

Logging Shortleaf Pine in Arkansas

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Arkansas is one of the foremost states of the Union in lumber production. Until recently the material produced was largely yellow pine, principally shortleaf and loblolly. Many tracts of pine have been cut over, and several mills of considerable size have been dismantled.

There remain within the state, however, several large holdings which will continue to produce lumber for a number of years to come. Among these are the timber properties of the Fordyce Lumber Company, located near the town of Fordyce in southern Arkansas. The company, and their operations should be of peculiar interest to Iowans, since it is owned very largely by Davenport capital. The logging study detailed below was made on the operations of this company and much of the information contained in it was generously supplied by the men in charge of the various divisions of the work, to whom the writer is greatly indebted.

The Fordyce Lumber Company has been operating for more than twenty years. The original holdings of the company were very extensive, and at the present time include a large part of the area within the counties of Cleveland and Dallas, lying north and east of the town of Fordyce. The exact acreage of the virgin timber remaining was not determined, but at present rate of cutting it will be fifteen years before the original stand is cut over.

The extensive timber holdings of the company were acquired in the early days when stumpage had little value, and was generally considered as detrimental to the land on which it stood. The larger part of the land was purchased in fee from homesteaders who acquired title under the United States homestead laws, or from settlers who obtained it from the State of Arkansas under the "Donation Act," which gave each settler 160 acres of

State land after three years' residence thereon. These tracts were purchased at an average price of less than \$2.50 per acre; and for some of the first areas acquired as low as \$1.00 per acre was paid. Other timber lands were bought of larger owners and estates at a low figure. The bulk of the holdings was purchased from 15 to 25 years ago; small areas and isolated lots lying handy for logging are still being acquired, but the majority of the later purchases include only the merchantable shortleaf pine timber, to be removed within specified time. The total stumpage owned by the company is estimated to be between 400 and 500 million feet, 80 per cent of which is shortleaf pine, and 20 per cent hardwoods.

The company's milling plant is located at Fordyce. Logs are delivered to the mill by a railroad about 18 miles long. The Fordyce and Princeton Railway penetrates the company's holding and terminates on the area being logged. It is extended from year to year as logging proceeds. The mill has recently been remodelled, and is modern in every respect. A band saw, and a 30 saw gang, turn out an average of 110,000 feet of lumber per day of 10 hours. Allowing a few days for overhauling during the Christmas season, the mill is in operation about 300 days per year, and during this time cuts out about 33 million feet of lumber. The logs sawn are cut almost exclusively from the timber lands owned by the company. Not more than 200,000 or 300,000 feet are cut from purchased logs per year.

To furnish the saw mill, and provide for a reserve supply of logs to run the mill 15 days in cases of emergency, when timber is not being cut on account of bad weather, lack of men, or for other reasons, about 115,000 feet must be delivered daily. About 20,000 feet of hardwood logs are cut with the pine, making an average total daily cut of approximately 135,000 feet. The timber averages from 7,000 to 10,000 feet per acre, so that around 17 acres are cut over each day, or 5,000 acres each year to supply the mill with the necessary timber.

No attempt is made to reforest or even protect the cut over lands. Tracts cut over 15 to 20 years ago are being cut a second time, as many of the trees then considered unmerchantable because of defects or small size, can now be logged at a profit. It is likely that much of the cut over area will be sold to settlers when the general price of land advances sufficiently in the region.

DESCRIPTION OF THE FOREST AREA

The topography of the holdings of the company is very regular. The land is generally flat, sloping only very gently to sloughs and creeks, which are usually dry. There are no pronounced topographic features, except here and there small hummocks, a few rods across which rise a few feet about the flat land which surrounds them. The few small ravines which are found on the tract are so shallow, that railroad cuts and fills are unnecessary even on the main line, the track being laid with little or no preparation of the surface.

The soil of the region is a light loamy sand, creamy or yellowish in color. It contains some clay and some humus, and is fairly tenacious when wet, but loose and mellow when dry.

That the soil is of poor quality is evidenced by the numerous abandoned farms in the vicinity. When freshly cleared, the land will raise fair crops for a few years, but afterward it only produces when well fertilized. The soil is shallow and light and is best suited to the growing of trees which use but little of its substances in their development.

The ground cover, other than the reproduction of hardwoods and pine is light. Few dogwoods, ironwoods, and other forest weeds grow on the "uplands." Along the creeks and sloughs are dense thickets of greenbay, witch hazel, blue beech, Hercules' club, holly and other shrubs. On the abandoned fields are briars, "sage" grass (sedge) and weeds on the areas still open, while pine, sweet gum, black gum, hickory, persimmon, water oak and willow in mixture, or in pure stands, form a young forest on the balance of the once cultivated areas.

The timber is mostly pine and oak. The tract is a natural selection forest of shortleaf pine and hardwoods. The percentage of these classes varies with the locality. On the "uplands" there is much more pine timber than on the "lowlands." Although there is not more than 10 to 30 feet difference in elevation between these sites the forest growth is entirely dissimilar.

The "upland" forest is composed about equally in numbers of shortleaf pine and hardwoods, but in volume the pine constitutes probably 60 to 85 per cent of the stand. If the remaining 15 to 40 per cent the white oaks comprise the bulk of the timber. Only occasionally does black gum, sweet gum, hickory, ash and other species occur.



A typical forest scene showing mixture of shortleaf and hardwoods, mostly white oak, on the operations of the Fordyce Lumber Company—Spur right-of-way in the foreground ready for laying track.

On the higher portions of the upland the principal associate of the pine is post oak. As this species grows mostly on dry, sterile soil, it would seem that the soil on these sites is of poor quality. Other species found on these localities are hickory, winged elm, and black oak, all species that grow in poor soil and on dry sites.

The soil in the lower portions of the "uplands" is of better quality, and is generally moist. The pine here is associated with white oak, and in especially moist situations, with cow oak. Other species as hickory and ash are only occasionally encountered as trees of merchantable size.

Shortleaf pine growing in mixture with hardwoods is tall, well formed, of good quality, generally thrifty and in good condition. The bole is clear of limbs, and the crown is carried above the tops of the hardwoods, forming a forest that may be called a modified two-storied type. The size of the timber is extremely variable. On some areas in favorable sites, old mature trees will average 2,000 to 2,500 feet each, and cut 5 to 7 logs, running $2\frac{1}{2}$ to 5 to the thousand.

In areas of immature timber where the trees will average 12 to 16 inches D. B. M., 15 to 20 logs are required to produce one thousand feet B. M. The shortleaf pine timber cut in 1912 averaged approximately 10 logs per M.

The hardwood timber, especially the white oaks, is generally thrifty and in good condition, tall and well formed, and produces a good grade of logs. The trees average smaller than the pine, and contain a much smaller percentage of merchantable material. Black ash, black gum, white ash and red maple are rarely found of merchantable size and are generally defective because of low limbs, crooks, rot and fire scars.

The "lowlands" comprise restricted areas bordering on the sloughs, bayous and streams. The extent of this type is small when compared with the "upland" areas in the region; however, as lower elevations are reached, the strip widens out until in the vicinity of larger streams it forms the bulk of the forest area.

The "lowlands" may be roughly divided into two types—the poorly drained lower areas, and the higher adjacent land. The latter type includes the higher better drained tracts, lying some distance back from the watercourses. The soil on these sites is dark, deep, always moist, contains much humus, and is of good

quality generally. The land is overflowed only during flood periods, and the water does not remain long upon the surface. The characteristic species on these areas are cow oak and red gum.

In virgin forests trees of these species are very large and of exceptional quality, thrifty and in good condition. Other merchantable species found are red maple, water oak, white oak and hickory.

Green bay, holly, Hercules' club, blue beech, dogwood, witch-hazel and other moisture loving shrubs form dense thickets on the areas adjacent to watercourses.

The characteristic species of the water or stream type are cypress (*Taxodium distichum*) and river or red birch. The bald cypress, a tall, straight tree with buttressed base, surrounded with numerous conical knees, occupies the bottoms of the sloughs, and bayous, and the immediate banks of the running streams. This species is not plentiful, but the specimens occurring appear very thrifty, and in good conditions. Individual trees were found that were upwards of 3 feet in diameter above the swell of the butt, and 75 feet to the first limb.

River birch grows somewhat above the water level, generally along the slope, or on the edge of the banks. This tree does not attain very large size, and branches low, forming an umbrella shaped crown, generally overhanging the stream. The species is very characteristic, picturesque and distinctive. The bark separates in reddish or pinkish bands, which gives the tree a shaggy and very pleasing appearance.

Other trees on this type are red gum, water oak, horn-beam and red maple, but as a rule they grow on sites much higher above the water table than the characteristic type species.

Reproduction of hardwoods and pine is more or less plentiful on all type areas.

On the "upland" type reproduction of all species of oak is very good, of all classes—seedlings, saplings and poles. White oak and post oak prevail, though young growth of red and black oaks was found in patches to the exclusion of all other species. Hardwood reproduction, especially oak, stands considerable shading in youth, and is always present in the virgin forest. When the merchantable stand is removed an understory is present which will soon replace the original forest if properly cared for.

Pine reproduction rarely occurs in the dense timber. Few scattering, spindling, individuals of little promise were observed. However, on open areas, which admit sufficient light for the development of the species, dense stands are common. These areas are clearly defined and occasionally are less than 50 feet in diameter. The future stand of pine will be much as it is at present, pure in patches, or as scattering individuals among the hardwoods.

Young growth of hickory, black gum, red gum, white ash, cherry, and other hardwoods occurs scattered among the oak reproduction, and is nowhere common; red gum of sapling and pole size however, is found in dense thickets on the lower areas of the "upland" type, covering considerable ground. This young growth is particularly healthy and vigorous, and is of much promise.

In the "lowland" type, reproduction of red gum and cow oak is decidedly not plentiful, and young growth of cypress and river birch is quite scanty. The forest is generally very dense, and the ground is largely covered with a heavy growth of blue beech, green bay, canebrake and other water loving shrubs and herbaceous growth, which effectively shuts out the possibility of the reproduction of the more desirable tree species.

LOGGING OPERATIONS

The logging operations of the Fordyce Lumber Company are carried on in an extensive manner. This is necessary because one operation furnishes the entire cut of 33 million feet annually, and must get out an average of 115 thousand feet per day. The logs are transported to the mill by rail, a distance of about 18 miles. Other than the building of the railroad and spurs, no improvements were necessary to get out the timber.

I. Labor

The labor used in the woods operations is practically all local, and is white and colored. There is usually an abundant supply, and new laborers are recruited from the farms in the vicinity. The white labor is of the ordinary "cracker" variety, and is sure and constant. The highest ambition of the white common laborer is to be employed at "public works" as camps and mills are called, and they begin young and stay long with the job. Teamsters and sawyers have been with the company

1 commissary clerk's house.

1 commissary.

12 cars for married employes, 12'x26'.

Besides these 26 cars there are several small portable buildings such as warehouses (2) and an oilhouse, which may be loaded on one ordinary flat car and moved without taking them down.

The average cost of the cars is about \$300 each. The wheels and other iron used in their construction were purchased at Marshall, Texas, and the cars were built in the company's shops at Fordyce. The timber used in car construction is mostly shortleaf pine, oak being sometimes used for the beams. All of the cars rest on wooden crossbeams, which in turn rest on the axles of the trucks.

The camp commissary is really a general store, which not only caters to the wants of the camp employes and their families, but to the needs of the neighboring farmers also. A full line of staple articles is carried, as provisions, groceries, meats, shoes, tobacco, clothing, dry goods, hay, feed, etc. The stock carried on December 1, 1912, invoiced more than \$4,100. The monthly sales average \$2,700. The sales to the boarding cars average \$400 per month; to contractors \$125; cash sales \$100; the remaining \$2,100 per month is sold to employes and farmers. Merchandise is sold on credit to employes, and the charges deducted on their monthly time checks. All other purchasers are required to pay cash. The system works very well and losses are small. It is necessary, however, with new men to see that they do not overdraw their credit and leave the camp without notice.

The commissary stock is housed in a special car, which is 44 feet long, 9 feet wide and about 7½ or 8 feet high. When extended the car makes a building 24 feet wide. The car is constructed with the sides hinged at the top, so that they may be swung out from the bottom and raised 7 or 8 feet, forming a serviceable roof. Posts are placed at the corners and along the sides; a floor, built in sections, is laid down even with the car floor on each side; the sides and ends are enclosed with sections made to fit; the outside corners of the car, and of the structure are propped up, and the building is complete. When the camp is moved the portable sections of the commissary are loaded on an ordinary flat car.



A birdseye view of the logging camp of the Fordyce Lumber Company. The camp proper consists entirely of cars set out on short spurs. The whole camp may be moved and set up in its new location in less than a days' time.

Two small frame warehouses set behind the commissary are used for storing flour, feed, hay, oil and other bulky merchandise. Supply cars from Fordyce are unloaded from a track located between the commissary and the warehouses.

Two men are employed in the commissary. The head clerk, who has charge of the store, receives a salary of \$65 per month. An assistant receives \$40 per month.

The commissary is a branch of the company's store at Fordyce. It is run very largely for the convenience of the camp employes, and pays a gross profit of about 20 per cent. The monthly profit after all expenses are paid, including \$150.00 charged against it by the Fordyce store for draying, supervision, etc., average \$250.00.

The boarding and bunk cars are operated by the company. The men are charged 50c per day for board and sleeping accommodations. The boarding cars are in charge of the wife of the section foreman, who directs the work. All of the boarding house labor is colored. The cook receives \$60.00 per month; the funkey, \$25.00; the waiter, \$20.00; all receive their board in addition. In the winter a "bull cook" is employed, who keeps the cars supplied with wood.

Two cars are used as boarding cars, each 10'x40' in size. One car is a store house, one end of which is used by railroad men as sleeping quarters. The other car is the dining car. One end (less than half the car) is used in preparing the food. The other end is the dining room. The tables are set on frail "saw horses" and are fastened to one of the walls of the car. Four tables are provided, each seating 8 men, making a total seating capacity of 32. The average number of men boarding at the cars is about 25 per day. Colored laborers are fed in a small building attached to the car at a charge of 45c per day, for board only. No attention is paid to the welfare of colored labor; no sleeping accommodations are provided for them and they get along as best they can. Many of the men have erected cheap "huts" in which they live in pairs, or several in one small shanty. Some of the men are married and live in better quarters.

The bunk cars provide good sleeping accommodations for the white laborers. There are two of them each with a capacity of 24 men. Each car is provided with two rows of bunks, two tiers high. The bunks on one side of the car are double, and on the

other side single. There are four sections on each side, the double sections accommodating four men each, and the single sections two men each. They are all $6\frac{1}{2}$ feet long. The double beds are 4 feet wide, and the single ones, 3 feet wide. The beds are provided with springs, mattresses, pillows, quilts and cotton sheets. The sheets and pillow cases are laundered every week by a colored woman who receives \$2.00 for the work.

Opposite each bunk is a half window which provides plenty of light. The sleeping quarters occupy 26 feet of the length of the car. The remainder of the car is used as a wash room, and a lounging place. Benches are provided in this room, and newspapers and magazines scattered about are evidences that leisure hours are not entirely wasted by some of the men.

For the married employes 12 cars, each 12 feet wide and 26 feet long are provided. Each car has two rooms. The cars are set close together on a single spur track. One car is allotted to each family, except in one case where a family occupies two cars. Three dollars per month is paid for the use of each car.

Married employes not living in cars own small lumber shacks located on the outskirts of the camp. These buildings cost from \$20 to \$50 each, and are torn down and moved when the camp changes its location.

The stable is made up of 3 cars joined end to end. These cars are each 30 feet long and 9 feet wide. The sides of the cars are hinged at the top, and are raised up to form the roof. The wings have a spread of 9 feet on each side, making the stable 27 feet wide. Under the corners of the wings and along the sides, posts are set up to sustain the roof. Swinging doors are fastened to the posts which enclose the sides. The ends are enclosed by sections made to fit. Each car has 3 double stalls on a side, each 9 feet long and 10 feet wide, and will accommodate 12 head of horses. Some of the stalls have floors of 2" plank, others have earth floors only.

Down the center of the cars is a passageway $5\frac{1}{2}$ feet wide, the whole length of the barn. The feed is kept in a store car, and wheeled out into this alley and fed as needed. All of the feeding is done from the alley. The feed boxes are attached to the sides of the car, at the right height, and the proper amounts of grain and hay are provided each animal through short chutes to

the mangers. The feed boxes are constructed to allow a minimum of waste.

The blacksmith shop is 24 feet long and 11 feet wide and contains drills, forges, benches and numerous small tools.

The camp water supply is obtained from Fordyce daily. The tank car is about 10 feet wide, 16 feet long, and 6 feet high, and is very substantially built of 2 inch planking.

A car 12x28 feet in size is set apart for the use of the camp physician. The company maintains a "practitioner," to look after the physical welfare of the camp employes and their families. He receives a salary of \$75 per month and board and feed for a horse, which he owns. The outside practice among the farmers amounts to about \$75 per month more. The physician is required to purchase all drugs and supplies needed in his work. This amounts to about \$15 per month. Three dollars per month is charged him for the use of the car.

The present camp doctor is not a licensed physician, but does very well, having had four years' experience. The work is light, and consists mostly of treating slight ailments. No surgical work has been necessary in years and few fractures are encountered.

Employes are charged 50c per month if single, and \$1.00 per month if married, to maintain the camp physician. Medical treatment is furnished free. Employes do not receive any pay during illness. An additional insurance fee of 1½c per dollar of wages is charged against employes which pays laborers who are unable to work from accidents, ½ of their regular wages during the period of disability.

A novel feature of the camp is the school maintained for the benefit of the children of the employes. The school is housed in a specially constructed car, 10 feet wide by 44 feet long, set somewhat apart from the others. The car is well-equipped, and has accommodations for 25 pupils. The school, until this year was maintained by private subscriptions, the company furnishing what money was lacking. At present it is supported by the district in which it is located, and the other district school is temporarily closed. The teacher is a young woman from the country; her salary is \$35 per month.

On holidays, Sundays and evenings the school house serves as a gathering place for the white population, for singing and other entertainments.

IV. Felling the Timber

The timber is felled with saws exclusively. The undercut is sawn and a small notch made with the axe, otherwise the tree is felled and bucked with the saw. The stumps are cut 16 to 20 inches high, although no especial attention is paid to this feature in felling. The cut is made where convenient.

In logging spurs of temporary track are laid down 300 yards apart, on either side of the main track. The timber lying between these spurs is laid off into strips 60 to 70 yards wide, along the track, extending back about 150 yards, or approximately one-half the distance between the spurs. The side boundaries of each block are blazed; one end of the block adjoins the spur, and the other end, a previously cut area, or the cutting limit from the next spur. Each block then is a well defined area, about 70 yards wide and 150 yards long and contains approximately $2\frac{1}{2}$ acres. The average stand within a block is 20,000 feet B. M. of pine and hardwoods, 80 per cent of the total merchantable timber being pine.

A crew of four men with one team is placed in each cutting area, two sawyers, one skidder and a swamper. These men work within a block until all the merchantable saw timber has been cut and skidded to the track. The timber on a block can be cut and removed in about two days.

The cutting crew of two men do all the felling and bucking. The pine timber is cut first in order that the logs may be skidded and landed at the track separate from the hardwoods. Since the pine logs and hardwood logs go to separate mills, it is desirable that separate piles be made of these classes along the spurs to facilitate the work of loading.

No special precautions are necessary in felling. The topography is uniform, the trees are straight and tall, and the timber may be made to fall in any desired direction. Much timber is broken by felling the trees across stumps, over skidways and windfalls, due largely to the general shiftlessness of the men.

Wooden wedges are used in felling, partly on account of the soft nature of the timber, into which iron wedges sink deeply when driven, making it difficult to fell the tree accurately, and partly because of the fact that no injury can come to the axes and saws through carelessness of the sawyers. The wooden wedges employed are about 11 inches long, 3 inches wide,

1 inch thick at the butt, cut or shaved on a uniform taper to the tip which is 1/16 inch thick. They are made of seasoned red elm when this wood is available, otherwise black gum and other tough woods are used. One man supplies the camp with wedges, making 100 to 125 per day, for which he is paid 1½¢ each.

The areas are cut clean of all merchantable pine timber above eight inches on the stump. All dead and down pine which has the appearance of having a sound heart is cut into logs, if the sound heart measures 10 inches in diameter or over. Utilization of pine timber is extremely high, and the trees are cut into logs to a very low top diameter limit. Carelessness in felling, however, generally breaks up the crown so that few top logs are obtained. In small timber, small, crooked, knotty and otherwise defective logs are taken from which a piece of 2"x4" dimension can hardly be obtained.

With the hardwoods which constitute 20 per cent of the entire stand there is a much greater waste. The hardwood logs—oak, gum and hickory are sold to a company operating a mill at Fordyce, at \$10 per M, delivered. Oak and hickory are cut to a top diameter limit of 10 inches; the gums to a limit of 14 inches. The portions of the trees above these limits are left on the ground. Trees which will not cut to the prescribed limits are left standing. Tie crews follow the logging operations and make cross ties of all oak suitable for the purpose, standing or down. Much of the small timber and many of the larger tops are utilized in this manner.

The saw timber is cut into 16 foot logs whenever possible. Butt cuts and top logs are sometimes cut less than 16 feet long, in order to obtain the greatest merchantable volume from the tree. Logs longer than 18 feet are cut only on special order. All logs are made 1½ to 3 inches over length to allow for damaged ends and trimming at the mill.

The day's output in ordinary timber is 10,000 feet B. M. for each crew. The men are paid \$1.75 each per day for cutting this amount. In timber running more than 10 logs to the thousand 100 logs is a day's work. Each sawing crew is required to cut 60,000 feet B. M. in 6 days. If the required amount is cut in less time, the men have the remaining time to themselves. The crews try to cut this amount by Friday night, in order that they may have Saturday off. The prescribed daily cut of 10,000 feet may

easily be finished by 2 or 3 o'clock in the afternoon in ordinary timber. The rule seems to be to cut about two-thirds or three-fourths of this amount in the morning, and the remainder after dinner. The last hour of the day is devoted mostly to waiting for the horn to blow; very little is done, everyone seems to be resting.

During the hot summer months the sawing is done very largely by negroes who are able to stand the hot weather and woodticks, much better than the white sawyers.

The yearly average cost of felling and bucking, including the fitting of the saws, for 1912, was 45c per thousand feet. By paying larger wages and requiring a larger output per crew this cost may be reduced to 40c or less per M.

V. Swamping

The operation of swamping is quite simple at this camp. The trees are felled advantageously for skidding; the swamper lops the branches from the portion of tree to be taken out. This is usually done after the tree is "bucked" by the sawyers. No attention is paid to the crown of the felled tree above the last cut. The brush is not disposed of in any regular manner, but simply thrown out of the way of the skidding. Little other work is required of the swamper. Only such other brush is cut and removed as is required to making skidding easy. Colored labor is generally employed as swampers. They are generally new and young, and receive \$1.35 to \$1.50 per day. One swamper is allotted to each skidding team. The cost for swamping during 1912 was 18c per thousand.

VI. Skidding

Draft animals are used entirely in the skidding operations. The haul is never longer than 150 yards; the surface is generally smooth, and the land level making this kind of skidding power entirely satisfactory. Large horses are employed, any team of which is easily capable of handling the largest logs encountered. Logs scaling over 900 feet B. M. are seldom found. The largest tree cut during the logging operations of the company was a shortleaf pine scaling about 8,900 feet. The logs from this tree were skidded by horse power to the spur.

The timber is skidded on "bummers," or by the use of tongs or draft chains. The latter methods are employed for short distances or with small logs, or during wet seasons.

A "bummer" is ideal for skidding ordinary sized logs short distances. The device is simply a low, two wheeled truck with a rigid V-shaped tongue about 5 feet long at the end of which is attached a short chain by which the truck is pulled. Attached to the bunk are tongs which have a spread of 31 inches. The "bummer" is backed up against the log by hand at a point somewhat above its center of gravity. The tongue stands perpendicular to, and the bunk is parallel with the log. The tongs are then fastened to the log and with the pulling of the horses hitched to the upright tongue it is swung or rolled upon the bunk of the truck. The tongs securely fastened into the log, prevent it from rolling off the bunk. The operation of loading is simply a part of the skidding as when the horses begin pulling they continue until the log is brought to the spur. The heavy end of the log drags on the ground behind the bummer, and the nearer the center of gravity is to the bunk on which the log rests the easier is the haul.

Bummers are either entirely hand made or are constructed with factory made parts, as wheels, skeins, etc.

Home-made "bummers" are constructed of oak, hickory and black gum. The axle is of oak, 4" square, to which are attached the hounds, 2 or 4 inches square, also of oak. Resting on the axle and securely bolted to it by the use of $\frac{3}{4}$ " iron bolts is the bunk 6" high and about 4 inches thick, of oak, slightly cut away at the top to better receive the log. The top of the bunk reaches to the height of the wheels, and is plated with an iron strip $\frac{5}{8}$ " thick and 3" wide to prevent wear.

The wheels are made of sections of black gum and are 15" in diameter and 10" wide. The iron skeins into which the axle fits are 3" in diameter. All parts of a bummer are securely braced to withstand the great strain they must bear in handling large logs.

The other style of "bummer" is in all respects similar to the handmade one except for the iron wheels. These are 20" in diameter, with an 8 inch face or tire. The rim is of $\frac{3}{8}$ inch material. Ten oval spokes $\frac{7}{8}$ "x $\frac{1}{2}$ " in size support the rim. The tread of "bummers" is generally 4 feet from center to center.

The cost of a hand-made "bummer" is about as follows: Skeins, \$1.50 per pair; tongs, \$2.50 per pair; chains, about \$2.00; labor, \$2.50, and materials, \$1.00. Total cost, \$9.50 each.

A "bummer" with iron wheels will cost \$11.00 additional for wheels, or \$20.50.

Wooden wheeled "bumpers" have these advantages over the iron wheeled hummers: (1) are cheaper; (2) don't slide in wet weather as easily as iron wheels; (3) are lower, nearer to the ground, hence more easily loaded.

In exceptionally wet seasons "bumpers" cannot be used, because they sink too deeply into the soil to be readily moved. The "crazy dray" is employed in skidding during these seasons. This device is similar to the ones used in Idaho in white pine and fir, having two runners, attached to the center of which is a bunk. The runners are not rigidly fastened to the bunk, but may slide one ahead of the other in turning sharp curves. They are long and wide and do not sink deeply into the ground even in the wettest weather.

The tongs used in skidding are made of $1\frac{1}{2}$ " round steel, and have a spread of $27\frac{1}{2}$ ". All tongs are made by the camp blacksmith. They weigh from 20 to 25 pounds a pair, and cost \$3.00 to \$4.00. Tongs are used only with logs difficult to get out with "bumpers" or on short hauls.

Draught chains are used in place of tongs with large or defective logs, or in bringing in several small logs at one time. These chains are usually 16 feet long and are made of heavy steel links.

Each skidding team is required to skid to the spur the logs cut by one sawing crew. This amount averages 10,000 feet per day. If the sawyers cut the required 60,000 before Saturday night, the skidders and swampers finish work early also, and have the remainder of the time to themselves. Skidding teamsters are always whites. Their labor ends for the day when their teams have been put in the barn and the harnesses removed. Teamsters receive \$1.75 per day.

The cost of skidding to the spur was 32c per M. for labor and rent of teams during 1912. The maintenance of teams (feed, barn labor, harness, etc.) amounted to 20c per thousand B. M. making a total cost for skidding of 52c per M. The cost of logs delivered at the track ready for loading is as follows:

Felling and bucking.....	\$.45 per thousand B. M.
Swamping .....	.18 per thousand B. M.
Skidding .....	.52 per thousand B. M.
Total cost at spur.....	\$1.15 per thousand B. M.

To keep the mill at Fordyce constantly supplied with logs requires the employment of 14 crews, of 4 men and one team each. These men fell, buck, swamp and skid to the spurs 140,000 feet of logs per day. Figuring that 80 per cent of the timber is pine, and 20 per cent hardwood, 112,000 feet of pine, and 28,000 feet of oak, gum, hickory and other hardwoods are relivered to the loading spur daily. The full woods crew however consists of 16 units, in order that a reserve supply of logs may be constantly on hand. When the woods operations are in full swing these men are employed:

1 woods foreman,	\$85.00 per month.
32 sawyers,	\$1.75 per day.
16 swamper,	\$1.35 per day.
16 teamsters,	\$1.75 per day.
1 water boy,	\$1.00 per day.

Making a total of 66 men and 16 teams necessary to deliver to railside the logs needed daily at the mill. About $1\frac{1}{2}$ million feet of logs are in reserve at all times, in the pond at the mill, and decked along the spurs in the woods.

Timber lying some distance back from the ends of the spurs is delivered to the track by contractors. The timber is felled and bucked by negro sawyers who receive 50c per M for the work. The swamping and delivery to the spur is done by the contractor. He receives \$1.25 per M for pine and \$1.50 per M for hardwood, for delivering the timber within a radius of one-quarter mile, from the end of spur. For greater distances he receives 25c per M for pine and 50c per M for hardwoods, for each additional quarter mile hauled.

The timber is transported on heavy 4 wheeled logging trucks. The logs are loaded on the trucks by use of the "cross haul," and skids, the ends of which rest on the bunks of the wagon. The wheels of the wagon are of uniform size and the heavy bunks extend just a little above them so that the logs may be easily loaded and unloaded. The loads hauled range from 400 feet to 1,000 feet B. M. depending on the distance and the species. Hardwood logs are heavier than pine, and the loads are smaller. No roads are prepared for hauling contract logs; the country is level and the bringing out of a few loads makes a fairly good

log road. Contractors deliver 5,000 feet B. M. per day, on the average, and do their own swamping. The company doing the same work gets out only 3,500 feet per day per team and besides each team is furnished a swamper.

VI. Scaling

Two men do the scaling, a scaler and a tallyman. The logs are scaled at the spurs in the afternoon, in order that all of the logs skidded each day may be "taken up." The scale of each compartment crew is kept separate, and when 60,000 feet have been delivered by any crew the work of that crew is finished for the week. The Doyle rule is used entirely in scaling; this is the statute rule in Arkansas and the use of any other rule is prohibited. With sound logs the general method of scaling is to allow for one thickness of bark.

The ordinary defects in the logs are red, soft, or punk rot, which may appear at any point in the cross section, and stained or decayed sap, in dead, dying or down timber. In the first instance allowance is difficult to make, as it is impossible to determine the extent of the defect. As the logs are not being sold, however, the contents of logs affected by this rot are estimated as nearly as is possible by the eye, using the log rule as a guide. With logs having decayed sap, only the sound and merchantable heart is scaled; this is generally an easy matter as the line of demarcation is very plain in shortleaf pine.

The majority of the timber scaled averages 5 to 10 logs per thousand. For logs of these sizes the Doyle rule greatly under runs the actual scale. The lumber cut in 1912 overran the log scale by 18 per cent.

The scaler receives \$2.00 per day, and his helper \$1.50. The cost of scaling per thousand B. M. is about $2\frac{1}{2}c$.

VIII. Railroads and Spurs

A. MAIN LINE

All logs are transported to the mill over the Fordyce and Princeton railroad. This is really the company's logging railroad, as it is owned and operated by the same people who own and control the lumber company. The main line to the logging operations is 18 miles long. A branch extends from a point about 5 miles below the camp, several miles in the direction of Princeton. It is intended when logging is finished to make this portion

of the line permanent, possibly connecting with the Rock Island or some other existing line of railroad traversing the country. The main track is fairly well constructed and can quickly and cheaply be made into a good road. The rights-of-way for the main line were cleared 50 feet wide at a cost of \$45 to \$60 per mile, the grading, surfacing and bridging averaged from \$600 to \$1,000 per mile, making an average cost per mile of right-of-way ready to lay the ties of approximately \$850. No expense was incurred for right-of-way purposes, except for one short stretch, as the necessary land was either donated or lay within the company's own holdings.

Oak ties are used in track constructions. These are laid 12 to 13 to the rail, or approximately 2,200 per mile. The company pays 18c each for standard ties delivered at the track, making the cost for ties \$396.00 per mile of track.

The steel used is new 45 lb. rail, which is worth \$28 per ton, costs \$1,980.00 per mile (70.7 tons per mile). Four spikes are used in each tie, or 8,800 spikes, 4,150 lbs at 2c per lb., \$83.00; 374 splice joints at 10c each, \$37.40; 1,124 lb. bolts and nuts at 4c per lb., \$44.90; total for steel, per mile, \$2,145.36.

Cost of putting down ties and laying steel is \$126.72 per mile. The filling in, and straightening of the track and other work necessary to put the track in good condition for traffic will cost probably \$50.00 per mile.

The average cost per mile of completed main line is then \$3,568.08, distributed as follows:

Cost of right of way.....	Nothing
Cost of clearing right of way.....	\$ 50.00
Cost of grading, surfacing and bridging.....	800.00
2,200 ties at 18c each.....	396.00
70.7 tons 45 lb. steel at \$28.00 per ton.....	1,980.00
4,150 lb. spikes (5"x9-16") at 2c lb.....	83.00
374 splice joints at 10c each.....	37.40
1,124 lb. bolts and nuts at 4c lb.....	44.96
Laying ties and steel.....	126.72
Filling in between ties, straightening track, etc.....	50.00

\$3,568.08

The main line is kept in repair by 3 colored sections crews of 5 men each, who receive \$1.50 per day. The foreman of these men is white and receives \$50.00 per month.

B. SPURS

Spur tracks are temporary lines run out into the timber, about 300 yards apart along the main line. These spurs are

from $\frac{3}{4}$ to $1\frac{1}{2}$ miles in length, depending upon the width of the strip of timber to be cut. They are laid out upon the ground by the superintendent, by eye, and afterwards staked. The most open part of the woods is selected, and curves are often made in the "survey" to avoid large trees, or bad places in the ground. When the line has been located it is cleared. A right of way 20 feet wide is cut clean of all brush and timber. The "swell" is cut from the larger trees with the axe, and then the timber is sawed off at the ground. One or two logs are cut from the felled tree with the saw, so that the timber may be easily removed from the cleared area.

Colored labor is employed entirely in this work. Six men can brush and clear away the timber on $\frac{1}{4}$ mile of spur right of way per day.

When 6 men work together 4 men pull the saw, and 2 do the swamping. One team, driver and swamper will remove all the material from a right of way of maximum length in one day.

Sawyers on right of way receive \$1.75 per day; swampers, \$1.35; teamsters, \$1.75.

The cost of clearing one mile of spur right of way is as follows:

4 sawyers, 4 days, at \$1.75 each.....	\$28.00
2 swampers, 4 days, at \$1.35 each.....	10.80
1 teamster, 1 day, at \$1.75; 1 swamper, 1 day, at \$1.35; 1 team, at \$2.00; removing timber	5.10
Total	\$43.90

Spur right of way has been cleared as cheaply as \$35 per mile. The cost of clearing spurs in 1912 was 8c per thousand feet of timber cut.

A portion of the branch of the main line above camp, upon which steel is now ready to be laid cost as follows for the operations to date:

For cutting right of way, 25 feet wide, per mile.....	\$35.00
3 teams and drivers, at \$3.50 per day.....	10.50
3 slip holders, at \$1.50 per day.....	4.50
3 levellers, at \$1.50 per day.....	4.50

Nine men then with three teams grade and level a 12 foot tie bed on 600 feet of right of way per day at a cost of \$19.50, or a cost of \$3.25 per 100 feet, or \$171.60 per mile. This was in light sand with few roots and was easy to work.

The laying down of spur track is done by a special crew consisting of 18 colored laborers under a white foreman. The equipment necessary in the work consists of one 35 ton Lima locomotive and two 30-foot flat cars for carrying ties and rails. The locomotive engineer and fireman completes the list of workmen, making 21 in all. This crew takes up 30 rail lengths and the ties from an abandoned spur in the morning, and lays them down in their new location in the afternoon. This task constitutes a day's work for the crew. The placing of switches is also included. The taking up and relaying of a mile of steel is a standard week's work. The cost of taking up and relaying a mile of track is about as follows:

Wages of men per day—

Foreman	\$ 2.50
1 locomotive engineer	2.00
1 fireman	1.50
4 tie carriers, each	1.50
4 spikers, each	1.75
2 linemen, each	1.50
2 nippers, each	1.50
(All of the latter 8 men carry rails)	
1 spike peddler	1.50
1 tie shover	1.50
1 spotter of ties	1.50
1 wrencher	1.50
1 or 2 grading ahead of steel crew, each	1.50
Total wages for 1 day.....	34.00
Coal and repairs, depreciation, etc.....	6.00
Total cost per day.....	40.00
Cost per mile for taking up and re-laying 1 mile of spur track	240.00

Beginning at the switch ties are laid down, 10 to 12 per rail length upon the right of way. When 15 to 20 ties have been laid the steel is placed on them. The rails are connected using but two bolts, one in each rail. Only every other tie is spiked.

Spur rights of way are not surfaced, graded or otherwise prepared to receive the track, except in bad places, where it is necessary to lay stringers across small gullies or bogs, or to place small poles under tie ends to level the rails. This rough work and simple grading is done by one or two men who precede the track laying crew.

A spur track is taken up and laid down about 10 to 12 times per year. Ties are used over and over again until they are so filled with spike holes that spikes can no longer be driven in them. The life of a tie is about three years. Ties are seldom discarded because of defects due to rot, but mostly because of

mechanical abrasion and spike holes. They are seldom imbedded in the ground and then only when forced into the earth by the weight of the heavy log trains, crossing low pieces of track.

The area logged to each spur averages about 100 acres—a tract extending 150 yards on each side of the spur, and about a mile long. From this area 700,000 to 1,000,000 feet of logs B. M. are skidded to the railside, where they are loaded and hauled to the mills.

The cost per thousand feet for taking up and relaying spur tracks in 1912 was 44c, and the cost of maintaining them was 12c per thousand feet B. M.

IX. Logging and Railroad Equipment

A. LOCOMOTIVES

Five locomotives are used in connection with the logging operations. One engine is permanently assigned to the steel laying operations; one to the loading operations; one, a rod engine, is used exclusively for hauling logs to the mill; another engine is held in reserve and one does general and miscellaneous service.

Four of these engines are Lima locomotives, as follows:

2 geared locomotives, each	35 tons
1 geared locomotive	37 tons
1 rod locomotive	45 tons

One second hand rod locomotive of 54 tons, was bought from an eastern company for \$4,200.00.

The cost of new Lima locomotives is about \$142.00 per ton. When new the above locomotives were worth as follows:

35 ton, each	\$5,000
37 ton	5,300
45 ton	6,400

Together with the second hand locomotive recently purchased, the locomotives in the company's service cost originally about \$25,900.00. Lima engines are equipped with air brakes.

All of the engines are coal burners. Spark arresters are not provided for the stacks. Coal is supplied from a coal shed at the camp. Water is taken from a pond along the track below camp.

B. LOGGING CARS

Eighty-five logging cars are necessary to properly care for the output of the camp. These cars are all of uniform size, and



The American log loader at work. Loading white oak logs from the spur right-of-way.



Shortleaf logs landed at the spur. The numerous low skidways demand a loading machine which has a wide radius of action and can be easily and quickly moved.

pattern. The wheels, trucks and other steel used in their construction were purchased in Marshall, Texas, and the cars were built in the company's shops at Fordyce. The cars are all of the skeleton type built for heavy service. Two parallel beams 6"x12" and 1 foot apart extend the length of the car through the center. Between these beams at the ends are inserted drawheads. Set across the beams forming the bunks are 2 timbers, 12"x12" in size and 10' long, placed equal distances from the ends, so as to be 12' apart. Sway beams 8"x8" connect the bunks, and 2 other beams 6"x12" in size connect the sway beams between the bunks. All of the timbers are heavily braced with bolts and bands of steel, making an extremely solid car. The total length of the car is 20 feet (the length of the center beams). Air brakes are not provided, and the coupling is the common link and pin arrangement. The car frame sets on 2 four-wheel trucks. The wheels are 26" in diameter, with a 4-inch rim and a 1½ inch flange. The height of the flange is one inch.

The wood used in the construction of the cars is selected shortleaf pine and white oak. The cars are built to carry the weight of 4,000 to 4,500 feet B. M. of green pine or oak. This is equivalent to a capacity of 40,000 to 45,000 lbs. The completed cars cost about \$300 each. The cost price of the cars now in service is about \$25,500.

Besides the logging cars the company has two ordinary box cars for hauling freight and passengers, two flat cars used in spur construction and a small flat car used as a "bumper," for freight and passengers, when the box cars are set out.

X. Loading Operations

In loading operations at this camp, the American loader, as stated above, is attended by a locomotive which does the necessary moving of the machine and cars. Beginning at the last of a number of cars on a spur, the cars are loaded by the machine in regular order to the first. The logs are picked up along the right of way and about 3,000 feet is loaded on each car. In pine the average is a little over 2,500 feet. Several cars of hardwood logs were scaled, and found to average about 4,000 feet each.

The loading crew consists of 6 men; the loading engineer who receives \$110.00 per month; fireman, \$2.00 per day; and 4 colored tong pullers, who receive \$2.00 per day each. In addition the train crew with the loader consists of a locomotive engi-

neer at \$75.00 per month; a fireman at \$1.75; and a brakeman at \$1.50 per day. The total expense for labor per day to conduct loading operations is \$20.65; coal used about \$10.00; maintenance and depreciation of locomotive and loader about \$8.00 per day. The total expense of loading per day is \$38.65.

The tong men, 4 in number, change off after loading a car. The tong crew consists of 2 men who adjust the hooks in the ends of the logs and pull back the crotch chain when the log has been lowered into place upon the car. This work is hard and exhausting, a change is made every time a car is loaded.

It requires about 6 to 8 minutes to load a car with 2,500 to 3,000 feet of average sized logs. If the timber is all small, a longer time is required, as the logs are loaded one at a time. With very large timber a longer time is also required. About one minute is used in moving the loader from one car to another. Six or seven cars are loaded per hour on an average. The loader can load 80 cars per day. An average day's work, however, is 48 to 50 cars. The mill at Fordyce requires 100 to 110 thousand feet B. M. per day. Thirty-eight to forty cars of pine logs having 2,500 to 3,000 feet of logs each and 8 to 10 cars of hardwood logs are loaded daily. The cost of loading during 1912 averaged 31c per thousand.

XI. Hauling the Logs

The logs are hauled from the woods to the mill over the Fordyce and Princeton railroad. The railroad company charges the lumber company the actual cost of handling the timber. This in 1912 amounted to 79c per thousand feet of logs hauled. A Shay logging engine gathers the loaded cars together on the spurs, and each morning the 54 ton rod engine picks up the loads and hauls them to the mill. When logging operations are in full swing, 45 to 50 cars are hauled daily, and 2 trips are necessary to get the logs to the mill, 20 to 25 loads being hauled at each trip. The hauling of the logs is generally an easy problem, as the equipment used is well suited to the work, and the road is extremely good for logging purposes.

Three men are employed in hauling logs—the locomotive engineer, who receives \$90.00 per month; the fireman at \$2.00 per day; and a colored brakeman at \$1.75. From 115 to 130 thousand feet are hauled daily from the operation.

XII. Unloading the Logs

The logs are unloaded by 3 or 4 men at the landing, who, when not employed at this work, are busy clearing the pond of dead-heads. The pond comprises 3 or 4 acres, and has a capacity of 600,000 to 800,000 feet of logs. The logging road follows along the edge of the pond for some distance. Between the track and the water is built a strong sloping "dump" or platform upon which the logs are unloaded, and down which they roll into the water. Square timbers 12"x12" are driven some distance from the shore of the pond, about 5' apart, upon which heavy timbers are laid. A second set of piling is driven nearer shore, and capped. Next to the rail is a third set of stringers. At right angles to these timber and lying upon them are placed round, rossed logs, 15' long, 8 to 12 inches in diameter. These are about 5' apart. The space between the logs is planked to catch bark and other debris which would soon fill up the pond if allowed to fall into the water. The track next to the dump is lowered about 8" in order that the logs may be rolled off the cars with ease.

Logs are unloaded by releasing a patent fit hook which releases the chain which holds them. Most of the logs roll off the car quickly by gravity. The few sometimes remaining are rolled off by hand with the cant hook.

SUMMARY OF CAMP LABOR

1. General Labor, ten men—

Camp foreman, per month	\$175.00
Blacksmith, per month	75.00
Commissary clerk, per month	65.00
Commissary assistant, per month	40.00
Camp physician, per month	75.00
Scaler, per day	2.00
Scaler's helper, per day	1.50
Barn boss, per day	2.00
Blacksmith's helper, per day	1.50
Night watchman, per day	1.50

2. Boarding House Labor, four men—

Cook (colored), per month (and board)	\$ 60.00
Cooke (colored), per month (and board)	25.00
Waiter (colored), per month (and board)	20.00
Bull cook (in winter) per day	1.50

3. Logging Crew, 68 men—

Woods foreman, per month	\$ 85.00
32 sawyers, per days	1.75
16 swampers, per day	\$1.35 to 1.50
16 teamsters, per day	1.75
Water boy, per day	1.00

Wedge maker, per day	2.00
Saw fitter, per day	2.25
4. Spur Construction Labor, twenty-seven men—	
Construction foreman, per month.....	\$ 75.00
18 colored laborers, per day	1.50
4 tie carriers, per day (spikers).....	1.75
8 (4 spikers, 2 linemen, 2 nippers) rail carriers; 1 spike peddler, 1 tie shover, 1 tie spotter, 1 wrencher, 2 graders, ahead of steel, per day.....	\$1.50 to 1.75
1 locomotive engineer, per month	55.00
1 locomotive fireman, per day	1.50
6 colored laborers clearing right of way under general foreman, per day	\$1.50 to 1.75
5. Loading Crew, nine men—	
Loader engineer, per month	\$110.00
Loader fireman, per day	2.00
Locomotive engineer, per month	75.00
Locomotive fireman, per day	1.75
4 hookmen (colored), per day	2.00
Brakeman, per day	1.50
6. Hauling Crew, three men—	
Locomotive engineer, per month.....	\$ 75.00
Locomotive fireman, per day.....	1.75
Brakeman, per day	1.50
7. Section Labor, sixteen men—	
White foreman, per month	\$ 50.00
15 colored laborers, per day	1.50
Total number of men employed at camp, including foreman, 137; average daily output, 140 thousand, or approximately one thousand feet per day per man.	

SUMMARY OF LOGGING COSTS, 1912

Yearly Average

Sawing	\$.45
Swamping .....	.18
Skidding .....	.52
Labor and horse rental	\$.32
Horse feed .....	.20
Spur construction .....	.66
Right of way clearing .....	.08
Steel laying .....	.44
Maintenance .....	.14
Loading on cars .....	.31
Locomotive and car repairs .....	.05
Hauling logs (F. & P. R. R. Co.) .....	.79
Main line repairs (other than by R. R. Co.) .....	.01
Fuel (locomotive, loaders, etc.) .....	.15
General labor .....	.16
General expense, contract logs, etc. ....	.27

Total cost per thousand feet delivered at mill.....\$3.55



Photographed by Prof. G. B. MacDonald
Norway Pine, shore of Lake Helen, on Star Island.