

Meadow River Lumber Co.
Rainelle
Greenbriar Co.
West Virginia

HAER WV-24

HAER
WVA,
13-RAIN,
1-

REDUCED 8" x 10" DRAWINGS

Addendum to:
Meadow River Lumber Company
Highway 60
Rainelle
Greenbrier County
West Virginia

HAER WV-24

HAER
WVA,
13-RAIN,
1-

WRITTEN HISTORICAL AND DESCRIPTIVE DATA
PHOTOGRAPHS

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, D.C. 20240

HISTORIC AMERICAN ENGINEERING RECORD

WV-24

MEADOW RIVER LUMBER COMPANY

HAER
WVA,
13-RAIN,
1-

Date: Circa 1909

Location Highway 60 Rainelle, Greenbrier County, West Virginia

Owner Originally; John and Thomas Raines
Absorbed by Georgia Pacific Corp. in 1970

Significance The Meadow River Lumber Company was, at its peak, the world's largest hardwood saw mill in the world. Its history and operation is indicative of the changes in the lumber industry during the 20th century.

Transmitted by Dan Clement, 1984.

MEADOW RIVER LUMBER COMPANY

Rainelle, West Virginia

There were 10 million acres of virgin hardwood timber in West Virginia in 1870; by 1910, only 1-1/2 million remained; 10 years later, virgin forest was there a thing of the past. From the production of less than 100 million board feet of lumber in 1870, the West Virginia lumbering industry expanded to produce over 800 million feet of boards per year at the turn of the century. In 1909, the peak year of production, the amount of lumber sawed reached nearly 1-1/2 billion board feet. [1] Some extraordinary changes took place in the lumbering industry in these years. The expanded production was most notably the result of the conjunction of technological developments in the industry with the extension of railroad transportation throughout the State. Together, these two factors produced marked changes in patterns of industrial settlement and had far-reaching consequences in the lives of the people who lived in the hills and hollows of West Virginia. The 40 years between 1870 and 1910 saw the change from an industry composed of small, local operations, selectively cutting only the choicest of timber in backwoods hollows, to an industry of huge factory complexes which swallowed whole forests and shipped their products to all parts of the Nation.

The first sawmilling of a mechanized nature, in what was to become West Virginia, began in the Eastern Panhandle, where, by 1775, there were at least a dozen water-powered sawmills in operation.² These proliferated throughout the trans-mountain area for the next century. In one county alone, there were 50 water-powered sawmills by 1810.³ According to lumber historian, Roy Clarkson, it is safe to say that hundreds of these mills were in operation throughout the State, during the nineteenth century.⁴ Even after the coming of the steam-powered mill, during the first half of the century, water mills remained predominant. In 1860, they were responsible for seven-eighths of the lumber sawed in the State.⁵

The introduction of the water-powered mill into the area was a considerable improvement over the previous method of sawing lumber by a whip saw. A whip saw was powered by two men, who pushed and pulled the seven-foot blade through a broad-axe-squared timber, placed on a trestle or across a pit--one man standing on the timber, the other beneath it. In this manner, two men could saw 100 feet of rough planking in a long and tiring day.

As with the first step in most technological development, the water-powered sawmill sought to duplicate human motion. The "up and down" or "sash" sawmill consisted of what was essentially a whip-saw blade stretched between the two horizontal members of a vertically

moving sash, or "gate," which was actuated by a pitman connected to a shaft from the waterwheel.* The carriage that held the log was moved by a rack and pinion arrangement that advanced the log to the saw one cog at a time with each stroke. Travelling a stroke of 14 inches eighty times a minute, these "up today and down tomorrow" saws allowed the operator to attend to other business while the log was being sawed; he could plow a few furrows or have his lunch in the time it took to cut one board. According to mill equipment manufacturer, D. C. Prescott,

A sawyer on one of these mills once told the writer that he could sit on a log that was being sawed and go to sleep. When the log had moved up far enough, the saw would scratch him when it came down and he then had plenty of time when the saw went up to wake up and get off the log⁶

Despite this relatively slow pace (by later standards), the up-and-down sawmill could cut 500 feet of lumber daily, at the cost of considerably less effort than the 100 feet accomplished by two men and a whip saw.

*This description of a sash mill is the result of personal observation of the only remaining sash mill in the State at Jackson's Mill near Jane Lew, West Virginia. This mill was moved to Jackson's Mill from the Hammer Mill in Pendleton County, which was razed in the mid Forties. It is, by all accounts, a representative sash mill and, in the light of conversations with Mr. Fred. Rogers of Union, West Virginia, is very much like the mill operated by the Rogers Family until 1906, when it was replaced by more modern equipment. Even though the sash mill at Rogers' Mill had been replaced, Rogers' Mill remains as a good example of the water sawmill because of its age, its location, and the unaltered state of the mill building.

One of the few remaining examples of sash mill technology is the Rogers' Mill, in Monroe County. Built in 1785, Rogers' Mill was one of the first sash mills in the southeastern part of what is now West Virginia. Erected by Frederick Gromer, it was one of twenty-three mills eventually built in the vicinity of Union, West Virginia, and one of twelve grist and lumber mills on Second Creek. It was operated continuously until 1940, passing through the hands of various owners during the first half of the century, until it came to the Rogers Family, during the Civil War.⁷

Originally powered by an undershot wooden waterwheel, Rogers' Mill was both a grist mill and a sawmill, one on each side of the timber and fieldstone mill building bifurcated by the mill race. Like most mills combining these two operations, it could only saw logs when not grinding grain. Power was transmitted from the waterwheel to either the grindstones or the sawmill by a series of shafts and handmade wooden gears. In 1906-7, the wooden water wheel was replaced by wrought-iron water turbines and the sash mill was converted to a circular saw.⁸

As the names of these mills indicate, they were nearly all family operations. Sawmilling of this type could scarcely be called an "industry" were it not for their large numbers. That Rogers' Mill was able to remain in operation for 165 years as one of twelve mills on a relatively small creek, indicates how circumscribed these operations really were. Except for their own needs, mill operators rarely did any

logging themselves. Rather, they cut for a fee the logs brought to them by their neighbors. And their neighbors brought in logs only when they needed lumber for a new barn or chicken coop. Thus, sawmill operation was an intermittent business, and was nearly always supplemented by farming and grain milling. The major restraints to any expansion of operations were the result of the same conditions which made water sawmills possible in the first place. Perhaps the most important of these was their location. They were tied to their source of power, which in most cases meant that they were located on remote mountain streams too small to be avenues of transportation and far from any major roads. All logs and lumber had to be hauled by oxen and mules over mountainous terrain because the kind of river suitable for rafting logs was not suitable for running a mill. Thus, a mill could draw timber only from an area within the range of draft animals. Once this area was cut, operators would have to turn to other operations. It seldom happened, however, that even the small area within range of the sawmill was clear cut. This was due principally to transportation difficulties but also partly to the slowness and lack of versatility of the sash mill. The sash mill could cut only the straightest of logs because, in addition to time wasted squaring a crooked log, the peculiarities in the grain of knotted and crooked logs caused the saw to bind. Sash mills were also unable to handle the largest of virgin timber--which, in any case, was difficult to haul to the mill. Thus, transportation difficulties and water mill technology

restricted lumbermen to small, local operations practicing selective cutting in remote areas. By 1807, after nearly a hundred years of operation, these mills had made no more than a dent in the vast tracts of virgin timber.

The limitations imposed on the sash mills by their lack of speed and their dependence on running water were mitigated somewhat by the introduction of the portable steam mill. The steam mill employed a circular saw, for the first time breaking away from the notion that a sawmill must duplicate human motion. Although it was invented by an Englishman named Miller, in the eighteenth century, the circular saw was not widely employed until steam power was able to provide the speed and power necessary for its efficient use. Free from dependence on swift-running streams, steam mills could locate near larger rivers on which logs could be rafted from logging areas farther upstream. By 1835, there were fifteen such mills in what is now West Virginia, and from then on, areas along streams, such as the Kanawha River, saw a great expansion of lumbering activity.⁹ Difficulties in transport, however, were still a great hindrance to lumbering activity. Although portable steam mills could be located on a river or hauled within a convenient distance to logging areas, it was not an easy operation. Bad roads and dependence on draft animals made them less mobile than their name would indicate. Although they could saw great quantities of timber, they could only be commercially viable operations in areas of

easy access to markets. They were generally faced with the choice of being either close to a large commercial market or being close to the source of timber. The few places having both of these advantages, such as those along river, were quickly cut clear. Because of these difficulties, steam-powered milling grew slowly, awaiting transportation developments in the trans-Allegheny area. The small increment of efficiency enjoyed by steam mills was not sufficient to cause widespread adoption of steam power until that increment was expanded by the coming of the railroads.¹⁰

The arrival of the railroads in West Virginia marked the beginning of the first phase of the great lumber boom that lasted from Reconstruction to World War I. During this time, great fortunes were made and the State was stripped of its virgin forests. Large permanent steam mills were built in all parts of the State as the railroads connected mills to logging areas and markets. The transition from water mills and small steam mills to huge mills operating as big businesses was almost instantaneous once the tracks were laid. Sophisticated steam technology had been waiting only for transportation. By 1880, the majority of the 472 lumber mills in the State were circular sawmills powered by steam.¹¹ This first phase of the railroad-induced lumber boom witnessed a refinement of all of the lumber milling technology that had been developed up to that time. With most technological development, previous technologies reach their most elaborate, and even monstrous, forms on the eve of the introduction of more sophisticated and efficient ways of doing

things. So it was with lumber mills. The railroads released the bonds restraining the expansion of sash mill technology and the old sash mill was elaborated into the sash gang mill. Whereas in the old water-powered mill, one blad made eighty strokes per minute, now as many as forty blades made two hundred fifteen strokes per minute, slicing boards from large timbers squared by eight-foot circular saws. The St. Lawrence Boom and Manufacturing Company, at Ronceverte in Greenbrier County, was one of the largest mills of the type and represented the apogee of pre-band mill technology. Located on the main line of the Chesapeake and Ohio Railway, it combined the sash gang mill and the large circular saw to produce 130,000 board feet of lumber daily. By 1882, there were 82 sawmills of this type along the C&O in West Virginia, and the most accessible timber was rapidly being cleared.¹²

It was soon realized, however, that the sash gang and the circular saws were wasteful. The dwindling supplies of timber along the mainline railroads brought about pressure for the adoption of the less wasteful band mill. Although developed much earlier in France, the first band mill was not put into operation in the United States until 1869, when some lumbermen began to see that supplies of virgin timber was going fast. The adoption of the band mill awaited a change of perception on the part of lumbermen and a few changes in the machinery itself. The change in perception entailed a realization of the fact that the lumber industry could not long remain a mobile industry, cutting down one tract of timber after another, slicing up logs indistriminately, with the faith that there were more untouched timberlands over the next hill.

Adding to the pressure for the adoption of the band mill was a correction of a minor fault. The band mill is a toothed steel belt run on two large wheels of from seven to ten feet in diameter. Because of its elasticity, the band had a tendency to deflect as it entered and left the log being sawed. This meant that the board sawed from the log contained ripples. This was corrected by the introduction of a wider band and by the addition of guides. From 1880 to 1890, Lumbermen were persuaded, by observation, that the band saw was superior to previous methods. What a single band saw lacked in speed (compared to a multi-blade gang mill) was soon made up by the use of two or three high speed band mills with their concomitant rise in efficiency.

Since the band mill made only one cut at a time, it allowed the sawyer to manipulate the log to maximize the production of high grade lumber--unlike the gang saw, which simply sliced up the log regardless of its peculiarities of shape and grain. Since there was less tendency to bind in the cut, the set of its teeth could be narrower than those of the circular saw, resulting in considerably less waste.¹³ By the 1880s, the peak of sawmill technology was a band saw "fifty feet long and twelve inches wide, travelling over pulleys eight feet in diameter, making five hundred revolutions per minute and tearing its way through logs much too large for a circular saw, at the rate of nearly two miles a minute.¹⁴ The first such mill in West Virginia was installed by the Deveraux Lumber Company at Charleston in 1881. Mills all along the C&O, such as the one at Ronceverte, followed soon after.

The large-scale lumbering industry of West Virginia followed the construction of the B&O lines in the north and the C&O line from Roanoke to Huntington in the south, during the seventies and eighties. Once all of the most accessible timber along these lines were cut, large-scale steam mills moved into the back country. The clear cutting of the timber along the main railroad lines had given the large operators enough capital to build their own logging railways and their own spurs to the main lines. Railroad technology justified the construction of large mills by insuring a constant supply of timber and accessibility to expanding domestic and foreign markets. Just as in the coal industry, the advent of new transport facilities to lumbering precipitated the rapid development of even the most remote and sparsely settled areas. The beginnings of the Meadow River Lumber Company were characteristic of such development.

The Meadow River Lumber Company was formed in 1906, by the brothers, John and Thomas Raine, both of whom had run successful operations along the Baltimore and Ohio Railroad. With the pooled resources of Raine and Raine of Empire, Pennsylvania, and Raine-Andrews of Evenwood, West Virginia, they purchased 12,000 acres of the Joseph Beury estate in Fayette and Greenbrier Counties, for the sum of \$360,000.¹⁵ At the first meeting of the new Meadow River Coal and Land Company, the stockholders voted to capitalize the company at \$600,000, and to begin construction of a mill. Thomas Raine was elected president and, shortly after, the company added the remaining 20,000 acres of the old Beury estate to its holdings. It soon became obvious that the anticipated spur linking the

mill to the C&O Railway would be long delayed and the company began construction of its own line. In 1907, the capital base of the company was increased to \$800,000 to provide funds for the construction of a logging railroad.¹⁶ The Sewell Valley Railroad, twenty miles long, was completed in 1909, and construction of the mill commenced.¹⁷ The first log was sawed at the Meadow River Lumber Company in September of 1910.

In 1906, when John Raine rode horseback from Beury Station on the C&O to Big Sewell Mountain, the Meadow River Basin was still a stand of virgin timber. By 1918, it still contained about one three thousandth of the estimated timber stand of the continental United States (exclusive of Alaska).¹⁸ It was basically a stand of hardwoods and hemlock with White and Red Oak, Yellow Poplar and Chestnut predominant. Interspersed with these were scattered stands of Beech, Birch, Basswood, Walnut, Hickory, Butternut, Cherry, Maple, Cucumber, and Locust. Except for the operations of a few portable mills, all this timber remained untouched.¹⁹ According to John Raine, this was because the Meadow River region contained "one of those stands of timber either too far from market for profitable wagoning of their product, or on streams too rocky for safe and sure tide flotation to market, and these trees escaped the woodman's axe until pioneering days were past."²⁰ The advent of the railroad so altered this situation that during the next sixty years, the Meadow River Lumber Company logged over 100,000 acres of virgin timber.

Initial projections put the life of the Meadow River Lumber Company

at about twenty-five years - a fairly long span for a mill of that period. Due to innovations in transport, in logging methods and production techniques, the mill stayed in business for sixty years and became, in its middle years, the largest hardwood mill in the world. Because of transportation difficulties or the limitations of their equipment, earlier mills had always been faced with problems of waste both in the logging camps and in milling operations. The Meadow River Lumber Company was able to overcome these by its ability to bring all of the timber out of the woods and to process it very efficiently at the mill.

The scale of operations of the company and its efficient organization of work was a notable departure from that of earlier steam mills and marked a new era in the history of the area's lumbering. The versatility of the band saw made possible the utilization of even inferior timber and stimulated the practice of clear-cutting. The use of every last scrap of lumber meant that the company's life was prolonged while the great stand of virgin timber which had once covered the Meadow River Basin slowly and inexorably disappeared.

The organization of the Meadow River Mill was typical of the production-line techniques which were, at the time, becoming characteristic of all large-scale industrial enterprises. This process began with the "swamping out" of logging roads first and the clear-cutting of timber from them. The earlier process had been to cut the timber first, and then to build a road which would pass nearest to the greatest quantity of the

selectively cut timber. Timber was felled by hand with axe and crosscut saw. The previous practice had to "ballhoot" the timber to the road by sliding or rolling it down the rough mountainside. Because of the greater quantity of timber obtained by non-selective cutting, however, it was more efficient for the Meadow River Lumber Company to build a semi-permanent V-shaped "slide", or timber trough, which moved the logs to the road with much less "severe and arduous exertion than "ballhooting."²³ The logs were then hauled with a team of oxen to the railroad or river landing. The Meadow River Company seldom logged an area, however, that had a useable stream for rafting the logs to the mill at Rainelle. "Due to the ruggedness of the mountains, and the crooked and rocky river beds, as well as the poor floating qualities of most hardwoods, no large percentage of Appalachian timber has been handled by water transport in the log," said R. C. Staebner of the Meadow River Lumber Company. Staebner knew that the key to the company's success lay in the development of the logging railroad, and particularly in the geared locomotive capable of hauling large loads up steep grades.²⁴ The Meadow River Lumber Company had several Shay locomotives, and it moved its tracks about in the mountains as the timber supplies dictated.²⁵

The logs, having been stamped with the mark of the camp from which they came, arrived at the mill and were dumped from railroad cars into common millpond or stored in a yard.^{A**} After having been cleansed of

** Refer to isometric and floor plan of MRLC.

grit by washing in the pond,^C they were guided one at a time by men with pike poles up the "jack-slip," or "log haul-up."^D There, an endless "bull chain"^H with cleats^I attached to hold the logs as they traveled up the trough elevated them the 25 feet to the mill. The Rainelle mill was large enough to handle whole trees with only the tops and branches removed.* As the logs entered the mill at the top of the jack-slip, they were measured by a workman and cut into standard lengths by an overhead circular saw which was lowered by a steam cylinder and turned by a belt from the power source.^O The workman who ran the crosscut saw also controlled the jack-slip machinery and the "dogs", or "log clamps,"^Q which held the log during sawing. The log then moved on through a level log trough on the log deck.^R From the trough, the deck sloped down on both sides^V toward the carriages which held the logs during sawing.^{DD} A workman stationed on the deck decided to which of the three band saws each log would be routed.^U If the log was to go to the left or right mills, the "deck man" would push the appropriate level to accuate a steam cylinder, which in turn moved the "kickers"^{AA} which pushed the log from the trough down the sloping deck to the "log stops"^{BB} which held the logs until they were rolled onto the carriage. The logs that were to go to the center mill continued along the trough to be kicked out in like manner down the line.^{CC}

* Most specific information about the process of lumber milling at the MRLC is from conversations with Mr. Thomas Forbes, a fifty-year employee at the mill who knows every aspect of its operation, both in his time and before. These conversations were taped in August, 1974.

The logs were loaded singly on to each of the three carriages^{DD} and held against the carriage headset by barbed "dogs," so that the side facing the saw was exposed. The carriage was advanced toward the saw by a piston in a steam cylinder on the floor between the carriage tracks.^{MM} Depending on the carriage, the piston had a stroke of from 34 to 50 feet. The carriage advanced and retreated from the saw very rapidly, making one cut on each advance. The 12-inch-wide saw band was stretched on two nine-foot wheels, requiring 200 horsepower to turn them at a speed of 500 rpm. Even though planks were sawed only on the advance of the carriage, the saw was double edged so that it would not bind against or burn the cut side of the log on the return motion of the carriage.

Each sawyer decided how best to cut each log, paying attention to its peculiarities, so as to saw the maximum of high-grade lumber from it. The sawyer also had to watch for logs that would be able to fill any special orders that had been placed. Those logs not suitable for special orders were sawed into stock. After deciding how to treat a particular log, the sawyer communicated his wishes to the man who rode the carriage by an elaborate system of hand signals. The man on the carriage then set the log for each cut. The first step in "working over" each log was to cut "slabs" off the sides in order to square it into a timber. It was then sawed into planks. The timber was turned on the carriage by a steam-actuated barbed iron bar operated by one of the men riding the carriage. These bars, now called "turning bars," were formerly known as "niggers."

The center sawyer^Y at the Meadow River Lumber Company was the least experienced and was given the smaller, poorer-quality logs that were to be made into railroad ties. The right^X and left^W sawyers sawed the higher grades of lumber, and the "right-hand" mill could also accommodate logs as long as forty feet. (A right or left-hand mill was determined not by its position, but by the hand used to control the advance of the carriage.) All three sawyers had to be quick-witted and dextrous, in order to saw and at the same time decide on the character and disposition of up-coming logs. Logs came up closely spaced, in a continuous and rapid stream; and the sawyers kept us, providing sawed planks at the rate of 3500 to 4000 board feet per hour.

After each board was "sliced" from the log, a "turn-down man"^{GG} removed it and placed it on a set of live rollers^{HH} leading to the edger. One single edger^{JJ} and one double edger^{JJ} were operated by three "edgermen," who manipulated batteries of small circular saws which trimmed the rough-sawed lumber, longitudinally, to standard widths.

After edging, the lumber was placed on moving chains and carried laterally^{SS} to the trimmer,^{TT} another battery of saws to cut the lumber into standard lengths. Lumber which was too long or thick to be trimmed in this manner was sent to the "bill saw"^C which trimmed railroad ties and the large 40 foot timbers that went to the shipbuilding industry.

The lumber was then moved laterally on sets of endless chains^{VV} to the sorting dock, where it was graded and sorted onto carts for transport either to the yards or the kilns to be seasoned. Since there were as many as fifteen varieties of wood being sawed at random, each sorter^{WW} had to have an acute eye for distinguishing "about ninety different thicknesses, kinds, and grades of lumber...."²⁶

Sorted and graded lumber was moved by hand-propelled lumber carts^{XX} on rails to various marshalling points,^a from where it was taken in larger loads to the seasoning operations. Shay steam locomotives moved these larger loads on the various tracks which criss-crossed the yard. If the lumber was to be air seasoned, it was carefully stacked in "double-tipped" (crossed) piles, over thirty feet high, by "green lumber handlers," who knew exactly how to place the lumber to minimize warping and reduce drying time. Air seasoning took from a few weeks to several months, depending upon the type, size and moisture content of the lumber. The yards of the Meadow River Lumber Company were capable of holding 20,000,000 board feet of lumber in various stages of the seasoning process.

The best grades of lumber, intended for furniture and flooring, were moved to the six "box," or "compartment" kilns where it was dried by steam heat, a process which took from 40 to 168 hours. In addition to speed, this method of seasoning dried the wood more completely and prevented discoloration of the wood by running sap.²⁷

From the kilns and the yards, the lumber went to the company's

various planing and reshaping operations, where one million feet of lumber monthly was manufactured into flooring, ceiling, siding and car door boards, coffins, table tops, and stock for Ford automobile interiors. In later years, these facilities were expanded to include a furniture-stock shop and a women's shoe-heel shop that turned out 4,000,000 heels yearly.²⁸ The major part of the lumber was not used in the company's remanufacturing operations and was sold by the company sales force.

When it opened in 1910, the capacity of the mill put it among the one percent of mills in the country with the ability to saw more than 10,000,000 feet of lumber in a year.²⁹ Within the next twenty-five years, it surpassed all other mills sawing hardwood and was, in the mid-thirties, the largest hardwood mill in the world, employing over five hundred men. With an output of 110,000 to 150,000 board feet of lumber in a ten hour day, and an occasional day when production rose above 200,000 board feet, the Meadow River Lumber Company's mill required a daily feeding to seventeen acres of forest to satisfy its huge appetite.³⁰

In order to maintain this production with a minimum of wasted effort, the mill was organized as efficiently as possible. From the time a log came up the jack-ship, it was tended and monitored constantly through all operations until it went to the yard. As soon as the sawyer decided what to do with a log, his decision was communicated to those performing succeeding operations, so that the edgemen and trimmers

could check and modify their order sheets accordingly. When a mill had to be shut down, the timber was rerouted without an interruption in the flow, until it resumed operation. This happened two or three times a day when the sawblades of the band mills dulled by dirt and the hard wood required changing. When this was necessary, the tension on the band relaxed and it was removed and hoisted up to the filing by a steam winch.^{FF*} The band was immediately replaced so that shut-down time was held to a minimum.

As with time, neither was there any profligacy with energy. The mill was organized to minimize both human and mechanical effort. The highest point in the mill was at the cut-off saw at the top of the jack-slip; from there, the logs descended for each operation--they went down to the carriages and band saw, down to the edger, down for trimming, down for sorting and, finally, down to the yard. Steam and muscle power were never used where gravity would do.

Once the log was dumped into the pond, no part of it was wasted. All scrap and waste was used or remanufactured in some way. Scrap from the cut-off saw and trimmer was sent via conveyors^{T PP} directly to the "hog," or "chipper,"^{QQ} to be ground up either as fuel for the boilers or

*The saw filer and his equipment, stationed in a room above the milling floor, were very important adjuncts of the mill. Upon his skill depended the quality of the cut lumber. He was a craftsman who filed the saw teeth to razor sharpness and swaged them to the precise pitch necessary for waste-free production. He was the most highly-paid workman at the mill.

to be sold to the metallurgical industry near Charleston. All slabs and trimmings from the band mill and edgers were sent through a "slasher"⁰⁰ which cut them into standard lengths to be sent by conveyor through the lath and resaw departments. All pieces which could not be resawn into stock for small items, such as hatchet handles, or into lath, continued on to the chipper. All sawdust was conveyed to hoppers which fed the boilers in the powerhouse--coal was used only to keep up steam when the plant was not in operation.

Although there were many changes and modifications of mill equipment over the years, the basic organization of the mill and the milling techniques remained the same until the mill closed in 1970. The mill building burned in 1924, but the \$150,000 insurance made possible its immediate rebuilding.³¹ Most of the equipment is either original or of the same type as the original. The band mills, carriages, edgers, and live rollers, as well as most of the Milwaukee, a firm which had manufactured milling equipment since 1869.³²

The steam power to run all of the various equipment was generated in three Houston, Stanwood and Gamble boilers, which serviced two Corliss engines. The power for the mill was provided by a Filer and Stowall type "1900" Heavy Duty Corliss Engine (#4352) which had a 28 3/16 inch bore and a 48 inch stroke. The power was transmitted to a main shaft in the mill by a leather belt drive from a flywheel 20 feet in diameter and 4 feet wide.³³ Electrical power for various motors and lighting in the plant and the company town was provided by a General Electric 23,000 Watt

AC steam generator powered by a Hamilton Corliss Engine. While the two Corliss engines went on performing their original tasks, the powerhouse underwent extensive expansion in the Twenties with the addition of three dynamos to meet the demands of the company's electricity sales to surrounding communities. Before the establishment of the mill, there had been no electricity in the area.

Over the years, the major change in mill operations were those adaptations which allowed the mill to continue operation after large amounts of virgin timber were no longer available. Large turn-of-the-century mills were built for the purpose of sawing first-growth timber. It was expected that they would close down when that was accomplished. Thus, in 1918, John Raine expected the Meadow River Lumber Company "to be in the game for the next fifteen to twenty years."³⁴ The company actually remained "in the game" for the next fifty-two years. This was extraordinary in an industry in which a twenty-five year longevity was considered to be the norm. The operator's early concern for efficiency and complete control of the production process led to increasingly sophisticated techniques for using the whole tree, bark to bird's nest, and intervened to prolong the life of the mill.

The scale of operations and the organization of the Meadow River Lumber Company carried over into the structure of the town of Rainelle as well. Located on the old route of the James River and Kanawka Turnpike, just inside the western boundary of Greenbrier County, the town owed its existence to the lumber operation. Prior to 1905, the

surrounding area had been a region of scattered farms and small-scale sawmills. To lure workers from their homes in the surrounding hills, the Raines built an entire town which John Raine described in 1918 as

...the best hardwood sawmill town in the country. Workmen's houses are built with a view to comfort and sanitation. All are well constructed frame houses, plastered, papered, and painted white. All are supplied with the purest running water and most of them with modern bath rooms. Each house has its own lawn and garden patch. Some houses are furnished in native hardwoods, are steam heated, electric lighted and electric cleaned,³⁶ and so compare favorably with the best type of city cottages.*

These houses were and remain far superior to the jerry-built structures that the coal industry was providing for its workers during the same period. The housing and other facilities, such as the church, the library, the schools, and the restaurant, were built by the company and comprised an effective tool to recruit labor and insure its efficiency and dependability. They were used as an attractive incentive to encourage workers to shed their rural habits and adapt to an industrial organization of work.

The availability and assignment of various types of workers' housing seems to have followed an interesting pattern of status hierarchy. While there are no records available to confirm such a hypothesis interviews with former employees indicate that the system was based partly on ascription* and partly on achievement. Lowest on the status

* Information on housing is from taped conversations with former workers several of them of whom grew up in company houses. On file at HAER, Washington, D. C.

scale were loggers, or "woodhicks" who were housed in camps in the woods. When they came into town, they were usually put up in the company hotel. Single workers in the mill were housed in dormitories at the company's boarding houses. Married workers were allowed to rent, at a low rate, one of the company's 128 houses. These houses varied in size, from four to eight rooms, and apparently in quality. Men with larger families were generally allotted larger quarters. There is no available record of early rents, but later examples all indicate that they were nominal. In 1942, one eight room house rented for \$8.75 per month. The size and quality of house assigned to a worker also depended on his performance on the job. If a new worker with a family passed muster, he was assigned one of the small houses in Center Rainelle. Once he had proven himself a good worker and a responsible citizen he was allowed to join the queue for the larger, more pleasant houses in West Rainelle. Evidently, the combination of ascribed and earned status did not prove to be much of a problem. The company viewed workers with families as more dependable than the unattached loggers and millhands who were more likely to leave the area. Raine disliked the lumberman's traditional rootlessness and did all he could to encourage **sedentary habits**. "The migratory habits of the woodman are proverbial," he said, "Now, for him, as for us 'Where his treasure is, there will his heart be also.' We must see to it that that treasure is not in moonshine or other stimulating dopes."³⁷ It is also quite probable that workers with families were more likely to put up with the confining discipline of an industrial system than those with fewer vested interests.

The hierarchy of the mill carried over to the other aspects of the town's society. Incorporated in 1913, nearly all of its 1,000 residents were employees of the company and their dependents. The name, Rainelle, had its origins in the founder's name and that of Thomas Raine's wife and daughter - both named Nell. Town officials, such as the postmaster, the bank president, and the leader of the town band, were drawn from the company's upper echelons, while the mayoralty rotated among the company managers.³⁸ During the early years, the only church in town was the Methodist Episcopal, built by the company. Its most prominent member was John Raine himself, who, in addition, oversaw the life of the town from his vantage point on the Board of Temperance, Prohibition and Public Morals.³⁹

John Raine's desire for efficiency of production was not limited to the organization of the mill and the workers' living environment. Raine also proved to be something of an amateur psychologist in the area of labor relations. In an article published in Lumber World Review in 1920, he revealed a concern for worker motivation. "What I believe we want," said Raine, "is to satisfy primarily the mind of the laborer; to place him where he will be interested in the accomplishment of a good piece of work, and where he will feel that it is all a part of his honest toil and effort." [Italics mine]⁴⁰

In the same article, he attacked the hourly wage as a system which rewarded inefficient and efficient labor equally. Raine condemned this as an "economic crime" because it supposedly removed the incentive for good work. Instead, Raine advocated the piecework system on the grounds

that it better rewarded excellence.⁴¹

Raine's point of view was typical of management in the early stages of large scale industrial enterprise. By insisting on the piecework system, Raine sought to make each individual worker's relationship to the management the focus of his job. In so doing, he sought to prevent the division between workers and management which was beginning to characterize large operations. He sought to minimize the effect of on-the-job social relations which led to worker solidarity.

One of the latest illustrations of Raine's attempt to maintain an integrated organizational structure was his espousal of "industrial democracy." Raine's concept, modeled on the tripartite division of powers in the Federal Government, gave the workers a voice analogous to that of the legislative branch. The president filled the executive role, while the board of directors served as the judiciary. In Raine's plan, however, the legislative branch did not have control of the purse strings, an idea which he associated with "the I.W.W. and the bolshevists."⁴² Raine was convinced, however, that the important thing for the worker was to "feel" that he had control of his destiny. By giving each man a vote in this advisory "congress", he tried to prevent the division of management and labor, and make the worker relate to the administration, rather than to his fellows. There is no evidence that this system was ever implemented and it is likely that the company's provision of quality housing and other services was the principle mechanism for integrating

workers into the organization.

The transformation that took place in this basic industry is indicative of the changes that characterize the metamorphosis of the entire economy of the country between the Civil War and the First World War. In less than forty years, the sawmill industry was transformed from a pattern characterized by isolated, scattered mills, perhaps with the owner/operator sleeping on the log he was sawing for his neighbor, to a pattern of large industrial complexes grappling with the problems of employee relations. The stimuli for these changes were the development of an integrated transportation network, effected by the railroads and general technological development--both in concert with a general availability of capital. Taking the railroads as a given, the greatest impact on the expansion of production in the lumber milling industry were improvements in the technology of steam milling and the integrated industrial procedures of the assembly line. The Corliss engine in team with the band saw, integrated into an efficient production system with industrial and social pressures directed at the worker to produce seems to be largely responsible for the success of the Meadow River Lumber Company.

For many years, the Meadow River Lumber Company escaped the last inevitable step in this extension of organization. Finally, in 1970, it was absorbed by a conglomerate, the Georgia Pacific Corporation, and shut down. As a result, milling in the area has now returned to an early stage of small, family-owned sawmills, living on the culls and regrowth of the vanished virgin forest.