UMC

Science and Technology

GUIDE

Published by the University of Missouri - Columbia Extension Division

Circular Sawmill Alignment and Maintenance

Bruce E. Cutter
School of Forestry, Fisheries and Wildlife

When most people think of sawmills, they probably think of mills that use a large diameter (48- to 60-inch) circular saw as the headrig (the main saw in a mill) to saw logs into lumber. Of the several types of headrigs used, this single circular saw, or *circle saw*, as it is commonly called, is one of the easiest to set up and maintain. The relatively easy operation and maintenance are probably major reasons for the popularity of the *circle saw* among part-time sawmillers, such as farmers, who only saw when they need lumber and money.

This type of headrig is also versatile. It can cut a variety of products from a single log. Some of the other headrigs can only cut a single product from a single log.

However, the fact that the circle saw is easy to operate gives some people a false sense of security. They tend to overlook the need for regular, preventive maintenance and proper alignment of the saw, the carriage, and the tracks the carriage rides on.

The discussion and illustrations in this UMC Guide can help small sawmill operators align equipment and uncover problems that may be affecting the efficiency of their operations. All the information in the Guide is based on the assumption that preventive maintenance is performed at regular intervals.

Mill Foundation

Before contemplating alignment of the saw itself, let's start at the bottom of the mill—the mill foundation—and work our way up. All the parts of the mill must be anchored securely to the foundation, which in turn should rest in or on solid ground. The foundation, either concrete piers or treated wood posts, must be solid enough to support the mill without sagging or shifting. If the foundation is not solid, proper alignment of the saw, the carriage, and other equipment will be nearly impossible. On unstable ground, you may have to pour a reinforced concrete slab to provide an adequate working surface. Space piers and posts no farther than four feet apart, and make sure that footings are at least 18 inches below the frost line.

Tracks

Next, check the tracks that the carriage rides on. To cut lumber accurately, the carriage must travel in a straight line past the saw without side-to-side or up-and-down motions. The tracks and the ways, the wooden members the tracks are fastened to, must be properly installed to provide smooth, straight travel for the carriage. The ways must be fastened securely to the piers or posts.

The tracks in most mills consist of a flat track and a V-track. The flat track is generally next to the saw itself and supports the carriage. The V-track provides directional guidance as well as support. The V-track is generally located away from the saw to lessen the chance of sawdust and other debris falling on the track and causing derailment.

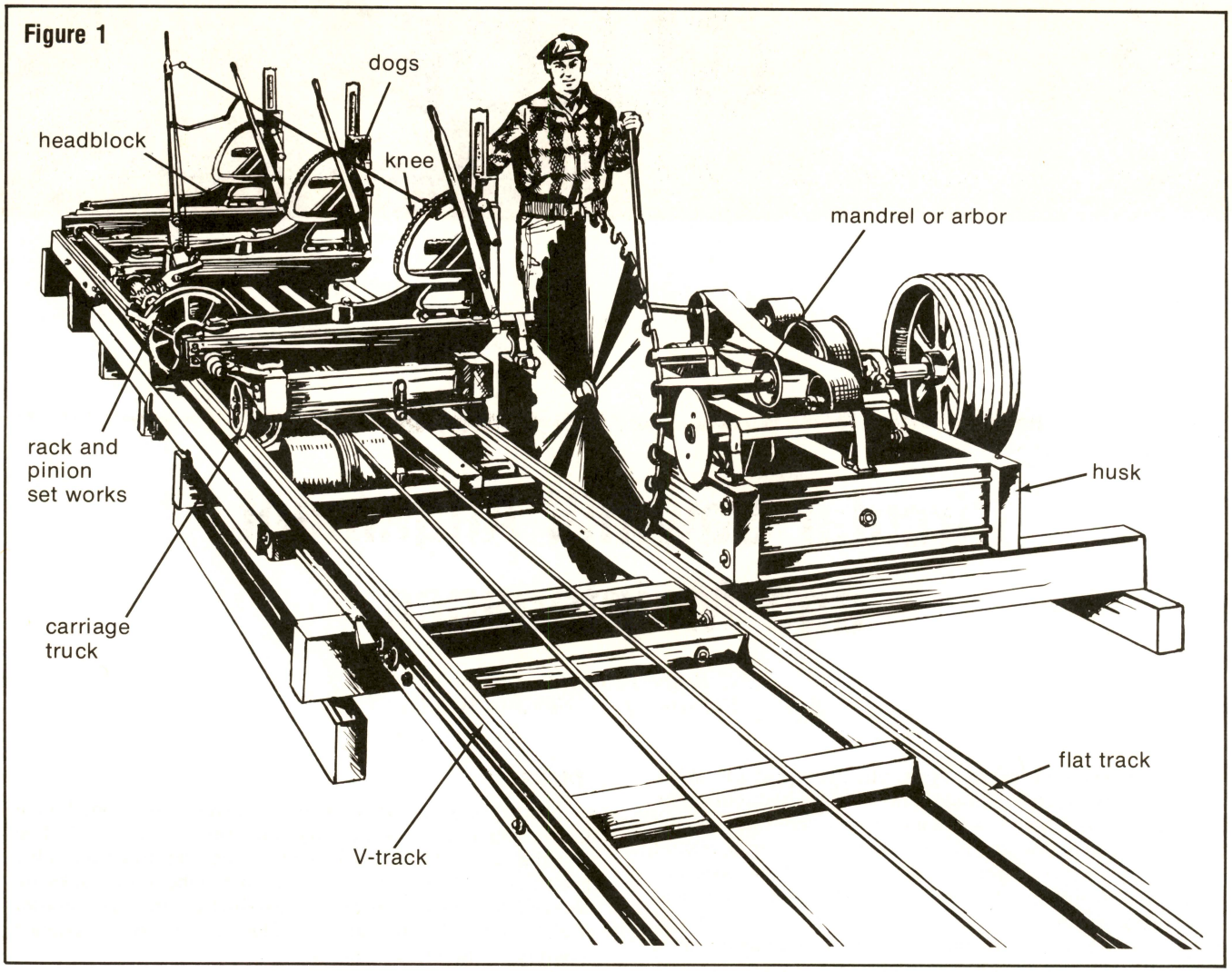
The tracks are laid on the ways, starting in the center of the ways and working toward each end. The V-track, the guide rail, must be parallel with the husk, the support for the saw itself. You can accomplish this by stretching string or fine piano wire along the rail and measuring the distance from the track to the wire at several places. After aligning the V-track, place the flat track in position.

In addition to being straight, the tracks must also be level with one another. Level the V-track first using a carpenter's or mason's level; then bring the flat track into alignment with the V-track. While the tracks may be level without any weight on them, they also should be level when a heavy log is placed on the carriage and moved along the track. Check this by placing a heavy log on the carriage and rolling the carriage along the track. A spirit level placed on the carriage can be used to see where the tracks might not be adequately supported.

Carriage

The function of the carriage is to carry the log past the saw in a straight line at a uniform rate of speed while holding the log securely in place. For the carriage and track to function properly, keep the headblock-knee assemblies aligned, the

Figure 1



carriage trucks free from end-play, the setworks tight, the dogs sharp and in good working order, and the tracks level and aligned.

Most small circle saw carriages ride three or four trucks. Check the wheels on these trucks for excessive end-play by trying to give the carriage a hard shove sidewards. Keep the axles tight and properly lubricated. Track cleaners should be in front of and behind each wheel on each truck. These cleaners will sweep debris from the tracks; adjust them so they barely clear the tracks and the wheels.

The setworks move the headblock-knee assembly in and out on the carriage in relation to the saw itself. Each carriage knee should be square with the headblock and the same distance from the saw. Align the knees by stretching a string or fine wire across the knee faces and by adjusting knees as needed until all touch the line. Use a carpenter's square to check the headblock-knee assembly for squareness. Check the headblock base with a machinist's level. Eliminate rough spots whenever necessary. Some carriages have replaceable knee faces while others must have the faces re-machined.

Check the rack-and-pinion setup that moves the headblock-knee assembly for excessively worn gears, bearings, keys and keyways. Check for slack in the setworks caused by worn gears, keys, and keyways by measuring the thickness of the remaining cant after each board has been removed. Variation of more than 1/32 inch between the desired and the actual thickness indicates problems.

The dogs should be sharp and move freely on the knees. If a log is inadequately dogged (held in place), the log or cant can spring back against the saw, forcing it out of line.

Saw Mandrel or Arbor

The mandrel upon which the saw is hung must be level. One way to check the arbor is to place a level on the shaft. (A grooved machinist's level is self-centering and works well for this purpose.) Another method is to use a plumb line from the top of the saw and hanging beneath the bottom of the saw. The line should be as close to the collar as possible (Figure 2). When necessary, place shims under the bearings to level the mandrel.

Mandrel bearings should be in excellent condition so that the mandrel runs steady and true with little vibration or end play. Bearings should run cool because the mandrel and collars readily transmit heat generated by bearings to the eye of the saw. Heat near the center of the saw expands the metal and causes the saw to dish and run erratically in the cut.

Saw Collars and Lug Pins

The basic functions of saw collars and lug pins are to hold the saw securely on the mandrel and to provide support for the saw blade. The center hole of the saw, the eye, should fit the mandrel perfectly. If the eye is too large, the saw will hang off center as it hangs on the mandrel. If the eye is too tight, the

Figure 2

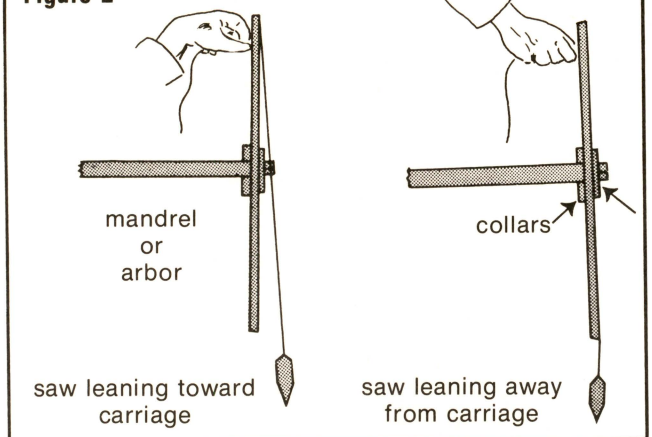


Figure 3

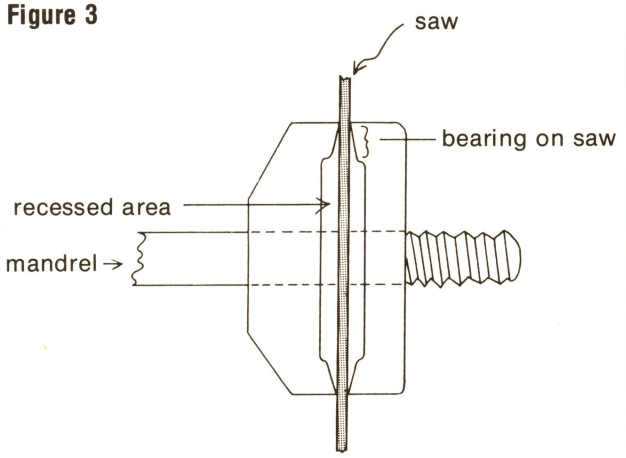
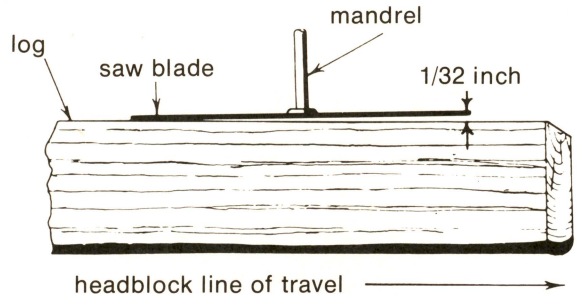


Figure 4



saw may be dished when the mandrel nut is tightened. Pin holes may be larger than pins, but before tightening the mandrel nut, turn the saw until the lug pins bear firmly on the pin holes in the saw.

Collar trouble is one of the most common causes of saw trouble. Defective collars can cause a properly tensioned and sharpened saw to operate poorly. Machine the collars so that they contact the saw blade only along the outer perimeter in a zone approximately ¾ inch wide. The center of the collar should be recessed to clear the saw (Figure 3), and the bearing edge. The taper is slight (0.002 to 0.003 inch from the outer portion of the ¾ inch bearing surface to the inner portion). When the mandrel nut is properly tightened, the clearance will be reduced and the entire bearing surface will contact the saw. Always use a mandrel nut wrench and exercise care to prevent overtightening, which may spring perfectly ground collars.

A simple method for checking the effect of collars on the saw is:

- Loosen mandrel nut until saw is free and re-tighten by hand.
- Set guide pins so that there is approximately 1/16 inch clearance on each side of saw.
- Tighten the mandrel nut in the usual manner (without turning the saw).
- Check the clearance between the guide pins and saw.

If the saw is closer to one guide pin than the other the saw has been dished in the process of tightening the collars. The most probable cause of such dishing is faulty collars, which should be repaired or replaced. As a further check, turn saw over and place it on the arbor backward. With the same point of the saw between the guide pins, repeat the four steps above. If the saw still moves toward the same guide pin on tightening, the collars are certainly defective. If reversing the saw pushes toward the opposite guide pin, there is probably a lump on the saw where the collar contacts it, and the saw should be leveled and re-tensioned.

Lead

Lead is the term used to describe how much the saw angles into the log from the saw line. Because of the round contour of logs, the saw teeth on cuts are making a deeper cut on the log side than on the slab side. Hence, usually the log side of the teeth become dull quicker. Also, because of the heavier cut on the log side, the saw takes the path of least resistance and moves out of the log. To overcome these two factors and to give clearance to the back of the saw on the carriage return, the saw should be led slightly into the log. The correct lead is ⅛ inch in 20 feet, but for convenience in checking, 1/32 inch across the diameter of the saw is sufficient for most mills (Figure 4).

To check saw lead, follow these steps:

- Move the carriage until one of the headblocks is opposite the cutting edge of the saw.
- Place a pointer on the headblock so it just contacts the saw, and clamp it securely in place with a "C" clamp.
- Move the carriage forward until the pointer is opposite the back edge of the saw.
- Rotate the saw until the same tooth is opposite the pointer.

At this point, there should be 1/32 inch gap between the saw tooth and pointer. To adjust lead, loosen all mandrel boxes and move the saw end of the mandrel either left or right. Re-check lead after mandrel boxes are tightened. Never attempt to change the lead by adjusting guide pins or filing the saw teeth unevenly.

The above method of determining lead is only an approximate method. Seldom do two saws operate best with the same lead, but with a little experimenting, you can determine the correct lead for a saw blade. If the saw heats in the center, it needs more lead into the log. If it heats on the rim, reduce lead. Lead is a necessary evil, and the least lead that can be used is best.

Guide Pins

The saw guide serves to steady the saw in the cut. Hence, guides should be as high as possible without interfering with the cut. Guide pins should clear the bottom of the shanks by approximately ¼ inch and should be positioned so that they are as close to the saw blade as possible without rubbing. Make final adjustments of the guide pins while the saw is running at full speed. Be careful!

If you carefully check and adjust all alignments of the saw, track, and carriage, the mill will produce perfectly sized lumber and will operate faster and more efficiently. You can catch many minor problems before they become major breakdowns during a daily inspection.

■ Issued in furtherance of Cooperative Extension Work Acts of May 8 and June 30, 1914 in cooperation with the United States Department of Agriculture. Leonard C. Douglas, Acting Director, Cooperative Extension Service, University of Missouri and Lincoln University, Columbia, Missouri 65211. ■ An equal opportunity institution.

5600 *Revised 3/80/8M*