

## UNIT 6

# POWER SAWING

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Portable and stationary power can be used to cut lumber and other wood products quickly and easily. In this unit, you will study the basic portable and stationary power saws commonly found in the woods laboratory. You will be able to identify each type of saw and explain which saw is best for the different cutting operations. In addition, you will be able to list the basic safety procedures for each power saw.

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In this unit, power saws—both portable and stationary—will be discussed. Certain factors must be kept in mind prior to operating any tool powered by an outside source, such as electricity. One important factor is that the cutting motion is not the result of a force exerted by the operator. With that in mind, you should realize any problem that may occur will continue until the outside force is removed. Some general safety rules must be understood before operating any type of power tool.

1. Never operate a power tool without prior permission of the instructor. Even after you have received permission to use the tool, do not operate the power tool unless the instructor is present.
2. Determine the method of starting and stopping the tool before using it to cut stock. Some saws are equipped with a brake button that must be pressed after the power switch is released. The brake button is used to stop the blade from rotating (coasting). If the tool continues to coast after the machine has been shut off, do not leave the tool unattended until the blade stops. Someone might inadvertently be injured.
3. Safety glasses (or other eye protection) must be worn by the operator of portable

and stationary power tools, as well as by everyone in the area of the tool.

4. Many portable and stationary power tools produce high noise levels. Wear ear protection if the noise level is high, or if you will be exposed to the noise for a long period of time.
5. Inspect the power cord of any power tool prior to starting it. If the cord is frayed, split, or worn do not use the tool. Do not use the tool if the grounding pin is missing from a grounded plug. Refer to Fig. 3-4.
6. When changing the blade or setting up a tool for a cut, always remove the plug from the wall receptacle or switch the electrical disconnect to the OFF position.
7. Think through every step of the procedure about to be performed. Is something in the way? Is an outfeed stand needed? Is a push stick at hand? Is additional help needed to do the procedure?
8. Make sure all guards are in place. Special setup jigs and accessories should be properly positioned and secured. If the guard must be removed for a certain cutting procedure, ask the instructor for permission before removing the guard. After you have removed the guard, ask the instructor to check the setup and procedure. Finally, ask the instructor to assist you in the procedure. Instructors have experience and knowledge of the tools that are very valuable!
9. Do not attempt to operate a power tool that has a dull blade. Blades tend to overheat when dull, causing them to warp or break easily without warning. Dull blades also cause the motor to overheat, which may result in permanent damage to the tool. In addition, a dull blade burns the cut surface of the wood. This then requires more sanding, or the surface will not readily accept glue or a finish.

When classifying power saws as stationary or portable, you should consider their use in relationship to the material being cut. A power saw is considered to be "portable" if the saw is taken to the material to be cut and it is pushed through the stock. A power saw is considered to be "stationary" if the material is brought to the saw and the stock is fed into the saw. It is obvious that a 300-pound saw bolted to the floor and wired directly into a circuit box is stationary. However, this difference is pointed out because of some of the smaller "bench-top" scroll saws, table saws, and bandsaws that are now on the market. They may indeed be movable, but are not classified as "portable" because the stock is still fed into the saw.

### PORTABLE POWER SAWS

The most common portable power saws used in the woods laboratory are the SABER SAW and the CIRCULAR SAW. Some models of these power saws have a switch that must be held in the ON position during use. When the switch is released, the saw should immediately stop. Blades on some older models of the circular saws coast after releasing the switch, while some saber saws have a toggle-type ON-OFF switch.

### SABER SAW

The SABER SAW is a versatile power tool. It can be used to make straight cuts across or parallel to the grain, as well as curved cuts. Most saber saws have a base that allows for tilting the blade to make angled and compound cuts. Fig. 6-1 shows two different models of saber saws.

A variety of blades may be used with the saber saw. There are blades to cut hardwoods or softwoods, blades to make smooth cuts, blades to make coarse, rapid cuts, blades to cut steel, and blades to cut plastic. Make sure that you use the proper blade for the type of cut being made and the material being cut.

Before using a saber saw, clearly mark the cutting path on the stock to be cut. If a long, straight cut is to be made, consider using a straight cutting jig. Firmly support the stock being cut, making sure the cutting path does not run into the support. Place the base of the saw flat on the stock with the blade slightly away from the stock. Turn on the saw and slowly move the blade into the stock while keeping the base firmly on the stock. Continue the cut until it is complete. To avoid breaking the blade, con-

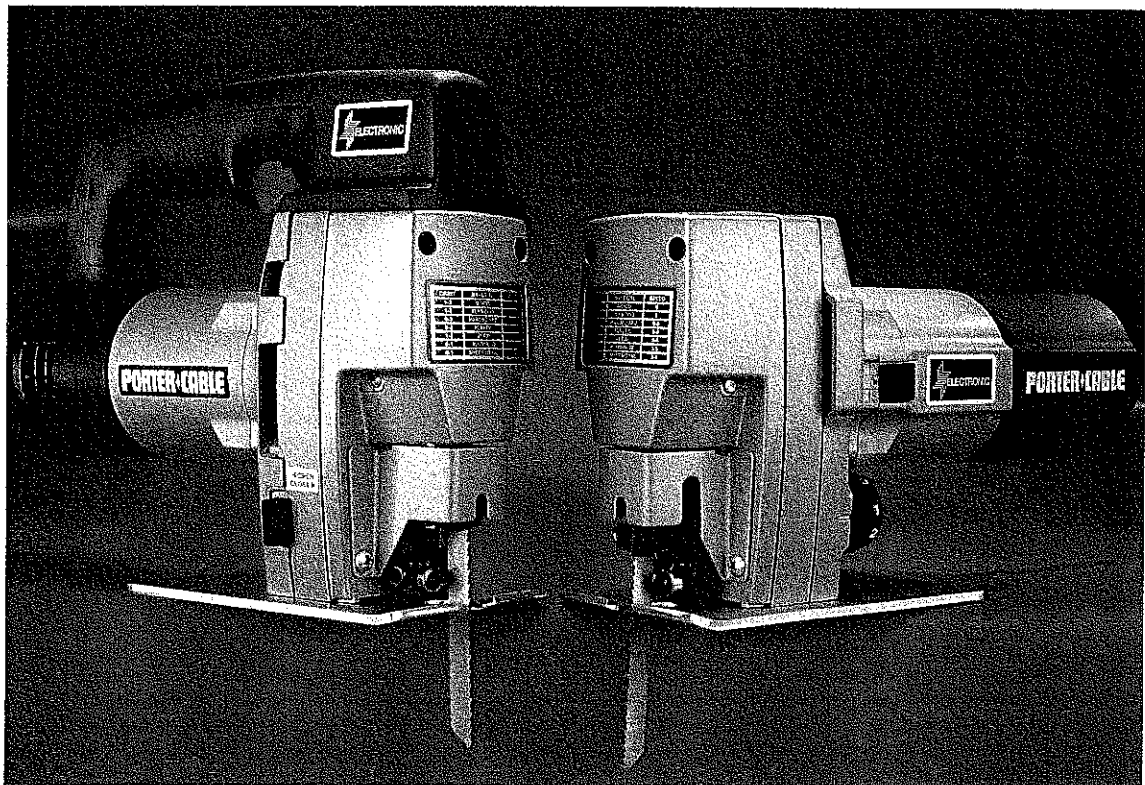


Fig. 6-1. Saber saws are multipurpose tools. Left. Handle-grip model. Right. Barrel-grip model. (Porter-Cable)

tinue running the blade for a second after the cut is complete to make sure the blade has cleared the stock.

### Making Internal Cuts with a Saber Saw

Two methods can be used to make internal cuts, or cut stock when the cut does not start at the edge. The first method is similar to making an internal cut with a coping saw. A small hole, about 1/4 inch in diameter, is drilled in the waste area. The saw blade is then inserted into the hole, the saw is turned on, and then guided to the cutting line. This is generally the best method for the beginner to follow to avoid blade breakage.

The second method to make an internal cut is called a PLUNGE CUT. See Fig. 6-2. A plunge cut is made by tilting the saw at an angle and touching the front of the base on the stock to be cut directly above the cutting line. Next, align the blade with the cutting line, but hold it about 1/4 to 1/2 inch above the surface of the stock. Hold the saw firmly and turn it on. Slowly and gently lower the blade into the stock. Allow the base to move slightly toward the hole being cut with the blade while reducing the tilting angle of the base until the base is resting flat on the stock. Proceed to cut on the cutting line as previously discussed.

If it becomes necessary to remove the blade while it is still in the stock, shut the saw off and wait for the blade to stop. When the blade has stopped moving, gently lift the saw straight up to remove the blade.

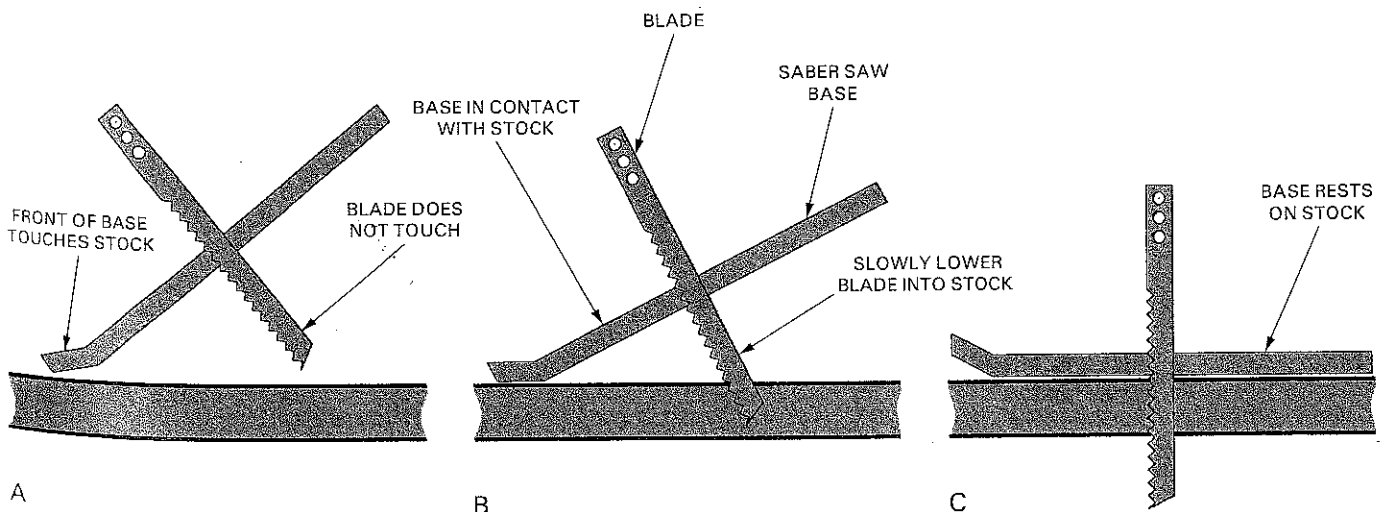


Fig. 6-2. Plunge cutting with a saber saw. A—Tilt the saw and place the front of the base on the stock. B—Turn the saw on and slowly lower the blade into the stock. C—Rest the base on the stock and proceed with cut.

### PORTABLE CIRCULAR SAW

The PORTABLE CIRCULAR SAW, or POWER SAW, is a useful tool for rapid cross-cutting and ripping of large stock. It should only be used for straight cuts. This saw is available in a number of blade sizes ranging from 4 1/2 inches to special circular saws used in timber framing with 12- to 14-inch diameter blades. Newer circular saws are equipped with blade brakes that reduce coasting and a trigger-type ON-OFF switch that cannot be locked in the ON position. They also have a blade guard that automatically retracts as the cut is started and covers the blade when the saw is lifted from the stock. Fig. 6-3 shows a portable circular saw with its parts identified.

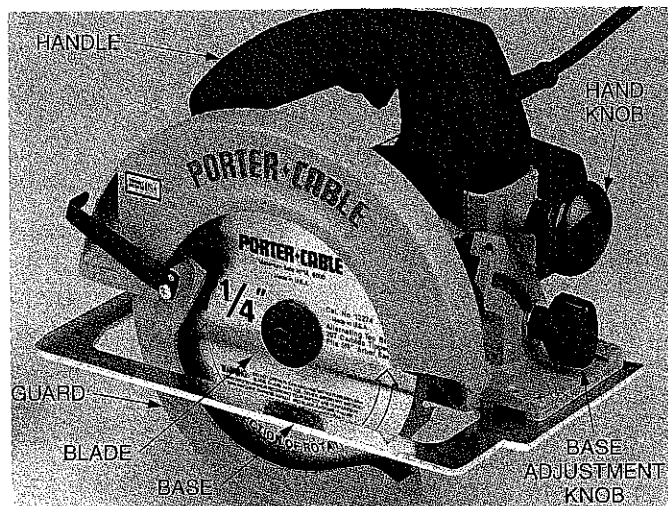


Fig. 6-3. Portable circular saws are used to make straight cuts. (Porter-Cable)

Portable circular saws can have a number of attachments. The rip fence allows you to easily rip (cut to width) long stock. Other attachments, such as a dado blade or a "sawhorse-table" arrangement should not be used by the beginning woodworker. You should become familiar with the saw's basic operation before trying advanced procedures.

### Making Cuts with a Portable Circular Saw

Make sure your stock is properly supported and secured into position before making a cut with a portable circular saw. Use sawhorses, clamps, or an assistant to help you support the stock. Carefully lay out the cutting line (always a straight line) on the stock. Make sure that the support is not cut by the portion of the blade that extends below the material.

Hold the stock firmly on the support with one hand. Have an assistant help you support the stock until you are familiar with the saw. Place the base of the saw on the stock with the blade about 1/2 inch away from the stock. Turn the saw on and slowly move the saw forward along the cutting line, Fig. 6-4. Be careful not to allow the saw to bind while making the cut. Binding is normally caused by not following a straight path, or by feeding the saw too quickly into the stock. Reduce the forward speed of the saw slightly near the end of the cut. Your assistant should help you hold the piece being cut off. However, make sure they do not lift up on the material causing the blade to bind.

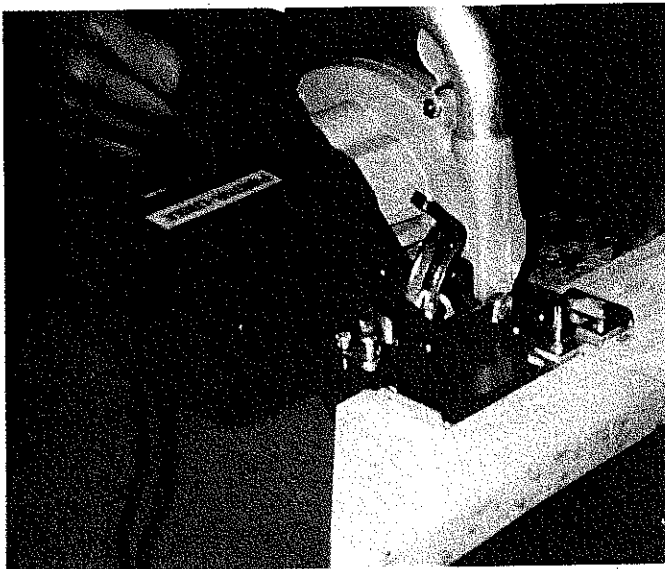


Fig. 6-4. Crosscutting with a portable circular saw.

A number of different types of blades are available, each designed for a certain purpose. Always match the blade to the type of work being done. Most woodworking can be done with a combination blade. This will work for both crosscutting and ripping stock. If a great deal of cutting is planned, a carbide-tipped blade should be used. This type of blade is similar to a standard blade, except that the teeth have carbide tips to prolong cutting life.

## STATIONARY POWER SAWS

Four common and basic stationary power saws found in many wood laboratories are covered in this section. They are the:

- Scroll saw, or jigsaw.
- Bandsaw.
- Radial arm saw.
- Table saw.

Certain precautions must be followed for safe use of stationary power saws. Refer to the general safety statements at the beginning of this unit, as well as in the safety unit, before using any stationary power saws. Each of the stationary power saws also has an additional safety rule list. Every student should know the safety rules prior to the use of any of these tools.

### SCROLL SAW

A SCROLL SAW, or JIGSAW, is used to cut arcs or curves in stock. The scroll saw allows you to perform the same tasks you did using the coping saw, but more quickly and with greater accuracy. These saws are fun to operate and are probably the safest of the power tools in the woods laboratory. Some woodworkers point out a difference between the scroll saws and jigsaws. However, the term "scroll saw" will be used when referring to a "scroll saw" or "jigsaw" in this book.

Scroll saws are available in three basic designs—the fixed, or rigid arm saw, the C-frame constant-tension saw, and the parallel arm constant-tension saw. See Figs. 6-5 through 6-7. Each of these saws have their own features, advantages, and benefits. The fixed, or rigid arm saw, Fig. 6-5, will cut stock up to about 1-inch thick. The maximum length of stock that can be

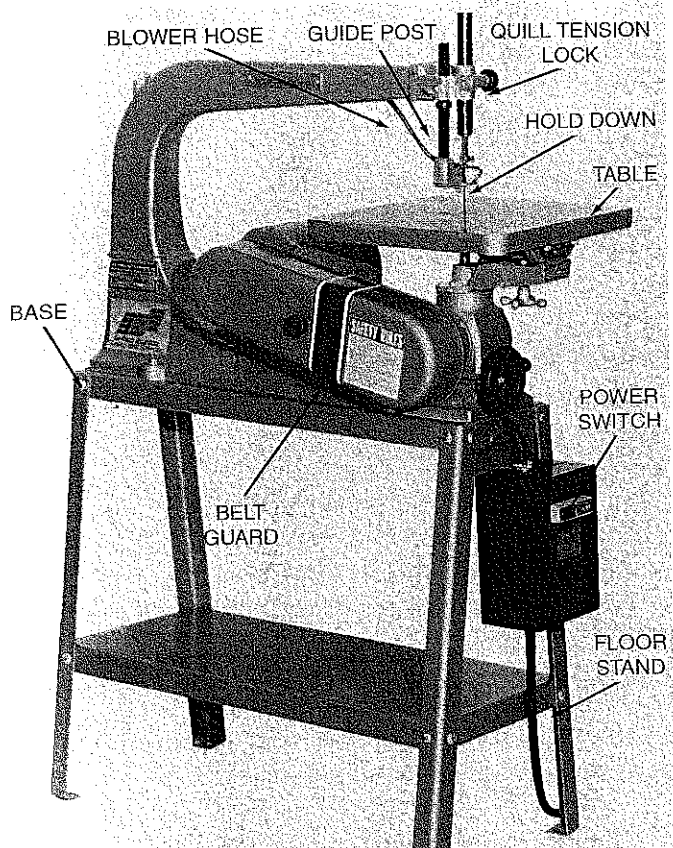


Fig. 6-5. Fixed arm scroll saw. (Powermatic-Houdaille, Inc.)

cut is equal to the distance from the blade to the back of the arm. The blade moves up and down, cutting only on the downward stroke like any other scroll saw. The motor pulls the blade down and the tension sleeve pulls the blade up. The number of strokes (up and down cycles) per minute may be changed by either moving a belt on a cone pulley or by an adjustable pulley.

The other two types of scroll saws are **CONSTANT-TENSION SAWS**, meaning that the blade always has a certain amount of tension. See Figs. 6-6 and 6-7. These saws are capable of doing very detailed work in stock up to 2-inches thick. Blade breakage tends to be less of a problem with the constant-tension saws. In addition, the proper blade will allow you to actually turn around in the kerf.

There are many different blades that can be used with these saws. The type of blade to be used is determined by the kind and thickness of the stock, and the diameter of the curves being cut. Almost all blades for scroll saws are 5-inches long. The teeth of the blade must point downward toward the table when installed.

### Scroll Saw—Safety and Care

1. Unplug the saw before making any adjustments.
2. Keep your fingers away from the front of the saw blade and out of the cutting path at all times.
3. Turn the saw by hand before turning on the power. This ensures that the blade is not binding.
4. Push the stock forward rather than toward the sides.
5. Always wear safety glasses when operating the scroll saw.

When using a rigid arm saw, the tension sleeve should be adjusted to prevent binding of the blade during a blade cycle (one up stroke and one down stroke). The pressure foot, or hold

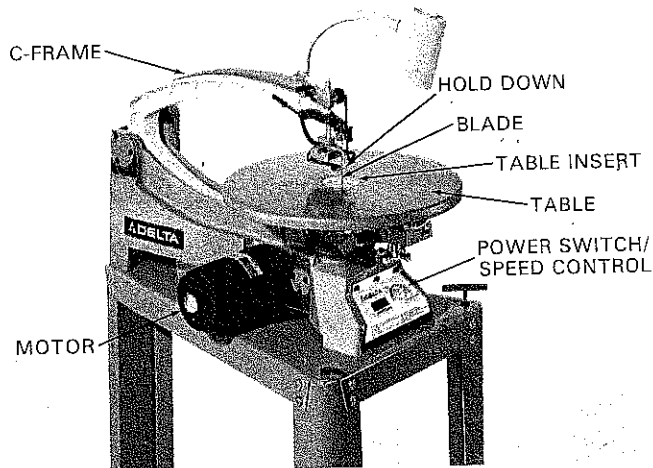


Fig. 6-6. C-frame constant-tension scroll saw. This model also offers a variable-speed option. (Delta International Machinery Corp.)

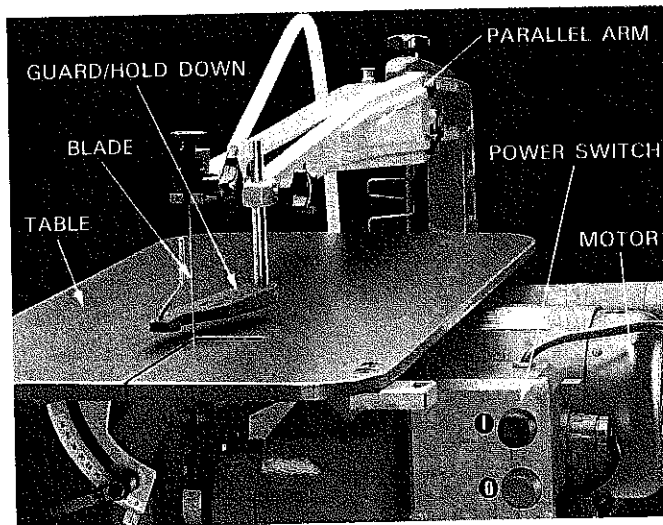


Fig. 6-7. Parallel arm constant-tension scroll saw.



down, should be placed snugly on top of the stock being cut.

When using a constant tension scroll saw, the blade is brought under tension with an adjusting knob located at the back of the saw. The thumb screw just above the blade in the front of the overarm should not be tight. However, it should be lowered just enough to prevent the upper blade clamp from popping out if a blade breaks. If this thumb screw is tightened against the upper blade clamp, blade breakage is likely to occur. The hold down is used more for guiding the blade, and for safety reasons rather than actually holding the stock being cut.

### Making an Internal Cut

The procedure for making an internal cut with a scroll saw is similar to making an internal cut with a coping saw. First, make sure the scroll saw is unplugged. Drill a hole with a large enough diameter to insert the blade in the waste area of the stock near the cutting line. Loosen the guide post and hold down on the scroll saw. If you are using a fixed arm saw, turn the machine to the downward stroke by hand. Place the blade (teeth pointing downward)

through the stock to be cut and hole in the table. Insert the end in the lower blade clamp. Place the other end of the blade in the upper blade clamp and adjust the blade tension. Finally, place the hold down in position. Have your instructor check the setup before turning the saw on until you become familiar with this procedure.

When sawing, guide the work with both hands, pushing forward just fast enough to keep the saw cutting. See Fig. 6-8. Do not cut sharp bends; they may be cut out later. Avoid starting a cut in the middle of a straight or slightly curved area, rather start a cut at the endpoint. Use relief cuts whenever possible, but avoid making them too deep. RELIEF CUTS allow waste to break loose as you saw your workpiece. Each relief cut is made almost to the cutting line. Do not over-cut because these marks are very difficult to sand out later.

### BANDSAWS

The bandsaw has a wide variety of uses. It can be used to make straight or curved cuts, with or without a guide. It can cut wood, plastic, and metal. Fig. 6-9 shows a typical bandsaw. The

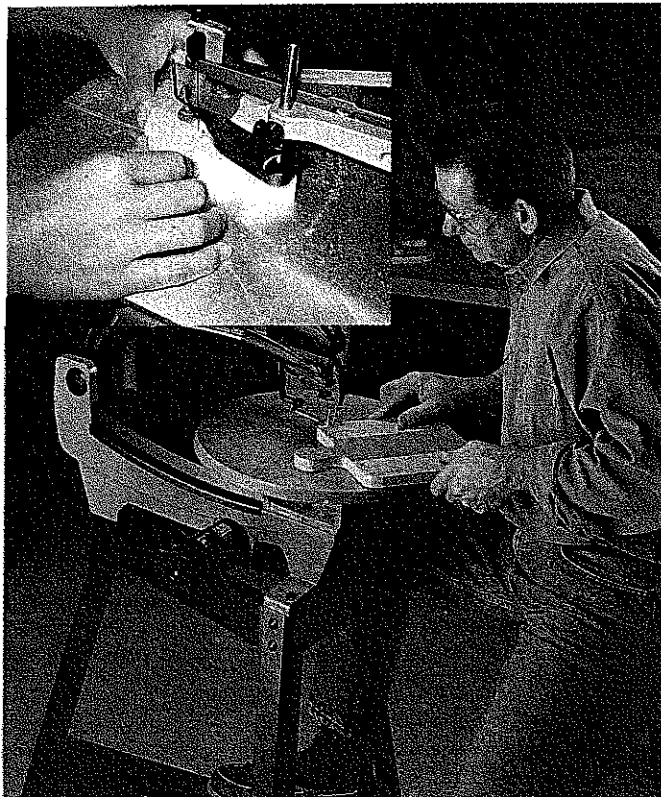


Fig. 6-8. Making detailed internal cuts. Note the hand position in the insert. (Delta International Machinery Corp.)

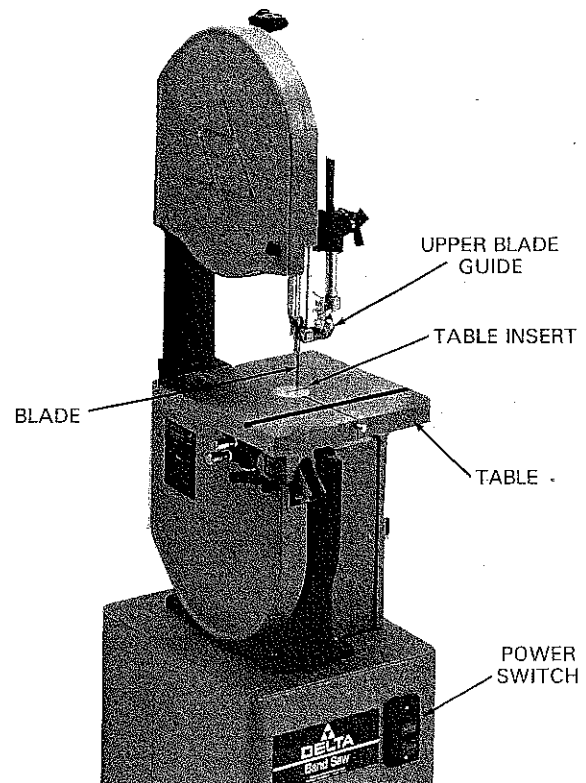


Fig. 6-9. A 14-inch bandsaw. (Delta International Machinery Corp.)

blade of a bandsaw is a continuous band that revolves on two wheels. The size of a bandsaw is determined by the distance from the blade to the back of the saw. Normally, this distance is the same as the diameters of the wheels. A 14-inch bandsaw is a popular size. The upper wheel is adjustable to tighten or loosen the blade. It can also be tilted forward and backward to adjust tracking of the blade so that it "rides" in the middle of the wheel.

Blades for the 14-inch bandsaw are available in widths from 1/8 to 1 inch. Fig. 6-10 shows the minimum radii that can be cut by a given blade width. Do not cut a radius that is smaller than the blade can handle safely. Bandsaw blades are available in a variety of tooth sizes and styles. The proper tooth style or size is determined by the type of material being cut and the coarseness of the cut you want to obtain. The total length of the blade is specified by the bandsaw manufacturer.

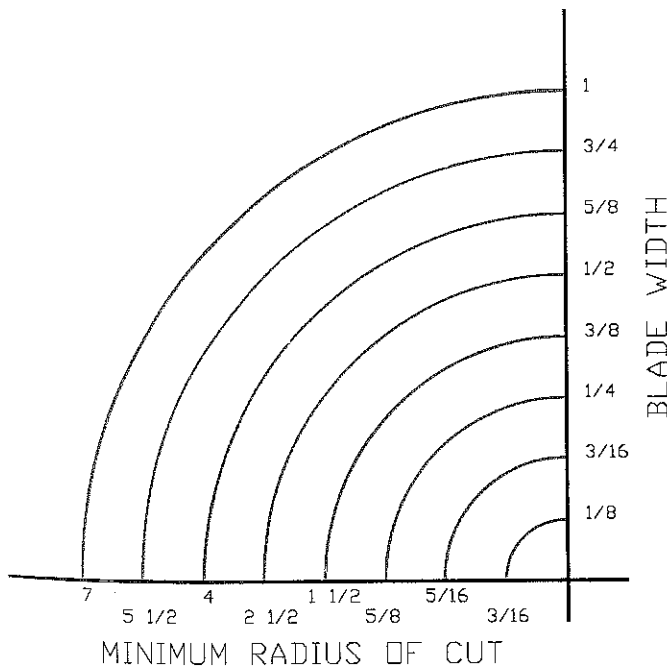


Fig. 6-10. Blade guide for selecting the proper blade width for the arc or curve radius being cut.

The upper and lower guide assemblies should be checked frequently. Always consult the instructor before making an adjustment, or if the saw is out of adjustment. The blade guides should clear the blade by about 0.003 inch (approximately the thickness of a piece of paper). The roller supports (backing bearings) should clear the back of the blade by about 1/32 inch.

### Bandsaw - Safety and Care

1. Keep hands to the side of the blade, away from the path of the blade.
2. If the blade breaks, step aside and disconnect the electricity to the machine.
3. Keep your fingers at least 2 inches from the blade at all times. Use a fixture to hold small pieces.
4. Always keep the upper guide assembly 1/4 to 1/2 inch above the stock. This prevents an excess amount of the blade from being exposed.
5. Push the stock forward rather than to the side.
6. Work within the capacity of the saw. A thick piece of stock must be fed slower into the blade than a thin piece.
7. Observe the safety zone around the bandsaw. If a blade breaks, it will occasionally "climb" out to the right side of the operator.

### Cutting with the Bandsaw

Lay out the cuts to be made on the stock and consider the sequence of the cuts. Short cuts should be made first so that it is not necessary to back out of a cut, Fig. 6-11. Straight cuts should be made before curved cuts for the same reason. When sharp curves are necessary, make longer curves first and then finish these cuts later. Sharp outside curves can be made by making several relief cuts perpendicular (at a 90 degree angle) to the curve, as shown in Fig. 6-12. Many pieces can be cut at one time on a bandsaw. Fasten the pieces together by placing several nails in the waste area, as shown in Fig. 6-13.

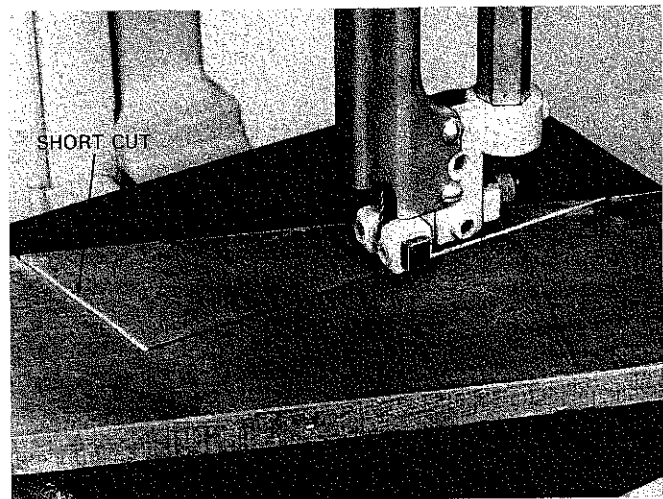


Fig. 6-11. Make the short cut first with a bandsaw.

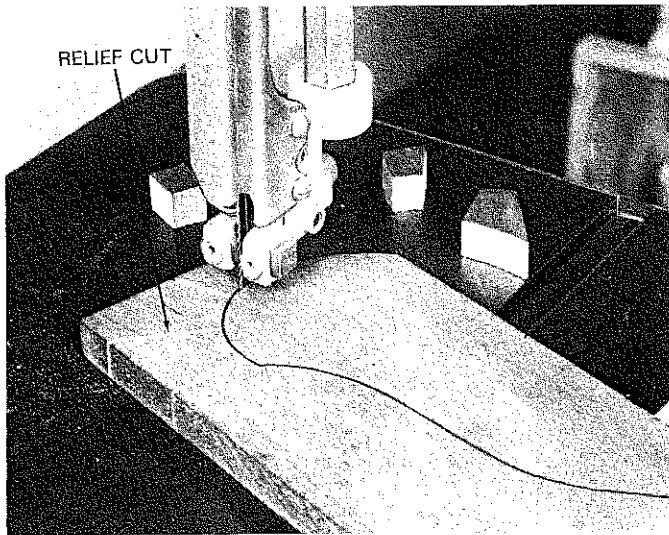


Fig. 6-12. Make relief cuts before cutting around sharp curves with a bandsaw.

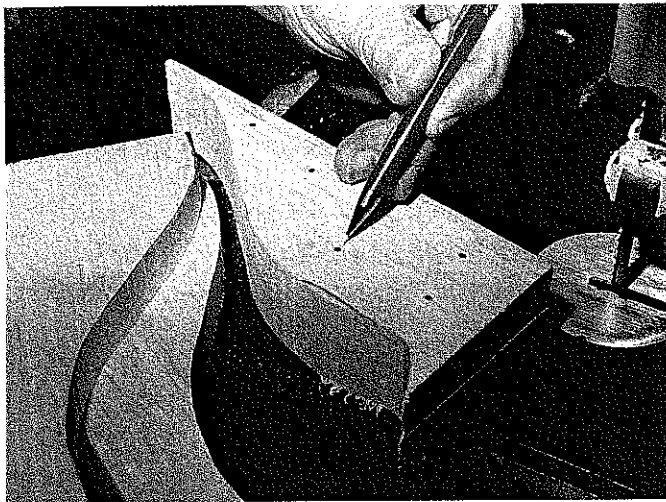


Fig. 6-13. Multiple pieces can be cut at one time on the bandsaw. Fasten pieces together by nailing in the waste area.

Before starting the cut, place the stock on the saw table and adjust the guide post so the upper guide assembly is about 1/4 inch above the work. Have the instructor check the setup before turning on the machine. When cutting, keep your hands to the sides of the cutting line, out of the direct line of the saw blade. Use only enough forward pressure to keep the blade cutting. Narrow, straight stock (less than three-inches wide) is ripped using a fence and a push stick. See Fig. 6-14.

### TABLE SAW

The TABLE SAW, Fig. 6-15, is often referred to as a CIRCULAR SAW or BENCH SAW. It is

one of the most productive machines in the woods laboratory if used properly. However, it can be one of the most dangerous machines if improperly used. If you practice a few safety precautions, you can learn to use the table saw safely and efficiently.

The size of a table saw is determined by the maximum diameter of the saw blade that can be safely used on the saw. The blade revolves at

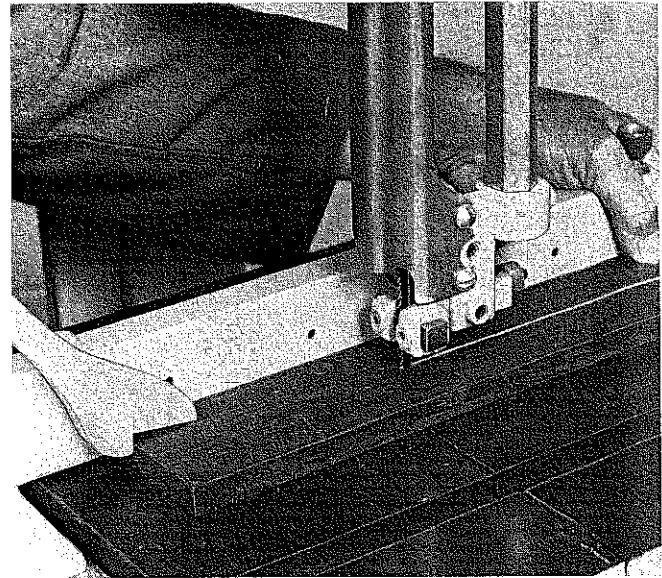


Fig. 6-14. Ripping narrow stock with a bandsaw and a push stick.

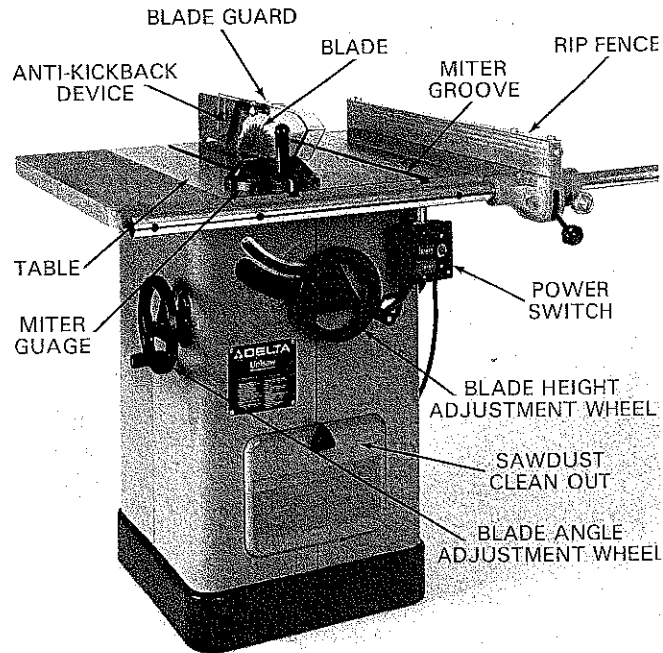


Fig. 6-15. Table saws are used to make straight cuts in stock. (Delta International Machinery Corp.)



high speed, and a **GUARD** is kept over the blade for protection of your fingers and hands. In addition, a guard is valuable for deflecting sawdust out of the line of sight. Most saws are equipped with small fingers called an anti-kickback device. The **ANTI-KICKBACK DEVICE** is designed to prevent kickbacks, or to reduce the velocity (speed) of a piece of stock if a kickback occurs.

Every table saw should be equipped with a splitter. The **SPLITTER** holds the saw kerf open in the ripping operation to reduce the kickback hazard. See Fig. 6-16. Splitters are commonly part of the anti-kickback device.



Fig. 6-16. Use the splitter when ripping stock.

A movable **FENCE** can be used for accurate ripping of stock. The fence slides along guide bars attached to the front and back of the table. Another piece of equipment used with the table saw is the miter gauge. The **MITER GAUGE** is used to aid in crosscutting and mitering pieces of stock. The fence and miter gauge should not be used at the same time without attaching a clearance block to the fence. See Figs. 6-17 and 6-18.

The types of blades commonly used with the table saw are the crosscut, rip, and combination blades. The **CROSSCUT BLADE** has teeth similar to a hand crosscut saw. They look and cut like a series of knives. The crosscut blade is usually used for cutting across the grain of the wood. The **RIP BLADE** has teeth similar to a hand rip saw. The rip blade cuts like a series of

chisels, and is used for cutting along the grain of the wood. The **COMBINATION BLADE** has both crosscut and rip teeth. It is used for all-purpose work. Some combination blades are **HOLLOW GROUND** making the blade thicker near the teeth. This provides for clearance of the blade in the saw kerf, and eliminates the need for setting the teeth. A standard combination blade makes a smooth, accurate cut when crosscutting and mitering. However, when ripping stock it tends to overheat because of insufficient blade clearance.

There are many special blades for cutting plastic laminates, plywood, tempered hardboard, and similar materials. Always use the proper type of blade for the work to be performed. Today, carbide-tipped blades are available for most cutting purposes. Carbide-tipped blades offer many advantages. First, they cut cleaner and faster than standard blades. Next, they require less edge preparation before gluing, and cause less strain on the saw's motor. Some blade makers claim that a carbide-tipped blade will outlast 200 or more standard blades. Two basic problems exist with carbide-tipped blades. First, they are costly, and second, they require special sharpening equipment when they become dull.

### Table Saw—Safety and Care

1. Have the instructor check the setup before turning on the saw.
2. Stand slightly to one side of the cutting path; do not stand in line with the blade. This protects you from being hit if a kickback occurs.
3. Always keep your hands and fingers 4 to 6 inches away from cutting path.
4. Make sure others are not in the safety zone around the table saw when you are using the saw.
5. Use the correct blade for the type of cutting being done. For example, do not use a rip blade to crosscut wood. Make sure the blade is sharp and the teeth have set.
6. Properly position the fence, miter gauge, outfeed stand, and other accessories before starting the saw. Do not forget the push stick for narrow stock.
7. The blade should not be raised more than 1/4 inch above the stock. The blade speed is

the same no matter how high you raise the blade.

8. Make sure the stock is properly prepared before using the table saw. Warp must be removed from the wood's surface and at least one edge must be surfaced before cutting it.

### Crosscutting

Make sure your piece of stock has one true (planed smooth) edge. Layout your cutting line on the piece of stock to be cut, placing your square along the true edge. Raise the blade so it projects above the stock 1/8 to 1/4 inch. Move the fence out of the way since it will not be needed for the crosscutting operation. Lay the board on the table with the true edge against the miter gauge. Align the mark with the saw blade and place the guard in the proper position. Pull the miter gauge and stock away from the blade carefully so that you do not move the stock from side to side. Stand slightly to one side of the blade and turn on the machine. Hold the stock firmly against the miter gauge as the gauge is pushed slowly along the miter groove. Feed the stock slowly into the saw. Push the board past the saw blade and turn off the saw.

In some cases, you may need to crosscut stock to equal lengths. In these cases, you will need to clamp a clearance block to the fence or use a stop block attachment, Fig. 6-17. The clearance block or stop block should be attached well in front of the blade, so that the stock being cut

does not get pinched between the block and the blade. See Fig. 6-18. When figuring out the length of the pieces, measure from the edge of the blade to the clearance block or stop block, not the fence itself.

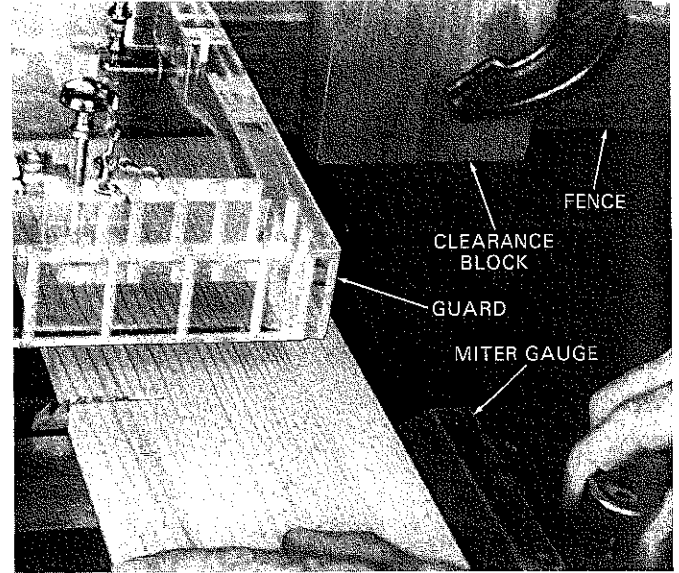


Fig. 6-18. Crosscutting duplicate pieces using a circular saw and clearance block.

### Mitering

Angled cuts may be made across pieces of stock by using a procedure similar to crosscutting stock. Miters (45 degree) are commonly used to form 90 degree angles for products like picture frames. The miter gauge should be set to the proper angle of the cut. Check the angle to make sure that it is correct. Some miter gauges

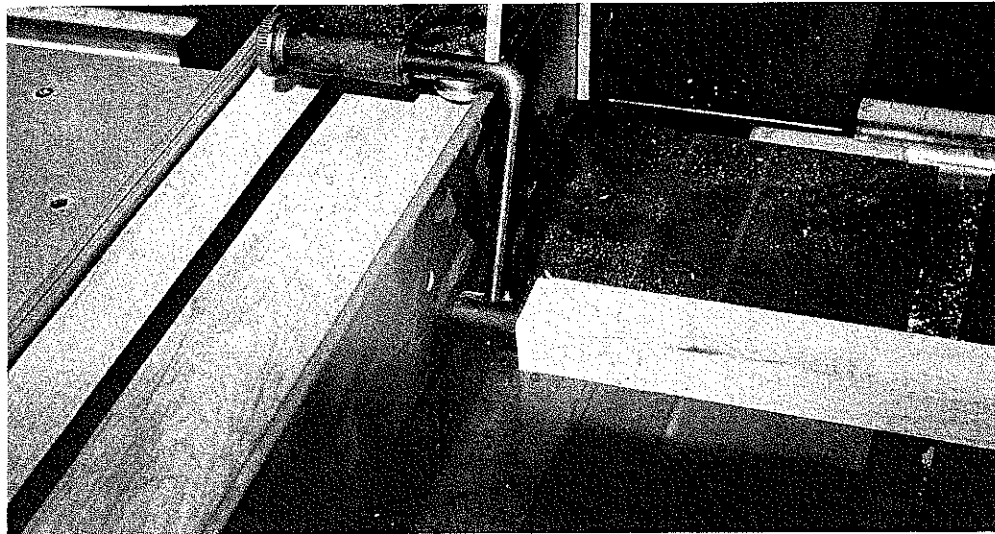


Fig. 6-17. Stop block attachment for a table saw.

may have hold-down fixtures to prevent the stock from moving. Then proceed with the cut as you would when crosscutting stock.

### Ripping

Softwood lumber is available in standard widths and lengths. Hardwood lumber is sold in random widths and lengths. In many cases, the width dimensions of your product are not the width dimensions of the stock. In these cases, you must rip the stock to the correct width. Make sure when you are ripping stock that the edge resting against the fence has been planed or smoothed.

Remove the miter gauge from the saw and place it out-of-the-way of the ripping operation. Raise the blade so that it is  $1/8$  to  $1/4$  inch above the stock, as in crosscutting. Set the fence using the scale on the front guide bar. Before cutting, use a bench rule or tape measure to verify the ripping width. This is done by measuring from the tooth set to the fence. Adjust the distance as necessary.

Place the guard in position, making sure the splitter and anti-kickback fingers are properly positioned. Lay the stock flat on the table with the true edge next to the fence. Make sure a push stick is at hand (if it is needed) before turning on the saw. A push stick is required for pieces less than six inches wide. Turn on the saw and push the board slowly into the blade. Apply forward pressure only on the piece between the blade and the fence. Continue pushing the board until its entire length has been cut, and then turn off the saw. Wait until the blade stops rotating before removing pieces of wood from around the blade. Be sure to use the splitter for ripping operations. See Fig. 6-19. The SPLITTER acts as a metal wedge in the saw kerf and separates the two pieces being cut to help prevent binding.

### Ripping Accessories

Accessories allow you to do your work more safely and accurately. All of the following devices are useless unless installed and adjusted prior to the ripping operation. Always think the process through before starting the saw.

Some fences are equipped with a device that may be used instead of a push stick. This "finger-saving" device holds down the stock while

pushing it past the blade, Fig. 6-20. This device is normally mounted to the fence so that it is available when needed.

Another fixture that may be used when ripping simply holds the stock firmly against the table. This allows the operator to guide the stock using both hands. This fixture may be installed

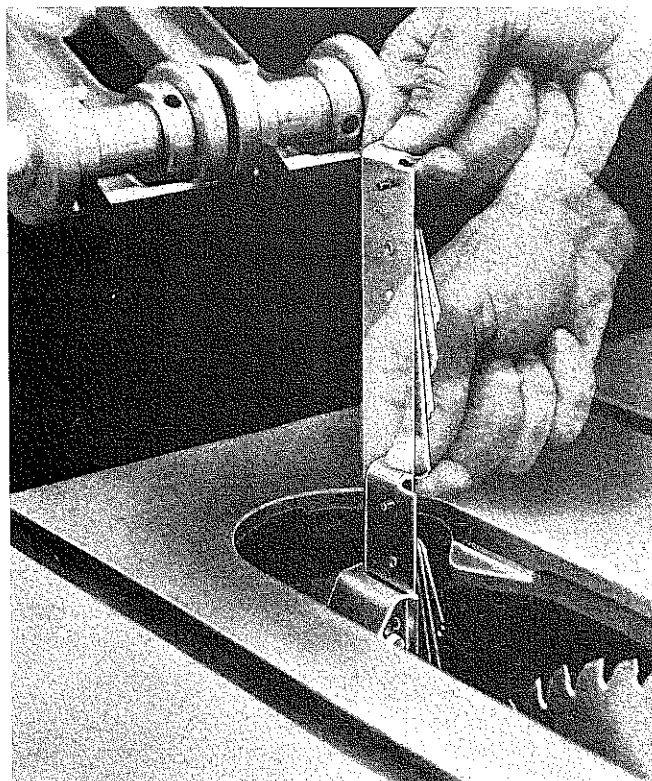


Fig. 6-19. A splitter separates the two pieces being cut to prevent binding.

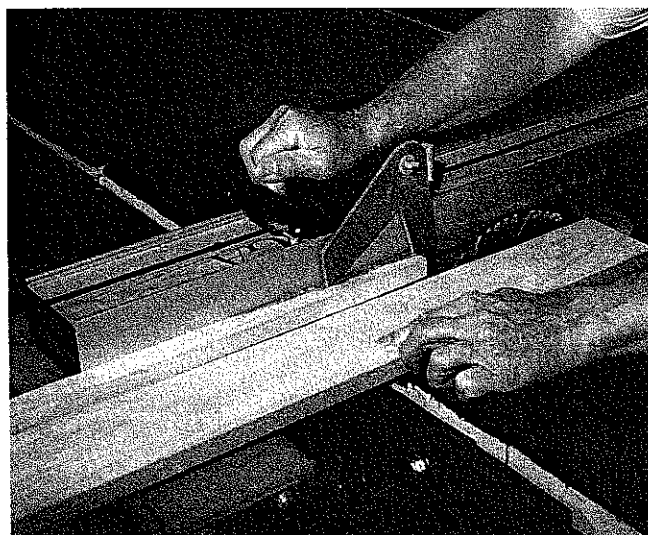


Fig. 6-20. This finger-saving device holds the wood down while allowing you to cut it.

on the fence when performing ripping operations. In addition, the fixture also prevents kickbacks if the blade binds. Fig. 6-21 shows this fixture in use.

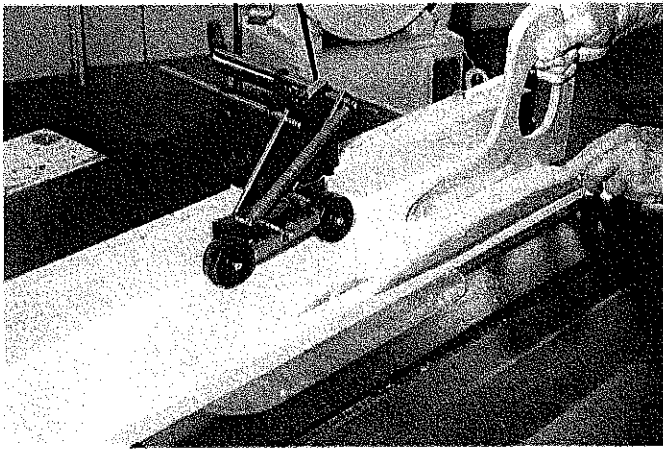


Fig. 6-21. This ripping fixture holds the stock against the table, and also prevents kickbacks if the blade binds.

Another accessory that is helpful when ripping is the **OUTFEED STAND**, also called a **STEADY-REST** or **DEAD-MAN**. See Fig. 6-22. The height is easily adjusted to provide support when ripping long stock.

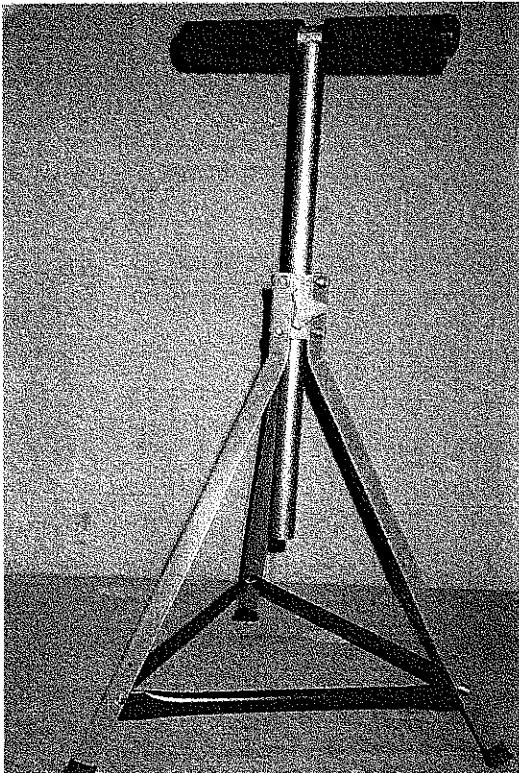


Fig. 6-22. An outfeed stand supports long pieces of stock. Make sure these devices are properly placed and weighted to prevent them from tipping during a ripping operation.

A **FEATHERBOARD** is a device that is typically made in the woods laboratory. A featherboard is simply a piece of stock with a series of kerfs cut along the grain (not across the grain). When clamped to the table of the saw and properly positioned against the stock being cut, the featherboard guides the stock into the blade by pushing the stock firmly against the fence. See Fig. 6-23.

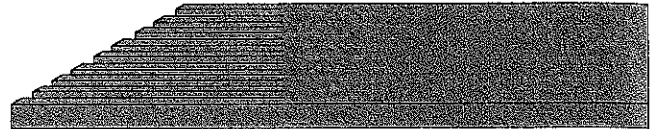


Fig. 6-23. A featherboard is used when ripping stock. It is clamped to the table of the saw.

### Beveling

A **BEVEL** is an angled cut along an edge of a board. The blade must be tilted to cut a bevel on the table saw. Turn the saw tilt handwheel to the correct angle. Always check the saw blade angle with a sliding T-bevel and protractor. The saw-mounted gauge is seldom accurate enough for finish cutting.

Since you will be cutting at an angle, the blade may need to be raised to cut all the way through the stock. Before starting the saw, make sure that the blade does not come into contact with the guard or fence.

### Sawing a Rabbet

A **RABBET** is a type of wood joint commonly used in drawer and cabinet construction. One-half of the thickness of the wood is removed so that another piece can fit into position.

Lay out the size of the rabbet on the end of the stock and set the blade to this height. Place the stock flat on the table with the marked edge next to the fence. Use a push stick to move the board into the saw as if you were ripping stock. Place the surface of the board against the fence and make the second cut as shown in Fig. 6-24.

### Cutting a Groove or Dado

Grooves and dados are other types of wood joints used in cabinet construction. **GROOVES** run parallel to the grain of the wood. **DADOS** run across the grain of the wood.



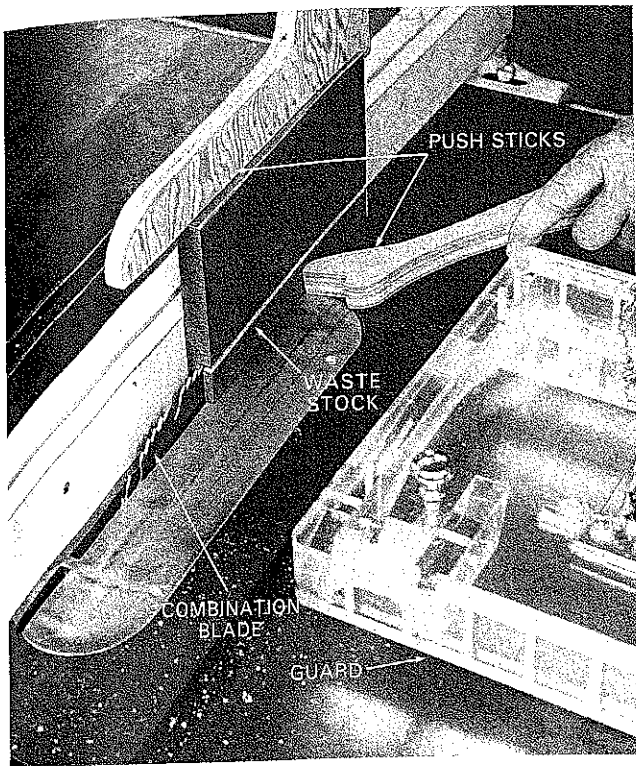


Fig. 6-24. Sawing a rabbet.

Grooves and dados are usually made with a dado head, Fig. 6-25. A DADO HEAD makes a wide cut in a piece of stock. They should not be used to cut through stock. Two types of dado heads are available. One type consists of two saw blades, and a set of chippers with cutting edges varying from 1/16- to 1/4-inch wide. The

chippers are set up between the saws to the width of the desired cut. Dados or grooves ranging from 1/8- to 13/16-inch wide can be made. The other type of dado head consists of three parts. In this type of dado head, the center piece (containing the cutters) is turned to adjust the blade to the desired width. In either case, a different throat plate must be used to allow clearance for the wider blade.

When cutting a groove or dado, adjust the dado head to the width and depth of the cut desired. Check these settings using a scrap piece of stock. Use a push stick to move the stock slowly into the dado head as in ripping or crosscutting. Make sure that you hold the stock securely, since the dado head is removing more stock than a standard blade.

### Cutting a Tenon

A TENON is a wood joint commonly used in furniture construction and cabinetmaking. Material is removed from both sides of the stock. A table saw with a TENONING JIG will cut an accurate tenon safely. A standard rip blade, combination blade, or dado head can be used to cut a tenon. However, a dado head is suggested to reduce the number of steps required.

First, set-up the dado head to the width of the shoulder of the tenon. Install the proper throat plate. Adjust the height of the dado head to the depth of the tenon shoulder. Place the tenoning jig in the miter groove and firmly clamp a piece of scrap lumber, which is the same size as the tenon stock, into the jig. Keep the saw turned off and move the tenoning jig toward the dado head. Stop just as the stock begins to touch the dado head. Adjust the stops on the tenoning jig for the left shoulder and tighten the lock nut, Fig. 6-26A. Repeat this procedure for the right shoulder, Fig 6-26B. Move the jig away from the dado head. Turn on the motor and make a test cut. Adjust the jig as necessary before using the finish stock.

### Changing the Blade

Before changing the blade, disconnect the power to the saw and remove the INSERT PLATE (plate around the saw blade, frequently called a THROAT PLATE). Place a wrench on the arbor nut with one hand. Wedge a board under the saw blade with the other hand to

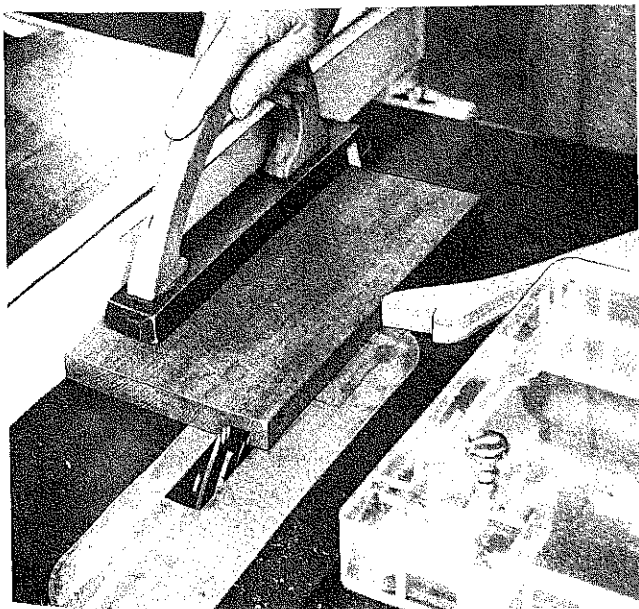
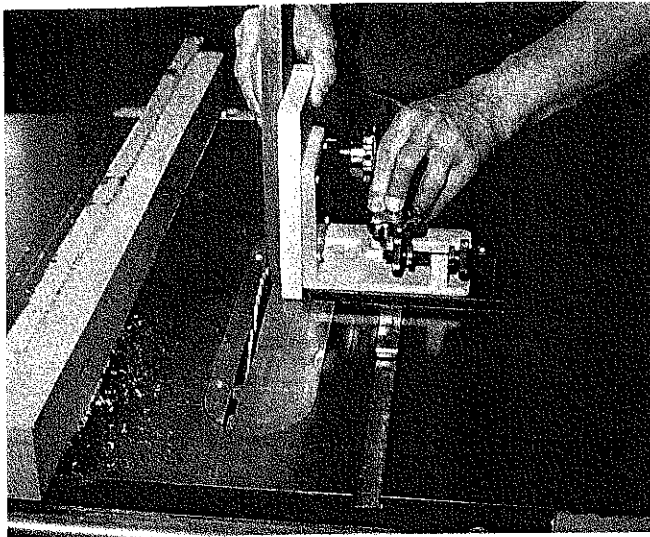
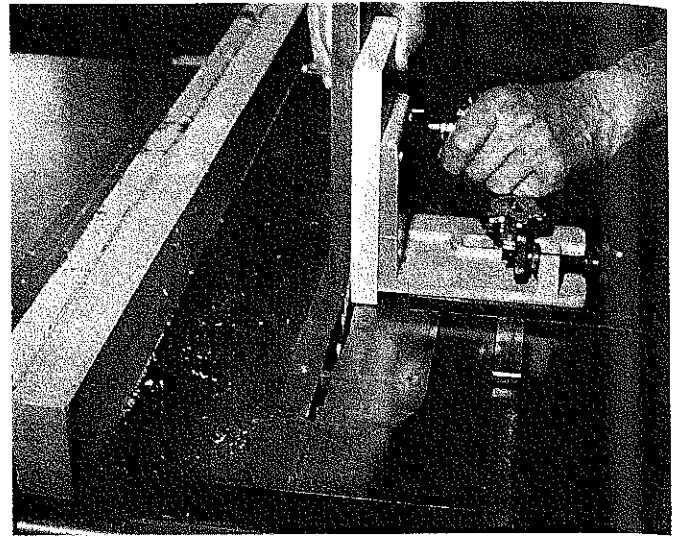


Fig. 6-25. Cutting a groove with a dado head. (Guard is removed to view the operation.)





A



B

Fig. 6-26. Cutting a tenon with a tenoning jig. A—Make adjustments for the left shoulder. B—Make adjustments for the right shoulder.

prevent the blade from turning. Many saws provide a second wrench and nut allowing the arbor to be held in place. Turn the nut on the arbor clockwise for removal; most saw arbors have left-hand threads. After loosening the nut, place your index finger on the end of the arbor and unthread the nut onto your finger. This prevents it from dropping into the sawdust below. Remove the nut. Place your index finger on the end of the arbor again and slide the washer onto your finger. Remove the blade being careful that you do not cut yourself on the sharp teeth, or chip the teeth by hitting the table.

Place the new blade on the arbor. Make sure the teeth of the blade point toward the stock and operator when in operation. Put the washer on your finger and slip onto the end of the arbor. Do the same for the nut. Tighten the nut using the wrench.

### POWER MITER SAW

The POWER MITER SAW, also called the CHOP SAW, is very useful for accurate crosscutting and mitering. See Fig. 6-27. These saws have an angle gauge that allows you to rotate the movable head to any desired setting from 0 to 45 degrees on either the left or right. Make sure that your fingers are not in the cutting path when using the power miter saw. Also, make sure that the stock is firmly held against the fence and down on the table. After making the cut, do not leave the saw unattended until the blade stops. Some saws have an automatic brake, while oth-

ers have a button on the handle that stops the blade when pushed. The parts of the power miter saw are shown in Fig. 6-28.

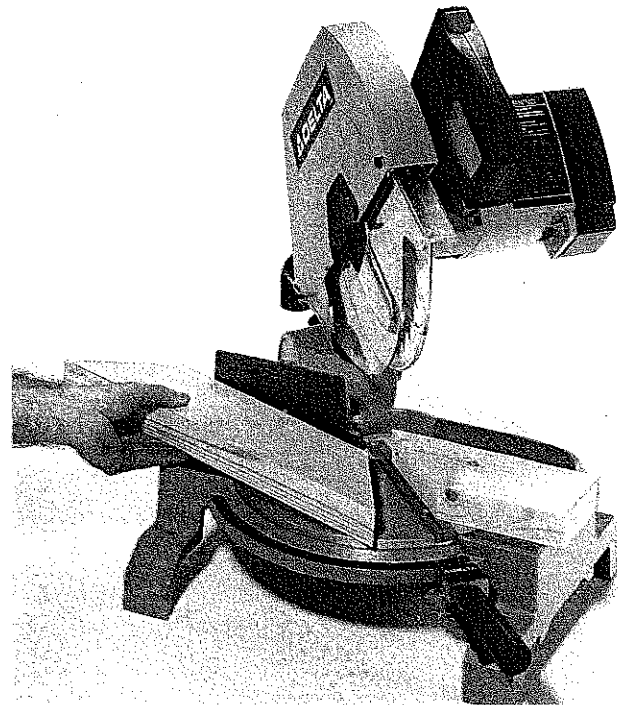


Fig. 6-27. Power miter saws are used for accurate crosscutting and mitering. (Delta International Machinery Corp.)

### RADIAL ARM SAW

The RADIAL ARM SAW was originally designed for doing very accurate crosscutting at a 90 degree angle, as well as any other desired

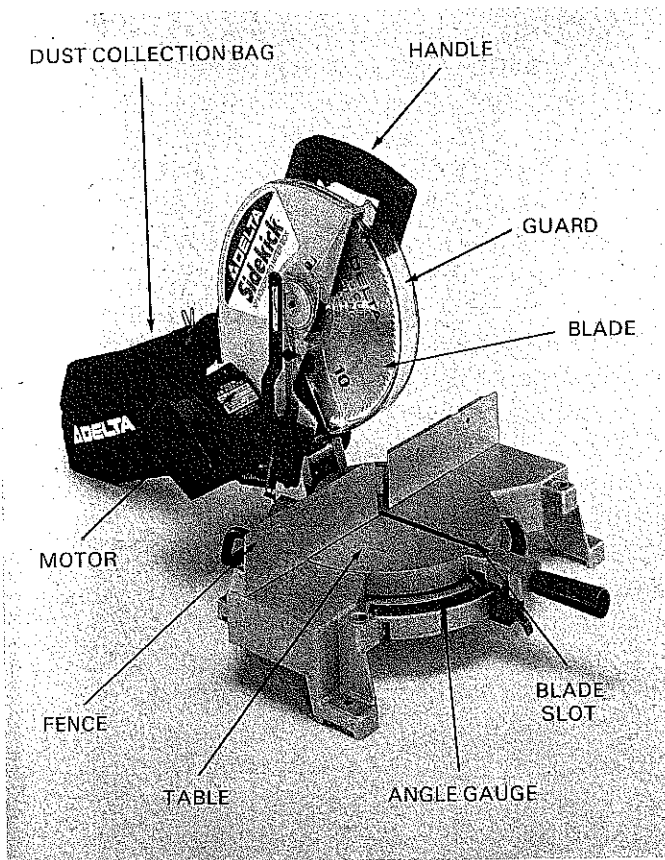


Fig. 6-28. Parts of a power miter saw. (Delta International Machinery Corp.)

angle. It is now commonly used in the woods laboratory for rough cutting stock to length. The tilting head (motor-blade assembly) makes it possible to cut angles on the ends of stock. In addition, if the overarm is set at an angle other than 90 degrees, nearly perfect compound angles can also be cut. Fig. 6-29 shows a radial arm saw.

A number of accessories that are made for the table saw can also be used with the radial arm saw. These include sanding discs, molding heads, and dado heads. Other accessories are designed just for the radial arm saw such as, jacob chucks, cutoff stops, mitering jigs, belt and drum sanders, and pin router devices.

**Radial Arm Saw—Safety and Care**

1. Become familiar with the ON-OFF switch, its location, and operation.
2. Make sure the blade guard and sawdust deflector are set properly for the cut that is planned.
3. Check the relationship of the blade to the slot cut into the fence and the groove cut into the table. Adjust the fence as necessary to align all three.

4. Allow the saw blade to reach its full speed before beginning to cut stock.
5. Keep your hand that is not on the motor-blade assembly at least 6 inches from the blade and blade cutting path. Tuck your thumb under your hand. Hold the stock in position with the heel of your hand.
6. Always return the motor-blade assembly to the rear of the saw after making a cut. All saws under Occupational Safety and Health Act (OSHA) regulations must return automatically.
7. Do not leave the saw unattended until the blade has stopped turning. All new saws have an automatic brake to stop the blade.
8. When ripping stock, make sure the splitter and anti-kickback devices are properly adjusted. Make sure to feed the stock into the blade against the blade rotation, and not in the direction of the rotation.

The radial arm saw blade cuts into the wooden table with each cut that is made. Attach a 1/4-inch thick piece of plywood to the original top to reduce damage using small nails or brads. Make

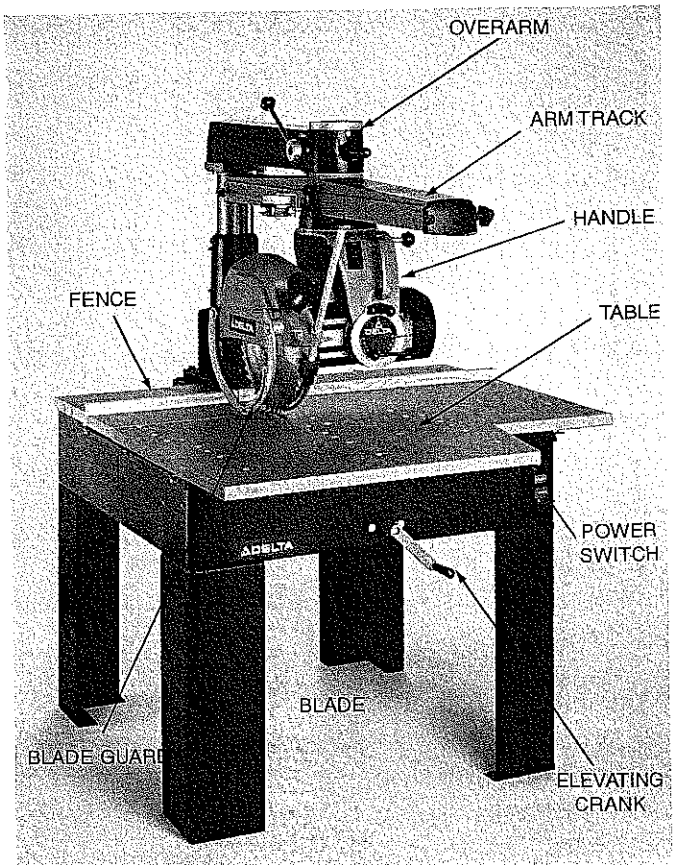


Fig. 6-29. Radial arm saw with parts identified. (Delta International Machinery Corp.)

sure the nails are not in the blade path. When the plywood top is scored with saw cuts, simply replace it. The crosscutting action of the radial arm saw is somewhat different than the table saw. Stock is pushed through on the table saw; the motor-blade assembly slides on the overarm through the stock on the radial arm saw. When molding or ripping stock, the stock is again pushed through the blade as on the table saw.

### Crosscutting

Make sure the blade is properly attached to the motor. As you look at the end of the motor that has a blade attached, the blade should rotate in a clockwise direction. Be sure that the fence and movable portion of the table have been firmly tightened.

When making a 90 degree crosscut, first place a steel square against the fence, aligned with the path of the saw blade. Gently pull the saw along the square with the power turned off. The teeth of the blade should be the same distance away from the square at all points along the blade path. If there is any variance, consult the owner's manual for proper saw adjustment.

After determining the squareness, turn on the power and lower the blade into the table until it makes a cut 1/8 to 1/4 inch in depth. Pull the saw along its entire path. This kerf clearly indicates the blade's path. Then, turn off the saw. Carefully mark and square the desired cutting location on your stock. Align this mark with the cut made in the fence. Make sure the saw kerf will be made in the waste portion of your stock. Firmly hold the stock against the fence, keeping your hands away from the blade path. Turn on the saw and gently pull the saw through the stock. Be prepared to use some backward pressure on the saw carriage as the blade cuts through the stock. Return the saw to its original position and turn off the saw. Check the cut for squareness.

### Ripping

When ripping stock, remember that the blade rotates into the stock at the front of the blade, not the back. If the stock is fed from the back of the blade, the power of the motor will force the stock to "shoot" under the blade without being cut, and without your control. This is a very hazardous situation.

Most radial arm saws allow the motor/blade assembly and carriage to be rotated either left or right for in-ripping or out-ripping operations. The width of the stock being ripped and the size of the saw determine whether to set the saw for in-ripping or out-ripping. Disconnect the power to the radial arm saw. Raise the carriage slightly above the table and rotate the head either left or right depending on the width of the cut. Secure the head into position. Loosen the carriage locknut and pull the carriage until the desired width is obtained between the fence and the saw blade. Tighten the carriage locknut. Check this measurement with a rule and adjust as necessary. Reconnect the power and turn on the saw. Lower the blade into the table about 1/8 to 1/4 inch. Rotate the blade guard to approximately 1/4 inch above the stock. Adjust and align the anti-kickback device and splitter. Refer to the owner's manual for specific adjustment procedures. Make sure one edge of the stock has been squared. Place this edge against the fence and feed the stock into the blade. Continue the cut using a push stick, if necessary.

### TEST YOUR KNOWLEDGE, Unit 6

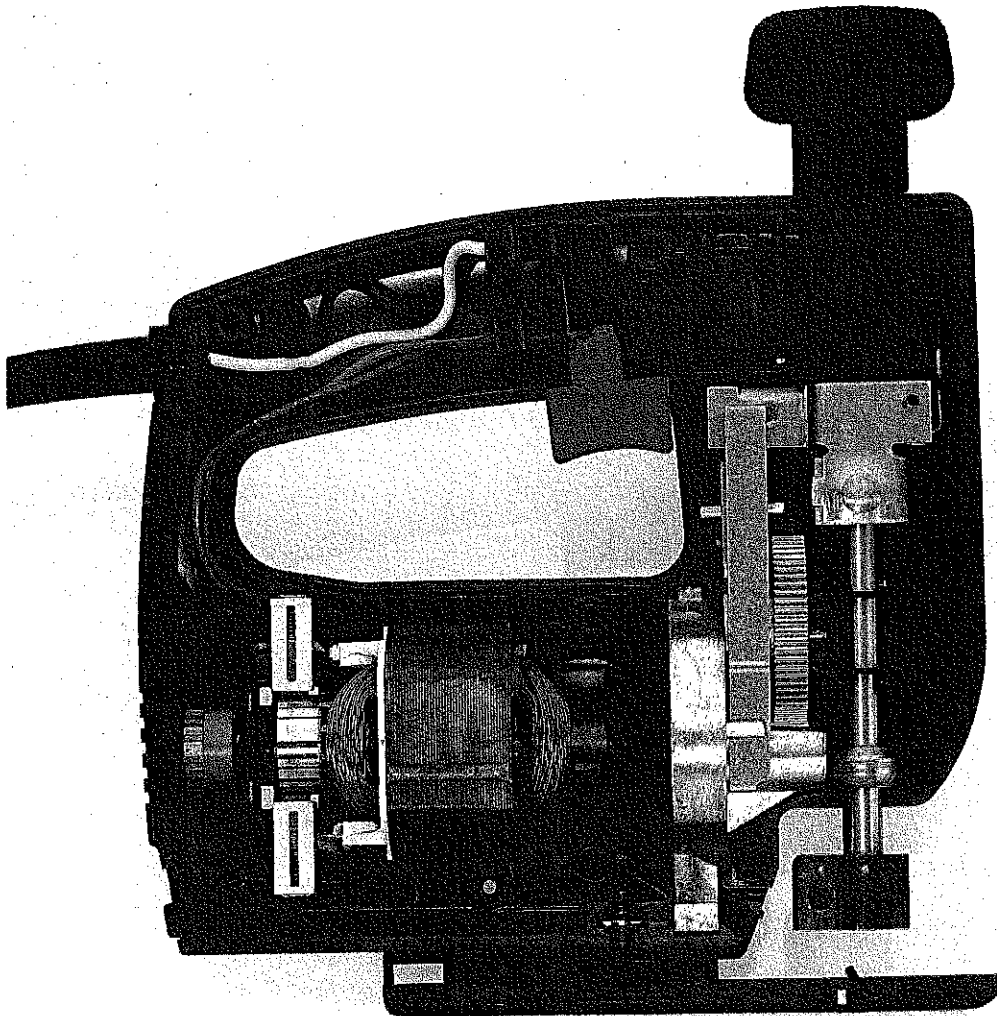
Please do not write in this text. Place your answers on a separate sheet of paper.

1. Only the person operating the power saw needs to wear eye protection. True or False?
2. The saber saw will cut \_\_\_\_\_ lines and \_\_\_\_\_ lines.
3. The portable circular saw is designed to cut only \_\_\_\_\_ lines.
4. The \_\_\_\_\_ is used to hold the kerf open when ripping with a table saw.
5. The teeth of the blades used in a stationary scroll saw always point \_\_\_\_\_.
6. When making an internal cut with a scroll saw, it is necessary to first drill a small hole in the waste area of the stock. True or False?
7. A bandsaw may be used to make both \_\_\_\_\_ cuts and \_\_\_\_\_ cuts.
8. The blade of a bandsaw is continuous. True or False?
9. The two primary cuts made on the table saw are the \_\_\_\_\_ and the \_\_\_\_\_.
10. The guard of the table saw protects fingers and hands but also deflects \_\_\_\_\_ from the eyes.

11. What is a featherboard?
12. On a portable circular saw, a \_\_\_\_\_ covers the blade at the end of each cut to protect the operator and the saw.
13. When crosscutting with the radial arm saw the blade is pulled through the stock. True or False?
14. A device used to cut a rabbet using a table saw is called a \_\_\_\_\_.
15. The rip fence and the miter gauge should never be used together unless a clearance block has been properly attached to the fence. True or False?
16. The motor/base assembly on a radial arm saw is called the carriage. True or False?
17. When ripping with a radial arm saw, the stock should be fed into the \_\_\_\_\_ of the blade.
18. The squareness of a radial arm saw can be checked using a \_\_\_\_\_.
19. On a radial arm saw, the blade should not cut into the table. True or False?

### ACTIVITIES

1. Following safety rules is important. Design a safety poster that can be used with any single piece of portable or stationary equipment discussed in this chapter.
2. Draw sketches that show the shape of cross-cut, rip, and combination table saw blades. You may need to reference manufacturer catalogs.
3. Visit a cabinet shop or other woodworking industry. Find out about the types of power saws they use. Report your findings to the class.
4. Visit your local hardware store to see what types of power saws they sell. Make a list of the options offered with a particular saw.



Internal construction of a saber saw. (Skil Corp.)