B-138

Single Unit Sawmills for Farms and Ranches

THE COVER: Farmers and ranchmen grow more timber and use more lumber than any other class. Using simple equipment described in this publication many of them can saw much good lumber at least cost from their own woodlands. The cover pictures show lumber sawed in Harris and Jasper counties with mobile, low cost sawmills designed for farm use.

Without suitable power units and machines, lumber is still made by many people, like these Koreans, using crude devices. This whipsaw is a forerunner of the sash gang saws. The average day's production per man by whipsaw work is about 150 board feet. The production of modern sawmills, large and small, averages about 1,000 board feet per man-day for softwood lumber.

FOREWORD

There is much need for suitable power, equipment and knowledge of methods used to utilize profitably and improve to a practical degree the forest resources on Texas farms and ranches. Timber cutting, logging, lumber sawing and other wood processing of farm timber and making things of wood should be done to greater extent by the farmer. Many farm and ranch families have important advantages along this line and given suitable opportunities can grow useful forest resources and produce many wood products economically and efficiently during slack seasons for the longest time.

East Texas farmers have the difficult problems of selling, using or otherwise reducing much low grade hardwoods which are invading their pine forests and cut-over land. Pine reforesting requires much hardwood removal. Meanwhile, much little-used hardwood can be used on farms and ranches and for many local purposes everywhere, while waiting for better timber to grow. The three principal uses of wood on the farm, are lumber, fence posts and fuelwood. Profitable use and management of the usual type of farm forest for these and other products will require lighter and more efficient power and equipment and better processing methods for farm family operation.

This bulletin and the following companion publications describe the native timber and wood uses on Texas farms and ranches and also the equipment and methods found useful for them. These publications and other information can be obtained free from your county agricultural agent or by writing the Extension Service, College Station, Texas: B-135, "Suitability of Native Woods for Farm Use"; B-136, "Fence Post and Other Wood Treatments for the Farm"; B-137, "Cutting and Logging for Farm Forestry Work"; FB-1907, "Equipment and Methods for Harvesting Farm Woodland Products"; L-20, "Tree, Log and Lumber Scale Card"; "How to Sell Timber by Tree Scale", and other farm forestry publications. (Bulletins B-135 and FB-1907 explain lumber seasoning and other information which should be important, especially for better use of native hardwoods). Saw and sawmill manufacturers, especially of new types for farm use, prepare good information, specific instructions and plans essential to construction, operation and care of sawmills. Plans for construction of many types of farm buildings, including barns, sheds and equipment can be obtained from the Extension Service or County Agricultural and Home Demonstration Agents.

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Single Unit Sawmills for Farms and Ranches

By
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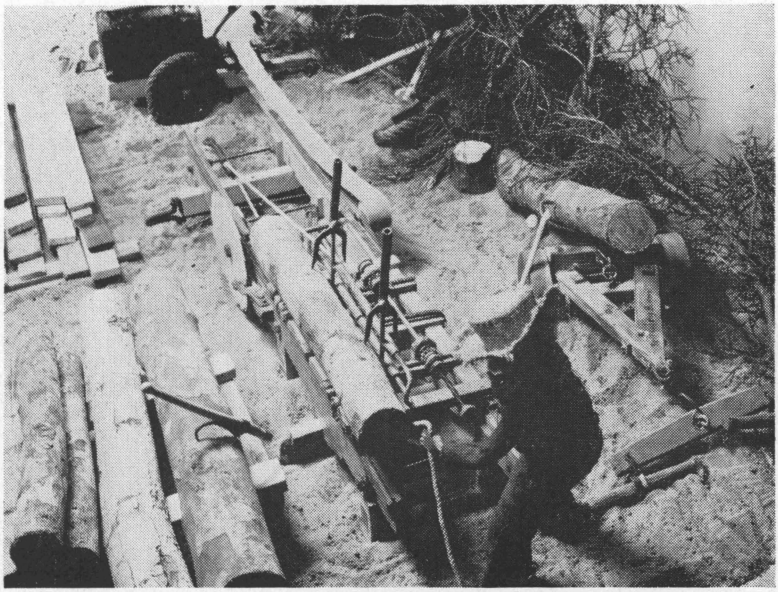
With only crude tools farm forest owners have done well to make better than crude products for farm use or for sale with low return. A better practice for many farmers would be to cut and log timber wisely, and make useful materials and products of wood. Forest products which the farmer can make, such as lumber, fence posts, fuelwood, pulpwood and ties, will require lighter and more efficient power and equipment for farm use. Productive work of this kind will more nearly bring a fair return any year.

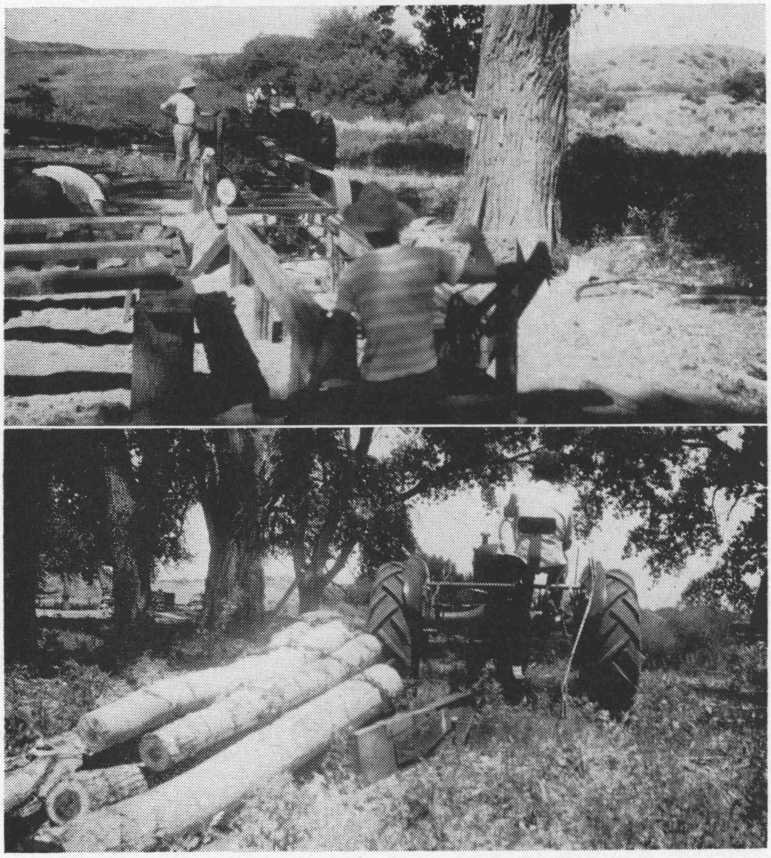


This model shows one of lowest cost farm built, mobile type, single-unit mills for short log sawing and other equipment used in the woods which provides low cost logging on the farm. It pays to move the mill close to the timber.

Many Farm Sawmills Are Needed

To obtain better timber use and more value and return from it each year, much of the vast amount of yearly growth of native sawtimber on Texas farms and ranches should be first sawed into lumber. Lumber is one of man's oldest and one of his most useful materials. The timber is mostly hardwood. Farmers and ranchmen own most of the hardwoods and also require and use the greatest amount. The average length of lumber used on the farm is eight feet. Much hardwood lumber also is used on roads, railroads, by oil fields and others requiring strong, durable wood.

Sawtimber is small. Most of it is in small areas of ownership. About



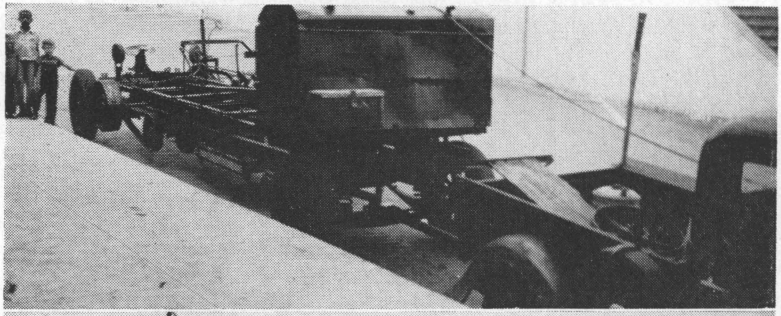
Boys of Boy's Ranch School on Canadian River, Oldham County, besides regular schooling, learn all ranch work. This picture shows how they log and make lumber from their carefully managed cottonwood forest. This mill cost about $200. They utilize the whole tree; they saw lumber from good limbs as well as tree stems (trunks) and make fuelwood with a buzz saw from slabs and crooked parts of trees.

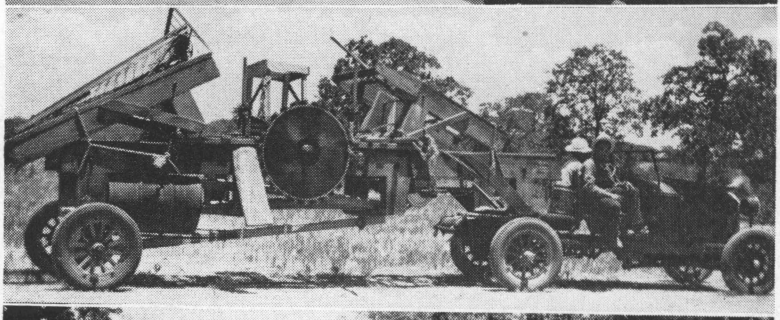
90% of farm sawtimber stump diameters measure between 10 and 24 inches and log diameters average ten inches at small end. The average length of pine tree stems suitable for lumber use is about 24 feet and the shorter sawing lengths of hardwood stems over the state average about ten feet. The smallest diameter of pine or cedar log ordinarily sawed is five inches. The smallest hardwood log diameter sawed ordinarily on the farm mill is about eight inches. Farmers and ranchmen own about one-third of the East Texas pine-hardwood forests and about all of the forest areas which includes the hardwood, cedar, mesquite and other types, west of the pine forest region.

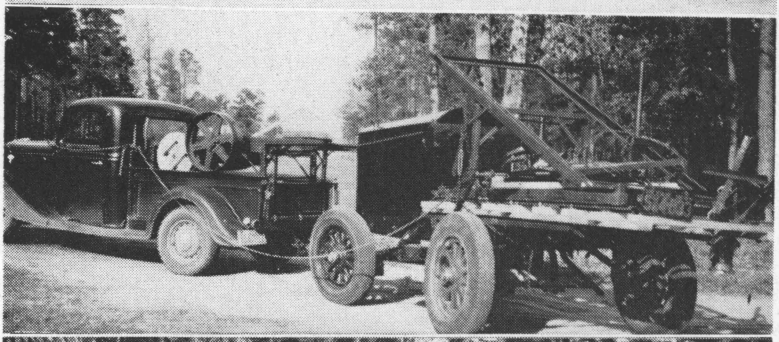
Surplus Amounts Grown In Texas

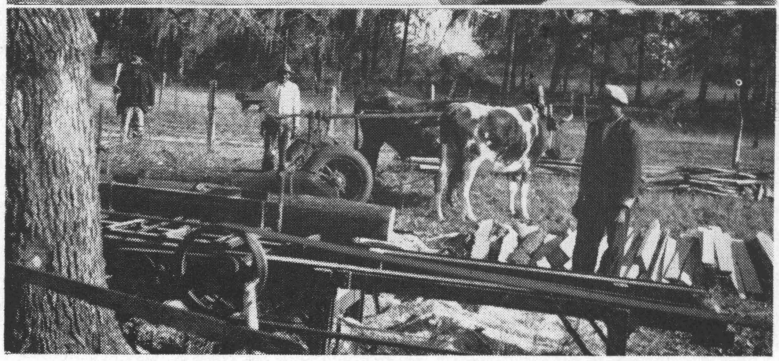
Over fourteen million acres of the vast area of farm and ranch forests grow yearly about one billion board feet within tree sizes large enough for farm and many local saw timber purposes and some for the general market. This growth alone is over twice the amount of lumber used yearly on Texas farms and ranches. Farmers and ranchers have a number of small sawmills which they operate in slack periods, about thirty or more days each year. Working about two months per year, usually during the winter, two farmers ordinarily can cut, log and saw their own and some neighbors' annual sawtimber growth and produce about 50,000 board feet per mill. The total production of all the farm mills now operated in Texas is less than 5% of the yearly lumber requirements of all farms and ranches in the State. Ten times the number of mills used for seasonal farm operations would still not produce half the farm lumber required, nor use one-fourth the yearly farm and ranch sawtimber growth.

Rural areas ordinarily require about half of the total lumber production of commercial mills. Commercial mills operate largely in East Texas and about 80% or more of their output has been pine. Pulpmills use practically all pine trees at present. Sawtimber is ordinarily purchased in lump sum or by the Doyle, Scribner or combination scales which, to the great disadvantage of farm timber sellers measure only 40 to 85% of the volume of small sound timber. (Use the International Rule Scale Card, listed on page 3, for more accurate scaling.) The operations which have insufficient timber ordinarily buy only pine stumpage. Most farmers who wish to sell timber should cut their own properly and move the logs and other products to the nearest truck road. See Foreword, Page 2. Unless specifically called for in timber sale contract, most commercial operations select the largest and best tree form and growth in age classes, 15 to 25 years and older. Trees which are left within the logging slash may often be easily destroyed by fires. Good pine timber on many farms thus has been made scarce by these improper practices. The minimum requirement for pine reforesting is to leave enough well distributed, heavy seed producing trees.









Pine Sawtimber Decreasing

Continuing decrease in quality and quantity, contrasted with increased price of good heartwood or sapwood pine lumber alike, have the effect of increasing use and value of all kinds of sawtimber owned by the farmers and ranchmen of the State. Much of the hardwoods will produce strong and durable lumber which is more desirable than softwood for many farm purposes. More hardwood lumber will be used locally but, principally, because it is ordinarily heavier than pine for shipping, may never compete to much extent with softwoods on the general market for general construction purposes. It is an advantage to many farmers or ranchers to have ample hardwood. The farmer, having many uses for rough lumber or other wood from any kind of tree has an advantage in forest improvement and management, providing, of course, he has suitable equipment.

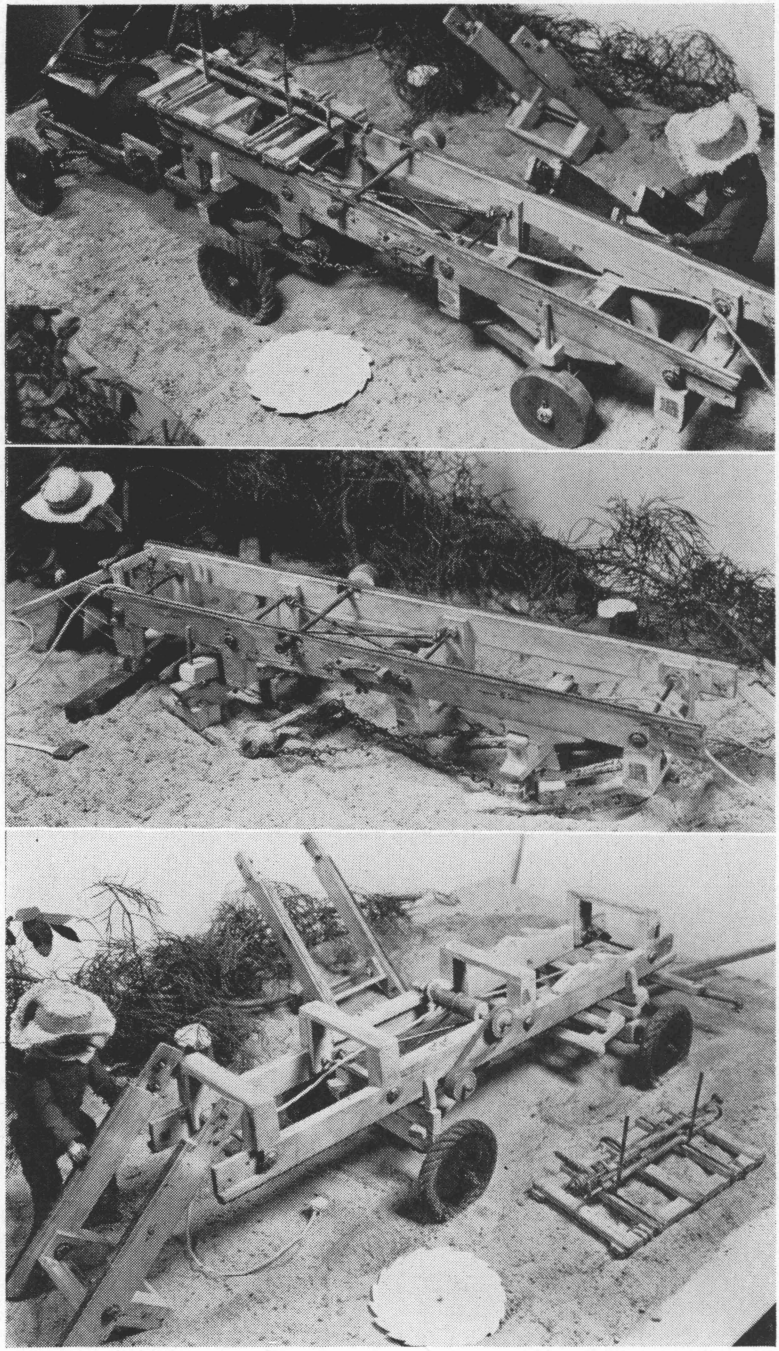
There are many kinds of woods. One kind of wood is superior usually or may be more practical to use for some specific purposes than another, and it is upon this basis that wise use of farm timber can be best determined. "The Suitability of Native Woods For Farm Use," which is the title of a companion publication listed under Foreword on page 3 should be used by the farmer with this and other publications listed. Using the scale card, page 3, the farmer can quickly select and scale the right amount of timber to cut for any purpose.

Light and Efficient Sawmills and Logging Equipment Are Needed for Family Type Farms

Harvesting a small number of properly selected uneven-aged trees or small groups of even-aged trees, for good forestry from the average size farm or ranch woodland each year does not offer opportunity ordinarily for many types of commercial sawmill outfits. Ordinarily mills such as these, employing five or more men, and buying and hauling logs too far away, insist on cutting more good trees than good forestry allows for small forests. Farm mills described in this publication are for use for family type of farms, farm forests and small timber. Mills made for this purpose should have the least number of light parts necessary for sawing lumber efficiently. Small power units are used, ordinarily an old and medium size automobile engine, and for many conditions about all of its power should be used to drive only the saw.

←———Illustration at Left

Three mobile units are shown with log cart or bummer rear support. First and third pictures from top show various types of experimental mills. Second from the top is a Fayette County ten-negro-farmer cooperative outfit which cost less than $400 including automobile used to run and move mill. It has sawed several hundred thousand feet of pine and hardwood for farmers at $10 to $14 per 1000 board feet and was awarded second prize in a national contest for Negro self help enterpises. Lower picture shows how the farm can combine old and new equipment to greatest advantage. Wet ground can stop many operations but not this modern log cart pulled by oxen.



A number of mills are permanent sets owned and operated by individual farmers or ranchmen. Most of them are farm family outfits operated more like any other implement or machine on the farm than a commercial enterprise. This bulletin is not intended as a manual for commercial mills but as a guide for farmers in helping them to set up and operate simple farm units. Mobile farm mills can be made for neighborhood sawing or can be moved each year from shed to woods on the owner's farm if desirable. Some of the mobile mills, described in this publication, can be loaded, this publication, can be loaded or set up for sawing by one or two men in less than an hour.

Move the Mill to the Forest

Total cost of logging and sawing with mill at the forest is four to ten dollars per thousand board feet of lumber. Ten to fifteen dollars is a common charge where the mill runs up a good mileage between jobs, usually over the county. Occasionally one man can run the mill, but ordinarily two men, or man and a boy, are required. They also cut logs and can move them to the mill by small homemade sled or cart pulled with one or two work animals at the lowest cost. Low cost logging of this character requires that the mill be moved to the woods or permanently set up within about one-fourth mile, more or less, from the timber cuttings.

The cost, therefore of cutting, logging and making lumber by a very simple but well organized farm operation of this kind, operating in spare times and preferably in winter, is often less than the average cost of cutting and logging or sometimes the log haul alone of a commercial operation. Winter has always been the choice season for the farmer to do woods and mill work and his equipment should be adapted to winter working conditions. The ordinary commercial operation requiring log haul with trucks, extending out several miles, requires dry woodlands, dry roads and often woods road making. Truck logging must have drivers, skidders, loaders, insurances, and expensive repairing of frequently damaged equipment. Trucks used steadily for this purpose have an average operation life of about two to four years. Farm trucks should be used only on good roads for hauling out the lumber, ties, posts, fuel and pulpwood and other forest products of this kind. Heavy sawmills and logging equipment, of course, are necessary where there remains sufficient quantity of large timber exceeding about twenty inches or two feet in diameter at the stump. If a farmer has only a few large logs, he might be able to split them into two or more parts for sawing on the light mill, but it is usually best where there is much big timber to sell it to a commercial mill.

←——Illustration at Left

The home-built, single-unit mill can be moved to the woods from its shed each year to harvest the farm timber crop, like any other farm implement. (1) The mill model pictured at top is moved on its power unit and log bummer; (2) on log sleds linked by cross-chains; (3) on wagon. The middle base section should be about 18 feet, and for sawing longer logs the end sections, 6 to 9 feet, can be loaded on top.

Farm Mills Can Be Low Cost But Should Have Good Parts

The single-unit mill can be low cost but its light and small number of necessary parts should be made of good quality materials. Prices have changed very little during the last ten year period. However, during this period there has been considerable change and improvement in some parts, especially the carriage and some of the feed works.

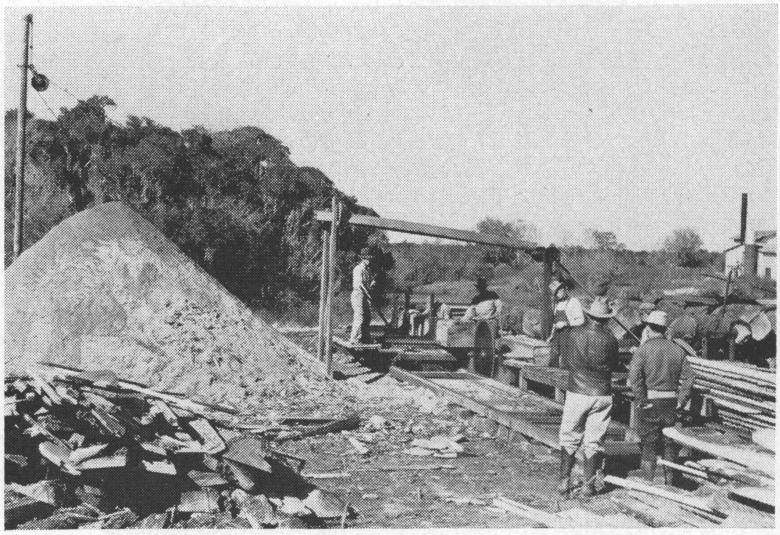
There is a variety of single-unit mill equipment made for the customers. Many of the prospective buyers usually seek information on the kind and number of parts which will serve their purpose. No one knows all the conditions on the individual farm better than the farmer himself.

The following equipment with approximate factory prices (f.o.b.) at present have been found satisfactory for variety of farm conditions in the State, and therefore, are listed as follows: (Mail order houses now supply farm mills).

(1) Two 6-foot all steel carriages including steel track and hardware parts for making a 30 to 36-foot wood base (for sawing logs up to 16 feet in length) $170;

(2) Saw mandrel assembly including arbor, 54 inches long with babbitt bearings, saw-guide, wrench, and lead adjusters .....$ 20;

(3) Power-save, hand crank feed, double sprockett type, with flexible steel cable .....$ 26;



Sufficient timber of the size shown on the log deck above requires a heavy husk mill like this one with strong construction throughout. For information on the small husk type sawmills, write U. S. Dept. of Agriculture, Washington, D. C., for: Miscl. Publication No. 509, "Operating Small Sawmills . . . "

(4) About a 40-inch diameter 8-gauge insert tooth saw which should include insert tooth wrench, hand swage tool, box of extra teeth and file ..... $ 94;

(5) A 50-foot endless rubber belt, 6-inch width, 4-ply ..... $ 26;

(6) Steel split pulley, about 24-inch (?) in diameter and about 7 inch face ..... $ 17;

(7) Approximate cost of lumber for base including cresote for brushing on or better wood preservative treatment, estimated cost ..... $ 20;

Total cost of above equipment $373

If lowest cost power feed is preferred instead of hand crank device above, add about $25. (See third type from top in group of feeds, page 21). If small engine is used the power-save feed will be more satisfactory.

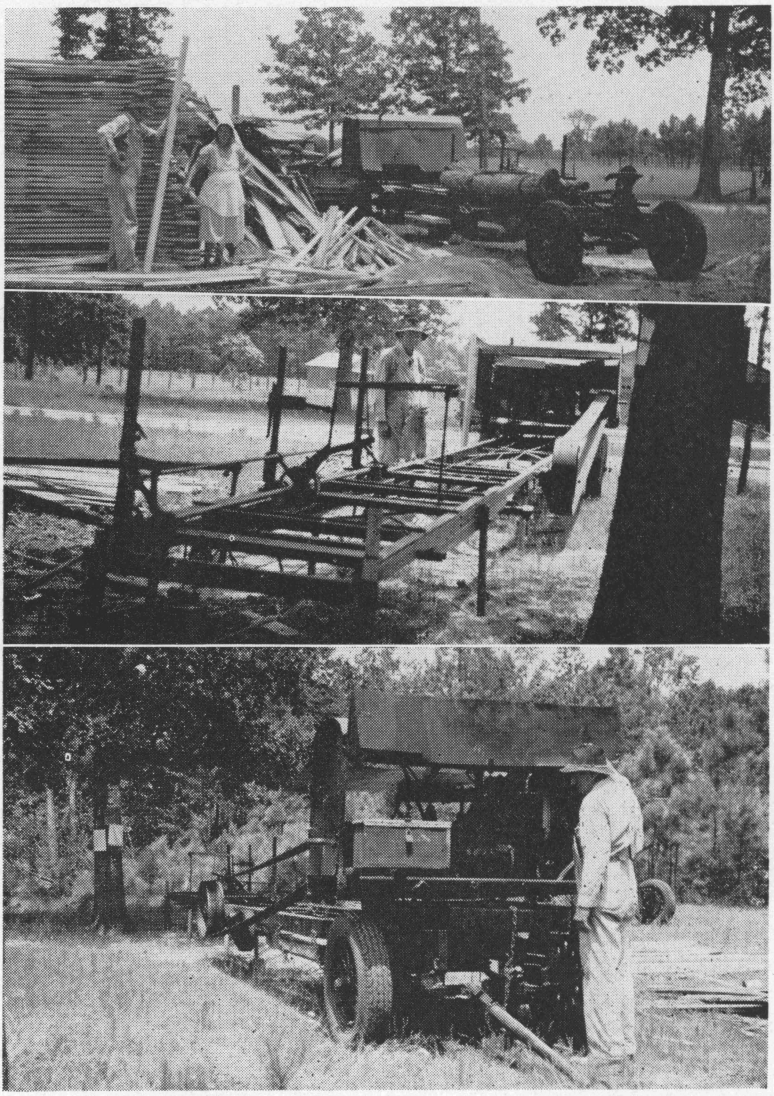
This type of long life, single-unit equipment for spare time use on the farm will cost approximately half the price of the lowest cost husk mill having as much necessary equipment. Ordinarily a sawmill is priced without belt, pulley, saw and tools. Single-unit mills may be priced with only a solid tooth saw and small pulley. The usual power used is a converted and reconditioned automobile engine which cost ordinarily $50 to $100. An old saw, if good, can be sent to the factory to be made a good insert tooth type probably for $50 to $60. Farmers may save money by shopping around for some second hand parts such as the engine and its parts, also pulleys, belt, sometimes the saw, feed parts, and base materials. There are a lot of useful sawmill parts and logging things in old machines and scrap piles.

Many home built farm mills have cost less than $200. Some have purchased only the set works headblocks and knees, rolls, track, saw and mandrel and with factory plans have built their own single-unit mills at the lowest cost.

A blacksmith in Livingston, Texas, built a light mill, using two 24-inch insert tooth saws, one above, and finds it is more efficient than the ordinary type, single, large, headsaw.

The Mill Base Should Be Made to Last Many Years

The base for the carriage track, saw mandrel and feed works can be made easily and much cheaper on the farm than buying one and paying freight on it. Long lasting heartwood or preservative treated wood should be used. It can also be made of scrap automobile channels or steel pipes, angles or other iron at local shops but with greater difficulty. The base may have ground sills running parallel to the track beams, which will strengthen it considerably for frequent moving. If carriage and other parts are purchased one should obtain plans for making the base from the factory. The base



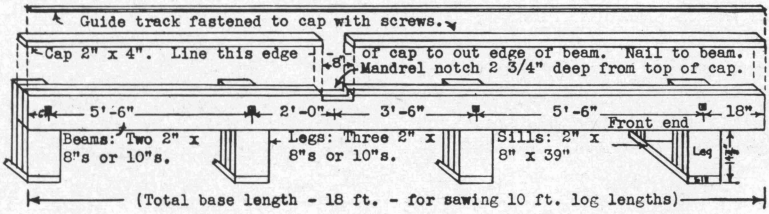
Above is shown an all-in-one, all steel mobile mill. Old motor truck parts and factory-made sawmill parts were used in its construction. A shop made power unit with new V-8 motor is built on tail end of mill. The rear end of the trailer is supported by a detachable Perry log cart.

should be well braced and straight and made somewhat adjustable. If it is to be moved often, it should be made easy to set up. For light timber, it need not be made excessively heavy. For short log sawing the power unit can be mounted on the tail end of the base for making ready to saw or move quickly.

See picture (page 14) of mobile outfit made of truck frames for sawing logs up to 16 feet long. This has two track sections; one fifteen-foot section rolls on another fifteen-foot section of trailer frame for loading. One of the best types of log carts fastens to two cantilever springs to support the rear end of the trailer. The cart has breaks operated by rope from the truck cab or a team driver. (See bulletin B-137, page 3, for description of this cart.)

The carriage way of any mill is roughly about three times longer than the carriage or over twice the length of longest logs to be sawed. The usual base is made into three sections for long log sawing so that the middle or mandrel section, 15 to 20 feet, ordinarily 18 feet, can be moved conveniently as a trailer with the carriage left on and the two base extensions, 6 to 9 feet long, loaded on top. Beams of a wood base should be made of two 2 x 8's or 10's of moderate length so that they will stay straight when nailed together by staggered construction. Bases, 18 to 20 feet long, are proper for logs up to 10 ft. long, 30 ft. long for logs up to 14 ft. and 36 to 40 ft. for logs up to 20 ft., etc. The base width, outside is 39 inches for types in common use. Height of the base may be about 28 inches for conveneint working and to clear average size saws several inches from the ground. Dig a small sawdust pit below the mandrel to avoid striking the saw with the sawdust scoop or for installing a power sawdust mover.

Place the guide track straight, by use of a tight wire above, on the saw side beam and allow three-eights to one-half inch clearance between the front edge of saw and carriage and with the carriage left on guide track, fasten the flat track to right beam for flat rolls to follow. The log deck or rollway should be about level with the top of the carriage. Allow walking clearance of about 18 inches between the deck and mill. This space is bridged with two hinged or removable pieces to roll logs on to the carriage.



Construction details of left beam and legs for short mill base or middle section of longer base. Use this beam as a pattern for right beam and leg construction. See drawings and pictures elsewhere in bulletin for other details. Factory plans may be different and should be followed when their equipment is used.

Carriage Frames Should Be Built Low and Strong

Carriages for the light single-unit mills will handle logs not to exceed 20 to 24 inches in diameter and 10 to 15 inch logs are the best to grow, transport and saw. Wood frames for lightest carriages should be made of strong and durable 2 x 4 material. Steel frames for the longest service are made of strong channel cross members spaced one and one-half to two feet apart and with a flat face or side up. Side rails are made of one or two angle irons, flat face up.

Cross members, except the knees usually are welded to the rails and the knee channels are bolted on. Knee channels which serve as head-block beds have slots punched along the top for racks in which the set works shaft gears mesh and run for head-block movement across practically the width of the carriage. Each knee of the wooden carriage may have two 2 x 4's on edge, spaced about two inches apart, and capped with a strap iron rack. Short carriages have a knee and head-block at each end and two or more fastened together should have one head-block and dog to each section.

Head-blocks slide on the knees and are held down by a clamp which slides under the knee. They are supported by a connecting rod reaching from one block to the other and by the gear set works shaft running through them. The blocks, usually, iron, are triangular shaped brackets with a base length and height of about eight inches. An upright dog post about one-half by one and one-half by thirty inch bar iron is bolted to the side of each head-block. These bolt holes in the head-block must be slotted for proper post alignment. Posts can be pipes flattened at the end or strong round wood to bolt to head-block for use with pipe dogs.

Carriage Lengths

Single carriage lengths are ordinarily six feet and two bolted together are commonly used to handle logs up to sixteen feet. Log lengths two to four feet longer than the carriage can be handled fairly satisfactorily if the ends extend about equally from the carriage ends. Average length of lumber used on the farm is eight feet, and general use requires about 45% 14's and 16's.

Wood frames can be built satisfactorily on the farm with some parts purchased from factory and heavy parts will be more satisfactory for either wood or steel frame construction. The all steel constructed carriages last many years longer than wood and have better track rolls. The single-unit mill carriage must have low rolls and should have sufficient number, especially on log side, for strength and long wear.

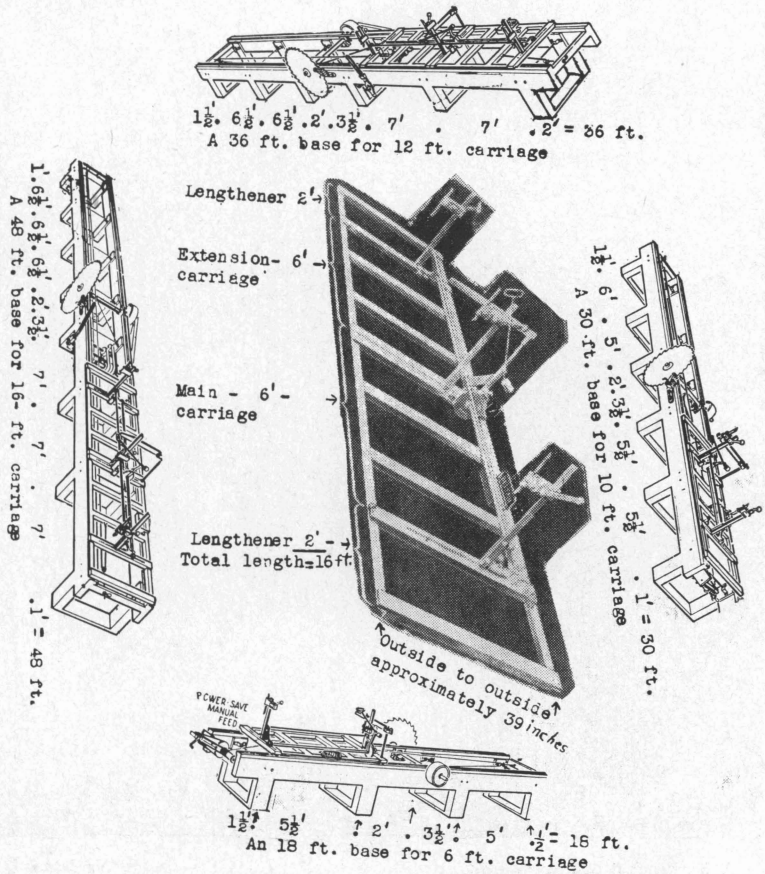
Carriage Set Works

The set works and gear shaft of the single-unit types, with few exceptions, are integral, i. e. built into the head-block unit and with gears running in the knee racks move the

head-blocks to or away from the saw side. The type described in this publication (See page 23) is operated from the side by lever and reversable pawl to a ratchet wheel for head-block movement and graduated settings and friction check fastened directly to the gear shaft. Another type (See page 18) is operated at end of carriage and mill by a wheel on a countershaft.

Carriage Dogs

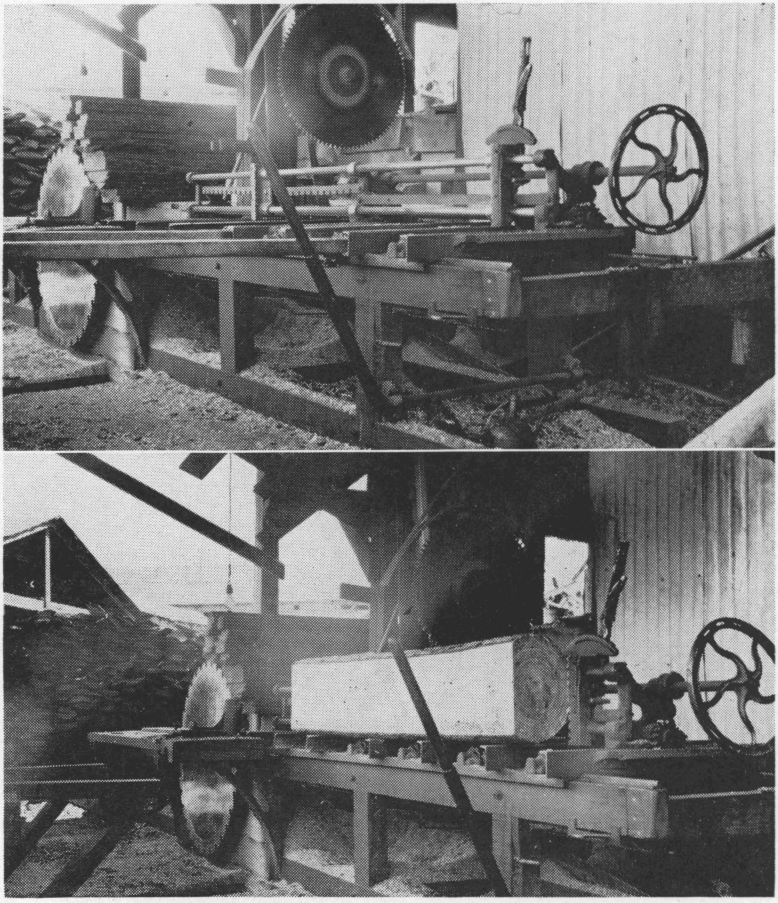
Carriages for single-unit mills may have both top and end dogs to grip the logs to the head-blocks. Top dogs are used to hold logs of various lengths or for resawing and edging work. End dogs are more efficient than top dogs for sawing fairly even lengths of small dimension from bolts or short logs on short carriages with hand or power feed.



Carriage and base lengths are shown in group above. A popular type for much farm use has either one 6-foot carriage and lengtheners or two 6-foot steel carriages, a 30-foot, base, hand crank feed, and about a 40-inch insert tooth saw. A South Texas rancher has a 4-carriage, 60 ft. base to saw lengths up to 30 feet.

There are several kinds of factory made top dogs which should be made to grip or release log by lever movement. Single, strong and fast operating drop dogs to slide up and down the head-block posts can be made of pipes about two feet long with two spikes welded to a cross bar at the lower end. (See pages 23 and 27).

The final cut leaves a dog board (back board) with usually two-inch thickness. The short reach dog spike should clear the saw about one-half inch in the final cut and a stopping device should prevent its getting closer. Light dogging is ordinarily sufficient for the light carriage traveling about half the speed per revolution of saw



A heavy, fast-cutting single-unit mill for small logs is practicable for large farm or ranch forest operations. Longer carriages, base and top dogs to handle logs of any length are made by manufacturer. The cost is about double the lighter steel types of same sawing lengths. This one has been in use over 25 years sawing bolts for a handle factory. Its steel parts have two fires. This is a factory-made mill costing about $500 to $700, depending upon length of carriage and base.

recommended for highly powered heavy types.

Carriage Traction

The single-unit mill carriage which runs over the mandrel arbor between the saw and mandrel pulley requires fast running rolls of small diameter to allow maximum saw radius. Grooved rolls run on the guide track and may have flat faces on each side of groove to run on the track flange which bear the load. Flat rolls without bearings run on the flat track of the right beam and do not carry much load. Rolls for the log side with roll or ball bearings satisfactorily overcome the friction wear difficulties with small rolls and axles. One carriage with high cross members has 3-inch rolls with axles above the side rail for frequent oiling.

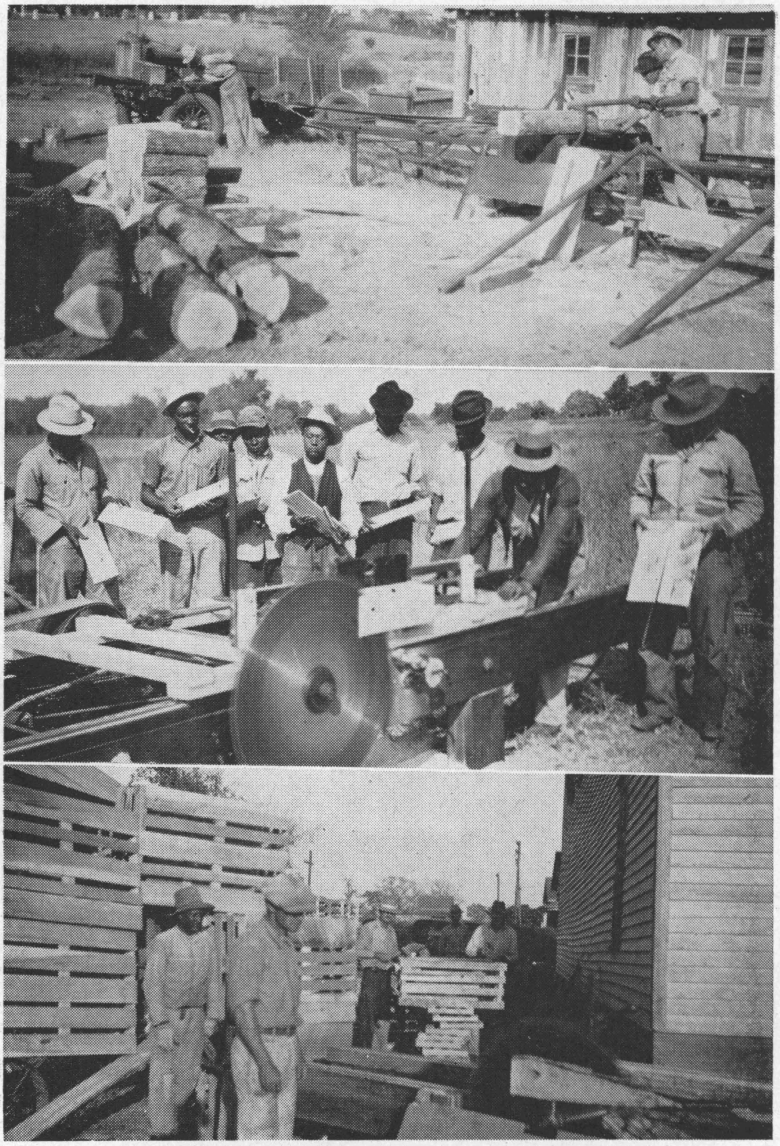
Roller bearings which are made with oil sealed in and need no lubrication have been used as auxiliary rolls to run on the flanges of guide track and are proving satisfactory. These bearings, about 1½ inches in diameter, are inserted in tight fitting steel tires cut from hard steel pipe. The rolls with tight fitting axle are fastened in a small housing or frame bolted or welded to the carriage rail.

Small roll traction can be improved by other means. Load on the logside is better distributed if rolls are spaced 1½ to 2 feet apart or are grouped in tandem or two to the axle. Guide rolls fastened at ends of cantilever springs or cushioned with rubber will reduce wear on both guide rolls and high guide track rib for fast running if oil sealed bearing rolls or greased skid boards are used as auxiliaries to carry the load on the track flanges.

Many Carriage Driving Devices (Feeds) Are Used

Small and short bolts of wood can be sawed on light carriage by pushing and pulling the carriage. Many types of hand and power driving devices are used for log sawing. Some of them may be made at home or at a local shop. The feed should have ample variation in speed with good power. The hand crank (manual) device must be geared with two sprocket wheels and chains to the crank and drum shafts. About 5 turns of a two inch crank drive sprocket to one turn of the ten-inch driven drum sprocket will feed the log to the saw with easy turning. Two more sprocket wheels of about same size on crank and drum for one to one turning speeds up the gigback.

Fast power feeds exceeding one or two inches advance of carriage per revolution cut of saw through an 8-inch cant are usually not safe or suited to the light farm mills. Mills for fast cutting (3 or 4 inches through 8 inch timber per r.p.m. of saw) must have greater carriage weight, heavier track and mandrel, wide belt, and much power. Some heavy single-unit mills (See page 18) and most husk mills are made for this purpose. (See heavy-duty feed, second from bottom, page 21). Soft

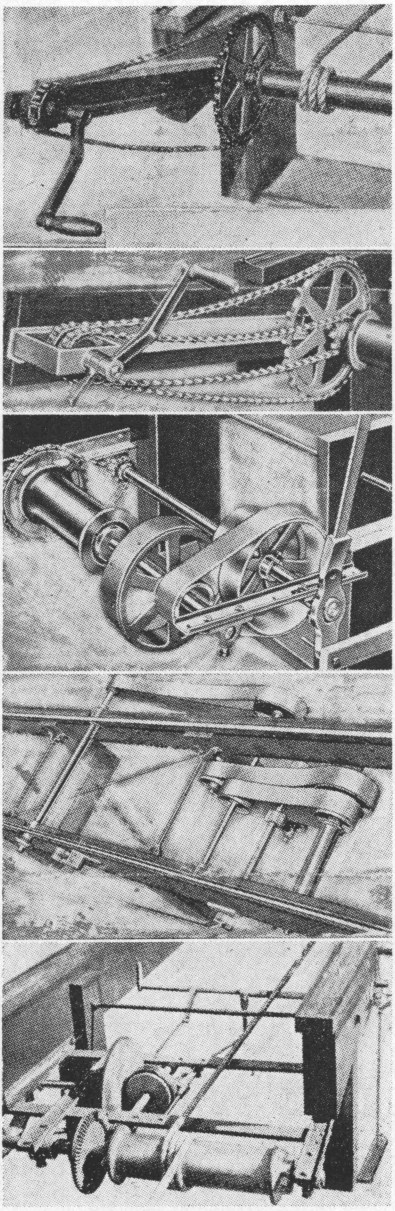


Smallest dimension products such as shingle bolts, shingles and crate lumber can be zipped off with proper saw and light carriage parts. Shown at top is a 36″ cordwood saw, middle is 36″ spring set rip saw; and bottom is 36″ swage tooth. Some saw long thin lumber as shown at bottom and cut off the proper lengths. Profits from the production of crates from cottonwood within two weeks exceeded cost of this mill.

woods, of course, saw faster than hardwoods. Cutting somewhat less than big mills per revolution of saw through average size logs the farm mill with only two operators saws good lumber at low cost and sometimes as much or more, per man per day. The type of equipment required for increased output for big mills is not necessary for most farm mills.

Two Way Variable Hand Feed

Many farmers are satisfied with the two way variable type of hand feed. Improvements can be made in this simple hand feed with roller type chains and with roller bearings if desired. The crank shaft with a pin projection is thrust right or left to engage slots either free running drive sprocket. Any feed for the single-unit mill should be built of materials suited to outdoor use and should be inside the base for a better mobile unit. Hardwood bearings can be used satisfactorily with or without babbitt



Single-unit carriage driving devices should fit inside the mill base. The two carriage feeds shown at top are turned by hand and three below are power driven by belt from mandrel. Many farmers should first start with the two-way crank device, second from the top which is the most variable of all feeds. It is safer to place the crank on the right beam out of line of saw, as shown on page 6. The best power feed is the heavy-duty, slip-belt type, second from bottom. Its speed variation is obtained by amount of force exerted on the lever by the sawyer. The lower feed can be made to operate with one lever. Approximate costs of above feeds, include cable and pulleys, beginning at top: (1) $20, (2) $25, (3) $55, (4) $100, (5) $75. These prices may vary somewhat.

lining for the shafts and soap or meat rinds are good lubrication for wood shafts and bearings. Old automobile bearings which will fit the steel shafts can be inserted in holes bored in wood. Steel shafts for power feeds should be about one and one-fourth inches in diameter and some of the pulleys can be made of wood driven on green to shrink tight in drying. Some shafts may be made of wood or pipe. The gig-back speed of most power feeds should be two to three times faster than the forward or saw feeding speed. The cable drum, about four inches in diameter for the single-unit mills can be increased to increase speed if desired, and believed safe, by lagging up with wood cleats of ½ to 1 inch thickness ordinarily. The cleats are cut to drum length and are laid closely around the drum and wired tight at the ends. A drum or pulley can be made of two half round pieces of wood channeled through centers and fastened tight to the shaft by two bolts at each end on each side. A wide channel key also can be used.

Flexible Type Steel Cable

Flexible type steel cables about five-sixteenths to seven-sixteenths inch are much better than ropes (usually three-fourths of an inch) for the hand or power feeds. Cables with fiber cores should be used and should be lubricated with only linseed oil. Cable sheaves should be about six inches in diameter. One sheave is needed at tail end of the mill for the hand power and one at each end for power feeds. Most operators give the drum about 4 or 5 wraps of the cable and some fasten the ends of two short cables to each end of the drum.

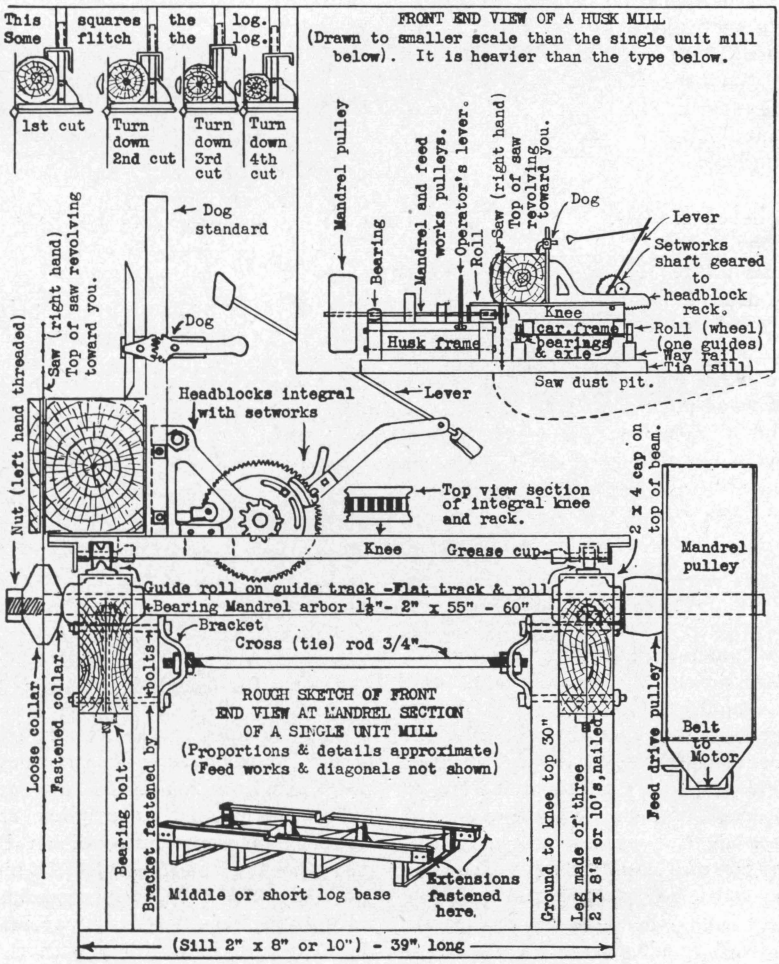
Some old type feeds had a cast iron toothed rack extending under the carriage which was geared to a driven pinion gear near the mandrel. The pinion was turned either way by the feed lever. Steel toothed automobile fly wheel rims might be straightened to make the rack. The drive pinion fastened to the base may be turned by power feed or hand crank through a device similar to the hand power sprocket chain feed.

The Saw Mandrel Must Run True

Diameter of the mandrel arbor used on the light single-unit mills is usually 1½ inches and is 54 inches long. The saw stud diameter of this mandrel is one and three-eighths inches, left hand thread. A spring steel mandrel of this size is considered sufficiently strong for belts up to six inches in width and belts of this width are commonly used on the farm for other machines. Wider belts may be used on stronger shafts Some of the heavier single-unit types and most small husk mills have a two and three-sixteenths mandrel with two lug pins fastened in the cold shrunk collar on the mandrel to insert into the pin holes in the saw. The mandrel collars or flanges, (6″ in diameter) for the light mill have no pins and hold the saw satisfactorily by friction. The left hand threads on end of saw stud tighten the nut in the opposite direction from

which the mandrel arbor and saw rotates to prevent the saw from loosening. The right hand single unit mill must therefore have left-hand threads on the saw stud. The saw must slip on the mandrel stud without forcing it and fit perfectly. Use the saw wrench instead of a stillson or chissel to turn the nut.

The saw must be straight on log side and plumb with the bed of the carriage or its head-block base which is tested by a carpenter's square. Shims may have to be placed under one of the mandrel bearings to plumb accurately. The mandrel arbor should run steady and true with about one thirty-second of an inch end play in the



Cross-section detail at mandrel of single-unit and husk mills is shown.

bearings after the pulley is fastened on it.

The base beams in proximity of the mandrel should be built strong and should be braced with adjustable diagonal rods. Too much belt tightening, which is too easy with a tractor, may move the saw too far in lead, sometimes to the extent that the mandrel bearings cannot be adjusted correctly without adjusting the diagonal and cross rods. After a tractor is properly lined up the final tightening should be done by a jack, wedges, or chain hoist to tractor. Strong set screws against the bearings and wedged if necessary, will hold a properly adjusted saw lead more firmly to the base beams.

The Saw is About the Most Important Part of the Mill

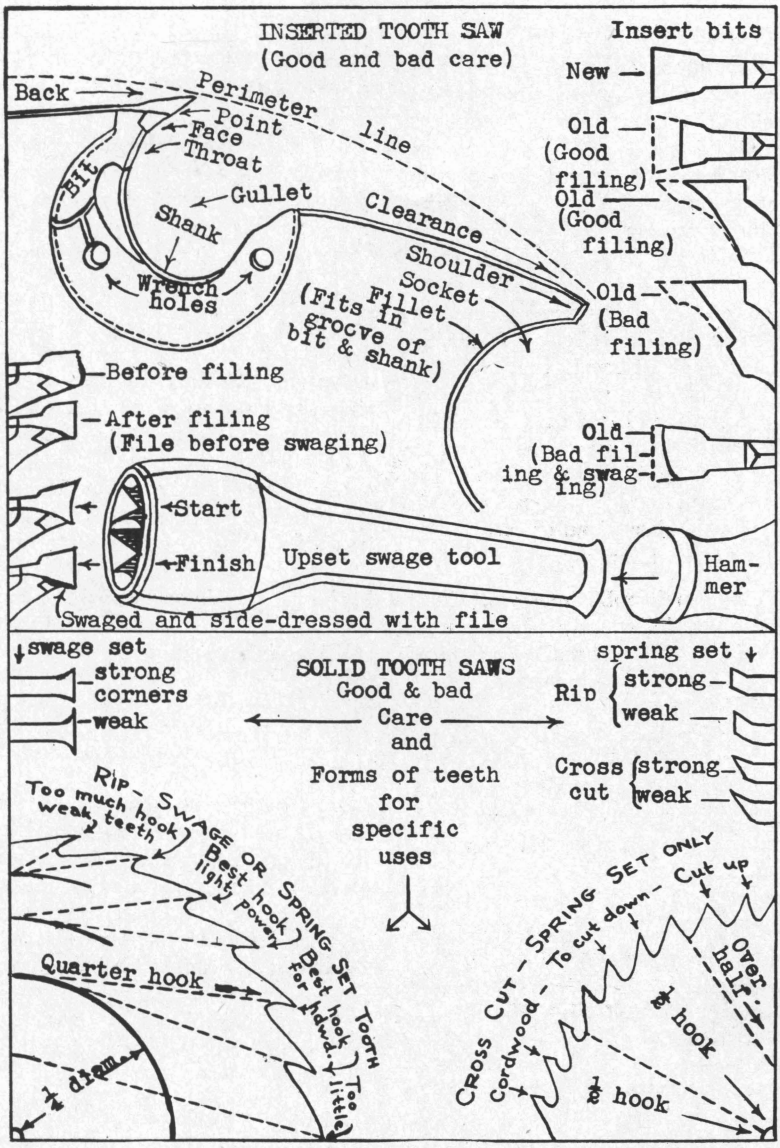
The circular saw makes possible the construction of a simple, practical and low cost fast-cutting sawmill. A good saw is required to cut lumber from some of the hard and tough native hardwoods. Insert tooth saws require the least saw work and meet requirements of most farm mills better than solid tooth saws. "After I got an insert tooth saw," according to one farmer, "my troubles were over."

The spring set (brier tooth) saw costs less than other saws and is satisfactory, if made of good saw metal, for sawing easy cutting logs, such as cottonwood, soft elm, some pine and the like, and for bolting and resawing work. Cheap, soft metal blades can saw lumber, if worked on often enough, only from the softest woods. Alternate tooth points of spring set saws are bent slightly out opposite each other to give set to the teeth as is done with handsaw teeth. Tooth spread is necessary for any saw to cut sufficient kerf for clearance to prevent friction and heat on the saw plate, the body of the saw. A monkey wrench can be used to set brier points or for straightening the points of a practically useless soft metal saw.

The insert or solid tooth swage set saw which has each tooth set on both sides, is best for lumber sawing because one tooth does the work or two brier teeth. The metal at each properly shaped tooth point can be swaged on both sides by hammering lightly an up-setting tooth held on the point. Solid tooth saws of all kinds must be kept in "round" or jointed by grinding and their gullets must be ground out with emory grinder or filed a little deeper into the saw blade after every few filings. When not in use, the saw should be greased and put away or covered.

Saws for Single-Unit Mills

It is cheaper in the long run to buy a suitable type insert tooth saw. An inserted tooth saw requires no jointing or grinding and is easy to keep in condition by simply filing the faces of teeth and swaging out the points occasionally or replacing worn-out or badly damaged teeth (bits) with new ones, which cost only a few cents



Above is a diagram showing methods of saw conditioning. Use the old sawyers commandment religiously: "Thou shalt keep the saw in good condition and run it properly at all times."

each. Insert teeth are removed with a special wrench. Always oil new teeth for easy removal.

Saw diameters used by the single-unit mills, having small arbor and hub (stud) for one and three eighths saw hole usually range from 36 to 48 inches. A close fitting bushing can be inserted in a saw hole which may be too large for the mandrel stud. Saw sizes 40 to 44 inches are satisfactory for the general run of our sawtimber. The average log is about 10 inches inside bark at small end. Roughly estimated, the saw diameter for single-unit mills should be a little more than twice the diameter of the large logs to be cut and if a much larger proportion is in the small sizes, smaller saws may be more satisfactory.

Single-unit mills and most husk types usually are right-hand which require right hand hammered saws. Saws smaller than 36 or 38″ should be stiff. Some slowing of speed in the cut with light power is safe and will not harm the saw. A saw, 40″ or larger requires more tension, looseness in the body for safety and straight line running at fast speeds up to about 700 r.p.m. They should be hamered for the rim to fall a little easier away from the log when the saw is idled for jigging back to reduce side rubbing on the log. Saws having tension must run in the cut close to the speed for which they are hammered. Mandrel collars may be slightly beveled at the factory to dish the smaller stiff saws just a little from the log to prevent scratching of timber on the gig-back or leading in too much if run too fast.

If the body of the saw is believed too loose for light power use, it can be placed on a block or stump and struck lightly and equally around both sides of the rim with a heavy round face hammer. Places to be struck should be marked a few inches below each tooth if wide apart or about at five-inch intervals. The rim is expanded and the saw made stiffer to stand up for slower running. Strike very lightly the first round then shake the saw to test its stiffness. If struck harder on one side or on one side only, the fall of the rim may be changed to that direction. A round faced sledge gripped closely by one hand can be used to strike very lightly on a burned spot in the body of the saw to level the hump. Do not dent your saw or allow others to dent it. If the saw needs considerable hammering in the body to make it run true it must be done by a good sawsmith who must be told the kind of power used, kind of timber to be cut and which is its log side.

Most of the large saws, 40″ or larger, used on small mills should be eight-gauge. Some operators prefer a nine-gauge rim and eight-gauge center for pine, or other soft and even textured woods. Old saw blades, known to be good, can be converted at factories or well equipped saw shops to good insert tooth type at less cost than new ones.

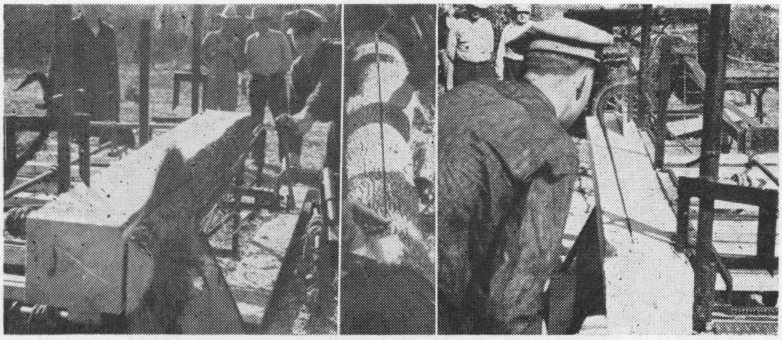
For shingles or other small products cut from bolts on the single-unit mill, a 12 to 15 gauge solid tooth tapered saw about 30 inches in diameter is used. The swage set solid tooth saws of thin gauge and

small size for bolting work cut best but require a little more power and are more difficult to set than the brier tooth. For this use one may prefer a good quality spring set saw.

Mills using gasoline engines or tractors for power will operate better if teeth of mill saw are four to six inches apart. If the power is too light or saw is too large every other point of an inserted tooth saw can be replaced easily with dummies to keep the clamps fastened in the sockets of the saw. Inserted tooth saws, well cared for, will do more work with less teeth and power than a solid tooth saw.

Saw Speed

The saw should be run uniformly in the log at the speed for which it is hammered. Small stiff saws will stand up in the cut at slower speed or with more speed variation better than tension hammered saws. More variation in speed or slowing of speed in the log is to be expected with light gasoline engines. The carriage feed should be hand power or a variable type if light gasoline power is used to enable the sawyer to check the carriage movement frequently for an instant for motor and saw to regain speed. It is the best feed to learn proper sawing and, having learned well, it remains the best variable device to respond instantly to a mind and hand that knows how and what to do. Fast saw speed makes smooth lumber but excessive speed is liable to be ruinous to the saw; it is dangerous, bad work results, power is wasted without accomplishing much work, and the teeth must be sharpened and set more often. Slow saw speed with same motor speed but with large mandrel pulley and faster carriage speed saws rough lumber but can saw more of it. When run too slow a loose body saw or stiff saw without enough set for clearance will heat, wobble and quickly form blisters and bumps on the blade.



Straight logs for straight grain lumber, shown in side pictures above, can be cut in various lengths from crooked trees, shown in center picture, by sawing logs off at crook. Straight grain lumber is strong, works more easily and has less tendency to warp in seasoning or in use. Final products from this log will be six 2 x 4's when the three 2 x 8¼'s are turned for a middle cut. This method which leaves them stuck together at end saves sawing time and heavy lumber handling. In squaring a log for resawing, an allowance of ¼ inch must be made ordinarily for each subsequent saw kerf.

Discover saw difficulties quickly and back the log clear of the saw and make the necessary adjustments or repairs to keep it always running straight and cool. Run carriage a little slower when cutting large, knotty or hard textured wood or when edging a stack of boards. Large saws must revolve slower than small saws, but the rim speeds may be about equal. The carriage should not be permitted to slow up too much or stop over a fraction of a minute while the saw is running in the cut to avoid heating. Some operators who saw considerable hardwood run a small stream of water on the saw plate.

Saw Hook for Solid Tooth Saws

Saws with greater hook in the teeth, (meaning the tooth face and gullet have been ground back from the point with greater pitch) will cut faster into the wood. Saws should have sufficient hook with good metal, swage, sharpness and power to take out small chips of wood instead of fine dust. If the chips are too large, one-quarter inch or larger for soft woods, it indicates that the carriage speed may be too fast for the saw speed and may force the saw to cut out of line. Saws used on farm mills in this state should have about a quarter-hook or greater pitch below point because they are required to cut all kinds of wood with light power. Easy cutting woods like cottonwood, willow, cypress, gum, some pines, hackberry, and soft elms should have more hook and more swage (set) than is necessary for the oaks, hickories, pecan, and other hard textured woods which require somewhat stronger teeth.

A circular cross-cut or cordwood saw has one-half hook. Some small combination bench saws are made for cross-cutting and ripping and may have two kinds of teeth each of which must be ground and filed square or beveled at points according to its purpose. Long and wide bevels from points on the cross-cut circular or straight saws, also increase their cutting speed. More metal is hidden in farm timber because of fencing which causes difficulty in keeping solid tooth saws in condition and is an important reason why the farm mill should have a hand grinder. It is still more important for this reason to have an insert tooth saw which requires only a few minutes to replace a few teeth which may be injured beyond repair. Replaced points can be used again after all other points are worn and filed to their refitted size. New points cost about five cents and a solid tooth grinding job at a saw shop may cost several dollars.

The half-hook of cross-cut saw can be maintained in future filings and grindings by placing a straight-edge from the points of teeth to the center of the saw and file or grind the face to a marked line down to the depth of gullet required. Cordwood saws frequently have the gullet about three-fourths of an inch below the point ground back about a half-inch to increase the filing life of the tooth faces and gullets will carry out more sawdust. Quarter-hook on solid tooth lumber saw is main-

tained by filing or grinding to a straight line down to desired depth of gullet from the point of each tooth past and touching a circle drawn around the blade half way between the center and rim, which is one-fourth the saw diameter. A greater circle drawn to almost six inches of rim of small saws to mark tangent lines from points will give greater and probably more satisfactory hook for some light powered mills. The front face of each tooth should be filed or ground to the straight edge line and down about one and one-half inches below the point for bottom of gullet. An easier method is to draw a pattern of several teeth on a small board held to the side of a new solid tooth saw or one which has proper hook, gullet and back slope and try to follow this pattern in future filing and grinding. A suitable hand grinder can be adjusted to grind all tooth backs to good clearance, all faces to the hook desired, all gullets to good depth and bottom rounding, and to sharpen and joint all points to the same radius for good perimeter rounding.

Saw Troubles and Remedies

Saw troubles will occur and success will depend on how quickly they are observed and how well one can prevent and remedy them. A new mill of any kind set up and run according to instruction, saws fine until usually the saw teeth become dull. The teeth may be worn round at corners just a little and after more wear from sawing and filing the points must be swaged. Lack of sufficient set on one side will cause the saw to lead into the side having more set and sharper corners. After a few filings the swaged teeth of solid and insert tooth saws need spreading with the upset or swage tool. Spring set teeth have to be bent out a little more. Teeth do not have to be kept knife-sharp and can be wasted more by over-filing than by sawing. It is important that the swage or set at the points have enough metal tapering down from the corners to hold up strong points for several filings. The set for a spring tooth point are made stronger by bending them close to the point.

A solid tooth saw which has backs as high or higher than its points will rub the wood and hum an unfamiliar tune from its vibrations; it will cut fine dust or not cut at all and will heat on the rim. Back rubbing is caused usually by not holding the hammer end of the upset swage high enough and by the "unpardonable" mistake of filing the tops of points for sharpening. Back rubbing is remedied by filing off some metal far enough back of the point to give some clearance. A straight edge resting on two adjacent tooth points should show a little clearance beginning from the point and should increase rapidly, depending on tooth spacing, to gullet of next tooth. Never file the back except when it has no clearance or to rub off filing burs from the point. Do not attempt to swage a thick or dubbed point tooth before filing the face to good form and sharpness as it may crack or crumble the point. A drop of oil always should be placed on point after filing to swage

easier. Attempting to swage dubbed point of an insert tooth is harmful to the sockets and clamps in the saw. If a solid saw tooth is too thin or has too much hook there may not be enough stock to hold up good corners or to resist bending or breaking. A V-gauge with same angle as throats of upset tool can be used to show how to file each point to fit the upset before swaging. One's feel through the left hand holding the upset tells from the right hand hammer stroke how it should be guided for good swaging and should be lifted to observe the effect. The cutting edge of teeth should be raised a little in swaging (up setting).

Guide pegs may be set either too close or too far from the saw. Make the pegs of good hardwood. The pegs should clear just enough from each side of the saw (about 1/32 inch) to prevent rubbing on the blade and should be set in from the rim far enough (about ¼ inch) to clear the gullets of a solid tooth or the clamps of an insert tooth saw. Do not try to lead or force the saw either way with its guide pegs. Purpose of pegs is to steady the saw. Saws less than thirty inches in diameter may need no guide. Set the saw guide high enough on the base to clear the overhang of the carriage. A saw guide can be made of wood, a 4x4 and about one foot long, with slot for saw in end and with pegs held firmly in each side hole by a nail.

The saw may not have enough lead or may have too much. If the set is excessive on the log side, the saw will lead too far and the lead may increase with too much saw speed. The proper lead should be about one-thirty-second of an inch, i. e. the front rim is that much closer to guide track than back, when the saw is new or in good condition and an old one may require about one-eighth inch lead. Hardwood requires less lead than softwood. A saw is kept in good lead by proper speed in logs, by good filing and swaging and by side dressing the swage corners if necessary also by a straight track and belt which is not too tight. Always file square across the front face of all rip saw teeth. A half round or round edge saw file will keep gullets rounded after filing the face well below the point. A square-edge file may leave a corner in the throat and cause the tooth to break off or crack the rim. A corner obstructs good clearance of sawdust. A saw crack may be stopped by drilling a small hole through the blade at the end of the crack. Small, high speed saws are made sometimes with about three equally spaced narrow slots or cracks in the rim with small holes for bottom rounding at end of cracks to allow greater rim-expansion.

If the carriage is dragging on the power or jumps the track, the track may be crooked. The track should be clean, level and straight.

Belts and Pulleys Are Placed Clear of Working Side

The belts and pulleys of a single-unit mill are all on the right side of the base which leave the left side clear for log and lumber handling. A six inch belt is standard for the light farm mill. Belts which stretch too much or run too loose or run on pulleys which are too small may slip and cause loss of power transmission. It pays to have a good belt. Keep the belt clean and out of the dust when run and out of the weather when not in use. Don't try to tighten the belt too much to prevent slipping especially to a light mandrel. It will pull the saw into too much lead. Remove the belt to adjust saw lead and always stop the engine to take it off or slip on. One person can put on a fairly tight belt if one side near the end is tied with small rope to rim of the pulley which is then turned with the loose side of the belt forced over the rim.

The pulleys should be ½ to one inch wider than the belt. The belt should be run on the pulleys with good alignment. Don't try to hold belts on with a stake in the ground. Align the pulleys or turn the belt if it slips off. If an idler is used, place it on the loose side of the belt and it should be near the small pulley where most of the slipping likely occurs. Apply only good belt dressing to a stiff belt to reduce slipping. A castor oil dressing is good especially in winter. When a clean and flexible belt continues to slip with good dressing, the pulley sizes should be increased. Use of larger pulley diameters gain more efficiency in power transmission than wider belting.

Engine Pulleys

An engine pulley (drive pulley) large enough to run light mills should be not less than seven or eight inches in diameter. The engine pulley may be increased in size somewhat in proportion to the power efficiency of the engine. The average farm mill in this state which cuts a wide variety of species and logs of moderate size should probably have a thirty inch mandrel pulley (driven-pulley) if run with average size automobile engine. This kind and size of engine ordinarily should have an eight or 10-inch drive pulley. The mandrel pulley should be steel split type and engine pullely should probably be fiber or home-made wood type.

If the feed belt runs too loose the feed can be shifted under the base or may need an idler pulley or some lagging with tape on the small pulley. Cable sheaves should be at least six inches in diameter and attached with a long threaded draw bolt for easy tightening.

Home-made Pulleys

Pulleys of small sizes are made frequently of cross-grained wood, ordinarily black gum or cottonwood, and driven on green to shrink tight to shaft. They are easily turned against a wood chissel, held on a wrest, to true roundness and for crowning. Diameters of wooden pulleys are easily increased by lagging up with pieces of belting which also reduces slipping.

Mandrel Pulleys

The following examples can be used to calculate the diameter de-

sired for a driven or mandrel pulley. Assume motor used should run no faster than 1500 r. p. m. for good long time efficiency which has an eight inch drive pulley to run an inserted tooth saw which is hammered for 500 r. p. m. Formula: Multiply r. p. m. of drive pulley by its diameter and divide product by r. p. m. of saw. Example No. (1) $\frac{1500 \times 8}{500} = 24$ inch diameter. (2) If motor has surplus power and one wishes to use it lightly it may be slowed down to about 1200 r. p. m. and have a ten inch drive pulley: $\frac{1200 \times 10}{500} = 24$ inch diameter. (3) If motor lacks power for satisfactory carriage speed sawing, try one or two changes if the saw can be run slower or can be hammered to stiffen the rim: $\frac{1500 \times 8}{400} = 30$ inch diameter. (4) If we have a surplus of power as of (2) above and the engine can run efficiently at 1500 r. p. m. one might try larger pulley and slower saw speed as of (3) and increase the carriage speed somewhat to saw more lumber.

(An ounce of trying is worth a ton of theory.)

Light Power is Used for Single-Unit Mills

Power on most farm sawmills is required to drive only the saw, carriage feed, if hand power device is not used, and sometimes a small sawdust chain. Edging is done on the mill carriage and end trimming is done usually by persons using the lumber or by hand crosscutting. Old automobile engines of average size are common power units used. They give very satisfactory service especially after good reconditioning and should have an easily controlled governor. An old automobile engine used to run the farm mill should deliver at moderate speed (1500 r. p. m.) about a third to half its rated full speed horsepower.

Farm Tractors

Medium to large size farm tractors are satisfactory for power. Some with hydraulic lifting arms at the back are also useful in logging for distances not greater usually than one-fourth mile from timber cutting to mill. The front ends of small logs can be raised and skidded by the hydraulic suspension device on some tractors. The tractor can move the mobile mill easily to the woods. Farm tractors also may have the usual circular or drag saw attachments for fuelwood cutting from slabs and waste wood. Other devices might be used or developed on tractor for wood splitting, fire lane construction, fire fighting, thinning, prunning, reforesting and so on. An iron wheel tractor might be run over poles to loosen the bark for easier peeling.

With a power-save feed one can saw small, short or soft wood logs with 12 to 15 horse power gasoline engine. Small dimensions can be worked up with small diameter and thin gauge saw from small poles and bolts or from lumber, slabs, etc., with less power. The automobile engine should

furnish 25 to 35 horse power at about 1500 revolutions per minute for average farm logs. Small stiff saws will allow more variation of engine speed and power. A small automobile engine having 20 to 25 horse power for sawing 12 to 18-inch logs may have to be run more continuously at speeds from 1500 to 2,000 r. p. m. and carriage should be run by the handpower feed. Engine efficiency is conserved if run a little slower for the carriage gig-back. Slower gig-back speed also reduces swage wear from the back-lash on the log. The engine should idle when a log is rolled on or is turned. The sawyer must run a wire or cord to the throttle for hand or foot control and should run another line to the switch to stop the engine in an emergency.

Governors for Sawmill Engines

Sawmill engines should have a governor which automatically adjusts the throttle to the load to maintain proper saw speed in the log. The sawyer should be able to release the governor contact by slacking a line to it for engine idling.

The motor pulley shaft can be adapted by welding or clamping to rear end of automobile engine crank shaft through the universal joint. The pulley shaft must be carefully aligned with the crank shaft. There should be a bearing on each side of the pulley. These bearings may be roller or ball type if not too expensive. Wood or metal split bearings with babbitt linings are efficient and much cheaper. They must be oiled several times

Sawing farm logs without assistance after school hours pays more per day than teaching for this rural school superintendent shown operating his carriage by hand crank feed. All purchased mill parts cost him about $210. Log slabs can be edged or resawed for some used on the farm but most of them should be cut to stove lengths on a fast cutting circular saw like this one in fore-ground or one on the mill mandrel shown on page 20. Slabbing should be thin on straight, slow tapering logs. Mast tapering logs should be blocked out at small end for slabbing off parallel to grain.

daily. Oil sealed ball bearings may be useful. The engine should run in high gear but a transmission left on for shifting to neutral is useful at times. Most automobile engines are run on battery ignition and some of them can be changed to magnito if desired.

Adequate cooling is very important. The radiator built for the automobile engine is too small for the stationery power unit. A large size radiator with the engine's fan cooling should be used. Many persons use a barrel of water with circulating hose connection.

Auxiliary Machines Are Sometimes Useful

Ordinarily the farm mill has no auxiliary sawing machinery. Bark edged lumber is resawed to desirable widths on the mill. A number of pieces of about equal widths are piled on the carriage, dogged down and sawed at one time. However, there may be need sometimes for considerable small dimension ripping such as making crate material. Small edgers and cut-off saw equipment can be purchased to do all such resawing work.

A side edger can be made somewhat like a miniature husk mill. The mandrel consists of a small circular rip saw on one end and small driven pulley on other end and its bearings are bolted to a small husk frame. The saw frame is fastened at the side and middle of a narrow carriage base which is about twice the length of most boards to be ripped. The carriage is built like a ladder which is usually about board feet length and 12 to 18 inches wide. It must have small guide rolls to run on the narrow base tracks.

The most simple type used is a base with a greased board top which has wood cleat guides nailed along the sides. A board with greased bottom is used, instead of the roll type carriage, which slides between the guides. A board, to be ripped to smaller widths or to be bark edged is laid on top of the greased board or carriage and is held down and pushed through the saw.

Rulers of some kind are placed across each end of the carriage or sliding board to make the distance by inch graduations from the saw. The tail end marker and stop can be made of a board shaped like a stairs with each step offset one inch. This stop is nailed to top of carriage. The end of a board to be edged is simply shoved against the stop at the notch width desired and held down at the other end over the corresponding ruler mark.

Apply Safety Measures Always

Maintain a saw guard. The lean-to type with the top board coming close to the outside of the saw and level with the hub sheds off both large and small pieces of wood. Keep sawdust and chunks cleaned out under the saw. Stop the saw to pick up a chunk dangerously close to it. Avoid working in line or within reach of the saw when at full speed. Safe working zones must be planned to be out of line or reach of any fast running machinery if guards are not practical. The mill should be stopped for repairs and cleaning. Keep working areas clear of holes and obstructions along the mill. Avoid using gloves or wearing loose clothes when oiling or working close to running machinery. Think before you begin to do something about a job of timber cutting, logging, or machine operation. Don't hurry but work skillfully, sensibly and steadily.

Native lumber should be piled carefully for the best air drying.

Terms Used Which the Lumber Maker Should Know

Air-dried lumber. Lumber which has been seasoned in the open air as contrasted to that seasoned in a dry kiln. (See bulletin B-135 listed on page 3.)

Back, n. The upper or convex part of a saw tooth.

Backing board. (dog board.) In sawing lumber on a head-saw, the last board in the log to which the carriage dogs are attached. This board is ordinarily left 2″ thick.

Base, n. The table or frame of the single-unit mill which supports all working parts.

Bit, n. (point) A tooth which is used in an inserted-tooth saw.

Blank, n. (billets) The rough sawed pieces from which axles, spokes, handles, chair rounds and other turned stock are made.

Block setter or ratchet setter. One who operates the set-works on a sawmill carriage.

Blued lumber. (sapstained) Lumber, the sapwood of which has been stained by fungi.

Board. Ordinary thickness: 4/4 is 1″, 5/4 is 1¼″, 6/4 is 1½″, 7/4 is 1¾″. (See plank).

Board foot. A unit of measure in the lumber trade. A board foot is a section 12 by 12 inches in sizes and 1 inch thick, or its equivalent.

B. M. Board measure. M.B.M. = 1,000 B.M.

Bolt. A short log for stave or shingle making, etc. A block is shorter than a bolt.

Box shooks. (box boards) Pieces of lumber cut to size for boxes, but which have not yet been made into a box.

Box the heart, v. In sawing timbers in a sawmill, to cut boards from all sides of the heart, leaving the center as a piece of timber or for resawing into two or more heavy dimension, materials, (Good way to saw live and post oaks).

Butt cut. The first log above the stump.

Cant, n. A log which has been slabbed on one or more sides.

Carriage feed. A device used to drive the sawmill carriage back and forth.

Carriage trailer. An extension section of a log carriage which may be attached or detached at will.

Case harden. In seasoning lumber, a piece is said to be case hardened when the exterior becomes very dry while the interior remains moist. (See B-135, page 2).

Circular Saw. A circular plate having cutting teeth on the periphery. (Good saw plates are pounded to approximate thickness from a ball of heated saw metal and finished to proper gauge by grinding stones).

Clear lumber. Lumber practically free from all defects.

Coarse grain. As applied to the grain of lumber, that which has wide annual rings.

Comb-grained. (quarter sawed or edge grained) The best quality of quarter-saw lumber, the growth rings of which are nearly or quite at right angles to the face of the board.

Common dimension. In southern yellow pine 2-inch stock ranging, by even inches, from 4 to 12 inches in width.

Course, n. A single layer of boards in a pile of lumber.

Cross-cut, v. To cut a board or timber at right angles to the general direction of the fibers.

Cross grain. As applied to the grain of lumber, a piece in which the wood elements interweave and are not constant in any one direction.

Cull, v. A term refering to quality of wood for use. Non-merchantable part of tree, log, etc.

Cut, n. The output of a sawmill for a given period of time.

Cut-off saw. A circular or drag saw used to cross-cut logs, timbers, and boards.

Dado-head saw. A grooving saw which can be adjusted to cut any size groove or tongue by the insertion of one or more cutter heads between two outside saws of special pattern.

Dead rollers. Rollers, used for the handling of lumber, which are not power driven.

Dimension, n. Any lumber cut to size, but especially large timbers cut to order.

Dipping vat. A tank containing a solution into which lumber is dipped in order to prevent sap-stain.

Dote, n. The general term used by lumbermen to denote decay or rot in timber.

Drop siding. A pattern of lumber used to cover the exterior sides of buildings. Drop siding is horizontal. Vertical siding is perpendicular on buildings.

Dry kiln. A structure in which lumber is dried by artificial heat without apparent moisture.

Dry Rot. Decay in timber without apparent moisture.

Edge, v. To make or saw square-edged.

Edgings, n. (strips) The waste strips cut from the edges of boards.

End match, v. To tongue and groove the ends of matched lumber.

Face, n. The lower concave portion of a saw tooth.

Feather-edge. A board which is thinner on one edge than it is on the other.

Fencing, n. A grade of lumber usually 4 or 6 inches in width.

Fiber-saturation point. In seasoning wood, that point at which all the free water has been driven off and the cell walls begin to dry.

Fine grain. Wood is said to have a fine grain when the annual rings of growth are narrow.

Finish, n. The higher grades of lumber.

Fit a saw, to. To put it into proper condition for sawing. Syn.: file a saw, to.

Flitch, n. A thick piece of lumber with wane (bark) on one or both edges.

Gauge, n. The thickness of a saw blade. In the United States it is measured according to the Stubbs wire gauge. (8-gauge is about 11/64 of an inch thick).

Gig a carriage, to. (gig back) Reversing the run of a sawmill carriage after a board has been cut from the log.

Grade, n. A term referring to the quality of lumber.

Green lumber. (unseasoned) Lumber, the moisture content of which is greater than air-dried lumber.

Gum, v. To grind out the throats of a saw. Syn.: chamber.

Gummer, n. A tool used to cut out the throats of a saw. Ordinarily an emory grinder.

Hammer a saw, to. To pound it with a special type of hammer in order to adjust the tension.

Hang a saw, to. In a sawmill, to place a saw in position on arbor ready for operation.

Hardwood, a. As applied to lumber, that which is cut from broad leaf (deciduous) trees.

Head-saw. (log saw) The main log-cutting rip saw in a sawmill.

Holder. (Shank or clamp) A device for holding insert teeth in a saw.

Honey-comber, a. Lumber is said to be in a honey-combed condition when numerous large season cracks are present on the surface.

Hook, n. The angle between the face of a tooth and a line drawn from the extreme point of the tooth perpendicular to the back of a band saw, or to the center of a circular saw.

Husk, n. The frame fastened to side of carriage way to support the arbor and other working parts of a husk mill circular head-saw.

Inserted-tooth circular saw. A circular saw on whose periphery are sockets in which removable shanks and bits are inserted.

Interior trim. Lumber used for finishing the interior of buildings.

Joist, n. A piece of dimension or a timber which is used to support the floor of a building.

Kiln-dried lumber (K.D.) Lumber which has been seasoned in a dry kiln and contains less moisture than air-dried lumber.

Knee, n. (head-block bed) That part of a sawmill carriage which bears the carriage head-blocks and dogs which hold the log while being sawed. (S. U. mill).

Log deck. (rollway) The platform in a sawmill upon which logs are collected and stored previous to placing them on the carriage for sawing.

Log jack. (log haul-up) The gearing in the sawmill driving the endless chain which elevates logs into the mill.

Log roller. At a portable sawmill plant, one who assists the sawyer in placing logs on the carriage.

Log run. Merchantable lumber of all grades as it comes from the saw. Also the average number logs per 1000 bd. ft.

Loose. In circular saw fitting a saw is "loose" in those places which fall away too much from a straight edge.

Lumber, n. Timber sawed or split for use.

Mandrel, n. See Saw arbor.

Merchantable timber or log. Usually interpreted to mean timber or logs that can be manufactured and sold at not less than cost.

Milll run. As generally understood, all of the lumber output of a sawmill which has a sale value.

Mobile sawmill. Ordinarily a compact type easily moved on wheels or other supports.

Odd lengths. A term applied to lumber the length of which is in odd feet.

Off bearer, n. (saw tailer) One who stands behind the head-saw in the mill and seizes slabs and boards as they come from the saw.

Open up a saw, to. To increase the tension.

Out of round. A circular saw is said to be "out of round" when it is not a perfect circle.

Overrun, n. The difference between the mill cut of merchantable lumber and the log scale. Usually calculated as a per cent of 1000 feet log scale.

Pine Sawyer. A beetle of the genus monohammus which attacks the sapwood of pine logs.

Pin worm holes. (pin holes) Small worm holes in timber and lumber.

Plain-sawed. (flat grain) All lumber which is not classed as quarter-sawed.

Plank, n. A piece of lumber from 2 to 3 inches thick.

Portable sawmill. A small sawmill (ordinarily a husk type) which can be readily moved from one place to another. The usual daily capacity varies from 3 to 10 m. board feet—about one man per 1000 bd. ft.

Refuse, n. (slash) That portion of a tree which cannot be removed profitably from the forest or utilized profitably at the manufacturing plant.

Resaw, v. To cut boards, planks, slabs, or other material into two or more pieces on a resaw.

Right-hand sawmill. A sawmill in which, when standing on the log deck and facing the rear of the mill, the carriage and saw are on the right hand.

R. P. M. Revolutions per minute.

Saw alive, to. To make all cuts on the log parallel. Not turned for squaring.

Saw arbor, n. (mandrel) The shaft and bearings on which a circular saw is mounted.

Saw around, to. In sawing, to cut from three or more faces of a log, the latter being turned in order to get the best quality of lumber.

Saw bill. The instructions given to a sawyer for sawing lumber of various kinds and sizes from given logs.

Saw guide. A device for steadying a saw.

Saw kerf. The width of cut made by a saw.

Saw timber. Logs suitable in size and length for the production of lumber.

Sawyer, n. One who controls the carriage and other machinery used in sawing logs into lumber. The quality and quantity of lumber sawed depends on his judgement, skill and speed.

Scantling, n. A piece of timber of small size.

Season, v. To dry lumber.

Season's cut. The output of a sawmill for that portion of the year the mill is operated.

Setting, n. (set-up) The temporary station of a portable sawmill.

Set-works. The mechanism on a sawmill carriage by means of which the block setter advances the blocks and the log toward the saw line after a piece has been cut from the log.

Set-Works Scale. A rule or disk on a saw carriage which shows the distance in inches between the saw line and the face of the head-blocks.

Shake, n. A long form of shingle split or sawed from a bolt of wood.

Shingle, n. A thin, oblong piece of roofing wood, and with one end thinner than the other.

Shingle bolt. A short split section of a log from which shingles or shakes are manufactured.

Shingle press or paker. A frame in which shingles are packed in bundles.

Shingle saw. A thin gauge circular saw used to cut shingles from bolts.

Shiplap, n. A form of matching for lumber.

Shipping dry. A condition of lumber in which the moisture content is the same as that of air-dried lumber.

Shop, n. A quality of lumber in several grades which is used in the manufacture of sashes, doors, blinds ,and like products.

Shot holes. Holes made in wood by boring insects (Ordinarily larger than pin hole defects).

Side cuts, n. Boards sawed from the outer portion of a log when the central part is made into a timber.

Single-unit sawmill. A farm type mill having all parts on a single base; easy to build, operate, transport and to log.

Sizer, n. A machine for surfacing timbers and dimension.

Slab, n. The exterior portion of a log which is removed in sawing lumber.

Slat, n. A strip used in the manufacture of crates.

Softwood, a. As applied to lumber, that which is cut from needle leaf (coniferous) trees.

Solid-tooth circular saw. A saw in which the teeth are cut into the periphery of the saw.

Sound knot. A knot which is solid across its face, as hard as the surrounding wood and so fixed that it will retain its place in the piece.

Spiked skid. A skid in which spikes are inserted in order to keep logs from sliding back when being loaded or piled.

Spike knot. A knot sawed in a lengthwise direction.

Spring set. (briertooth) A saw is spring set when one tooth is sprung to the right and the next one to the left. Cross-cut and some rip saws are spring set; also very narrow band saws. Syn.: beveled dress, briar dress.

Square, n. When applied to shingles, that number which will cover 100 square feet of surface.

Standard knot. A knot that is sound and not over 1½ inches in diameter.

Sticker, n. (strip) A piece of lumber which separates the different courses of lumber in a pile.

Stock logs, to. To deliver logs from stump to mill or landing.

Strip, n. A narrow 1-inch board.

Surface, v. (dress) To plane one or more sides of a board, plank, timber, or other sawed material.

S1S1E. Term used to designate lumber which has been surfaced on one side and one edge. The same system is used to designate lumber which has been been surfaced on a greater number of sides: e. g., S4S designates a board surfaced on four sides.

Swage, n. (upset) A tool used to spread the points of teeth of a band or circular rip saw.

Swage, saw, to. To spread the ends of the teeth of a band or circular rip saw.

Swage set. (Square dress) A saw is swage set when the ends of the teeth are spread to a width greater than the thickness of the saw.

Sweep, n. The crook in a log.

Tally, n. A record of the number of pieces and the grades of lumber.

Taper set lever. It is of service when making the first cuts on swell-butted logs. Some place a block of proper thickness between small end of log and head-block.

Tension, v. (open) To make a circular or a band saw more loose in the center than on the cutting edge.

Throat, n. (gullet) On a saw, the rounded cavity in which sawdust accumulates and is carried from the cut.

Timber, n. Sawed or hewed material, 4 by 4 inches or more in dimension.

Trim, v. (butt off) To make square the ends of boards and timbers.

Trim, v. (swamp) To cut off limbs from felled trees or logs.

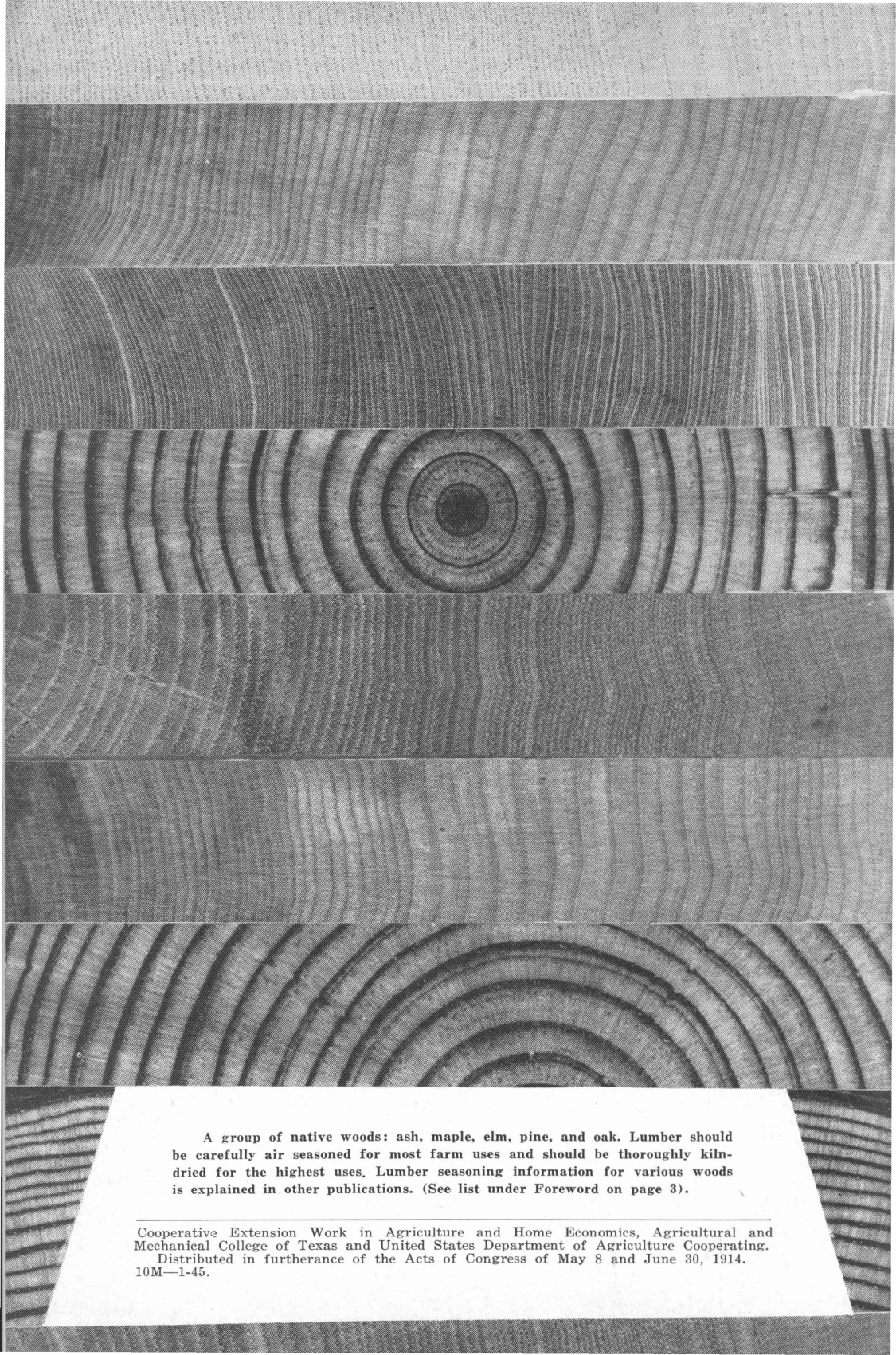
Trolley, n. A small iron-wheel car running on a wooden track, which lumber from a portable sawmill to the storage yard.

Veneer, n. A thin piece of lumber cut on a veneer machine. There are three kinds of veneers, namely, sawed, sliced, and rotary cut.

Wane, n. Bark or the lack of bark or a decrease in wood width from any cause on the edges of a board, plank, or timber.

Washboard, v. A term used to denote the action of a saw or a planing machine cutter head which makes ridges on lumber.

Waste, n. That portion of the tree log or lumber having a merchantable value or use which is not utilized.



A group of native woods: ash, maple, elm, pine, and oak. Lumber should be carefully air seasoned for most farm uses and should be thoroughly kiln-dried for the highest uses. Lumber seasoning information for various woods is explained in other publications. (See list under Foreword on page 3).

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