Register eligibility criteria are discussed.

CHAPTER 3

HISTORICAL STATISTICS ON MILLING OPERATIONS IN TENNESSEE

There exist four classes of archival records which shed light on the numbers and types of mills and related industries in Tennessee, as follows: United States census records, county records, directories, and specialized books. The United States has conducted population census data collection each decade beginning with the 1790 census. Until 1850, the information contained in these early records was sketchy, including generally only the name of the head of household, a tally of the males and females in the household among various age groups, and in some cases an indication of occupation. However, in the 1850 and succeeding censuses, the name of each household member was listed, along with the age, sex, and (usually) occupation data. As time progressed, more and more detail was added to the census, but the quality of the data collected depended solely on the competence and penmanship of the field personnel. Therefore, not all information can be accepted as accurate. These records are useful in locating, for example, those individuals who were classified as "millers," "manufacturers," and the like, but in many cases, millers were primarily farmers, so were listed under that common occupation.

Generally, a summary following each census was undertaken and published by the United States. Clerks read through the field manuscripts (which were, of course, hand written) and tallied the counts by county, occupation, age groups, etc. These summaries were bound volumes, so have survived. Many of the original census manuscripts, on the other hand, have been lost, notably the entire 1890 census. Within a given state, often the researcher will find certain counties missing, even though the county was in existence when the census was taken.

There was interest as early as the 1810 census in collecting manufacturing data along with the population data, but the first attempt resulting in any usable information occurred in 1820. During that census year, the marshals were directed to visit as many manufacturing concerns as possible within each county, for the purpose of collecting information regarding ownership, size, machinery used, products produced, investment, and profits. Unfortunately, they were provided no forms on which to record this data, and their instructions were sketchy at best. They generally attempted to catch the proprietor at work (sometimes unsuccessfully) and requested that he fill out the form himself. This met with much suspicion and a reluctance to provide any information, for the owners often felt the data would be used to further tax their businesses. As a result, it is safe to assume that many mills were omitted. In fact, of the 47 Tennessee counties existing in 1820, only 17 are represented in the surviving 1820 Census of Manufactures, as it was called. Even county boundaries were obscure and not known for certain by the census takers, so a business existing in one county sometimes is found listed in another. Due to the nature of the data collection, and the lack of adequate instruction, the surviving 1820 Census of Manufactures for Tennessee is in what could almost be described as narrative format. Although further interest in collecting manufacturing data was apparent in subsequent census years, it was not until 1850 that any usable information appeared in a manufacturing census. By this time, forms were used with columns requiring specific information to be filled in by the census taker. These original field manuscripts were then summarized as was the population data, and the results were published by the Government in their own volumes. Because the greatest interest through the years seemed to lie in the population records, the manufacturing records were allowed to deteriorate and, though now on microfilm, are in many cases extremely dim or otherwise difficult to read. In addition, congressmen developed the noxious habit of removing census records for their own use and sometimes never returning them. This explains many of the gaps now occurring in the early field records. Others were lost through neglect or fire (especially in the case of the 1890 records). In the surviving 1850 Census of Manufactures records for Tennessee, 71 of the 81 counties are represented. The 1860 and 1870 records do not fare as well. Tragically, the entire first half of the 1860 Census of Manufactures for Tennessee has been lost, so the surviving records begin with Monroe County and proceed alphabetically through Wilson County. For some curious reason, the opposite is true for the 1870 census – in this case, only Anderson through Greene Counties can be found. The 1880 census is relatively complete by counties, but unfortunately seems lacking in much information (in other words, many large mills and factories known to be operating in that year do not appear in the records). The 1890 field data is completely gone, but the summary volumes survive. Subsequent census records are generally complete.

County records surviving in Tennessee are also very good sources for information on mills and factories. Many counties retain their records back to the year of formation of the county, although they are often in deteriorating condition. Most of the deeds records, which contain some of the more useful information on mill ownership, have been micro-filmed and stored in the Tennessee State Library and Archives in Nashville. However, court records, which frequently reveal detailed information about mills and factories, are not always as readily available. Due to the sheer volume of these records, the large number (95) of Tennessee counties, and the existence of many thousands of mills and factories throughout the history of the state, it was beyond the scope of this study to attempt an exhaustive archival search of these records. However, where useful information could be provided, some of these records were reviewed.

Directories were published during the nineteenth century which contain lists and additional data on grist and textile mills. The best known are E. H. Cawker's directories of United States flour mills (under different titles for at least 1880 and 1890), and textile manufacturers directories such as Dockham's (beginning 1866 annually) and the "Blue Book" (begun by Palmer prior to 1888 and carried on by Davison). Although information is usually sparse, the names, owners, and locations of the establishments are given, with sometimes further data on products and machinery.

A final source of useful information regarding mills and factories in Tennessee is the specialized work which lists establishments by location. The earliest known volume of this type is Eastin Morris' *Tennessee Gazetteer* of 1834. Many grist and saw mills and textile factories are listed by either town or county, and sometimes the power source is noted (there were a few steam engines this early). The author has also discovered a few other sources during previous research, notably J.B. Killebrew's *Introduction to the Resources of Tennessee* (1874), in which Mr. Killebrew presents a rambling county by county discussion which often includes highlights of milling and textile establishments. Possibly the best known work of this type is Goodspeed's *History of Tennessee*. It was the goal of the Goodspeed Publishing Company to compile county histories among many of the states, the results of which appeared in numerous volumes in 1887. Most large genealogical libraries contain these. As well as the author has been able to determine, the method of information collection was to send a field representative to the county. This person typically located the oldest surviving settlers and historians who would agree to be interviewed and collected oral histories. The Goodspeed representative would also usually pull interesting court cases from among the county records and quote from these. Finally, the prominent men and women in the county were interviewed regarding their ancestry and contributions. Much information about mills and factories resulted, particularly those in operation at the time of the interviews. The acceptance of the earlier milling history of each county must be tempered with the knowledge of how the data was collected (i.e., through oral history long after the fact). In most cases, although probably not totally accurate, it is useful in providing a general overview of milling evolution in the area, and so has been included as a source for this study.

Because of the voluminous county data resulting from this mill evaluation, an effort has been attempted to condense the information into a useful summary statistical table. Table 1 below illustrates the progression of population and mills in the state by census period. Several points need to be emphasized, however. First, only the mills and factories listed in the census records are included, with the realization that many (particularly small) milling establishments were omitted by the census takers. Among these were the mills which might fall below a certain annual profit level, those whose owners were absent, and those which were strictly family or small neighborhood mills, operating sporadically and not generally for dollar profit. Obviously, the astute reader will realize the potential for omission of a significant number of milling operations. Second, because so many counties are missing from certain manufacturing census years, an extrapolation has been attempted in order to estimate the mills and factories which could be reasonably expected in the missing counties. This was done by comparison of the "mills per capita" in the counties for which data is available, and the increase or decrease from decade to decade of the types of mills. Extrapolated numbers appear in red in the table, whereas actual numbers are in black. Third, other knowledge has been factored into the table to arrive at estimates for numbers of establishments. This includes the statements of Killebrew (see above) that a reasonable distance to travel to a mill in 1874 would be no more than four miles, as travel beyond that distance to have grain processed was difficult and time consuming. In fact, during this period there was approximately one grist or flour mill every 42 square miles in the state, so his figure is probably accurate. Finally, it is difficult to classify many of the mills into any one category, since they had multiple uses. For example, numerous water powered grist mills also had sawmills and sometimes carding machines. Some full-fledged textile factories also milled grain. This is evident from a study of the census data. When the data was summarized by the clerks, it was not always clear whether a mill with multiple applications was counted only once under its primary function, or was counted more than once under different headings.

The data in Table 1 below is fairly accurate for the census decades 1860 – 1900, except that many small mills were probably excluded. The data for the census decades 1790 – 1850 represent a combination of statistical extrapolation and conjecture based on historical evidence.

Census Year	State Population	Grist/Flour Mills	Saw/Lumber Mills	Textile Mills (incl. Carding)
1790	35,691	25	10	1
1800	105,602	50	25	5
1810	261,727	110	40	15
1820	422,823	174	60	36
1830	681,904	300	150	60
1840	829,210	360	300	75
1850	1,002,717	435	491	90
1860	1,109,801	481	543	100
1870	1,258,520	1,058	724	176
1880	1,542,359	990	770	125
1890	1,767,518	918	860	69
1900	2,020,616	1,618	1,820	68

Table 1. Growth of state population and change in numbers of mills of various types by census year, based on actual census data, statistical estimation, and historical evidence.

Several conclusions may be drawn from Table 1 and the data which contributed to it. The average rate of increase in Tennessee's population per decade between 1790 and 1900 was 44.33%. However, growth was at a greater rate before the Civil War than afterward. As late as 1800, most of the present state of Tennessee was in control of Native Americans. By the time of the 1820 Census of Manufactures, however, only part of the western quarter of the state and the extreme southeastern corner were classified as "Indian lands." By 1830, the entire state was laid out in counties, but their boundaries continued to change as more counties were added through 1879 (James County was annexed to Hamilton County in 1920 and disappeared, leaving the present 95 counties).

Tennessee covers approximately 42,175 square miles. Using the 1900 data, this would indicate about 48 persons per square mile on average. It would also indicate a grist/flour mill about every 26 square miles, so each mill was servicing approximately 1,250 people at that time.

The census data is a bit misleading in that it would appear the sawmills often outnumber the grist/flour mills. This is probably not the true case, since many (perhaps hundreds) of very small family operated grist mills existed. Also, certain textile mills in the nineteenth century operated seasonally (as in fact did some saw and grist mills), so if the census taker arrived during off-season, the mill might appear to be permanently closed and thus ignored.

It is evident that textile operations were declining during the latter part of the nineteenth century. In fact, as indicated earlier, most small textile factories closed around the turn of the century. On the other hand, grain mills proliferated, due primarily to the roller process for flour (1880's and 1890's) and expanding markets as a result of improved transportation. The increasing demand for lumber and the decline of hand-hewn log houses caused sawmills to also increase greatly. The 1890's in the South seem to mark the beginning of a significant timber harvesting effort, with the resulting mass destruction of virgin forests.

Census data also provides insight into the application of power sources to mills and factories in Tennessee. It is interesting to study the topography of the state as it relates to power as well. For example, the eastern third of the state is more mountainous and therefore provided better mill seats for water power, particularly in the case of overshot water wheels. The further west settlers progressed, the flatter the terrain. Coincidentally, as westward migration and settlement began in Tennessee, the water turbine and steam engine were becoming available, and were better suited for less mountainous areas. Killebrew makes the point that in 1874 there were operating in Nashville 82 steam engines and 12 water wheels (which could have been turbines). The 1880 Census of Manufactures summary is the first that attempted to quantify the power sources employed in manufacturing. Table 2 provides this information for 1880 and 1890.

Type of Mill	Year	No. of Mills	Water Wheels No.	Water Wheels Hp.	Steam Engines No.	Steam Engines Hp.	Electric Motors Hp.
Grist/Flour	1880	989	933	12,699	273	8,741	-
	1890	918	897	11,166	247	8,820	65
Saw	1880	755	349	4,165	494	13,734	-
	1890	717	161	2,264	643	20,055	-
Textile	1880	125	52	1,102	25	1,280	-
	1890	69	58	1,219	34	3,678	-

Table 2. Power sources for mills of various types in the census years 1880 and 1890.

Several observations may be noted regarding the data in Table 2. Only sawmills (as contrasted with lumber finishing mills) are included in their category. Some mills undoubtedly had both water wheels and steam engines, which was common in situations of seasonal low water. 31% of the water wheels listed for all mills in 1890 were turbines. The average horsepower (hp.) for a water wheel in 1880 was about 13, whereas for a steam engine was 30. The figures for 1890 are about the same, except the average steam engine horsepower increased to 35. Electrical power was available to a very small number of establishments in 1890. These may have been motors powered from a water-driven generator, or could have been located in metropolitan areas powered from an early electrical grid. Steam was evidently becoming the power of choice for the saw milling business, but was slower in supplanting water for grain milling.

In order to better understand the regional development and distribution of mills and factories in Tennessee, the next chapter provides a brief summary of the milling history of each of the state's 95 counties.

CHAPTER 4

A BRIEF HISTORY OF MILLING IN EACH TENNESSEE COUNTY

During the course of this study, a voluminous amount of material was gathered on the milling history of each of the 95 Tennessee counties. The sources for this information included the U.S. Census of Manufactures schedules and summaries (1820, 1850-1900), Morris' *Tennessee Gazetteer* (1834), Killebrew's *Resources of Tennessee* (1874), the Goodspeed histories (1887), various mill and factory directories of the nineteenth and early twentieth centuries, certain county records, and numerous contemporary county histories. These sources have been discussed in some detail in Chapter 3. In addition, the Tennessee list of existing mills, compiled and updated by the Society for the Preservation of Old Mills (SPOOM), has been referenced and is included in its entirety in Appendix A. The SPOOM list is based on information compiled by members of SPOOM. While it is probably the most complete list of mills in the state, it is not based on a comprehensive survey and some mills or mill sites may not be listed. This source (as well as the author's experience in restoration of several old mills around the state) was used to generate a group of mills to visit, assess, measure, and photograph. The mills selected were believed to be representative of a period, an architectural style, a power source, or machinery.

The county by county synopses which follow cannot be judged complete, as it would be virtually impossible to catalog every mill which existed in the state of Tennessee. In fact, no source of information is in itself complete. The census records are certainly not all-inclusive, especially of small family mills. Goodspeed's county histories are based to a large extent on oral tradition, so are not necessarily accurate. Killebrew's work was not intended to be a study of mills and factories per se, nor was Morris'. And most of the contemporary county histories reference Goodspeed for much of their material!

However, an effort has been attempted to convey an overall picture of each county's milling development, including the names of the individuals who contributed to this important aspect of Tennessee's industrial heritage. Unfortunately, several counties have very little information regarding their milling past, including Bledsoe, Campbell, Chester, Clay, Cumberland, Fentress, Grundy, Houston, Jackson, Lake, McNairy, Macon, Marion, Meigs, Pickett, Polk, Putnam, Rhea, Scott, Sequatchie, Trousdale, Unicoi, and Union. In many of these cases, the counties were formed relatively late, so it seems reasonable to believe that their mill history and development are tied to their parent counties. Information for mills in some of these counties may therefore be contained in records from the county from which they were formed.

From the viewpoint of settlement, it is obvious that the earlier mills originated in East Tennessee. Since water power sites were abundant in these areas, and travel to a mill was restricted by terrain, large numbers of mills were concentrated in this region of the state. By the 1880's, many of these counties each sustained over 40 mills of various types. By the time the western portion of the state was being more heavily populated (post-1850), steam engines and water turbines were becoming available. This was fortunate, for the flatter topography did not lend itself well to the use of water wheels. Logging was easier in the west, so an abundance of sawmills sprang up. They often outnumbered grain mills in certain counties.

The pre-Civil War textile centers of the state were located in Franklin, Henry, Lawrence, and Sullivan Counties, but numerous additional counties boasted one or two cotton and/or woolen factories. After the war, the heaviest textile production seemed to be in Lawrence, Warren, Henry, and McMinn counties, at least until the huge factories of the 1880's and 1890's were established in larger metropolitan areas.

An entire study could be undertaken of the milling families associated with the state's early history. In many cases, three or four generations of the same family carried on the traditions of grain milling, such as the Ketners in Marion County and the Massengills in Grainger County, often in the same mill structure. The history of the Faulkner family and its contributions to the textile industry of Warren County is also fascinating.

For the sake of brevity, however, the following summaries are offered as snapshots of the development of a complex and widespread industry, and are not designed to be a comprehensive study of each county. They are presented alphabetically by county name. More detailed archival research among county records could be expected to reveal much additional information.

ANDERSON COUNTY

Anderson County is located in northeastern Tennessee. It was established in 1801 and occupies 340.54 square miles. The county seat is Clinton. Prior to 1840 Whitson and Gibbs operated a mill and distillery near Andersonville, and the Harts had a saw and grist mill on Hind Creek. There were no doubt many others, and by 1850 the Census of Manufactures listed five grist and one sawmill, including the merchant mill and cotton gin of James Banham. These were all water powered. In 1860, the census summary showed 14 grist/flour mills, 10 sawmills, and a wool carding operation. By 1870, several more grist and sawmills were operating, as well as three carding operations. Many of these were located on Clear Creek. By 1880, only three grist mills and three sawmills were listed in the census. In 1887, a large mill (presumably flour) was run by Narcross and Thomas' Sons, employing 30 men. Today, two mills are known to survive in the county. These are the Rice Mill (see Chapter 5), moved from another location but operable, and the Webb Mill near Clinton, once powered by an overshot wheel but now used as a barn.

BEDFORD COUNTY

Bedford County was established in 1807 and is located in southern Middle Tennessee. It is 469.74 square miles in size and the county seat is Shelbyville. The earliest mill in the county was probably Goge's, on the creek of that name, erected perhaps in 1809 or 1810. Prior to that time, settlers had to carry corn to Phillips' horse powered mill in Rutherford County, or grind it themselves on hand stones. There were by 1820 at least eight grist mills (according to the Census of Manufactures). Killebrew mentions in 1874 13 water and 2 steam powered grist/flour mills in the county. This number had grown to 18 by 1880, with 18 sawmills and two carding operations as well. The Duck River and its tributaries offered significant water power, and mills proliferated after 1815. The Wilhoit family was involved in milling for many years, with the earliest Wilhoit mill dating to about 1815. Cotton gins were also common, with the earliest about the same year. The first merchant in Shelbyville was James Deery, and the Deery family later (about 1850) built a large textile factory in Franklin County on Elk River. The best-known textile factory in Bedford County was the Sylvan Cotton Mill near Shelbyville on Duck River. It was established in 1852 by Gillen, Webb, and Company, and later called Whiteside and Company. In 1857, George Pickup came from England to assume the position of weaving boss in the factory. His wife Martha also worked in the mill. When it burned in 1881, they left for the Warren Cotton Mill in Lincoln County to find work. On the way, they passed near Falls Mill in Franklin County and decided to visit. They soon bought an interest in Falls Mill and moved there. The Sylvan Mill was rebuilt and operated by steam and water power through at least 1912. In 1887, it ran 3,680 spindles and 108 looms and had a daily capacity of 6,000 yards of cotton drilling and sheeting. By the late 1880's, two large flour mills operated in Shelbyville, the Victor and the Shelbyville. They each had capacities of over 225 barrels of flour per day. Today, Cortner's and Fairfield Mills survive. Cortner's Mill operates as a restaurant and lodge, and Fairfield Mill is a residence. Both are on the Duck River and were powered by water turbines.

BENTON COUNTY

Benton County is situated in northwestern Tennessee with Camden as the county seat. It was formed in 1835 and occupies 423.32 square miles. The earliest mills were said to be hand or horse powered, but the water powered grist mill of Matthew Williams was thought to date to about 1824. Several soon followed, and it was not long before sawmills were attached to several of them, and gins were erected. The Big Sandy became the major water power source, although no factories were ever built in the county. The number of mills listed in the Census of Manufactures for the year 1870 were seven grist, one grist/saw, and one sawmill. By 1880, these were six grist and five sawmills. The Hudson family was prominent in milling in the county during the latter part of the nineteenth century. There are no mills known to survive presently in Benton County.

BLEDSOE COUNTY

Bledsoe County was established in 1807, and is located in the western edge of East Tennessee, north of Chattanooga. The county seat is Pikeville, and the county area is 399.38 square miles. Little is known of the milling history of this county, since the Goodspeed Publishing Company failed to include it in their histories. In addition, it is missing from every extant Census of Manufactures except 1880, where only one grist mill is included. A history of Bledsoe County (Robnett 1993) mentions a circa 1807 grist mill erected by George Skillern on Skillern Branch in Sequatchie Valley near Pikeville, and this is said to be the earliest industry in the county. Tollett's Mill near the source of the Sequatchie River is mentioned in an 1808 record, and was later well-known. By 1840, there were 15 grist and 10 saw-mills operating in Bledsoe County. Cawker's 1880 and 1890 flour mill directories list two and three mills, respectively. No mills are known to survive in the county today.

BLOUNT COUNTY

Blount County (county seat Maryville) is just below Knoxville in East Tennessee. It was established in 1795 and covers 569.09 square miles. There is considerable information regarding its milling and manufacturing history. Settlement began circa 1785, and small tub mills were erected on the numerous creeks, one of the earliest near McTeer's Fort. The first archival reference to a mill is in 1788, when John Kirk went to John Sloan's mill on Nine Mile Creek the morning his family was massacred. Before the county was officially formed, several other mills were known to be in operation, including McCullock's Mill on Pistol Creek (which existed from 1792 until it burned in the 1940's). Ish's Mill and Kelly's Mill were also in production prior to 1795. After the county was established, numerous permits were granted for the erection of mills. There were also at least six cotton gins as early as 1802, and a wool carding business by 1820. In 1815 Samuel Henry built a brick mill and installed French buhrs, presumably for the production of flour by the Evans system. This mill operated until the 1940's, and is now gone. In 1842, Samuel Henry also built the first dam on Little River near the present site of the recently burned Peery Mill (Walland). The later dam of the Peery Mill still exists. Alexander Kennedy operated an early mill at “Horseshoe Bend” on the Little River. It later became the Cave Roller Mill, and was destroyed by flood twice, in 1875 and 1900. Kennedy produced flour and meal, lumber, and gunpowder, supplying Andrew Jackson with the latter at the Battle of New Orleans in 1814.

By 1850, there were at least seven grist/flour, four saw, and two textile mills in the county of significant size, not to mention the dozens of small tub mills scattered throughout the isolated coves and hollows. Cades Cove, now a part of the Great Smoky Mountain National Park, boasted several early mills. The John Cable Mill, built in the 1880’s and reconstructed in the 1940’s (see Chapter 5), is the only survivor. The number of larger mills and textile factories was around 20 during the period 1860 – 1880, although Killebrew makes reference in 1874 to 16 grist and 23 sawmills. Three of the sawmills were steam powered, but many of these were no doubt small operations. The 1880 Census of Manufactures lists 12 grist/flour mills, 3 grist/sawmills, 7 sawmills, a wool card, and the Parham Woolen Mill on Pistol Creek (this may have been one of the mills discussed below under a different name).

Blount County also has an interesting textile history. Several wool carding machines and carding factories existed, some quite early. In 1838, the dam of William Oldham’s cotton spinning factory in Knox County was ordered destroyed (see Knox County), so he relocated near Rockford in Blount County on Little River the following year. Alexander Kennedy acquired this factory in 1845, and it was reported in 1850 that he was to manufacture “good quality yarns, domestics, and tickings.” In 1852 the Rockford Manufacturing Company was organized to produce wool, cotton, silk, and hemp goods, and Kennedy was involved in this enterprise as well, later transferring his saw and grist mill property to the company. After the Civil War, this company was re-chartered and continued operation almost to the time it burned in 1909. By 1889, with 5,000 spindles in production, it was one of the larger cotton mills in the state.

In 1848, a company of Englishmen was chartered to erect a large cotton and wool spinning and weaving factory on Abrams Creek. It was known to be in production by 1853, and operated until its closure before the Civil War. The two other textile factories known in Blount County were the Maryville and the Anchor Woolen Mills. The

Maryville Woolen Mill originated in 1873 and operated until 1901, and was destroyed by fire sometime after 1910. The Anchor Mill existed from 1880 until 1906. Textile production in Blount County shifted to hosiery in the early twentieth century.

Lumber and saw milling also have contributed significantly to the history and economic development of Blount County. The earliest sawmill is thought to have been that of Alexander Kennedy in 1796, and this would have been an up-and-down variety. Numerous others followed, and by the latter part of the nineteenth century, large timber companies were organized and began buying and leasing huge tracts of timber. At least six of these existed, exploiting vast forest lands, building canals and railroads for moving logs, and erecting sawmills, planing mills, and drying kilns. Most of these large mills were steam powered by stationary engines. Coal or lumber waste was used to fire their boilers. Probably the best known of these lumber interests was the Little River Lumber Company, which founded the village of Townsend in 1902. Remains of their operations may still be seen in parts of the Great Smoky Mountain National Park. The company closed in 1938 (Burns 1957).

Today there are six known extant mills in Blount County, and five more mill sites with historical significance. The greatest recent (1986) loss was that of the large Peery Brothers mill on Little River near Townsend, a victim of suspected arson.

BRADLEY COUNTY

Bradley County was formed in 1836, and is located in southeastern Tennessee east of Chattanooga. The county seat is Cleveland, and the county occupies 342.91 square miles. The county boasted a considerable number of grist and sawmills in its early history, all of which were originally water powered. The 1850 Census of Manufactures lists twelve grist and 8 sawmills. There were probably several more tub mills and small family establishments. One tub mill in the Laurel Hill Community, built by John Roberts, was described by T.E. Thatch. He also stated that Roberts built the first sawmill in the area, which ran “up and down…by water power and would saw two or three hundred feet per day” (Lillard 1976). At least two carding machines also operated in the county. By 1880, the numbers of grist mills and sawmills were at least eleven and six, respectively, with two wool cards. Hardwick Woolen Mills was established in Cleveland in 1868 (then called Cleveland Woolen Mills). By 1887 it employed 60 people and produced 1,500 yards of jeans material per day, by steam power. W.C. Mansfield moved roller milling equipment into the Cleveland Flouring Mill prior to 1887, and was producing 200 barrels per day. There are no mills known to exist in the county today.

CAMPBELL COUNTY

Campbell County is in northeastern Tennessee on the Kentucky line north of Knoxville. Its county seat is Jacksboro, and it was founded in 1806. It covers 464.12 square miles. Its milling history is very sketchy. Although it probably followed closely the mill development of other counties in upper East Tennessee, extant data is scarce. There was a carding operation as early as 1820, and by 1850 a grist/saw and two additional sawmills were listed in the Census of Manufactures. By 1880 five grist mills and two sawmills were listed. Four flour mills were known in 1890 (Cawker 1890). There are no existing mills known in the county today.

CANNON COUNTY

Woodbury is the county seat of Cannon County, which is in Middle Tennessee southeast of Nashville. The county was formed in 1836, and covers 266.54 square miles. Only the 1880 Census of Manufactures records survive for this county. It lists seven grist/flour mills, six sawmills, and one wool carding operation. Goodspeed, however, mentions several early mills, beginning with Charles Ready's mill on Stones River in 1812. Ready was one of the earliest settlers in the area, and gave his name to the community of Readyville. A later mill (circa 1870's) was built on the site of Ready's Mill, and still stands, although in a deteriorating condition (see Chapter 5). Other early mills were generally on the Stones River or its tributaries, and probably numbered more than a dozen. Four major flour and meal mills operated in the county by 1887, and there were said by Goodspeed to be from ten to fifteen portable steam sawmills at work. Carding operations were also represented, although no textile factories were ever known to have been built. The only mill which may still survive in Cannon County, other than Readyville, is known as Wildwood Mill, and was turbine powered and in a deteriorating condition as early as 1980.

CARROLL COUNTY

Carroll County was formed in 1821, and is located in West Tennessee. The county seat is Huntingdon, and the county occupies 599.62 square miles. It is stated by Goodspeed that no mills existed prior to 1822, and the settlers had to carry grain to Humphreys County to have it milled. However, several mills were soon established, and the highest number of operating mills seems to have been in 1870. In that year, the Census of Manufactures lists 32 grist, 2 saw, and 4 textile mills. Two of the textile mills were simply carding operations, but the other two were termed cotton mills, although no further information is known of these enterprises. By the 1880 census this had declined to only 11 grist/flour mills, although 9 sawmills were included. The Huntingdon Woolen Mills Company was incorporated in 1888 (Dockham 1890). There are no known mills surviving in Carroll County.

CARTER COUNTY

Carter County is in extreme upper East Tennessee, with the county seat at Elizabethton. It traces its origins to 1796, the year of statehood, and covers 372.24 square miles. Landon Carter is thought to have had a forge and mill at Elizabethton in 1795. Matthew Talbott built what is said to be one of the earliest mills in the state on Gap Creek. By 1820, there were at least five grist and six sawmills, and two carding operations. These numbers had swelled by 1850 to 12 grist mills, one grist/saw mill, 9 sawmills, and one carding mill, all water powered. Killebrew mentions 10 merchant mills in 1874. The highest number recorded by the census was in 1880, with 20 grist mills, one grist/saw mill, and 10 sawmills. The Doe River Woolen Mills were established in 1869 by Slinker, Lewis, and Scott. Scott left in 1876 to found the Watauga Woolen Mills on the Watauga River one mile from Elizabethton. This enterprise employed both water and steam power, and was producing in 1886 more than 45,000 yards of goods. The Doe River Woolen Mills employed about 40 people, and was rebuilt after a fire in the 1890's. The great flood of May, 1901, washed it away. Four mills and one ruin are known to survive in Carter County, but none are operable. They were powered by turbines or overshot wheels.

CHEATHAM COUNTY

Cheatham County is 308.73 square miles in area and is located west of Nashville. The county was founded in 1856 with the county seat at Ashland City. The establishment of several mills preceded the inception of the county, and one built by Marvel Lowe on Rose's Branch was said to date to about 1800. One built by Swigert near Pleasant View had its dam and pond in the mouth of a cave. A paper mill was established by George Brown in 1825 on Spring Creek. All these mills were gone by the 1880's. The Cumberland Valley Flouring Mill was erected in Ashland City in 1880, and soon combined with a saw and planing mill. No less than 17 sawmills were listed in Cheatham County in the 1860 Census of Manufactures. This number had dwindled to nine by 1880, with seven grist mills also operating.

The most interesting milling story in Cheatham County is centered around Sycamore Shoals. Sycamore Creek provided about 250 horsepower to developers in the early nineteenth century, and an unusual geologic phenomenon allowed this significant water power to be harnessed. The bluffs in the valley at Sycamore Shoals rise about 200 feet. A pointed bluff extends into the valley from the south, and descends and narrows to a width of only 30 feet. The creek is forced to travel a distance of about two miles in a horseshoe bend, and returns within 600 feet of where it traverses the narrow place in the ridge. By erecting a dam above this point, and cutting a raceway through the top of the ridge, the water could be made to drop about 20 feet, providing a considerable amount of power. The first dam and mills were erected by Seay and Shepard around 1835. They continued with a grist mill, sawmill, and cotton factory until 1844, also building the first powder mill, for which the site became famous. In 1844, Judge Samuel Watson came from Boston and secured an interest in the firm, changing the name to Cheatham, Watson, and

Company. The cotton factory was quite large, but with the coming of the railroads by 1858, the operation was forced to close due, it is said, to the increased freight costs for the raw cotton. The manufacture of gunpowder continued until the fall of Fort Donelson in 1862. After the Civil War, a new dam was built and the Sycamore Manufacturing Company was founded. About 1868 the company bought the entire machinery holdings of the Confederate Powder Works at Augusta, Georgia, and put it into production at Sycamore Shoals. Judge Watson superintended the establishment until his death in 1876, when it passed to F.L. Kneeland, then to E.C. Lewis. The business was still strong in 1887, when Goodspeed representatives visited Cheatham County, producing 400 kegs a day of gunpowder, for shipment. DuPont Company owned and operated Sycamore Powder Mill for many years. Today it is only a distant memory, as are all other early mills and factories in the county.

CHESTER COUNTY

Chester is a relatively recent Tennessee county, formed in 1875/79. It is located near Jackson in West Tennessee, with the county seat at Henderson, and occupies 276.36 square miles. Little information is available regarding mills in Chester County. There are mentioned in Goodspeed four early mills on Forked Deer River and Clark Creek, and a steam sawmill operated by J.A. Fry from 1857 through the time of publication of the Goodspeed histories in 1887. Five flour mills operated in 1890 (Cawker 1890). No mills are known to survive.

CLAIBORNE COUNTY

Claiborne County is in upper East Tennessee above Knoxville on the Kentucky line. It was formed in 1801 and occupies 468.85 square miles. The county seat is Tazewell. Information is somewhat sketchy on mill history for this county. However, 1860 seems to be the peak year for mills. There were 19 grist, 12 saw, and 4 carding mills in the Census of Manufactures for that year. In 1870 the number of grist mills remained the same, but sawmills and carding operations diminished somewhat. In 1880 there were included 14 grist/flour mills and 10 sawmills. The most notable industry in the county was the pre-Civil War millstone quarry near Big Spring (Killebrew 1874). This was unusual in the state, most of the so-called “millstone grit” coming from further east and north, or from overseas. There are four surviving mills in Claiborne County, and Johnson’s Mill was operating as of 1989, using a Meadows vertical stone buhr mill and a Munson “under runner” mill (in these unusual mills the lower rather than upper stone turned). Remains near Russell Mill are thought to be that of a water powered mill using a primitive “paddlewheel” turbine, perhaps similar to that excavated at the Brainerd Mill site near Chattanooga (see Chapter 2).

CLAY COUNTY

Clay County is on the Kentucky line northeast of Nashville. It was founded in 1870 and has Celina as the county seat. It is 274.13 square miles. Little information has been obtained on historic mills in this county, but since it was formed late from Jackson and Overton Counties, its mill history is probably similar. The 1880 Census of Manufactures includes only one grist mill and two sawmills. No mills are known to survive in the county.

COCKE COUNTY

Cocke County (county seat Newport) is east of Knoxville on the North Carolina border. It covers 420.79 square miles and was organized in 1797. Due to the abundance of water power, Cocke County witnessed the establishment of numerous mills. As early as 1850, there were 21 grist, 6 grist/saw, 9 saw, and one wool carding mill, all water powered. In 1870 24 grist mills operated, but the numbers fell in the 1880 census to 4 grist and 7 sawmills. Newport Mills was probably the longest-lived flour milling business in the county, beginning before 1887 and still in production in 1982, although in a modern facility. Four mills are known to survive in Cocke County, although none are presently in use.

COFFEE COUNTY

Coffee County is located between Chattanooga and Nashville in Middle Tennessee. It covers 471.93 square miles. The county was founded in 1836, and the county seat is Manchester. The first grist mill is thought to be that of Josiah Berry, built about 1812 on the Barren Fork of Duck River. Several more followed, and the county boasted more than a dozen as early as 1840. Sawmills and gins were also erected during this period, and all were water powered. The number of grist and flour mills seemed to decline somewhat, and through the period 1850 – 1880, there were around two to four active at any one time. Sawmills outnumbered these. Wool carding was represented in the county in the 1860 census, and in 1871 a cotton factory was erected by William Murry on Brewer Creek near Manchester. In 1852, W.S. Whiteman built a paper mill on Barren Fork of Duck River in Manchester, but it burned in 1871. Later a large frame paper mill was built on the same site and operated for many years. The Tullahoma Woolen Mill was established in 1873, and by 1887 had 125 employees. It ran 4 cards and 85 looms, but burned in 1888 (Dockham 1890). Steagall's large planing and sawmill also operated in Tullahoma through the 1880's, employing some thirty men. An early conglomerate millstone quarry operated near Manchester for some period, but little is known of its distribution or location. The last milling establishment in the county was the Spaulding Mill in Manchester, and the building is still standing. It was in flour and corn meal production until about 1996, when it was forced to close after about a century of operation. It was last powered by electric motors, although much of the machinery was flat belt driven. No other extant mills are known in Coffee County.

CROCKETT COUNTY

Crockett County was formed in 1845, and is located in West Tennessee. Alamo is the county seat, and the county covers 266.39 square miles. There are no pre-1880 census records for mills in the county. Goodspeed states that early settlers had to grind their corn with mortar and pestle until a horse powered mill was erected in Dyer County. Soloman Shaw is believed to have built the first water powered grist mill in Crockett County on

Middle Forked Deer River. He later built a large steam spinning factory at what was called Quincy, to which were added wheat and corn milling equipment. The mill operated until the Civil War, when Mr. Shaw was murdered and his factory burned. Due to the flat terrain, steam engines found favor among grist mill, sawmill, and cotton gin owners, and they supplanted water power earlier than in the eastern portion of the state. By 1880, there were six active grain mills and eight sawmills. After the roller process for flour caught on, several large flour mills were erected or converted from older mills, and at least six were operating in 1887. It was also said by Goodspeed that James Ward ran a grist mill, sawmill, cotton gin, and woolen factory in the county. No mills are known to survive today.

CUMBERLAND COUNTY

Crossville, between Nashville and Knoxville, is the county seat of Cumberland County. The county was formed in 1855 and occupies an area of 674.85 square miles. Although no textile manufacturing was known in the county, four grist, four saw, and 4 grist/saw mills operated in 1870, along with a carding machine. In 1880 these numbers were one grist/sawmill and five sawmills. Little else is known of the milling history of Cumberland County, except that the last known standing mill, Linary's Mill, was destroyed in a flood in 1991.

DAVIDSON COUNTY

Davidson County lies in the middle of the state and includes the state capital of Nashville. It was founded in 1783 and occupies 557.7 square miles. Nashville's location on the Cumberland River, later its position as a railroad hub, and its choice as the capital, brought early manufacturers and industrialists to the area. Consequently, a myriad of mill-related businesses flourished during the nineteenth century. Crew's *History of Nashville, Tennessee*, published in 1890, includes a long list of mills and manufactories, including a cotton spinning factory he claims was operating in Nashville in 1802. Due to the shipping and transportation advantages enjoyed by the city, steam engines found an early home there. Morris' *Tennessee Gazetteer* of 1834 mentions two sawmills and a rolling (iron) mill, all powered by steam engines. Even the pumps for the city's water works were said to be operated by a high pressure steam engine that year. Certainly these were very early applications of steam in the South, other than on steamboats. The number of sawmills in the census records of Davidson County always seemed to exceed that of grain mills, with as many as 31 by 1880, compared with 14 flour and grist mills. Killebrew, however, states in 1874 that there were some 40 grain mills in operation in the county, in addition to those in Nashville. He refers to seven sawmills and eight planing mills in Nashville. In addition, he mentions a paper mill, two cotton oil mills, and a "giant" cotton factory in the city. This was the Tennessee Manufacturing Company, formed in 1869 and operating 14,000 spindles (Dockham 1874-75). By 1888 this factory ran 34,000 spindles and 1,018 looms by steam (Dockham 1888). Nashville Cotton Mills and National Manufacturing Company (both steam cotton mills) also operated in 1890, as well as the Nashville Woolen Mill Company (Dockham 1890). Killebrew points out that there were 82 steam engines and 12 water wheels at work in Nashville, powering a variety of mills, factories, and shops. It seems strange today that no representatives of these nineteenth century mills survive in Davidson County. Only two former textile mills within the city are still standing, and these certainly do not date to the early period. The last known standing grain mill was Newsom's (or Newsome's) Mill on the Harpeth River. It was supposedly built in 1862 and destroyed by fire in 1960.

DECATUR COUNTY

Decatur County is in West Tennessee east of Jackson. It was established in 1845 and occupies 325.41 square miles. The county seat is Decaturville. Goodspeed's histories provide no mill information, but Younger's *Decatur County* (1979) mentions four mills. One of the earliest grist mills was said to be Buckner Mill, on a bluff above Beech River. It was turbine powered (or perhaps tub wheel driven), but its date of construction is not given. Several sawmills and gins were located in the county at a fairly early date, including one horse powered gin (probably turned by a multi-horse sweep). The 1870 Census of Manufactures lists eight grist and one textile mill (probably a carding operation), but the 1880 census only includes one grist and two sawmills. No mills are known to survive in the county.

DeKALB COUNTY

DeKalb County is in Middle Tennessee east southeast of Nashville. It was formed in 1837 and covers 333.57 square miles. The county seat is Smithville. The earliest mill in the vicinity was thought to be the log grist mill of Adam Dale, built near Liberty around 1800. Several other mills soon followed. By 1860, the Census of Manufactures lists five grist mills and seven sawmills. These numbers had grown to 15 and 10 by 1880, and several establishments were operating on steam power by the early 1870's. In 1852, a flour mill was built in Alexandria. During the Civil War, Union General John T. Wilder, who later figured prominently in the industrial development of Tennessee, ordered the machinery of this mill rendered inoperable. At this same time, a steam mill on the site of Dale's old mill was burned by Wilder. The roller milling process for flour found its way to DeKalb County in the mid-1880's, and several mills were built or converted for this purpose. Allan Wright built the Dowelltown Woolen Mill in 1866, as well as a flour mill on the same site. This is the only known textile operation in the county, but it is not known how long it was in production. The 1880 Census of Manufactures lists the "White" Woolen Mill (which may be mistaken for "Wright'). There is today a mill at Dowelltown, but it is said to have been built in 1965. Three other mills still survive in DeKalb County, including the well-known Evins Mill near Smithville. As will be discussed in Chapter 5, this is an unusual mill, in that it was built as late as 1939, but uses a complete Fitz Water Wheel Company installation, including the overshot wheel, gearing, forebay, and roller chain drive. It is still in operable condition, although the site primarily functions as a conference and retreat center.

DICKSON COUNTY

Dickson County is just west of Nashville in Middle Tennessee. The county seat is Charlotte, the county was formed in 1803, and it occupies 505.19 square miles. Dickson County is more closely associated with the early iron industry in Tennessee than with mills, although water power was used for both, so they often operated on the same site. There are at least seventeen archaeological sites in the county connected with the iron industry, including furnace locations and forges. The best known is probably the Cumberland Furnace, which traces its roots to an early effort by Montgomery Bell (circa 1795) to establish an iron furnace near or on the later location of the site (Smith 1988). The 1820 Census of Manufactures lists Bell's furnace, and states that it employed a 36-foot water wheel to power the blast machine. Bell later cut a tunnel through the Narrows of the Harpeth (now in Cheatham County) to power another large furnace.

Although the number of mills in Dickson County was not great, according to the Census of Manufactures reports (the maximum was in 1880 with eight grist and seven sawmills), there were two unusual operations said to exist there. One was the early gin machinery manufactory of Robert Jarman, said to have begun in 1807. The other was operating in 1887. This was a grist, saw, and sumac mill in Bon Air owned by J.F. Gunkle. The sumac leaves were collected and ground, and sold for $70-$90 per ton for use in medicinal teas.

The only known surviving mill in Dickson County is the Old Spencer Mill, owned by Tim and Trish Miller (an appropriate name for a mill owner). Its odyssey from location to location is highlighted in Chapter 5.

DYER COUNTY

Dyer County is in northwest Tennessee on the Mississippi River. It was founded in 1823 and covers 508.29 square miles. The county seat is Dyersburg. In about 1826, G.L. Rutherford is said to have built a water powered grist mill on Mill Creek, and this is thought to be the earliest in the area. Several water and horse powered mills followed. By the mid-nineteenth century, steam engines began to appear, and sawmills proliferated.

The county seemed to always have some eight to ten sawmills operating throughout the nineteenth century. The earliest has been said to be that of Captain A.M. Stevens in the 1850's. He also erected a steam grist mill in Dyersburg in 1855, but it burned in 1886. Cotton gins were also prevalent, the earliest being horse or water powered. A large roller mill for flour was operating in Newbern in 1887, run by G.W. Parker. Johnston's Cotton and Wool Factory, listed in the 1880 Census of Manufactures, is the only known textile mill in the county prior to 1900. There are no mills known in Dyer County today.

FAYETTE COUNTY

Fayette County was organized in 1824. The county seat is Somerville, and the county covers 728.58 square miles. It is located in southwestern Tennessee just east of Memphis. Goodspeed states that the first mill for grinding corn was built by David Jarnigan and William Owen on the North Fork of Wolf River. The first horse mill was erected in 1827 by Thomas Cook. The first cotton gin appeared about 1830. Wool carding was present in the county in 1860, but there apparently was never a large number of grist or sawmills. By 1887, Goodspeed mentioned that S.B. Salmon operated a large water powered mill on the Loosahatchie River, no doubt powered by turbines, since the streams in the county did not fall a great amount. Also, it stated that C.H. Havens established a grist, cotton, saw, and planing mill at Hickory Withe in 1880. In the Census of Manufactures for that year, 8 grist/flour and 4 sawmills are listed in Fayette County. There is also included Somerville Mills, although this may not be a textile factory. No mills are known to exist today in Fayette County.

FENTRESS COUNTY

Fentress County is in the western edge of East Tennessee northwest of Knoxville. The county seat is Jamestown. The county covers 494.95 square miles and was established in 1823. The milling history of this county is quite sketchy. Killebrew lists four grist/flour mills on Wolf River (the second river of that name in the state), and four wool carding operations. The 1880 Census of Manufactures includes only one grist mill and one sawmill. The only surviving mill today in Fentress County is the Alvin C. York Grist Mill near Pall Mall, thought to have been built about 1835 and later operated by the famous World War I hero. This mill is also on the Wolf River, but no longer runs, although it is a state historical park and well-maintained.

FRANKLIN COUNTY

Franklin County is in southern Middle Tennessee on the Alabama line. It originated in 1807. The county seat is Winchester, and the county covers 569.17 square miles. Franklin County has a rich history of early settlement and milling, particularly pre-Civil War textile factories. Springs and water power sites are abundant in the county, and attracted settlers such as the Beans and Russells. David Crockett was the most famous figure in the county's formative years. There has been much speculation regarding the earliest mills in the county. It is generally believed, from archival information, that Jacob Rich established a grist and sawmill on Beans Creek in the western end of the county prior to 1820. Some sources also state that George Stovall had an early mill on the same creek, and place the date at 1812. The area near these mills became the village of Salem, and Goodspeed states it was a major cotton shipping point as early as 1815, with over a dozen gins in operation in the vicinity. Cotton was in those days loaded on flatboats and transported in high water to markets in New Orleans. Sometime after purchasing land on Factory Creek (a tributary of Beans Creek earlier called Falls Creek) in 1822, Isaac Vanzant built a grist mill and cotton gin. There was also an early mill built by James Dodson before 1816 above Lee's Ford on the Elk River northwest of Winchester.

Early deeds mention at least three mill seats surveyed in Franklin County, those on Factory Creek where Falls Mill now stands, one on Town Creek in Owl Hollow, and that of Dodson's Mill mentioned above. The Town Creek seat was apparently developed prior to 1834. By 1850, there were five known textile mills operating in Franklin County. These were run by Maney and Baker (Factory Creek), Teasdale and Company (Beans Creek), Allisonia Cotton Mills (Elk River) (also see Sullivan County), Town Creek Mills (Town Creek), and Crisman and Decherd (on the Dodson's Mill site). The only one producing cloth was that of Crisman and Decherd, which was probably the earliest textile factory in the county; the others were carding and spinning factories. In this same year, the Census of Manufactures lists 7 grist mills, 7 grist/sawmills, and 5 sawmills, all water powered. By 1860, this number had grown to 16 grist/flour mills, 13 sawmills, 4 wool carding operations, and at least 3 operating textile factories. It is interesting to note that one of the few nineteenth century mills in the state owned and operated by a woman was Ann Upton's grist and wool carding mill on Boiling Fork Creek in Franklin County.

The Civil War had a devastating effect on the industry of the county. All but one of the textile factories were burned or otherwise ceased production, and harness factories and mills were destroyed as well. By 1870 the number of operating mills had dwindled due to the destruction of the war, but by 1880 the industry had recovered somewhat. In that year, the number of grist/flour mills was 14 and sawmills numbered 21, according to the Census of Manufactures. The Griffin Woolen Mill was also listed in Winchester, but no further information is known of this particular textile operation.

The textile factory at Falls Mill was the only such enterprise to survive the Civil War intact. The old factory at the site, built in the 1840's by the Estill family, had been purchased in 1851 from Maney and Baker by George W. Hunt and Thomas W. Bell. It was afterward known as Hunt's Factory. During the Civil War it was operated by the Criddle family of Nashville, with assistance from Robert Newton Mann. In 1864, Mann became partners with Azariah David, whose textile factory on nearby Beans Creek had been burned by Union troops. They completed the present Falls Mill in 1873, and operated it as a cotton and woolen factory until bankruptcy forced its sale in 1884. All textile operations except carding ceased there around 1900, and in 1906 the present 32-foot Fitz steel overshot water wheel was installed, and the mill became primarily a cotton gin. Falls Mill now operates as a grain mill, and is a well-known tourist attraction in the state (see Chapter 5) (Lovett 2000).

No discussion of the milling history of Franklin County would be complete without a mention of the remarkable flour milling enterprise established near present-day Estill Springs, and the well-known Loop Plant. These were constructed in two different bends of the Elk River. In both cases, the river looped back to within a few hundred yards of its channel, providing attractive water power sites. Dams were constructed on the upper side of the loops, then tunnels were cut from just above each dam through the short land neck back to the river. This took advantage of the natural fall of the river as it looped, and the dam provided the additional head of water necessary to power the machinery. A similar, but earlier application occurred at Narrows of the Harpeth River in present-day Cheatham County (q.v.). At Estill Springs, a giant flour mill was erected about 1890 by Dr. E.T. Noel, near the site of the earlier Allisonia Cotton Mill. It was said to be the largest such mill south of the Ohio River, and surviving photographs seem to bear this out (*Franklin County Historical Review* 1987). It had its own railroad spur to the huge elevators and the loading docks. It was powered by water turbines placed in the tunnel that cut across the loop of the river. Some millstones may have been used in this operation, since several large ones could recently be seen about the site. The mill burned in 1912 and was never rebuilt, although the turbines were later used to power an electrical generating plant. The earliest generating plant in the county was the Loop Plant, established in 1901. It produced electricity for Winchester until the Tennessee Valley Authority began its program of electrification in the 1930's. Another noteworthy industry in the county was a cedar faucet factory at Beans Creek, established in the late nineteenth century. These faucets were used in vinegar and liquor barrels.

The only known surviving intact mill in Franklin County besides Falls Mill is the so-called Cedar Bluff Mill on Boiling Fork Creek near Winchester. It is noteworthy in that it was powered by a turbine (still *in situ*) built in the machine shop and factory of Union General John T. Wilder in Chattanooga.

GIBSON COUNTY

Gibson County is in northwestern Tennessee. It was formed in 1823 and occupies 589.9 square miles. The county seat is Trenton. The first water powered grist mill in Gibson County was said by Goodspeed to be that of Fite and Randolph on the North Fork of Forked Deer River, erected about 1825. A later author (Culp 1961) mentions that this was a trip hammer pestle, raised and lowered by action of the water wheel. Several other early mills and cotton gins followed. Although the 1850 Census of Manufactures only lists three grist, two saw/grist, and four sawmills, by 1860 the number of sawmills had grown to eight. Also in that year was listed a cotton mill and wool carding operation.

Nothing is known of this early cotton mill, although the large Trenton Cotton Mills were established in 1884 by J.A. Landis. It was said to be operating 3,200 spindles and 100 looms in 1888 (Dockham 1888). Several flour mills were built around the time of the Civil War. The Gibson County Mills in Trenton were erected in 1861 and converted to rollers in 1886. The Trenton Flour Mills were established in 1882, at the very beginning of the roller process era, and were said to have Old Process machinery (buhrstones and purifiers). A large steam flouring mill was built in Humboldt before 1858 by Taliaferro and Allison. Jarrell and Hamilton erected a steam sawmill in 1871. The Rutherford saw and grist mill was built by Wren and Williamson in 1876 and converted to rollers in 1884. The 1870 Census of Manufactures lists 11 grist/flour mills, 15 sawmills, one planing mill, and six wool carding operations in Gibson County. Killebrew (1874) makes reference to a woolen mill in Humboldt, although further information is unavailable. In 1880, there were 15 grist/flour mills, 12 sawmills, and a woolen factory in the county. Perhaps the longest-lived milling enterprise in Gibson County was Cooper's Mill, operating on the Middle Fork of Forked Deer River from before 1836 to 1920, when water was lost due to the digging of a new river channel (Culp 1961). No mills are known to exist in Gibson County today.

GILES COUNTY

Giles County is in southern Middle Tennessee and occupies 652.5 square miles. The county seat is Pulaski, and the county was formed in 1809. Giles County ranks in the top five counties in the state for number of mills and cotton gins operating throughout the nineteenth century. The earliest settlers had to grind their corn by hand or take it to Williamson County, but by 1812 there were several water and horse powered grist mills established. The first was said to be Nathaniel Moody's, followed by Buchanan, Cunningham, Hightower, White, Baylor, Williams, and Mayfield. When water was low, the horse mills were utilized (McCallum 1876). In addition to grist mills, several sawmills and numerous cotton gins were erected throughout the county beginning in 1810. Most of these gins were very small machines powered by hand or by horse treadmills or sweeps. Gradually, larger gins were built and powered by water, and eventually by steam. It is said by Goodspeed that nearly every farm raising cotton had its own gin. In addition, the early industries of the county included at least three gunpowder factories. Most of the saltpeter for the production of the powder is said to have come from a cave near Campbell's Station in Maury County.

Although the 1850 Census of Manufactures lists only nine grist and grist/saw-mills, and four sawmills, there were undoubtedly many more operating at that time. Also in the census, the Richland Manufacturing Company, a steam powered cotton mill, is said to be recently opened. This was later called the Pulaski Cotton Mills (or Manufacturing Company) and operated at least through 1876 (McCallum 1876). There was also a cotton rope and yarn factory called Vale Mills in 1874 (Killebrew 1874), and it may have been active before the Civil War, since there are two cotton factories listed in the 1860 Census of Manufactures. It was not mentioned as a cotton mill by Goodspeed in 1887, however, only as a grist mill and cotton gin, although it was known to produce textile products until about 1892 (Dockham 1891-92). In addition, the 1860 census lists 9 grist/flour mills and 13 sawmills. By the 1880 census year, the county data shows one cotton mill, 31 grist/flour mills, and 19 sawmills. The Webb and McGrew woolen factory was also operating by the time of Goodspeed's county survey in 1887. Goodspeed also includes by names of owners an incredible number of active mills and gins for that year. No less than 31 grist/flour mills, 14 sawmills, and over 100 gins are listed! A few of these were woman-owned, and the power sources were a mix of water and steam, with a great number of the gins horse powered. With such a significant amount of mills historically, it is surprising that today only the small mill in the Bodenham community is known to remain. Although most of this structure appears early-twentieth century, the site may date to the 1880's or before.

GRAINGER COUNTY

Grainger County was formed in the year of Tennessee statehood, 1796. It is located in upper East Tennessee and covers 307.0 square miles. The county seat is Rutledge. Although a county of very early settlement, Grainger unfortunately has little written information concerning its milling history. In the 1850 Census of Manufactures, there are listed ten grist mills, four sawmills, and two wool carding operations. There was also a paper mill. By 1860, the numbers were essentially the same, and they did not change appreciably through 1880, although in that census year 11 grain mills and 9 sawmills are included. One extant mill is known to remain in Grainger County today. This is the Richland Mill, which is now primarily a residence, although some machinery remains. It was powered by a Fitz turbine. Until recently, the Massengill Mill was also standing, but has now been removed. The Massengill Mill will be thoroughly discussed in Chapter 5 and is illustrated in Chapter 2 (Figures 63 and 64). It is believed to have been built in the 1790's, and the structure and stone dam were original. The mill was located in a state game preserve in a very deteriorated condition. It was powered by a water wheel. Remains of the building were moved in 2001 to Townsend, Tennessee.

GREENE COUNTY

Greene County (county seat Greeneville) is an early Tennessee county, formed in 1783. It is 616.94 square miles in area and is located in upper East Tennessee. Due to its mountainous terrain and abundance of water, Greene County witnessed the construction and operation of numerous mills. However, like Grainger County, little milling history is known in this area. In the 1820 Census of Manufactures, four grist mills are listed, but the actual number probably far exceeded this, since the census data collection was spotty at best. The number increased steadily through the mid-nineteenth century, and by 1860 the census recorded 25 grist/flour mills, 14 sawmills, and 6 wool carding operations. These numbers had grown to 37 grain mills and 23 sawmills by the time of the 1880 census. Goodspeed also reported Stevens Brothers (or Greeneville) Woolen Mill in operation in 1887. It burned in 1891 (Dockham 1891-92). The Home Woolen Company also operated from circa 1874 - 1906 by water power (Dockham 1874-75, 1907). Today 16 mills are extant in Greene County, more than in any other Tennessee county. Most, however, are in very poor condition, and actually three of these are thought to be ruins. One is a private residence. The most notable, as discussed in Chapter 5, is Babb's Mill near Walkerton. It is located at the foot of a high waterfall, and used a Pelton wheel for power.

GRUNDY COUNTY

Grundy County is located on the border of Middle and East Tennessee just northwest of Chattanooga, and Altamont is the county seat. It was established in 1844 and covers 349.88 square miles. Grundy County is rugged and has never been highly populated. Its milling history is very scant. In 1860, the Census of Manufactures listed two grist mills and four sawmills in the county. In 1870 only one sawmill and no grist mills were listed. It is known that a steam sawmill operated in the 1870's near Monteagle. The 1880 census lists 4 grist/flour mills and 4 sawmills for the county, and notes that one of the sawmills was "portable." There are no known mills surviving in Grundy County today.

HAMBLEN COUNTY

Hamblen County, in upper East Tennessee, is of relatively recent establishment, having been formed in 1870. The county seat is Morristown, and the county occupies 172.76 square miles. Due to the young age of Hamblen County, there is very little nineteenth century census information available on milling history. Since Hamblen was formed from Grainger, Hancock, and Jefferson Counties, its mill development no doubt closely paralleled that of these neighboring areas. The Hamblen County Centennial Celebration Committee published *Historic Hamblen 1870-1970*, in which they referred to several early mills. The first was thought to have been built by Michael Bacon on Bent Creek as early as 1779. The Old Cain Mill on Fall Creek near Russellville was built circa 1836, and was still standing in 1970, although now is gone. Four grist and sawmills were erected on Flat Creek, and the only mill still standing in Hamblen County is one of these, known as King's Mill. It has not operated in many years, although a few years ago it retained machinery. Shield's Mill (or the Holston Paper Mill) three miles north of Morristown, was a water powered paper mill built in 1825 by Dr. Milton Shields. Steam dryers were added in 1850. The Civil War closed the mill in 1861. A pre-Civil War steam flour and sawmill also operated in Morristown. The 1880 Census of Manufactures lists 17 grist/flour mills, 12 sawmills, and one wool carding operation. Goodspeed also mentions a 100-barrel steam flouring mill owned by McCrary and Gant in 1887.

HAMILTON COUNTY

Hamilton County, in southeastern Tennessee, contains the county seat of Chattanooga, one of the major industrial cities of the state. The county was formed in 1819, and covers 598.18 square miles. The earliest mill known in the area on which extensive research has been conducted was the mill at Brainerd Mission on the west bank of Chickamauga Creek, erected about 1817. The site was archaeologically investigated and a number of mill-related artifacts recovered, including the early turbine discussed in Chapter 2 (Lautzenheiser 1986). In 1852, Philamon Bird purchased the old Brainerd Mission Mill site and erected Bird's Mill. This mill was included in Goodspeed's histories as an operating mill in 1887, with three runs of buhrstones, a bolter, and a sawmill. It was undoubtedly run at this time by a water turbine, as the horsepower was stated at 75. Joseph Rogers is also said by Goodspeed to have built a mill in 1831 on North Chickamauga Creek. Chattanooga was in a growth mode prior to the Civil War, and as early as 1850 there were at least eight sawmills at work in the county.

Chattanooga's position on the Tennessee River, as well as its important pre-Civil War railroad connections, helped it become a significant early center of industrialization. The Bluff Furnace, located on the bank of the river, is the only such iron furnace site to be extensively investigated in the state (Council et al. 1992). It is thought to be the earliest of its type in the South. In 1860, the Census of Manufactures lists five grist/flour and nine sawmills in Hamilton County. Despite the devastation wrought on Chattanooga during the Civil War, by 1870 there were 58 manufacturing establishments utilizing over a dozen steam engines and about 21 water wheels. Killebrew (1874) states that the Mountain City Cotton and Woolen Factory was operating in Chattanooga in 1874. The 1880 Census of Manufactures includes nine grist/flour mills and eight sawmills in Hamilton County. John T. Wilder, who had marched through the area as a Union General, moved to Chattanooga after the War and established in 1880 the Wilder Machine Works, for the manufacture of his patented water turbine. He was involved in some investor capacity in the textile factory at Falls Mill in Franklin County in the early 1880's, and is known to have shipped one of his turbines there in 1882. Its application is unknown, although the water wheel at the factory about that time was aging. One of his turbines survives at the Cedar Bluff Mill in Franklin County. The population of Chattanooga was almost 18,000 in 1870, and this number grew to almost 24,500 by 1880. C.C. Shelton's flour mill was said to be the first in the South to install the roller process for flour, in 1881 (Goodspeed 1887). Chattanooga also had a silk factory established about 1890 (Dockham 1890).

Several large flour milling operations survived in Chattanooga into the twentieth century, and some exist today. However, only two earlier mills are known to survive, and neither is operable. The Lower Mill in Hixson (part of Chattanooga) is illustrated in Figure 23 in Chapter 2.

HANCOCK COUNTY

Hancock County is located in the northeastern part of the state and was formed in 1844. Its area is 237.12 square miles, and the county seat is Sneedville. The 1850 Census of Manufactures lists four grist, four grist/saw, and two sawmills in Hancock County, as well as a wool carding operation. All these were water powered. The 1860 census lists three grist/flour and two sawmills, with two wool carding establishments. The 1870 information is missing, but by 1880 there were listed nine grist/flour and two sawmills. A.B. Kesterson is said by Goodspeed to have built a water powered grist mill on Big Mulberry Creek, and later established the Mulberry Woolen Mills (circa 1887). Today, three mills are known to survive in Hancock County, all of which were powered by overshot water wheels. None is currently operating, and one was built as late as 1932.

HARDEMAN COUNTY

Hardeman County is in West Tennessee on the Mississippi border. The county seat is Bolivar, and the size is 677.59 square miles. The county inception dates to 1823. Goodspeed states that, aside from hand mills, mortars, and tub mills, the first mill built in the county was by Samuel Polk near Bolivar in 1823. The mills of Murray and Jarnigan soon followed. The father of John Norment built the first (and only) cotton mill in Hardeman County near Whiteville prior to 1839. Paul Jones established the Hardeman Woolen Mills in 1868, and his sons were still operating the factory in Leatherville when Goodspeed conducted interviews in 1887. In the 1850 Census of Manufactures, there are included four grist, three grist/saw, and eight sawmills, as well as the Norment cotton factory. The cotton factory was again listed in 1860, and by this census year there were five grist/flour mills and ten sawmills. Although the 1870 report appears incomplete, in that year seven sawmills are listed, and in 1880 22 grist and flour mills and three saw/grist mills are included. The Hatchie River supported a number of water powered mills, but since the county is relatively flat, water turbines and steam engines found early applications. An interesting later industry in Hardeman County was the steam powered Hickory Valley Sassafras Mill, where sassafras oil was extracted. No known nineteenth century mills exist in the county today.

HARDIN COUNTY

Hardin County is also in West Tennessee, on the Mississippi-Alabama lines. The county seat is Savannah. The county was formed in 1819 and occupies 620.14 square miles. A surprising number of grist mills were built around the time of the county's formation. These included the mills of Lacefield, Garner, Williams, Nelson, Montgomery, Berry, Johnson, Ross, and (later) Kincannon. Nelson's was a horse powered mill, and the remainder were water powered. Eastin Morris' *Tennessee Gazetteer* of 1834 includes a large number of mills and mill-related industries in the county in that year. He cites 11 cotton gins, 19 grist mills, 5 sawmills, and "2 or 3 horse mills." The 1860 Census of Manufactures lists for Hardin County two cotton factories, ten sawmills, and one wool card (curiously no grist/flour mills are listed for that census year). In 1870, five grist/flour mills are listed, along with eight sawmills and three lumber planing mills. In 1880, 14 grist/flour and 8 sawmills are included. No extant mills are known to remain in Hardin County today.

HAWKINS COUNTY

Hawkins is a very early county in upper East Tennessee. It was formed in 1786 and occupies 455.38 square miles. The county seat is Rogersville. Goodspeed states that the earliest mill in what became Hawkins County was the 1783 grist and saw mill of Thomas Amis near Big Creek. There was also mentioned a mill at Surgoinsville erected by John Rogers sometime after 1815. Hawkins County is one of the 17 counties in Tennessee included in the 1820 Census of Manufactures. This census includes five grist and eight sawmills, and a wool carding operation. By the 1850 census, five grist and two sawmills are mentioned, as well as one cotton mill and a wool carding and weaving establishment. By 1860, 17 grist/flour mills are listed, only one sawmill, and two wool carding operations. In 1874, Killebrew refers to two woolen factories, one at Rotherwood (water powered) and Kirkpatrick's (steam powered). Each ran one card and four looms (Dockham 1890). By 1880, the census lists 25 grist/flour mills and 13 sawmills, as well as Kirkpatrick's Woolen Mill. Goodspeed refers to the Walnut Hill Rolling Process Flour Mills built by Robert Kyle in 1886, and the flour and sawmill of David Tunnell at Slide in 1887. Two mill structures are known to survive in Hawkins County (see Appendix A), but neither is operable.

HAYWOOD COUNTY

Haywood County is northeast of Memphis in West Tennessee. It was established in 1823 and covers 505.88 square miles. The county seat is Brownsville. According to Goodspeed, the first grist mill was horse powered and erected by Wilson Mann in 1829. The earliest water powered mill was on the South Fork of the Forked Deer River, built by Daniel Cherry in 1836. Haywood County is not a part of the surviving 1850 Census of Manufactures, but in the 1860 report there are 14 grist/flour mills, 15 sawmills, and three wool carding businesses. Most of the grain mills by 1874 were steam powered (Killebrew 1874), and there was a cotton mill in Brownsville with 3,600 spindles and 113 looms. This was the Brownsville Manufacturing Company mentioned by Goodspeed, which is said to have operated (unprofitably) from 1874 until it burned in 1882. The 1880 Census of Manufactures lists 15 grist/flour mills, 12 sawmills, and 2 carding establishments producing batting. Eight grain milling operations are listed by owner in 1887 in the Goodspeed histories. No mills are known to survive in the county today.

HENDERSON COUNTY

Henderson County is in West Tennessee, with Lexington as the county seat. The county was established in 1821 and occupies 520.5 square miles. About the time of the county's inception, John and William Brigham are said by Goodspeed to have built a mill on Mud Creek. Daniel Barcroft also built one on Forked Deer River at this time. These were water powered, and a horse powered mill is said to have been erected circa 1822. Major John Harmon built the first cotton gin on Beech Creek in 1823. The Shackleford Mill about five miles east of Lexington was built circa 1823-1830. McGee's and Trice's Mills, and McClure's Gin were built before 1830. Another source (Stewart 1979) mentions Philpot's Mill on Dobb's Creek (after 1824), and a mill and gin built near Luray circa 1830. A large, early cotton factory was built by John and William Brooks near Lexington during the period 1835-40. Twelve cotton gins were said to be in the county between 1831-1851, and all but two were converted to steam around 1850. Nine millers are listed in the county in 1850 by Stewart. He also refers to a woolen factory on Piney Creek during the period 1855-1860. By the 1870 Census of Manufactures, six sawmills were also listed in Henderson County. In 1880, 14 grain mills, 2 grist/sawmills, and a wool card were included. By 1887, some mills had become large and converted to the roller process for flour. Two of these mentioned in Goodspeed are the G.W. Hodgin and Company steam mill, gin, and sawmill in Reagan, and the Fields, Powell, and Company mill in Sardis. Today, no historic mills are known to survive in the county.

HENRY COUNTY

Henry County is in the northern portion of West Tennessee on the Kentucky line. It was formed in 1821 and occupies 608.89 square miles. The county seat is Paris. One of the earliest grist and sawmills is said by Goodspeed to have been built by Jesse

Kuykendall on the North Fork of the Obion River about 1824. He apparently obtained rapid wealth with this establishment, but had problems later. It seems his millpond flooded an area of three square miles, and caused the timber to die and decay. This led to disease in the area, and neighboring citizens were finally successful in petitioning the court to have the dam destroyed in 1848. Another early mill was that of Josiah Cavitt and sons on Terrapin Creek about 1835. By 1850, the Census of Manufactures lists five grist, one grist/saw, and two sawmills, although the actual number was probably greater.

The textile industry in Tennessee found early beginnings in Henry County, as in several other counties scattered about the state. Cotton was grown soon after settlement, and the Chickasaw Cotton Mill was established two miles east of Paris about the year 1830 by Currier, Mann, and Peters. This factory was still in operation by Maria Currier and son in 1887, when the Goodspeed interviews were published. It was said to consume 900,000 pounds of cotton per year in the production of yarns and carpet warp. Forty people were employed, and the power sources included both water and steam. Oakley, White, and Company erected the Embryo Cotton Factory near Paris about 1835, and operated successfully until 1884, when the factory closed. Eastin Morris mentions in his 1834 *Tennessee Gazetteer* that two cotton factories existed in Henry County, so there is the possibility that the Oakley and White mill was established earlier. Killebrew in his 1874 work states that this factory ran 1,120 spindles and consumed 800,000 pounds of seed cotton annually in the production of yarn. It employed thirty workers at the time. The Mansfield Cotton Mills in Mansfield were erected by William H. Thompson in 1856, being the fifth cotton factory built in the county. It was equipped with about half the capacity of the Embryo Cotton Factory. A grist mill was operated on the same premises (Killebrew 1874). The Dinwiddie Cotton Factory (Spring Creek Mills) twelve miles southwest of Paris was built after the Civil War for the production of yarn and cloth. By 1887 it employed about thirty people and was also successful financially. Killebrew states that none of the cotton factories in the county had looms. He also refers to a woolen mill near Conyersville and nine tobacco factories in Henry County, one of which had been established in 1846.

By 1880, the number of grist mills included in the Census of Manufactures was 23, with 14 sawmills and a wool card also listed. Unfortunately, today there are no known nineteenth century mills remaining in Henry County.

HICKMAN COUNTY

Hickman County is in Middle Tennessee southwest of Nashville. The county seat is Centerville, and the area is 566.64 square miles. The county was formed in 1807. Goodspeed includes a rather extensive discussion of the county's milling history, as follows: In 1808, William Hale, an East Tennessean, built the earliest known mill in the area on Mill Creek. The following year, a horse powered grist mill was erected by Andrew Carrothers. In 1828, Edward Corender built a water powered mill on Lick Creek, and in 1887 (the year of publication of the Goodspeed histories) it was still in operation by John Tatum. William Briggs established a water powered mill on Swan Creek in 1830, but it was abandoned in later years. All these mills were said to grind corn only. William McCutchen erected a mill and carding machine in Mill Hollow near Centerville in 1833, which was operating by a Dr. Montgomery in 1887. The Montgomery Mills, established on Piney River by John Montgomery in 1835, were also running in 1887, owned by Josiah Bastin. They produced corn meal, flour, and lumber, powered by an overshot water wheel. In 1840 Joshua Downing erected a water powered corn mill on Cane Creek, which he was still operating in 1887. Five more early water powered mills are mentioned, some still in production in 1887. Samuel L. Graham came to Davis' Mill (later renamed Pinewood) in 1848 and erected a factory and mill, which burned in 1871. A large three-story building was constructed in its place, and used in 1887 for the production of sheeting and cordage, as well as grain products. This 1,800-spindle factory was also mentioned by Killebrew in 1874. In the 1880 Census of Manufactures, nine grist/flour mills, eight sawmills, and a wool card are listed for Hickman County. The only one known to survive today is a small mill of log construction in a remote area of the county. It utilized a wooden overshot water wheel, of which a few parts still remain. No additional information is currently known of this mill.

HOUSTON COUNTY

Houston County was formed primarily from Dickson and Stewart Counties in 1871. The county seat is Erin, and the county is located on the border of West and Middle Tennessee more or less west of Nashville. The area of the county is 207.96 square miles. Like Dickson and Stewart Counties, Houston has a long history of iron production, dating to an era well before the formation of the county. The grain and saw milling history of the county is more obscure. Residents interviewed by Goodspeed in the 1880's recalled only three or four horse and water powered mills from the period 1800-1815. They indicated that many early settlers pounded corn into coarse meal by hollowing a log, turning it upright, and using a wooden club or pestle. The 1880 Census of Manufactures includes three grist mills and five sawmills. Before 1887, a large steam powered grist and flour mill had been erected by Lockett and Boone near Erin, and was said to serve the entire county. No historic mills are known to exist there today.

HUMPHREYS COUNTY

Humphreys County was formed in 1809. It is located on the border of Middle and West Tennessee west of Nashville. The county is 572.38 square miles in area, and the county seat is Waverly. The most famous milling and manufacturing establishment in Humphreys County is Hurricane Mills, the flour mill of which still exists as a part of the Loretta Lynn Ranch. Hurricane Mills was established before 1872 (and probably prior to 1870) by George W. Hillman for the manufacture of grain products, woolen goods, lumber, and blacksmith articles. The woolen mill was in production in 1890 with two cards and nine looms (Dockham 1890). Goodspeed states that the first water powered mill in the county was erected in 1810 or 1812 by John Massing on Cane Creek. Four other mills of that early period are referenced. Apparently, there were several sawmills in the county as well. By 1880, there were ten grist/flour mills and ten sawmills, according to the Census of Manufactures. Goodspeed lists about 30 grist/flour and sawmills producing in the county in 1887. The only other mill surviving in Humphreys County today is Enochs' Mill (see Chapter 5), built in the 1930's and still operable. Hurricane

Mills has not operated in many years, and is now used as a museum and gift shop. So far as is known, Hurricane Mills and Enochs' Mill are the westernmost extant historic mills in the state.

JACKSON COUNTY

Jackson County is on the border of Middle and East Tennessee, east of Nashville. The county seat is Gainesboro, and the county occupies 292.48 square miles. It was formed in 1801. Little information is known of Jackson County's early milling history. Census data is very scant. Killebrew's book of 1874 mentions seven grist/flour mills operating by either steam or water power, and two wool carding operations. However, the 1880 Census of Manufactures schedules do exist for the county, and include nine grist/flour mills and five sawmills. The Jackson Woolen Manufacturing Company was organized in 1884 and ran 4 cards and 50 looms by steam (Dockham 1890). No known mills survive in the county today.

JEFFERSON COUNTY

Jefferson County in upper East Tennessee was formed in 1792 and encompasses 327.93 square miles. The county seat is Dandridge. As with other East Tennessee counties, Jefferson had significant water resources to be exploited by the early settlers, so a large number of mills were constructed. Goodspeed credits Captain Thomas Jarnagin with the first mill, built on Long Creek about 1784. Mills on Beaver Creek followed about six years later. The 1820 Census of Manufactures includes a mill in Jefferson County said to have eleven runs of stones, unless this is a clerical error. Before 1836, Mossy Creek was host to several mills and factories, including Peck's Mill, an ax handle factory, a wool carding operation, and the cotton spinning factory of Knight, Humes, and Gill. This latter factory was subsequently owned by Oldham, then by Fain, but closed about 1875. In the 1850 census, there are included 22 grist and 11 sawmills in Jefferson County, along with 5 wool carding operations and the cotton factory. The numbers had changed to 16 grist mills, 20 sawmills, and 2 wool cards in 1860. In 1880, eight grist mills and three sawmills were enumerated. Bible's *Bent Twigs in Jefferson County* (1991) discusses three existing mills in detail and provides photographs. These are Dumplin (Cate's) Mill, French's Mill, and Cox's Mill. The Cox Mill is very unusual because it is a large brick structure of very early origin (somewhere between 1803 and 1812), with its exterior façade generally intact and original. There are also two other known extant mills in the county, neither of which currently operate (see Appendix A). One of these is the W.C. Hill Milling Company in Dandridge, a twentieth century mill now used as a store.

JOHNSON COUNTY

Johnson is the most northeastern county in the state, bordering on North Carolina and Virginia. The county seat is Mountain City, and the area is 289.87 square miles. When Johnson County was established in 1836, there were already eight iron works operating, the earliest having been founded circa 1793. As was the case in Dickson and other iron industry counties, water power was typically utilized to run the blast fans (*History of Johnson County*, 1986). The presence of numerous streams in the mountainous terrain of the area beckoned mill builders. John Vaught is thought to have built one of the earliest mills on Roane Creek before 1798. Although census records are sparse, the 1850 schedules list ten grist, two grist/saw, and one sawmill in the county. The 1880 census has two grain mills and three sawmills listed. Seven grain mills are highlighted and illustrated by vintage photographs in the *History of Johnson County* referenced above. Four standing mills remain, although none is operable. Wills Mill, built in the 1930's on the site of an earlier mill, probably has the most bizarre application of milling machinery of any Tennessee mill. The buckwheat mill was used in the 1960's and 1970's to grind movie film for, presumably, reclamation and recycling of silver.

KNOX COUNTY

Knox is not only an early East Tennessee county (formed in 1792, before statehood), but a center of industrial development, due to the growth of the county seat of Knoxville. The county covers 516.67 square miles. Goodspeed contains an interesting account of the early milling history of Knox County. It seems that twelve permits were granted for the erection of grist and sawmills within only 18 months of the county's inception. Soon every stream had one or more mills. One of the earliest mills is said to have been a tub mill built by General James White. By 1830, the three grist mills and two sawmills on First Creek were all owned and operated by James and William Kennedy. Eastin Morris' *Tennessee Gazetteer* of 1834 mentions four grist mills, three sawmills, two gins and carding machines, and two spinning factories, in Knoxville. One of these spinning factories was established by William Morse, the second by Nathaniel Bosworth, both on Second Creek. In 1833 William Oldham built a cotton spinning factory on First Creek. It was said that he hauled the machinery for this factory by wagons over the Cumberland Mountains from Kentucky. This mill was small, having only 300 spindles. By this time, so many dams had been erected in the vicinity of Knoxville that the town was almost entirely surrounded by water. It was believed at the time that the prevalence of water harboring rotting vegetation was creating an epidemic among the population, so it was ordered in 1838 that all the dams should be destroyed. This of course was no doubt prudent for the health of the people, but it was a setback for industry, for conversion to steam power was not practical at this early date for most establishments. Mr. Oldham removed his textile machinery to Blount County, where he founded what later became the Rockford Mills.

As early as 1820, there were several other notable factories in Knoxville, including two flaxseed oil mills, a paper mill, and a merchant flour mill. Cotton was produced early in the county's history, so gins were necessary, but after 1820 its cultivation declined and almost ceased entirely by 1830.

The 1850 Census of Manufactures lists for Knox County a grist mill, five grist/sawmills, fourteen sawmills, one grist/textile mill, and one textile mill. About 1855, a large steam flouring mill was erected in Knoxville by M.W. Williams, but soon burned. It was succeeded by the Knoxville City Mills, which operated until the 1880's. The Hazen and Bearden Paper Mill was in production from 1838 until the dam failed in 1886. It was said to have been run by water seven months a year, supplemented by steam power the rest of the time. The 1860 Census of Manufactures lists 24 grist/flour mills, 18 sawmills, one lumber planing mill, and two wool carding machines, as well as the paper mill above. These numbers declined following the Civil War, but gradually increased again to 37 grain mills and 16 sawmills in 1880, along with two wool carding establishments.

Following a lapse of many years, the textile industry returned to Knox County in 1877 with the establishment of the Knoxville Woolen Mills. The operation was so successful that new buildings were completed in 1885. The Mill at that time employed 150 people, with 7 cards and 193 looms, producing wool jeans. By 1905 the workforce reached 900. In 1886, C.J. Sweet constructed Brookside Cotton Mills, a very large factory in Knoxville, with over 5,000 spindles and 176 looms. This facility employed 1,200 people by 1905 (Rothrock 1946). It was still running in 1919 (Dockham 1919).

With the introduction of the roller process for flour, milling became big business by the 1880's, and Knoxville witnessed the erection of large facilities. Knoxville City Mills mentioned above produced, by 1887, about 150 barrels per day of flour, and shipped to Alabama, Georgia, Tennessee, and North Carolina. Peters, Jones, and Company and Trio Mills also had sizable production facilities. Champion Manufacturing Company operated a mill which produced corn meal and feed grain exclusively.

Lumber products were also extensively manufactured in the Knoxville area by the time of the Goodspeed histories in 1887. D.M. Rose and Company had moved from Sevier County to Knoxville in 1880 and established a mill with a capacity of about 50,000 feet of lumber per day. A mill of similar size was operated by the Scottish Carolina Timber and Land Company, and several mills of smaller size were in production. Lumber finishing mills sprang up, as well as specialized woodworking factories, which produced items such as handles and furniture.

Today, Knox County boasts 12 standing mills (see Appendix A), including the Brookside Cotton Mill. Most have been inoperable for many years, and some are in a state of extreme deterioration. The Riverdale Mill, with a 30-foot Fitz overshot water wheel, is now used as a residence.

LAKE COUNTY

Lake County is a small (228.38 square miles) county in extreme northwest Tennessee. It includes most of Reelfoot Lake, which was created by the cataclysmic earthquake of 1811-12 along the New Madrid fault. The county was not organized until 1870, so very little census data is available regarding early mills. Goodspeed has some discussion, the main point being that a lack of suitable water power necessitated the use of horse powered mills almost exclusively, until steam power found its way into the area. If the account is accurate, the first steam engine in the county was used to power a sawmill in the early 1840's. After the Civil War, steam gins and additional sawmills were erected, and James Cronan operated a gin and grist mill in Cronansville for over twenty years following the War. The 1880 Census of Manufactures only lists four sawmills in Lake County. There are no known mills existing in the county today.

LAUDERDALE COUNTY

Lauderdale County is another West Tennessee county on the Mississippi River. It occupies 506.83 square miles and was founded in 1835. The county seat is Ripley. Although census data is somewhat scant for this county (only about a half dozen sawmills are listed for 1860-1870, but 18 grist mills and 8 sawmills in 1880), Goodspeed has a brief synopsis of the mill history. The first mill was said to be a tub mill erected on Mill Creek by Benjamin Porter for Griffith Rutherford. It was built in 1826 and was used to grind both wheat and corn. A similar mill was built on Jordan Creek by Benjamin Jordan in 1828. Five more water powered mills followed after 1831. The proximity to the Mississippi River apparently was advantageous in bringing steam power to the county very early. The first steam mill was said to have been built by Samuel Lusk about 1840, with a second by A.G. Bragg in 1851. Four cotton gins were also erected in the period 1828-1834. By 1887, all mills and gins were said to be steam powered. Six grist mills are mentioned, along with twenty sawmills, several lumber finishing mills, and numerous gins. Many of these establishments served multiple functions. None are known to survive in the county today.

LAWRENCE COUNTY

Lawrence County is in southern Middle Tennessee on the Alabama line. It was formed in 1817 and covers 612.52 square miles. The county seat is Lawrenceburg. The most famous miller in Lawrence County was David Crockett, who was in the area before 1817. He is said to have owned a mill for a short period, but whether he actually participated in its operation is conjectural. Moses Pennington, one of the earliest settlers, is said by Goodspeed to have built the first water powered mill in the county in 1816, along with a distillery (these early distilleries were quite numerous in the state prior to the Civil War, and the 1820 Census of Manufactures lists a large number). Jesse Helton erected the first cotton gin in 1817. A second grist mill was built by James Scott in 1820. In the census for that year, five grist and one grist/sawmill were included.

Although the number of grain mills was never large in the county, the principal early industries were associated with textiles. Lawrence County has probably witnessed the construction and operation of more cotton and woolen factories than any other county in the state. These manufacturing establishments played a major role in the economic development of the county and the state, but like most areas, they faded away about 1900 or before and are now only distant memories. The Goodspeed histories of 1887 highlight seven cotton and woolen factories operating in Lawrence County. The Shoal Mills near Lawrenceburg were owned by William Parks. They produced various textile products, utilizing 1,068 spindles and 30 looms. The power sources were a 35-horsepower water turbine and a 25-horsepower steam engine. A similar water turbine powered the Crowson Mills on Shoal Creek, established in 1856 and owned in 1887 by W.H. Sykes and Brother. They had 576 spindles and manufactured only yarn. The Crescent Mills, also on a fork of Shoal Creek, were built in 1852 and were operating in 1887 with a 40-horsepower turbine. This mill had 1,152 spindles and 32 looms. Hope Mills operated 768 spindles with a 35-horsepower turbine. McCrea and Company's Eagle Mills were powered by a 40-horsepower turbine, and had 1,176 spindles. The Hope and Eagle Mills were also yarn and thread mills. The Laurel Hill Mills, on Buffalo River, used 1,570 spindles, 56 looms, and 18 cards. These six factories were all cotton mills. Marcella Falls Woolen Mills were established before 1875. Most of these operations closed before 1900.

Today there are believed to be six mills surviving in Lawrence County, and all were originally grain mills (the existence of one of the six, the so-called Peach Mill, is currently in doubt). One of these is a reproduction in the David Crockett State Park. The earliest extant mill is probably the Garner Mill on Shoal Creek, said to be built in 1820. It has not been operable for many years. Fall River (or Wilburn) Mill is in relatively good condition structurally, and in a picturesque location, but also has not operated recently. Efforts to restore it were halted about five years ago.

LEWIS COUNTY

Lewis County (county seat Hohenwald) is situated on the border of West and Middle Tennessee southwest of Nashville. It was established in 1843 and covers 304.87 square miles. Lewis County was not heavily populated during the nineteenth century, so was not witness to a large number of mills and factories. However, a few are noted in the Goodspeed histories. The two earliest water powered mills were Tom's Mill on Cathey Creek and the Widow Cavitt's Mill on Swan Creek, both built around 1812, well before the county was formed. Several early iron forges were also erected. In the 1850 Census of Manufactures, five sawmills and two cotton factories were listed. One of the cotton mills was the Rockdale Cotton Factory on Big Bigby Creek, established in 1825 by Skipwith and Nightengale. It produced cotton yarn only, and closed by the Civil War. There are no extant historic mills in Lewis County. A new mill and restaurant powered by an overshot water wheel were recently constructed by Mr. And Mrs. Willie Terry (and now for sale), utilizing a Meadows vertical stone buhr mill.

LINCOLN COUNTY

Lincoln County was established in 1809 in southern Middle Tennessee on the Alabama line. It encompasses 576.97 square miles. The county seat is Fayetteville. In its histories published in 1887, Goodspeed states that many of the early grist mills in the county were turned by horse sweeps, and the man bringing his corn to mill would hitch his own horse to the sweep. Joel Yowell is said to have operated a large horse mill near

Petersburg, with a hand bolting machine attached for sifting the meal. Water mills were soon erected, and John Greer, an early settler, operated one on the Elk River near Fayetteville. Thereafter, grist mills, sawmills, and wool carding operations proliferated, most water powered. The 1850 Census of Manufactures lists five grist mills, two saw/grist mills, one grist mill with wool card, and two cotton factories, but there were undoubtedly many more. One of the cotton factories was established in 1837 by Crosby in a little hollow three miles from Flintville, which came to be called Oregon. In 1839 it was bought by Henry Warren, and he and his sons operated the factory throughout the nineteenth century. Today only the remains of the stone dam mark the site, and the area is now the Flintville Fish Hatchery in Warren Hollow. A gin and grist/flour mill was said to operate in conjunction with the cotton factory. Nothing is known of the other factory listed in the 1850 census.

In 1860, Lincoln County had at least ten grain mills and eight sawmills. By 1880, these numbers had increased to 26 grain mills and 17 sawmills, and the census for that year also listed 3 woolen mills, although little information is available on these. The Elk Cotton Mill, incorporated in 1900, operated for many years in Fayetteville, by steam power (Dockham 1901). The only two extant mills known in Lincoln County today are Rochelle's Mill, now a residence, and Buck's Mill, a small frame structure with dam intact on the Alabama line. There are a few remaining dams scattered about the county.

LOUDON COUNTY

Loudon County is southwest of Knoxville in East Tennessee. It was formed in 1870, covers 235.04 square miles, and has county seat Loudon (early spelling was also Loudoun). According to Goodspeed, about 1820 Robert and Ebenezer Johnston owned a cotton gin, press, hemp breaker, and grist mill in the county. Jacob Pearson built a grist mill about 1821 in Philadelphia. John Holston operated an early sawmill building large boats. After 1852, Mason, Wilson, et. al., erected a flour mill in Loudon, and Harvey and King put a sawmill into operation. By 1880, at least 15 grist/flour mills and 10 sawmills were in production in the county, as well as a cotton factory. This factory, the Lenoir City Cotton Mills, was water powered and survived structurally until 1991, when it burned during a restoration effort by local historians. Three other mills still stand in Loudon County. Robinson's Mill operated until recently as a flour and grist mill under the name Pond Creek Milling Company. It was originally water powered but converted to electric motors. Fowler's Mill, an 1875 structure, also operated by water turbine until recently, producing corn meal and whole wheat flour on a 24-inch Meadows vertical stone buhr mill. The third mill, Walker Mill, is an abandoned, vacant building.

McMINN COUNTY

The county seat of McMinn County is Athens, and the county is located in southeast Tennessee. It was established in 1819 and is 421.6 square miles in area. The area has been host to a large number of mills and textile factories, this early industrial heritage even continuing well into the twentieth century. Although records of the earliest mills are scant, by 1850 there were 24 grist mills, 12 grist/sawmills, 11 sawmills, one sawmill with wool card, 3 carding mills, and 2 cotton factories. Ephraim Slack's cotton spinning factory on Mouse Creek was built in the 1830's and operated successfully until Slack drowned in the millpond. Charles W. Metcalf established the Eureka, later Mt. Verd, Cotton Mills about 1850. This large spinning factory was in 1866 leased to the McElwee Brothers, Frank and James, who operated it until it burned about 1894 (Byrum 1984). Frank also built cotton mills in Meigs and Rhea Counties. The North Athens Manufacturing Company cotton mill was incorporated in 1887, and operated 5,000 spindles by steam (Dockham 1890). About 1877, a large woolen mill was erected three miles south of Riceville by Getty Brothers. This grew into the textile mill village of Sanford, and by 1887 the factory was operated by Knoxville Woolen Mill Company. In Athens, a woolen mill with 64 looms was established by W.M. Nixon, who also ran a 25-barrel flour mill in 1887 (Goodspeed 1887). After 1900, the textile industry in McMinn County generally changed to hosiery production.

The changes in the number and application of mills may be traced through the Census of Manufactures records for McMinn County. In 1860, there were listed 16 grist/flour mills, 17 sawmills, 2 wool cards, and 2 cotton factories. The 1870 census is incomplete, but Killebrew mentions in his 1874 work that McMinn County had 31 grist mills, 8 merchant (flour) mills, 30 sawmills, 2 lumber planing mills, 2 wool cards, and 2 cotton factories. The 1880 census lists 21 grain mills, 10 sawmills, and 4 woolen factories, and is probably not a complete listing.

McMinn County witnessed the operation and demise of several large flour milling concerns. One of these was owned by the Saulpaw family and powered by water. They marketed "Silver Queen" flour into the 1920's. The Athens Roller Mill, run for many years by the Long family, produced "Morning Glory Flour" and "Long's Perfection Self-rising Flour." It operated until the 1970's. Riley Thompson's mill near Riceville was five stories high.

An interesting mill-related legend persists in McMinn County concerning the famous ballad "When You and I Were Young, Maggie." It seems that George Johnson, who wrote the poem that inspired J.A. Butterfield's song, met and married his "Maggie" (Marie Harris) near an old mill close to Reliance, Tennessee, which later inspired the poem. Although the mill is now gone, the site of the poem and song's beginning is marked today (Byrum 1984). The irony is that it is in Polk County and not McMinn. Not to spoil the story, but it may be mentioned that at least one other mill site (not in Tennessee) claims the origin of the song!

Thompson Spring Mill near Riceville is a private residence. Cog Hill Mill near Etowah was built about 1863 and is three stories. It was powered by a turbine and contains much milling equipment, but is not operable.

McNAIRY COUNTY

McNairy County is located in southern West Tennessee on the Mississippi line. It is 561.48 square miles in area and was established in 1823. The county seat is Selmer. This is another West Tennessee county about which very little milling history is known. The 1850 Census of Manufactures schedule includes two grist mills, five grist/sawmills, one sawmill, and one carding operation. In 1880, 9 grain and 9 sawmills are listed. Five flour mills were known in 1890 (Cawker 1890). In Killebrew's book of 1874, he mentions that most of the mills in McNairy County were water powered. None are known to exist today.

MACON COUNTY

Macon County is northeast of Nashville on the Kentucky line. It was formed in 1842 and occupies 309.55 square miles. The county seat is Lafayette. About the only milling history known is taken from a comment by Killebrew in 1874 that mills in the county were “numerous” (and many were listed by name), and the results of the 1880 Census of Manufactures. This schedule listed nine grist/flour mills and ten sawmills. Goodspeed does have a brief comment about W.L. Chamberlain’s steam saw, grist, and wool carding mill in Lafayette in 1887. No mills are known to survive in the county today.

MADISON COUNTY

Madison County is in West Tennessee and contains the county seat and city of Jackson. It traces its inception to 1821 and covers 542.02 square miles. Since the early cotton crops did not mature well in the county, little was grown, so most milling interests were associated with grain and lumber. James Cockrell is said to have brought the first hand mill into the county in 1821, and a James built the first water mill on Wallick Creek the same year. Ten additional grist mills, all water powered, were built in 1822-24 (Goodspeed 1887). The 1850 Census of Manufactures lists 9 grist and 10 sawmills in the county; these numbers were 10 and 5 in 1860, and 12 and 7 in 1870. 13 flour and grist mills and 12 sawmills were included in 1880. Little further information is known, and there are no known mills surviving in Madison County today.

MARION COUNTY

Marion County is just west of Chattanooga, and the county seat is Jasper. The county covers 505.17 square miles and was established in 1817. The 1860 Census of Manufactures lists ten grist mills, five sawmills, and one wool carding operation. These numbers declined after the Civil War, and the 1870 schedules seem unreliable. In 1880, five grist/flour mills and three sawmills are included. Two flour mills were in Cawker’s directory of 1890. Little additional history is known, aside from that connected with

Ketner's Mill (see Chapter 5), which still survives in operable condition on the Sequatchie River.

MARSHALL COUNTY

Marshall County is in Middle Tennessee due south of Nashville. It was formed in 1836. The county seat is Lewisburg, and the area covered is 371.36 square miles. Goodspeed names four mill owners in what became Marshall County in 1810. Brittain and Bagley had horse mills, and Ramsey and Leiper had water mills. Verona had a mill circa 1819. By 1850, three grist, two grist/saw, and four sawmills were listed in the census. These numbers increased to six grist mills, seven sawmills, and three wool carding businesses in 1860. After the Civil War, the grist mill numbers declined, but sawmills increased to eleven, perhaps to meet the demand to rebuild after the conflict. Numbers rebounded by 1880, with 13 grist/flour mills and 12 sawmills. The larger mills included in the Goodspeed histories that operated in 1887 were as follows: G.A. McClane flour mill in Lewisburg, Cornersville Flouring Mill (converting to roller mills), Verona Flouring Mill, Spring Place saw and grist mill, and Rich Creek saw, grist, and flour mill. Lillard's Mill near Lewisburg was recently still standing. It is the last known in the area.

MAURY COUNTY

Maury, like its neighbor Marshall County, is in Middle Tennessee south of Nashville. The county seat is Columbia. The county area is 619.24 square miles, and the date of establishment is 1807. According to Goodspeed, Moses Frierson built an early water mill on Lick Creek. The earliest mills on Knoll Creek were the horse mill of John Gwynn and the water mill of Partees. In Columbia, the first horse mill is attributed to Henderson and the first water mill to Wallace. The 1820 Census of Manufactures included Maury County as one of the 17 counties whose schedules survive. Six grist mills were detailed in the reports. The next census data is contained in the 1860 schedules. These reveal five grist and flour mills, ten sawmills, and one wool carding operation. In 1870, three grist/flour mills made the census, along with 16 sawmills, six wool carding establishments, and a cotton factory. This cotton mill is thought to be the predecessor of the Columbia Cotton Mill Company, which in the late 1880's was running 5,000 spindles and 124 looms with a 200-horsepower steam engine (Goodspeed 1887). This large factory was still in successful production in 1905, when it was said that most other textile concerns in the South had suffered from fluctuations in the cotton market (*Century Review*, 1905). It was still running as late as 1924 (Dockham 1924). Although the cotton mill is excluded from the 1880 census reports, for this year there were listed 25 grist/flour mills and 21 sawmills. Other large 1900-era mills in Maury County were the Columbia Mill and Elevator Company (1889), Ashton Mills (operating by water power on the site of William Horsley's 1826 mill), and three lumber planing mills. The only known standing mill today in Maury County is the Kettle Mill on Duck River near Williamsport, but it is no longer operable and the dam is removed.

MEIGS COUNTY

Meigs is a small county (216.06 square miles) in East Tennessee northeast of Chattanooga. It was formed in 1836, and has Decatur as the county seat. Little information is available concerning its milling history outside of a few census records. The only entry for the county in the 1860 Census of Manufactures is a cotton factory. This may have been the one established by Frank McElwee of McMinn County (q.v.). The 1870 schedules are probably not representative, since Killebrew in his 1874 book states that there were "several" flour/grist mills and wool cards in the county, and "numerous" sawmills (all water powered). The 1880 census mentions 13 grist/flour mills and 11 sawmills. Seven flour mills are included in Cawker's 1890 directory. Ziegler's Mill, badly deteriorated, is a turbine powered mill remaining in Meigs County.

MONROE COUNTY

Madisonville is the county seat of Monroe County, which is in East Tennessee south of Knoxville. This is a large county of 671.8 square miles, established in 1819. Again, data other than census records is scant on the county's milling history, although the number of mills was apparently substantial. The 1850 Census of Manufactures includes 18 grist mills, 4 grist/sawmills, 4 sawmills, and a wool card. The 1860 numbers are much lower and probably not reliable, and 1870 results seem to be missing. In 1880, 19 flour and meal operations and 13 sawmills are listed. Goodspeed mentions the Sweetwater Mill Company, a flour mill established in 1883, and two lumber planing mills in the same locality. The Sweetwater Woolen Mills were built in 1891 to produce jeans by steam power, using 4 cards and 72 looms (Dockham 1891-92). Four mills are known to be standing today in Monroe County. The Fowler Mill is in an operable condition. In addition, the Dixie Roller Mill in Madisonville is an electrically powered flour mill, and its current operating status is not known.

MONTGOMERY COUNTY

Montgomery County is on the Kentucky line northwest of Nashville, and the city of Clarksville is the county seat. The county dates to 1796, the year of Tennessee statehood, and is 538.42 square miles in area. This was another county with an extensive history of iron production, and many furnace locations. The county also witnessed its share of grain and sawmills. The 1850 Census of Manufactures lists 8 grist mills (all water powered except one with a steam engine), 5 water powered sawmills, and a wool carding business. In 1860, the number of sawmills included increased to 9. The 1870 census lists 13 grist mills and 10 sawmills. The 1880 schedules have 9 grist/flour mills, 5 sawmills, 2 lumber planing mills, and a woolen factory. Goodspeed in 1887 lists four large flour mills in Clarksville, as follows: Anchor Mills, Lafayette Mills, Meriwether and Gilmer Mills, and T.J. Munford Mills. The Sewanee Planing Mills are also mentioned. Whitfield, Bates, and Company in Clarksville were manufacturers of engines, and operated a foundry, sawmill, and sugar mill. Although no information is available from the census records or

Goodspeed histories to substantiate the existence of textile operations in Montgomery County, one author (Beach 1988) does refer to these. Peacher's Mill on Big West Fork of Red River was said to be an extensive grist, saw, and cloth milling area. A new textile factory was said to have been erected there in 1897. Glen Ellen was said to have had woolen, cotton, and flour mills after 1885 (Beach 1988).

Eleanor S. Williams, a Montgomery County historian, has supplied the remaining information in this section on several old mills (personal communication 2000). She states that five mills operated on Big West Fork of Red River, as follows: Barker's, Henry, Peacher (first textile, later grist), New York, and Bridgewater. In addition, the following mills are noted: Port Royal Mill, Central Rolling Mill (Clarksville, 1890), McAllister's Mill, City Mill, Lafayette Mill (built 1854 by Forbes and Pritchett), Montgomery Mill, F.L. Smith Mill (burned 1891), Wheatley's Mill (possibly the first merchant mill in the county), Whitfield's Mill (circa 1815), Thompson, Orgain, and Company Mill (1857 steam mill), McGowan's Mill, Cobb's Mill, McCauley's Mill, Johnson's Mill, and Oakland's Mill.

Today, Ringgold Mill about seven miles from Clarksville on Little West Fork of Red River, a three-story turbine powered mill, is standing in good condition. The first mill on this site was in 1810. In 1853, a stone dam was built, and a new mill structure was erected in 1865. This mill operated until 1885, when it burned. It was rebuilt on the present site. The family that currently owns the mill purchased it in 1907 and changed its name from Gallego to Ringgold Mill. It no longer operates, but is said to be operational. The Dunlop Milling Company in Clarksville is still standing, and was recently placed on the National Register of Historic Places (Williams 1999).

MOORE COUNTY

Moore County is a very small county (143.43 square miles) in southern Middle Tennessee. It was established late (1871) in Tennessee county history. The county seat is Lynchburg, home of the famous Jack Daniel Distillery. Since the county is not large, there were few historic mills. One of the earliest referred to in Goodspeed is Brown's Mill (circa 1812), near where the distillery now stands. The first cotton gin (1818) was also nearby. William P. Long operated an early gin and mill in Lynchburg. In addition, Goodspeed mentions two very early "cotton mills" in what is now Moore County. One was built by Thomas Roundtree on the creek at Lynchburg, and the other was Levi Roberts' on East Mulberry Creek. Both were said to date to 1820, which, if accurate, is extremely early for textile mills in the state. It is more likely these were built somewhat later. In the 1870's, the cotton mill of Womac, Donce, and Company was operating (*U.S. Textile Manufacturers Directory* 1874). In 1880, there were at least three grist mills and five sawmills in the county. The only extant mill known in Moore County is Ledford Mill, a small frame mill built in 1884, in a beautiful setting on Shipman Creek. This mill was restored to operating condition several years ago, but presently functions as a bed and breakfast and gift shop. The mill at Cumberland Springs is now gone, but the dam remains. The mill was once used to grind corn for use at the Jack Daniel Distillery.

MORGAN COUNTY

Morgan County is west of Knoxville in East Tennessee. The county seat is Wartburg. The county covers 546.96 square miles, and was founded in 1817. Since Goodspeed has no information on the mills of Morgan County, the following is taken from a county history written in 1987: Deer Lodge had a mill on Witt Creek circa 1845 operated by Bowmer, and a grist/sawmill about the same time built by James Davidson. Ruffner operated a mill on Little Emory River near Coalfield circa 1850. Mills around Wartburg circa 1850 included John White's grist and sawmill on Crooked Fork Creek (listed in the 1850 Census of Manufactures), Gerding's Mill (also on Crooked Fork), Kreis sawmill on Emory River, Melhorn Mill, Kuhn Mill, and Nitzschke Mill. Gerding's was a grist, flour, and oil mill (this could mean flaxseed or turpentine). There was a lumber planing mill in Deer Lodge which closed about 1900. The first steam engine appeared in the county about 1870. This history book has a photo of the Isaac Laymance grist mill on Crooked Fork Creek (Dickinson 1987).

The Census of Manufactures for 1860 lists only two grist mills and three sawmills in Morgan County. Killebrew also affirms the fact that the number of mills of these types was few, and he makes a point that no textile factories existed in the county (Killebrew

1874). The 1880 census lists two grist/flour mills and two sawmills. No mills are known to survive in Morgan County today.

OBION COUNTY

Obion County is in northwest Tennessee and covers 563.38 square miles, including a portion of Reelfoot Lake it shares with Lake County. The county seat is Union City, and the county was formed in 1823. Due to the terrain, water power was somewhat limited for the early settlers. Goodspeed makes reference to the use of a water lever, or "Lazy Jim" (Figure 14 in Chapter 2), to pound corn into meal. Horse powered mills were erected by Wyatt Bettis and Colonel Wilson about 1823. The first water mill was built by Thomas McDonald on Davidson's Creek in 1826, and the first cotton gin by John Parr. Union City had a flouring mill in 1868 and a saw and planing mill in 1871. Kenton had a steam flouring mill in 1882 and a sawmill. Obion Station had two planing mills. There were steam powered grist mills at Palestine, Rives, and Woodland Mills. Steam engines entered the county at an early date, as evidenced by two steam sawmills listed in the 1850 Census of Manufactures. The 1860 census schedules list 10 grist and 15 sawmills for the county. By 1870, the numbers were 2 and 9, respectively, perhaps a result of the Civil War destruction. Killebrew in 1874 mentions two large steam flouring mills in Union City, "many" sawmills (mostly steam powered), and a woolen factory in Union City. By 1880, the numbers of grist/flour and sawmills had rebounded to 10 and 18, respectively. The Howard Woolen Mills were also included. No early mills are known to exist today in Obion County.

OVERTON COUNTY

Overton County lies in the northern part of the state on the border between Middle and East Tennessee. Its inception dates to 1806. The county seat is Livingston, and area is 422.8 square miles. Apparently the Goodspeed histories omitted Overton County, and there is little census data on mills. The 1850 schedules show two water powered saw-mills, but 1860 and 1870 schedules cannot be located. In 1880, 6 grain mills and 6 sawmills are listed. Eastin Morris in his *Tennessee Gazetteer* of 1834 states that grist and sawmills were "numerous" in the county. He also notes a 60-spindle spinning factory (presumably cotton), wool card, grist mill, and cotton gin all at one location.

Three mills are known to have survived until recent times in Overton County. These were the Dennis and Beaty Company Rolling Mill on Eagle Creek (burned in 1960's), Gate City Mill (burned 1977), and Holman's Old Water Mill (site now a trout farm). The last miller in the county was said to be Isham Wilborn, who operated a tractor powered vertical stone buhr mill near the Ozone community into the 1970's (*History of Overton County, Tennessee* 1992).

Two known mills survive in Overton County today. One is Keisling Mill near Livingston, which is no longer operating. The other is Union Hill Mill, a small mill in a private nineteenth century village located in a picturesque hollow. This mill is interesting in that the water to operate the overshot wheel came from a spring on the property, and disappeared into a fissure as soon as it exited the wheel.

PERRY COUNTY

Perry County is on the border between West and Middle Tennessee, and covers 401.95 square miles. The county seat is Linden, and the county dates to 1818. Goodspeed has some information about the county's historic mills. The first horse mill is attributed to James Dixon in 1820 on Lick Creek. John Tracy built the first water mill on Cedar Creek in 1821, and Samuel Denton established the first cotton gin on the same creek in the same year. During the 1870's, Josiah Bastian operated a woolen mill on Cane Creek. Between 1866 and 1880, Thomas Whitwell ran a wool carding mill on Rockhouse Creek, then removed to Hurricane Creek, where Henderson and Williams rebuilt it and updated the machinery. There were "a number" of grist and sawmills by 1887.

Some census data exists for Perry County. The 1850 Census of Manufactures only lists one water powered sawmill. The 1860 census has two sawmills listed. The 1880 census lists nine grist/flour mills, one saw/grist mill, and four sawmills. Killebrew in 1874 mentions that the number of mills in Perry County is insufficient to support the needs of the populace. No mills are known to exist in the county today.

PICKETT COUNTY

Pickett County is in East Tennessee on the Kentucky line. It was formed in 1870 and covers 188.59 square miles. The county seat is Byrdstown. No information is available on mills for this county. However, since it was established relatively late from Fentress and Overton Counties, its milling history probably closely follows theirs. No mills are known to survive in the county today.

POLK COUNTY

Benton is the county seat of Polk County. It is the most southeastern county in the state and occupies 450.97 square miles. It was established in 1839. The only extant census records for the county are the 1850 and 1870 schedules. In 1850 there were listed five grist and one sawmill. In 1870, only three grist mills were included. Goodspeed only mentions a grist mill and gin in Benton owned by Rogers and Johnston in 1887. Three flour mills were known in 1890 (Cawker 1890). There are no known mills in the county today, but the site of Maggie's Mill is marked near Reliance (see McMinn County).

PUTNAM COUNTY

Putnam County is on the border of Middle and East Tennessee, east of Nashville. The county seat is Cookeville. The county dates to 1842 and covers 427.31 square miles. The pre-Civil War mills of Putnam County are not well documented. There is mention of Mill Creek, Robinson, and Scarborough Mills on Calfkiller River, and on Barnes Farm near Cookeville (DeLozier 1979). The 1860 Census of Manufactures only included five saw-mills (no grist mills). Killebrew only states that there were "several" grist and flour mills in the county in 1874, but does not elaborate. The 1880 census schedules show 8 grist/flour mills and 6 sawmills in the county. Eight flour mills are also included in Cawker's 1890 directory. Burgess Mill on Falling Water River and Brown's Mill south of White Plains are the only post-Civil War mills known by name (DeLozier 1979). A reconstructed mill in Hidden Hollow Theme Park is the only known standing mill in Putnam County today.

RHEA COUNTY

Rhea County is in the western portion of East Tennessee, northeast of Chattanooga. Dayton, site of the celebrated “Monkey Trial,” is the county seat. The area of the county is 363.27 square miles, and it was founded in 1807. Despite the age of the county, there is very little information on mills among the Goodspeed histories, the census records, Killebrew’s 1874 work, and contemporary sources. Eastin Morris’ *Tennessee Gazetteer* mentions two cotton gins in the town of Washington in 1834. The 1870 Census of Manufacturers lists three wool carding operations. Goodspeed mentions two flour mills in Dayton in 1887, and one of these was probably the W.G. Allen and Sons Roller Mills, of which an 1890’s era photograph survives (Broyles 1991). No mills are known to survive in Rhea County.

ROANE COUNTY

Roane borders Rhea County in East Tennessee, and Kingston is the county seat. Roane is another fairly early county, established in 1801. It occupies an area of 384.55 square miles. The 1850 Census of Manufactures lists one sawmill and one cotton factory in Roane County. By the 1860 census, there were included 15 grist/flour mills, 6 sawmills, 2 wool cards, and the cotton factory. Apparently this cotton factory survived the Civil War, for in 1870 it is included along with 5 sawmills and 4 wool carding concerns. Curiously, no grain mills are listed in this census. The 1880 census includes 13 grist/flour mills, 12 sawmills, and a carding operation. Three mills are still standing in Roane County, all in relatively good structural condition. Cook Mill has no equipment or water wheel left and is used for farm storage. Huffine Mill (circa 1880’s) has also lost its water wheel and is now a private residence. The restored mill at Crosseyed Cricket Campground was originally built about 1850 and is now used as a restaurant. A pitchback wheel (see Chapter 2) is occasionally used to grind corn meal.

ROBERTSON COUNTY

Robertson County was born with statehood in 1796. It is due north of Nashville on the Kentucky line, in Middle Tennessee. The size of the county is 466.63 square miles, and the county seat is Springfield. The Goodspeed histories include a considerable discussion of early mills. Among the earliest were said to be the Thomas Kilgore Mill on Midfork of Red River (circa 1785-90), the Thomas Woodland Mill on Beaver Dam Creek, and the Major Charles Miles Mill on Sulphur Fork (1793). There were also said to be two gins about 1804. George Conrad had a wool carding machine in Springfield. The Mitchellville grist and sawmill was thought to be established in 1848. The 1850 Census of Manufactures listed four grist mills, one saw/grist mill, and seven sawmills. A steam flouring mill was built in Springfield in 1854, according to Goodspeed. The Stewart steam flouring mill followed just after the Civil War in 1865. The W.R. Sadler Mill was established on Elk Fork in 1871, a sawmill on Black Branch in 1879. Two additional flour mills were mentioned by Goodspeed in 1887, the G.A. Farmer Mill in Adams Station and F.M. Watts steam mill in Coopertown. In the 1860 Census of Manufacturers, ten grist/flour mills and nine sawmills were included, and in 1870 the numbers were eight and fourteen, respectively. In 1880 there were listed 21 grist/flour mills and 14 sawmills. No mills are known to survive in the county today.

RUTHERFORD COUNTY

Rutherford County (county seat Murfreesboro) is southeast of Nashville in Middle Tennessee. It was founded in 1803 and covers 613.26 square miles. The prevalence of good water power sites in the county provided the catalyst for erection of numerous mills. Goodspeed lists several of these. Thomas Rucker is said to have built the Cave Mill as early as 1799. By 1804, at least three more mills existed (Anthony's, Cummings', and Smith's). David Dickman built a mill on the West Fork of Stones River in 1809, and James Rucker had the county's first cotton gin the same year. John M. Tilford erected a grist and sawmill on the West Fork of Stones River in 1814-15, to which was added a distillery later. Samuel Tilford built his mill on the East Fork of Stones River about the same time. The 1820 Census of Manufactures included Rutherford County, and three grist mills were listed, although some sources have stated there were at least 20 at this time. Charles Ready settled near the boundary of present-day Rutherford and Cannon Counties and is said to have built a mill about 1812, which burned during the Civil War. The present mill on the site, called Readyville Mill (see Chapter 5), was built sometime after the war, but is actually located in Cannon County. Dickinson's Mill was built about 1829 (Pittard 1984). Morris' 1834 *Tennessee Gazetteer* mentions two cotton factories in Rutherford County, along with one grist mill, two cotton gins, and one wool card. It is not known whether these cotton factories were actually in present-day Rutherford County. The 1850 Census of Manufactures only includes one grist mill, four grist/sawmills, and one sawmill, so is probably not accurate. The 1860 census lists five grist mills, eight sawmills, and two wool cards. In 1870 these numbers were four, three, and four, respectively. By the 1880 census, the number of grist/flour mills was 18 and the number of sawmills was 19. Other nineteenth century mills included McPeak Mill (1878-1912), Ransom's Mill (one of the largest in the county), Nice's Mill, Johns Mill, Halls Hill Mill, Gregory Mill, and Jones Mill. The Nice's and Gregory Mill dams still exist. Elam's Mill on Middle Fork of Stones River was built circa 1880 and reportedly utilized an undershot water wheel, somewhat unusual for the mills in Tennessee. Bowman's Mill was a pre-1820 mill on West Fork of Stones River. The last original mill in Rutherford County was Brown's Mill on East Fork of Stones River near Lascassas. Its predecessor was thought to have been constructed around 1820, but the later mill was built in the mid-1870's. It was then established as a turbine powered mill with the mill perched on the side of the river bank above the penstock. The Brown family was involved in the ownership and operation of the mill for 120 years, until 1940. Later owners continued the business until 1976. At that time, the mill was heavily loaded with machinery, and the foundation was deteriorating. The city of Murfreesboro purchased the dam and mill site for emergency water resources in 1980. During an attempt by a local historic preservation group to stabilize the mill building, it collapsed in 1996, and everything was lost. The only other mill in Rutherford County is the reconstructed Ellis Gray Mill in the pioneer village called Cannonsburgh.

SCOTT COUNTY

Scott County is in East Tennessee on the Kentucky line. Huntsville is the county seat. The county was founded in 1849 and covers 576.21 square miles. The only information on historic mills for this county is the statement by Killebrew in 1874 that only “a few” grist mills were operating, and there were no textile factories. Goodspeed has no data, but the 1880 Census of Manufactures includes one grist mill and one sawmill. There are no known mills left in the county.

SEQUATCHIE COUNTY

Sequatchie County was established in 1857. It is north of Chattanooga on the western border of East Tennessee. The county seat is Dunlap, and the county occupies 253.82 square miles. Like Scott County, little information is available on mills. The only census records listing any mills are the 1860 schedule, which includes two sawmills, and the 1880 schedule, which has one grist mill and three grist/sawmills. Killebrew in his 1874 book has an identical statement for Sequatchie County as for Scott County above (“a few” grist mills and no textile factories). No mills are known to survive in the county today.

SEVIER COUNTY

Sevier County (county seat Sevierville) is in East Tennessee bordering North Carolina, southeast of Knoxville. It includes a portion of Great Smoky Mountain National Park. The county was formed in 1794 and covers 615.14 square miles. Sevier County, with its significant water resources, has had several mills throughout its history. Goodspeed refers to the Isaac Thomas Mill on Pigeon River near Sevierville as a 1795 mill. The 1820 Census of Manufactures lists 6 grist and 5 sawmills for the county. The 1850 schedule includes 3 grist/sawmills and 3 sawmills. In 1860, there were 5 grist mills, 4 sawmills, and one wool card. In 1874, Killebrew states that the county had no textile factories, and the mills were mostly “old-fashioned,” which could mean pioneer-style tub mills or overshot mills with wooden wheels and gearing. In 1880, there were 11 grist mills and 7 sawmills included in the Census of Manufactures. Today, there are 12 known extant mills in Sevier County, including the two tub mills in the Great Smoky Mountain National Park (see Chapter 5). Three of these are relatively recent reconstructions, and actually the two tub mills are also reconstructed to some degree. Probably the oldest operating mill in the county is the Old Mill at Pigeon Forge, supposedly built in the 1830's. If in fact this date is accurate, at some point the mill was converted to turbine power. Many years ago a water wheel was added to the side of the building for aesthetic purposes. It is not known whether the turbines are still used to power any milling equipment. The mill has been in production recently, although it has been sold and the area converted primarily to a restaurant.

SHELBY COUNTY

Memphis, in the extreme southwest tip of Tennessee, is the county seat of Shelby County. Due to its location on the Mississippi River, the county was formed somewhat earlier than many of the state's other western counties (1819). The county occupies 756.29 square miles, making it second largest in area of all Tennessee counties. The earliest reference to a mill is in the Goodspeed histories, which state that Wilson Sanderlin built a saw and grist mill on Wolf River near Raleigh about 1836. The 1850 Census of Manufactures lists four grist and sawmills in the county. Goodspeed goes on to say that Memphis had a flouring mill and three "factories" (textile?) in 1853. It is probable some or all were steam powered. The 1860 census refers to two grist/flour mills, nine sawmills, and two lumber planing mills in the county. By 1870, during the era of Reconstruction, a cotton factory was operating, along with 17 grist/flour mills, 20 sawmills, and 10 planing mills. Killebrew in 1874 states that the county had a cotton factory "planned," "a few" grist and flour mills (all steam powered), and three large cotton oil mills. The 1880 census lists at least 17 grist/flour mills, 12 sawmills, and one planing mill. Five "clothing manufacturers" are also included. Goodspeed in 1887 made reference to the mill-related industries currently operating in Memphis, including 11 cotton oil mills, 7 saw and planing mills, 6 flour and corn meal mills, and the Pioneer

Cotton Mills (later called Bluff City Cotton Mills). Speers Manufacturing Company was organized in 1886 for the production of cotton batting and wadding (Dockham 1891-92). Other mills in the county were the steam saw and grist mill and steam cotton gin in Arlington, the grist mill and sawmill in Collierville, and the two mills in Bartlett. No historic mills are known to survive in the county today.

SMITH COUNTY

Smith County is in Middle Tennessee east of Nashville. It was established in 1799 and covers 320.76 square miles. The county seat is Carthage. Evidently steam power found an early beginning in Smith County. One source has stated that a steam mill existed in the county prior to 1819, although this is unlikely. However, Eastin Morris' *Tennessee Gazetteer* of 1834 does include a steam powered grist and sawmill in Carthage. Other early mills were Lancaster's Mill on Smith Fork Creek, Adam Dale's Mill on Smith Fork at Liberty, Samuel Caplinger's Mill (1821) also on Smith Fork, and mills on Peyton's, Goose, and Defeated Creeks. Apparently, in 1803 the state of Tennessee purchased the right to use the patent of Eli Whitney's cotton gin, so five gins were established early in the county's history (*The History of Smith County, Tennessee*, 1987). The 1850 Census of Manufactures includes three grist mills, one grist/sawmill, and four sawmills. By 1860, there were listed seven grist mills and six sawmills. In the 1870 census, only five sawmills are included (no grist mills). In Killebrew's 1874 work, he also mentions the New Middleton woolen factory in Smith County, although no other references to this textile operation can be found. The 1880 census lists 17 grist/flour mills, 11 sawmills, and a wool carding business. Late nineteenth century flour mills were the following: Hickman Milling Company (1888), Snow Creek Roller Mill (also a sawmill), Gordonsville Milling Company (believed to be steam powered), Rewoda Milling Company (circa 1895), and Brush Creek Mill and Elevator (*The History of Smith County*, *Tennessee* 1987). No known mills are left standing in Smith County today.

STEWART COUNTY

Stewart County (county seat Dover) is located on the Kentucky line northwest of Nashville, on the border between West and Middle Tennessee. It was founded in 1803 and occupies 495.87 square miles. Stewart County is best known for its early iron industry, but mills were also abundant. Goodspeed furnishes a long discussion of the milling history of Stewart County, although the Census of Manufactures schedules seem incomplete and of little value. Goodspeed states that the earliest mills in the county were constructed about 1800 and were all water powered. They were generally of rough log construction and operated by tub wheels, although an occasional overshot wheel was constructed. The first mill may have been that of William Haggard on Hickman Creek. Bryon O'Neal had a mill on Lick Creek three miles above Dover in 1801. In 1804, W.R. Bell erected a grist mill on Wells Creek, and in 1805, Jessie Denson had a saw and grist mill on Long Creek. Soon after followed the mills of Outlaw, Ellison, Bard, Atkins, Davidson, Pugh, Chambers, Allen, Little, and James. About 1826, Nathan Skinner erected what was described as an "excellent" overshot mill on Shelby Creek, and this mill was still operating at the time of the Goodspeed interviews in 1887. The water wheel was said to be twenty feet in diameter and powered two sets of buhrstones and a saw. Stephen English had a good water powered mill on Standing Rock Creek around 1820. The Bumpus Mills were established in 1846 by A.J. Bumpus, and were enlarged and improved until, by 1887, they were among the best in the county. Saline Creek provided the power to turn machinery for grist and flour milling, saw milling, planing, and wood turning. A village grew around the mills, and survives as Bumpus Mills to the present day. Mills in Stewart County in 1887 included the "Rough and Ready" Steam Grist Mill, Tippet's Mill, Free's steam sawmill, Moreland's Mill, Francis' steam grist mill, Parchman steam saw and grist mill in Cumberland City, Walter Brothers steam flour and grist mill in Dover, Rice grist and sawmill, Biggs' sawmill, Murphy's steam flour, grist, and sawmill, and Magee's saw and grist mill. Despite this plethora of mills, none is known to have survived to the present day.

SULLIVAN COUNTY

Sullivan County lies in upper East Tennessee on the Kentucky line. It was the second county to be organized in what is now Tennessee (1779), and today contains 438.33 square miles. The county seat is Blountville, and the county contains the two large cities of Kingsport and Bristol. Sullivan County may lay claim to the earliest mill in the state, established before Tennessee became a state. King's Mill Fort is said to have been originally a grist mill fortified before 1774. It became the heart of the Reedy Creek settlement of 1772-73 (Spoden 1976). Another early mill mentioned by Goodspeed was the tub mill of John Sharp at the mouth of Muddy Creek, where a later mill was built by John Spurgeon. Other pre-1840 grain mills were David Roller's Mill (circa 1833-35) and a mill on the site of the present-day Leslie Mill prior to 1827 (Spoden 1976). The 1850 Census of Manufactures lists two grist mills, one grist/sawmill, and one cotton factory. In fact, Sullivan County witnessed the establishment of several textile operations during the early nineteenth century. Lynn, Wall, and Company is said by Goodspeed to have had a cotton spinning factory in Kingsport circa 1833. Ross' cotton factory, Meyers' hemp factory (rope), and a paper mill in Paperville (pre-1834) were also established early. Bristol Cotton Mills were founded in 1875 by Fulton and Sparger, and the Bristol Woolen Mills, built by Lewis, were operating in 1887. It is said that Frederick A. Ross had a cotton mill on Long Island that operated as late as 1849, hauling cotton by wagon from Knoxville. The Prather Mills at Bluff City (1874-75) and Jordan and Hoard Woolen Mills in South Bristol lasted only a few years (Taylor 1909). The 1860 census for Sullivan County includes 10 grist/flour mills, 4 sawmills, and 2 wool cards. In 1870 these numbers were 13, 3, and 6, respectively. In 1874, Killebrew lists two woolen mills in the county and a third under construction (possibly the Prather Mills). The 1880 census lists for Sullivan County 31 grist/flour mills, 25 sawmills, and 2 cotton factories. One of these cotton mills was the Holston Cotton Mills owned by Stover and Patterson. It had 864 spindles, 6 cards, and 12 broad looms (*Textile Manufacturers Directory of the U.S.* 1881). Patterson and Frye were also involved in the Bluff Manufacturing Company, a spinning and carding factory (Dockham 1890).

Perhaps the most unusual early factory in the county was not related to grains, lumber, or textiles, but deserves a special mention nevertheless. This was the large nail manufactory at Pactolus, owned by Elijah Embree. It is referred to as early as 1834 in Morris' *Tennessee Gazetteer*. It is said that nails from this factory were shipped as far away as Huntsville, Alabama.

The history of Sullivan County is linked to that of Franklin County by the Deery family. According to the Goodspeed histories, James White met William Deery on a trip to Baltimore. He learned that Mr. Deery, an Irish peddler, had traveled throughout the settlements of Tennessee. Mr. White proposed to sell Deery a lot and house in Blountville, which was effected. Deery bought a stock of goods in Baltimore, and he and White returned to Blountville. Deery then began a long career as a very successful merchant. Upon his death, he was said to be the wealthiest man in Sullivan County. Late in life he married a Miss Allison, and became the father of three sons and two daughters. Two of his sons, James A. and William B., established the Allisonia Cotton Mills in Franklin County in 1849 (q.v.), which burned in 1856. They also owned the steamer *Cassandra*, the only steamboat ever to enter Sullivan County.

Today, five extant mills are located in Sullivan County. The Pettyjohn Mill near Blountville is on the site of David Roller's Mill mentioned above. Leslie Mill is also on the site of an earlier (1827) mill. Bluff City Mill was formerly water powered, but is now a feed and farm supply business. Halls Mill is a residence with an overshot water wheel. The last mill, Kingsport Milling Company, has an interesting history. It is said to be Kingsport's oldest continuous business, begun as a sawmill by Joseph Everett circa 1814. A grist mill with a wooden water wheel was supposedly built about 1816 and operated for many years. The present structure is of much later origin (perhaps 1900) and was turbine powered, although the dam is now gone. It continued as a grain milling operation until the 1950's. It is now used as a feed and farm supply store. Some roller milling equipment is still in part of the building, and the turbine is intact, though silted up.

SUMNER COUNTY

Sumner County was established in 1786 and occupies 555.26 acres. It is situated in Middle Tennessee on the Kentucky line northeast of Nashville. The county seat is Gallatin. It was settled very early for a Middle Tennessee county, and has many interesting anecdotes and sites associated with its history. The names of several notable Tennessee pioneers are linked to Sumner County, including Thomas Sharp Spencer, James Winchester (whose circa 1800 home still exists), Kasper Mansker, and the Wynne family (whose 1828 home, Wynnewood, still stands as the largest original log structure in the state). The earliest settlers built several forts in the 1780's for their protection from Native American tribes in the area, including Mansker's Station and Hamilton's Station. As hostilities waned toward 1795, mills began to be erected. The first permanent water powered mill, and the most elaborate, was said to be that of James Winchester (Goodspeed says George Winchester) on Bledsoe Creek. It milled corn and wheat, sawed lumber, and distilled whiskey. Other early mills were said to have been operated by Kasper Mansker, William Montgomery, Phillip Trammel, and R.D. Barry (Durham 1969). According to Goodspeed, Cairo had a cotton factory in 1810, which seems a very early date. However, Eastin Morris in his *Tennessee Gazetteer* of 1834 includes the "cotton and wool factory" of Cairo. This is said to have closed when farmers ceased to raise cotton in the area. The earliest Census of Manufactures schedules surviving for the county are the 1850 records. These include 3 grist mills and 10 sawmills. In 1860, the industry of the county was varied, with 12 grist mills, 13 sawmills, 2 wool cards, a cotton factory, and a woolen factory. The 1870 census lists only 2 grist mills, 7 sawmills, a lumber planing mill, 4 wool cards, a cotton factory, and 2 woolen factories. In the 1880 census are included 7 grist/flour mills, 18 sawmills, and the Eagle Woolen Mills. Goodspeed presents the names of several mills and factories in Sumner County in 1887. In Gallatin there were Walton and Sons merchant mills and woodwork, Gallatin Flouring Mills (established 1854 and operated by Samuel Lyon), Simpson's planing mill, and Nickelson Woolen Mills (established during the Civil War). The Gallatin Cotton Factory had been established there in 1850, but burned in 1873. It was rebuilt to accommodate 4,096 spindles and 80 looms, but closed in 1885 due to a depression in business.

Cottontown had a saw and grist mill in 1887 also. Today, no mills are known to survive intact in Sumner County.

TIPTON COUNTY

Like many of the West Tennessee counties, Tipton was formed in 1823, with county seat Covington. It is just north of Memphis on the Mississippi River, and covers an area of 443.92 square miles. The Goodspeed histories provide some details of the milling history of Tipton County. The first horse mill in the county was said to be that of Thomas Ralph in 1823, and the first water mill was built by Henry Yarbro the following year. Both were close to Covington. In 1825 White and Davis built a water mill on Indian Creek. Around 1826 William Starnes erected a water mill near Atoka, and about 1829-30 John Mickleberry built a horse mill on Pea Ridge. Soon cotton gins were attached to the mills of Ralph and Mickleberry. Gins were also owned by Hightower and Simonton. By 1887, when the Goodspeed histories were published, at least 18 grist/flour mills operated in the county, along with 14 sawmills and 17 gins. Many of these were multiple operations, and virtually all were steam powered. The Census of Manufactures data adds little additional information, although in the 1870 schedules a manufacturer of cotton and woolen machinery is listed. No mills are known to survive to the present day.

TROUSDALE COUNTY

Trousdale County is in Middle Tennessee northeast of Nashville. It is the smallest Tennessee county in area (108.09 square miles), and was formed in 1870. The county seat is Hartsville. Mill information is lacking for this county, particularly since it is of late origin. The 1880 Census of Manufactures lists three grist mills and one wool card. Cawker also lists three flour mills in both the 1880 and 1890 directories. There was a grist and sawmill in Hartsville in 1887, according to Goodspeed. The Hartsville Flour Mill was built by Marcus D. Rickman in the mid-1890's and marketed "Purity" flour and "White Pearl" meal. It was a 100-barrel mill and existed until at least 1947 (Allen 1991). The most notable mill-related industry of Trousdale County was the famous millstone quarry near Hartsville. Goodspeed offers the following statement concerning this quarry: "A short distance from Hartsville, near the top of a ridge, is a bed of mill-stone grit, which has supplied Middle Tennessee with many pairs of stones. The bed is six to eight feet thick in its heaviest part. The rock is … principally a mass of silicified shells mixed with more or less limestone matter." (Goodspeed 1887) Today, Millstone Knob still exists just north of Hartsville. No mills are known in the county today.

UNICOI COUNTY

Unicoi County is another county of late formation (1875), established from Carter and Washington Counties. Erwin is the county seat, and the county is 206.63 square miles in area. Little information has been obtained on milling history in the county, except Cawker's inclusion of one flour mill in his 1890 directory. Since it was formed so late, its mill development probably followed closely that of its parent counties (q.v.). No mills are known to exist in the county today.

UNION COUNTY

Union County is located in East Tennessee due north of Knoxville. The county seat is Maynardville. The county covers 231.3 square miles and was established in 1850. The 1860 Census of Manufactures lists four grist mills, four sawmills, and a wool carding operation for the county. Unfortunately, no other census data is available. Goodspeed mentions that M.D. Kincaid operated a flour, grist, and sawmill at Effie in 1887. Cawker only lists one flour mill in 1890. Surprisingly, five intact mill structures remain in Union County (see Appendix A). The Skaggs, Mynatt, and Wolf Mills are non-operative. The Sharp Mill is a reconstruction in the Museum of Appalachia. Occasionally corn is ground here, using a one-cylinder gasoline engine for power. The fifth mill is Norton Mill, a small one-story building with overshot wheel within Big Ridge State Park.

VAN BUREN COUNTY

Spencer is the county seat of Van Buren County, located almost due north of Chattanooga. The county was formed in 1840 and occupies 263.34 square miles. The earliest extant Census of Manufactures records are those for 1850. Three grist/sawmills are included. No census records are found between 1860 and 1870. In 1880, only two grain mills are included, those of Passons and partners York and Kell, both water powered. During the late 1870's, Bone Cave was said to have had a grist, saw, and carding mill on Rocky River, as well as a steam sawmill. The community of Rocky River also had a flouring mill. In the early 1880's, Spencer had a steam sawmill and two grist mills, and Sparkman also had a steam sawmill. By 1887, Cummingsville had the Hill, Brady, and Company flour mill, Cane Ridge had two flour mills, and Olio had three lumber manufacturers and two grist mills. In 1891 there were two flour mills in Cane Ridge, one in Cummingsville, two in Gillentine, two in Laurelburgh (one also a sawmill), two lumber and one grist mill in Olio, and two grist mills in Painville (Medley 1987). No mills are known to survive in the county today.

WARREN COUNTY

Warren County is on the border between Middle and East Tennessee, about midway between Nashville and Chattanooga. The county seat is McMinnville. The county was formed in 1807 and covers 418.1 square miles. A mill, Johnston's Mill on the Dry Fork of Smith's Fork, was known as early as 1808 when it was referred to in a deed (Majors 1992). However, the manufacturing history of Warren County is dominated by the Faulkner family, who were involved in several textile and flour milling industries in the area for over 70 years. The earliest Faulkners in the county were Dr. Archibald and Asa, who settled about 1810. Archibald had a grist mill and the first woolen mill and cotton gin on Hickory Creek (date unknown). Asa Faulkner began his career with a grist mill on Hickory Creek in 1830. In 1846 he erected a large cotton mill on Charley Creek about two miles from McMinnville, called the Central Cotton Factory. According to Killebrew's book, it was still in full production in 1874, with four men and thirteen girls operating 720 spindles for the manufacture of yarn for home weaving. In 1861 Faulkner and S.B. Spurlock built a second cotton factory on Barren Fork of Collins River, near a railroad. Faulkner named the factory in honor of his wife. Annis Factory (sometimes called Annie's) went into production the following year, with 2,000 spindles and a daily capacity of 2,500 yards of cotton domestics. In 1863 the Confederate Army took possession of the factory, and thereby gave General Rosecrans reason for destroying it April 21, 1863. This factory was rebuilt on the same foundation in 1866, with 2,016 spindles and 60 looms. It employed 54 people (mostly "orphan girls") and had a daily capacity of 2,400 yards. Asa Faulkner had two sons, Thomas and Clay, who followed their father into the textile production business. Asa had learned to manufacture wool cards, and Thomas continued this endeavor. Thomas and Clay became joint owners of a woolen factory near McMinnville in 1873 (probably the Charles Creek Woolen Mills), and in 1877 they also formed a partnership in a second woolen factory with Robert Cantrell. In 1879 the brothers dissolved this partnership, and the woolen mill became Cantrell and Faulkner (or Tennessee Woolen Mills). It employed 62 people and could produce 1,000 yards of woolen goods daily. Clay Faulkner with another brother J.J. took charge of the Butler Flouring Mills on Charles Creek in 1866. After Clay and Thomas dissolved their partnership, Clay became sole owner of the Mountain City Woolen Mills at Faulkner Springs (also called Faulkner's Factory) (Goodspeed 1887). It is interesting to note that both the Charles Creek Woolen Mills and Annis Factory were powered by water turbines in 1874, the former by a Faulkner turbine (relationship to the family unknown), and the latter by a Leffel turbine (Killebrew 1874).

At the age of 79, Asa Faulkner launched perhaps his most ambitious endeavor. In 1881 he purchased property between the Caney Fork and Collins River, in what is now Rock Island State Park. This is the location of the Great Falls of the Caney Fork, and was an ideal location for a water powered factory. Along with his son Clay Faulkner, H.L. and Jesse Walling, Asa Faulkner formed the Great Falls Manufacturing Company. The partners had a dam and water wheel pit built at the falls, and hired James McGiboney to erect a saw and grist mill. Plans were drawn for a large textile factory near the same location. Asa Faulkner died in 1886, before the construction of this factory, but plans proceeded. By 1892, the large three-story brick structure was completed and furnished with modern machinery. The Falls City Cotton Mill was chartered with a capital of $30,000 for the purpose of manufacturing, spinning, weaving, bleaching, dyeing, printing, finishing, and selling all goods of every kind made of wool and cotton. A small community called Falls City grew around the factory. Business continued for ten years, until a catastrophic flood on the Caney Fork destroyed the wheelhouse in March, 1902 (Dunlap 1999). Legend says that the water wheel was over 40 feet in diameter, and still lies at the bottom of a deep pool below the factory building, which still stands today. This has never been verified. This building is one of the few nineteenth century textile factory buildings surviving in Tennessee, Falls Mill in Franklin County being the oldest (1873). Several photos survive of these early Faulkner mills (see Womack 1960).

Besides the industrial legacy of the Faulkners, Warren County was witness to the building and operation of numerous grist and sawmills throughout its history. Fourteen early mills are mentioned by name in Goodspeed. In addition, Henry Bridleman is said to have built a cotton factory on Charles Creek as early as 1812.

By 1880, Warren County boasted, in addition to its textile factories, 15 flour and grist mills and 12 sawmills. Goodspeed lists in 1887 no less than 25 grist and flour mills and 16 sawmills operating within the county, not counting similar establishments in McMinnville. Possibly the longest-lived flour mills in the county were those in Viola and Morrison, both now gone. Thomas Gonder operated the Viola mill, producing "Viola Best" flour, until at least 1960. The mill at Morrison was only recently torn down.

Only one mill structure, Yager's Mill, remains in the county, besides the Great Falls Cotton Factory. It has not operated in many years. The Shellsford Mill site is noteworthy, although its exact location is not known. It was built circa 1838 by a pioneer settler named Shellsford, and is said to have been used by the Cherokee for the grinding of their corn as they passed through the area on the Trail of Tears.

At least two millstone quarries were in the county, one on the west side of Shot Mountain and one near the headwaters of Mountain Creek of the Caney Fork (Majors 1992).

WASHINGTON COUNTY

Washington is the first county in Tennessee, formed 19 years before statehood in 1777. Originally it is said to have covered most of present-day Tennessee, then a part of North Carolina. Today the county occupies 316.2 square miles and is located in upper East Tennessee. The county seat is Jonesborough, the state's oldest town, although the county contains the much larger Johnson City. Much research has been conducted on the mills of Washington County, which were quite numerous. The oldest continuously operating milling establishment in the state is the Dungan-St. John Mill (see extensive history in Chapter 5), located in Washington County. The original mill, which still exists structurally (although surrounded by later additions), is also believed to be the oldest extant mill building in the state, built circa 1778. Also in 1778, Goodspeed states that Michael Bawn and James Pearn were each granted permission by the county to build a grist mill on Little Limestone Creek. There were no doubt many others prior to 1800, although these are not documented except perhaps in county records. The 1850 Census of Manufactures is the first to include mills in Washington County. There were 26 grist mills, 23 sawmills, and 7 textile operations (mostly carding) listed. In 1860, these numbers were 27 grist mills and 30 sawmills. In 1870, after the Civil War, the numbers diminished, but rebounded by the 1880's. The census records for 1880 list 36 grist/flour mills and 14 sawmills, although there is evidence that more than 40 flour mills were operating during that period. Mill seats were abundant, so the majority of these mills relied upon water wheels or turbines for their power. Jonesborough Cotton Mills were incorporated in 1890 for the production of yarns by steam power (Dockham 1893-94). The *History of Washington County, Tennessee*, compiled in 1988 by the Watauga Association of Genealogists, contains many historic photos of mills and histories of mill communities. There are 12 mills remaining in Washington County today. In most cases the structures are in relatively good condition, although none is known to operate any longer as a producer of flour or meal products. The Bashor (or Knob Creek) Mill will be highlighted in Chapter 5 as one of the best remaining examples in the state of a pre-Civil War Old Process mill, although its water supply and wheel are gone. Several other mills are worthy of mention. The Flourville Mill is a very large structure, partially used as a residence, and still has a Fitz overshot water wheel in place, though not operable. The Taylor Mill is a well-maintained art studio. The second Bashor Mill is also a residence with a large water wheel, which operated until recently. Eureka Roller Mill in the community of Telford supposedly operated until about 1986. It also retains a Fitz overshot water wheel.

WAYNE COUNTY

Waynesboro is the county seat of Wayne County, which is located on the Alabama line on the border between Middle and West Tennessee. The county was formed in 1817 and covers 763.7 square miles, making it the largest in area in the state. The first mill was said by Goodspeed to be the tub mill of John Meredith on Moccasin Creek in 1818. The horse mill of John Roberts on Beech Creek followed in 1820. William Ross erected the first cotton gin near Old Carrollsville in 1819. John Biffle built a mill on Buffalo River near Ashland about 1830. There were three grist/sawmills listed in the county in the 1850 Census of Manufactures. One grist mill and three sawmills were included in the 1860 schedules. These numbers were two and five, respectively, in 1870. By 1880, there were listed six grist/flour mills, one grist/sawmill, and three sawmills. The Johnson and Dixon Mills survive in Wayne County today, although both are abandoned.

WEAKLEY COUNTY

Weakley County is in northwest Tennessee, with county seat Dresden. The county is 593.05 square miles in size and was established in 1823. The first milling had to be done at Lumbrick’s Mill in neighboring Henry County, according to Goodspeed. The first water powered grist mills were built about 1824 by Robert Uree on Cave Creek and another south of Dresden. Three grist mills were listed for Weakley County in the 1850 Census of Manufactures, but by 1860 there were 10 grist mills and 14 sawmills. In 1870 a cotton factory was included, along with four grist mills and ten sawmills. This was Gilbert and Company cotton spinning mill with 500 spindles, located on Middle Fork of Obion River near Gleason (Killebrew 1874 and Dockham 1874-75). By 1880, there were established 12 grist/flour mills and 21 sawmills. Mrs. Virginia C. Vaughan, the Weakley County historian, sent a map to the author showing the locations of eight mills in the county in (it appears) 1880. She discusses two important mills, Janes Mill and Lochridge Mill, in her book on the history of Weakley County. The Battle of Lochridge Mill took place during the Civil War (Vaughan 1999). Goodspeed states that in 1887 there were several mills in the county, including Martin Roller Mills in Martin, Irvine and Scott grist mill, sawmill, gin, and wool card in Dresden, and four grist/sawmills in Greenfield, Sharon, Palmersville, and Latham. Greenfield also had two steam gins and two box and basket factories. No mills are known in the county today.

WHITE COUNTY

White County is on the western edge of East Tennessee and covers 371.1 square miles. The county seat is Sparta, and the county was formed in 1806. The first mill may have been erected prior to 1808 on Lost Creek (Seals 1935). Another early mill was that of William Scarborough on Caney Fork River, a water powered corn mill built about 1810-1812. William Glenn erected a similar mill on Calfkiller River circa 1815, and Thomas Simpson also built a mill about the same time on the same river, four miles below Sparta. Seven more water powered grist mills were established by 1820. Several years before the Civil War a large three-story brick cotton factory was built on Calfkiller one mile below Sparta. At the outbreak of hostilities, the machinery was removed farther south and never returned. The building was later used as a handle factory (Goodspeed 1887). In addition to the carding services performed at this old factory, there were four more carding mills in the county before the Civil War. George Ogden’s at Sparta may have been the earliest, built in 1831 (Seals 1935). The 1850 Census of Manufactures lists three grist/sawmills, two sawmills, and a textile operation. In 1860, there were six grist mills, six sawmills, and a wool card. In 1870, only one grist mill and two sawmills are listed. By 1880, these numbers again increased, this time to eight and eight. The Taylor (or Tebo) Woolen Mills was also listed. This factory was six miles south of Sparta, owned by J.W. Taylor. Carding machines and ten looms were operated in the factory, along with a grist mill (Goodspeed 1887). This factory was later moved near Doyle, where it became Burroughs, Taylor, and Company, making garments as late as 1935 (Seals 1935). Goodspeed lists by name more than 30 grist, flour, saw, and planing mills, several steam powered, in White County in 1887. The only known surviving mill is an early twentieth century steam sawmill, still intact and operated until recently by the Roland family in the small community of Quebeck.

WILLIAMSON COUNTY

Williamson County is just south of Nashville in Middle Tennessee. It was established in 1799 and occupies 588.47 square miles. The county seat is Franklin. Industry moved early to the county, for by the 1820 Census of Manufactures, there were already 17 grist mills. In addition, Goodspeed states that as early as 1815, a cotton factory was erected on Big Harpeth near Franklin by Sample, Currin, and Petway for the manufacture of cotton bagging and other products. This factory was referred to as “extensive” in Eastin Morris’ *Tennessee Gazetteer* of 1834. In the 1850 Census of Manufactures, two grist mills, eight grist/sawmills, four sawmills, and a steam powered cotton and woolen factory are included. By 1880, there were listed 11 grist/flour mills and 9 sawmills. Goodspeed mentions the following mills that were operating in Franklin by 1887: J.B. Lillie Flour Mill (established 1870, and installed the roller process in 1884, becoming Franklin Flouring Mills); Atlas Mills (established 1882); Rezer Mill (also established 1882). The only two known remaining mills in Williamson County are the Nolensville Mill and Boyd Mill.

WILSON COUNTY

Wilson County (county seat Lebanon) is in Middle Tennessee east of Nashville. It was formed in 1799 and covers 545.72 square miles. According to the Goodspeed histories, the first mill for corn erected in the county was the horse powered sweep mill of Samuel Caplinger about 1798. Apparently the horse was hitched to the sweep pole under the small mill building, and by turning a shaft with the sweep, transmitted power up into the building to turn the millstone. The stones were later removed to a water powered mill.

The first water powered mill is attributed to Thomas Conger on Barton's Creek, also about 1798. The Donnells also had a horse powered mill around the same period. Prior to these mills, the settlers either ground their grain on a mortar and pestle, or carried it to a mill in Davidson County. In 1799, Mathew Figures built a water powered grist mill on Cedar Creek, and afterwards added a saw. Trigg and Hendricks built a similar mill on Spencer Creek about 1800. Nine more mills followed in the subsequent years, scattered among the water power sites of the county. A short-lived paper mill was also established very early on the Cumberland River twelve miles from Lebanon. At least 14 cotton gins existed shortly after 1800. The milling community of Baird's Mill was founded about 1805 by Seldon and William Baird and several other settlers, including the author's great-great-great grandfather Dawson Hancock. A mill complex and tannery later grew around this location (Burns 1987). In Eastin Morris' *Tennessee Gazetteer* of 1834, he mentions in Statesville a large cotton factory (about which no further information is known), a wool card, two gins, a tread powered sawmill, and two grist/sawmills, one horse and one water powered. The 1850 Census of Manufactures lists only two grist mills, two grist/sawmills, and six sawmills in the county, but there were probably many more, for in 1860 the numbers were 15 grist mills, 23 sawmills, and 6 wool carding operations. A woolen mill had been established by 1870, and the number of wool carding businesses increased to about 12 by 1874. Also in that year was reported some 20 grist mills (at least 6 steam powered) and over 25 sawmills (about half steam powered) (Killebrew 1874). In the 1880 census there were listed 25 grist/flour mills and 23 sawmills. Goodspeed in 1887 lists 40 owners of water or steam powered grist, saw, and/or carding mills in Wilson County, as well as the steam powered woolen factory of J.N. Cowen. One of the 40 mills listed is that of S.T. Alsup on Fall Creek, which is the only mill structure of its kind still existing in Wilson County. The mill is now a private residence, and was last run by a water turbine. The structure is believed to date to 1807, and if so, it is one of the oldest extant mill buildings left in the state. Lebanon has the distinction of having the last woolen mill to operate in Tennessee. This was the Tennessee Woolen Mill, established in 1909. It operated until its closure in the mid-1990's.

CHAPTER 5

SOME REPRESENTATIVE SURVIVORS

Although much of Tennessee's industrial heritage has been lost through disrepair, disinterest, development, and disaster, some representative structures and equipment remain, scattered primarily throughout the eastern half of the state. It is the purpose of this chapter to select several surviving grain, saw, and textile mills as examples of the types of mills built and operated in Tennessee over the past two centuries. Due to the progress of technology and the desires of the mill owners to profit from their enterprises, it is a difficult task to identify a mill which would, for example, be representative of a specific time period. Machinery, products, and applications typically changed to meet demand and competition. Very few mills remained as originally constructed and furnished. In addition, virtually all standing mills in the state which could be judged to reflect pre-Civil War technology are reconstructed, although in some cases using salvaged original parts or building materials. Because several of the mills featured herein produced various products during the same period or at different periods, no attempt is made to categorize them into any specific class or time period. However, where appropriate any of the mill's features of interest to the student of early technology or culture will be presented.

MILLS OF THE GREAT SMOKY MOUNTAIN NATIONAL PARK

The three mills on the Tennessee side of the Great Smoky Mountain National Park all represent the small neighborhood mills of the Pioneer and later periods of the state's history. However, all three were reconstructed on the sites of original mills, in most cases using parts and materials salvageable from the older structures. The only two tub mills known to exist in the state are the so-called Ogle and Reagan mills on the Roaring Fork/Cherokee Orchard Motor Nature Trail in the park near Gatlinburg. The original structures, though only dating approximately to the 1880's, were good examples of small tub wheel powered mills with a single set of millstones, and the reconstructed mills are faithful to their predecessors. They also employ log diversions on their respective creeks and hollowed log flumes, which are primitive. The Reagan Mill has been recently restored again by the Park Service and made operable. The Ogle Mill and tub wheel are in a deteriorating state (see Figures 17, 30, 35, 37, 38, and 65 in Chapter 2).

These types of mills could be constructed in a short time by enterprising families for their own use and sometimes for custom (toll) grinding for neighbors. They were apparently quite numerous in the park area prior to 1900, with some 20 or more on the creek where the Ogle Mill is now situated (Noah 'Bud' Ogle Place Self-guiding Trail Brochure 1999).

The John Cable Mill in Cades Cove is also a reconstructed 1880's era mill, although certain features would place it alongside much earlier mills (see Figures 43 and 66 in Chapter 2). It utilizes a small wooden overshot water wheel, large wooden axle (both of which have been recently replaced), and iron gearing to the millstones. The building, water wheel, and placement of the millstones may be taken as fairly representative of a Pioneer era mill, although the gearing would have been wooden.

It is worth mentioning at this point that an original Pioneer-type mill of log construction still exists in Hickman County, Tennessee. The actual date of construction and history of this mill are not known, and it is in a precarious structural condition. Its wooden water wheel is gone, but certain parts remain.

JAMES RICE MILL IN NORRIS DAM STATE PARK

The James Rice Mill located in Norris Dam State Park in Anderson County is also a reconstruction of a much earlier mill (1798). It was originally constructed on Lost Creek in Union County, and was said to be a two-story log structure with a wooden overshot water wheel. The gearing and cogs were supposedly constructed of hickory, a very durable hardwood. At times through its history, the mill was used to power not only the millstones, but a sawmill, cotton gin, trip hammer (for forging), and later an electric dynamo. After a severe storm in 1874 damaged the mill building and gearing, replacements were built for the water wheel axle and gears.

Four generations of the Rice family operated the mill until 1935, when the Tennessee Valley Authority (TVA) condemned the site and constructed Norris Dam. At that time, the Civilian Conservation Corps, National Park Service, and TVA disassembled and moved the mill structure and drive trains to their present location in the state park. Recently the gearing and other parts were again restored, and the mill is operable, using an overshot water wheel with steel axle (Norris Dam State Park brochure 2000).

The Rice Mill is the only known operable mill in the state with wooden cog gearing (excluding turbine mills such as Ketner's that utilize cast bevel gears with wooden teeth). Other examples of (non-operative) original wooden gearing may be viewed at the Tennessee State Museum and Museum of Appalachia.

Figure 145. James Rice Mill in Norris Dam State Park.

DUNGAN-ST. JOHN MILL IN WASHINGTON COUNTY

The Dungan-St. John Mill in the Watauga community of Washington County is unique in the state. It is believed to be the oldest intact mill structure in Tennessee, and also has the singular distinction of being recognized as Tennessee's oldest continuously operating business. The entire area has an interesting history. As early as 1772, the influx of settlers to the area was so great that an independent governing body, the Watauga Association, was established. This is considered to be the first such government in America. Three years later the Association purchased a large land tract in upper East Tennessee from the Cherokees and began to issue land patents. Of course a mill to service the growing settlement was necessary, and by 1778 a plantation, fort, mill, and stone house had been erected by Jeremiah Dungan. The mill and house still remain. Dungan was of English heritage, and his family had settled very early in Pennsylvania.

The Dungan-St. John Mill is possibly the best existing example in the state of a mill that witnessed virtually every transition, as milling techniques changed. The earliest power source is said to have been a 16-foot overshot water wheel, powered from a dam (now gone) on Brush Creek. The wheel operated the customary wooden gears of seasoned maple and dogwood. Lubrication was by beef and mutton tallow. Local farmers brought their "turn" of corn, as it was called, for custom grinding, and the miller scooped his toll from the grain, usually about seven or eight pounds per bushel (56 pounds). Jeremiah operated the mill until his death in 1813 at age 83, when his daughter Mary and son-in-law John Houston (a brother to the famous Sam Houston) took over. They continued the milling business until 1839, when the property passed to their sons. Son William, the sole owner by 1843, sold the mill in 1846 to Henry Bashor, of Dutch descent. (The Bashors were a well-known milling family in the area, and there are still two extant mills that bear their name.) Henry Bashor enlarged the mill and was using two buhrstones, one for corn and one for wheat, as well as elevators and a separating reel. Products were shipped by barge, mostly to Loudon.

George Washington St. John, of Virginia, purchased the mill and Dungan plantation from Bashor in 1866. His wife was a niece (possibly great-niece?) of Jeremiah Dungan, so the business and farm returned to the original family. The Watauga region had luckily escaped most of the ravages of the Civil War, and was a major grain producing area. With so many disrupted farming operations throughout the South, the demand for milled products was great during Reconstruction, so the Dungan-St. John Mill prospered. John J. Lilly was the miller during this period. Shipments were regularly leaving by barge and railroad to Knoxville, Loudoun, Cleveland, and Chattanooga, Tennessee. The Read House Hotel, which still operates in Chattanooga, was a major customer.

As the roller process for flour became popular, G.W. St. John contracted with the W.J. Savage Company of Knoxville to install a complete roller milling system for wheat in the mill about 1898. Around that time there was said to be over 40 such mills in Washington County alone. Also about this time, hard wheat was being grown and processed in huge quantities on the western plains, and cheap flour was distributed throughout the eastern United States. This placed keen competition and stress upon the small milling companies, and many folded as a result.

James St. John, the son of G.W., took over the milling operation in 1904 and continued to make a living, supplying local markets and custom grinding. Gradually, however, the large accounts diminished, as small family-owned stores gave way to supermarkets. James took on a miller as a partner to deal with the custom grinding, while he devoted more time to the farming business. His son, George W. St. John, bought out the miller's interest in 1935. Over the next several years, George had to refurbish the mill to make it more profitable. He renovated the time-worn structure, added new buildings, replaced the water wheel with motor-driven machinery, and added a large feed mill. Despite a declining flour market for small mills, George's operation continued to produce a fine grade of flour for many years, until it finally was no longer profitable. In 1975, having reached retirement age, George sold the business to his daughter Betty and son-in-law Ronald Dawson, who still run the mill. In order to continue the business profitably, they have discontinued the milling of flour and meal products for human consumption, and have instead concentrated on feed milling and sales of fertilizers, pet foods, seed and garden supplies, veterinary and livestock supplies, and other general needs for the farm and home. In 1996, during Tennessee's Bicentennial Celebration, the family and mill enjoyed the unique distinction of being designated "Tennessee's Oldest Business" by Governor Don Sundquist. It is most fitting that a grain mill, which represents historically a vital necessity to the growth and sustenance of the population, should be chosen for such an honor (St. John 1996). Below are images of the Dungan-St. John Mill as it appeared originally and today.

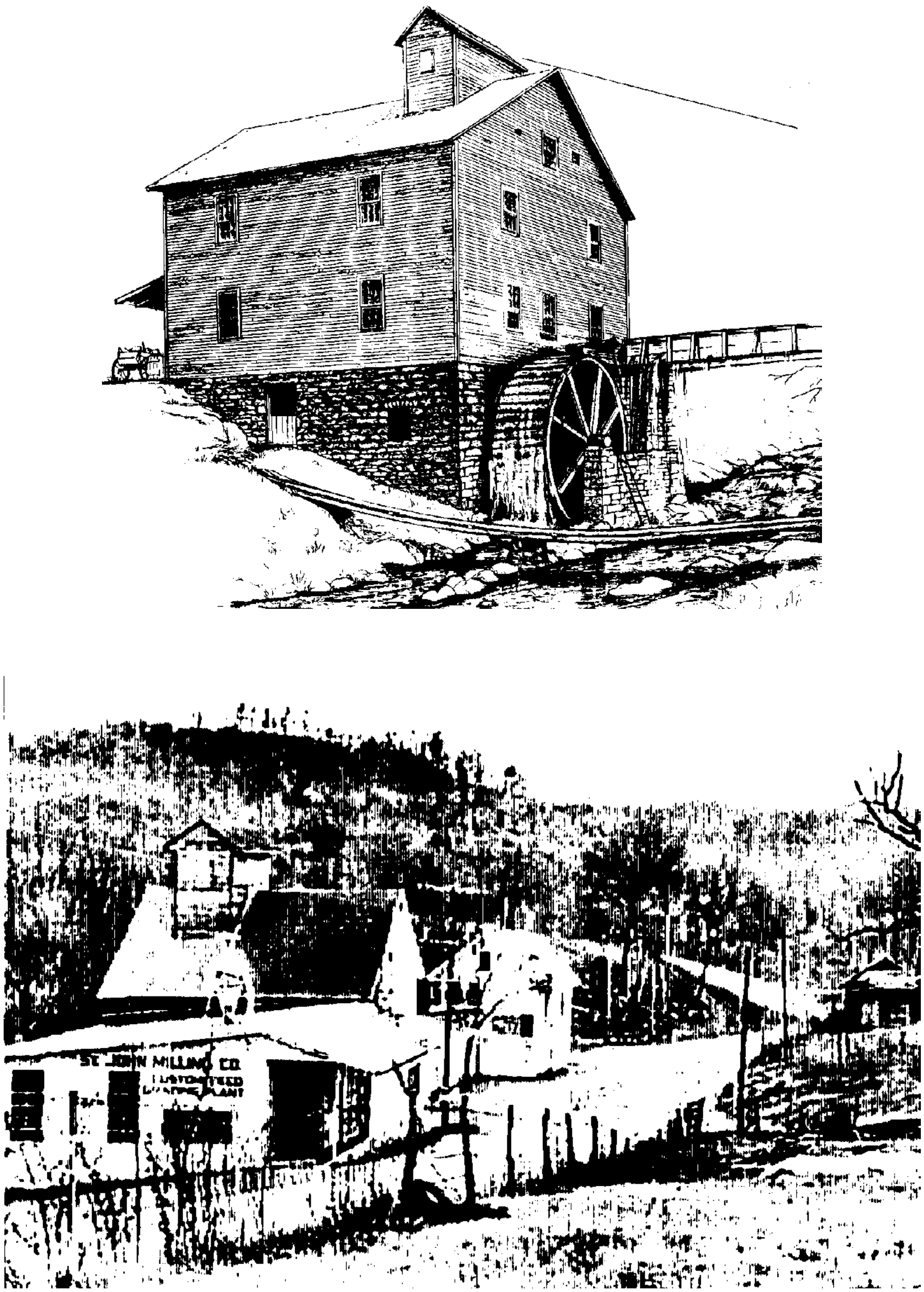


Figure 146. Artists' conceptions of the Dungan-St. John Mill originally and today.

KETNER'S MILL IN MARION COUNTY

Ketner's Mill on the Sequatchie River in Marion County also possesses several unique features. It is probably the oldest extant mill powered by water turbines in the state. It also has the only double wool carding machine left in the state, and this extremely rare device is additionally the only remaining piece of pre-Civil War textile equipment original to a mill structure in Tennessee. Finally, the rear structure of the present mill is thought to be the oldest (circa 1824) single-room mill building still standing, although it is evident that some underpinnings, siding, and roofing have been replaced over the years. Not only did Ketner's Mill serve the valley as a grain and wool carding mill, but it also was an important saw milling and lumber finishing mill in later years.

Much of the history of Ketner's Mill was related by Clyde Ketner, a fourth-generation miller and millwright who operated the mill until his death at age 80 in 1992. According to Mr. Ketner, his great-grandfather David Ketner operated a mill in what is known as Ketner's Cove (or Gap) on Looney's Creek at the base of Suck Creek Mountain (about three miles east of present-day Whitwell, Tennessee, in Marion County). That mill structure was supposedly built about 1820 and was a two-story frame building. In 1840 David bought the wool carding machine second-hand and operated it at the old site, along with his grist mill and blacksmith shop.

In 1868 the present mill site was purchased by Alexander Kelly Ketner, the son of David. Apparently the small mill structure which still stands was already there, but work soon began on a much larger brick building. The Civil War interrupted this project, but the mill was finally completed in 1876 (some sources say 1882). The small original mill was kept at the rear for use of the carding machine. Whether the small mill was originally powered by a tub wheel or an overshot wheel is conjectural. However, Mr. Ketner stated that the early turbine on display at the mill (Figure 77 in Chapter 2) was used there before the Civil War, presumably to run the small mill. The turbine's design certainly places it during that time period, but it would not have been available as early as 1824 (more likely circa 1850's). A water powered sawmill was built alongside the brick mill in a large open shed, and supplemented the grain business. Lumber finishing machinery was added around 1900, and three of these pieces are still on display in a reconstructed sawmill building.

In the early 1880's the wool carding machine, then over 60 years old, was dismantled. Mr. Ketner stated that the wooden frame for the machine was stored in a barn, but the rollers and all working parts were kept in the loft of the mill. The frame was lost when the barn burned, but approximately a century after its storage, Clyde Ketner assembled the old parts, built a new frame, and put the machine into operation once again (Figure 74 in Chapter 2).

Clyde's grandfather Alexander "Pappy" Ketner operated the grain and saw milling businesses successfully for many years, passing the enterprise along to his son. As with most mills, rollers were installed for flour in the late nineteenth century, and these along with the earlier millstones may still be seen in the mill. Clyde began working in the mill when he came of age, and later became the full-time miller. Many years ago, he replaced his dam with a huge new concrete one. Typical of his perseverance, he built the dam himself over a four-year period, using a small two-bag cement mixer and a helper. He ran the mill with an old tractor during this painstaking dam reconstruction. The grain and feed milling continued until Clyde's death, when the mill ceased regular operations. It is now only operating and open during its October crafts festival. The mill and property were recently purchased by Frank and Sally McDonald of Lookout Mountain, with the goals of restoring the mill and continuing the festival.

It is worthy to note that during Clyde's later years, he became quite active in the Society for the Preservation of Old Mills (SPOOM). With his long years of experience in milling, millstone dressing, and millwright work, he was recognized as one of the few experts in the field. He spent many days visiting other mills to help with restoration and interpretation, often at his own expense. His last major goal, after restoration of his carding machine, was to put his lumber mill back into operation as a working exhibit. To this end, he built a new structure (the original had been lost in a flood), salvaged the old woodworking machinery (which spent many years at the bottom of the river), and reworked his third turbine to power the sawmill. As his grain milling business declined, he poured most of his remaining energy into the sawmill, but tragically did not live to fulfill his dream. He was a most remarkable man, and a close friend of the author's.

The following is a collage of views of Ketner's Mill (also see Figures 20 and 21 in Chapter 2). Clockwise from top: View showing the early (1824) wooden structure attached to the rear of the later (1876) brick mill (the three turbines are under the small building); an early photo of a steam traction engine bringing wagons of rough lumber to the finishing mill; Clyde Ketner at the millstones, testing the corn meal.

Figure 147. Collage of views of Ketner's Mill.

FALLS MILL IN FRANKLIN COUNTY

Another unique mill survivor is nestled in a scenic hollow near a natural series of waterfalls in western Franklin County. Falls Mill has a history distinctive from any other mill in Tennessee, as well as several one-of-a-kind features. It was originally built as a textile factory, and is the oldest remaining structure (1873) in the state built for that purpose which features a full complement of nineteenth century woolen machinery. It also utilizes the largest (32 x 4 feet) overshot water wheel in the state. In fact, this is thought to be the largest wheel in the United States still used in productive service for a commercial business. Falls Mill, now operating as a grain mill and museum, is the only known flour and corn meal mill in the state which still mills regularly and ships throughout the country. It is also one of the few mills still performing custom grinding for farmers. Falls Mill was the first mill in Tennessee to be listed on the National Register of Historic Places (1972). The following is a brief history of the enterprise:

Falls Mill is a 3-story brick and post-and-beam structure built in 1873 as a cotton and woolen factory. It is located on Factory Creek 12 miles west of Winchester in Franklin County, Tennessee. It is now a fully operational grain mill and museum powered by a 32-foot overshot water wheel. Falls Mill features a large collection of antique grain and textile machinery, a country store, and log cabin bed and breakfast accommodations, located in a setting of exceptional scenic beauty.

The site on which the mill was constructed was surveyed as a “mill seat” in 1808. It was not until the early 1840’s, however, that the natural fall in the creek was harnessed to power a textile factory. By the 1850’s this enterprise was known as Hunt’s Factory. During the Civil War, the factory was owned and operated by the Criddle family, assisted by Robert Newton Mann. In 1864 Mann became a partner with Azariah David, whose own textile factory had been burned by Union troops. Mann and David contracted to build the present Falls Mill in the late 1860's. The current stone dam replaced an earlier wooden dam in 1871. It was used to power a sawmill to cut the timbers for the new factory and cotton gin building. These were completed in 1873. Cotton was ginned, carded, and spun into thread and yarn, and wool was carded for home spinning. Young women and children were employed as operatives about 8 months a year, working 72 hours per week for a $2 weekly wage. Men supervised the manufacturing and earned $8 per week. In 1876 Mann and David also built a water powered flour mill farther up the creek, which recently collapsed. The older factory building was dismantled in 1881.

Financial difficulties dissolved the Mann and David partnership in 1883, and the property eventually passed into the hands of the Lucas family. A new wooden overshot water wheel was installed at the textile factory in 1887 and the operation continued sporadically until about 1906. In that year the present 32-foot Fitz steel water wheel was installed, the millrace relocated, and the mill converted to a cotton gin.

In 1930, the advanced age of the owner and the effects of the Great Depression caused the mill property to be divided and auctioned. The gin continued to be operated by J.H. Walls until World War II. Following the war, Harry Dalton and his father bought the mill and converted it to a woodworking factory. The textile machinery was scrapped, but the water wheel continued to operate. In 1968, Colonel and Mrs. Woodrow Crum of Huntsville, Alabama, restored Falls Mill and moved most of the present grain milling equipment from the Boiling Fork Mill in Winchester. The Crums sold the mill to Donald Cunningham in 1974, and he in turn sold to John and Jane Lovett in 1984.

Falls Mill (see Figure 148) is now home to the Museum of Power and Industry, Inc., a non-profit educational organization founded by the Lovetts in 1981. The mill also produces a variety of stone ground flour and meal products, many of which are shipped to restaurants and specialty stores. Falls Mill is open 6 days per week for tourists, shoppers, picnickers, and tour groups. Admissions and donations fund continuing restoration and educational exhibits (Lovett 2000).

Figure 148. Falls Mill in Franklin County, Tennessee.

STEAM SAWMILLS

Although there are no existing examples of up-and-down sawmills known in Tennessee, a few steam powered sawmills still operate. The most accessible was until recently at Dollywood amusement park in Pigeon Forge. This was a traditional circular sawmill powered by a Frick one-cylinder, portable steam engine, and was operated on a regular basis. This mill is thought to be relocated. Another *in situ* Frick sawmill was until recently located in Hickman County, but had not operated in many years. It is said to be restored and now located near Nashville. There is also an Amish steam sawmill operating near Cookeville, and the Faulkner's steam sawmill near Lawrenceburg. In addition, the annual threshing and engine show at Adams, Tennessee, features a sawmill pulled by a steam traction engine (see Figure 149). Perhaps the most recently operated original steam sawmill, utilizing a stationary steam engine and separate boiler, is the Roland sawmill located in White County in the community of Quebeck.

Figure 149. The reconstructed steam sawmill at the Adams, Tennessee, engine show.

SOME ADDITIONAL INTERESTING EXTANT MILLS

It is a difficult task to select representative mills throughout the state without omitting one or more possessing their own distinct features. However, the following additional mills have been highlighted for one purpose or another, with a brief discussion of each:

Readyville Mill. The Readyville Mill in Cannon County is an interesting mill structurally. It is a four-story frame building, and is typical of many long-forgotten flour mills of somewhat similar construction (see Figure 150). The Readyville area was settled by Charles Ready, who is believed to have established the first mill there about 1812. The present structure is thought to have been built in the 1870's, and if so would have preceded the roller process for flour. It was converted later. The present Leffel turbine is said to have been brought from a gold mine in Dahlonega, Georgia, where presumably it was used to pump water. It was oversize for the mill, so frequently pulled the pond dry in times of low water on the Stones River. The mill area also boasts an early store building and ice house, although all these structures have been allowed to deteriorate markedly over the past 15 years. Until about twenty years ago, the mill operated, producing a variety of flour and meal products for the local area.

Figure 150. Readyville Mill.

Massengill Mill. Massengill Mill in Grainger County was located in what is now the Buffalo Springs State Wildlife Management Area. It has already been illustrated (Figures 63 and 64) and mentioned as probably the only remaining example in Tennessee of an unaltered (possibly) eighteenth century merchant mill structure, until its recent dismantling. Unfortunately, little is known of its history, except that it was probably established by Robert Massengill in the 1790's, then operated by at least two more generations of the Massengill family beyond 1870. It was built in the style of many Virginia and northern merchant mills, having an enclosed water wheel with stone arch tailrace. The structure was in a state of extreme deterioration, with only partial roof and collapsing floors. The large stone dam appears original, and is still in relatively good condition. Portions of the millrace also remain. Salvaged timbers and other materials from Massengill Mill are being used in a reconstruction in Townsend, Tennessee, and will be named The Little River Milling Co. The reconstructed mill has been altered from the original form, and apparently will not retain the enclosed water wheel. It is scheduled for completion in the spring of 2002 (Bronson 2002).

Bashor, or Knob Creek, Mill. This mill is located in Washington County about three miles from Johnson City, and it is attributed to Henry Bashor (see the discussion of the Dungan-St. John Mill). It is a simple, box-like structure of a style representative of many pre-Civil War mills built on the Evans plan (Figure 151), using Old Process machinery. It sits on a large limestone foundation, and is said to have originally had two dormers. A large stone chimney and Dutch entry door dominate the front of the mill. It is thought to date prior to 1832, when archival records show it was functioning. Most of the original equipment, including two large millstone sets, remain in the building. The water wheel and dam are gone, the wheel having deteriorated about 1954. The site is threatened by development, although the mill building itself is fairly stable.

Spencer Mill. Spencer Mill in Dickson County has the unusual distinction of being Tennessee's most traveled mill structure. Built originally about 1856 (another box-like structure similar to Knob Creek Mill) to utilize the water power of Parker Creek, the mill was disassembled, moved, and reconstructed about 1919 in the community of Burns, some 8 miles away. Here it was powered by a steam engine, and produced flour, meal, and cereal into the 1940's. In 1985, the Dickson County Historical Society bought the mill with the intent of moving it to the site of the old Cumberland Furnace. This plan never materialized. Tim and Trish Miller bought the original Parker Creek site of the mill, purchased the mill building, and moved it back to its original location (Figure 152). Although the dam is gone, they have developed a recreational and conference center around the mill theme, and are now restoring the structure and machinery.

Figure 151. Bashor, or Knob Creek, Mill.

Figure 152. Old Spencer Mill returned to its original location.

Hurricane Mills. Hurricane Mills in Humphreys County was a large milling area established before 1872 by George W. Hillman. Over the years, the mill processed woolen goods, flour, meal, and lumber. There was also an active blacksmith operation. The whole area was purchased many years ago by country music star Loretta Lynn and her late husband James Doolittle Lynn. It operates primarily as a tourist attraction, and although the mill still contains a small amount of grain milling equipment, it has not been used since before the Lynns purchased the property. The mill contains a gift shop and Loretta's country music memorabilia. It is a large frame structure with attached warehouse, originally used for grain storage. Three Leffel turbines remain in the penstock, and the dam is in good condition (Figure 153).

Figure 153. Hurricane Mills and dam.

Enochs' Mill. This tiny mill of log construction located near McEwen in Humphreys County is an enigma. At first glance it would appear to be of the Pioneer era, but it was actually built in 1934 by Wilbert and Annie Enochs. The tiny turbine used to power the single set of vertical millstones is unique to the state, so far as is known (Figure 154). It was made by the Athens Water Wheel and Manufacturing Company of Athens, Ohio, and is similar in design to the National Water Wheel Company's register gate turbine shown in Figure 82 of Chapter 2 (also see below). Mr. Enochs ran a small direct current generator for home lighting from the turbine between 1934 and 1950, when rural electrification came to the area. Daughter Joyce Bullington still owns the family farm, and the mill is operational.

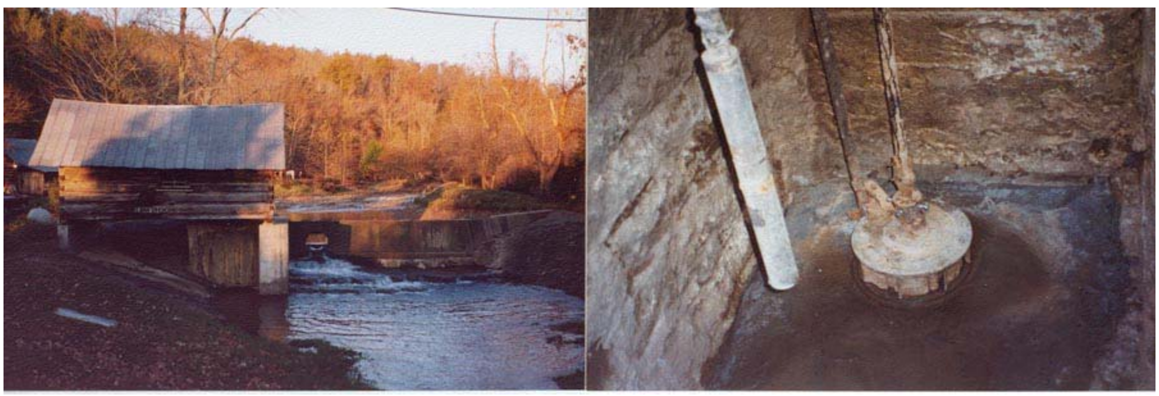


Figure 154. Enochs' Mill and the small turbine which powers it.

Babb's Mill. Babb's Mill in Greene County has a power source unique to mills in the state, although it has not functioned in many years. The mill is located on one of the few sites that has a high enough waterfall to operate a Pelton wheel (Figure 155). This little 24-inch wheel has a Pelton "quintex" nozzle (five separate water nozzles), and was capable of generating at least 40 horsepower (Pelton Water Wheel Company circa 1910).

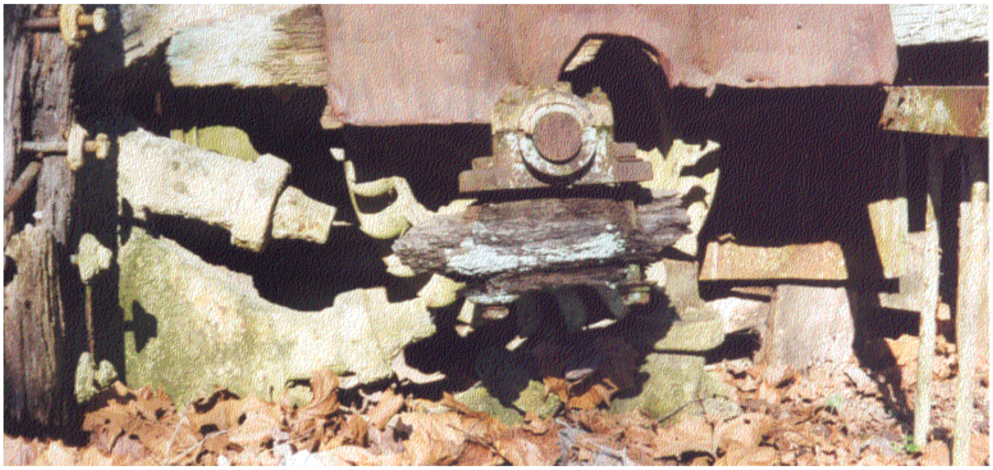


Figure 155. Pelton wheel and nozzle at Babb's Mill.

Evins' Mill. Located in DeKalb County near Smithville, Evins' Mill is unusual because it is a water wheel powered mill built very late (1939), and also retains a full complement of Fitz Water Wheel Company components. The mill structure is concrete block, built during the ownership of Tennessee Senator Edgar Evins on Fall Creek on the site of the 1824 mill of James Lockhart (see Figure 29 in Chapter 2). Senator Evins contracted with Fitz Water Wheel Company of Hanover, Pennsylvania, to supply a 20 x 5 foot overshot steel wheel, forebay (the water collection box just above the wheel), gearing, large sprocket, and roller chain drive. This was a common power transmission system during that time. From the main axle of the water wheel, a large bull gear drives a small pinion gear (this is different from Falls Mill, where a segment gear mounted to the wheel structure is used). On the other end of the pinion gear shaft inside the mill building is a large sprocket, over which a roller chain runs, transferring motion to a small sprocket on another shaft. This shaft runs to a gear box, where motion is shifted 90 degrees to run the basement line shaft. All additional shafts and machinery upstairs belt from this basement shaft. The mill is operable, but rarely is run. It contains a Meadows stone buhr mill and roller mills, as well as peripheral equipment. The mill area is primarily used as a conference center and retreat.

CHAPTER 6

SOME OLD-TIME MACHINERY MANUFACTURERS

Any study of milling history would be incomplete without discussion of the production of the machinery, equipment, and tools necessary to furnish the mills and factories. This chapter provides lists of some of the better-known manufacturers of water wheels, water turbines, grain milling machinery, sawmills, textile machinery, steam engines, internal combustion engines, electrical motors, and miscellaneous equipment and tools. The lists are by no means all-inclusive, since there were dozens (and sometimes hundreds) of producers of various machinery throughout the nineteenth and early twentieth centuries. In addition to these listings, an effort has been attempted to select and synthesize the most prolific or long-lived manufacturers in each category.

Several points need to be considered regarding the building of machines and making of tools. Prior to the early nineteenth century, virtually every piece of equipment was hand-made by craftsmen skilled in certain areas. Much machinery for mills and factories utilized wood extensively, for it could be easily worked and formed. Metal parts were much dearer. These usually had to be hand forged by a blacksmith. As the early iron industry began to develop in Tennessee beginning in the late eighteenth century, blast furnaces were becoming equipped with forging and casting facilities. Understandably these were crude until advances such as the Bessemer process for steel production was developed in the 1850's. However, they could turn out parts for millstones such as the rynd, the lower bearing cup, and the bridgetree lever. As machine tools were patented beginning primarily after 1820, screw threads and other turned or milled parts could be achieved. Water wheels and gearing in the earliest periods of Tennessee history were almost totally wooden, except for the iron gudgeons and bands on the water wheel axle and gear shafts. A skilled carpenter could produce a water wheel, but in many cases millwrights versed in the design and construction of these wheels and accompanying gearing were called in. No exact date is known for the production of the first metal water wheels, but they probably preceded the Civil War. Their great advantages over wooden wheels were their efficiency, their streamlined construction, their balance, and their long life. Such was also the case with water turbines versus old-fashioned wooden tub wheels.

Textile machinery required precise parts and close tolerances in operation. The carding machines were the first to be produced, followed by spinning machines (jennies, jacks, and mules) and finally power looms. Most of the early manufacturers of this equipment were in the Northeast U.S.

As steel and iron production, casting methods, forging, and machine tools continued to improve after the Civil War, and the concept of interchangeable parts (attributed to Eli Whitney circa 1799) was setting the stage for mass production techniques to come, manufacturers of mill-related machinery multiplied dramatically. Inventions and patents came fast and furious, and each company was clamoring to seize upon its own slight twist to a design to capture more market share. Companies encouraged their satisfied customers to write testimonials, which they published unabashedly in their sales catalogs and manuals. They also routinely discredited their competitors' products. It is hard to believe today that in the nineteenth century there were over one hundred manufacturers of water turbines, dozens of steam engine and sawmill builders, and numerous producers of milling machinery.

One primary reason for presenting as many names of companies as possible is for the purpose of identifying existing machinery in old mills. If it does not retain its patent information or manufacturer's name, it may sometimes be identifiable by certain design features, which may be matched in early sales catalogs or operating manuals. These publications typically contained beautiful and detailed drawings printed from woodcuts. If the goal is restoration of the machine, knowledge of the manufacturer may help in locating a similar complete example elsewhere in a museum or old mill.

The brief company histories that follow are composed from material found in early publications, and from contemporary sources. In almost all cases, the companies featured herein have been long out of production, or were absorbed by larger companies that changed product lines. A few were located in Tennessee, and these are highlighted.

WATER WHEELS

Fitz Water Wheel Company. Although several foundries and machine shops had the capability of building steel water wheels in the nineteenth century (and occasionally did by special order), only one manufacturer dominated this market. This was the famous Fitz Water Wheel Company of Hanover, Pennsylvania. According to the company's Bulletin Number 70, published in 1928, the manufacture of overshot water wheels was begun in 1840 by Samuel Fitz. The earliest Fitz wheels were built of wood, and the bulletin states that orders were still being received for iron parts for wooden wheels. Although the exact date for Fitz' manufacture of its famous steel "Overshoot" Water Wheel (a trade name) is not known for certain, its conception and development is credited to John Fitz, the son of the company founder. Since John was born in 1847, it is most likely his idea hatched after the Civil War, perhaps in the late 1860's. The bulletin says that he devoted his life to the study of the principles of the steel overshot water wheel and to the improvement of its efficiency. Certainly by the time he died in 1914, the wheel had captured the market and was well known for its superior design and efficiency. Part of this improved performance came from an optimization of the bucket design for the wheels. They were provided with a precise curve that allowed them to retain water to almost the bottom of the wheel's rotational arc, thereby maximizing the lever effect of the water's weight in the buckets and the wheel's horsepower potential.

Although the "Overshoot" wheel was the company's primary product (built in any size to the customer's requirements – the largest known being fifty feet in diameter and still surviving in a closed hydroelectric plant in Wisconsin), Fitz also entered the water turbine building business by acquiring the Hanover and Burnham patents. Most likely the manufacture of the Fitz-Hanover and Fitz-Burnham turbines was in response to intense competition from turbine builders of the day. There was a heated debate throughout the production period of water wheels and turbines as to which was superior. No clear-cut answer was ever really achieved. Water wheels were simple engines to maintain and operate, and they weren't affected by trash coming down the millrace. They were, however, notoriously slow and required sophisticated step-up gearing or belting to run the machinery. They also froze up in icy conditions, unless built inside the mill. Turbines were appealing because they were smaller, easier to install, ran at a much higher speed, and required little step-up in power transmission. They were difficult to keep cleaned out, however, and subject to cavitation, as has previously been discussed. But they normally ran submerged, so had less trouble with ice. Both machines had about the same efficiencies, although Fitz always claimed higher numbers than their turbine competitors.

Fitz probably built more than 80% of all metal water wheels ever produced. The company dissolved in the mid-1960's, and a story persists about its closing. It seems that the president of Fitz' chief competitor at the time, the James Leffel and Company of Springfield, Ohio (which made turbines), hated Fitz so much that he bought the records and foundry patterns of his nemesis and ceremoniously burned them in a giant bonfire! This story is only partially plausible, because in truth most of the old Fitz records of shipment and customer correspondence still survive in the Hagley Museum in Delaware. These records are invaluable in dating a surviving Fitz wheel, and there are dozens scattered about Tennessee.

W.J. Savage Company. Tennessee has the distinction of being the home of a second, though lesser known, manufacturer of water wheels. This was the W.J. Savage Company of Knoxville. Savage is thought to have begun in the 1890's as Savage and Tyler. It is not known for certain when they built their first water wheel, as they were primarily in the flour milling machinery business. It seems safe to assume that most Savage wheels were constructed after 1900, and Savage was still building both steel and wooden water wheels in the 1930's. In many respects they are similar to Fitz wheels, differing slightly in the design of their hubs, spokes, and rims. Their efficiencies were thought to be somewhat below those of the Fitz wheels, but not significantly. They often used similar principles of gearing and power take-off as Fitz wheels, such as large segment gears with inside or outside teeth mounted to the spokes near the perimeter, these driving a smaller pinion gear shaft at a faster rate. There are at least two of these wheels surviving in Tennessee, one at the French Mill in Jefferson County and one at Virtue Creek Mill in Knox County (see Figure 144 in Chapter 2). The latter wheel was set up to drive two separate pinion gears. W.J. Savage Company survived until the mid-1980's, although water wheel production was curtailed many years before (Savage Company correspondence).

The James Leffel and Company. By far the best-known, longest-lived, and most prolific water turbine manufacturer is the James Leffel and Company of Springfield, Ohio, founded in 1862. Leffel's original turbine runner design was said to be a departure from the well-known Francis type, having a double runner. The upper half was a radial inflow runner of the standard Francis type, but the lower half consisted of a runner with inward radial admission and axial discharge. As originally designed, Leffel's turbine had a narrow bucket, slow speed, and low power (Mead 1915). It was called the James Leffel Double Turbine, and was tested at the Holyoke, Massachusetts, testing flume beginning in 1869. The preliminary results for a 40-inch diameter runner showed an efficiency of almost 80%, which was quite good, but in later tests the efficiency seemed to prove lower, at best about 70% (Emerson 1881). Subsequently, the runner was redesigned, and the new model was introduced as the Samson turbine (a trade name). This model was produced until 1913, when the design was again slightly modified and called the Improved Samson. There are many of the older model Samsons still operational in restored mills around the country. The newer ones are more plentiful. Many mill investigators will assume the turbine they examine was made in 1913, because this date will be cast in the top plate. This is not usually true, since that date only signifies that the turbine is a post-1913 design. The actual date of manufacture can often be ascertained from the Leffel Company, which still exists and retains many of the old manufacturing records. The company ceased the production of turbines only in recent years. At that time, the foundry patterns, all spare parts, and machine tools were purchased by Thomas Brothers Hydro, Inc., in Covington, Georgia, and moved there. This firm is still engaged in the turbine restoration and repair business. James Leffel and Company still maintains an office and Internet Web address (http://leffelcompany.com).

As has been discussed earlier, Leffel turbines are the easiest to recognize of almost any turbine manufacturer. The top has a series of gate control arms which radiate from the center to the outer casing, giving the appearance of a spider or octopus. Most turbines encountered at old mill sites will be Leffels or identical turbines built by other companies under the Leffel patents.

During the great period of turbine development in the United States, between the 1840's and 1920's, there were many variations of the earlier French designs, as well as "new" concepts. Inventors such as Francis, McCormick, Swain, and Leffel found their names attached not only to their company products, but to their unique design twists as well. Turbine manufacturers became numerous after the Civil War, and by the 1880's the following were known, in addition to Leffel (taken from Emerson 1881):

American (a turbine type), Stout, Mills, and Temple, Dayton, Ohio
Angell, Providence, Rhode Island
Arrowsmith, Lockport, New York
Barber, Ballston Spa, New York
Bastion, Canton, New York
Bee, Lancaster, Massachusetts
Blackstone
Blake, Pepperell, Massachusetts
Bodine Jonval, Mount Morris, New York
Bollinger, York, Pennsylvania
Boyden Fourneyron, made at Chicopee, Holyoke (Massachusetts), and other locations
Bryant Brothers, Westchesterfield, Massachusetts
Bryson Turrett, Miles Greenwood, Cincinnati, Ohio
Burnham, York, Pennsylvania
Buzzell, St. Johnsbury, Vermont
Case, National Water Wheel Company, Bristol, Connecticut
Chapman, Clark and Chapman, Turner's Falls, Massachusetts
Chase, Orange, Massachusetts
Coleman, Turner's Falls, Massachusetts
Cook, Lake Village, New Hampshire
Cox, Ellsworth, New York
Curtis, Ogdensburg, New York
Cushman, Hartford, Connecticut
Eclipse, Stilwell and Bierce Manufacturing Company, Dayton, Ohio
Geyline, Philadelphia, Pennsylvania
Gillespie, Turner's Falls, Massachusetts
Green, Juda, Wisconsin
Grow, Dubuque, Iowa
Hercules, Holyoke, Massachusetts
Holman, Adams, New York
Holyoke Machine Company, Holyoke, Massachusetts
Houston, Beloit, Wisconsin
Humming Bird, Willis Read, Danbury, Connecticut
Humphrey, Humphrey Machine Company, Keene, New Hampshire
Hunt, Rodney Hunt Machine Company, Orange, Massachusetts
James A. Davis Water Wheel and Machinery Company, Atlanta, Georgia
Kindleberger, Cincinnati, Ohio

Knowlton, Saccarappa, Maine
Leavitt, Lebanon, New Hampshire
Lesner, Fultonville, New York
Libby, Medford, Massachusetts
Lucas, Hastings, Minnesota
Luther, Iowa
Mallery, Dryden, New York
Mosser, Allentown, Pennsylvania
Mullikin, Lansing, Iowa
National, Josiah Buzzby, Crosswicks, New Jersey
Perry, Bridgton, Maine
Platt, New Brighton, Pennsylvania
Raney, New Castle, Pennsylvania
Reaser, Milwaukee, Wisconsin
Rechard, York, Pennsylvania
Reynolds, Oswego, New York
Risdon, Mt. Holly, New Jersey
Sherwood, Independence, Iowa
Small, Urbana, Ohio
Smith, York, Pennsylvania
Staples, Boston, Massachusetts
Stetson, Fitchburg, Massachusetts
Stevenson, New York City
Stowe, Newark, New Jersey
Swain, North Chelmsford, Massachusetts
Teller, Fort Plain, New York
Terry, Terryville, Connecticut
Thompson, Springfield, Missouri
Tice, Cincinnati, Ohio
Trullinger, Oswego (says Oregon, but may mean New York)
Tuttle, Waterville, Maine
Twitchell, Pulaski, New York
Tyler, Claremont, New Hampshire
Upham, Worcester, Massachusetts
Vandewater, Rochester, New York
Victor, Stilwell and Bierce Manufacturing Company, Dayton, Ohio
Wagner, Chicago, Illinois
Walsh, Waupaca, Wisconsin
Watson Jonval, Paterson, New Jersey
Wetmore, Claremont, New Hampshire
Wheeler, Berlin, Massachusetts
Whitney, Leominster, Massachusetts
Wolf, Allentown, Pennsylvania
Wynkoop, Owosso, Michigan

In addition to this extensive list may be added several more obscure manufacturers, which were generally very short-lived. However, one saw widespread distribution primarily in the South and is worthy of special note. This was the Davis turbine, a ponderous looking cylinder gate design, manufactured by the Davis Foundry and Machine Works in Rome, Georgia. These are occasionally encountered at old mill sites, along with the Rodney Hunt turbines and Rechard types. Also, in previous discussions the Wilder turbine, manufactured in Chattanooga at the machine shop of Union General John T. Wilder, has been presented as a Tennessee produced example.

MANUFACTURERS OF SPECIALIZED WATER POWER DEVICES

Pelton Water Wheel Company. The Pelton Water Wheel Company was formed in the 1880's to manufacture and market the invention of Lester Pelton, a high-head, high velocity water wheel of unique design. By about 1910 the company had sales offices in San Francisco and New York City. Its production life is not known, but at some point the James Leffel and Company apparently acquired the patent and production rights, for they were building Pelton wheels in the early twentieth century. The Pelton company also built miniature "water motors" in 6 to 24-inch runner diameters, as did several other companies. These were designed to connect to city water lines or hoses, and run small devices by flat belt drives from the water supply (Pelton Water Wheel Company circa 1910). The Pelton wheel has been discussed and illustrated in Chapter 2.

Woodward Governor Company. In order to regulate the speed of a water wheel or turbine within tight bounds, without having to manually adjust the water gate, a governor became a useful apparatus. This was particularly true with the application after (primarily) 1900 of water turbines to turn electrical generators. The Woodward Governor Company, still in business, was founded in 1870 in Rockford, Illinois, by Amos W. Woodward, for the purpose of manufacturing his patented water wheel governor. These early governors were mechanical, with flyballs similar to those used on steam engines. The lift of the flyballs would change with the speed of the governed device, and through a complex system of levers, friction discs, and sprockets, the water gate could be opened or closed to adjust the water wheel or turbine speed. Later a compensating device was added to keep the governor from oscillating the turbine speed by continually opening and closing the gate. One of these compensating governors, made by Woodward in 1923, is on display at Falls Mill in Franklin County (see Figure 84 in Chapter 2). In 1910, Woodward introduced its first oil pressure governor. Today the company still produces governors for gasoline and diesel engines, gas and steam turbines, jet aircraft engines, and other products (Woodward Governor Company brochure 1984).

The Lombard Governor Company of Boston was another manufacturer of water wheel and steam engine governors, established in 1894. The design of their products differed somewhat from Woodward's, but the principles of operation were much the same (Lombard Catalogue D 1903).

GRAIN MILLING MACHINERY

As with water turbines, the manufacturers of flour milling equipment have been numerous. The earliest production was almost solely limited to stone buhr mills, and many of these were built by local craftsmen after the stones were quarried and finished. Later, companies began to take over this business, and most were in the East and Northeast. As cleaning and sifting machinery became more sophisticated, these producers expanded into these product lines, and competition became more intense. The major period of production of this type of machinery followed the Civil War, and by the 1920's dozens of companies were well established. A few of the more prolific and better known are highlighted below, with a list following of many others.

Nordyke, Marmon, and Company. Ellis Nordyke and his son Addison formed a partnership in 1851 for the purpose of manufacturing flour mills. They named their company E. & A.H. Nordyke and built a small plant near their home in Richmond, Indiana. They began importing French buhrstones, building the necessary parts to make them functional, and selling to small mills in their general area. Daniel W. Marmon had, as a boy, spent much time in the Nordyke plant. He was mechanically inclined and showed promise, so upon his graduation from Earlham College in 1865, he was asked to become a partner with the Nordykes. After his acceptance, the company changed its name to Nordyke, Marmon, and Company in 1866 and built a new factory. Business was so brisk that this plant became too small, so in 1875 the company relocated to a vacant industrial building in Indianapolis. Soon they employed 500 people, and continued to grow over the next 25 years. By this time they were a major producer of grain milling machinery of all types, including buhr mills, roller mills, cleaning and sifting equipment, elevators, flour packers, and mixers. Daniel's son Howard joined the company in 1899. He became fascinated with a new invention, the automobile, and developed one on his own. Nordyke, Marmon, and Company began manufacturing the Marmon automobile in 1905. The big car soon became a favorite for its comfort, smooth ride, and reliability. Despite the success of this endeavor, the company continued to produce milling machinery until it was bought by the Allis-Chalmers Company in 1926. Allis-Chalmers carried on the flour equipment manufacturing for several years. Today, Nordyke and Marmon buhrstone mills and machinery are common in old mills throughout the country. (Information taken from the Marmon Motor Car Company information page on the Internet, 2000 (http://php.lupui.ed/~harrold/Indiana/marmon.html), and the author's experience)

R.D. Cole Manufacturing Company. In 1854, Robert Duke Cole, Sr., and Thomas Barnes formed the firm of Cole and Barnes in Newnan, Georgia. Soon after, Barnes sold his interest, and eventually the enterprise became R.D. Cole and Company. In its early years, the business was primarily devoted to saw milling and finishing lumber, and produced "made while you wait" coffins. In 1877 a new building was constructed, and the establishment gradually moved into a variety of production endeavors. Over the years, R.D. Cole Manufacturing Company, as it came to be called, built steam boilers and engines, tanks of many types, and was involved in numerous construction projects and charitable work in its home county. The company still survives, although all lumber and founding operations ceased by 1960. R.D. Cole began to build horizontal stone buhr mills for corn grinding about 1880. Cole constructed all parts for these mills on site, except the granite stones were brought from one of the Esopus quarries in New York (they were not French buhr, as some claim, although Cole may have experimented with these before selecting the Esopus stones). The Cole mills were manufactured in standard sizes based on the millstone diameters of 30, 36, 42, and 48 inches. They were mounted in a heavy heart-pine timber frame, and were termed "portable," although they weighed a considerable amount. They were either flat-belt driven directly to a horizontal drive pulley under the stones, or equipped with a set of bevel gears, one having wooden cogs, the countershaft for which was turned from a vertical flat-belt pulley. They were of superior construction and very durable and reliable. Many are still found scattered among the old mills of the South. It is believed that Cole continued to furnish parts and repairs for these mills until about 1960, and some complete mills are believed to have been built as late as the early 1950's (Information taken from *The Newnan Times-Herald Centennial Magazine*, 1965, and R.D. Cole Catalogue 1905).

Meadows Mills, Incorporated. The only known U.S. manufacturer of stone buhr mills still in production is the Meadows Mill Company (now known as Meadows Mills, Incorporated) in North Wilkesboro, North Carolina. The company traces its origins to circa 1902, when a mechanically inclined Baptist minister named William Calloway Meadows designed and built a buhr mill with stones mounted in a vertical position. Although this was not an original idea, Meadows obtained a patent on his design in 1907. In 1908, a group of investors bought the W.C. Meadows Mill Company and erected a large factory in North Wilkesboro. The production of stone buhr mills reached a peak during the World War I years into the 1920's. They became common fixtures at country stores, small mills, and farms, where they could be powered with gasoline engines, tractors, or electric motors. Attachments included sifters for separating the bran and grits from the corn meal. Meadows sold direct and through Sears and other mail order companies. These early mills were housed in wooden casings, but in the late 1930's, metal casings began to supplant the older ones. In 1924 Meadows acquired the company that manufactured the Williams mill, a very similar product (see Figure 10 in Chapter 1), which had been formed in 1912. Also that year Meadows bought the W.J. Palmer Company, a builder of sawmills. The merged companies were called Meadows Mill Company, and still produce stone buhr mills, hammer mills (for crushing feed), and sawmills. The present plant was constructed in 1965. The company is now owned by Bob and June Hege. In addition to manufacturing various milling machinery, they restore old buhr mills for resale or for use by museums or individuals (Information taken from the Meadows Mills, Inc., Internet Web site www.meadowsmills.com 2000).

Great Western Manufacturing Company. The Great Western Manufacturing Company of Leavenworth, Kansas, was established in 1858 and incorporated in 1886. By 1900, it boasted an extensive plant with large engineering, foundry, and machining departments. The product line included roller flour mills, corn meal mills, elevators, and almost all known grain related equipment, although not all was actually manufactured by the company itself. Great Western also built sawmills and engines (steam and gasoline). Its Catalogue No. 45 from about 1903 (from which this information is taken) is almost 450 pages in length.

The following synopsis of companies and list of manufacturers is taken for the most part from the *Consolidated Grain Milling Catalogs of 1927-28*:

S. Howes Company, Inc. The S. Howes Company of Silver Creek, New York, acquired the manufacturing rights for the Eureka and Invincible lines of grain cleaning equipment. Eureka began manufacturing smutters and cleaners in the 1850's, and the Invincible name dates to 1895. By the late 1920's, over 75,000 machines had been built under the Eureka name. These included cleaners of almost every type, including scalpers, receiving separators, finishing (or milling) separators, wheat scourers, buckwheat and corn scourers, oat clippers, disc aspirators, grain graders, grinders, dust collectors, feed and flour mixers, and packers. At least one Eureka or Invincible machine seems to find its home in most old mills around the country. Usually the elaborate stenciling will reveal a machine of this manufacturer.

Barnard and Leas Manufacturing Company. Barnard and Leas of Moline, Illinois, established in 1860, was another prolific manufacturer of an extensive line of grain milling equipment. A short list of its products would include roller mills, bolters, middlings purifiers, reel bolters, scourers, separators, elevators, packers, and dust collectors. One common machine often found in old flour mills is the Barnard and Leas bran duster, a small machine which acted as a sifter, separating the last vestiges of flour from the bran.

B.F. Gump Company. One of the most interesting names in milling machinery was the B.F. Gump Company of Chicago, founded in 1872. Gump provided an extensive line of milling equipment, and like W.J. Savage of Knoxville, would contract for the furnishing of entire mills with their products. In addition to their manufactured products, they engaged in the repair and servicing of mill equipment and tools, including the re-corrugating of roller mill rolls and the re-sharpening and tempering of mill pick heads. They are believed to have survived until at least the 1970's.

Many other famous names in milling machinery have come and gone through the years, and their products will often be encountered in old mills. These include Sprout, Waldron, and Company of Muncy, Pennsylvania (one of the largest producers of milling machinery and makers of the Monarch line of stone buhr mills); Allis-Chalmers Manufacturing Company of Milwaukee; Anglo-American Mill Company of Owensboro, Kentucky (builders of the Midget Marvel Mill discussed in Chapter 2); the Straub Company, which made a portable stone buhr mill; Munson, which made an "under-runner" stone buhr mill; Richmond Manufacturing Company of Lockport, New York; The Wolf Company of Chambersburg, Pennsylvania; W.J. Savage Company of Knoxville, Tennessee (discussed under water wheel manufacturers in this chapter). Other lesser known manufacturers include the following:

The Bauer Brothers Company, Springfield, Ohio
Buckley Brothers, Inc., Louisville, Kentucky
Carter-Mayhew Manufacturing Company, Minneapolis, Minnesota
Cornelius Mill Furnishing Company, St. Louis, Missouri
Clark Dust Collecting Company, Inc., Chicago, Illinois
Dings Magnetic Separator Company, Milwaukee, Wisconsin
Essmueller Mill Furnishing Company, Kansas City, Missouri
The Gedge-Gray Company, Lockland, Ohio
Gruendler Patent Crusher and Pulverizer Company, St. Louis, Missouri
A.E. Jacobson Machine Works, Inc., Minneapolis, Minnesota

George W. Moore Company, Chicago, Illinois
Novadel Process Corporation, Buffalo, New York
O.W. Randolph Company, Toledo, Ohio
Robinson Manufacturing Company, Muncy, Pennsylvania
J.B. Sedberry, Inc., Utica, New York
Weller Manufacturing Company, Chicago, Illinois
Willey-Ellis Company, Chicago, Illinois
Williams Patent Crusher and Pulverizer Company, St. Louis, Missouri
K.I. Willis Corporation, Moline, Illinois

In addition to these manufacturers, there existed a multitude of companies engaged in the production of supporting materials and equipment for mill operations. Their products included belting, pulleys, gears, and power transmission equipment; bolting and sifting cloth and screens; perforated metal for grain cleaners; chemicals for flour bleaching; elevator cups; augers; insect control apparatus and chemicals; specialized tools, such as mill picks, belt lacers, proof staffs, dye staffs, and scoops.

SAW MILLING MACHINERY

As with the case of grain milling machinery, there have been many dozens of companies engaged in the production of sawmills and supporting equipment. Prior to the Civil War era, sawmills were primarily of the up-and-down variety discussed earlier. The special blades for these were often made by skilled craftsmen and not manufacturers, and the remaining parts necessary for the mills to function were custom built by millwrights and carpenters. However, with the advent of the circular saw and the portable mill, the production of this new machinery became profitable. A few of the better-known builders of sawmills are presented below, with the admission that many have been omitted:

The Frick Company. The Frick Company was organized in 1853 in Waynesboro, Pennsylvania, for the production of steam engines, gins, threshers, and related machinery. Frick produced one of the earliest portable steam engines (horse-drawn on wheels), as well as early traction (or self-propelling) steam engines. They were also one of the most prolific and longest-lived manufacturers of sawmills, surviving well into the twentieth century. Their early sawmills were sold in many sizes under the name “Eclipse.” They could be set up in a short time and were reported to be quite reliable (see Figures 130 and 131 in Chapter 2) (Information from Frick Company Sales Catalog of 1888).

Because a large number of the sawmills of the late nineteenth and early twentieth century were powered by steam engines, it was natural for many of the manufacturers of steam engines, particularly the portable and traction varieties, to also build sawmills. Case, Geiser, Farquhar, and others engaged in these enterprises. Meadows Mill Company, discussed earlier, entered the sawmill manufacturing business about 1924, and is still in production. Sawmills were built in Chattanooga for many years by Corley and Wheland Foundry. L.M. Rumsey of St. Louis was also an early builder. Allis-Chalmers was another early builder of sawmills, and they along with Filer and Stowell and others, later built large band mills, which found application in areas where huge logs had to be sawed (such as the West Coast) (Information provided by Walter B. Clement, 2000).

TEXTILE MACHINERY

The manufacturers of textile machinery found their beginnings well before the Civil War, primarily in the New England area. Prior to that time, almost all textile machinery was built in England. The primitive machines fabricated in the United States in the years following Samuel Slater's arrival in Rhode Island in the 1790's were hand-crafted by artisans according to specifications furnished by a handful of knowledgeable people. The first machines built were carding machines, similar to the one surviving in Ketner's Mill in Marion County (see Figure 74 in Chapter 2). The spinning jack, a vast improvement over the jenny, was invented in England around 1810, and began to appear in American textile mills in New England circa 1820. Power looms first appeared in New England about 1815. By the 1840's, all these machines were universally employed in the larger textile factories. It is obvious from the surviving schedules of the 1820 Census of Manufactures for Tennessee that several carding machines were in operation. There are also some references to spinning factories prior to 1820 in the state, but these recollections are often difficult to verify. One source accepted as reliable is Eastin Morris' *Tennessee Gazetteer* of 1834. This remarkable work includes references to three spinning factories, six cotton factories, and a cotton/woolen mill in the state. It is also known that several textile factories were in production in the state in the 1840's. By this time, large manufacturers of textile machinery were established in New England. Some of the better known are highlighted below:

Davis and Furber. The Davis and Furber Company of North Andover, Massachusetts, was established before the Civil War, and survived until recent years. It was perhaps the longest-lived and largest manufacturer of most types of textile machinery, including pickers, cards, and spinning jacks and mules. The only product of this company known to survive in Tennessee is an 1866 Davis and Furber finishing card at Falls Mill in Franklin County (see Figure 134 in Chapter 2).

Crompton Loom Works. In the early 1840's, a large textile mill in Massachusetts put into operation several power looms designed by a newly emigrated British mechanic named William Crompton. Soon after, the Crompton Loom Works was established in Worcester, Massachusetts. William's son George took over the business later, and by 1876 the company was producing an extensive line of looms of many types. The company became Crompton and Knowles and continued to build looms well into the twentieth century. The only Crompton looms known in Tennessee are the three in the Falls Mill collection, two small plain looms and a large broad loom, manufactured in the early 1870's (see Figure 138 in Chapter 2).

In addition to these two famous companies, there were many others worthy of mention. John Boynton and Son of South Coventry, Connecticut, was an early (1840's) builder of carding machines. Harwood and Quincy also produced these machines, as did D.T. Gage, later Furbush and Gage, later Furbush and Son, of Philadelphia. (There is an 1866 Furbush and Gage card in the Falls Mill collection. See Figure 133, Chapter 2.) John Goulding patented and built spinning jacks in 1826, and four of these survive in the Watkins Woolen Mill in Missouri. Johnson and Bassett of Worcester, Massachusetts, was also a long-lived and well-known builder of spinning mules and other machinery. An 1883 Johnson and Bassett mule survives in the Falls Mill collection (see Figure 135 in Chapter 2). Two other manufacturers of pickers, cards, spinning machinery, and power looms were the James Smith Woolen Machinery Company of Philadelphia and Mason Machine Works of Taunton, Massachusetts. Joel S. Perkins Company of Philadelphia, the Lowell (Massachusetts) Shuttle Company, and many others also dealt in supplies and parts for textile machinery (*Homespun to Factory Made*, 1977).

STEAM ENGINES

The steam engine saw its first practical applications in Europe, particularly England, in the second half of the eighteenth century. These early engines, many of which were "beam" engines, were used primarily for pumping. It was not long, however, before they were tried for motive power, and road vehicles and rail locomotives emerged around 1800. Steamboats also appeared very early in the nineteenth century in America. The steam engines used for powering mills and factories, however, were the stationary type, although in later years portable and traction engines became popular, especially for sawmill work. Some of these first engines were also beam types, then sliding valve, Corliss, and finally Unaflow designs. They required separate boilers, which were fired by wood, straw, coal, sawdust, or other combustible materials. Since these engines were often large and heavy, they were probably shipped from the manufacturer by boat, then hauled on wagons in pieces to the early factories and assembled on site. By the 1850's, railroads began to be employed for transport purposes. Steam engine manufacturers appeared in the United States primarily in the 1830's, although there were earlier engines built. Eastin Morris, in his *Tennessee Gazetteer* of 1834, lists six steam engines operating in the state. The following list includes some pre-Civil War manufacturers of steam engines, with additional information where known, listed approximately chronologically:

West Point Iron Works, Cold Spring, New York, 1830-1900; slide valve engines
Stillman – Allen (Novelty Iron Works), New York, ca. 1840; slide valve engines
Harlan and Hollingsworth, Wilmington, Delaware, ca. 1840; beam and slide valve engines
Cameron, McDermid, & Mustard, Charleston, South Carolina, 1845-1860; slide valve engines

George H. Corliss, Providence, Rhode Island, 1849-1890's; Corliss engines

Ames Iron Works, Oswego, New York, 1850; slide valve engines

Smith and Porter, Charleston, South Carolina, ca. 1850-1860; slide valve engines

Schofield Iron Works, Macon, Georgia, 1850-1935; slide valve engines

Erie Iron Works, Erie, Pennsylvania, 1850-1925; slide valve engines

Frick Company, Waynesboro, Pennsylvania, 1853-1935; slide valve and Corliss engines (see sawmill discussion in this chapter)

Winter Iron Works, Montgomery, Alabama, 1854; slide valve engines

R.D. Cole Manufacturing Company, Newnan, Georgia, 1854-1930; slide valve engines (see grain milling machinery discussion in this chapter)

Watts – Campbell Company, Newark, New Jersey, 1854-1933; slide valve and Corliss engines (still in business, but no longer building steam engines)

Benoit Engine Works, Detroit, Michigan, began pre-1860; slide valve engines

William Harris, Providence, Rhode Island, 1865-1930; Corliss engines (took over G.H. Corliss works, later became Franklin Machine Works)

Manchester Machine Works, Manchester, New Hampshire, began pre-1870; slide valve engines

E.P. Allis, later Allis-Chalmers, Milwaukee, Wisconsin, 1870-1935; slide valve, Corliss, and Unaflow engines

Geiser Manufacturing Company, Waynesboro, Pennsylvania, 1870-1930; slide valve engines

Tozer and Dial, Columbia, South Carolina, 1875-1931; slide valve engines

Vilter Manufacturing Company, Milwaukee, Wisconsin, 1880-1930; Corliss and Unaflow engines

Murray Iron Works, Burlington, Iowa, 1880-1930; slide valve and Corliss engines

Fitchburg Manufacturing Company, Fitchburg, Massachusetts, 1880-1925; Corliss engines

Orr and Sembower, Reading, Pennsylvania, 1880-1925; slide valve engines

Nagle Engine Works, Erie, Pennsylvania, 1890-1930; slide valve and Corliss engines

Wheland Company, Chattanooga, Tennessee, 1890-1930; slide valve engines

Skinner Engine Company, Erie, Pennsylvania, 1892- (still in business, but no longer building steam engines); slide valve “automatic” engines; after 1913, primary product was the Unaflow steam engine

James Leffel and Company, Springfield, Ohio (dates of steam engine manufacture unknown; see water turbine discussion in this chapter)

In addition to these manufacturers, Atlas Engine Works of Indianapolis built many large steam engines, which found frequent application in cotton gins. Blakely also built pre-Civil War engines, one of which survives from a cotton gin in Mississippi. There were also numerous builders of steam traction and portable engines, and some of these built stationary engines as well. These names include J.I. Case Threshing Machine Company, Nichols and Shepard, Keck-Gonnerman, Birdsall, Minneapolis, Emerson Brantingham, Reeves, A.D. Baker, Huber, Buffalo Pitts, Buffalo Springfield, Peerless, Kitten, Advance Rumely, Avery, Russell, Port Huron, Sawyer-Massey, D. June and Company, A.W. Stevens, Aultman-Taylor, Gaar Scott, Blumentritt, Harrison Jumbo, A.B. Farquhar, and many others (Information furnished by Walter B. Clement, 2000).

INTERNAL COMBUSTION ENGINES

Internal combustion engines first appeared in the 1880’s, but were not distributed widely until after 1900, when the number of manufacturers increased dramatically. Many of these early engines were one cylinder, although multiple cylinder engines soon found wide application in cotton gins and other large industrial plants with considerable power requirements. These engines, although often difficult to keep in good running order, required only gasoline or other oil products for fuel, so the cost and maintenance of a large boiler was avoided. Smaller models gained widespread use among country stores for running small stone buhr mills. These engines were also used extensively on farms. They were produced in sizes ranging from ½ horsepower to 25 and beyond. A set of horizontal millstones required at least 8 to 10 horsepower, but the smaller vertical mills could be run with a 6-horsepower engine on average. Following is a partial list representing internal combustion engine manufacturers and/or their brand names: Acadia, Aermotor, Alamo, Alpha-Delaval, Associated, Bessemer, Brandford, Briggs and Stratton, Burkett, Coldwell, Cook, Cushman, Delco, Demster, Detroit, Domestic, Easy, Economy (Hercules), Edward, Emerson-Brantingham, Fairbanks-Morse (one of the largest manufacturers), Fairmont, Foos, Franklin, Fuller and Johnson, Galloway, Gray, Hancock, Hercules (also a large manufacturer), Ideal, International Harvester Company (IHC) (also large), Imperial, Iowa (Associated), Jacobson, Jaeger, John Deere (also large), Johnson, Kohler, Lauson, Leroi, Majestic, Massey-Harris, Maytag, Monitor, Nagel, Nelson Brothers, New Holland, New Way, Novo, Ohio, Olds, Olin, Orr and Sembower, Ottawa, Reid, Sandwich, Sattley, Sterling Dolphin, Stickney, Stover (a large producer), United, Waterloo Boy, Waukesha, Weber, Witte (a large manufacturer) (Information from Hit & Miss Enterprises sales catalog 2000).

ELECTRICAL MOTORS AND GENERATORS

Electric power began to find application to industrial machinery about the same time internal combustion engines did, beginning in the 1890's. Large motors manufactured by such firms as Edison, Westinghouse, General Electric, Crocker-Wheeler, Bullock, Sprague Electric, and Allis-Chalmers, as well as others, were used where power grids were available to turn line shafts, from which flat belts powered plant machinery. It was not until some years later that motors were downscaled in size, and each machine carried its own motor. In those situations where power grids were not yet accessible, the factory or mill with a water or steam power source could use the prime mover to turn a generator, from which current could be routed to one or more motors. A good example of one of these early generators is the 1903 direct current (DC) Westinghouse on display at Falls Mill in Franklin County, Tennessee (see Figure 140 in Chapter 2).

CHAPTER 7

EVALUATING ELIGIBILITY OF A MILL OR MILL SITE FOR THE NATIONAL REGISTER OF HISTORIC PLACES

The purpose of this chapter is twofold. The first is to present an approach for evaluating mills or mill sites for eligibility for the National Register of Historic Places (NRHP). Before a mill or mill site may be considered significant historically, it is important to understand the various aspects of mills and mill sites by which they may be studied or classified. The second goal is to provide a means of classifying mills according to time period, application, architecture, machinery, power source, and market.

CRITERIA FOR EVALUATION

In order for a mill or mill site to qualify for the National Register of Historic Places, it must be associated with an important historic context and meet one of the NRHP criteria. These criteria require that the quality of significance in American history, architecture, culture, and archaeology should be present in buildings, structures, objects, sites, or districts that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that the buildings, structures, objects, sites, or districts

a) are associated with events that have made a significant contribution to the broad patterns of our history; or
b) are associated with the lives of persons significant in our past; or
c) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
d) have yielded, or may be likely to yield, information important in prehistory or history (NPS 1986).

As an example of Criterion (a), a mill may have figured prominently in a significant Civil War battle. Under Criterion (b), the mill associated with David Crockett might qualify. For Criterion (c), Falls Mill represents an 1870's brick textile mill design with original architectural components, unusual in Tennessee. Under Criterion (d), the

Brainerd Mission Mill, during excavations in Chattanooga, yielded a primitive turbine of unusual design, possibly the earliest of its type in the state (Lautzenheiser 1986).

Some properties may not quality under the four basic criteria, but may be eligible under special requirements. These Criteria Considerations cover (A)religious properties, (B)moved properties, (C)birthplaces and graves, (D)cemeteries, (E)reconstructed properties, (F)commemorative properties, and (G)properties that have achieved significance within the last 50 years. For mills, the most probable Criteria Considerations would be (B)moved properties; (E)reconstructed properties; and (G)properties that have achieved significance within the last fifty years (NPS 1986).

Since moving a resource destroys the relationship between the resource and its surroundings, the NRHP limits the consideration of moved properties. Moving also may cause the loss of historic features such as landscaping, foundations, and archaeological components. Properties that have been moved must meet Criterion Consideration B if they were moved during or after the period of significance; are in a district in which a significant number of resources have been moved; are in a district that has one moved building that makes an especially significant contribution to the district; is a portable resource that is relocated to a place incompatible with its original function; or is a portable resource whose importance is linked to its historic location or route (NPS 1986).

A reconstructed resource must meet Criteria Consideration E if most or all of the fabric is not original or if it is a district in which an important resource or a significant number of resources are reconstructions. The reconstruction must be accurately executed based on sound archaeological, architectural, and historic data, and must be in a suitable environment. The reconstruction can also be eligible if it is the last surviving property of that type (NPS 1986).

For resources that have gained significance in the past 50 years, Criteria Consideration G must be met. The NRHP guidelines encourage the listing of such a resource only if it is of exceptional importance or it if is a contributing part of a National Register eligible district (Sherfy and Luce 1996).

In order to evaluate a property's qualification for the National Register of Historic Places, a physical examination and documentary research are required. The following sequence is recommended when evaluating a property such as a mill or mill site (NPS 1986):

1) Categorize the property as either a district, site, building, structure, or object
2) Determine which historic context(s) the property represents
3) Determine if the property is significant under the National Register criteria
4) Determine if the property is a type usually excluded from the National Register
5) Determine whether the property retains integrity

Each of these steps will be addressed in the sections that follow.

1. Categories of Historic Properties. A mill, mill site, or its appurtenant structures will generally fall into one of the following categories of historic properties: building, structure**,** site, district, or object. A building is defined as being created principally to shelter some human activity, or may refer to a functionally or historically related unit, such as a mill and its grain warehouse. By definition, an extant mill is an example of a building, whether it was for the purpose of grain milling, saw milling, or textile production (or some other application, such as a paper mill).

A structure is a functional construction made for purposes other than creating human shelter. Under this category, a dam and millrace are examples of structures.

A site is the location of a significant event, historic activity, or structural ruin which possesses historic, cultural, or archaeological value. In this category, a site with no physical remains might qualify.

A district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically by plan or physical development. An example of this category would be an extant textile factory building with the owner's house and worker housing still standing in the immediate vicinity.

2. Evaluating a Property Within its Historic Context. Historic context refers to those patterns, themes, or trends in history by which a specific occurrence, property, or site is understood and its meaning and significance within history made clear. In order to decide whether a property is significant within its historic context, five determinations are required, as follows:

1) The facet of history of the local area, state, or nation that the property represents
2) Whether this facet of history is significant
3) Whether the property under consideration has relevance and importance in illustrating the historic context
4) How the property illustrates that history
5) Whether the property possesses the physical features necessary to convey the aspect of history with which it is associated

The first step is to identify the facet of history the property represents. In the case of old mills, this might be the community development around the mill site, the industrial development of the area within a certain time period (e.g., 1840 – 1860), the Civil War history of the area and the role played by the mill, or the relationship of a textile factory to the cultivation of cotton in the area.

The second step is to demonstrate that the theme is significant in the history of the local area, the state, or the nation. The construction and operation of mills, particularly grain mills, was of primary importance in providing a basic necessity of life as well as a social gathering place for the neighborhood. Mills and factories not only demonstrate technological change, but social and transportation influences, too. The areas of significance recognized by the National Register include the following (as specifically related to mills): agriculture, architecture, historic archaeology, commerce, community development, economics, engineering, industry, invention, science, social history, and transportation.

The third step is to determine whether the property under consideration is relevant and important in illustrating its historic context. Suppose an historic context theme is defined by "The Economic and Social Influence of Nineteenth Century Industrialists in Warren County, Tennessee." In this context, the Faulkner family and their textile factories would need to be researched through archival records, and the surviving Great Falls Cotton Mill building in Rock Island State Park could serve as a representative property for possible National Register qualification. If the theme is "Millstone Quarrying as an Early Tennessee Industry," the old quarry north of Hartsville might be located and investigated archaeologically for the remains of buhrstones and quarrying techniques. This site, as one of the few which demonstrates the theme, might qualify for the National Register as a result.

In addition to technological contexts, mills were important in social history. Did the mill serve as a rural substitute for the courthouse? Did the mill serve as a gathering place for social events, and if so, how would this fit into a context of community organization? Pond Creek Mill in Loudon County, for example, maintained a grinding wheel operated from the belt drive system whereby customers could sharpen their knives and axes while they waited for the grain to be ground. They also used this occasion to catch up on the local news. The Eve Mill, also in Loudon County, was one of several mills that served as post offices (Lautzenheiser 1986).

If the property to be evaluated is the sole surviving example of a particular theme, or if it strongly and clearly represents the context, it cannot be compared to other properties. However, it will still be considered within the context of the history of the community.

The fourth step in evaluating a property within its historic context is to determine how the property illustrates the theme of its historic context. For example, in the case of the Faulkner family and the Great Falls Cotton Mill, the building and its location might be viewed in terms of the family's reliance on water power for the operation of their factories, the design of the building relevant to the workers, machinery, and lighting, or the building as a representative of 1890's industrial construction by the family. In the case of the millstone quarry context mentioned above, the physical remains and evidence of rock drilling, cutting, and finishing would serve to illustrate early millstone quarrying techniques in Tennessee.

The fifth and final step in evaluating a property within its historic context is to determine whether the property possesses the physical features necessary to convey the aspect of history with which it is associated. A mill whose original structure remains, for example, but has been surrounded by twentieth century additions might not be eligible, since its integrity may have been compromised. However, it those additions convey the history of changes through time in the technology of milling, they may enhance its potential for eligibility.

3. Determining Significance of a Property. When evaluated within its historic context, a property must be shown to be significant for one or more of the four basic criteria for evaluation: its association or linkage to events or persons, its design or construction value, and its information value. In the case of association to persons or events, the property must be well documented through archival research, archaeology, and/or oral history to establish its presence at the time of the event, and its interrelationship to the event. Its association with a person of significance (local, state, or national level) must also be solidly documented for the property to be eligible.

A mill that might qualify under the design/construction criterion might embody distinctive characteristics of a type, period, or method of construction. For the "Pioneer Period," the Massengill Mill was a recent example of a mill with the physical characteristics of early colonial mills. The hybrid turbine from Brainerd Mill can illustrate the rapid change in water power transmission during the "Pre-Civil War Period of Early Industrialization (1820 – 1860)." Themes can be time-based, or history-based. For example, the theme "The Influence of the 'New Process' for Flour Production on Mill Architecture in Tennessee," is exemplified by an extant mill, such as Readyville Mill, that demonstrated the need for several stories to accommodate the proliferation of machinery required to support this innovative change in milling techniques.

Criterion D is particularly important in archaeological investigation of mill ruins or mill sites. For example, a mill site would be the only property possibly eligible for National Register inclusion if the historic context theme is "Pre-Civil War Textile Factories in Tennessee," because there are no known extant buildings remaining. In this case, an archaeological assessment of the site may yield important information on the dimensions of the building, the foundation design, the typical power source and horsepower requirements, the type of machinery employed (from artifacts found on site), and how the site was destroyed. Documentary evidence could hopefully provide answers to other important questions, such as the approximate age and manufacturing period, goods produced and their markets, and people employed and their wages.

4. Determining if the Property is a Type Normally Excluded. As noted above, some resources that would be normally excluded may be eligible if they meet the Criteria Considerations (NPS 1986; Sherfy and Luce 1996). In the case of old mills, a structure that has been moved or reconstructed would usually fall into the category of a property normally excluded from the National Register. However, in some cases, a moved or reconstructed mill may be eligible for qualification. In the case of the Old Spencer Mill (see Chapter 5) in Dickson County, the structure has been moved from its original site, reconstructed, then moved back to the original location, while retaining the structural design and integrity of the building. If this design could be demonstrated to have unusual or unique aspects, the property may be eligible. Several mills around the state have been built in recent years as representative of a particular style or time period and may be eligible under Criteria Consideration G. For example, the two tub mills in the Great Smoky Mountain National Park, although rebuilt to a large degree, are unique in the state as authentic reproductions of pioneer tub mills in their original settings. Resources that would normally be excluded from the basic criteria would usually require more work in the evaluation process.

5. Determining Whether the Property Retains Integrity. The National Register criteria recognize seven aspects or qualities that, in various combinations, define integrity. These are location, design, setting, materials, workmanship, feeling, and association (NPS 1986). The location of an historic property, complemented by its setting, is very important in recapturing the sense of historic events or persons. The design reflects historic functions and technologies as well as aesthetics. The setting may reflect the physical conditions under which a mill was built, such as topographic features (e.g., water flow, head, and terrain). The materials used in the construction of the property should be evaluated to reflect such elements as indigenous wood or use of brick where clay was available. The key exterior materials dating from the period of historic significance should ideally be intact. However, if the degree to which exterior changes do not alter the character defining elements of the resource, replacement materials may be acceptable. If the significant form, features, and detailing are not obscured, the resource can still be eligible.

Workmanship is the physical evidence of the crafts of a particular culture or people during some period of history. Early mills often incorporated hand-hewn timbers where sawmills were not available. Later, as sawn wood was obtainable, the post-and-beam technique was used extensively. Nineteenth century brick buildings usually incorporated brick made on site, and used large anchor bolts through the walls into the main wooden support beams, with decorative exterior plates over the ends of the bolts. Exterior trim on early buildings might reflect hand planing techniques, whereas later moldings were machine cut.

Feeling is a more abstract quality, reflecting the ability of the property to convey life in its time period, for example. This may be enhanced by the lack of contemporary structures in close proximity. In the front entrance of Falls Mill, for instance, the huge door buck plates retain the deep cuts where the axles of cotton wagons rubbed as they backed into the doorway to unload. Association refers to a direct link between the historic property and an event or person. The site of a burned textile factory, for example, might convey the association to a Civil War skirmish, or the movement of Union troops through the area.

A water mill complex is not just the mill building itself but includes the dam and storage pond, the head race or flume, the tail race, perhaps the miller's residence, and other outbuildings. If only the mill building survives, it can still convey its historic character. However, if only the dam survives, it is much less likely to do so.

The interior of the building should also retain integrity. It is preferable for the machinery to be present. If it is gone, the building can still convey its character defining elements if the interior structure is intact.

The steps in assessing integrity are as follows:

1) Define the essential features that must be present for a property to represent its significance
2) Determine whether these physical features are visible enough to convey their significance
3) Determine whether the property needs to be compared with similar properties

4) Determine, based on significance and physical features, which aspects of integrity are particularly vital to the nomination of the property, and if these aspects are present

The foregoing discussion has focused primarily on individual properties, such as mill buildings. However, certain areas may qualify as historic districts as well. To meet the district criteria, there must normally be remaining buildings and structures that support and enhance the historic context of the area. The mill can be the centerpiece of an industrial district, or it can be a contributing element of a village or community.

A CLASSIFICATION SYSTEM FOR QUALIFYING MILLS

In order to present the significant aspects of a mill that may qualify it for eligibility to the National Register of Historic Places, it is first necessary to develop a classification system for mills. The following is a suggested system:

Classification by Time Period. In the second chapter of this report, milling history in Tennessee was viewed relative to four time periods, each spanning roughly forty-year intervals. The first, termed the Pioneer Period, covered the state's history from the time of earliest permanent settlement, primarily in the late 1770's, to 1820. This period was typified by either primitive mills of small size and log construction, powered by horses, tub wheels, or wooden water wheels, or by a few larger merchant mills which sought to market their products beyond their immediate neighbors. This desire to establish manufacturing concerns rather than strictly neighborhood businesses led to the second period, called the Period of Early Industrialization. This lasted from about 1820 through 1860, or to the time of the Civil War. During this period of milling history, the increasing population, the development of iron processing and machine tools, the establishment of more efficient transportation methods and networks, and the emergence of new power sources and machinery combined to allow people of vision and determination to construct larger and more diversified mills and factories. Following the devastation wrought by the Civil War, patents for new machines and materials increased, capital began to flow back into Tennessee, and the Late Industrial Period emerged. Iron and steel replaced wood to a large degree in machine and power source construction. This period witnessed the roller process for flour replacing the stone buhr mills, the circular saw dramatically increasing the capability and production of sawmills, and textile machinery becoming extremely sophisticated and versatile. Steam engines began to supplant water power throughout this period, and very large factories were constructed. By 1900, the end of this period, water and rail transportation had improved to the extent that national and international markets were available. Electrical grids and internal combustion engines were appearing, and would eventually alter the entire power transmission systems of mills and factories. After 1900, the Modern Period saw the decline of water power and small community milling establishments, the development of large-scale milling and manufacturing corporations, and the mass production of crops, milled products, lumber, textiles, and virtually all types of consumer goods. The only small mills which survived beyond the World War II era were primarily those which could hold on to niche markets, or those that were kept functioning for family or nostalgic purposes.

It was pointed out earlier that any system of classifying mills into time periods is open to counter-example, because the construction and operation of some mills makes them difficult to place chronologically. There have been examples mentioned in Tennessee of “primitive” mills of log construction being built as late as the Great Depression of the 1930’s (e.g., Enochs' Mill in Humphreys County), as well as large, advanced mills which appeared very early (e.g., Massengill Mill in Grainger County). However, for the most part, the following time line provides a reasonable classification system for mills according to their time periods:

Date	Period & General Characteristics	Important Event in Mill History
1760		Earliest European exploration toward settlement of the area which became Tennessee.
1770		Hand and animal powered mills in Tennessee. Perhaps first mill in Sullivan County, TN, pre-1774. Washington County, TN, formed, 1777 (first). Dungan Mill established pre-1778, Washington County, TN.
1780	**Pioneer Period:** Small, family mills; grist (toll) mills; some merchant mills; stone grinding; up-and-down sawmills; wool carding machines; transportation by wagon, flatboat.	Revolutionary War (1776-1781).
1790		Oliver Evans introduces his flour milling system in *The Young Mill-wright and Miller's Guide*, 1795. Tennessee statehood established, 1796.
1800		Spinning jenny and cotton gin introduced. Water wheels built on Evans plan; tub wheels at smaller mills; flutter wheels at sawmills.
1810		A few carding machines and possibly spinning jennies appear in TN textile mills.
1820		Primitive turbines (e.g., Brainerd Mission Mill) appear in Tennessee; spinning jacks and power looms find their way into New England factories.
1830	**Early Industrialization Period:** Evans system and Old Process milling, using stone buhrs; better flour separation processes and machinery develop; more large merchant mills; up-and-down sawmills continue, but circular saws begin to appear; large textile factories emerge, with more sophisticated machinery; railroads and shipping improve. Steam engines and water turbines provide alternative power sources.	Earliest steam engines appear in Tennessee. Several textile and paper factories established. Iron industry improves casting and forging, more iron parts appear on machinery.
1840		Water turbines introduced into America.
1850		Railroad construction increases. The purifier is introduced as a means of recovering more flour from middlings
1860		The Civil War begins in 1861, and lasts until 1865. Many mills and factories in Tennessee destroyed, economy devastated.

Date	Period & General Characteristics	Important Event in Mill History
1870	**Late Industrialization Period:** Reconstruction of factories, mills, and economic conditions after the Civil War; New Process milling methods and the middlings purifier become the norm, with a switch in the 1880's and 1890's from stone buhrs to steel rollers for flour; large saw and lumber finishing mills emerge, with the circular saw almost totally supplanting the up-and-down sawmill; large textile factories employing large numbers of operatives and commonly constructed of brick, begin to replace the smaller pre-Civil War factories; further improvements in transportation networks, and new power sources (the internal combustion engine and electric motor) spur industrialization on a large scale.	Automatic spinning machinery in textile factories. Circular sawmills replace up-and-down varieties. Larger and more efficient water turbines and steam engines provide greater power for bigger mills.
1880		Steel roller milling process for flour introduced into Tennessee mills, beginning 1881; proliferation of flour mills; expanding markets. Internal combustion engines and electric motors are developed.
1890		Decline in markets for textile products among smaller mills. Flour mills become larger with complex systems and machinery requirements to compete. Vast timber tracts begin to be exploited by large logging and saw milling enterprises.
1900		Most small textile mills close. Vertical stone buhr mills become popular in rural areas of Tennessee; the Midget Marvel flour mill is introduced (1909), simplifying somewhat the production of roller-milled flour; flour bleaching processes become more sophisticated.
1910	**Modern Period:** Large-scale milling and textile concerns; mass markets; decline of water power; later decline of steam power; mass transportation networks develop after the automobile, modern railroads, aircraft.	World War I (1914 – 1918).
1920		Roaring Twenties – much investment in industry.
1930		Great Depression has profound impact on milling and manufacturing; some reversion to earlier methods such as tolling and stone grinding.
1940		World War II and following – most small milling establishments close due to competition, obsolescence.
1950		Water powered mills primarily survive as romantic reminders of a simpler past; historic interest in old mills begins to develop; milling becomes highly automated; last horizontal stone buhr mills built; large textile factories are established in certain areas of the South.

Classification by Application. Classifying mills by their application is also somewhat difficult, because so many mills were used for various production processes, either simultaneously or at different periods in their existence. The aim throughout this study has been to distinguish among, primarily, mills associated with the processing of grains, lumber, or textiles, with the recognition that many other types of applications existed (although not in great numbers). Whenever sufficient power was available, a mill owner often capitalized upon this fortune by diversifying. This was also done since many milling processes were seasonal as well. For example, wool carding usually took place in the spring following sheep shearing. The heaviest period of corn grinding was in the fall after the crop was harvested (for winter wheat it was in the spring). Saw milling was frequently performed in the winter when the sap was down, and lumber had less of a tendency to split and warp. The summer, when water was low, was probably used to tend crops and make repairs. Consequently, the enterprising mill owner not only might have one or two sets of buhrstones for grain milling, but possibly a sawmill and wool card, too.

Most historical mills and mill sites encountered in Tennessee today will be associated primarily with grain milling. Aside from the strictly pioneer and family mills, their structures had to be substantial, with good foundations, whereas sawmills were usually less sophisticated in construction, and therefore less likely to leave obvious physical remains. The relatively few textile factories constructed in the state were generally quite significant buildings, but few have survived. Occasionally, however, their remains may be located and studied archaeologically.

Within each of these categories, there were many variations. These included number of millstones employed, peripheral equipment used, appurtenant structures, power sources, later machinery (such as roller mills) installed, changes and modernization of equipment over time, and complete change in manufacturing applications (such as at Falls Mill in Franklin County). Frequently, archival records in the county, supplemented with additional sources such as early textile or flour mill directories, will provide the most accurate depiction of the life of a milling establishment over time.

Classification by Architecture. As has been pointed out in earlier chapters, the architectural style of a mill building and its appurtenant structures may often be studied to reveal the time period and application. However, this is not always a foolproof method of dating a mill, since occasionally a builder would revert back to earlier construction techniques, materials, or architectural features. Generally speaking, the small grist mills of the Pioneer Period in Tennessee history were built of logs or crudely sawn lumber, in much the same style as the cabins of that day. They were roofed with lathing and wooden, hand-split "shakes." Due to the limited life of certain of these building materials, and the problems with floods, fires, and abandonment, mills of this era are almost totally extinct. In most cases, their sites are undetectable due to alterations in physical features from past floods along streams. Occasionally, some rock piers or foundation stones, large dam timbers remaining in a creek, or depressions where wheel pits were located, may be observed. There may even be old millstones lying nearby or in the stream, or other iron parts which provide clues as to the milling application.

The large merchant mills of the Pioneer era were not common, but were generally built of hewn and sawn timbers, the hewn logs used primarily as the supporting structure, such as the sills, first floor joists, posts, columns, and beams. Sometimes these were sawn also, and the straight saw marks will sometimes point to early construction (an up-and-down sawmill being employed). However, some later buildings will show faint straight saw marks from a band mill, although close examination will reveal the reciprocating motion of the older method versus the continuous motion of the band saw blade. The construction in this early period, which also persisted even after the Civil War, was of the "post and beam" variety, with supporting posts or columns (sometimes elaborately finished for decorative purposes) holding heavy beams spanning between the posts. Floor joists were then mortised into the main timbers to support the flooring. The posts and beams were connected by mortise and tenon joinery, and held fast with wooden pegs. Truss designs were often employed for strength and stability, as at Massengill Mill in Grainger County. Rafters were frequently lap jointed and pegged at the peak. Ridge poles were not commonly used, and the roof lathing, often wide sawn slabs, provided structural support for the roof skeleton. Before metal roofs, the lathing was placed fairly close together to allow the wooden shakes to lap as they were nailed (these shakes were rarely over two feet in length or six inches in width). Metal roof lathing was usually smaller and spaced wider, sometimes up to two feet apart. The post and beam and lathing features may still be viewed in Falls Mill today.

During the Early Industrial Period, grain mills of any size were usually box-like structures with strictly utilitarian features. Windows were provided mainly for light and ventilation. Foundations were often stone, and the support structure was heavy to withstand weight of the machinery and vibration. Siding was commonly lap board or clapboard. Eaves were sometimes boxed in with returns, sometimes left open. Floor joists were usually on 18-inch centers to allow for flooring of at least a full inch thickness. Often the support structure was oak, whereas the flooring would sometimes be a lighter weight wood such as poplar. Stairs were of course provided, and the buildings were usually at least two floors. This was to accommodate the Evans or later systems, which required elevators to carry the grain or milled products to upper levels for cleaning or bolting. The grain storage bins were usually located on the upper floors, to allow for gravity feed to the millstones. These were almost always on the first floor, on elevated platforms. A round hole at least three feet in diameter will sometimes be a clue that a millstone once rested in that spot in an old mill.

The construction of textile mills in the pre-Civil War era is not so well documented. None has survived intact in Tennessee, so far as is known. In researching the history of Falls Mill, the author ran across references to the dismantling of the earlier (1840's) textile mill building at that location. It was said to be of timber framing and thought to have clapboard siding. It was most likely two stories. Textile machinery was for the most part heavier than grain milling equipment, so these buildings had to provide substantial support. The motions of power looms and spinning jacks and mules was also such that resistance to sway and vibration was important.

Although wood was the most common building material for mills and factories before the Civil War, there is evidence that brick was occasionally used. Its resistance to the insects and elements that broke down wood made it appealing to some. However, the manufacture of brick was slow and laborious, usually performed at the construction site or very close by. Early brick will be solid and display glazed surfaces if those particular bricks were close to the fire in the kiln. Brick walls in those days were at least a foot thick of solid brick. The door or window buck plate was often three inches thick and a single plank. The older industrial buildings many times had only shutter-type windows, since glass was expensive and difficult to produce. Early glass panes will be very small, increasing in size as processes improved.

The typical sawmill building differed dramatically from the grain and textile structures. It was usually an open shed, often less than elaborate. Oliver Evans' depiction of his up-and-down sawmill design in Chapter 2, Figure 67, is the ideal, and was probably not achieved in most of the Tennessee sawmills. It was usually required that these mills be erected as quickly as possible to provide lumber, so presumably no great architectural pains were taken in their construction.

After the Civil War, the circular sawmill allowed rapid production of high quality lumber. Many of these mills also operated planers and other lumber finishing machinery. As materials and methods improved, Late Industrial Period mills and factories could be fitted with decorative features as well as utilitarian. Some of these were manifested in arched or circular upper windows, double-hung windows, and boxed-in eaves with returns (e.g., Falls Mill, Ketner's Mill). Window and door lintels were wooden in many of these old structures. Falls Mill has an oolitic limestone door lintel over the front entrance, with the names of the builders and the date of construction (1873). Some of the textile buildings of this era, such as Falls Mill, were built with "monitors," or an upper story whose walls were set in closer than those of the lower floors. Water powered factories often had bell towers for signaling the workers, whereas steam mills had whistles. The later textile factories were generally long, rectangular buildings. Most of the post-Civil War textile mills were brick, while the majority of the grain mills continued to be of frame construction. Ketner's Mill and Cox Mill are exceptions.

Some believe that the use of square or cut nails indicates great antiquity in a building. This is not always the case, as these nails were used into the 1880's in many locations. In most earlier buildings, however, nails were expensive, so their use was restricted to shake roofs, siding, and flooring. Sometimes even flooring was pegged down with wooden dowels. The most accurate way to date an industrial building is through a combination of archival research, comparison to existing structures of known dates, expert architectural opinion, and study of the type of machinery used in the operation of the business.

Classification by Machinery. Since the application and architecture of an old mill are closely tied to the type of machinery used, it seems logical to devote some additional discussion to equipment placement and identification. In the case of early grain mills, the most obvious surviving piece of machinery is the buhrstone mill. The term "mill" is used here to denote the stones and their casing and integral parts. It is also of course used to denote the structure in which milling equipment is housed. It must be emphasized that all stones were not used to grind grain. In his book *The Versatile Millstone, Workhorse of Early Industry*, author Jon Sass presents dozens of applications of millstones to grind such varied raw materials as tanbark, tobacco, and mustard seeds. As a result, the type and design of stones and their furrow patterns are important with respect to their intended use. In small rural or family mills, one set of millstones may be the only machinery in the entire mill. As the milling process became more sophisticated, machinery proliferated, some of it complicated and difficult to identify. Throughout this report, as many illustrations as possible have been provided for, among other things, the purpose of easier identification. In an extant mill with much machinery remaining, it is very important to know the flow of materials in the mill in order to better understand the positioning and identity of odd looking machines. Layouts and elevations of typical mills in various periods have been included also as a guide. Materials were typically routed by elevator, auger, and drop chute in these old mills, so start at the beginning, where the grain is brought into the mill, then work through the appropriate elevators to the cleaners, storage bins, stones or roller mills, bolters, mixers, and packers if these are present.

Sawmills are less complicated. The small circular sawmills still in use vary little from those which appeared just after the Civil War. It is also helpful to visit one of the many engine shows, such as the annual one at Adams, Tennessee, to witness a steam powered sawmill at work. No up-and-down sawmills exist in Tennessee. The only locations to view these are primarily in the northeastern U.S. and at Henry Ford Museum in Dearborn, Michigan. There is a working, water powered reconstruction in Old Sturbridge Village, Massachusetts, complete with flutter wheel.

The only example of a nineteenth century textile mill with vintage equipment in Tennessee is Falls Mill in Franklin County. Not only is this structure an example of 1870's textile factory design and construction, it is also still a working water powered mill museum, although presently its products are flour and meal. The woolen machinery in this mill is extremely rare, and has been illustrated in Chapter 2 of this report. The only known nineteenth century textile factory in the entire United States with its original equipment intact is the circa 1860 Watkins Woolen Mill north of Kansas City, Missouri. This was a steam powered mill now in a state historical park. It provides a unique example of the layout and function of textile machinery, and was used as the model for the layout shown in Figure 108 in Chapter 2. One of the best sources for studying and identifying early textile machinery is the Museum of American Textile History in Massachusetts.

Classification by Power Source. Closely related to the machinery of the mill, and integral to its study, are the power source and transmission equipment. Although these have been discussed at length in the preceding chapters, a few points of summary may be helpful. Milling equipment has been powered since the beginnings of Tennessee by the following: animals (or humans), water, steam, internal combustion, and electricity (in other areas by wind as well). Animal power was typically harnessed by sweeps or treadmills. Water power was utilized by water wheels or turbines of various designs. Steam engines were either stationary or portable, and transmitted power primarily through flat belt or rope drives off their flywheels, as did early internal combustion engines. Electric motors first used flat belt drives as well, later converting to V belts.

There were primarily two methods for taking power from a water wheel. Either the main axle was used, or a large segment gear attached to the perimeter of the wheel turned a smaller pinion gear on a jackshaft. If power was taken from the main axle, a double set of wooden gears (four in all) was used to transmit power to the millstone shaft in the pioneer mills (see Chapter 2). Later, either a large flat belt pulley or a cast iron bull gear was connected to the axle, this in turn stepping up the speed of the water wheel by belting or gears to jackshafts. This method can be viewed in operation at several restored mills around the state, including Evins Mill near Smithville and John Cable Mill in the Great Smoky Mountain National Park. In the second method, used almost exclusively on the larger steel or wooden wheels of post-Civil War design, the gear segments were cast and bolted to the spokes of the wheel and to each other, or to heavy wooden cants. The only example of this type known to be in regular operation in Tennessee is the water wheel at Falls Mill. If numerous machines were to be run off the water wheel, the method was to run a long main line shaft through or underneath the building, then belt or gear machinery off this main shaft through the use of secondary shafts (jackshafts). As machinery was replaced or relocated in old mills, telltale signs of the earlier shaft locations can be spotted. These include belt holes cut in the floor, and bolt holes in the ceiling joists where shaft hangers were positioned. Sometimes oil stains in the floor indicate where a machine had stood at one time. These are important clues in determining the evolution of machinery and applications in mills and factories.

The size of an existing water wheel may be used to estimate its horsepower potential and the extent of the machinery it could operate. For a Fitz wheel, find the diameter and width in feet. Add 2.5 feet to the diameter to obtain the approximate operating head (H) of water. Allow 2.7 cubic feet per second (cfs) of water flow per foot of wheel width (use 2.4 cfs for a W.J. Savage wheel), and call this Q. Assume the water wheel's efficiency (E) is about 89% (this may be a bit of exaggeration by the manufacturer). The horsepower of the wheel is therefore approximately found by the following formula:

$$\text{horsepower} = (0.1135)(Q)(H)(E)$$

To illustrate, take the Fitz wheel at Falls Mill. Its diameter is 32 feet and width 4 feet. Therefore, $H = (32 + 2.5) = 34.5$ feet; $Q = (4)(2.7) = 10.8$ cfs; $E = 0.89$. Then

$$\text{horsepower} = (0.1135)(10.8)(34.5)(0.89) \sim 38$$

This is rated in brake horsepower, the old rating for steam engines and water wheels, so should not be compared to automotive horsepower (Omland 1983-84).

If a turbine remains at a mill site, measure the diameter of the runner inside the casing, determine the operating head of water, and go to the Leffel turbine tables to judge the horsepower (these are available through Leffel or the Museum of Power and Industry at Falls Mill). Even if the turbine is not a Leffel, this will yield a rough estimate.

If there is no water wheel or turbine left, the horsepower of the stream may be estimated using a float or weir method, or from flow data if this is available. Once the cubic feet per minute (cfm) of water flow is known, determine the operating head for the mill site (e.g., height from top of dam to stream level at mill). Then multiply the cubic feet of water per minute by 62.4 (the weight in pounds of one cubic foot of water). Next multiply this result by the head in feet, and divide the product by 33,000. The result will be the full horsepower of the stream (Fitz Water Wheel Company 1941).

A large concrete or rock platform with threaded studs sticking out may often indicate the location of a previous engine or generator at a mill site. Look to see how any surviving pulleys line up, and what their ratios are. This will indicate the speed at which an engine or machines were running. The widths of pulleys give an indication of how power was transmitted as well. The wider pulleys were generally nearer the power source. Heavier machinery, such as millstones and roller mills, required wider belt drives than cleaners, bolters, and elevators.

Water turbines commonly employed bevel gears at the tops of their vertical shafts, which changed shaft configuration from vertical to horizontal. One of these gears usually had wooden cogs (see those under Ketner's Mill today). Later mills used clutches to engage shafts (e.g., Evins Mill near Smithville).

If an engine survives at a mill site, it will usually have a nameplate with the manufacturer, horsepower, and other information. If this is missing, the make and size can sometimes be ascertained from the bore and stroke and design features of the engine.

Often at old mill sites, remains of an electrical generator are found. If the kilowatt output of the generator can be found on the nameplate, the horsepower required to turn it may be estimated. A rule of thumb is that 2/3 kilowatt may be produced per horsepower. If the generator is 10 kilowatts, it would take at least 15 horsepower to produce its rated output. This may give some indication of the size of the power source that once ran the mill machinery.

Classification by Market. The last means of classifying mills is by market. This is sometimes difficult to determine without resort to archival records, surviving ledgers, advertising records, or early directories. If the mill was quite small, it is usually safe to assume that the mill operated for the immediate family's benefit as well as their close neighbors'. "Sales" were most likely on a toll system, with no money changing hands. Larger mills sometimes used their tolled earnings to sell to stores nearby. The big merchant mills, as has been pointed out, found wider markets for their products. Particularly after the Civil War, with improved transportation, these mills could ship for many miles. An example is the Dungan-St. John Mill in Washington County, which enjoyed a considerable distribution area in the late nineteenth century (see Chapter 5).

Textile factories, even before the Civil War, basically had two options for selling their goods. These were sales directly to the consumer from the factory (such as yarns for home weaving), or sales through agents located around the country. The early textile directories offer clues to the markets of these enterprises. They commonly will state whether the mill "sells own products" or works through "selling agents" in St. Louis, Chicago, New York, or other large cities.

Early sawmills usually sold lumber locally. It was not until the late exploitation of huge forest tracts beginning in the 1880's and 1890's that much lumber was shipped, except from the largest of sawmill operations.

In summary, these classification methods are important in understanding the historical context of mills and industries in Tennessee. Another invaluable source of information about a particular mill or factory is a vintage photograph. Many mills were photogenic spots, and even if the mill itself was not the subject, some of its features may be viewed behind the Sunday school picnic crowd below its water wheel (Figure 52 in Chapter 2). Interior shots of early mills are quite rare, so these are of exceptional value to the industrial historian or archaeologist. Often descendents of the mill owners or workers, if they can be located, will possess old photographs.

This classification system and the Criteria for Evaluating Eligibility for the National Register of Historic Places discussed above form a basis from which a determination for National Register eligibility may be developed. Toward this end, the following section utilizes the classification system to develop some significant aspects of mills.

SIGNIFICANT ASPECTS OF MILLS

By utilizing the classification system for mills in the second part of this chapter, an historic context may be established for a mill building, structure, or site, and the important features delineated that may qualify the property for inclusion in the National Register of Historic Places. Some significant aspects of each of the categories of mill classification are presented below, for the purpose of evaluating a candidate property, and offering examples of those features that might support its nomination.

1) Classification by Time Period:

- Pioneer Period (pre-1820) mills or remains are extremely rare. There are four or five known extant merchant mills in Tennessee from this period, but no small neighborhood mills which date to this era. Therefore, any mill or factory building, structure, or site that can be documented through records and archaeological studies to fall into this period would be quite significant.

- Early Industrialization Period (1820 – 1860) mill buildings are also scarce. Most of those built of wood have been allowed to deteriorate partially or wholly, and those few of brick have generally been destroyed. Again, this time period is very under-represented by extant buildings in Tennessee, so such a property would be highly significant.
- Late Industrialization Period (1860 – 1900) mill and factory buildings are more prevalent, though certainly not common throughout the state. A mill of this period could have unique or unusual aspects. However, it may also be a good example of a common type.
- Modern Period (post-1900) mills survive with comparable frequency to Late Industrial buildings. They should generally be over 50 years old to qualify for National Register eligibility and possess unique or unusual features, as outlined below.
- As a general consideration, any mill or factory building (or site) located in West Tennessee would be a significant find, for this region of the state is virtually devoid of identified sites or extant buildings. Since West Tennessee was settled generally after the Pioneer Period, mills would fall into one of the latter three time periods.

2) Classification by Application:

- Grain mills. In this category, small tub or overshot mills with one set of buhrstones were usually used for corn grinding exclusively. Examples are in the Great Smoky Mountain National Park, with a handful of others scattered around. These are usually the earliest types of grain mills and the rarest. They could be used to represent the historic context of pioneer life in a certain area. The early merchant mills were equipped to process wheat flour also. In these mills are usually found at least two sets of buhrstones. Many of these mills were converted to roller mills in the late nineteenth century, and their earlier context lost or obscured. Other mills were built during this period for the roller process. They would have contained roller mills (and in some cases a set of millstones for custom corn grinding) and peripheral equipment. Grain mills have distinct construction and architectural styles which normally distinguish them from textile factories or sawmills (see below).

- Sawmills. Sawmill structures were not generally designed for permanency, so few have survived. Several reconstructions offer clues to the earlier buildings. Most power sources for sawmills are no longer present, with the possible exception of a buried turbine or parts from an old steam engine. Any of these sites, particularly those where an up-and-down sawmill was operated, would be quite significant. More permanent mills were usually used for lumber finishing, and were of later origin. The sites of early sawmills sometimes retain unique features which may identify them. One of these is a sawdust pile, more often associated with a steam powered mill. Many of the earliest water powered mills were perched above the stream, and the sawdust allowed to fall below and wash away. Other physical remains may include discarded logs, slabs, and cutoffs, foundation remains, and the like.
- Textile factories. As noted previously, few textile factories from the nineteenth century survive in Tennessee. The earliest were no doubt log or frame construction, the later typically brick. They normally possessed architectural features which distinguished them from grain or sawmills, typically being multi-storied and heavily timbered to support the great weight of the machinery. A floor was commonly devoted to each of the major steps in the textile process (carding, spinning, weaving, and finishing). Any extant buildings are likely to be eligible due to the rarity of the mill type.
- Other. Certain unusual manufactories existed in Tennessee in the early days, and the discovery of an extant building or remains would be highly significant. Several iron blast furnaces remain. There were also several paper mills in the state, some dating to the Pioneer Period. There were oil mills, turpentine stills, gun powder mills, and a multitude of distilleries, many of which shared power sources with other operations.

3) Classification by Architecture:

- Grain mills, depending on their period of use, had various architectural designs. The earliest neighborhood grist mills were typically small, one-room structures, often with a loft. The water wheel was usually on the outside of the building, or the tub wheel directly underneath the millstones. The stones were usually mounted in an elevated platform, so that the ground products could exit the spout into a meal box. These are quite rare today, and if extant, would be highly significant. Merchant mills were usually two stories, sometimes utilizing a loft as a third level for elevator heads and perhaps some cleaning equipment. Three story log or frame buildings in the early nineteenth century were difficult to construct, and the local fire companies were at a disadvantage since hand pumpers had difficulty reaching buildings that high. Sometimes northeastern influence is observed in elaborate stone arches in wheel pits, such as in Massengill Mill in Grainger County, and these features are important. For the most part, however, these buildings were utilitarian in function and not ornate. The Old Process mills were often two story box-like structures with clapboard siding. Representatives of this period are very uncommon. Even later nineteenth century mills were not always built with great care or architectural appeal. The New Process and roller mills were generally higher (at least three stories) to accommodate the necessary machinery and requisite flow of materials. Some Modern Period mills are of stud wall construction and frequently sided with metal. Architecturally, these are not usually significant, although another aspect may qualify them for the Register.

- Sawmills were distinctive from grain or textile mills. If any physical building remains are present, they will usually indicate a long, low, open shed. The length was to accommodate the saw carriage, which in some cases might be equipped to cut a 30-foot log. These buildings were typically thrown up in a hurry, without too much care in design or construction. Often, the mill was moved after the area was logged out, and the building torn down or allowed to fall to ruin. Exceptions were the earlier, more permanent up-and-down sawmills. The basic building features were similar, but greater care was usually taken in their construction. Any early sawmill sites with physical remains would be quite rare and significant.
- Textile factory architecture before the Civil War was probably similar to that of merchant mills, the building being a two-story design of timber construction. The later factory buildings often mimicked the mills of New England, with brick construction, monitors on the third story, bell towers occasionally, and heavy timber framing inside. Since these mills employed several workers, they were usually equipped with fireplaces or stoves and designed to take advantage of natural lighting. Late nineteenth century textile mills were often long, two-story, box-like brick structures, more practical than aesthetic in design. Any extant examples of the architecture of a particular period would be highly significant, since they are so rare.

- Generally speaking, any early mill or factory building that retains its original design, construction materials, and integrity is valuable as a resource for study, and may qualify it for National Register eligibility.

4) Classification by Machinery:

- Usually, any grain mill retaining a full complement of machinery representative of its period of construction would be extremely significant. This would include the pioneer mill with millstones intact; the Old Process mill with multiple sets of buhrs, a hopper-boy, and perhaps primitive cleaning and bolting equipment; the roller mill with all roll stands, elevators, and peripheral equipment intact; the later (post-1900) country mill, barn, or store with a vertical stone buhr mill and engine. The earlier two categories are quite rare and highly significant. The latter two are less rare, but certainly not common. If, for example, a roller mill in good condition was extant with its entire range of machinery and power source intact, and perhaps reflected the industry of a small milling community, it might be eligible for qualification. In addition, any mill containing an entire set of machines installed by one manufacturer, such as the W.J. Savage Company of Knoxville, would be rare.
- A nineteenth or early twentieth century sawmill with power source, saw carriage, and blade remaining would be quite rare. Several years ago, such a mill was located in Hickman County. Although long abandoned, the steam engine, log carriage, blade, oil cans, sawdust pile, and logs were still *in situ*, offering an extraordinary opportunity for study. It has since been relocated and restored.
- As pointed out earlier, there is no known mill in Tennessee that retains its original textile machinery, with the exception of the early carding machine at Ketner's Mill. This and the complete collection of woolen machinery at Falls Mill are the only known representatives of this class and age of equipment left in the state for study. The discovery of any of this machinery in its original context, even early twentieth century vintage, would be of remarkable significance.

5) Classification by Power Source:

- Water power. The following types of water power devices or contexts would be of particular significance in Tennessee: wooden water wheels with gudgeons; tub wheels; undershot wheels; Pelton wheels; unusually large water wheels of wood or steel construction (at least 30-foot diameters); water turbines of an unusual design or manufacturer; water turbines of great antiquity (e.g., the Brainerd Mission Mill turbine); water turbines in pressure cases rather than penstocks; any wheel or turbine of Tennessee manufacture (such as Savage wheels or Wilder turbines). In addition, structures associated with water power may be unusual or significant. These would include any wooden dam remains, dams of cut or field stone construction, earthen dams, unusual millraces (such as those highly elevated on rock or wooden piers, or inverted siphons), or odd gating systems.

- Steam power. Surviving stationary steam engines in Tennessee are quite rare. Any in an original mill or cotton gin context would be significant. The remains of pre-Civil War steam engines at their factory sites would also be valuable from an archaeological or informational standpoint. Those remains connected to Civil War activities could be highly significant as well (there are reports of steam engines being pushed off cliffs or into rivers during Union occupation of the state).
- Other power sources. Although internal combustion engines and electrical generators/motors are not necessarily rare, there are certain exceptions. These would include any particularly early examples of these prime movers in their original context, or representatives of unusual manufacturers or designs.
- Power transmission devices. Most mills of the nineteenth century employed standard power transmission equipment, such as line shafts, pulleys, flat belts, and gearing. These are not particularly unusual, but occasionally an exception is encountered. One might be an exceptionally large diameter drive pulley off the water wheel shaft, or an inside segment gear on the water wheel. There have also been reports of power transmitted over longer than normal distances by link rods, such as oil fields later used. This system would be significant if located. In early pioneer mills, which used double sets of wooden gears, the secondary jackshaft carrying the wallower and lesser cog gear was sometimes made to pivot, in order to throw the gears in or out of mesh. This was not only a safety precaution in case of emergency, but allowed the water wheel to operate without the stones rotating, thereby saving gear tooth wear. The remains of this type of system would be a rare find in Tennessee.

6) Classification by Market:

- Grain mills which ground on a toll system sometimes have tolling charts on their walls, or marks or toll boxes near the stones where the percentage of product was calculated by weight or volume. Due to the (reportedly) rampant dishonesty of the milling class in the nineteenth century, these tolls became established by law in many states. Old mill bags lying about may also offer a clue to the distribution network of mills. During the roller-milling era, most mills sold under a brand name for their flour, and distributed among stores in their area. These mills will typically have loading docks for wagons and wagon scales for bringing in grain. If old ledgers can be located, these are valuable resources for analyzing markets.
- Sawmills usually sawed for local markets, and most of the work was done on a custom basis. Later their products could be shipped by rail, and finished lumber could command a premium price.
- Textile markets varied, as has been previously discussed. Many of the smaller mills sold locally from the factory, and others worked through agents. The presence of a mill store as a part of the historic context of a textile complex offers valuable information as to the sale of goods.

In conclusion, there are many potentially significant features of a mill building or site that bolster its qualification for the National Register of Historic Places. These need to be documented as they support the historic context theme for which the property is deemed representative. There are currently 42 mills and mill sites listed in the National Register of Historic Places in Tennessee, including several Historic Districts containing mills (see Appendix B for a complete listing through 2001). A study of the contexts and features that made the eligibility of each property successful would be instructive prior to the pursuit of National Register status on another site.

CONCLUSION

The foregoing report is the culmination of almost three years of research on the milling history of Tennessee, with research in Franklin County extending back some twenty years. The author has also drawn upon eighteen years of association with the Society for the Preservation of Old Mills, ownership and operation of Falls Mill, and restoration projects involving over twenty other old mills. Although this report is not intended to be an exhaustive inventory of historic mills in Tennessee, it has attempted to offer an overview of the milling history of each county and region of the state, where any information was available. Themes of historic context as they apply to mills have been presented with the hope that additional Tennessee mills and mill sites may be added to the National Register of Historic Places. The historic context of mills has been evaluated relative to their relevant time periods, applications, architectural features, power sources and machinery, and markets. Extant examples have been presented throughout the state to illustrate these classification categories. An extensive guide has been offered toward qualifying a mill property for eligibility in the National Register of Historic Places. A field survey form and manual have been developed (see Appendix C) for TDOT personnel to help evaluate a mill or mill site.

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FIGURE CREDITS

(Refer to References and Bibliography for Additional Information)

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13. Spring-pole pestle, Storck & Teague, *Flour for Man's Bread: A History of Milling*, reproduced with permission of University of Minnesota Press
14. Lazy Jim, Storck & Teague, *Flour for Man's Bread: A History of Milling*, reproduced with permission of University of Minnesota Press
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16. Hourglass mill, Storck & Teague, *Flour for Man's Bread: A History of Milling*, reproduced with permission of University of Minnesota Press
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108. Layout of a nineteenth century woolen mill, reproduced from Lautzenheiser, Lovett, & Liemenstoll, *Data Recovery at Freeman's Mill*, 1998, drawing by John Lovett
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119. Purifier, Great Western Manufacturing Company, Catalogue Number 45
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122. Bran duster, Great Western Manufacturing Company, Catalogue Number 45
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APPENDIX A

SOCIETY FOR THE PRESERVATION OF OLD MILLS (SPOOM)
LIST OF OLD MILLS OF TENNESSEE (UPDATED 1998)

SPOOM
LIST OF OLD MILLS OF TENNESSEE
(05/27/98)

ANDERSON COUNTY

Using the official Tennessee state highway map we have included the map coordinates to show the approx. location of mills. We hope this will make it easier to find old mills. Maps may be obtained from Tennessee Tourism, PO Box 23170, Nashville, TN 37219. Maps may also be obtained at welcome centers on major highways as you enter the state.

RICE MILL. TN-001-001, NORRIS, TN Updated: 08/93
(aka NORRIS MILL) CONDITION-*Operational*, POWERED BY-*Overshot Wheel*
Location; (B 13) adjacent to US 441 about 1.5 mile south of Norris Dam, within the Norris Dam State Park, on Clear Creek.
Comments; Late 19th century construction. Rescued from flooded waters of Norris Lake by TVA and CCC, and reconstructed into an operating mill in the 1930's. Scenic, but difficult to photograph because of shading and foliage. Closed in winter.
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WEBB MILL. TN-001-002, CLINTON VICINITY, TN Updated: 01/98
CONDITION-*Other Business*, POWERED BY-*Overshot Wheel*
Location; (B 13) vicinity of CLINTON near the Mt. Hebron Church on Hill Road, 3.5 miles north-northeast of Hansard's Mill, which is in Knox County. Exact location not known.
Comments; Now used as a barn.

BEDFORD COUNTY

CORTNER'S MILL. TN-002-001, NORMANDY, TN Updated: 01/94
CONDITION-*Restaurant*, POWERED BY-*Turbine*
Location; (D 9) in eastern Bedford County on the Duck River, about 2.5 miles northwest of NORMANDY, on Cortner's Mill Road.
Comments; Now a fine restaurant with pvt. residence quarters on upper floor. Open on a limited basis.
Reference OMN;
LaForest, Michael J., "SPOOM Conference, 1992", Summer 1992, pp. 12

FAIRFIELD MILL. TN-002-002, SHELBYVILLE, TN Updated: 11/89
CONDITION-*Pvt. Res.*, POWERED BY-*Turbine*
Location; (D 8), 14 miles east of SHELBYVILLE on Garrison Fork, and 4.5 miles from WARTRACE.
Comments; After being idle for many years, the mill was converted into a residence by George and Kathy Dennis in 1978-79. The turbines are used to generate commercial electric power.

BLOUNT COUNTY

JOHN R. CABLE MILL. TN-005-001, SMOKY MTN. NATL PARK, TN Updated: 03/93
(aka CADE'S COVE MILL) Built-1870, CONDITION-*Operational-Photogenic*
POWERED BY-*Overshot Wheel*
Location: (C 14) within the CADES COVE loop, in the SMOKY MOUTAIN NATIONAL PARK. Follow signs from Gatlinburg, Pigeon Forge or Townsend.
Comments; Built after 1870, a small wood frame mill with long wooden flume. Powered by a wooden overshot waterwheel and uses buhrstone to do demonstration grinding of corn. The park is open year around except during severe weather. Recent rulings by the FDA prohibit the sale of cornmeal ground in the mill for human consumption. Listed on the National Register of Historic Places, 1977.
Reference OMN;
Dodd, Don, "John P. Cable Mill, Cades Cove, TN", Fall 1975, pp. 13
LaForest, Michael J., "SPOOM At The World's Fair", Spring 1982, pp. 15
"SPOOM Photo Contest Winners For 1988", Winter 1989, pp. 12
LaForest, Michael J., "FDA Shuts Down Mills In The Smokies", Winter 1991, pp. 17

JOHN R. CABLE MILL. TN-005-001, (CONTINUED)
LaForest, Michael J., "CARTOON - Ed & Fred", Winter 1991, pp. COVER

CAVE MILL. TN-005-002, MARYVILLE, TN Updated: 11/89
CONDITION-*Pvt. Res.*, POWERED BY-*Turbine*
Location; (C 13) on Wildwood Pike where it crosses the Little River northeast of MARYVILLE. Quad: 147 SW.
Comments: Has been converted to a pvt. residence. The turbines are used to heat and cool the house.
Reference OMN;
Gore, Edwina, "Old Cave Mill,Sevier County, TN", Winter 1978, pp. 12

CLOVER HILL MILL. TN-005-003, MARYVILLE, TN Updated: 06/96
CONDITION-*Feed Mill*, POWERED BY-*Electric*
Location; (C 13) at head of Baker Creek. Take US 411 south out of MARYVILLE and turn right (north) at the junction with US 129. Go 1 mile to mill which is at Mill Road & Clover Hill Road.
Comments; Was originally water powered, now operates with electricity. Primarily a feed mill, originally was a distillery. Listed on the National Register of Historic Places, 1989. Quad; 139 NE.

COADA MILL. TN-005-004, MARYVILLE, TN Updated: 03/93
(aka SNAKEY JOHN MARTIN MILL) CONDITION-*Operational*, POWERED BY-*Turbine*
Location; (C 13) on Hesse Creek. Take US 321 south from MARYVILLE and turn right (west) on the first road past the Foothills Parkway. Go left at the Miller Cove Church and follow the road 0.5 mile to the mill.
Comments; Will grind corn for a toll. Uses flat runners. Very nice, simple one storey wood sided mill. Listed on the National Register of Historic Places, 1989.
Reference OMN;
LaForest, Michael J., "SPOOM At The World's Fair", Spring 1982, pp. 15
"Coada Mill", Spring 1982, pp. 17

WHITE'S MILL. TN-005-005, MARYVILLE, TN Updated: 06/96
CONDITION-*Other Business*
Location; (C 13) on Old White's Mill Road, on Crooked Creek, 5 miles east of MARYVILLE.
Comments; Wooden structure, now used for storage. There is no milling equipment. Listed on the National Register of Historic Places, 1989.

PEERY'S MILL. TN-005-006, TOWNSEND, TN Updated: 06/96
(aka LITTLE RIVER MILL) CONDITION-*Ruins*
Location; (C 13) on Old Walland Hwy, 0.1 mile north of Cold Springs Road, on the Little River.
Comments; Mill was in the process of restoration when it was destroyed by fire. It had been listed on the National Register of Historic Places in 1989.
Reference OMN;
"Peery's Mill", Spring 1974, pp. 17
Furrow Auction Co., "Peery's Mill Sold", Summer 1974, pp. 7
Ball, Stephen S., "Peery's Mill", Fall 1981, pp. 12
Evey, Dick, "Little River Mill Burns", Fall 1986, pp. 18

BRICK MILL. TN-005-007, MARYVILLE, TN Updated: 07/96
CONDITION-*Site Only*
Location; (C 13) on Brick Mill Road in the vicinity of MARYVILLE. Exact location not known.
Comments; Listed on the National Register of historic places, 7/25/89. No other information available.

JOHN HACKNEY MILL. TN-005-008, FRIENDSVILLE, TN Updated: 07/96
CONDITION-*Site Only*
Location; (C 13) on Main Street, near Front Street, in FRIENDSVILLE.
Comments; Listed on the National Register of Historic Places, 7/25/89. No other information available.

PISTOL CREEK DAM/RACEWAY. TN-005-009, MARYVILLE, TN Updated: 07/96
CONDITION-*Site Only*
Location; (C 13) between Church Avenue & Ellis Street, on Pistol Creek, in MARYVILLE.
Comments; Listed on the National Register of Historic Places, 7/25/89. No other information available.

JOHN MARTIN MILL. TN-005-010, WALLAND, TN Updated: 07/96
Location; (C 13) on Mill Road, 0.3 mile south of West Millers Cove Road in the vicinity of WALLAND.
Comments; Listed on the National Register of Historic Places, 7/25/89. No other information available.

SHADDON MILL SITE. TN-005-011, MARYVILLE, TN Updated: 07/96
(aka SILAS PEARSON MILL) CONDITION-*Site Only*
Location; (C 13) at the junction of Big Elm & Trigonia roads, on Ninemille Creek, in the vicinity of MARYVILLE. No better location available.
Comments; Listed on the National Register of Historic Places, 8/21/89. No other information available.

CANNON COUNTY

WILDWOOD MILL. TN-008-001, PLEASANT VIEW COMMU., TN Updated: 11/89
CONDITION-*Deteriorating*, POWERED BY-*Turbine*
Location; (C 9) vicinity of WOODBURY on Bull Pen Creek, 5 miles east of SR 53 and 1 mile west of Pleasant View Community. Town not on map.
Comments; It was turbine powered and deteriorated in 1980.
Reference OMN;
Gore, Edwina, "Wildwood Mill", Fall 1976, pp. 13

READYVILLE MILL. TN-008-002, READYVILLE, TN Updated: 06/96
(aka READY MILL) CONDITION-*Deteriorating*, POWERED BY-*Turbine*
Location: (C 9) on the north side of US 70 South in READYVILLE COMMUNITY on the Cannon-Rutherford county line.
Comments; Operable in the 1970's, but badly deteriorated. Vandalism is obvious. Dam needs repair. A restoration grant has been received from the National Park Service, but until now little has been accomplished. Listed on the National Register of Historic Places, 1973.
Reference OMN;
Carignan, Marie I, "Readyville, Tenn., MIlls", Spring 1975, pp. 13
Martin, Donald W., "More About the Readyville, TN, Mills", Spring 1975, pp. 13
"Readyville Mill At Arts & Crafts Show", Summer 1975, pp. 16
"OLD MILLS IN THE NEWS", Spring 1978, pp. 7
LaForest, Michael J., "Readyville Mill For Sale", Summer 1980, pp. 5
Lovett, John Jr., "The Readyville Mill, Grinding Through History", Spring 1982, pp. 3-4
Lovett, John Jr., "Spring 1982, pp. COVER
"Tennessee Mills In The News", Fall 1992, pp. 8
"Readyville Mill, Tennessee, In Peril", Fall 1994, pp. 16

CARTER COUNTY

FARMER'S MILL. TN-010-001, ROAN MOUNTAIN, TN Updated: 01/98
CONDITION-*Deteriorating*
Location; (B 15) vicinity of ROAN MOUNTAIN on Trivett Creek near the Elk River and the Avery County, NC, line. Exact location not known.
Comments: Very small mill, badly deteriorated. Indication of once having an overshot wheel. There is no milling equipment.

HYDER'S MILL. TN-010-002, MILLIGAN COLLEGE, TN Updated: 02/94
(aka DOC BOWERS MILL) CONDITION-*Ruins*, POWERED BY-*Overshot Wheel*
Location; (B 16) east of ELIZABETHTON, On Buffalo Creek at is junction with the Wautaga Rriver, on the Milligan College campus.
Comments; The mill burned several years ago, and only the mill ruins remain.
Reference OMN;
LaForest, M., "Hyder Mill, Carter County, TN", Fall 1989, pp. 12

MILL AT ROANNE MTN. S.P.. TN-010-003, ROANE MTN. STATE PK., TN Updated: 11/89
CONDITION-*Other Business*
Location; (B 16) within the Roane Mountain State Park.
Comments; Former mill, now used as a public bldg. in the park.

DUNGAN MILL. TN-010-004, ELIZABETHTON, TN Updated: 02/94
(aka CAMPBELL'S MILL) CONDITION-*Non-Operating*, POWERED BY-*Turbine*
Location; (B 16) on Siam-Blue Springs Road just east of ELIZABETHTON, TN.
Comments; This mill was shown on page 11, OMN #62, Winter, '88. Additional information is needed.
Reference OMN;
"New Tennessee Mill", Spring 1988, pp. 17

BENFIELD MILL. TN-010-005, VALLEY FORGE, TN Updated: 02/94
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (B 16) near VALLEY FORGE, which is on US 19E and US 321, south of ELIZABETHTON.
Comments; Little is known about this mill. It was shown in OMN #62,on page 11, Winter '88.,
Reference OMN;
"Where Are These Mills?", Winter 1988, pp. 11

CLAIBORNE COUNTY

BLACK FOX MILL. TN-013-001, CUMBERLAND GAP, TN Updated: 08/93
CONDITION-*Pvt. Res.*
Location; (A 14) vicinity of TAZEWELL in village of CUMBERLAND GAP.
Comments; Had an overshot wheel which is gone. Wooden exterior is in very poor condition. The structure is now used for non-milling purposes.
Reference OMN;

BLACK FOX MILL. TN-013-001, (CONTINUED)
"We Heard It By The Grapevine", Winter 1988, pp. 23

HURST MILL. TN-013-002, NEW TAZEWELL, TN Updated: 08/93
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (A 14) on Little Sycamore Creek, 4 miles south of NEW TAZEWELL, and 0.5 mile east of US 25E. From US 25E, turn northeast on Little Sycamore Road, go about 0.5 mile and look for a driveway on the right. Quad: 154 NE.
Comments; Overshot wheel is missing, but bldg. is in fair condition. Inoperable.

JOHNSON'S MILL. TN-013-003, TAZEWELL, TN Updated: 11/89
(aka HEATH'S MILL) CONDITION-*Operational*, POWERED BY-*Overshot Wheel*
Location; (A 14) adjacent to SR 33 on Big Barren Creek, 8 miles west of TAZEWELL.
Comments: Jimmy Johnson is the owner and operator. Uses a Munson Underrunner and Meadows mill for production.
Reference OMN;
Breeden, Sam L., "W.N. Johnson's Mill", Summer 1974, pp. 16
"Johnson's Mill", Winter 1983, pp. 11

LONESOME VALLEY MILL. TN-013-004, NEW TAZEWELL, TN Updated: 08/93
CONDITION-*Deteriorating*, POWERED BY-*Overshot Wheel*
Location; (A 14), 5 miles NW of NEW TAZEWELL near the Mayes Chapel on Lonesome Creek.
Comments; Inoperable, no equipment. Only deteriorated frame remains.

ROGERS MILL. TN-013-005, TAZEWELL VICINITY, TN Updated: 01/98
(aka DAVIS MILL) CONDITION-*Site Only*
Location; (A 14) vicinity of TAZEWELL on Davis Creek, 1 mile north of the Russell Mill (TN-013-006). Going east on Old Rt. 63, turn south at the Caywood Church and go 0.5 mile to mill.
Comments; Mill is idle, machinery mostly gone. Destroyed by fire 7/88.

RUSSELL MILL. TN-013-006, TAZEWELL VICINITY, TN Updated: 01/98
CONDITION-*Under Restoration-Photogenic*, POWERED BY-*Pitchback Wheel*
Location; (A 14) vicinity of Speedwell on Davis Creek, 0.5 mile beyond the Rogers Mill (TN-013-005). Difficult to see from the road. From the intersection of Old Rt 63 & the Caywood Church, go 1.5 mile and turn left (east) on a dirt driveway to the mill.
Comments; Has a 4 ft. X 23 ft. Fitz pitchback wheel, but is idle. Much machinery, but exterior is in bad condition. Being restored by SPOOM member Ned Russell. Has an earthen flume of 3/4 mile. Dam is in good condition, and the site is very scenic. A second mill remains can be seen on Davis Creek, 50 yards upstream from where the Russell Mill flume crosses Davis Creek. This mill used a very primitive, homemade paddlewheel turbine. Nothing remains but a stone foundation.

COCKE COUNTY

BLUFTON MILL. TN-015-001, HARTFORD, TN Updated: 08/93
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (B 9) on Groundhog Creek. Take HARTFORD exit from I-40 and go west on Hollow Road 4 miles; turn east on Lindsay Gap Road. Difficult to find.
Comments; None.

CATON'S GROVE MILL. TN-015-002, COSBY, TN Updated: 11/89
Location; (C 14) on Canary Creek in a small community of the same name, 3 miles east of COSBY. Hard to find. Quad: 173 SW.
Comments; None.

BROOKSIDE MILL. TN-015-003, PARROTSVILLE, TN Updated: 08/93
CONDITION-*Deteriorating*, POWERED BY-*Overshot Wheel*
Location; (B 14) on Clear Creek, 0.5 mile north of PARROTSVILLE off US 321.
Comments; Small, badly deteriorated mill.

BLUE MILL. TN-015-004, UNICOI, TN Updated: 01/98
CONDITION-*Other Business*
Location; (C 15) vicinity of UNICOI on Trail Fork of Big Creek near Mulberry Church, 1 mile west of SR 107, near the NC state line.
Comments; Now a barn, no machinery.

COFFEE COUNTY

MANCHESTER FLOUR MILL. TN-016-001, MANCHESTER, TN Updated: 10/97
(aka SPAULDING MILL) Built-1890, CONDITION-*Non-Operating*, POWERED BY-*Electric*
Location; (D 9) in the city of MANCHESTER on SR 55, at the railroad overpass.
Comments; After more than a century, the mill has closed due to competition from more modern mills. In 1965 the mill converted from steam to a pneumatic, or air-pressured, system. Ruby brand flour and Ruby brand cornmeal was produced. According to the Tennessee Dept. of Agriculture, this was one of the last independent mills in middle Tennessee.
Reference OMN;
Beals, Fred, "Young At Heart - In Youngstown", Winter 1992, pp. 10-13

CUMBERLAND COUNTY

LINARY MILL. TN-018-001, CROSSVILLE, TN Updated: 08/93
(aka SUTTON'S FORD MILL) CONDITION-*Site Only*, POWERED BY-*Turbine*
Location; (C 11_ on Daddy's Creek, 5 miles south of CROSSVILLE off US 127. Going south on US 127, turn east on Old Rt. 68 at the Griffith Store and go 3 miles to the mill.
Comments; Mill was destroyed by a flood in 1991.

DAVIDSON COUNTY

NEWSOM'S MILL. TN-019-001, BELLEVUE VICINITY, TN Updated: 01/98
Built-1862, CONDITION-*Site Only*, POWERED BY-*Turbine*
Location; (B 7) vicinity of BELLEVUE in community of NEWSOM'S STATION on the Harpeth River.
Comments; Built in 1862, burned in 1960. Only limestone foundation remains. Listed on the National Register of Historic Places, 9/13/76.

WERTHAN PACKAGING. TN-019-002, NASHVILLE, TN Updated: 05/96
(aka WERTHAN BAG CO.) CONDITION-*Non-Operating Textile Mill*
Location; (B 7) in NASHVILLE at 1400 8th Avenue North.
Comments; A former manufacturing facility for burlap bags. Operations ceased in 1995. It is being prepared for an alternative use, possibly apartments.

MARATHON VILLAGE MILL. TN-019-003, NASHVILLE, TN Updated: 05/96
CONDITION-*Other Business*
Location; (B 7) in NASHVILLE at 1305 Clinton Street.
Comments; A former steam powered textile mill now being developed to house artists studios. A very good example of a small southern textile mill. The Southern Engine and Boiler Works, also known as Southern Motor Works, the manufacturers of the Marathon automobile moved operations from Jackson, Tennessee, to this site in 1910 and many of their cars were built here before the company went out of business.

DE KALB COUNTY

BARNES MILL. TN-021-001, SMITHVILLE, TN Updated: 11/89
CONDITION-*Other Business*
Location; (C 9). From SR 56 south of SMITHVILLE, follow signs to Pates Ford Dock on Center Hill Lake. At Jefferson community (2 churches) turn south to Sink Creek.
Comments; Mill is idle, converted to use as a storage building.

CRIPPS MILL. TN-021-002, GASSAWAY, TN Updated: 11/89
CONDITION-*Pvt. Res.*, POWERED BY-*Overshot Wheel*
Location; (C 9) 6 or 7 miles due east of GASSAWAY, or 6 or 7 miles west of SMITHVILLE. On Dry Creek, near a trout farm.
Comments; None.
Reference OMN;
Beals, Fred & Betty, "Mill Hunting - Indiana To Georgia", Winter 1982, pp. 12-14

DOWELLTOWN MILL. TN-021-003, DOWELLTOWN, TN Updated: 11/89
Built-1965,
POWERED BY-*Turbine*
Location; (C 9). No information available.
Comments; Built in 1965. Spring water is directed to the turbine.

EVIN'S MILL. TN-021-004, SMITHVILLE, TN Updated: 05/95
(aka EVINS MILL RETREAT) Built-1937, CONDITION-*Other Business*
POWERED BY-*Overshot Wheel*
Location; (C 9). Take I-24 to the McMinnville exit. In McMinnville, take Hwy 56 to the junction with Hwy 70 in Smithville. Go 2 miles east of SMITHVILLE on Hwy 70 and turn right on Falls CreekRoad. There is an historical marker for the mill on that intersection. Look for the "Pirtle Nursery" sign for a landmark. Go south 3 miles to the mill, on Fall Creek.
Comments; Mill has been restored to operational condition with a 30 ft. X 8 ft. Fitz overshot wheel, although the mill is not in operation. There is a very high dam, with Carmac Falls nearby. The mill exterior is cinder block. This is a pvt. mill, being used as a corporate retreat, owned by William Cochran of Nashville. There are Bed & Breakfast facilities on weekends. Phone: 615-597-2088. The property is now fenced in, with "NO TRESPASSING" signs posted.
Reference OMN;
Beals, Fred & Betty, "Mill Hunting - Indiana To Georgia", Winter 1982, pp. 13-15

DICKSON COUNTY

SPENCER MILL. TN-022-001, BURNS, TN Updated: 04/95
(aka OLD SPENCER MILL) Built-1856, CONDITION-*Non-Operating*, POWERED BY-*Turbine*
Location; (B 6) south of the community of BURNS, which is about 10 miles southeast of the town of Dickson. The mill is south of I-40 on Old Spencer Mill Road.
Comments; Built in 1856 on Parker Creek. In about 1919 the mill was disassembled and moved 8 miles to south of the town of Burns where it was installed in a 2 storey frame building. With an external steama plant it produced stone ground meal, flour and breakfast cereal until it closed in the 1940's. The steam engine is gone but the building, with 2 run of stones and auxiliary equipment, remains under lock in Burns. The Dickson County Historical Society bought the mill in about 1985. intending to move it intact some 20 miles north to Cumberland Furnace, an early iron-making site now being revived as a tourist center. The building was placed on steel beams by a moving company, but the move never materialized. Tim and Trish Miller bought the original millsite on Parker Creek where they have developed a rustic cultural and recreational conference center. They have purchased the mill and plan to move it back to its original location. (The location of Parker Creek cannot be found on my Delorme map). Address: Old Spencer Mill, 399 Old Spencer Mill Road, Burns, TN 37029. Phone: 615-412-5169.
Reference OMN;
Gorin, Stan, "Spencer Mill Homecoming", Summer 1995, pp. 10

FENTRESS COUNTY

ALVIN C. YORK GRIST MILL. TN-025-001, PALL MALL COMMUNITY, TN Updated: 03/93
(aka SGT. YORK MILL) Built-1835, CONDITION-*Museum-Photogenic*, POWERED BY-*Turbine*
Location; (A 11) in the PALL MALL community on US 127.
Comments; A Tennessee State Historical Site, on the Wolf River. Built in 1835. World War 1 hero Alvin York operated the mill. Nicely restored, although not in operation. Open only during the summer months. Listed on the National Register of Historic Places, 1973.
Reference OMN;
LaForest, Michael J., "SPOOM At The World's Fair", Spring 1982, pp. 15
"Where Are The Scenic Mills?", Summer 1986, pp. 10-11
Foster, Donna, "Alvin York Gristmill, Pall Mall, TN", Fall 1987, pp. 9
Stephenson, Jeff, "Winter 1995, pp. COVER

FRANKLIN COUNTY

CEDAR BLUFF MILL. TN-026-001, WINCHESTER, TN Updated: 08/93
(aka HANLEY'S MILL) CONDITION-*Site Only*, POWERED BY-*Turbine*
Location; (E 9), 5 miles east of WINCHESTER on Boiling Fork River.
Comments; There has been a mill on this site since 1817. It was a 2 1/2 storey structure, but the upper portion was removed in 1954.

FALLS MILL. TN-026-002, BELVIDERE, TN Updated: 06/96
Built-1873, CONDITION-*Operational-Photogenic*, POWERED BY-*Overshot Wheel*
Location; (E 9), 12 miles west of WINCHESTER on US 64. Turn right (north) at Belvidere on Old Salem Road, 2 miles to the mill. On Factory Creek. Address: 134 Falls Mill Rd, Belvidee, TN 37306.
Comments; Built in 1873 as a thread mill and lataer converted to a cotton gin, then to a woodworking shop. Much of the machinery is from the Red Mill which was flooded out by Tims Ford Lake. The 32 foot overshot steel wheel is the largest operating wheel in Tennessee. Listed on the National Register of Historic Places, 1972. Owned and operated by SPOOM members John and Jean Lovett, with the assistance of miller William Janey. Milled products are sold in the mill store, along with many local craft items. Fairs and festivals are held each year at the mill. The mill contains extensive textile machinery. VERY PHOTOGENIC!
Reference OMN;
"Old Mills In Tennessee", Spring 1975, pp. 3
Gastler, George, "Falls Mill, Huntland, TN", Summer 1975, pp. 17
Local Newspaper Article, "Old Falls Mill, TN", Fall 1978, pp. 3-4
LaForest, Michael J., "Fall 1978, pp. COVER
"Falls Mill", Fall 1980, pp. 16
"Falls Mill: A Legacy of Power and Industry", Spring 1985, pp. 10-12
"SPOOM Photo Contest Winner For 1988", Winter 1989, pp. 12
"Falls Mill To Host Pioneer Skills Day", Summer 1991, pp. 19
Beals, Fred, "Young At Heart - In Youngstown", Winter 1992, pp. 10-13
Rigler, Bill, "Chaff From The President", Winter 1992, pp. 20
"1992 SPOOM Conference, Monteagle, TN", Spring 1992, pp. 19
York, Stan, "Summer 1992, pp. COVER
LaForest, Michael J., "SPOOM Conference, 1992", Summer 1992, pp. 12-13

FALLS MILL. TN-026-002, (CONTINUED)
LaForest, Michael J., "11th Annual SPOOM Convention", Winter 1993, pp. 12-14
Lovett, Jane, "Falls Mill Features Artist of the Month", Spring 1994, pp. 7
Lovett, Jane, "Fall 1995, pp. COVER
Lovett, Jane, "Development Continues At Falls Mill, Tennessee", Fall 1995, pp. 4-5
Editor, "MILLING AROUND", Spring 1996, pp. 21

MONEY MILL. TN-026-003, BELVIDERE, TN Updated: 08/93
(aka SNOW'S MILL) CONDITION-*Site Only*, POWERED BY-*Overshot Wheel*
Location; (E 9), 500 feet upstream from Falls Mill (TN-026-002).
Comments; 3 storey brick bldg. with some equipment. Not operable. Overshot wheel is missing. This mill has been dismantled and moved, completely, to unknown site in a northwestern state.

GILES COUNTY

BODENHEIM MILL. TN-028-001, PULASKI, TN Updated: 11/89
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (D 7), 8 miles west of PULASKI on US 64 in the community of BODENHEIM
Comments; Not operable, but has a steel wheel behind the mill, hidden from view A 1 storey bldg. with tin siding, on Choate Creek.

GRAINGER COUNTY

MASSENGILL MILL. TN-029-001, BLAINE, TN Updated: 01/98
CONDITION-*Deteriorating*, POWERED BY-*Overshot Wheel*
Location; (B 13) vicinity of BLAINE, 750 yards north of Tampico Road, just south of Buffalo Springs Game Farm.
Comments; An 18th century mill which has been inoperable for many years, and has deteriorated badly. A forest surrounds the mill now.

RICHLAND MILL. TN-029-002, BLAINE, TN Updated: 06/96
CONDITION-*Pvt. Res.*, POWERED BY-*Turbine*
Location; (B 13). From exit #392, I-40, take US 11 W north. In BLAINE turn onto Indian Ridge Road at Breedings Restaurant. Go 2 1/2 miles to the mill.
Comments; Now a beautiful pvt. residence. Much machinery has been removed. The mill has been purchased by SPOOM member Marvin House and is being restored.

GREENE COUNTY

AFTON MILL. TN-030-001, AFTON, TN Updated: 11/89
Built-1783, CONDITION-*Feed Mill*, POWERED BY-*Electric*
Location; (B 15) in the community of AFTON. In GREENVILLE take US 11E to Greenville Hospital, turn north just past the bridge, go 1/4 mile to the mill on Sinking Creek.
Comments; Was water powered, now uses electricity. Mostly a feed mill. Original mill was built in 1783 at what was then Henderson's Station.

BABB'S MILL. TN-030-002, WALKERTON, TN Updated: 08/93
CONDITION-*Deteriorating*
Location; (B 15) vicinity of GREENVILLE in the community of WALKERTON on Roaring Creek.
Comments; Not operable, now used for storage. Frame bldg. in run-down condition. The water wheel is a Pelton wheel.

CANEY BRANCH MILL. TN-030-003, CANEY BRANCH, TN Updated: 08/93
CONDITION-*Abandoned*, POWERED BY-*Overshot Wheel*
Location; B 15) vicinity of GREENEVILLE in the community of CANEY BRANCH on Old Newport Highway (Old US 411).
Comments; Appears to be gutted, but still standing.

CLEAR CREEK MILL. TN-030-004, JEAROLDSTOWN, TN Updated: 06/95
CONDITION-*Site Only*
Location; (B 15) vicinity of GREENEVILLE. From JEAROLDSTOWN exit off I-81, turn south for 1.5 mile, then turn left (south) to mill on Clear Creek Road. Mill is on Clear Creek.
Comments; Overshot wheel is gone. Now used for storage.
Reported to have burned down in 1995. No other information.
Reference OMN;
Editor, "MILLING AROUND", Spring 1996, pp. 21

COLLEGE CREEK MILL. TN-030-005, SIMPSON, TN Updated: 11/89
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (B 15) vicinity of GREENEVILLE, 0.5 mile north of SIMPSON ISLAND in the Nolichucky River, along College Creek near its confluence with the Nolichucky River.
Comments; Mill is very small and uses a 7 foot diameter wheel to power a generator. Appears to be abandoned.

GREENE COUNTY (CONT.)

EAGLE MILL. TN-030-006, JOCKEY, TN Updated: 11/89
CONDITION-*Non-Operating*
Location; (B 15) vicinity of GREENEVILLE near the community of JOCKEY on Jockey Creek.
Comments; Mill is inoperable and appears to be used for storage.

FILLERS MILL. TN-030-007, CEDAR CREEK COMMUN., TN Updated: 11/89
CONDITION-*Feed Mill*, POWERED BY-*Turbine*
Location; (B 15) 3 miles north of CEDAR CREEK COMMUNITY on Cove Creek. From GREENVILLE take Rt. 70 south 8 or 9 miles (1 mile south of the Nolichucky River bridge) to Cedar Creek Road, turn east for 2.5 miles to the mill.
Comments; Feed Mill.

HOLLAND MILL. TN-030-008, HOLLAND MILL, TN Updated: 08/93
CONDITION-*Pvt. Res.*, POWERED BY-*Overshot Wheel*
Location; (B 15) vicinity of GREENEVILLE in community of HOLLAND MILL, 1 mile east of LOCUST SPRINGS, on Union Temple Creek.
Comments; Converted to a pvt. residence in 1978.

MOHAWK MILL. TN-030-009, MOHAWK, TN Updated: 11/89
CONDITION-*Non-Operating*, POWERED BY-*Electric*
Location; (B 15) vicinity of GREENEVILLE in community of MOHAWK on Lick Creek.
Comments; Was water powered, now uses electricity. Appears to be not in use.

PATE HILL MILL. TN-030-010, GREENEVILLE VICINITY, TN Updated: 01/98
POWERED BY-*Turbine*
Location; (B 15) vicinity of GREENEVILLE on the Nolichucky River, 2 miles east of the Hale Bridge, near the Cocke-Greene county line.
Comments; Extremely small mill structure. NOTE: There is an authentic covered bridge nearby on Bible Branch Road.

ROMEO MILL. TN-030-011, GREENEVILLE VICINITY, TN Updated: 01/98
CONDITION-*Site Only*, POWERED BY-*Other*
Location; (B 15) vicinity of GREENEVILLE on Rt. 70, about 1.5 mile north of I-81, on Pigeon Creek.
Comments; Was powered by a gasoline engine. The mill is gone.

SCOOT MILL. TN-030-012, WARRENSBURG, TN Updated: 02/92
CONDITION-*Site Only*
Location; (B 15) vicinity of GREENEVILLE, 5 miles north of WARRENSBURG and 1.5 mile east of BEULAH COMMUNITY.
Comments; Large frame building. Reported in '88 as having been demolished.

SMITHTOWN MILL. TN-030-013, UNION TEMPLE, TN Updated: 11/89
(aka WAMPLER MILL) CONDITION-*Non-Operating*
Location; B 15) vicinity of GREENEVILLE. From community of UNION TEMPLE in northeast Greene County, go to Oakdale Church on the Jearoldstown Road, take 1st left. Go 1 to 2 miles to the mill.
Comments; Not operating, very remote.

STEPHENS MILL. TN-030-014, GREENVILLE, TN Updated: 08/93
(aka ANDY'S / LINK'S MILL) Built-1886, CONDITION-*Under Restoration*
POWERED BY-*Overshot Wheel*
Location; (B 15) at GREENVILLE near the Links Country Club, on Richland Creek.
Comments; Built in 1886. Reported in '88 as being in near-collapse condition.

WALKER MILL. TN-030-015, GREENVILLE, TN Updated: 11/89
CONDITION-*Non-Operating*
Location; (b 15). From GREENEVILLE go south on Rt. 70 for 8 miles, turn right (east on Meadow Creek Road, go over Allen Bridge (Nolichucky River), take 1st road left (south), then turn right at the 1st road fork to the mill.
Comments; Not in operation.

WATERFORK MILL. TN-030-016, GREENEVILLE, TN Updated: 11/89
CONDITION-*Deteriorating*
Location; (B 15). From GREENEVILLE, take Rt. 107 south, cross Nolichucky River, turn west on Old Jonesboro Road, go 2 miles to Myers Road, and turn left (south). Mill is on the left.
Comments; Last operated in 1946. Only a shell remains.

HAMBLEN COUNTY

KING'S MILL. TN-032-001, MORRISTOWN VICINITY, TN Updated: 01/98
(aka WHITLOCK MILL) CONDITION-*Non-Operating*
Location; (B 14) vicinity of MORRISTOWN on west side of SR 160, 1.5 mile north of the I-81 exit.
Comments; Inoperable, used for storage of junk. No machinery, only wood frame shell remains.

HAMILTON COUNTY

BELL'S MILL. TN-033-001, OOLTEWAH, TN Updated: 11/89
CONDITION-*Non-Operating*
Location; (E 11), 2.5 miles north of OOLTEWAH, just 0.5 mile west of Snow Hill Road.
Comments; Inoperable.

LOWER MILL. TN-033-002, HIXSON, TN Updated: 11/89
CONDITION-*Abandoned*
Location; (E 10) vicinicy of GEORGETOWN in community of HIXSON, on North Chickamauga Creek at its junction with Lower Mill Road. From Hixson Pike, take Middle Valley Road to Lower Mill Road, turn left for about 1 mile.
Comments; Mill appears to be abandoned.

HANCOCK COUNTY

MATHIS MILL. TN-034-001, SNEEDVILLE, TN Updated: 11/89
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (A 14), 4 miles west of SNEEDVILLE and 1 mile north of Rt. 33, on Briar Creek.
Comments; Mill appears to be in operating condition, but is not operating.

THOMPSON'S MILL. TN-034-002, ALANTHUS HILL, TN Updated: 11/89
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (vicinity of SNEEDVILLE near the community of ALANTHUS HILL, on Four Mile Creek at its confluence with the Powell River. Community not on state map.
Comments; Not operating, but could be made operable with some repairs. Mill was for sale but present status is not known.

MILL'S MILL. TN-034-003, SNEEDVILLE, TN Updated: 11/89
Built-1932, CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (A 14). Take Rt. 31 for 8 miles south of SNEEDVILLE, turn west on War Creek Road, and go 4 miles to mill site behind residence of owner, Mr. Mills (1985).
Comments; Cannot be seen from the road. Ask permission. Built in 1932, has 34" buhrs. A small mill with wooden wheel, now used for hay storage.

HARDEMAN COUNTY

HICKORY VALLEY MILL. TN-035-001, BOLIVAR, TN Updated: 01/94
CONDITION-*Deteriorating*, POWERED BY-*Steam*
Location; (D 3) in community of HICKORY VALLEY, south of BOLIVAR on SR 16.
Comments; Made sassafras oil. No longer operates, bldg. in poor condition. (See OLD MILL NEWS, Winter, 1985, page 7).
Reference OMN;
Henderson, Cary, "Hickory Valley Sassafras Mill", Winter 1985, pp. 7

HARDIN COUNTY

PAULK'S MILL. TN-036-001, SAVANNAH, TN Updated: 11/89
CONDITION-*Site Only*
Location; (D 5) 2 miles northeast of SAVANNAH on Rt. 128 at the Paulk's Mill Bridge
Comments; Only limestone foundation remains.

HAWKINS COUNTY

HORD MILL. TN-037-001, CHURCH HILL, TN Updated: 08/93
(aka CANTON ROLLER/TIPTON MILL) CONDITION-*Non-Operating*
Location; (A 15), 4 miles north of CHURCH HILL. From Church Hill go north on Rt. 346 to Carter Valley Road. Turn west 4 miles to Mt. Zion Road, then 2.5 miles to Tipton Lane.
Comments; Mill is inoperable.
Reference OMN;
"Wrong Sign, Wrong Mill", Summer 1973, pp. 3

RICE MILL. TN-037-002, CHURCH HILL, TN Updated: 11/89
CONDITION-*Deteriorating*, POWERED BY-*Overshot Wheel*
Location; (A 15), 2 miles west of CHURCH HILL on New US 11E. Can be seen from the highway below an historical marker. On Hord Creek.
Comments; Inoperable, but has a wooden wheel and gambrel roof. Deteriorating badly.

HUMPHREY COUNTY

ENOCH'S MILL. TN-043-001, MCEWEN, TN Updated: 08/93
(aka LITTLE BLUE CREEK MILL) Built-1934, CONDITION-*Non-Operating*
POWERED BY-*Turbine*
Location; (B 6), 4 miles west of McEWEN on Little Blue Creek. From McEwen, go west on US 70 for 3.5 miles and turn south on Old Blacktop Road. Turn south again on Dunn Road for 1 mile, and west on Little Blue Creek Road. The mill is located on Enoch Road, just off Little Blue Creek Road.
Comments; Built of hand hewn logs in 1934 by Mr. Enoch to generate electricity for his farm. According to the late Mr. Enoch's daughter, the mill is in operational condition but is not now operating. She would like to restore the mill.
Reference OMN;
Gore, Edwina, "Little Blue Creek Mill, McEwen, TN", Spring 1976, pp. 13

HURRICANE MILL. TN-043-002, HURRICANE MILLS, TN Updated: 01/98
(aka LORETTA LYNN'S MILL) CONDITION-*Other Business*, POWERED BY-*Turbine*
Location: (C 6). From I-40 exit at BUFFALO, go north on SR 13 for 8 miles and turn west on Hurricane Creek Road, 3 miles to the mill.
Comments; Singer Loretta Lynn, who lives in the large house directly across the river from the mill, uses it as a museum of her country music career, and as a gift shop. Not in operation as a mill.
Reference OMN;
James, R.H., "Loretta Lynn's Mill", Winter 1978, pp. 11

JACKSON COUNTY

WHITLEYVILLE MILL. TN-044-001, WHITLEYVILLE, TN Updated: 02/96
(aka BIG SPRING MILL) CONDITION-*Site Only*
Location; (B 10). From Gainesboro go north on Rt. 56N about 10 miles to WHITLEYVILLE. The mill site is at 707 north Fork Lane.
Comments; The mill has been demolished and a cottage has been built on the site. The owner is SPOOM vice president Thomas Churley Freestone. Address: 707 North Fork Lane, Whitleyville, TN 38588-9702. Phone: 615-621-3456.
Reference OMN;
Freestone, Thomas, "The Whitleyville Mill", Winter 1988, pp. 8

JEFFERSON COUNTY

W.C. HILL MILLING CO.. TN-045-001, DANDRIDGE, TN Updated: 08/93
CONDITION-*Other Business*, POWERED BY-*Electric*
Location; (B 14), 1.5 mile east of DANDRIDGE on the north side of US 70/25@.
Comments; Where "White Rose" flour was produced. Brick bldg. in very good condition, but not in operation. Power source or age of mill not known, but it appears to be a 20th century mill. Now used for furniture sales.

HUNNICUTT MILL. TN-045-002, DANDRIDGE, TN Updated: 08/93
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (B 14). From DANDRIDGE go north 3.5 miles on Old Rt. 92. Mill is on west side of road, on Cheney Creek.
Comments; Inoperable, but bldg. is in fair condition. No machinery.

HODGES MILL. TN-045-003, DANDRIDGE, TN Updated: 01/98
(aka DUMPLIN CREEK MILL) CONDITION-*Operational*, POWERED BY-*Overshot Wheel*
Location; (B 14) vicinity of DANDRIDGE. From exit #406 on I-40, turn north and take the first road on the rght. Go 3 miles, look for Hodges Mill sign. On Dumplin Creek.
Comments; Mill is operating, although not on a regular basis. Ask permission to enter mill area.
Reference OMN;
LaForest, Mike, "Hodges Mill", Winter 1983, pp. 7-8

COX MILL. TN-045-004, JEFFERSON CITY, TN Updated: 06/96
(aka MILL SPRING MILL) CONDITION-*Pvt. Res.*, POWERED BY-*Overshot Wheel*
Location; (B 14) north of JEFFERSON CITY on Fielden's Store Road, on Mill Spring Creek, just below TVA's Cherokee Dam, 0.5 mile north of Rt. 92, off Mill Spring Road, near Mill Spring Church.
Comments; Inoperable. Brick building converted to a studio/residence by SPOOM member Stewart Worden. Listed on the National Register of Historic Places, 1983.

K.C. FRENCH MILL. TN-045-005, DANDRIDGE, TN Updated: 05/95
(aka KITE MILL) Built-1877, CONDITION-*Under Restoration*
POWERED BY-*Overshot Wheel*
Location: (B 14). Exit I-40 at the 412 exit, about 20 miles east of Knoxville. Go south on Deep Springs Road for 0.1 mile to the Harbin Road (this road is directly across from the T/R Truck Stop). Turn left (the only way you can turn), follow this road about 1.9 mile back over I-40 to its end, then make a sharp left on French Mill

K.C. FRENCH MILL. TN-045-005, (CONTINUED)
Road, go 0.1 mile, cross bridge. Driveway to the mill is at the end of the bridge. Comments; Built c.1877, the mill has been idle for many years. Heavy rains did considerable damage to the foundation. All equipment was left in the mill. It has been purchased by SPOOM member Fritz Lambright of Angola, IN, who is in the process of restoring the structure to operational condition. Sometime just before World War 1, the W.J. Savage Co., of Knoxville, installed two Ty-sa-man rollers, the old buhrs were removed, and Savage brand scourers and packing machinery was installed. Even the extant waterwheel (a Fitz look alike) was made and installed by Savage. There is also a 20 inch Meadows mill for making table meal.
Address: Freeman C. (Fritz) Lambright, 15 LN 250B, West Otter Lake, Angola, IN 46703. Phone: (219)665-8907.
Reference OMN;
"K.C. French Mill Gets New Lease On Life", Spring 1991, pp. 17

JOHNSON COUNTY

LAUREL BLOOMERY MILL. TN-046-001, LAUREL BLOOMERY, TN Updated: 08/93
CONDITION-*Deteriorating*
Location; (A 17) in community of LAUREL BLOOMERY, about 500 ft./ west of SR 91, 8 miles south of DAMASCUS, VA. On Laurel Creek.
Comments; None.

SILVER LAKE MILL. TN-046-002, MOUNTAIN CITY, TN Updated: 11/89
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (A 17), 6 miles north of MOUNTAIN CITY and 1 miles east of SR 91, on Nat Wills Road. On a tributary of Wills Creek.
Comments; Inoperable. A white frame building.

WILLS MILL. TN-046-003, MOUNTAIN CITY, TN Updated: 08/93
Built-1880, CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (A 17), 1.5 mile Northwest of MOUNTAIN CITY on north side of US 421, on Corn Creek.
Comments; Built in 1880. Last used to grind movie film into flakes for the paint industry. Last operated in 1968. Has no water supply.

SNYDER'S MILL. TN-046-004, MOUNTAIN CITY, TN Updated: 11/89
Location; (A 17) on US 421, heading toward MOUNTAIN CITY, go to Evergreen Baptist Church and an old store. This is the community of Key Station. 0.2 mile past the store, 2 unmarked road turn left. Take a sharp left on the second road. Snyder's mill is on the right. Continue on this road and in 0.2 mile you'll be back on US 421.
Comments; This mill was reported in "TENNESSEE MAGAZINE", 12/88, but has not been confirmed.

KNOX COUNTY

CARNES MILL. TN-047-001, CLINTON, TN Updated: 01/98
CONDITION-*Abandoned*
Location; (B 13) vicinity of CLINTON in north Knox County on Conner Road, near I-75. On Conner's Creek.
Comments; In very poor condition, no machinery, bldg. vacant.

B.G. PETERS MILL. TN-047-002, KODAK, TN Updated: 01/98
CONDITION-*Deteriorating*, POWERED BY-*Overshot Wheel*
Location; (B 14) vicinity of KODAK in east Knox County at corner of Bales Road and Kodak Drive, on Tuckahoe Creek. Quad:156 NW.
Comments; Dam is breached and mill has been idle for many years. Some machinery, but the building is VERY DANGEROUS.

RIVERDALE MILL. TN-047-003, RIVERDALE, TN Updated: 06/96
(aka KENNEDY/PICKLE/FRASER) CONDITION-*Pvt. Res.*, POWERED BY-*Overshot Wheel*
Location; (C 13) east of KNOXVILLE in east Knox County at corner of Wayland and Thorngrove Pike, on Campbell Spring Branch.
Comments; Had been restored by SPOOM member Jean McCoy in the early '80's. Used a Meadows Mill for grinding. The Fitz overshot wheel is 30 ft. X 3 ft. The mill and property has been sold and has being converted to a pvt. residence. (4/91). The owners are Robin and Paul Schiefer. Listed on the National Register of Historic Places, 1987.
Reference OMN;
LaForest, Michael J., "Discovering Campbell Spring Branch", Fall 1988, pp. 16-18

ATCHLEY'S MILL. TN-047-004, KNOXVILLE, TN Updated: 06/96
(aka EBENEZER MILL) CONDITION-*Under Restoration*, POWERED BY-*Turbine*
Location; (C 13) west of KNOXVILLE in west Knox County on Ebenezer Road, on 10 Mile Creek.
Comments; Planned for restoration by SPOOM member Hooper Anderson. Dam was breached many years ago. Listed on the National Register of Historic Places, 1987.

HACKNEY MILL. TN-047-005, KNOXVILLE, TN Updated: 01/98
CONDITION-*Non-Operating*
Location; (B 13) west of KNOXVILLE in west Knox County, off Concord Road. Private access, on Turkey Creek.
Comments; Building is standing, apparently in good condition, but all machinery is gone. Use for storage.

HANSARD MILL. TN-047-006, CLINTON, TN Updated: 01/98
CONDITION-*Non-Operating*
Location; (B 13) vicinity of CLINTON in north Knox County, near Anderson County line, 2 miles northeast of US 441, on Bull Run Drive. Near Bull Run Creek.
Comments; Was a distillery and mill. No machinery. Small bldg. used for storage. Former water power not apparent.

JETT MILL. TN-047-007, KNOXVILLE, TN Updated: 01/98
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (C 13) vicinity of KNOXVILLE in north Knox County on Pedigo Road, across from Fairhaven Church. On Long Hollow Branch, near Bull Run Creek.
Comments; Mill is idle, but exterior appears in very good shape. Machinery apparently gone.

MC BEE MILL. TN-047-008, KNOXVILLE, TN Updated: 01/98
CONDITION-*Non-Operating*, POWERED BY-*Turbine*
Location; (C 13) vicinity of KNOXVILLE Aa intersection of Washington Pike and Idumea Road, on Flat Creek.
Comments; No longer operable. Remains of wooden dam visible.

NUBERT MILL. TN-047-009, KNOXVILLE, TN Updated: 01/98
CONDITION-*Pvt. Res.*, POWERED BY-*Overshot Wheel*
Location; (C 13) vicinity of KNOXVILLE in south Knox county, off Neubert Springs Road, on Stock Creek.
Comments; Site of a former health spa. Mill used to grind meal and generate power.

O'DELL MILL. TN-047-010, KNOXVILLE, TN Updated: 01/98
CONDITION-*Other Business*, POWERED BY-*Overshot Wheel*
Location; (C 13) vicinity of KNOXVILLE in north Knox County on Gray Road, off Rt. 33.
Comments; Now used by a commercial greenhouse. No machinery.

VENDEVENTER WATER WHEEL. TN-047-011, KNOXVILLE, TN Updated: 08/93
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (C 13) vicinity of KNOXVILLE. From Kingston Pike in Knoxville, turn south on Lyons View Drive for about 1.5 mile, turn left (south) on Northshore Drive for about 0.5 mile, then left (east) on Lyons Bend Road for 1.25 mile to the pump.
Comments; Not a grist mill, but a very picturesque Fitz water wheel about 30 ft. in diameter, 1 ft. wide, which was used to power a water pump in the 1930's.

VIRTUE MILL. TN-047-012, KNOXVILLE, TN Updated: 01/98
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (B 13) vicinity of KNOXVILLE in west Knox County on Virtue Road, along Virtue Creek.
Comments: Last used as a packing plant. No milling machinery. Used an overshot wheel, located behind bldg. Dam was breached many years ago. Building in poor condition.
Reference OMN;
LaForest, Michael, "The Carter Mill", Fall 1978, pp. 8-9
"Carter Mill Restoration", Winter 1979, pp. 18
"Carter Mill", Fall 1980, pp. 17

CREEK SIDE (?) MILL. TN-047-013, KNOXVILLE, TN Updated: 05/96
CONDITION-*Other Business*
Location; (B 13). From KNOXVILLE, take I-75 north. When you see the large smokestack, turn off at the next exit and go to the mill site.
Comments; A former steam powered textile mill. Now used for other purposes.

LAWRENCE COUNTY

DAVEY CROCKETT MILL. TN-050-001, LAWRENCEBURG, TN Updated: 01/98
CONDITION-*Museum*, POWERED BY-*Overshot Wheel*
Location; (D 6) near Lawrenceburg within DAVY CROCKETT STATE PARK.
Comments; Rebuilt from an earlier mill said to be located on the site. A very simple mill, used to show how a mill operates. There is a covered bridge beside the mill. Neither the mill or the covered bridge are of authentic construction.
Reference OMN;
Gore, Edwina, "Old MIll In David Crickett State Park, TN", Fall 1977, pp. 2

BUSH CREEK MILL. TN-050-002, WEST POINT COMMUNITY, TN Updated: 11/89
Location; (D 6) vicinity of LAWRENCEBURG. Said to be located 10 miles northwest of WEST POINT COMMUNITY near the Pea Ridge Church of Christ, on Spring Creek.
Comments; None.

LAWRENCE COUNTY (CONT.)

GARNER MILL. TN-050-003, LAWRENCEBURG, TN Updated: 06/96
(aka RICHARDS MILL) Built-1820, CONDITION-*Non-Operating*, POWERED BY-*Turbine*
Location; (D 6). From the center of LAWRENCEBURG take US 43 south for 5 blocks, turn right onto Garner Road at end of bridge over Shoal Creek. Mill is 500 feet on the right side.
Comments; Built in 1820 and has bee restored by owner SPOOM member Bud Richardson, and it is now used as a warehouse for his Holly House Antiques. Listed on the National Register of Historic Places, 1984. Not open to the public, but can be seen with 1 day's advance notice. The mill is currently For Sale. Address: W.A. Richardson, 419 Lawrence Street, Lawrenceburg, TN 38464. Phone: (615)762-5241.

FALL RIVER MILL. TN-050-004, LAWRENCEBURG, TN Updated: 10/97
CONDITION-*Non-Operating-Photogenic*, POWERED BY-*Turbine*
Location; (D 6). From LAWRENCEBURG take Fall River Road southeast for 10 miles. Located near a small country store, on Clear Creek.
Comments; Very picturesque mill. The mill has been stabalized and is kept in reasonable condition by its current owners, but is not in operation. Most of the milling equipment remains in the mill but is in poor condition.

LORETTO MILL. TN-050-005, LORETTO, TN Updated: 11/89
POWERED BY-*Electric*
Location; (E 6) in community of LORETTO on Bluewater Creek.
Comments; None.

PEACH MILL. TN-050-006, MINOR HILL, TN Updated: 11/89
CONDITION-*Deteriorating*
Location; (E 7), 5 miles west of MINOR HILL.
Comments; Badly deteriorated, not operable.

LINCOLN COUNTY

ROCHELLE,S MILL. TN-052-001, FAYETTEVILLE, TN Updated: 04/93
(aka SMITH'S MILL) CONDITION-*Pvt. Res.*, POWERED BY-*Overshot Wheel*
Location; (E 8). From FAYETTEVILLE go south 7 miles on Rt. 231, then 3 miles east on bypass 275. On Lincoln Road and Smith Mill road. On Cotrell Spring Branch.
Comments; After a long court battle, water rights were restored to the mill, and it is now a very nice residence. Address: Wyona Gibson, Rt. 4, Box 327, Fayetteville, TN 37334. Phone: 615-433-3244.

BUCK MILL. TN-052-002, FLINTVILLE, TN Updated: 11/89
CONDITION-*Non-Operating*
Location; (E 8) in community of FLINTVILLE, 3 miles south of US 64, on the Flint River.
Comments; None.

HARMS MILL HYDRO PLANT. TN-052-003, FAYETTEVILLE, TN Updated: 07/96
Location; (E 8) near FAYETTEVILLE on SR 15 at the Elk River. No better location available.
Comments; Listed on the National Register of Historic Places, 7/5/90. No other information available.

LOUDON COUNTY

ROBINSON'S MILL. TN-053-001, LOUDON, TN Updated: 06/96
(aka POND CREEK MILL) CONDITION-*Operational*, POWERED BY-*Electric*
Location; (C 12) on Old Rt. 72, 2 miles east of LOUDON, on Clear Branch.
Comments; Operates commercially as the Pond Creek Milling Co., by Joe Randle. Listed on the National Register of Historic Places, 1984.

WALKER MILL. TN-053-002, SUGAR LIMB, TN Updated: 11/89
CONDITION-*Abandoned*
Location; (C 12). vicinity of LOUDON. From SUGAR LIMB exit on I-75, turn south and take the first right to the mill. On Hotchkiss Creek.
Comments; Mill is gutted and vacant. Wheel and dam gone.

LENOIR CITY COTTON MILL. TN-053-003, LENOIR CITY, TN Updated: 06/96
CONDITION-*Site Only*
Location; (C 12) in LENOIR CITY on Depot Street near the railroad tracks.
Comments; Mill was being renovated by a local historical society (SPOOM members) when it was destroyed by fire in 1991. It was a 3 1/2 storey brick structure and was water powered. Recorded by HAER. It was listed on the National Register of Historic Places, 1975.
Reference OMN;
"Lenoir Cotton Mill", Spring 1981, pp. 15
"Lenoir City Cotton Mill Burns", Fall 1991, pp. 5

FOWLER'S MILL. TN-053-004, LOUDON, TN Updated: 01/93
Built-1875, CONDITION-*Operational*, POWERED BY-*Turbine*
Location; (C 12). From the LOUDON exit off I-75 onto Hwy 72, go to the traffic light, turn right onto Steekee Road, and then 5.9 miles to the mill.
Comments; Built in 1875 on the site of an earlier mill. Meal and whole wheat flour

FOWLER'S MILL. TN-053-004, (CONTINUED)
is produced on a Meadows 24" mill built in 1947, and power is supplied by a Leffel Samson turbine. SPOOM member Rhea Alexander, 733 Steekee Street, Loudon, TN 37774 is the mill owner. Phone: (615)458-2282.

MC MINN COUNTY

COG HILL MILL. TN-054-001, ETOWAH, TN Updated: 03/94
Built-1863, CONDITION-*Non-Operating*, POWERED BY-*Turbine*
Location; (D 12), 2 miles southwest of ETOWAH and 1.5 mile west of US 411, on Conasauga Creek.
Comments; Built in 1863, 3 storey mill. Owner is SPOOM member John Middleton, Jr. Much milling machinery remains in the large mill. Dam has been breached. Phone: (615)887-5278 for appointment to visit the mill.

THOMPSON SPRING MILL. TN-054-002, RICEVILLE, TN Updated: 11/89
(aka (REAL NAME UNKNOWN)) CONDITION-*Pvt. Res.*
Location; (D 12), 3/4 mile south of I-75 at the RICEVILLE exit.
Comments; The frame mill is now a residence and is opposite the Bell Springs Minnow Farm, adjacent to a large spring from which a ram pump is in operation.

MARION COUNTY

KETNER'S MILL. TN-058-001, WHITWELL, TN Updated: 06/96
CONDITION-*Operational*, POWERED BY-*Turbine*
Location; (D 10). From I-24 west of Chattanooga, exit on SR 28 (Nick-a-jack Dam), and turn north on Rt. 28. Go 3 miles to a "T" intersection, and keep to the right, which is Rt. 28. Go 3 miles to Ketner Mill Road and turn left across from Oak Grove Church.
Comments; Brick structure on the Sequatchie River. Listed on the National Register of Historic Places, 1977. The only known double carding machine in operation in the U.S. has been restored and is displayed in the mill. Due to the death of Clyde Ketner in July, 1992, the fate of this mill is uncertain.. Craft fairs are held here in the Spring and Fall.
Reference OMN;
- Gore, Edwina, "Ketner's Mill", Summer 1978, pp. 9
- "Ketner's Mill", Winter 1981, pp. 16
- Beals, Fred & Betty, "Mill Hunting - Indiana To Georgia", Winter 1982, pp. 12-14
- LaForest, Michael J., "SPOOM At The World's Fair", Spring 1982, pp. 15
- LaForest, Michael J., "Middlings", Fall 1982, pp. 13
- "SPOOM Conference '86", Summer 1986, pp. 12
- "130 Attend Annual SPOOM Conference in Dalton, GA", Winter 1987, pp. 19
- "We Heard It By The Grapevine", Winter 1988, pp. 23
- "Prater's, Ketner's Mills Hold Successful Fairs", Winter 1991, pp. 14
- Beals, Fred, "Young At Heart - In Youngstown", Winter 1992, pp. 10-13
- "1992 SPOOM Conference, Monteagle, TN", Spring 1992, pp. 19
- LaForest, Michael J., "SPOOM Conference, 1992", Summer 1992, pp. 12-13
- LaForest, Michael, "Fall 1992, pp. COVER
- LaForest, Michael J., "11th Annual SPOOM Convention", Winter 1993, pp. 12-14

MARSHALL COUNTY

WILHOITE MILL. TN-059-001, HENRY HORTON ST. PK., TN Updated: 02/92
CONDITION-*Site Only*
Location; (D 8) north of FARMINGTON in HENRY HORTON STATE PARK on the Duck River, adjacent to Rt. 31A.
Comments; This mill has been razed, and no longer exists.

LILLARD'S MILL HYDRO. TN-059-002, MILLTOWN, TN Updated: 07/96
Location; (D 8) vicinity of LEWISBURG on McLean Road at the Duck River, near MILLTOWN. No better location available.
Comments; Listed on the National Register of Historic Places, 4/20/90. No other information available.

MAURY COUNTY

KETTLE MILL. TN-060-001, WILLIAMSPORT, TN Updated: 11/89
CONDITION-*Non-Operating*
Location; (C 7), 5 miles west of WILLIAMSPORT on the Duck River

Comments; Dam is removed, but bldg remains Not operable

MEIGS COUNTY

ZIEGLER'S MILL. TN-061-001, TEN MILE, TN Updated: 06/96
(aka J.R. GETTY MILL) CONDITION-*Deteriorating*, POWERED BY-*Turbine*
Location; (C 12) near TEN MILE, 3 miles east of SR 58 on North No Pone Valley Road near the McMinn County line, on Little Sewee Creek.
Comments; Not in operation. Most of machinery remains intact, but the mill is in a serious state of deterioration. Listed on the National Register of Historic Places, 1982.

MC KENZIE WINDMILL. TN-061-002, GEORGETOWN, TN Updated: 11/89
Built-1931,
POWERED BY-*Wind*
Location; (D 11) in the community of GEORGETOWN on SR 58.
Comments; Built in 1931 by Aermotor. It is used to pump water, not to grind grain.

MONROE COUNTY

BELLTOWN MILL. TN-062-001, BELLTOWN COMMUNITY, TN Updated: 11/89
CONDITION-*Non-Operating*
Location; (D 12 vicinity of MADISONVILLE in the BELLTOWN COMMUNITY on Cane Creek.
Comments; Wood frame mill. Some machinery remains, but the bldg. is used mostly for farm storage.

CONASAUGA MILL. TN-062-002, RURAL VALE COMMUNITY, TN Updated: 11/89
CONDITION-*Deteriorating*
Location; (D 12) in the RURAL VALE COMMUNITY, 6 miles southwest of TELLICOE PLAINS.
Comments: Wood frame structure, deteriorating rapidly.

FOWLER MILL. TN-062-003, EVE MILLS, TN Updated: 06/96
(aka EVE MILL) CONDITION-*Operational Other Mill*, POWERED BY-*Turbine*
Location; (C 12). From LOUDON exit off I-75, turn left toward Hwy 11. Go to second traffic light, turn right onto Steekee Road and follow it about 6 miles to Fowlers Mill.
Comments; Used occasionally for seed cleaning. Owners are SPOOM members Rhea & Earl Alexander. Listed on the National Register of Historic Places, 1983.

DIXIE ROLLER MILL. TN-062-004, MADISONVILLE, TN Updated: 11/89
CONDITION-*Operational*, POWERED BY-*Electric*
Location; (D 12) within the city limits of MADISONVILLE.
Comments; This commercial mill was water powered, but has converted to electricity. Uses rollers for grinding.

MONTGOMERY COUNTY

RINGOLD MILL. TN-063-001, CLARKSVILLE, TN Updated: 06/96
(aka GELLO MILL (IN 1800'S)) Built-1875, CONDITION-*Non-Operating*
POWERED BY-*Turbine*
Location; (A 6), 7 miles northwest of CLARKSVILLE, on Ft. Campbell Blvd, then 200 yards on Old Mill Road, 1/4 mile east of US 41A in the RINGOLD COMMUNITY, on Little West Fork Creek.
Comments; Built in 1875, a 3 storey beautiful mill and grounds, but not operating. Listed on the National Register of Historic Places, 1980.

MOORE COUNTY

LEDFORD MILL. TN-064-001, TULLAHOMA, TN Updated: 01/97
(aka LEDFORD MILL B & B) Built-1884, CONDITION-*Other Business*, POWERED BY-*Turbine*
Location; (D 9), 3 miles west of TULLAHOMA on Ledford Mill Road. Going north out of Tullahoma on US 41A, turn onto Ledford Mill Rd at Lowes Hardware store On Shipman Creek.
Comments: The mill has been beautifully restored by SPOOM treasurar Bill Rigler, but has been sold to Dennis and Kathleen Depert. They reside on the lower level, and the upper floors are used for an artist's studio and as a Bed & Breakfast. The mill was listed on the National Register of Historic Places, 1985. For more complete information, phone: 615-455-2546. Address: Ledford Mill, Rt. 2, Box 152 B, Wartrace, TN 37183-9802.
Reference OMN;
"Old Mills In Tennessee", Spring 1975, pp. 3
Rigler, Bill, "Historic Ledford Mill Still Grinds Corn On Stones", Spring 1986, pp. 9
Beals, Fred, "Young At Heart - In Youngstown", Winter 1992, pp. 10-13
"1992 SPOOM Conference, Monteagle, TN", Spring 1992, pp. 19
LaForest, Michael J., "SPOOM Conference, 1992", Summer 1992, pp. 12
Rigler, Bill, "Ledford Mill Grinding Rehabilitation", Winter 1993, pp. 10-11

LEDFORD MILL. TN-064-001, (CONTINUED)
LaForest, Michael J., "11th Annual SPOOM Convention" Winter 1993, pp 12-14

OVERTON COUNTY

HOLMAN MILL. TN-067-001, LIVINGSTON, TN Updated: 11/89
(aka RAY MILL/SELLS MILL) CONDITION-*Site Only*
Location; (B 10) in DEEP VALLEY CAMPGROUND & TROUT FARM, 6 miles north of LIVINGSTON on Hunter Cove Road, along Mitchell Creek. Remains of mill are difficult to find without good maps.
Comments; None.

KEISLING MILL. TN-067-002, LIVINGSTON, TN Updated: 11/89
CONDITION-*Non-Operating*
Location; (B 10), 3 miles south of LIVINGSTON and 1/4 mile west of Rt. 42 at the OKALONA COMMUNITY.
Comments; Wood frame bldg., not operable.
Reference OMN;
"People, Places and Things...", Fall 1976, pp. 16-17
"OLD MILLS IN THE NEWS", Spring 1977, pp. 12

UNION HILL MILL. TN-067-003, LIVINGSTON, TN Updated: 06/91
(aka TINCH MILL) CONDITION-*Deteriorating*, POWERED BY-*Overshot Wheel*
Location; (B 10), 5 miles south of LIVINGSTON between Rts. 84 & 42. From RICKMAN, turn east on the Rickman-Monterey Road, go 2 miles to first blacktop north, which is Oak Hill Road. Go 3 miles north to a dirt road on east side of the highway. Mill is located at the end of the road in the old Union Hill Community.
Comments; Not operating but could be made operable. Very scenic. Mill has been abandoned and very overgrown. Wheel is falling off. The mill is located in a private village.
Reference OMN;
Beals, Fred & Betty, "Mill Hunting - Indiana To Georgia", Winter 1982, pp. 12-14

POLK COUNTY

MAGGIE'S MILL. TN-070-001, SPRINGHILL COMMUNITY, TN Updated: 11/89
CONDITION-*Site Only*
Location; (D 12), 4 miles north of RELIANCE.
Comments; Mill is gone, except for millstone which marks the site as the inspiration for the song, "When You and I Were Young, Maggie".

PUTNAM COUNTY

ALLEN'S MILL. TN-071-001, COOKEVILLE, TN Updated: 01/98
Built-1928, CONDITION-*Site Only*
Location; (B 10) vicinity of COOKEVILLE on Mill Creek near its confluence with Spring Creek, off of SR 37.
Comments; Built in 1928, now in ruins.

HIDDEN HOLLOW MILL. TN-071-002, COOKEVILLE, TN Updated: 05/91
CONDITION-*Other Business*, POWERED BY-*Overshot Wheel*
Location: (B 10), off I-40, west of COOKEVILLE. Follow signs to HIDDEN HOLLOW PARK.
Comments: A theme park with picnic areas and various types of recreational facilities owned by SPOOM member Arda Lee. There is a building with a large overshot water wheel. Use for this building is not known.
Reference OMN;
Lee, Arda, ""New" MIll For Putnam County, TN", Winter 1991, pp. 21

ROANE COUNTY

COOK MILL. TN-073-001, PAINT ROCK, TN Updated: 11/89
CONDITION-*Non-Operating*
Location; (C 12), 3.5 miles south of PAINT ROCK, on Cedar Fork Creek.
Comments; Wood frame bldg. in good condition, but now used for farm storage. Overshot wheel is gone. No equipment.

CROSSEYED CRICKET MILL. TN-073-002, LENOIR CITY, TN Updated: 02/93
(aka DALE/CHEVROLAKE MILL) Built-1850, CONDITION-*Other Business*
POWERED BY-*Breast Wheel*
Location; (C 12). From I-40, exit 364, turn right off the exit and go 1/4 mile to the first left. Follow signs to the mill. From I-75, exit 81, go west toward Oak Ridge for 5 miles. After passing under I-40 take the first left and follow signs.
Comments; A restored wood frame mill built in 1850. Now restaurant, campground and fishing camp. Corn and flour are ground for the restaurant on the premises.

CROSSEYED CRICKET MILL. TN-073-002, (CONTINUED)
Address: Route 2, Box 286, Lenoir City, TN 37771. Phone: 615-986-5435.
Reference OMN;
LaForest, Michael J., "SPOOM At The World's Fair", Spring 1982, pp. 15

HUFFINE MILL. TN-073-003, LENOIR CITY, TN Updated: 01/98
(aka REAL NAME UNKNOWN) Built-1880, CONDITION-*Pvt. Res.*
Location; (C 12) vicinity of LENOIR CITY near Watts Bar Lake. From Rt. 72 turn north on Richland Creek Road, go 3 miles to the lake and take the first left. Mill is on the left.
Comments; A wood frame, 2 1/2 storey bldg, c.1880's construction. In excellent condition. Huffine Spring is nearby. Had an overshot wheel about 20 ft. in diameter, which is missing.

RUTHERFORD COUNTY

BROWN'S MILL. TN-075-001, LASCASSAS, TN Updated: 06/96
CONDITION-*Ruins*
Location; (C 8), 2 miles southeast of LASCASSAS on the East Fork of Stones River. From Rt. 96 at Lascassas, turn south on Brown's Mill Road for 2 miles.
Comments; The mill was recently been purchased by the town, and was being restored when it collapsed into the river. It was listed on the National Register of Historic Places, 1978.
Reference OMN;
"NEWS AND NOTES", Spring 1978, pp. 9
Gore, Edwina, "Brown's Mill, TN", Winter 1979, pp. 15
James, Richard H., "Brown's Mill", Summer 1979, pp. 3
"Tennessee Mills In The News", Fall 1992, pp. 8

ELLIS GRAY MILL & GRAIN. TN-075-002, MURFREESBORO, TN Updated: 11/91
(aka CANNONSBURGH MILL) CONDITION-*Museum*
Location; (C 8) in the city of MURFREESBORO, in Cannonsburgh Historic park. From exit 81 on I-24, go east approx. 2 miles on Church Street (US 231) to Broad Street. Turn left on NW Broad Street a short distance to Front Street. The historic park, containing the mill and several authentic log structures, is about a city block from Broad Street on the right side of Front Street.
Comments; A reconstruction of the Ellis Gray Mill. It has a large steel overshot waterwheel. There is no admission charge to to park, but donations are accepted.

SEVIER COUNTY

ALLEN'S MILL. TN-078-001, SEVIERVILLE, TN Updated: 01/98
CONDITION-*Non-Operating*, POWERED BY-*Turbine*
Location; (C 14) vicinity of SEVIERVILLE on Sims Road, along Flat Creek.
Comments; A 1 storey wood frame bldg..

BLOWING CAVE MILL. TN-078-002, BIRD CROSSROADS, TN Updated: 11/89
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (C 14) vicinity of SEVIERVILLE, 0.5 mile south of US 411 near the Jefferson County line on Flat Creek, on the road to English Mountain.
Comments; Not in operation, but appears to be operable.

BUD OGLE TUB MILL. TN-078-003, GATLINBURG, TN Updated: 11/89
(aka JUNGLEBROOK MILL) CONDITION-*Operational*, POWERED BY-*Turbine*
Location; (C 14) on the Roaring Fork Motor Nature Trail. Take Airport Road out of GATLINBURG and look for Junglebrook Trail sign.
Comments: Maintained and operated by the National Parks Service. You must hike about 1/4 mile to the mill. A very old TUB MILL made of logs.

ELY MILL. TN-078-004, GATLINBURG, TN Updated: 07/93
CONDITION-*Other Business*, POWERED BY-*Overshot Wheel*
Location; (C 14) at the end of Roaring Fork Motor Nature Trail within the city limits of GATLINBURG. On Roaring Fork Creek.
Comments; Used as a woodworking and craft shop. The overshot wheel, which was 30 ft. X 8 ft., has almost completely deteriorated.

ELY MILL. TN-078-005, GATLINBURG, TN Updated: 11/89
(aka REAL NAME UNKNOWN) , POWERED BY-*Overshot Wheel*
Location; (C 14) about 100 yards north of the previous Ely Mill (see above).
Comments; This is a small 1 storey wood frame mill with a rotting wooden wheel.

LINDSAY MILL. TN-078-006, GATLINBURG, TN Updated: 11/89
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (C 14), 10 miles east of GATLINBURG on Webb Creek. 1.8 mile north of Rt. 73, just west of the Cobbly Knob resort.
Comments; Has several other names.

PIGEON FORGE MILL. TN-078-007, PIGEON FORGE, TN Updated: 06/96
CONDITION-*Operational-Photogenic*, POWERED BY-*Pitchback Wheel*
Location; (C 14) in the city of PIGEON FORGE on LIttle Pigeon River.
Comments; The mill is actually operated with a turbine, but the pitchback wheel is

PIGEON FORGE MILL. TN-078-007, (CONTINUED)
in place for cosmetic reasons only. One of the most photographed mills in the U.S. Listed on the National Register of Historic Places, 1975. Now mostly a gift shop with guided tours of the milling area. Admission charge to view the milling procedure.
Reference OMN;
"The Old Mill At Pigeon Forge, TN", Spring 1973, pp. 16
"West Bend Humidifiers 1974-75 Circular", Winter 1975, pp. 8
"NEWS AND NOTES", Summer 1976, pp. 16
"OLD MILLS IN THE NEWS", Summer 1979, pp. 12
LaForest, Michael J., "SPOOM At The World's Fair", Spring 1982, pp. 15
"Where Are The Scenic Mills?", Fall 1986, pp. 12
"1987 SPOOM Photo Contest Winners", Winter 1988, pp. 19-20

REAGAN MILL. TN-078-008, GATLINBURG, TN Updated: 01/98
POWERED BY-*Turbine*
Location; (C 14) along the Roaring Fork Motor Nature Trail. Take Airport Road out of GATLINBURG.
Comments; Operable TUB MILL. Mill is easily recognized
Reference OMN;
Breeden, Sam, "Another Old Mill Torn Down", Spring 1974, pp. 7
"", Winter 1992, pp. COVER

CARDWELL MILL. TN-078-009, GATLINBURG, TN Updated: 11/92
CONDITION-*Abandoned*
Location; (C 14) on south side of Rt. 321, 5 miles east of GATLINBURG.
Comments; A reconstruction. Overgrown with weeds and has been abandoned.

DOLLYWOOD MILL. TN-078-010, PIGEON FORGE, TN Updated: 11/89
Built-1983, CONDITION-*Museum-Photogenic*, POWERED BY-*Overshot Wheel*
Location; (C 14) in Dollywood Theme Park (Dolly Parton's).
Comments; Built in 1983. (SPOOM held its 2nd annual conference at this mill. President Fred Beals presented dedication address. The mill has buhrstones, and uses a Meadows Mill for grinding.
Reference OMN;
Beals, Fred & Betty, "Wandering With Fred & Betty Beals", Spring 1984, pp. 6-8

TEAGUE'S MILL. TN-078-011, GATLINBURG/COSBY, TN Updated: 11/89
CONDITION-*Operational*, POWERED BY-*Overshot Wheel*
Location; (C 14) between GATLINBURG and COSBY. Look for sign on north side of US 321.
Comments; Not an OLD mill, but built in the late 1970's by SPOOM member Harry Teague. A wood frame structure using a Meadows mill, powered by a steel waterwheel.

MORRIS MILL. TN-078-012, GATLINBURG, TN Updated: 07/93
CONDITION-*Operational*, POWERED BY-*Overshot Wheel*
Location; (C 14) in GATLINBURG on US 441 South, turn left onto US 321 (north). The mill is about 1/2 mile on the right, across from the Brookside Resort and motel.
Comments; The mill is used for an unknown business, but it also grinds corn with buhrstone powered by an overshot waterwheel. It was moved to this location and water is pumped to the flume.

WALKER MILL HYDRO PLANT. TN-078-013, SEVIERVILLE, TN Updated: 07/96
Location; (C 14) on the west prong of Little Pigeon River, just off US 441, near SEVIERVILLE.
Comments; Listed on the National Register of Historic Places, 11/20/90. No other information available.

SULLIVAN COUNTY

BLUFF CITY MILL. TN-082-001, BLUFF CITY, TN Updated: 11/89
CONDITION-*Feed Mill*, POWERED BY-*Electric*
Location (A 16) in BLUFF CITY on the south fork of the Holston River.
Comments; Water supply was removed by dams of the TVA. Now a feed and farm supply store.
Reference OMN;
"People, Places and Things...", Fall 1976, pp. 16-17
Tichy, Charles, "New Tennessee Mill", Spring 1987, pp. 16

LESLIE MILL. TN-082-002, KINGSPORT, TN Updated: 11/89
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (A 16), 6 miles east of KINGSPORT, 1/4 mile north of US 11W, on Boozy Creek.
Comments; Not operable.

PETTY JOHN MILL. TN-082-003, BLOUNTVILLE, TN Updated: 06/96
(aka INDIAN SPRINGS MILL) CONDITION-*Non-Operating*
Location; (A 16) on Creek Road, 2 miles northeast of WARRIORS PATH STATE PARK.
Comments; Was partially restored in 1978. Listed on the National Register of Historic Places, 1977.

KINGSPORT MILLING CO.. TN-082-004, KINGSPORT, TN Updated: 03/93
Built-1816, CONDITION-*Feed Mill*, POWERED BY-*Electric*
Location; (A 16) on East Stone Drive (Hwy 11), near Kings-Giant Plaza. Go south approx. 1/4 mile on Gibson Mill Road, turn left on Mill Street. This street deadends at the mill after approx. 1/4 mile.
Comments; Built in 1816 and originally used a wooden waterwheel, which is now gone. Capt. Joseph Everett started Kingsport's oldest continuous business as a sawmill in 1814. Later it was sold to Andrew Gibson, first Postmaster of Kingsport. In the late 1800's it was a voting place for presidential elections. In the early 1900's Orbie Milarn started milling flour and feed. Operations ceased in the 1950's. Now used as a feed store. Clara Perry is the manager. She knows much history of the mill and is more than happy to talk with visitors. Address: 1100 Mill Street, Kingspsort, TN 37660. Phone: (615)246-2712.

HALLS MILL. TN-082-005, KINGSPORT, TN Updated: 03/93
CONDITION-*Pvt. Res.*, POWERED BY-*Overshot Wheel*
Location; (A 16). Go south on Hwy 36 off I-81 near Colonial Heights. In approx. 1 mile go left on Fordtown Road, then right for 1/2 mile on Beechwood Drive. Mill is on the right.
Comments; Private residence with a waterwheel. There is a chainlink fence and "No Trespassing" signs posted.

UNION COUNTY

NORTON MILL. TN-087-001, MAYNARDSVILLE, TN Updated: 01/98
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (B 13) vicinity of MAYNARDSVILLE within BIG RIDGE STATE PARK, on Norris Lake.
Comments; A small mill, 1 storey wood frame bldg.

SKAGGS MILL. TN-087-002, LUTTRELL, TN Updated: 11/89
CONDITION-*Other Business*
Location; (B 13) in town of LUTTRELL and can be seen from Rt. 131. On Flat Creek.
Comments; Not used as a mill. No wheel.

MYNATT MILL. TN-087-003, LUTTRELL, TN Updated: 11/89
CONDITION-*Site Only*
Location; (B 13) a few hundred yards from Skaggs Mill (TN-087-002).
Comments; Difficult to find, with no road access. Only shell remains.

WOLF MILL. TN-087-004, TN Updated: 11/89
Location: (B 13) no location available.
Comments; Now used as a barn.

SHARP FAMILY MILL. TN-087-005, MAYNARDSVILLE, TN Updated: 09/92
(aka MILL BUILDING) Built-1969, CONDITION-*Operational*, POWERED BY-*Overshot Wheel*
Location: (B 13) at the MUSEUM OF APPALACHIA, Norris, TN.
Comments; Built at the Museum in 1969. Was originally powered by an overshot wheel, which is still mounted on the structure for cosmetic purposes, but is now powered by a large one cylinder gas engine. It is a gristmill, grinding corn.

WARREN COUNTY

YAGER MILL. TN-089-001, MC MINNVILLE, TN Updated: 11/89
(aka REAL NAME UNKNOWN) CONDITION-*Other Business*
Location; (C 10) in community of YAGER on Charles Creek, 3 miles northwest of MC MINNVILLE, on Judge Warren Road.
Comments; Mill and dam intact, but bldg. is used as a junk yard.

GREAT FALLS COTTON MILL. TN-089-002, ROCK ISLAND, TN Updated: 06/96
(aka FALL CITY COTTON MILL) CONDITION-*Non-Operating Textile Mill*
Location; (C 10) west of ROCK ISLAND off US70s, in ROCK ISLAND STATE PARK.
Comments; Best known example of a textile mill in Tennessee. No machinery, only an empty brick shell in good condition. Listed on the National Register of Historic Places, 1982.
Reference OMN;
"Old Mills Added To The National Register", Fall 1982, pp. 19
"Dedication Of The Great Falls Cotton Mill", Fall 1983, pp. 13

SHELLSFORDS MILL. TN-089-003, MCMINNVILLE, TN Updated: 10/94
Built-1838, CONDITION-*Site Only*
Location; (C 10) on the Collins River in the village of Shellsford, which eventuallly became the city of MCMINNVILLE. Exact location not known.
Comments; Built in 1838 by a frontier settler named Shellsford. At this time Cherokee indians were being force-marched to reservations in Oklahoma Territory (the infamous "Trail of Tears") and thousands of them passed through the area. They stopped over at Shellsfords Mill to grind grain and to bury their dead. Only a few pieces of the mill remain today, under the water of the Collins River.
Reference OMN;
Guess, Michael, "Shellsford's Mill", Spring 1994, pp. 17

WASHINGTON COUNTY

EVERREADY MILL. TN-090-001, TN Updated: 11/89
CONDITION-*Feed Mill*, POWERED BY-*Electric*
Location; (B 16). Turn east from SR. 81 onto SR 67. Mill is 0.5 mile down the road on Little Cherokee Creek.
Comments; Currently a commercial feed mill, formerly water powered.

FLOURVILLE MILL. TN-090-002, FLOURVILLE, TN Updated: 11/89
CONDITION-*Pvt. Res.*, POWERED BY-*Overshot Wheel*
Location; (B 16) in small community of FLOURVILLE on Boone's Creek, near Boone Lake.
Comments; Large Fitz wheel is hidden from view.

KINCHELOE MILL. TN-090-003, HARMONY COMMUNITY, TN Updated: 11/89
POWERED BY-*Electric*
Location; (B 16) vicinity of JOHNSON CITY in HARMONY COMMUNITY, 5 miles east of Rt. 93, along Kendrick Creek.
Comments; Was water powered, now uses electricity.

BASHOR MILL. TN-090-004, JONESBOROUGH, TN Updated: 06/96
(aka KNOB CREEK MILL) Built-1832, CONDITION-*Pvt. Res.*, POWERED BY-*Overshot Wheel*
Location; (B 16) at JONESBOROUGH. From the intersection of SR 75 & 81, go northeast on SR 75 about 3 miles and turn south (right) onto Pleasant Valley Road. Go 2 miles to the mill.
Comments; Built before 1832. The 24 foot Fitz overshot wheel was installed in 1916. Was known as Pleasant Valley Mill until it ceased operating in the 1950's. Listed on the National Register of Historic Places, 1980. In February, 1975, SPOOM members Larry and Debbie Bennett began restoration of the mill and it became their residence on December 22, 1980. For more complete information, see OMN, Fall, 1992, pp.11-12.
Reference OMN;
Tarr, Donald & Brenda Kay, "Tarr's Old Mill", Summer 1980, pp. 8
"Knob Creek Mill", Spring 1981, pp. 15
Bennett, Larry, "Bennet's Bashor Mill", Fall 1992, pp. 11

MILL BROOK MILL. TN-090-005, LIMESTONE, TN Updated: 01/98
CONDITION-*Feed Mill*
Location; (B 16) vicinity of LIMESTONE on Carson Creek along the western border of the county, just to the north side of Rt. 81.
Comments; An active feed mill.

ST. JOHNS MILL. TN-090-006, JOHNSON CITY, TN Updated: 06/96
(aka DUNGANS MILL) CONDITION-*Feed Mill*, POWERED BY-*Electric*
Location; (B 16) northeast of JOHNSON CITY near WATAUGA on Brush Creek in the northeast corner of the county.
Comments; An active feed mill, formerly water powered. Listed on the National Register of Historic Places, 1973.

TAYLOR MILL. TN-090-008, LIMESTONE, TN Updated: 06/95
CONDITION-*Other Business*
Location; (B 16) at 203 Gravel Hill Road, LIMESTONE, TN 37681. On Little Limestone Creek, 1 mile north of the Nolichucky River.
Comments; Has been converted to a studio and gallery by SPOOM member Margaret Gregg. Except for a large sifter, most machinery is gone. The sifter is available to anyone who can use it. Phone: 815-257-3875; or 815-753-3213.

MATTHEWS MILL. TN-090-009, TELFORD, TN Updated: 11/89
CONDITION-*Non-Operating*
Location; (B 16), 2 miles west of TELFORD, on Matthews Mill Road, along Little Limestone Creek.
Comments; Appears to be used for storage.

HACKER MARTIN MILL. TN-090-010, GRAY STATION COMMUN., TN Updated: 11/89
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (B 16) vicinity of JOHNSON CITY along Cedar Creek, 1 mile east of GRAY STATION COMMUNITY.
Comments; A small, 1 storey bldg. Mill is discussed in the FOXFIRE 5 book.

TELFORD MILL. TN-090-011, TELFORD, TN Updated: 11/89
CONDITION-*Feed Mill*, POWERED BY-*Electric*
Location; (B 16) near the community of TELFORD, along Little Limestone Creek.
Comments; Was water powered. Now an active feed mill.

EUREKA MILL. TN-090-012, TELFORD, TN Updated: 11/89
CONDITION-*Non-Operating*, POWERED BY-*Overshot Wheel*
Location; (B 16) in TELFORD, on Little Limestone Creek.
Comments; Was formerly water powered and a small wheel may be seen behind the mill. Reportedly ceased operations in October, 1986.

KEYS MILL. TN-090-013, JOHNSON CITY, TN Updated: 01/98
CONDITION-*Pvt. Res.*
Location; (B 16) vicinity of JOHNSON CITY, 2 miles east of Rt. 81. Exact location not known.
Comments; Built by Sweeny; purchase in 1832 by John Bashor. Owner in 1992 is Larry E. Bennett, 490 Pleasant Valley Road, Jonesboro, TN.

WAYNE COUNTY

JOHNSON MILL. TN-091-001, LUTTS, TN Updated: 01/98
(aka REAL NAME NOT KNOWN) CONDITION-*Non-Operating*
Location; (D 5) vicinity of LUTTS along Johnson Creek in the southwest corner of the county, adjacent to Weatherford Creek Road.
Comments: No machinery remains.

DIXON MILL. TN-091-002, TN Updated: 11/89
CONDITION-*Abandoned*
Location; (D 6) on California Branch Creek, On California Branch Road, near the Lawrence County line. Exact location not known.
Comments; Small mill with herring bone pattern wood siding. 1 storey.

WILLIAMSON COUNTY

NOLENSVILLE MILL. TN-094-001, NOLENSVILLE COMMUN., TN Updated: 11/89
CONDITION-*Feed Mill*, POWERED BY-*Electric*
Location; (C 8) along Mill Creek in NOLENSVILLE on US 31A.
Comments; Feed Mill, which was once water powered.

BOYD MILL. TN-094-002, FRANKLIN, TN Updated: 07/96
CONDITION-*Ruins*
Location; (C 7), vicinity of FRANKLIN, 1/10 mile south of Boxley Valley Road & Boyd Mill Pike, on the east bank of the West Harpeth River.
Comments; Listed on the National Register of Historic Places, 4/13/88. No other information available.

WILSON COUNTY

ALSUP MILL. TN-095-001, LEBANON, TN Updated: 01/98
Built-1807, CONDITION-*Pvt. Res.*, POWERED BY-*Turbine*
Location; (B 8) south of LEBANON and 2 miles south of the CEDARS OF LEBANON STATE PARK. then 2 miles east of US 231, on Falls Creek.
Comments; Built in 1807. Additional information needed.

APPENDIX B

TENNESSEE MILLS AND MILL SITES LISTED IN THE NATIONAL REGISTER OF HISTORIC PLACES THROUGH THE YEAR 2001

TENNESSEE MILLS AND MILL SITES LISTED IN THE NATIONAL REGISTER OF HISTORIC PLACES THROUGH THE YEAR 2001

Blount County

- **Brick Mill Site**, Listed 1989
- **Cades Cove Historic District** (includes Cable Mill), Listed 1977
- **Clover Hill Mill**, Listed 1989
- **John Hackney Mill Site**, Listed 1989
- **John Martin Mill**, Listed 1989
- **Peery Mill Site**, Listed 1989
- **Pistol Creek Dam and Millrace**, Listed 1989
- **Shaddon Mill Site**, Listed 1989
- **White's Mill**, Listed 1989

Bradley County

- **Hardwick Woolen Mills**, Listed 2001

Cannon County

- **Readyville Mill**, Listed 1973

Cheatham County

- **Sycamore Mills Site**, Listed 1979

Davidson County

- **Newsom's Mill**, Listed 1976
- **Tennessee Manufacturing Company**, Listed 1999

Fentress County

- **Alvin C. York Farm** (including mill), Listed 1976

Franklin County

- **Falls Mill**, Listed 1972, Declared Historic District 1987

Hamilton County

- **Signal Knitting Mills**, Listed 1999

Humphreys County

- **Enochs' Mill**, Listed 1999
- **Hurricane Mills Rural Historic District**, Listed 1999

Jefferson County

- **Cox's Mill**, Listed 1983

Knox County

- **Ebenezer Mill**, Listed 1987
- **Riverdale Mill**, Listed 1987

Lawrence County

- **Garner Mill**, Listed 1984

Lincoln County

- **Harms Mill** Hydroelectric Station, Listed 1990

Loudon County

- **Lenoir Cotton Mill**, Listed 1975 (Burned 1991)
- **Robinson Mill**, Listed 1984

Marion County

Ketner's Mill and Bridge, Listed 1977

Marshall County

Lillard's Mill Hydroelectric Station, Listed 1990

Meigs County

James R. Gettys Mill, Listed 1982

Monroe County

William J. Fowler Mill and House, Listed 1983

Montgomery County

Dunlop Milling Company, Listed 1999

Ringgold Mill Complex, Listed 1980

Moore County

Ledford Mill, Listed 1985

Rutherford County

Brown's Mill, Listed 1978 (Collapsed 1996)

Sevier County

Pigeon Forge Mill, Listed 1975

Roaring Fork Historic District (includes two tub mills), Listed 1976

Walker Mill Hydroelectric Station, Listed 1990

Sullivan County

Roller-Pettyjohn Mill, Listed 1977

Warren County

Great Falls Cotton Mill, Listed 1982

Washington County

Bashor (Knob Creek) Mill, Listed 1980

Dungan's Mill and Stone House, Listed 1973

Williamson County

Boyd Mill Ruins, Listed 1988

APPENDIX C

TENNESSEE DEPARTMENT OF TRANSPORTATION FIELD SURVEY FORM AND GUIDE FOR MILL OR MILL SITE EVALUATION

FIELD GUIDE FOR AID IN COMPLETING THE TDOT HISTORICAL MILL PROPERTY SURVEY FORM

This guide is designed to follow line by line the field survey form provided to TDOT for the assessment and evaluation of an historic mill or mill site property. It refers to the report document entitled "Historic Context Evaluation for Mills in Tennessee," prepared for TDOT in May 2002, under Project Number RES1039, Contract Number CUT 063.

Field Survey Form Page 1

Complete the information in the box at the top after the site survey, including the county name; Tennessee Historical Commission (THC) number (furnished by them); the Property number assigned; the Project title (e.g., "Cultural Resources Survey of Proposed U.S. Highway 64 Improvements"); National Register eligibility (yes or no, and perhaps what criteria); Section 106 involvement (yes or no, and whether physical impact, no adverse effect, etc.); 4(f) refers to Federal involvement in highway projects, as when a National Register eligible property is physically impacted by the project (again yes or no response).

PROPERTY INFORMATION:

Provide the present name of the mill and any known historic names.

Provide the name and address of the present owner, including phone number if available.

Provide the name of anyone living on the property other than the owner, particularly if this person was a source of information about the site.

Provide enough detail in the property location description so that a person unfamiliar with the area can find the site using a state map.

If the mill is located on a water source, provide the name of that source.

Specify if the principal property is a standing mill building, if any supporting structures are standing (there is a later section where these may be detailed), if the site is in ruins, or if only archaeological features remain.

If the mill building has been altered for adaptive use, such as a store, barn, dwelling, museum, or any use other than its original intention, specify.

At the bottom of Page 1 may be entered the name of the person surveying or assessing the property, its location on a topographic map, and details about photographs taken (e.g., roll numbers, frame numbers) and the date of the visit.

Field Survey Form Page 2

At the top of the page is again a space for entering the identifying information for the site.

HISTORICAL BACKGROUND:

Here may be provided a brief summary of any known history of the site as well as the estimated age of the building, if one remains. This might include the name of the original owner, whether this is the original structure on the site or a later one, the uses of the mill historically, etc.

REPRESENTATIVE TIME PERIOD:

If the mill building or site is known to have been built within one of the time periods discussed in the report, check the appropriate box. If two or more structures are known to represent more than one time period, check additional boxes. Refer to Chapter 2 of the report for a detailed discussion of these time periods, or to Chapter 7, pages 249-252, for a summary. In addition, a typical Pioneer Period grist mill is shown in Figure 35, page 26. Pioneer Period merchant mills are shown in Figure 62, page 46, and in Figures 63 and 64, page 47. A typical pre-Civil War grist mill of the Early Industrial Period is shown in Figure 43, page 32, and Figure 66, page 48. A merchant mill using the Old Process for flour milling from this period is shown in Figure 151, page 217. As a representative of the post-Civil War Late Industrial Period, Ketner's Mill, illustrated in Figure 147, page 211, is a brick structure built for New Process flour milling with stone buhrs, then converted to roller mills several years later, retaining a set of millstones for corn grinding. Readyville Mill, Figure 150, page 215, is a frame structure that was probably built as a New Process mill for stones also, and converted to rollers. A textile factory building from this period is Falls Mill, illustrated in Figure 148, page 213. The steam sawmill at Adams, Tennessee (Figure 149, page 214), although post-1900, is representative of earlier circular sawmills. The Spencer Mill, Figure 152, page 217, may be taken as an example of a post-1900, or

REPRESENTATIVE TIME PERIOD (continued):

Modern Period, mill, although timbers from the earlier mill structure were apparently used in its reconstruction about 1919.

ARCHITECTURAL DATA:

Enter the type of construction material for the foundation of the building, and indicate whether or not the mill sits on piers.

Check the appropriate construction method. Note that most early brick structures were also post and beam inside (Falls Mill and Ketner's Mill are typical). Frame structures will generally be later, and exhibit construction methods similar to modern stud-wall buildings, with smaller lumber than in earlier post and beam mills, although the exterior walls of both may be similar. A log structure refers to hewn or round logs fitted by notched corners, as in log cabin or house construction. A stone structure would refer to a mill whose walls are primarily stone above the foundation.

Siding types include clapboard, plank, shingle, or metal, and generally refer to a wooden structure.

Number of floors refers to the number of principal floors. If a basement or attic was used in the mill operation, these may be indicated here as well. Attics in grain mills were often used for access to the elevator heads for cleaning and servicing, and occasionally housed cleaners and dust collectors as well. Basements were typically used for line shafts, gearing, and elevator boots. In the latter case, grain was usually dumped into a floor bin or an outside bin under the wagon, these bins connecting to one of the elevators.

Window/door features include shutters, double-hung windows, unusual windows (such as arch or round window in gable, like Falls Mill and Ketner's Mill), standard or "homemade" doors, hinge and latch details if unusual, double or stable doors (such as Readyville Mill), hatches or loft openings.

Other exterior features include any eave or trim detail, presence of dormers or cupolas, types of door and window lintels (wooden, metal, stone, brick), porches or front overhangs, grain emptying areas, and wagon scales.

Roof type could include gable, hip, gambrel, or monitor (two levels of roof), with rafters, lathing, shingles, or metal covering.

ARCHITECTURAL DATA (continued):

Later additions, if obvious, should be noted, such as a wooden attachment to a brick building (e.g., rear of Falls Mill), an addition of later construction materials or methods (e.g., corn bin at Ketner's Mill), an engine house attached to the main building at a later date, etc.

Interior features (if interior is accessible) include presence of open beams (which was common), locations of stairs, posts (rough or finished decoratively), type of flooring (e.g., plank, tongue and groove, brick), wall treatments (e.g., open studs, plastered over brick or lathing, plank). If a mill has been altered for addition of new machinery at some point, any clues to the location of previous equipment should be noted. These may include holes where buhrstones were situated, bolt holes in the ceiling for earlier line shafts, belt holes in the floor (later covered with strips of metal or wood), bolt holes in the floor where machines sat, etc.

Dimensions of the principal building should be entered. The height may be height to the roof peak, or height of the outside walls (specify).

Field Survey Form Page 3

At the top of the page is again a space for entering the identifying information for the site.

PERIPHERAL STRUCTURES:

If there is a dam remaining at the mill site, check the type of construction. Most will be concrete, since this was the common replacement material for earlier dams. Some stone dams remain, and a few earthen dams. Virtually all original wooden dams are gone, but large mud sill timbers or abutments may remain (see Chapter 2, beginning page 19, for a description of dams). Note the condition of the dam and abutments. Is it breached? Has the stream eroded around the abutments? Are there serious leaks, or does it seem to be stable?

Identify the condition of the millpond. Is it silted in? Has it silted up the headgate?

The millrace, if present, would typically be either dug as an open ditch, or elevated of wood, or both, as at Falls Mill (see Figure 29, page 23). In later years, the races were sometimes concreted, or originally rock-lined. There are some installations that used a large pipe, sometimes called the penstock, to convey water from the

PERIPHERAL STRUCTURES (continued):

dam to the water wheel or turbine. The majority of the turbine installations, however, used a penstock in the form of an open water box next to the dam, with the turbine submerged in the box. This type of penstock was usually of concrete, although occasionally an earlier wooden one is encountered, and was often underneath the mill (see Figures 79 and 80, pages 59 and 60). Note the condition of the millrace and penstock, if present.

Normally, for water powered mills, there was provided a headgate at the dam for diverting the water from the stream through the race or into the penstock, a wheel gate (usually inside the mill) for controlling the flow of water onto the wheel or into the turbine, and perhaps a spillway plug for draining the race or controlling its water level (see Figures 31, 32, and 33 on pages 24 and 25). In turbine installations, it was customary to provide a trash rack to catch floating debris near the headgate or the penstock (see Figure 85, page 63). Sometimes flood gates were provided in the dam (see Figure 27, page 22). Check the appropriate boxes if these features are present.

If there are any attached or detached buildings that appear to be grain warehouses, describe briefly their appearance and condition.

If an engine or boiler house was added to the mill building, note this and describe.

If other sheds or structures are nearby and appear to be integral to the milling function, describe these. Such structures may include privies, stores, fuel sheds, etc.

If the miller's or owner's house is still present, describe it briefly and note the condition. Also estimate the dimensions of the dwelling.

TYPE OF PRODUCTION:

Check the type of production that is believed to have taken place at the mill. There may be multiple uses, which are only revealed through archival research. (For example, there is no remaining physical evidence at Hurricane Mills in Humphreys County that a woolen factory, sawmill, and blacksmith shop operated at the mill location.)

Field Survey Form Page 4

At the top of the page is again a space for entering the identifying information for the site.

POWER SOURCE(S):

If a water wheel is still present at the site, check the appropriate box and note the type of construction. Most surviving water wheels will be iron and steel, most likely of Fitz or Savage manufacture. Hybrid wheels were combinations of wood and metal parts. Check if the wheel is an overshot, undershot, breast/pitchback, or tub wheel (see Figure 18 on page 16, Figure 41 on page 30). Undershot, breast, and tub wheels are quite rare in the state, so would be highly significant. Pitchback wheels are simply overshot wheels allowing the water to enter below the top of the wheel, causing them to rotate in a direction opposite to the overshot. Obtain the diameter and width of the wheel, in feet. Look for nameplates or cast names on the spokes or hubs that might indicate the manufacturer. Fitz made two types of spokes – a wrought iron, flat spoke and a cast iron spoke. The cast iron varieties are known as "Yankee wheels" because most were made for icy conditions in the Northern U.S. A few, however, were bought in the South, and some were later moved south. Note the type of power take-off from the wheel. It would either have a gear or pulley mounted to the axle, or use a perimeter, or segment, gear, which drove a small pinion gear on a jackshaft (see Figure 115, page 91).

If a water turbine is the power source, locate it from its position in the penstock. Sometimes turbines are completely buried in sediment, with only the shaft sticking up. If this is the case, try to dig down to at least the large shaft coupling above the turbine, or preferably to the top of the turbine, if possible. The top should usually be enough to identify the manufacturer. If it has several rods radiating from the center out to the gates, it will most likely be a Leffel or Leffel copycat (see Figures 83 on page 61 and 86 on page 64). If not, it will usually have to be identified from early prints, such as those in Emerson's 1881 book (see References, page 271; this book is available through the Society for the Preservation of Old Mills – refer to their Internet Web site at www.spoom.org). If possible, determine the runner size (this is the spinning part inside the casing, and is how the turbine is sized). If not, carefully measure the diameter of the large top plate (it is sometimes easier to stretch a flexible tape around the perimeter and divide the result by *pi*) and the turbine shaft below the coupling. If the turbine is a Leffel, the runner size may be found from these two figures and the old Leffel tables. If possible, determine the gating style (see discussion and illustrations on page 61). If a distinct type of turbine is present, such as a Pelton wheel (see page 115 and Figure 141 on page 116), make special note and determine runner diameter and nozzle configuration (see Babb's Mill on page 219 and Figure 155 on page 220).

A steam engine will be either stationary, portable (on wheels or skids), or traction (self-propelled). (See Figures 87, 88, 89, and 128, on pages 65, 66, 67, and 106.) If a nameplate or other identification is present, record all information on it. Measure the bore of the cylinder and stroke of the piston, if possible. Determine the diameter and width of the flywheel. Is the boiler separate from the engine? Any steam powered equipment remaining will be quite significant.

Sometimes large internal combustion engines, such as diesel or oil engines, will be confused with steam engines. Steam engines normally have flyball governors that belt from the power shaft, and distinctive valve, base, piston, and rod features. If the power source is an internal combustion engine, again obtain nameplate data if present, bore, stroke, flywheel dimensions, and horsepower. Is the engine a single or multiple cylinder variety? Take plenty of photographs, because there are many active engine clubs and publications that could identify the manufacturer if not known.

For electric motors, obtain the same information as above, except these normally have small drive pulleys with flat or V belt configuration. Note the rated speed of the motor, if the nameplate is still intact.

Many old mills were used to generate electricity after generators became available, primarily beginning in the 1890's. Check the same data as above, and especially note the kilowatt rating if present (see Figure 140, page 115).

If the mill site had any animal powered equipment, such as treadmills or sweeps (such as for sorghum mills), note these (see Figure 2, page 3, and Figure 15, page 14).

POWER TRANSMISSION:

Note any types of gearing (such as bevel gears with wooden cogs on turbine shafts – see Figure 114, page 90), line shafts and their locations and configurations, rope drives (rare), positions of pulleys and their sizes (diameter and width), whether the pulleys are wooden or metal, flat or V belt, belt shifters or clutches, and any other unusual power transmission equipment, such as link rods. If time permits, it is prudent to sketch all the shafts, pulleys, and positions in the mill, and which machine each drove, if possible (see Figure 80 on page 60).

MACHINERY:

Inventory all machinery in the mill, and check boxes and provide additional information where possible. Use machinery illustrations and typical mill layouts in the report as guides (these are provided throughout Chapter 2).

Note any offbeat grain related machinery and describe if unidentifiable. Many mills had corn shellers, for example.

Check the kind of sawmill equipment present. A cutoff saw was usually hung from the ceiling and swung out to square off the ends of planks as they emerged from the main saw. Again refer to the discussions and illustrations of sawmill machinery during the various time periods, presented in Chapter 2.

Any extant textile machinery found in the state will be of the utmost significance, as this equipment is exceedingly rare nationwide. Again use the discussions and illustrations in Chapter 2 as a guide, or visit the Falls Mill collection.

If other machinery is present, such as tanbark mills, cane mills, oil presses, paper making machinery, gunpowder equipment, or the like, note these and be assured they are probably rare. The Museum of Appalachia in Union County, Tennessee, is a great resource for studying early tools and machinery for identification purposes.

Look around for any tools or supplies, such as mill picks (Figure 94, page 74), trammels (Figure 98, page 77), bags, toll charts, proof staffs, dye staffs (Figure 96, page 76), stone lifting cranes and their bails, screws, and cranks (Figure 93, page 72). Parts may sometimes be identified from the report illustrations or similar extant machinery.

Finally, Page 6 is provided for any sketches or layouts that may be relevant to the site.

Tennessee Department of Transportation

HISTORICAL MILL PROPERTY SURVEY FORM

COUNTY________________________ THC #__________ PROPERTY #__________

PROJECT____

NATIONAL REGISTER ELIGIBILITY_______________________________________

EFFECTS: Section 106 Involvement?_____________________________________

4(f) Involvement?____

PROPERTY INFORMATION:

Present Name of Mill____

Historic and/or Common Name____

Present Owner____

Owner's Address____

____

Occupant/Source____

Property Location (Community, Roads, Stream, Directions)________________________

____

____

____

____

Water Source (If Applicable)____

Condition of Site: (Specify Standing Building, Extant Supporting Structures, Ruins, Archaeological Features)____

____

____

____

____

Adapted Use:____

Surveyed by_________________________________ Quad__________________________

Film____ Date__________________________

PROJECT____________________ PROPERTY NAME & NUMBER_______________

____

HISTORICAL BACKGROUND: ____

____

____

____

____

Approximate Age of Building____

REPRESENTATIVE TIME PERIOD (Check Appropriate Period Below):

Pioneer (1780-1820)_______ Pre-Civil War Early Industrialization (1820-1860)_______

Late Industrialization (1860-1900)_______ Modern (Post-1900)_______

ARCHITECTURAL DATA:

Foundation (Check as Appropriate): Stone_____ Brick_____ Timber_____ Piers_____

Construction Method (Check as Appropriate): Log_____ Post & Beam_____

Frame (e.g., Stud Walls)_____ Brick_____ Stone_____ Other (Specify)_____

Siding____

Number of Floors____

Window/Door Features____

____

Other Exterior Features (Eaves, Trim, Dormers, Lintels, Porches, Entries, etc.)_________

____

____

____

Roof Type____

Later Additions____

____

Interior Features (Open Beams, Stairs, Posts, Flooring, Walls, etc.)__________________

____

____

Dimensions of Principal Building: Length_________ Width_________ Height________

PROJECT____________________ PROPERTY NAME & NUMBER_______________

____

PERIPHERAL STRUCTURES:

Dam (Check One): Concrete_____ Stone_____ Wood_____ Earthen_____ Other_____

Condition____

Millpond Condition____

Millrace (Check One or More): Dug___ Concrete___ Wood___ Elevated___ Pipe___

Condition____

Penstock (Check One or More): Concrete___ Wood___ Under Mill___

Condition____

Gating System (Check One or More): Headgate____ Wheel Gate____ Flood Gate____

Spillway(s)____

Grain House or Warehouse (Describe)____

____

____

Engine House (Describe)____

____

Sheds/Other (Describe)____

____

Miller's or Owner's House (Describe Briefly if Present)___________________________

____

____

Miller's/Owner's House Dimensions: Length________ Width________ Height________

TYPE OF PRODUCTION (Check One or More Below, and Provide Comments):

Corn Meal____ Flour____ Feed____ Sawn Lumber____ Lumber Finishing____

Wool/Cotton Carding____ Thread/Yarn____ Cloth____ Other (Specify)_____________

____

____

____

____

____

PROJECT____________________ PROPERTY NAME & NUMBER_______________

____

POWER SOURCE(S):

Water Wheel (Check)_____ Construction (Check): Wood____ Metal____ Hybrid____

Type (Check): Overshot___ Undershot___ Breast/Pitchback___ Tub Wheel___

Diameter__________ Width__________ Manufacturer (If Known)____________

Power Take-off____

Turbine (Check)_____ Manufacturer (If Known)______________________________

Runner Size (in.)__________ Turbine Shaft Diameter at Turbine (in.)__________

Gate Style (Check One): Register_____ Cylinder_____ Wicket_____

Steam Engine (Check)_____ Manufacturer (If Known)__________________________

Bore (in.)_______ Stroke (in.)_______ Flywheel Dimensions________________

Type (Check One): Stationary___ Boiler Extant?_____ Portable___ Traction___

Horsepower or Other Data____

Internal Combustion Engine (Check)_____ Manufacturer (If Known)________________

Bore (in.)_______ Stroke (in.)_______ Flywheel Dimensions________________

Horsepower or Other Data____

Electric Motor (Check)_____ Manufacturer (If Known)__________________________

Horsepower or Other Data____

Generator (Check)______ Manufacturer (If Known)______________________________

Kilowatt Rating______ Other Data____________________________________

Animal (Check)______ Type (Check): Sweep_____ Treadmill_____ Other___________

POWER TRANSMISSION:

Gearing (Check)_____ Describe____

Line Shafts (Check)_____ Describe/Location___________________________________

____

____

Rope Drive (Check)_____ Flat Belt Pulleys (Check)_____ V Belt Pulleys (Check)_____

Belt Shifters (Check)_____ Shaft Clutches (Check)_____ Other (Describe)___________

____

____

PROJECT____________________ PROPERTY NAME & NUMBER_______________

____

MACHINERY:

Stone Buhr Mill(s): Number ____ Diameter(s) (in.)__________________

Manufacturer(s) (If Known)____

Application (Corn, Wheat, Other, If Known)______________________________

Roller Mill(s): Number____ Manufacturer(s) (If Known)_________________________

Cleaner(s): Number____ Manufacturer(s) (If Known)____________________________

Application (Corn, Wheat, Other, If Known)______________________________

Scourer(s): Number____ Manufacturer(s) (If Known)____________________________

Bolter(s): Number____ Manufacturer(s) (If Known)_____________________________

Application (Corn, Wheat, Other, If Known)______________________________

Elevator(s): No._____ Auger(s): No._____ Mixer(s): No._____ Packer(s): No._____

Other Grain Related Machinery (Describe)_____________________________________

____

____

Sash Saw (Check)____ Circular Saw (Check)____ Cutoff Saw (Check)____

Lumber Finishing Machinery (Planers, Molders, etc.) (Describe)______________

____

Textile Machinery (Check): Carding Machine(s)____ Spinning Jack(s) or Mule(s)____

Ring Spinner(s)____ Loom(s)____ Picker(s)____ Warping Machines____

Other (Describe)____

____

Miscellaneous Machinery (Check If Present): Tanbark Mill____ Cane Mill____

Oil Press____ Paper Machinery____ Gunpowder Works____ Other (Describe)__

____

____

Provide Below any Additional Comments on Machinery, Tools, or Equipment Present:

____

____

____

____

PROJECT____________________ PROPERTY NAME & NUMBER_______________

Provide any appropriate sketches of building or machinery below: