No. 4573

GETTING THE MOST OUT OF YOUR BAND SAW AND SCROLL SAW

A DELTACRAFT® PUBLICATION

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GETTING THE MOST OUT OF YOUR

BAND SAW *and* SCROLL SAW

A DELTACRAFT® PUBLICATION
POWER TOOL SERIES

Edited by
SAM BROWN

A Complete Handbook on Band Saw and Scroll Saw Operation in the Home Workshop with Over Two Hundred Photographic Illustrations and Line Drawings

DELTA
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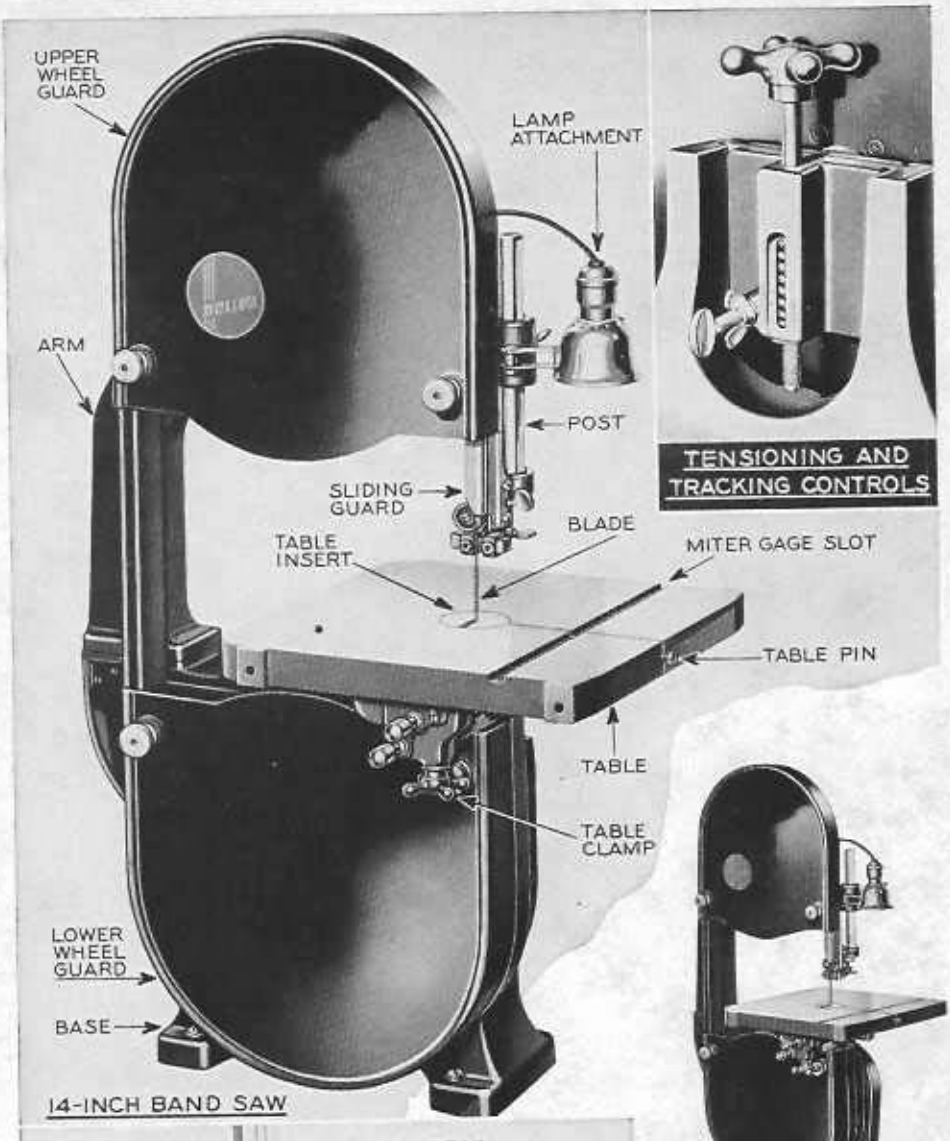
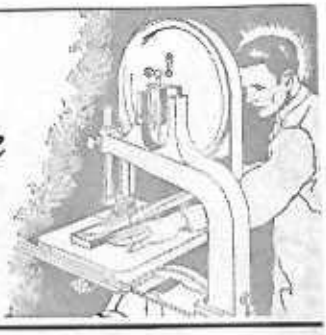
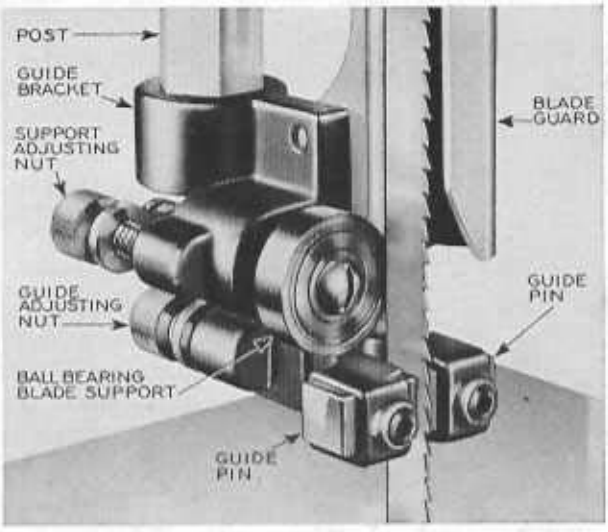

UPPER WHEEL GUARD
LAMP ATTACHMENT
ARM
POST
SLIDING GUARD
BLADE
TABLE INSERT
MITER GAGE SLOT
TABLE PIN
TABLE
TABLE CLAMP
LOWER WHEEL GUARD
BASE
14-INCH BAND SAW
TENSIONING AND TRACKING CONTROLS
REAR GUIDE RAIL
REAR CLAMP
FENCE
CLAMP HANDLE
RIPPING FENCE

The Mechanics of the BAND SAW



THERE are various types of band saws. The largest of these — the band mill — is fitted with a wide blade and is used for sawing logs into planks. Then, there is the band resaw, which is used in lumber yards and millwork factories for resawing thick stock into thinner material. A third type is the band scroll saw, used extensively for sawing all kinds of curved work or combinations of curved and straight work, and to some extent for resawing. It is this type of band saw which is found in the home and small professional shop, and the type of machine with which this book is concerned.



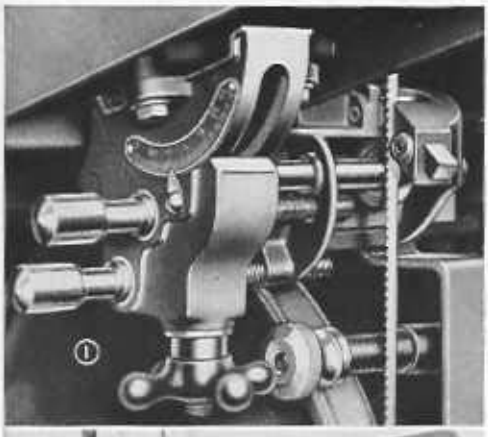
Upper guide of a modern 14-inch band saw. Micrometer controls permit accurate independent setting of guide pins and blade support.

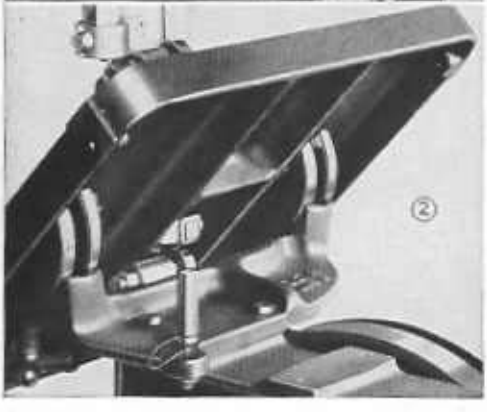
Construction. — All band saws operate on the same general principle. The saw itself is a flexible band of steel, with teeth cut on one edge. The saw is strained over two vertical wheels or pulleys, fitted with rubber tires and provided with adjustments for centering the saw upon the rims and for giving the saw the correct tension. To prevent the blade from twisting sidewise in the cut, and to give it support when cutting, the band saw is provided with guides, the design of which varies with different makes of saws. There are two guides, one located above and the other below a table which is fitted horizontally between the two pulleys. The table is fitted with a hole through which the blade works. Adjustments permit tilting the table a full 45 degrees to the right, so that bevel cuts can be made. A 10-degree left tilt is also usually provided so that table adjustments can be made.

Size.—The size of the band saw is measured in terms of the pulley diameter. Thus, a saw with 10-inch diameter pulleys would be called a 10-inch saw; a saw with 14-inch wheels would be called a 14-inch saw, etc. Size is also sometimes expressed in terms of the throat opening, that is, the distance between the two vertical portions of the blade. It can be seen that the throat opening of a 14-inch saw, for example, would be 14 inches, minus about ¼ inch which is taken up by the blade guard. Other important dimensions of the band saw are the table size and the height between the table and upper guide. The table size is usually proportionate to the pulley size, being about the same length or a little larger on the side than the diameter of the pulley. The maximum distance between the table and upper guide is usually 6 inches, which is the maximum thickness that can be sawed.

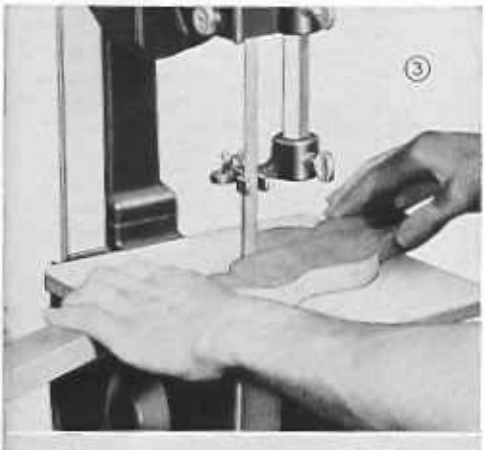
Installation.—The band saw should preferably have a central location in the shop. A wall position or even a corner location is quite satisfactory for the average run of work. Since the band saw is used extensively for rough cutting in making small blocks, etc., a position close to the workbench is indicated. The mounting for the machine can be either a steel stand or suitable wood bench. The band saw table should be from 42 to 44 inches from the floor, this being the "elbow height" of the average worker.

Power and Speed.—For most work around the home or small shop, a ⅓ H.P. motor will supply ample power. Only a constant-speed, 1725 R.P.M. motor should be used. The band saw blade should travel at a rate from 1500 to 3000 feet per minute. On a 14-inch saw, a





Above, under views of band saw showing guide, trunnion mounting and table pin for leveling. Below, band saw converted for belt sanding.



pulley speed of 600 R.P.M. will give an efficient cutting speed of 2200 F.P.M. Nothing is gained by running the machine faster than this except where wide blades are used extensively. Narrow blades run at higher speed will have a shorter cutting life, and will show a tendency to clog in the cut unless in first-class condition.

Guides.—The most common type of band saw guide consists of two square pins, one on each side of the blade. There is also a back guide or support, usually a ball-bearing wheel, which supports the blade as the work is pressed against it. With minor variations in the mounting, the lower guide is identical with the upper guide. Fig. 1 shows the lower guide of a typical 14-inch band saw, the controls for the guides and support being carried to the front of the table.

Tilting Table.—The band saw table is carried on two trunnions and is locked in place with two star wheels. A scale and pointer shows the exact degree of tilt at any position. A leveling stop pin is provided so that the table can be quickly and accurately returned to level position. This pin can be seen in Fig. 2. The pin can be removed entirely for left tilt table settings.

Sanding Equipment.—Some band saws are equipped with auxiliary guides which permit the use of a narrow sanding belt instead of the usual band saw blade, as shown in Figs. 3 and 4 below.

Height Attachment.—The capacity of the band saw can be increased to 12 inches by the addition of an extension block which increases the length of the upper arm. Longer blades are, of course, necessary, as well as an auxiliary blade guard and a longer guide support bar, both mounted as before.

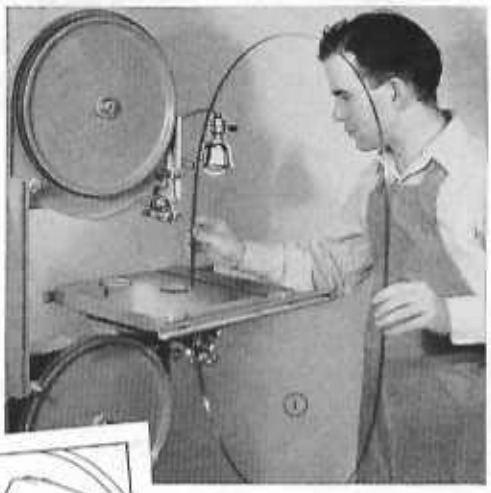
Table Guides.—Table guides on the modern small band saw include both fence and miter gage, these units being similar to equipment used on the circular saw.

Blade Fitting.—Before a new blade can be fitted on the band saw, it is necessary to remove both the lower and upper wheel guards by unscrewing the knurled knobs which hold them in place. The table insert and table alignment pin are removed. The tension on the blade already mounted is slacked off by turning the tension handle, after which the blade can be slipped off the wheels and out through the slot in the table. The new blade is fitted to the wheels by reversing this procedure, as shown in Fig. 1 on opposite page. It is always best to back off the roller support when fitting a new blade, and, if the blade is a different gauge (thickness), both guide pins and roller supports should be

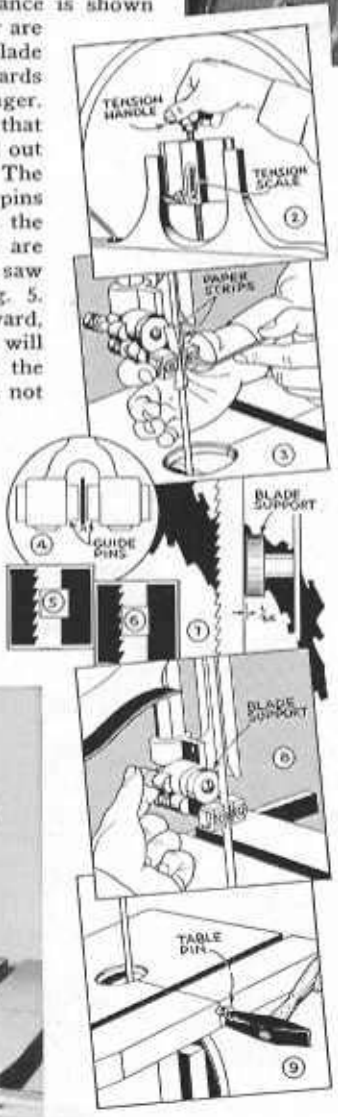
backed off so they will not affect the centering of the blade. With the blade in place on the wheels, the upper wheel is raised by means of the tension adjustment handle until the blade is held lightly. The saw is then turned by hand to see that the blade is centered on the rims of the wheels. If the blade does not center, the upper wheel is tilted in or out as necessary until perfect tracking is secured.

After the blade is tracking perfectly, the saw blade is tensioned fully by turning the tension handle, as shown in Fig. 2. The guide pins on either side of the blade must be close enough to the blade to prevent it from twisting, yet they should not come in actual contact with the blade. A very accurate method of obtaining the correct clearance is shown in Fig. 3, where strips of paper are placed on either side of the blade while the pins are pressed inwards between the thumb and first finger. In doing this it is important that the blade should not be pushed out of a true vertical position. The bracket carrying the guide pins is now brought forward until the front edges of the guide pins are just behind the gullets of the saw blade teeth, as shown in Fig. 5. If the pins are too far forward, Fig. 6, the teeth of the blade will be worn against the pins; if the pins are too far back they will not properly support the blade.

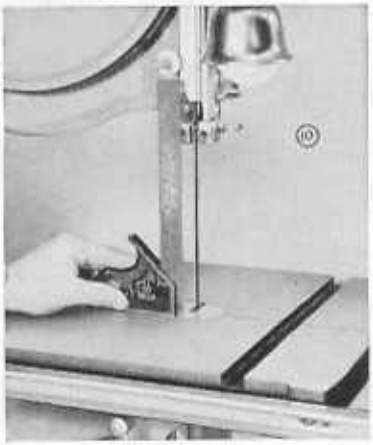
The blade support is now brought forward, as shown in Fig. 8. It should not contact the blade, but should be set about $\frac{1}{64}$ inch from the back of the blade, as shown in Fig. 7. The blade bears against the support only when it is actually cutting. If the blade is allowed to run hard against the support at all times, the back will become case-hardened and this will eventually lead to breakage of the saw.



Above, inserting blade through table slot. Drawings at left show all essential blade adjustments.

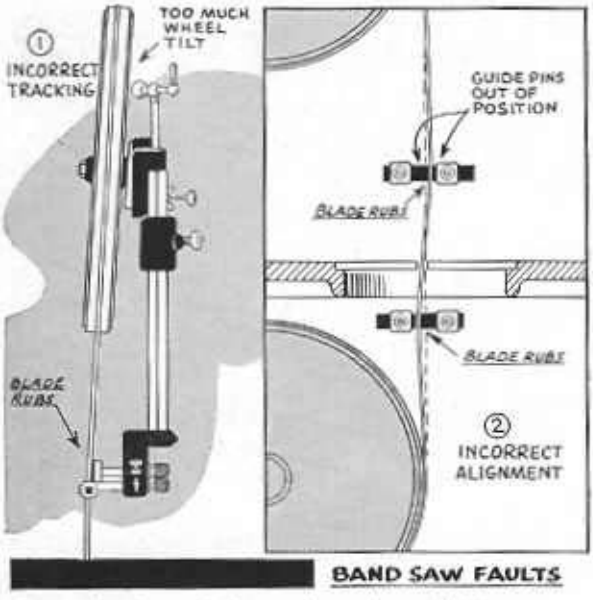


Below, the band saw table must be adjusted so that it is at exact right angles to the blade.



The guide adjustments, as described, are the same for both upper and lower guide. Summarized, the various steps are as follows: (1) Open up guide pins on both upper and lower guides. (2) Run blade support back. (3) Center blade on wheels by tilting upper wheel as required. (4) Set blade to correct tension. (5) Revolve band saw to check blade tracking. (6) Set guide pins inward to thickness of blade, with correct clearance. See that pins do not push blade sidewise. Lock guide pins. (7) Set guide pin bracket so pins come to bottom of blade teeth. (8) Set blade supports with $\frac{1}{64}$ inch clearance. (9) Check settings by revolving saw by hand.

The final step is to replace the table insert, alignment pin and pulley guards, after which the saw is ready for



Common band saw faults are shown above. Right, fitting a new tire. Bottom photo shows blade tensioning without the use of tension scale.

operation. The alignment pin should be gently tapped in with a hammer, as shown in Fig. 9.

Adjusting Table.—The table must be at right angles to the blade when it is in a normal level position. Check should be made with an accurate try square, as shown in Fig. 10 on the previous page. Adjustments are made by means of the stop screw under the table, turning this up or down until the table, when it rests against the screw, is at right angles to the blade. After the table has been checked level, the pointer should be set to zero.

Band Saw Faults.—Mechanical faults in band saw operation are largely concerned with the guides and blade supports. Fig. 1 is a common trouble—too much wheel tilt will cause the blade to ride hard against the support. This heavy rubbing action will caseharden the back edge of the blade and eventually lead to blade breakage. A similar rubbing action occurs when one guide is offset from the other, as shown in Fig. 2. Both of these faults can be avoided if the supports and guides are backed off completely at the time the blade is installed. The blade is then tracked in the center of the upper wheel, after which the blade supports are advanced to just barely touch the back of the blade. The fault shown in Fig. 2 can be avoided if the blade is strained just a bit more than required previous to setting the guide pins. The stiff blade will then resist side shift.

Fitting A New Tire.—Tires on band saw wheels will last indefinitely if kept clean. After long use they will score slightly and should be dressed down with coarse sandpaper. When the tires are badly worn, or, if they stretch and refuse to stay in place, new tires should be fitted. A new tire is always a very tight fit—it must be clamped at one position at the rim and then gradually worked on with a screw driver, as shown in Fig. 3. A thin coat of shellac or glue can be used but is not essential.

Blade Tension. — Some saws are not fitted with a blade tension scale and must be tensioned by feel. A simple method of doing this is to adjust the upper guide well above the table, as can be seen in Fig. 4, and then flex the blade as it is gradually tightened. A properly adjusted blade should have a flex of about ¼ inch in a 6 inch span. Avoid overstraining — the main purpose of tensioning is simply to supply tension to drive the blade.

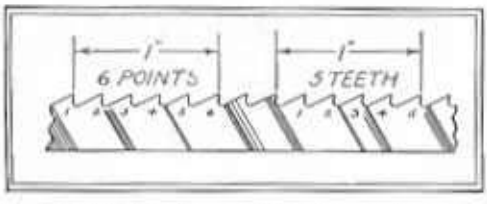
BAND SAW *Blades*

BLADES used on the small band saw include widths from ⅛ to ¾ inch, all of which are known collectively as narrow band saws. The favorite width is ¼ inch. This will do all kinds of curve cutting, and is also satisfactory for the average run of straight cuts encountered in variety work.

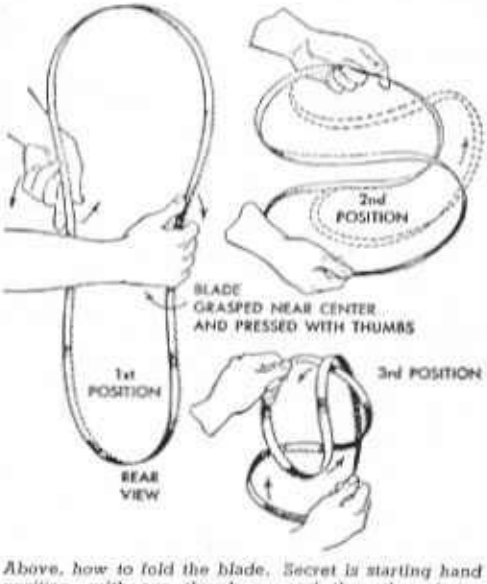
Blade Specifications.—Band saw blades are made in numerous tooth patterns, and also vary in the thickness and amount of set. The thickness of the blade averages .001 inch for each inch diameter of the wheels on which it is to run. Thus, a 14-inch band saw would take blades .014 inch thick. However, both thinner and thicker blades are often used. The set of the blade averages .005 inch on a side for ¼ inch blades, this being increased about .001 inch for each size wider to give a ¾ inch blade a set of about .010. Here, again, there are numerous departures from average values. Narrow band saws will have four to seven teeth per inch. It will be noted in the upper drawing that there is a difference between points per inch and teeth per inch. There is always one more point than teeth—a five-tooth blade has six points per inch.

The two most popular tooth styles for sawing wood are the standard and buttress, as shown in bottom drawing. The buttress pattern is also called skip-tooth because that is exactly what happens in the blade formation—every other tooth is skipped, as can be seen in the drawing. In both styles, a thin blade with light set is best for smooth cutting, while maximum cutting speed and freedom from binding is obtained with a thick blade with heavy set.

Folding the Blade.—Band saw blades are folded in thirds. This is done by grasping the blade firmly as shown in the center drawing. Note carefully how one thumb points up while the other points down. The drawing shows right hand with thumb up, but many workers prefer right thumb down and left thumb up. Either way, if you twist the blade—don't let it slip or turn in the hands—it will almost automatically fall in the three loops. Note that the right hand turns away from your body, and the left hand towards your body, as shown by the arrows in the starting position.

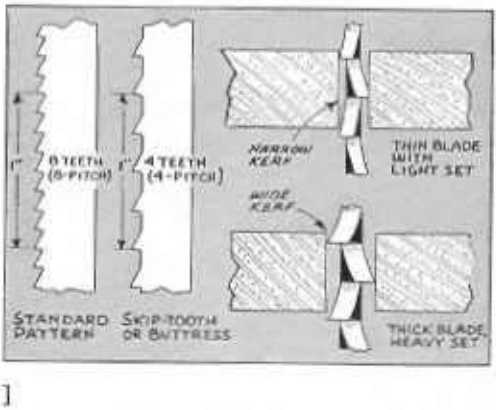


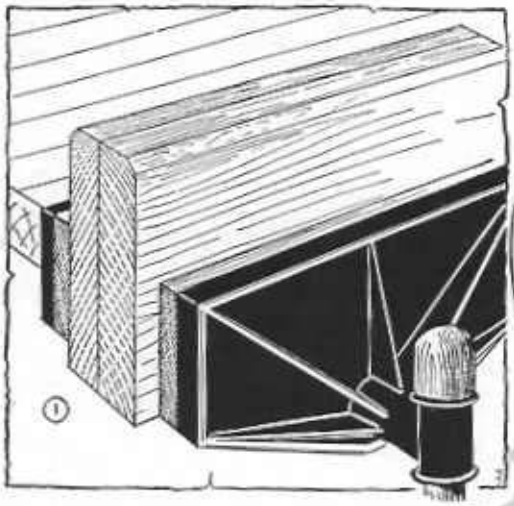
In any style of band saw blade, there is always one more point-per-inch than teeth-per-inch.

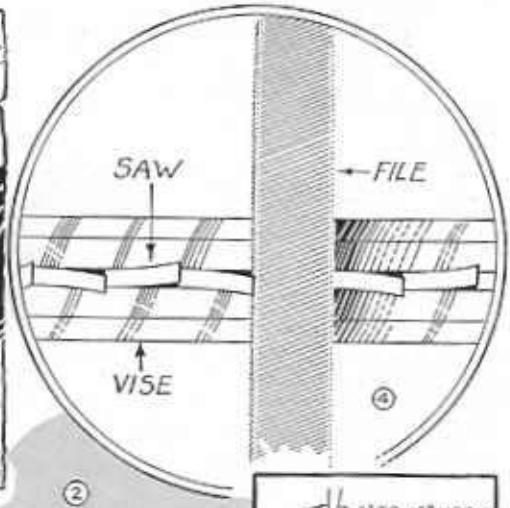


Above, how to fold the blade. Secret is starting hand position, with one thumb up and the other down.

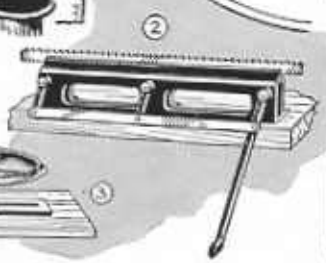
Below, a thin blade with light set cuts smooth but slow; heavy set blade cuts fast but coarse.

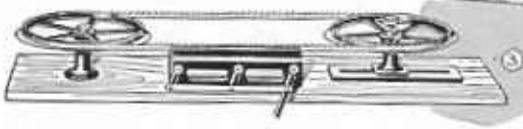


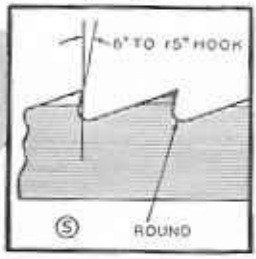




Two boards clamped in a vise can be used for occasional saw filing. Other filing devices are shown in Figs. 2 and 3. Filing should be square across blade, as shown.



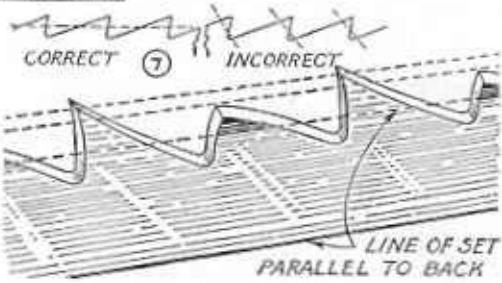


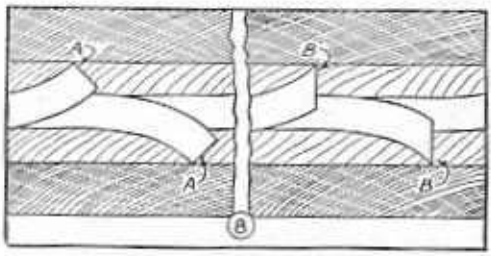


Filing.—Home craftsmen seldom bother with sharpening band saw blades since professional concerns do this work at a nominal price (about forty cents). There is, too, the fact that a brand new blade costs just a little over a dollar. However, it is useful to know the sharpening technique since on occasion you may find it necessary to touch up a worn blade.

The first requirement for sharpening is some kind of vise to hold the blade. A good enough emergency vise can be made by clamping two boards in a bench vise, as shown in Fig. 1. The boards can be hinged together if desired for more convenient handling. A shallow rabbet at top for the blade to nest in saves time in adjusting the blade. Purchased vises are shown in Figs. 2 and 3. It can be readily seen that the style with wheels greatly simplifies the set-up. For light touch-up filing, it is practical to do the work with blade mounted, as shown in Fig. 1 on opposite page. This is handier if the blade is turned inside-out and remounted with the teeth facing up. Three strokes across each tooth will make a world of difference.

Filing is done straight across, as shown in Fig 4, using a triangular saw file. These files have corners of 60° included angle, and this exactly matches the 60° tooth shape. A 7-in. slim taper triangular file is suitable for most blades. A slight rounding at the gullet (the corner between face and back of tooth) is essential to guard against cracking; this





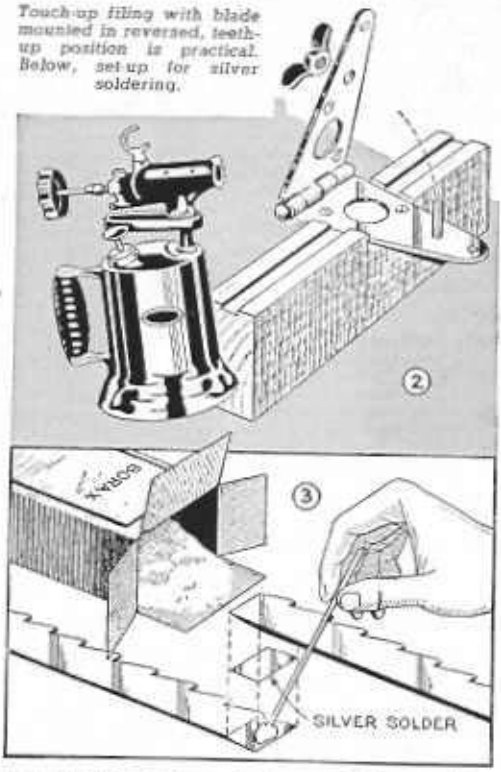
Setting should be done previous to filing and should be parallel with the back of the blade.

is automatically provided by the slightly rounded edge of the file. A slight amount of hook, Fig. 5, is usually desirable and is obtained by slightly tilting the file. The file cuts both face and back of tooth on each stroke although pressure is normally directed against the face of tooth and most of the actual removal of metal is from the face. File strokes should be counted; three or four strokes on each tooth are usually enough. Best results are obtained if the filing is done from both sides, that is, you file every other tooth from one side of the blade, and the skipped teeth are then filed from the opposite side. Purpose of this is to equalize the slight burr turned over by the file; this condition is a common cause of leading on some factory-sharpened blades filed one-way only.

Setting.—The saw may be filed several times before it needs setting. Very few workers set their own blades unless they have the special equipment needed for this work. Setting is required for clearance—the teeth must cut a kerf wider than the blade to prevent binding, as shown in Fig. 6. The set should be not more than half-way down the tooth, and must be parallel with the back of the blade, as shown in Fig. 7. Filing should follow setting in all cases. If the teeth are filed first, the set will destroy the face angle, as shown at A in Fig. 8. When the teeth are filed after setting (the proper way), the face angle of teeth will be square across as it should be for clean cutting, as shown at B, Fig. 8. Teeth can be set with an anvil and hammer, or with a plier-type of saw set, the same device used for setting hand saws. Thick blades require more set than thin blades. In most cases, a similar blade will be available for inspection and the amount of set can be determined from this. If you want a blade for free cutting on sharp curves, the amount of set should be increased. Blades with minimum set will track better on straight cuts, but will bind on curves. A very light side jointing with a fine abrasive stone when the blade is mounted and running is sometimes desirable to equalize the set.

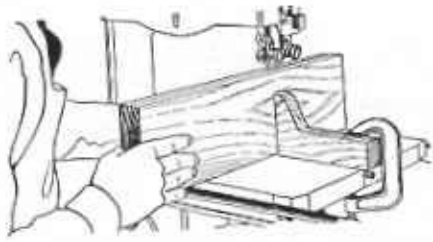
Soldering.—This is another job which most home crafters seldom bother about in view of inexpensive professional service. Factory-joined blades are usually butt welded, giving a clean, strong joint which is practically invisible. However, small shops doing this work usually employ silver solder. A homemade set-up for this work is shown in Fig. 2, consisting of a heavy hinge with center hole fastened to a wood guide board. The blade should be ground square at the ends and then beveled for a distance of one tooth so that when lapped the joint forms a single tooth. With the blade in the clamping jig, the joint is painted with a solution of borax crystals

Touch-up filing with blade mounted in reversed, teeth-up position is practical. Below, set-up for silver soldering.



dissolved in water. A piece of silver solder a trifle larger than the lap is then placed at the joint. The jig is clamped to hold the blade in alignment. Heat from a blowtorch is then directed at the joint and held until the solder melts and runs. Excess solder is removed by grinding so that the blade is of the proper shape and thickness. If the work is properly done, a soldered blade will work nicely although a slight amount of "bump" is almost inevitable with this type of joint.

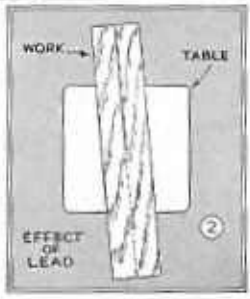
The Technique of **SAWING**



GIVE ANY man a band saw and a piece of wood and he will turn out a creditable piece of sawing on the very first try. The operation is safe and simple, and does not present the hazard, both actual and mental, which is present in the operation of a circular saw. All you do is saw. However, there is a bit more to it than that. You need "know how" to cut certain types of work, and it takes lots of experience before you can automatically do complex curve cutting without running into numerous booby traps where you get trapped at the end of a cut and have to saw or backtrack your way out to free the blade.

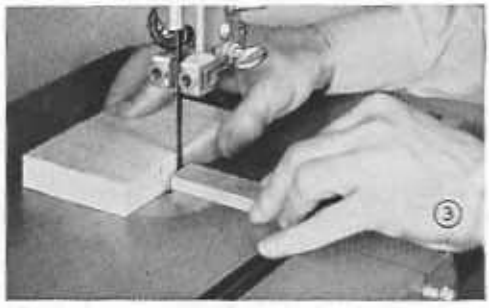
Position of Operator.—If the operator is right-handed, he will naturally take a position directly behind the left side of the table, as shown in Fig. 1. He will use his right hand to feed the work to the saw blade, while the left hand will be placed alongside the work to act as a guide. This position is not arbitrary—it can be varied to suit the work and the operator's natural style. The hand alongside the work more or less guides the work by means of side pressure. Side pressure against the blade should always be gentle. The feed hand should not jam the work forcibly against the blade, but should be fed lightly. The pressure of a single finger on the end of the work will cause the blade to cut; when more pressure than this is required, it is a sign that the blade is dull. The feed hand should not choke the work, but should be held at a reasonable distance from the blade. This gives much better control of the cut and will result in smoother operation than when the work is held close up and fed in a niggling manner.

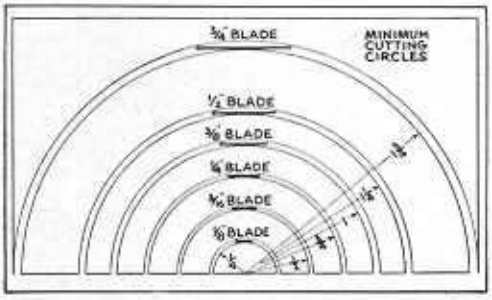
Fundamentals of Cutting. — Certain fundamentals of cutting, as pictured and described on the opposite page, must be thoroughly learned by the operator. The application of these elementary principles should be almost second nature—as much a part of the operator's mental processes as the fact that he should not stick his finger into the blade.



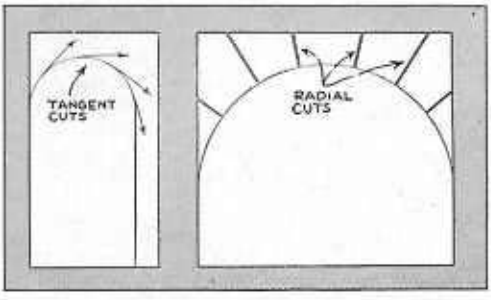
Effect of Lead.—If a piece of wood is pushed squarely into the saw blade, it should be cut in a straight line at right angles to the blade. Often, however, the blade will pull to one side or the other (lead), making it necessary for the operator to adjust the feed accordingly. Thus, in Fig. 2, the blade leads to the right, making it necessary to swing the feed hand to the right in order to follow a straight line. Lead is caused mainly by two things: (1) Improper setting of guides, (2) Improper set of saw blade. After checking No. 1, the fault can be reasonably laid to No. 2. Sawing

Top, proper working position. Diagram shows effect of lead and photo below shows remedy by honing.

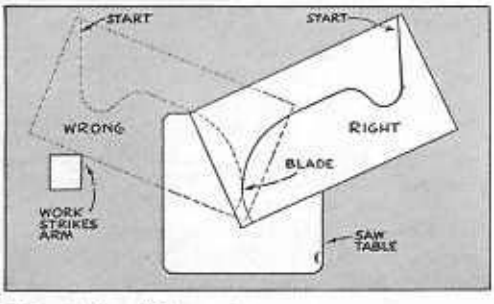




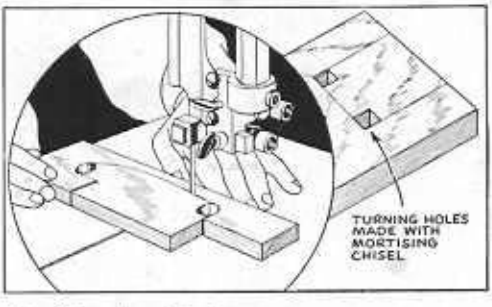
Use the Right Blade: *Use this table. For example, a ¾-inch blade cannot cut a circle less than 1¾-inch radius. In actual work, it is best to work one size smaller.*



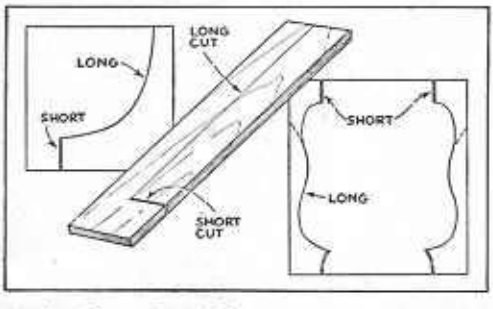
Break up Short Curves: *When it is necessary to make a wide blade go around a short curve, break the cut into a number of shorter tangent cuts, or, eliminate twisting strain by the use of radial cuts.*



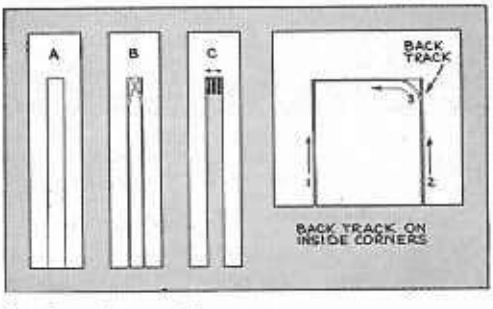
Watch Feed Direction: *Mentally follow the path of the cut before actually cutting the work. Many pieces of work will swing in such a fashion as to bind against the upper arm if not started properly.*



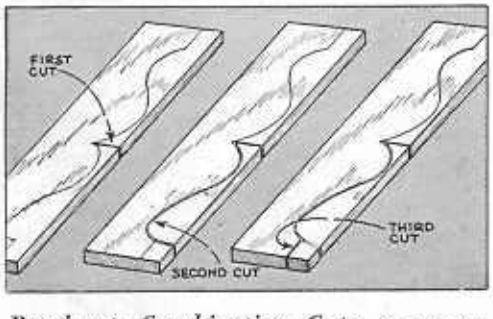
Use Turning Holes: *Time can be saved if round turning holes are drilled and square turning holes mortised into the work before band sawing. Use this method for short curves with a wide blade.*



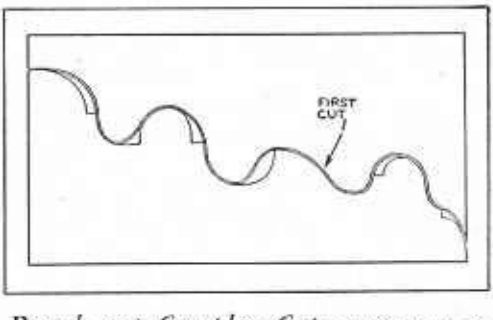
Make Short Cuts First: *Where choice of starting points is offered, make the shortest cut first. Backtracking out of the short cut can be done much more quickly than backing out of a long cut.*



Backtrack on Corners: *Very narrow grooves must be "nibbled," as shown at A, B, C. On other inside corners, cut to the corner and then backtrack to lead the blade over to second line.*



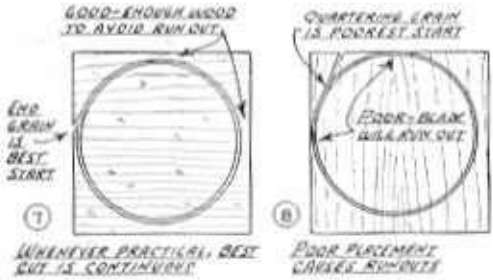
Break up Combination Cuts: *Combination cuts should be broken into a number of smaller cuts. The diagram shows a typical example. Study each piece of work to determine simplest method of cutting.*



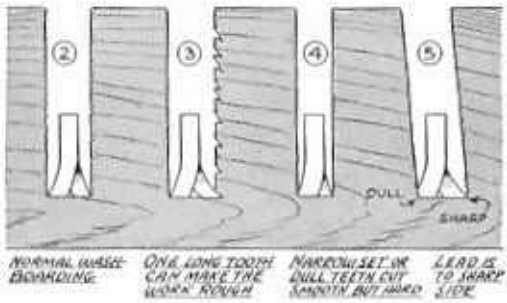
Rough out Complex Cuts: *Where cuts are complex, start at one end and follow as much of the line as possible on the first cut, then go back over the work and complete the smaller cuts.*

Typical washboard shows marks made by band saw blade. Washboarding can be minimized by proper blade tension, good support at guides and by decreasing blade set.

The full range of wood grain direction as related to cutting is found in the circular cut. Poorest cutting is quartering the grain; cross grain is easiest.



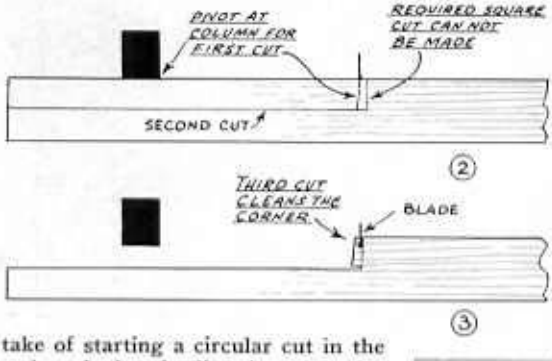
along the side of a nail, riding one side of the blade deep and tight in the guides, or poor filing will result in a saw blade which is dull and poorly set on one side while the opposite side is sharp and fully set. Cutting with this blade, the sharp side does not cut in a straight line but leads off. Where the lead is slight, it can be remedied by lightly honing the side of the blade with a fine stone, as shown in Fig. 3, page 10. Honing is done only on the sharp side of the blade (the side

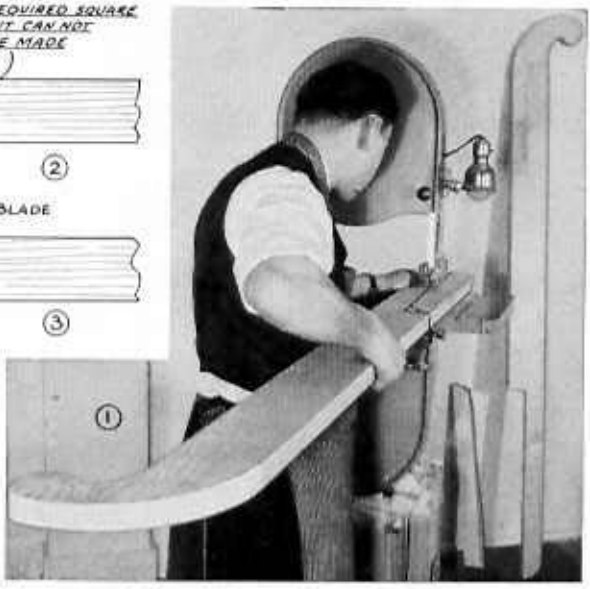


that leads away from the line). It should be noted that this is a negative approach to the problem since it is aimed at making both sides of the blade equally dull. However, it will often correct a blade which leads badly from being set too heavily on one side.

Washboarding.—Every tool leaves its mark. The mark of the band saw is a roughly corrugated surface somewhat resembling an old-fashioned washboard, Fig. 1, and from this similarity comes the term "washboarding" as applied to the cut surface of the work. Like other machine marks, washboarding can be mild or it can be so pronounced as to make band sawing impractical for certain work. The prime cause of washboarding is found in the set of the band saw blade—a blade with heavily set teeth will always washboard more than a blade with light set. Any machine vibration increases the fault. Any wood with alternate hard and soft grain (fir, yellow pine, cypress, etc.) will show more washboard than a wood of uniform density. Generally, if you want a smooth cut, you use a blade with light set, honing it lightly on both sides if necessary. This will reduce the cutting speed and also the freedom of the blade in the cut—but it will cut smooth. On the other hand, if you want a blade for fast, rough cutting, a normal to maximum amount of set should be used. Diagrams in Figs. 2 to 5 illustrate various points regarding the set of the band saw blade.

Wood Grain Direction.—A band saw blade will cut freely *across the grain* of the wood and will readily follow a marked line. When the cut is *with the grain*, the blade cuts slower and tends to follow the grain rather than the marked line. The beginner finds this out in its entirety when he cuts his first circle from solid wood, Fig. 6, since the circular cut represents the full range of grain direction. Because cross-grain cutting is a little easier to do, it follows that the start of the cut when sawing a circle should be in the cross grain, Fig. 7. Done in this fashion, the clean-up cut is across the grain of the wood where the blade action is at its best. The poorest place to make a clean-up cut is at 45 degrees to the grain—don't make the mis-



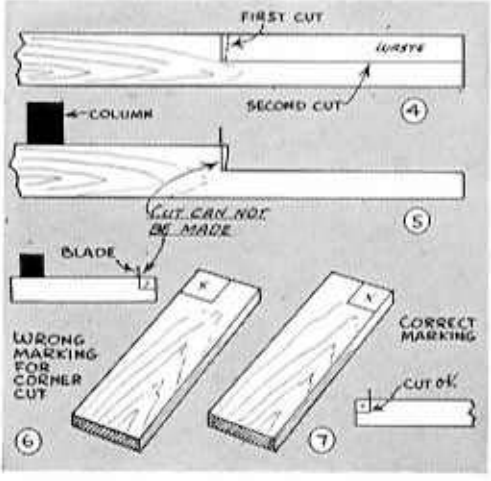


Interference of the column results in many booby traps in band saw work. Diagram above shows how a long corner cutout is made. Below, wrong side marking prevents cutting.

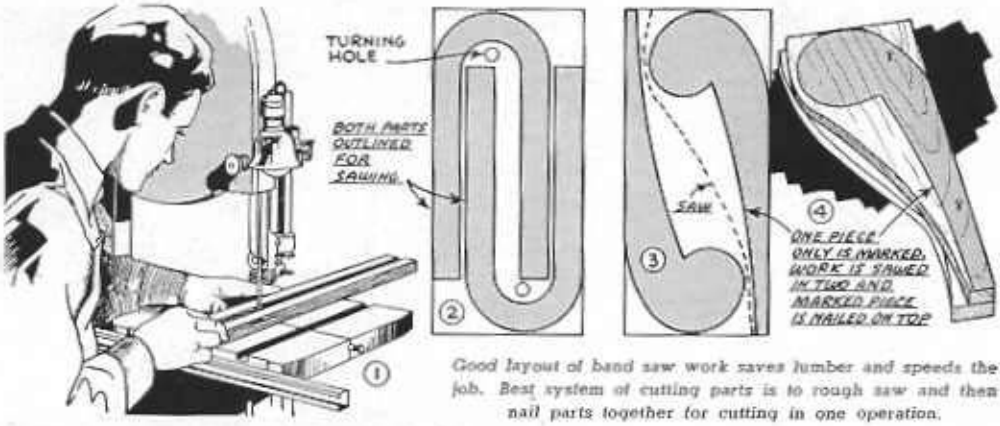
take of starting a circular cut in the end grain but leading in so gradually to the cutting line that the actual clean-up cut will be on the quartering grain. Avoid run-outs; the best band sawing is a continuous cut. If you must run the blade out, make the run-out on cross-grain wood rather than with-the-grain or quartering the grain where it is more difficult to make an accurate pick-up of the cut. This matter of wood grain direction is not too important, and other than circle-cutting where it is easily applied, need not be observed too closely.

Booby Traps.—Band sawing is simple—all you do is saw. Still, to watch an experienced mill hand working alongside an average home craftsman, it is obvious that the craftsman has much to learn. One of the peculiar features of band saw technique is that you can do the job "all wrong" and still turn out all right—you simply saw your way out and start over. A typical example is the "long and short" cut. Obviously the short cut should be made first, but if you do the job wrong and start with the long cut, it is simply a matter of back tracking a bit and sawing out—you lose ten or fifteen seconds and you waste a few square inches of wood. Figs. 2 and 3 show that it is not always possible to make the short cut first because of column interference. The least waste of wood and fastest cutting in this case is done by making the short cut on a curved line, followed by the long cut and cleaning up with the true short cut on the line.

The classic of many traps in band sawing is the cut-out corner, as shown in Figs. 4 to 7. It will be noted that if the work is marked on the wrong side, you can't make the short cut first, and you can't make it last, either—you can't cut it at all! The remedy is to stop the job and mark the work on the proper side to permit sawing. Band saw booby traps fall in two general types: (1) Wrong feed or starting position, as shown by the example on page 11, (2) Wrong side marking, as described in the case of the cut-out corner. The



first is the easiest to remedy since it takes just a few seconds to back track or saw your way out; wrong side marking is more annoying since the work must be re-marked, often a time-consuming job. Many jobs in the latter class can not be sawed from one-side marking alone but must be marked on both sides of the work. While both cases could be illustrated with numerous examples, it is doubtful whether any specific rules could be formulated covering all cases or whether such examples and rules, if given, could be carried in the mind of the worker and applied to the job. The whole thing reduces to a matter of experience and the ability to see in the mind and without conscious effort



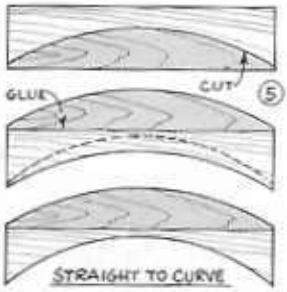
Good layout of band saw work saves lumber and speeds the job. Best system of cutting parts is to rough saw and then nail parts together for cutting in one operation.

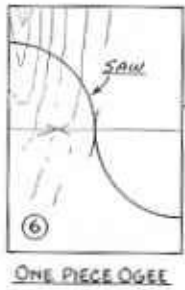
Scroll saw with fine blade cuts a smoother edge and is often more practical although considerably slower than the same job cut on the band saw.

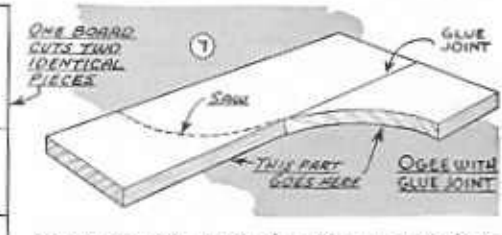
the band saw cut before it is made. Eighty percent of all band saw work can be cut without difficulty and without thought as to whether or not the cut can be made. For the rest, the most practical attack for the beginner is to start sawing. Some few booby traps may irk you so much you will learn to avoid them; others you will do hit-and-miss, right and wrong all your life without too much waste of either time or lumber.

Layout.—The laying out of band saw work is worth careful consideration. Other than the annoyance of wrong-side marking as previously described, there is the matter of saving wood, simplifying the job or doing better work. Fig. 2 is an example where considerable wood is saved by marking the two U-shape pieces on a single board. However, since the layout is a close fit on the wood stock, it is necessary to mark both pieces and then saw out separately. A better technique is shown in the example in Fig. 3 where the wood stock is sufficiently large to accommodate two pieces with a little to spare. In this case, one piece only is marked and the work is rough-sawed to free this piece which is then nailed to the second piece, Fig. 4, for cutting both in one operation.

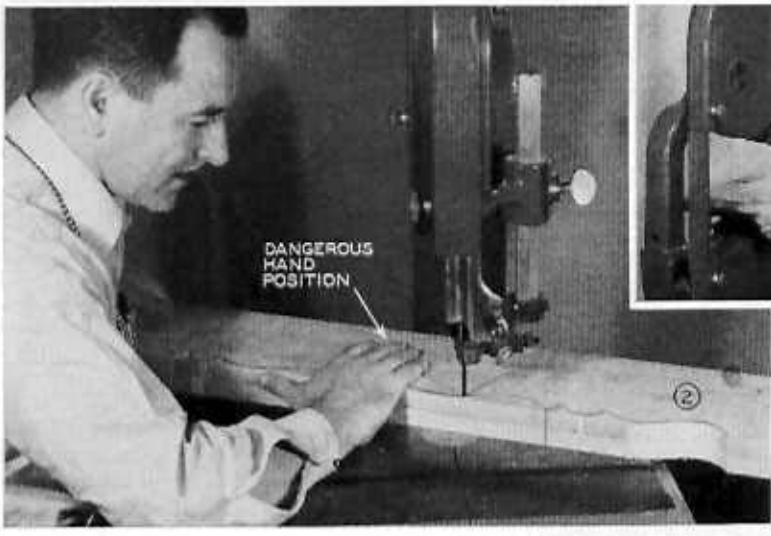
The nailing together of duplicate parts as described is the approved method of cutting similar pieces. Not only do you save time







Stock layout tricks save lumber. Diagram at left shows method of cutting curve from straight board without waste. Above, cutting symmetrical ogee shape.



High guide serves no useful purpose and is a definite hazard. Left, common cause of band saw accidents is heavy feed pressure on a run-out saw. Below, low guide gives positive protection if the feed hand should slip forward into the blade.

but you get two parts which are exactly alike. The work should remain nailed together for any clean-up sanding operation on belt, disk or drum which may be needed. Since sanding of intricate cutouts is a time-consuming business, it is worth noting that single sawing of duplicate parts is sometimes preferable. The photo shows a typical job example. Here, the two sides of a duck rocker are marked and cut separately on the scroll saw using a fine blade. Time and accuracy lost by the single cut method are compensated by the fact that edges sawed with the fine scroll saw blade require very little sanding.

Straight to Curve.—A stock layout trick is the cutting of a curved piece of work from a straight board, as shown in Fig. 5. Since it actually amounts to bending a straight board to any required curve, the savings in wood is often considerable. Mechanical requirements consist only of the fact that the board used for the job must be sufficiently large to accommodate one edge of the curve, as shown in top drawing, Fig. 5. The work is band sawed on this line. The two parts are glued together and the second curve is cut.

Ogee Shapes. — Symmetrical ogee shapes consist of two identical curves reversed. As such, two pieces can be made with a single saw cut from a single board, as shown in Fig. 6. In another method involving narrow stock, one cut across the board makes the full shape, the part cut off being glued in position, as shown in Fig. 7.

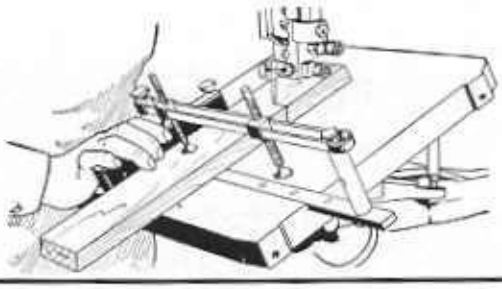
Band Saw Safety.—The band saw is a safe machine. Accidents seldom happen, and the few that do occur can usually be traced to a dull blade. It is a strange situation but it is the dull tool that cuts you. A dull cutting

edge on any power tool means that more hand pressure is needed to feed the work. The greater the muscular tension, the more likely you are to slip and the less control you have to stop the slip after it happens. With a sharp blade on the band saw, one finger can make the feed. There is no muscular tension, hence little tendency to slip.

In all tool operation, safety is simply the removal of any element of chance. If you work with a high guide, Fig. 1, you expose yourself needlessly if your hands should slip. Even the common guide setting an inch or so above the work, Fig. 2, does not give complete protection, but if you set the guide ¼ to ½ in. above the work, it is almost impossible to contact the blade even if your hand should slip, Fig. 3.

The few accidents that occur in band saw operation are usually the result of poor hand position in combination with a heavy feed pressure. The slip invariably occurs on a thin run-out cut, as shown in Fig. 2. What happens is that the work suddenly frees itself, and the feed hand pressing heavily on the work skids forward into the blade. The remedy—dull blade or sharp blade—is simply a matter of keeping your hands in the clear.

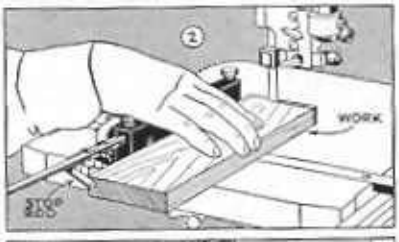
STRAIGHT CUTS

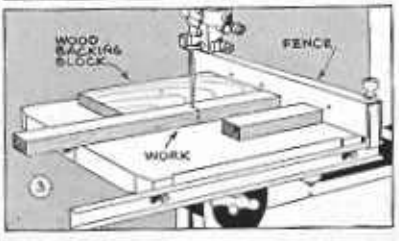


Cut-offs.—Cutting-off with the band saw makes use of the miter gage to guide the work. Various stops are employed to set the length of the cut-off. In Fig. 1, for example, the side of the rip fence is the stop; Fig. 2 shows the regular miter gage stop rod being used. When the band saw is fitted with a ripping fence but not a miter gage, good cut-off work can be done by guiding a wood backing block along the fence to project the work into the blade, as shown in Fig. 3. Another system is to fit a wood table beyond the regular table, Fig. 4, and groove this to take the miter gage. Similar to circular saw work, wide boards can be crosscut by reversing the gage, as shown in Fig. 5. All of the cut-off operations shown can be done equally well with the band saw table tilted to any desired angle.

A weakness of the band saw for cutting-off operations is that long work can not be cut, that is, on a 14 in. band saw, it is impossible to make a 15 in. cutoff because the work strikes the supporting arm. About the best that can be done in sawing a long board in two is to make two cres-

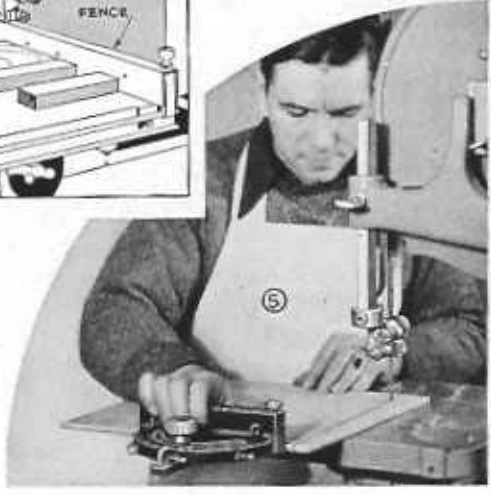
ALTHOUGH primarily a curve-cutting machine, the band saw does excellent straightline work and is a favorite for many jobs involving straight cut-offs. In most cases, work of this kind is guided, that is, it rides a fence or miter gage. Since this does not permit compensation for lead, it is important that the blade have sufficient and equal set to track properly in the cut.

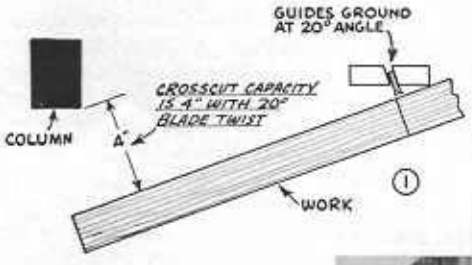




Drawings and photos show various methods of using the band saw for making square cut-offs.

Top, cutting dowel stock. Below, extension wood table can be grooved to take miter gage.



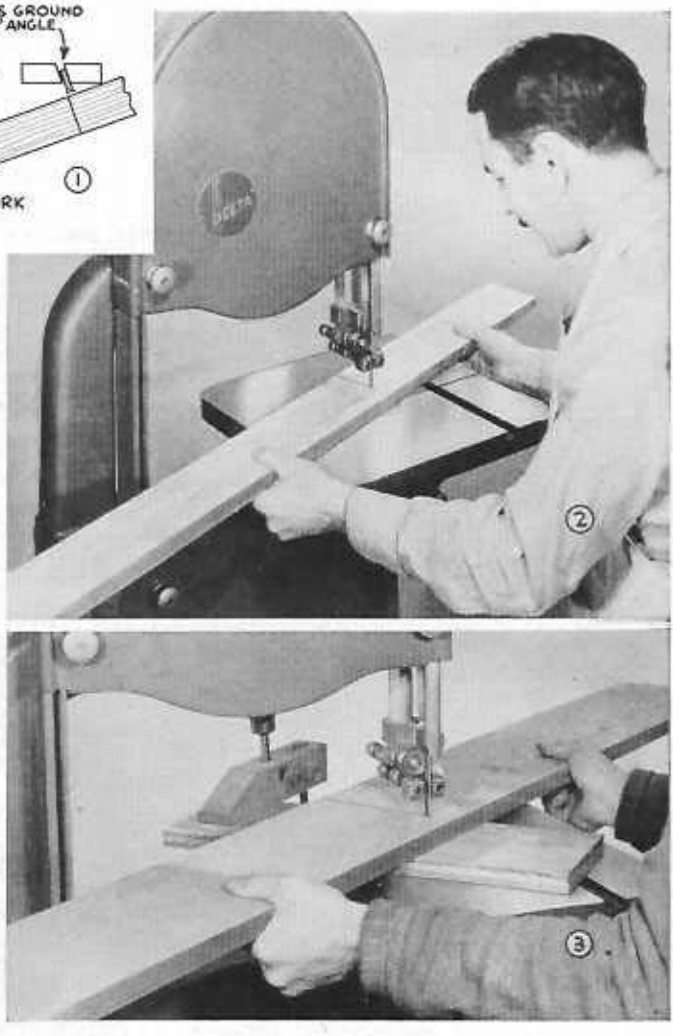


cent shape cuts, pivoting the work at the supporting arm and swinging it into the saw blade, cutting from both sides. This system will cut an 8 in. board in two with less than 1 in. waste on each piece. If the cut is worked from one side only, the pivoting action is more pronounced and will show a waste of about 2½ in. on each piece. Boards under 6 in. wide can be crosscut by standing the work on edge. This method should be used whenever possible because of the small amount of waste. Cuts made in this manner are, of course, in-the-rough only, and the cut ends will require cleaning-up with a second square-across cut.

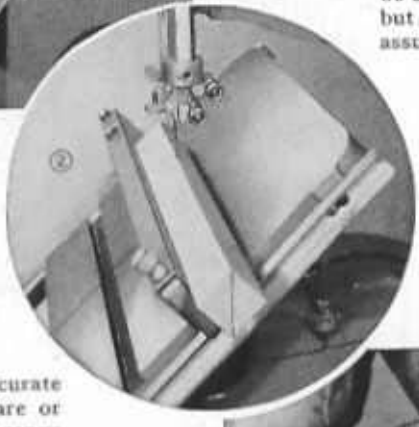
Angle Guides.—A practical method of making long cut-offs without throat interference is to twist the blade. The best method of doing this is to grind the guides, an angle of 20 to 25 degrees being the most practical. Fig. 1 is a plan view of the saw with the guides ground at 20 degrees, thereby twisting the blade outwards by the same amount. It can be seen that work about 4 in. wide can be cut square across without interference. By backtracking and cutting from both sides, an 8 in. board can be cut.

The angle guides are needed only for the top guide, the bottom guide being backed off completely. However, both blade supports are used. Since the ½ in. square guide pins are reversible, all you have to do is grind one end of each; you can then use them square or angled as desired. Narrow blades work best with the angle guide. No adjustment of the tracking or tension is needed. Fig. 2 shows the angle guides being used to crosscut a 4 in. board in one pass.

For occasional work, the simple set-up shown in Fig. 3 does good work. All you do here is run a baseboard through the saw, and then twist the baseboard after backing off both upper and lower guide. Both blade supports are used. Twists up to 30 degrees can be used with a ¼ in. blade; Fig. 3 shows a 6 in. wide board being cut square across in one pass. The clamp holding the twisted baseboard should be located far enough back so that the work will not strike it at the end of the cut, as can be seen in the photo. When using this method of angle sawing, it will be found that the blade gradually tends to square itself since it is at all times rubbing against the side of the base block. However, the twist will hold for several cuts. Metal guides will, of course, hold the angle permanently and can be used in connection with the miter gage reset to the same angle.



Angle guides solve the problem of making a square crosscut in center of long board. Top photo shows blade twisted with guides ground to an angle; lower photo, blade twisted with baseboard.



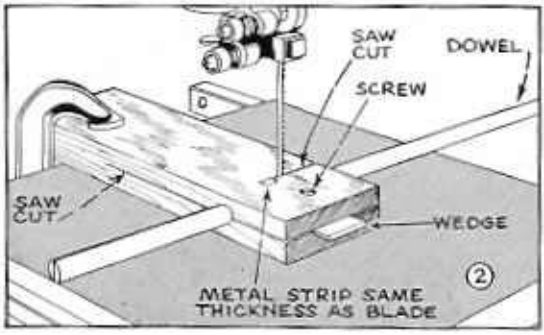
Band saw is excellent for removing corners of turning squares. Right, diagonal ripping.

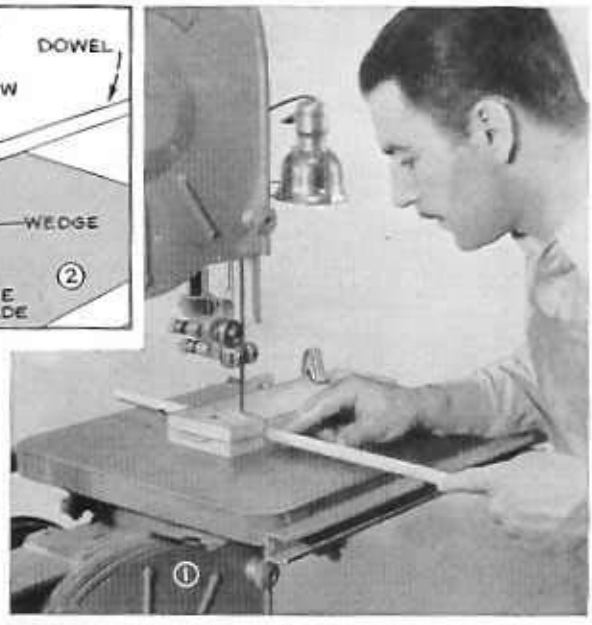
Ripping.—Ripping is done with the use of the standard band saw fence. As in all other guided cuts done on the band saw, the blade must be sharp and have a good amount of set to allow free and accurate tracking. Cuts can be square or beveled as desired in a range from 90 degrees (square) to a 45 degree bevel. Fig. 1 is an example of bevel ripping, the operation being the removal of corners from a turning square previous to turning. The band saw is excellent for this particular job since smoothness is non-essential. Splitting a square length of wood in two, diagonally, as shown in Fig. 2, is another operation well-suited to the mechanics of the band saw. This operation is commonly used in preparing glue blocks. Here, again, the cut need not be smooth since the diagonal surface does not make contact when used. Because of the slight clearance under the fence, the fence can be set to exactly halve the work without coming in contact with the blade.

Marking Squares for Turning.—Hardwood turning squares can be marked on the band saw by making up a suitable vee block, running a saw cut down through the center to permit the blade to work exactly in the center of the vee cut. The width of the block should be such that when the fence is placed at some even dimension on the guide bars, the vee block will be centered with the blade. Work to be center-marked is placed on the vee block and advanced to the blade, as shown in Fig. 3. Two diagonal cuts, about ⅛-inch deep are made, the intersection marking the center of the work while the cuts permit ready entry of the spurs of the live center.

Ripping Thin Work.—Where a wide piece of work is to be ripped into thin strips, the band saw should be used to take advantage of the thin saw kerf. Fig. 4 shows a job of cutting lace moulding, 1/16 inch thick, from a thick pre-formed piece. Almost twice as many pieces can be obtained as would be possible with circular saw ripping. The best blade for this kind of work is ⅛ inch wide, and it should have a normal amount of set. Smoothness of cut is important, which can be obtained with minimum set, but the set must be perfect to assure accurate tracking. A mild amount of side honing will make the average blade suitable for jobs of this kind. Tracking should be checked on scrap stock. Sometimes it will be found that tracking is better when the fence is used on the opposite side of the blade.

Above, kerfing hardwood turning stock to take spurs of live center. Below, narrow band saw kerf saves stock when ripping thin moulding.

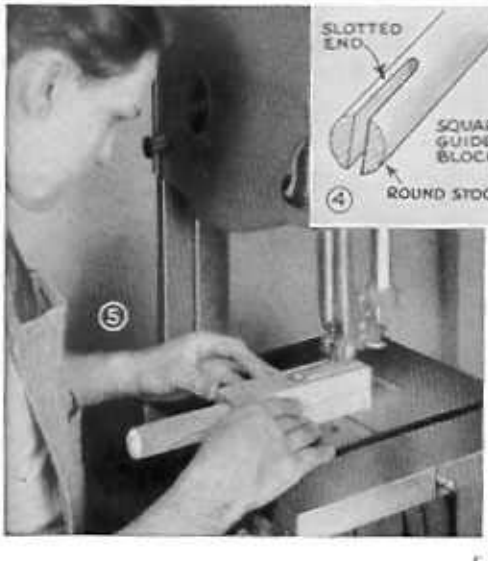


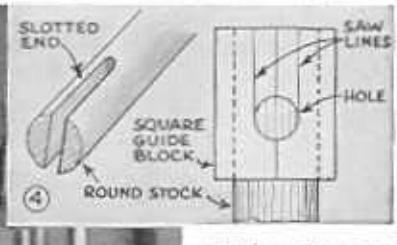


Ripping Round Work.—The ripping of round stock is always difficult, and often it will be found that the band saw does jobs of this nature better than the circular saw. Figs. 1 and 2 show a good set-up for splitting dowel stock. The wedge in the saw kerf allows setting of the jig to take the dowel stock with a moderate push fit; metal strip behind blade keeps the work square and prevents spiraling. Larger rounds of wood or plastic are easily ripped with the use of a vee guide, as shown in Fig. 3. In both instances, the guide is set up square with the blade, which is assumed to be in good enough shape to allow accurate tracking without compensation for lead.

Small half-round mouldings can be made by splitting dowel stock with this simple jig.

Right, vee block is useful for splitting rounds. Below, housed round is easy to cut.





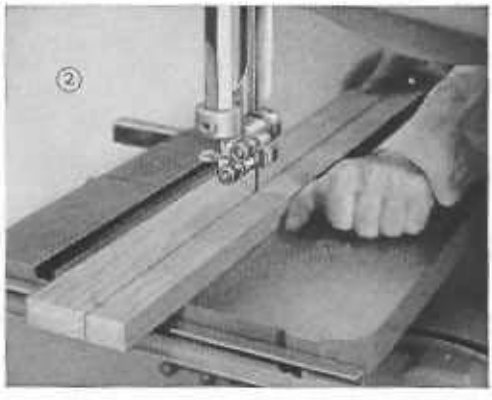
Another operation in cutting round stock is the slotted end, as shown in Fig. 4. This type of cut can be easily made by making up a square block of wood with a hole bored lengthwise through it to take the work. The shape is then marked on the square block, after which the rounded end is worked by drilling a hole through the block and work. The band saw cuts through combined block and work completes the job, Fig. 5. The same jig can be used for a number of pieces since the removal of part of the guide on the first sawing does not destroy the guide marks. Where the nature of the work does not justify this set-up, good work can be done by clamping the round stock to the side of a square board. Sawing is then done by eye, but the square board keeps the round from turning. This method is often used for splitting a short length of dowel stock, the dowel rod being nailed at either end to a flat piece of wood to keep it from turning. Another example of using a form block for cutting is shown on page 58.

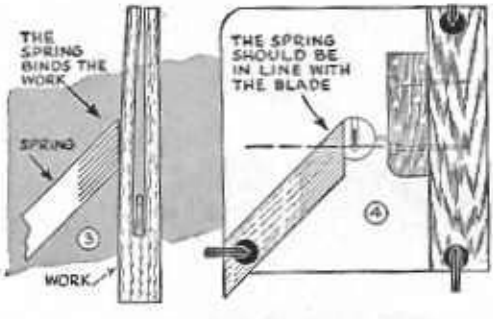
A blade which tends to lead can be used successfully with pivot style of ripping guide shown above. Bottom photo shows short fence and hold-in.

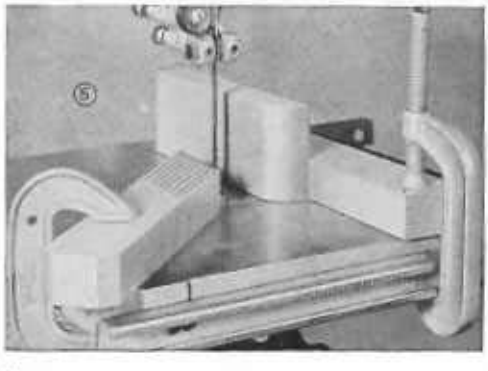
Resawing.—Resawing is the operation of ripping a thick board into two or more thinner boards. It gets its name from the fact that the board was originally sawed a certain thickness; any additional ripping is simply sawing again, or resawing. It is a job which the band saw does better than any other machine, and with less power. Cuts of this nature are best made with some form of guide or fence to keep the work in proper relation to the saw blade. One of the simplest guides is the pivot block shown in Fig. 1. It can be used on either side of the saw blade as desired. The guide is set opposite the blade and at the proper distance from it to cut the thickness required. A pencil mark on the work is an aid to cutting, although with a little practice the sawing line is easily gauged by eye. Assuming that the guide block is on the outer half of the saw table, the work is held tightly against it with the left hand, while the right hand makes the feed. Any leading tendency of the blade is easily corrected by turning the work slightly as required. A slow feed should be used until it is seen that the blade is tracking properly; after that, the feed can be as fast as the cutting action of the blade allows.

Instead of using a pivot block, some workers do good resaw work by simply using the thumb of the left hand as a pivot point, as shown in Fig. 2. This method of working is well-suited to conventional ripping cuts; also, it is often used for the band saw cut when the work has been previously sawed from both sides on the circular saw.

Another set-up for resawing is shown in Figs. 3, 4 and 5. This makes use of a short fence, which can be fastened to the regular band saw fence or to a longer piece of wood, as shown. The short fence provides more of a guiding action than the pivot block, yet is not so long as to entirely prevent a slight shift of the feed direction to compensate for blade lead. A spring hold-in made of wood is shown. This is essential in any resawing operation where the length of the work makes it impossible to use the left hand as a hold-in. The spring should be centered in line with the front of the blade, Fig. 4. If placed too far back, Fig. 3, it binds the work; if placed too far forward, it tends to push the work



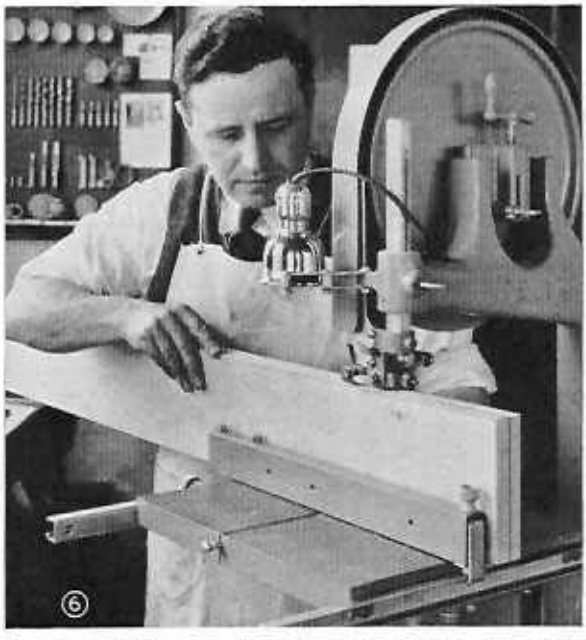




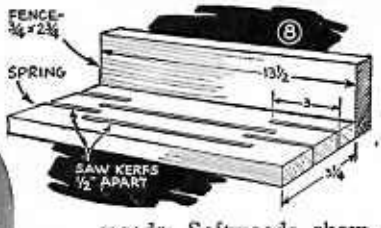
out of line. If it is found that the short fence does not have enough pivoting action to adjust the lead of the blade, it can be rounded slightly or made shorter.

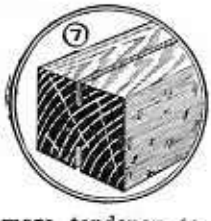
Fig. 6 shows the use of the standard band saw fence in a resawing operation. This set-up is usually practical, especially if cuts are previously run in on the circular saw, Fig. 7. The fault of the long fence is as mentioned several times previously; it does not allow a pivoting action of the work to compensate for lead. However, with a blade in good condition and adequate set, the long fence works perfectly.

The best blade for resawing is a wide blade with coarse teeth and a generous amount of set. On a 14-inch band saw, a ½ or ¾ inch wide blade should be used. It can be easily seen that a wide blade has much more "rudder-action" to follow a straight line than a narrow blade. Coarse teeth—four or five to the inch—will give a good action without clogging. A generous amount of set is absolutely essential to free cutting and to prevent the blade from jamming in the cut. Jamming in a resaw is a headache—you can't go ahead and you can't back out. If this should happen, stop the saw. Drive a taper wedge into the saw kerf at the end of the board, and then pump the board up and down to release it from the blade. Where extensive resawing is being done, blades specially suited for this work should be used. A skip-tooth or buttress blade, ½ inch wide and with 3 or 4 teeth per inch is recommended for hardwoods. Softwoods show more tendency to clog the blade and are best cut with a similar blade with 2 or 3 teeth per inch. In conventional pattern blades for resawing, the hook angle of teeth is usually from 20 to 30-degrees. In all cases, a generous amount of set is an absolute "must."



Resawing with the use of regular band saw fence is practical with a coarse set, free-running blade. Photo below shows a long type resaw fence fitted with hold-in springs.

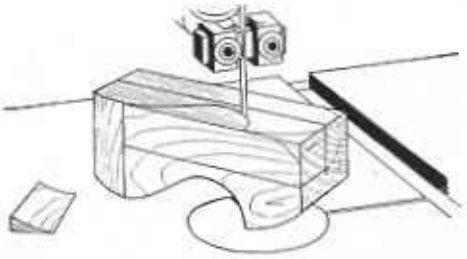


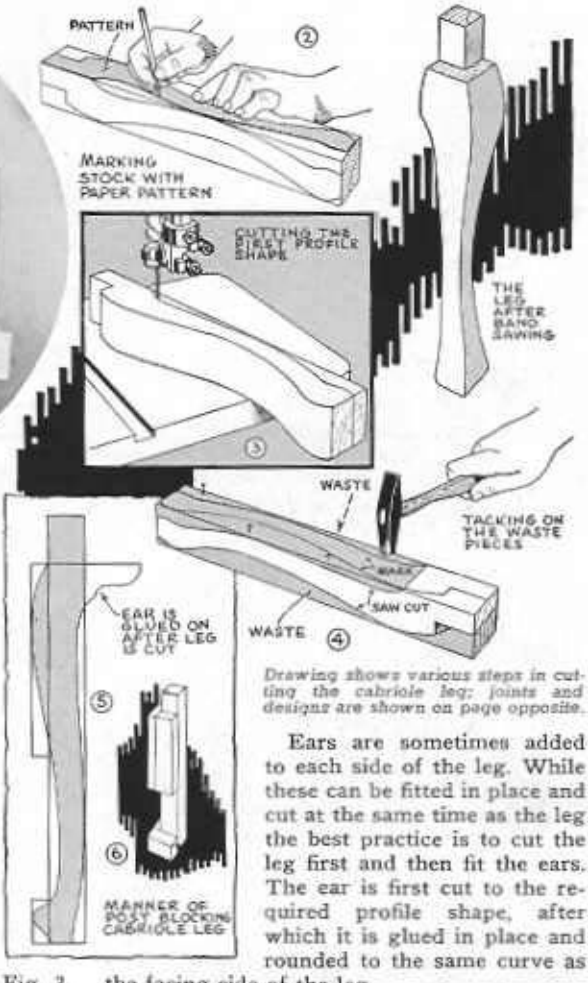


Still another type of guide for resawing is shown in Figs. 8 and 9. As can be seen, this is a long fence style, but is combined with spring type side pieces to allow a moderate amount of movement to adjust for lead. Identical guides are used on both sides of the work. Once set up, this type of fence does excellent work and is particularly suited for long runs.

The maximum capacity for resawing with a ⅓ h.p. motor is about 6 inches, which matches the mechanical capacity of the saw. When the band saw is fitted with a height attachment, it is mechanically possible to handle 12 in. wide lumber, but the ⅓ h.p. motor will not pull the cut unless the work is previously kerfed to a depth of 3 in. or more on each edge.

Compound CUTS





Drawing shows various steps in cutting the cabriole leg; joints and designs are shown on page opposite.

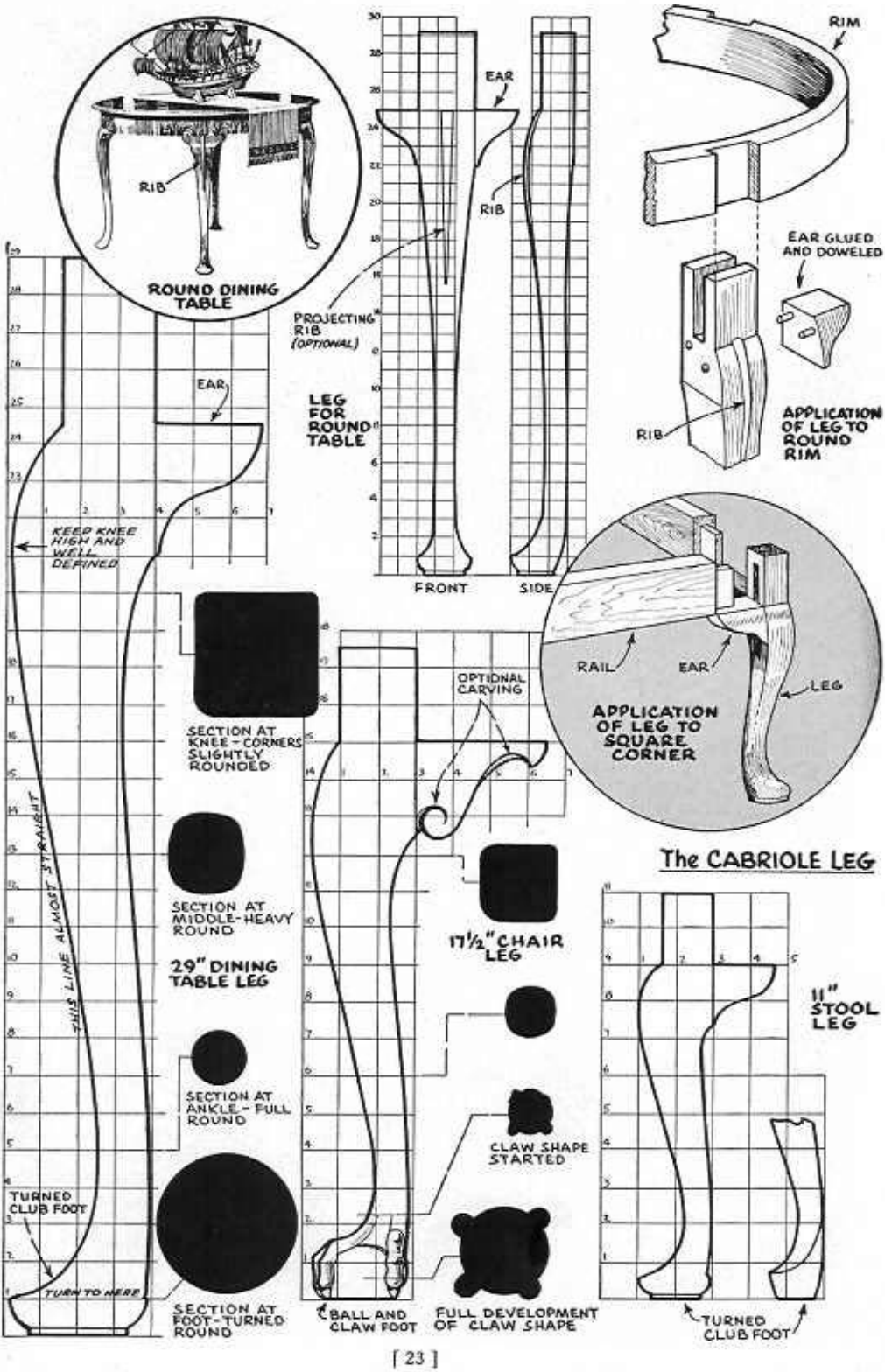
COMPOUND CUTS in band saw work indicates cutting from two or more sides. The most common example is the cabriole leg, but cuts of this nature are used in a wide variety of jobs.

The Cabriole Leg.—The stock for the leg must first be jointed perfectly square. It can be seen that if the original square of lumber is not true, neither will the band saw cuts be true. After jointing, the leg pattern is laid out on two adjoining sides of the wood, as shown in Fig. 2. A cardboard pattern is usually used to trace the outline.

The work can now be taken to the band saw where the two cuts necessary to form one of the complete profile shapes are made, as shown in Fig. 3. After this has been done, the waste cuttings are tacked back in place, as shown in Fig. 4, in order to give the work a base and to restore the pattern markings. The nails used to fasten the waste cuttings should be placed in such a position that they will not mar the leg. The second profile shape is now cut. From this stage the leg is finished by modeling the front and rear corners. This can be done on the shaper, but for the average homeshop job is usually done with a spokeshave or other hand tool.

Ears are sometimes added to each side of the leg. While these can be fitted in place and cut at the same time as the leg the best practice is to cut the leg first and then fit the ears. The ear is first cut to the required profile shape, after which it is glued in place and rounded to the same curve as the facing side of the leg.

Figs. 5 and 6 show the manner of post blocking stock for cabriole legs. This method of working is frequently used, since it is often difficult to secure a piece of fine cabinet wood sufficiently large to take in the full shape of many styles of cabriole legs. Working in this manner, the necessary blocking is first glued in place, taking care that all joints are tight and clean. The pattern is then laid out on the two flat adjacent sides, and cutting proceeds as already described. For quality work, the wood stock should be fairly well matched

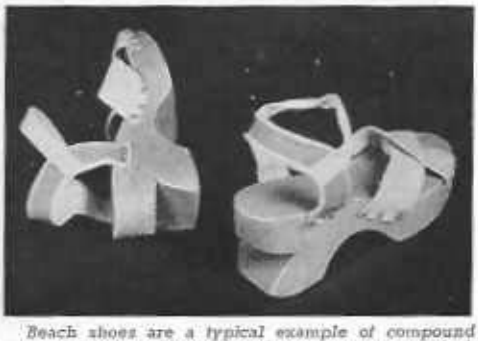

ROUND DINING TABLE
RIB
EAR
RIB
PROJECTING RIB (OPTIONAL)
LEG FOR ROUND TABLE
FRONT
SIDE
RIM
EAR GLUED AND DOWELED
RIB
APPLICATION OF LEG TO ROUND RIM
KEEP KNEE HIGH AND WELL DEFINED
EAR
RAIL
EAR
LEG
APPLICATION OF LEG TO SQUARE CORNER
OPTIONAL CARVING
SECTION AT KNEE - CORNERS SLIGHTLY ROUNDED
SECTION AT MIDDLE-HEAVY ROUND
29" DINING TABLE LEG
THIS LINE ALMOST STRAIGHT
SECTION AT ANKLE - FULL ROUND
TURNED CLUB FOOT
TURN TO HERE
SECTION AT FOOT-TURNED ROUND
17½" CHAIR LEG
CLAW SHAPE STARTED
BALL AND CLAW FOOT
FULL DEVELOPMENT OF CLAW SHAPE
The CABRIOLE LEG
11" STOOL LEG
TURNED CLUB FOOT

Flared leg design is a simple job of compound band sawing. Both lumber and labor are saved if the curved foot section is built up.

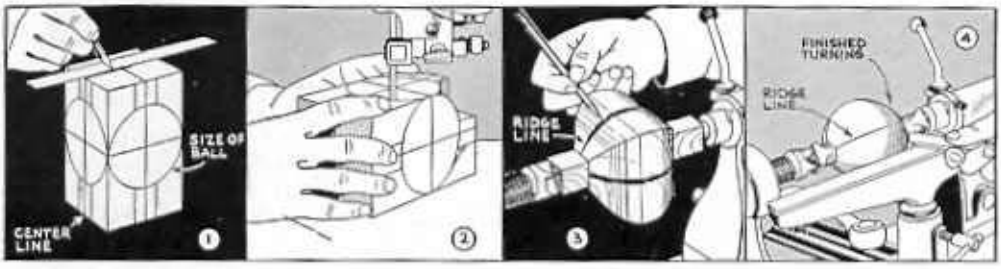
for color and grain. If the job is done properly, the post blocked cabriole leg has every appearance of being cut from solid stock. In fastening the leg to the framework for which it is intended, any common joint may be used. As in all other forms of cabinet work, the mortise-tenon joint is the strongest, but equally good results can be obtained with dowelled or glued-and-screwed butted joints. Typical joint construction and leg designs are shown in the drawing on page 23. The foot of the leg is sometimes turned, as indicated in the drawing. This is done after band sawing. The lathe mounting also provides an excellent device for holding the leg while modeling is being done.

Curved Legs.—An attractive style of furniture leg is made with a flared foot, as shown in the photo above. This is a simple job of compound band sawing. The work is usually glued-up, matching the grain and color of the wood for a clean, invisible joint. An advantage of the built-up leg in this particular style is that the central square stem can be sawed and sanded previous to fitting the glue blocks. If made from solid stock, the work would involve band sawing the square, which would then entail a lot of work sanding the surfaces smooth. In the same vein, it is obvious that any mortises or other joint work required on the leg is most readily done if worked on the square stem previous to gluing.

Unsymmetrical Shapes.—Many jobs in compound band sawing involve unsymmetrical shapes, such as the beach shoes in photos below. Similar work is also done when carving in-the-round where the profile and front shapes are sawed previous to carving.



Beach shoes are a typical example of compound band sawing where the shape is unsymmetrical.

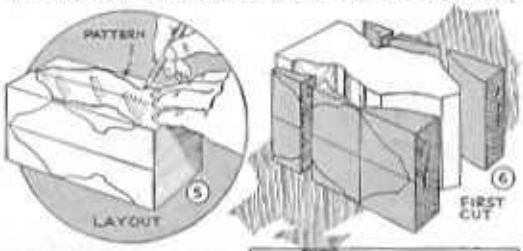


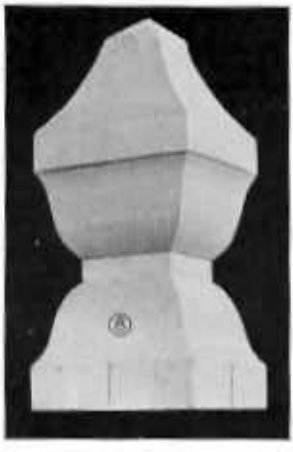
Compound-Sawed Turnings. — Good use can be made of compound sawing in preparing stock for turning. This applies especially to the turning of balls and similar work which must be worked to an exact spherical shape. Fig. 1 shows the start of the operation. The required shape, in this case a ball, is laid out on two adjacent sides of the stock. The stock must be previously prepared by jointing the opposite two sides perfectly square; also, the sides upon which the markings are made must be approximately square and smooth enough to take the pencil marks. Care must be exercised in laying out so that all centerlines will match. Sufficient stock must be left at each end of the ball shape to permit mounting in the lathe.

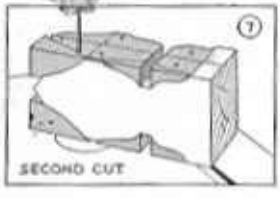
Fig. 2 shows the ball being compound sawed on the band saw. Fig. 3 shows how the ball looks after sawing. This picture shows the ridge lines of the intended ball turning being marked with pencil. These marks need not be centered but are simply very broad pencil marks blackened in on each of the four sides of the work. Turning is then carried on as usual, stopping the work frequently for examination. It is only necessary to watch the ridge lines. When the turning has progressed to the point where the ridge lines are almost removed, the turning will be practically complete, and the ball shape will be just as perfect as the original band sawed shape. Final trimming of the ball is done in a cup chuck in the usual manner employed for such work.

Ornamental Work.—A wide variety of compound-sawed ornaments can be made for finials, especially for outdoor work for post tops, rail ends, etc. Figs. 5 to 8 inclusive show successive steps in making an ornament of this kind. Fig. 5 shows the work being laid out, using a thin cardboard pattern to mark the two sides of the stock. Fig. 6 shows the work after the first two cuts have been made on the band saw. It will be noted here that the cut cannot be made in one continuous operation, yet the broken pieces are

Accurate turning of balls and similar objects can be done if the work is first compound-sawed to the required shape.



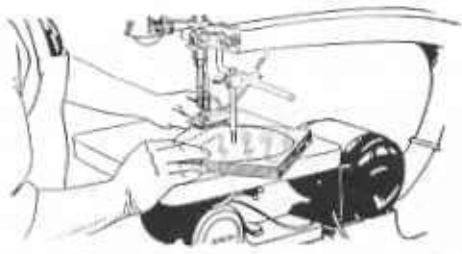


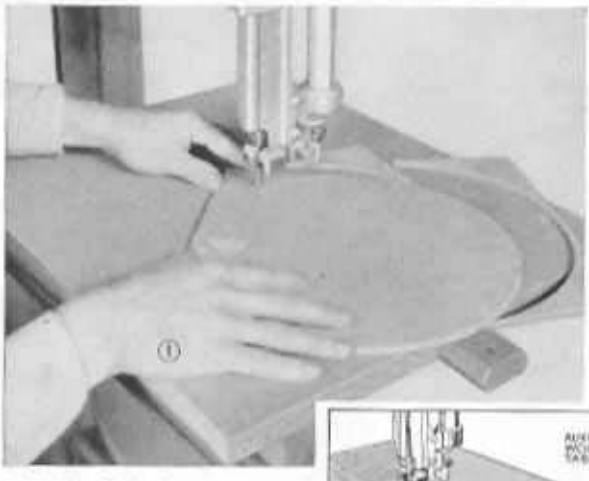


Drawings above show how square-cut finial at left is cut.

sufficient to form the base and to restore the markings for making the second pair of cuts. Fig. 7 shows the pieces bradded back in place to permit the second side being cut. After this has been done, the ornament is complete and will appear as shown in Fig. 8. Only a very light sanding should be necessary to complete the work. Where a turning of this same shape is desired, it can be seen that the square cut finial could readily be mounted in the lathe, marked with ridge lines, and turned down in the same manner as the ball already described. Where very large turnings are to be made, this is one of the best methods of working since the band saw cuts both remove waste stock and mark the turning outline. If the work is turned at slow speed, the required shape can be seen as a phantom image as the work revolves. After a little practice it is easy to follow the phantom shape with the chisel. Compound-sawed work which is to be turned must be exactly centered, otherwise undersize work will result. It is best to saw the work a bit "fat" to allow for a slight centering error.

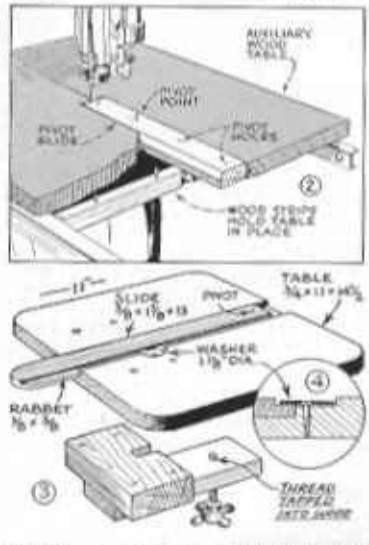
Circle JIGS





ONE OF the common operations in band saw work is the cutting of circles. Where only one piece is required, it is usually more practical to cut the work freehand and then clean the edge by sanding on belt or disk sander with the use of a pivot point. Where a number of pieces are needed, it is advantageous to use a circle jig. A number of different styles and the manner of using them are shown in this chapter.

Cutting Circles.—The cutting of circles on the band saw can be done freehand in the same manner as cutting any other curved line. However, where accuracy is required and especially when several pieces are to be cut, a pivot jig is advantageous. All circle-cutting jigs for the band or scroll saw feature a pivot point around which the work revolves as it is advanced to the blade. In order to get perfect circles, the pivot point must be at an exact right angle with the blade, and on a line with the cutting edge or teeth. What happens when this basic rule is not followed is shown in an exaggerated form in the diagram on opposite page. It can be seen, Fig. 2, that a forward pivot point will cause the blade to track to the inside of the work, while a pivot point behind the cutting edge will result in tracking to the outside. Tracking out, as in Fig. 3 on opposite page, is the more common fault. It should be noted that circle cutting with a jig requires a good blade with even set. It is a good idea to first test the blade by ripping a straight line with the use of a fence. If the blade does not track with a fence, neither will it track with a pivot jig. However, there is the possibility of slightly adjusting some types of pivot points to compensate for blade lead. Once the jig is adjusted, any number of circles can be cut accurately and rapidly providing the blade has a good amount of set to counteract slight drifting caused by the grain of the wood.



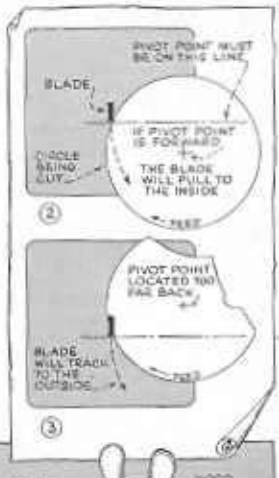
Circle Jigs.—Three types of jigs are shown. The simplest style is an auxil-

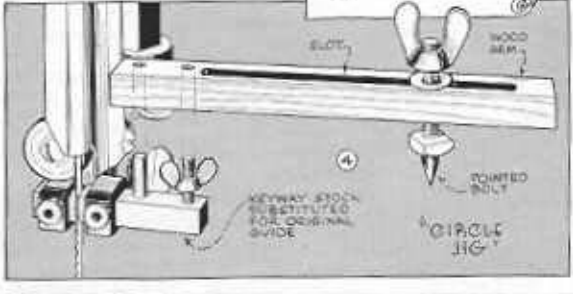
Wood table type of circle jig is easy to make and use. Two practical styles are shown.

iary wood table fitted with sliding pivot bar, as shown in Figs. 1 and 2 on opposite page. For occasional work, a board with nail pivot can be clamped to the band saw table at the required distance from blade. A good form of permanent jig is shown in Figs. 3, 4 and 5. This clamps to the right side of band saw table and can be slightly adjusted if needed to compensate for blade lead. The clamping device is sufficiently sturdy if the thread is cut directly in the wood clamping arm, as shown. However, a nut can be let into the wood if desired. A slight amount of clearance should be allowed around the cut-out for band saw table pin to allow movement of jig.

An entirely different idea is the use of a wood or metal arm which clamps to a length of keyway stock forming the right hand blade guide, as can be seen in Fig. 4 on this page. An advantage of this construction is that the overhead pivot point is easier to locate on the work. Instead of being fitted to the guide pin hole, a jig of this kind can be made to fasten to the guide post. Some commercial units of this style also have a crosswise adjustment at the pivot point to compensate for blade lead.

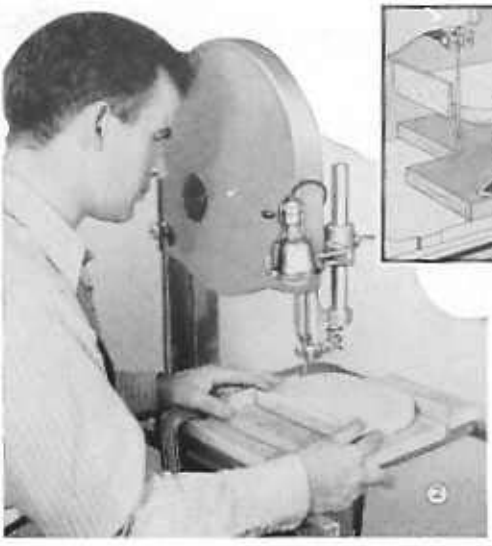
Extension guide bar type of circle jig has advantage of overhead pivot. Below, setups for band sawing big circles.



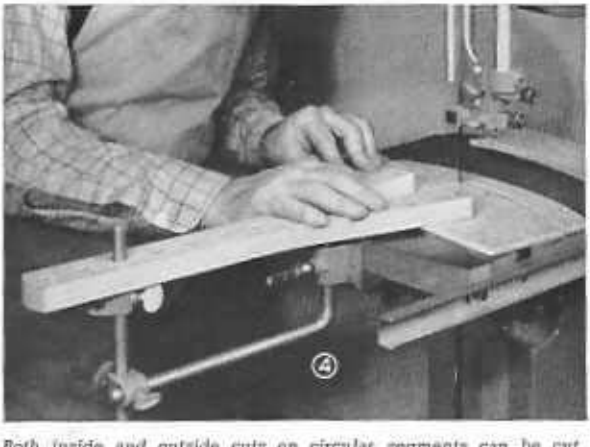


Most work cut with a circle jig is done without the use of reference marks, either for the center or outline. The work is pressed tightly against the blade and is then pressed down to seat the pivot point. When the saw is started, the blade will crowd the work a little to overcome the initial side pressure used in positioning. After that, the work is simply rotated. There is sometimes a little play at the pivot point or in the jig itself, hence a moderate side pressure, either against or away from the blade, should be used when feeding the work.

Big Circles.—On big work, the pivot point can be located entirely apart from the band saw, as shown in Fig. 5. Another idea, Fig. 6, can be worked with the band saw fence in combination with long extension



Corner rounding jig is useful for a variety of work. Style above uses auxiliary table; style below pivots on hole drilled in saw table.



Both inside and outside cuts on circular segments can be cut with this jig made of standard hold-down parts. Without wood arm, the pivot can be used for sawing large circle.

guides. A modification of this idea can be worked by simply clamping a board to the underside of the saw table and then blocking up as needed at the pivot point which is nailed to the board.

Corner Rounding Jigs.—A common operation in woodworking is the rounding of corners. Quite often you'll find that no specified radius is required—all you want is a round corner. The jig shown in Figs. 1 and 2 does this job neatly. The dowel pivot pin should be located ¾ to 1 in. from the blade for average work. Some variations in radii can be made by changing the location of the pivot pin. A modification of the same idea is shown in Fig. 3. In this set-up, a ⅛ in. hole is drilled in the band saw table about 1¾ in. from the blade. A nail driven into the underside of the jig fits in this hole to supply the needed pivot point. This construction eliminates the wood auxiliary table and is much faster to set up. If the band saw table insert is pinned in place so that it can not move, the pivot hole or holes can be drilled in the insert for cutting small rounds. Either of these set-ups should be made with ¼ in. blade centered on the wheels. The only control on blade lead is by tracking the blade to back or front of wheels.

Circular Segments.—A jig for cutting any diameter of circular segment is shown in Fig. 4. This makes use of standard circular saw hold-down parts in combination with a Y-shape wood arm. The forks of the arm are fitted with screws sharpened to a point to provide anchors. Work to be cut is placed under the arm, the anchor points are seated, and the work is then pushed into the blade. Where the ends of the work are pre-cut, extra strips of wood can readily be nailed to the jig as needed to furnish locating stops. The jig will cut both the inside and outside curve, the change in position being worked by holes on the wood arm or stop collars on the metal extension rod. The latter method is much the faster when individual pieces are being cut. When several pieces are being cut from one board, the inside and outside cut of each can be set by stop collars on the extension rod, while the step-up for each new piece can be made by means of holes in the wood arm. Without the wood arm, the extension rod and upright pivot can be used for cutting large circles beyond the capacity of the average circle jig. A hole half-way through the work pivots on the upright rod.

Special OPERATIONS

NUMEROUS operations on the band saw are not readily classified, and are most conveniently discussed under the heading of special operations. Some of the items in this chapter will be of special interest to production workers.

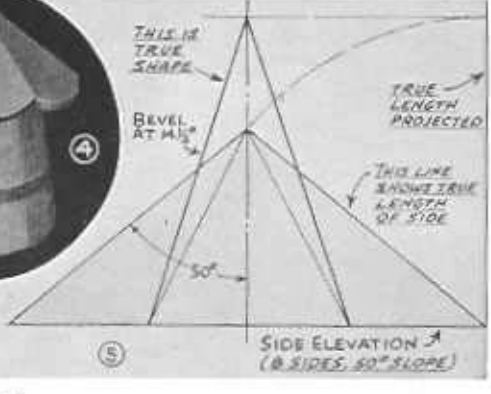
Loading Table.—A loading table or loading box is a device for holding odd-shape work which can not be manipulated directly on the band saw table. The example in Fig. 1 shows a stave for a hunting bow fastened to an auxiliary wood table by means of two pins, the whole idea being to provide a support for the work. A variation of the set-up can be made by nailing upright pieces at the end of the loading table and then nailing through the uprights into the work.

Parallel Curves.—Curved work which is to be ripped to an equal width can be cut with the use of a pivot guide, as shown in Fig. 2. One edge of the work is first cut to a pencil line. The parallel cut is then run in by working the stock against the pivot pin, as shown. The set-up is of little value for occasional work but can often be used to advantage on long runs of similar pieces. With a little practice, the skilled worker can cut ten or more pieces from a single board without the need of layout marks other than the initial starting curve.

Compound Cuts.—Compound cuts are usually made on the circular saw and a full description of methods and table of angles are given in the circular saw manual. However, it sometimes happens that a cut of this kind is made on the band saw. Fig. 3 is an example, which shows the eight sides for the

Loading box is useful for odd shapes. Below, parallel curves can be cut with the use of a pivot pin.

Compound cuts are easily made. Reference should be made to table in circular saw book for tilt table setting.



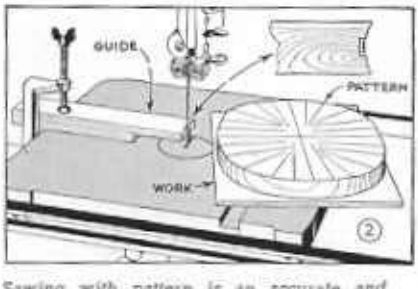
bird house roof, Fig. 4, being cut. The general idea of this work is that the shape of the piece is marked directly on the wood, substituting for the miter gage setting used for the same operation in circular saw work. The table tilt is the same as used for a similar cut on the circular saw. If the shape of the piece is to be determined at the workbench, the job starts with a front elevation of the project, as shown in Fig. 5. The slope should be marked at the required angle, and the drawing should show the shape of the work as viewed from the front. Then, erecting the side length, as shown, will give the true length of the work piece. The width of the piece remains the same, so that the true shape is as shown. It remains then to set the bevel by tilting the saw table and this setting is taken from the table in appendix of circular saw book. The example is an eight-sided figure with sides tilted 50° so the tilt table setting is 14½°. It is also practical to use the direct method of cutting, that is, setting band saw miter gage for the shape rather than using a marked outline.

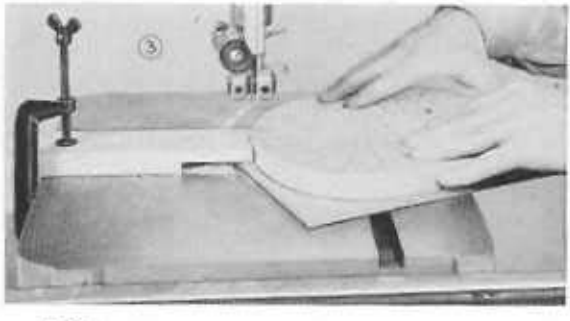
Sawing with Pattern.—Where a number of similar pieces are to be cut, sawing with the use of a pattern is a useful method of working. It requires a little skill in manipulating the work and can only be applied when curves are moderate. The set-up, as shown in Fig. 1, consists of a wooden arm which is clamped to the saw table. The end of the arm is cut to a curve, either concave or convex, depending on the nature of the work. The center of the curve in either case should be in line with the teeth of the blade, and a slight notch is made at this point to house the blade, as can be seen in Fig. 2.

A pattern cut to the required shape of the work is necessary. It should be smoothly sanded at the edges to reduce friction. The pattern is fitted with anchor points (nails or screws) so that it can be fastened to the piece of wood which is to be cut. Fig. 1 is a typical operation and shows how the pattern rides against the guide arm, while the combined pattern and work is manipulated to saw the required shape. The blade should just clear the pattern but must not cut into it; if the blade cuts the pattern, it should be set deeper in guide arm notch. After a little practice, work can be done quite rapidly. It is a little confusing at first to follow the pattern shape since the cutting is done blind and all that can be seen is the blade running parallel to the pattern. Some workers find it helpful to make pencil marks on the pattern at right angles to the edge, as can be seen in Figs. 2 and 3. Using the marks, the work is manipulated to keep the marks square with the blade, which amounts to the same thing as keeping the blade parallel with the edge of pattern.

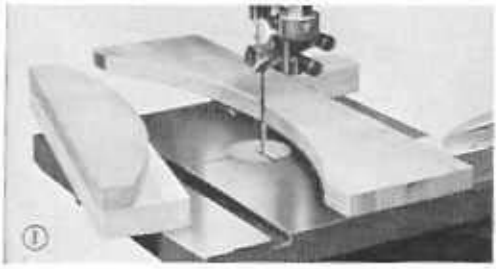
Jigs for Circular Arcs.—When the work is a regular curve, that is, part of a circle, a modified form of pattern sawing is faster and more accurate. This is set up as shown in Fig. 1 on opposite page. The guide is a piece of wood sawed to the same radius as the work. The guide is nailed to blocks of such thickness that the work can slip under it; the blocks also allow clamping to band saw table. As with the single guide point, the blade should be housed in the guide board. Fig. 2 shows the work being cut. It can be seen that as the pattern rides the guide, the blade will cut the same shape on the work.

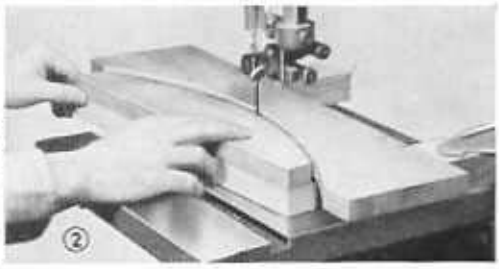
A production set-up of the same job is shown in Figs. 3 and 4. This is arranged so that a wide board can be cut into uniform curved pieces by re-setting the stop pins. No





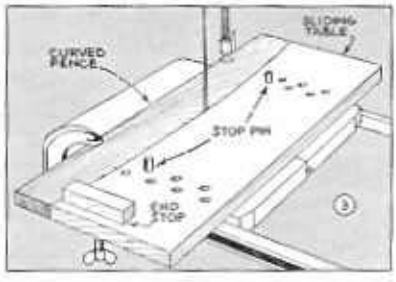
Sawing with pattern is an accurate and quick method of cutting duplicate parts.

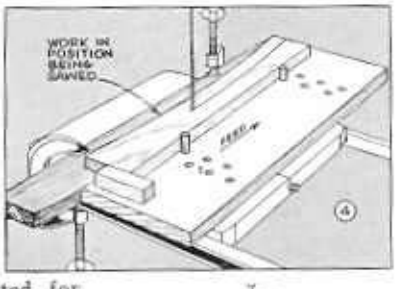




Regular curves are easily cut with pattern and guide fence corresponding to work shape.

anchor pins are needed since the dowel stops and end block locate and hold the work secure. This differs from the previous method in that the work rides on top of the pattern—the operator must develop a certain amount of "feel" to keep the pattern in contact with the guide which is under the work and cannot be seen.



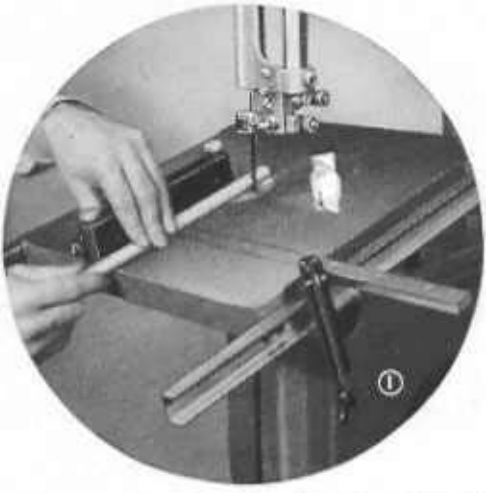


Parallel Curves.—Fig. 5 shows a simple set-up which is often useful for cutting on a line parallel with a previous cut. This method can be used for irregular curves as well as circular arcs. If a wood block is substituted for the band saw fence, the same system can be used for cutting almost any kind of slow curve where it is desired to have the second edge parallel to the first. The actual work requires a little skill since the shape is dependent on keeping the work in uniform contact with the mark on band saw fence.

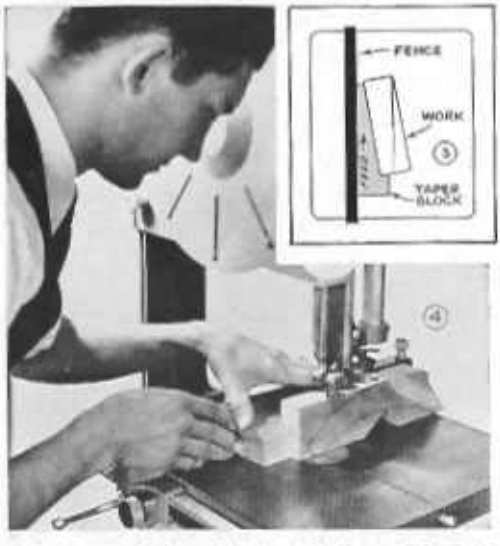
Left, simple method of cutting parallel curves. Below, pattern sawing a beveled curve.

Beveled Curves.—Regular pattern sawing methods as previously described can be used for beveled curves. The band saw table is tilted to the required angle and both guide and pattern are beveled. The work is done as before except an allowance must be made for the bevel angle. It is often more convenient to work with a level table, putting the bevel angle on the guide. This set-up is shown in Figs. 6 and 7; it is just the same as the job shown in Figs. 1 and 2 except the work is held at an angle in the pattern. It should be obvious that all jig work requires perfect tracking of the blade; this work is hopeless if the blade leads off to one side when tested on a straight cut.

Spiral Dowels. — Spiral dowels, which are preferred by many craftsmen for their superior holding power in glued dowelled joints, can be readily made on the band saw, as shown in Fig. 1 on the following page. The table is tilted fifteen or twenty-degrees, and the miter gage is clamped securely in position. The position of the miter gage should be set at such a distance from the band saw blade as to cut the required depth of groove. The work is then placed against the gage. The rod should be held firmly in the hand. It will feed itself in a perfect spiral, but the feed must be controlled to prevent the rod from being



Spiral dowels can be cut by tilting the table and rotating work against miter gage. Below, internal cutting simplifies the job of making cylinders.



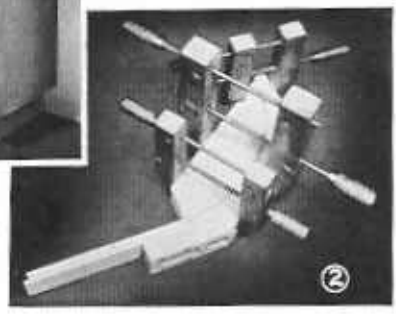
Both fixed and adjustable jigs for taper ripping can be used successfully on the band saw. Photo shows fixed type which is sawed to suit the work.

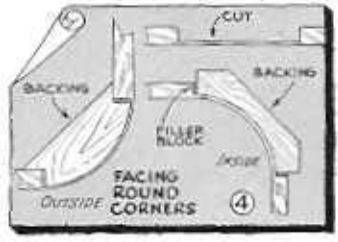
twisted along the gage faster than the blade can make the cut. This same idea can be used successfully for spiral turnings in marking the spiral and cutting the bottom of the groove. Where production warrants, proper table settings for cutting full vee-grooves could readily be determined. In this case, of course, the second and third cuts would be made with a guide pin engaging the first cut, the method of working being much the same as described in the circular saw handbook. Since the cut is shallow, the best blade for smooth work on any job of this kind is one with a minimum amount of set.

Cylinders.—While the band saw will not make an inside cut, it is often practical to saw into the internal cut and then patch the job when cutting is complete. A simple cylinder is a typical example. The outside is first turned or band sawed to shape. The cut into the inside cut should be made parallel with the grain because this provides the best surface for gluing. On most jobs of this kind it is advantageous to drill at least one turning hole within the area to be cut out. This will allow freeing the blade if for any reason the work should get jammed. Gluing of the entering cut can be done with direct contact, or, if accuracy is important, a slip of veneer can be inserted to fill the saw kerf.

Tapering Jigs.—Jigs for taper ripping on the band saw are similar to jigs used for the same purpose on the circular saw. A jig for an individual job should be laid out full-size on paper and then cut from wood. In use, the work is placed against the shoulder of the jig, and the combined jig and work is then pushed along the band saw fence, Figs. 3 and 4. Although the work will require jointing or sanding after sawing to remove the washboard, the band saw has much to commend it for taper work on thick stock. Any of the various adjustable tapering jigs for the circular saw can be worked just as well on the band saw.

Facing Strips on Curved Work.—In cabinet work it is frequently necessary to run a facing strip around curved work. This can be done without steaming if the facing strip is ripped to a thin section on the band saw, and then applied to a suitable groundwork or backing block. Fig. 1 on opposite page pictures a typical inside corner curve as applied to the base of a book shelf; Fig. 3 shows an outside curve for a hanging wall shelf or mantle. The thinned portion of the work need not be more than $\frac{1}{4}$ in. thick and may be even less than this if required. It is best to test the bend with a thin strip of wood before actually sawing the work. When the thinned strip is free at one end, the shoulder



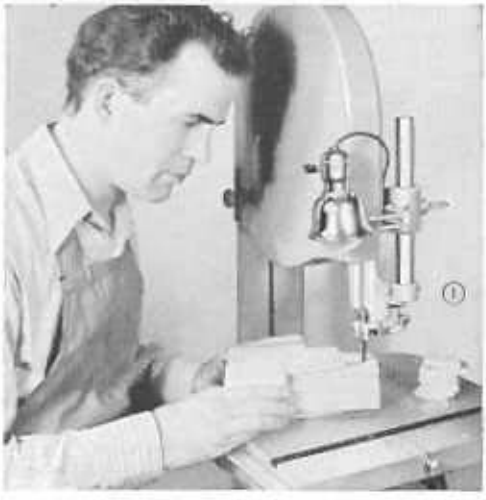


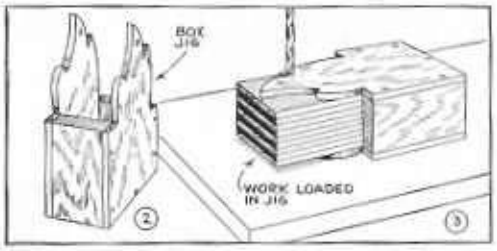
Facing strips for inside and outside curves are easily bent by thinning the curved portion. A thin wood strip should be used to test the bend before sawing.

is butted directly against the backing, as can be seen in Figs. 2 and 3. When the work does not have a free end, it is best to cut the thin section a little overlength and then take up with filler blocks, as shown in Fig. 4.

Kerfing.—Kerfing is a popular method of doing curved work in cabinet construction. In this method a number of saw cuts are made on the back of the work, leaving just a thin slice of uncut wood to take the bend. Fig. 6 is an example of kerfing done on the circular saw. Fig. 7 shows the set-up for kerfing on the band saw, the miter gage being rotated a few degrees so that the work will clear the column. Because band sawed kerfs are narrower, they permit more cuts for greater flexibility. Average work should have cuts spaced from ¼ to ½ inches apart; it is easy to make a small test piece to check the bend. The actual workpiece should not be bent too abruptly lest it break or splinter. A cautious half-bending of the piece followed by a hot water sponging, Fig. 5, and then proceeding with the full bend will permit much sharper bends with less danger of splintering. It is important that cuts be evenly spaced and uniform depth for an even bend. On the band saw, the spacing is made by marking a line with pencil on the miter gage stop and then lining each kerf with the mark to set the next cut. A stop block clamped to table controls the depth.

Curved parts can be readily formed by kerfing on circular saw or band saw. Band sawed kerfs are narrower and permit more cuts for greater flexibility. Cuts must be evenly spaced to get a uniform bend. Sponging with hot water will minimize chance of splintering the work.



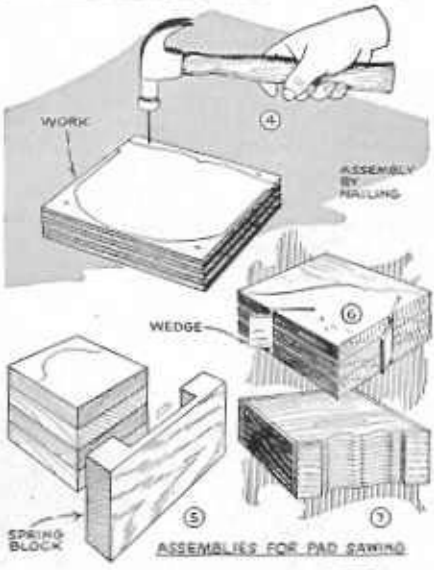


Above and right, various methods which can be used in band sawing cutout work in multiple units.

Sawing in Multiple.—In order to save time in production work, and often as a means toward accuracy in cutting duplicate parts, wood parts are frequently sawed in multiple. The general method consists of making a pad of the work by stacking layers of lumber on top of each other. Eight or ten designs in, say ¼-inch plywood, can thus be cut in one operation.

Various methods are used to hold the pad securely in place while cutting is being done. One of the best methods for production work is the box jig, as shown in Figs. 1, 2, and 3. Fig. 2 shows the jig, which is a simple box affair with plywood face and back cut to the required work shape. The distance from face to back is made to accommodate seven or more pieces of the work material, which in this example is ¼ in. plywood. The blanks are first cut to net width and length on the circular saw, and are then loaded into the box jig. On a stock material like plywood, no trouble is normally encountered as regards the combined thickness of the work, especially if the pad is confined to no more than ten pieces. Where work thickness may vary, the top of the box jig is usually mounted by means of bolts and wing nuts, this arrangement providing an adjustment to suit thickness variations and also to clamp the assembled pad securely in the jig.

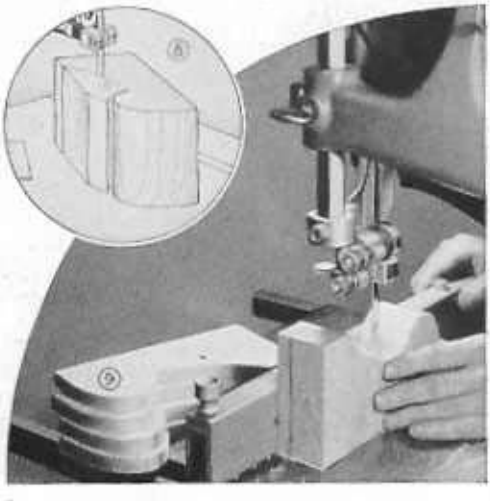
Fig. 3 shows the jig loaded and the work being drilled to facilitate turning of the band saw blade. It will be apparent that the jig also provides a guide for any holes which must be drilled through the work. Fig. 1 shows the work being cut, the edges of the jig serving as a pattern. Once a set-up of this kind has been made, the work can be turned out rapidly. A 12-piece load is not excessive for ¼ in. plywood (a 3 in. thickness). When working thick pads it is important to have the table perfectly square with the blade since any tilt would make the bottom piece of pad a different size than the top piece.

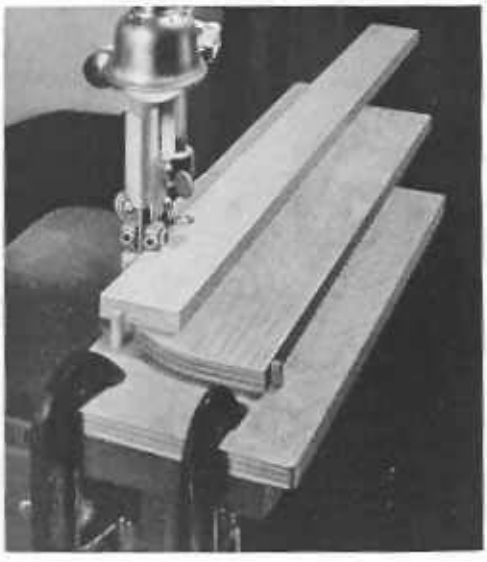


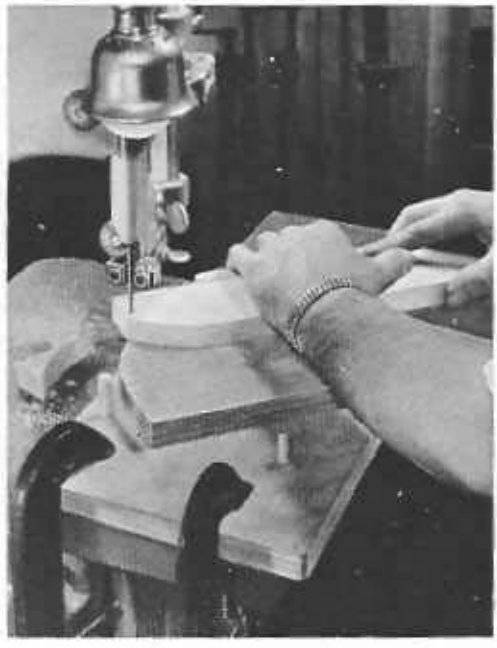
ASSEMBLIES FOR PAD SAWING

Other Pad Assemblies.—For occasional work, assembly by nailing, as shown in Fig. 4, is the method commonly used. The nails are usually

The pad method is reversed when the work is first cut to shape and then ripped apart.







Jig for cutting fence pickets is pivoted on dowel pin like corner rounding jig, page 28. A radius of about 4 in. from dowel to band saw blade will cut a suitable curve in 1 x 3 inch picket stock.

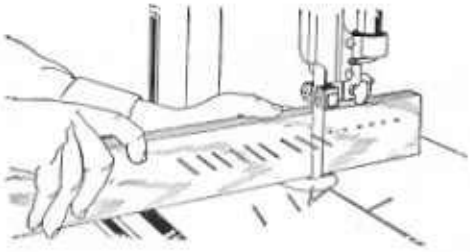
driven into the waste portions of the design. Work having two or more drilled holes can be held with wood dowels, or the dowels can be fitted in a wood base to make a permanent jig for the job. Fig. 5 shows the manner of making up a pad with a spring block, the opening in the block being cut to such a size as to be a spring fit over the work. Various kinds of metal clips, both fixed and adjustable, are also used for this kind of simple clamping. Fig. 6 shows an assembly by wedges. This type of pad assembly is most practical when other cuts required for the work also provide openings for the wedges. If the work has one drilled hole, a combination of one dowel and one wedge can be used. Fig. 7 is a box jig which is loaded from the top. The box is made to hold several pieces of work plus the master pattern which is fitted on top of the pad. Jigs of this kind usually have some kind of simple clamp at the top to press the work pieces together; a pressed pad cuts clean whereas individual pieces of a loose pad may show some splintering on the underside of cut.

Mass Cuts by Ripping. — For production work, the "rip apart" method of making duplicate pieces is often useful. This is just the reverse of pad sawing, the solid wood first being cut to the required shape on the band saw, Fig. 8, and then ripped to thickness, producing a number of thinner duplicate parts. Ripping is sometimes done on the circular saw, but because of the excessive waste in the saw kerf is more practical if done on the band saw, as shown in Fig. 9. A light sanding is then required in order to bring the band sawed faces to a smooth surface, this work being easily and quickly done on the 6 in. belt sander.

Cutting Fence Pickets.—A modification of the corner rounding jig shown on page 28 can be used for cutting fence pickets, as shown in the photos above. Like the corner rounding jig, this consists of a wood base which is clamped to the band saw table. The base carries an auxiliary table fitted with wood guide fence and pivoted by means of a dowel pin in the same manner as the corner rounding jig. The stop for end of work is a dowel pin, and a second dowel pin locates the jig square with the blade for the start of the cut. Like all other circle cutting jigs, the pivot point must be in line with the cutting edge of band saw blade to prevent run-out or run-in when making the cut. A radius of about 4 in. from dowel pin to blade will cut a suitable curve on standard 1 x 3 stock. After the cut is made on one edge, the picket is turned over for cutting the opposite side in the same manner.

Using Jigs for Mass Cutting.—While most of the jigs in this chapter have been shown cutting a single work piece, it is obviously practical to use them for multiple cuts. Corner rounding and picket jigs, for example, could carry a pad load of two to ten pieces depending on work thickness. Of course, work set-ups depend on the number of pieces to be cut—the worker with a 5,000 piece job can afford time and money on a jig which will speed production.

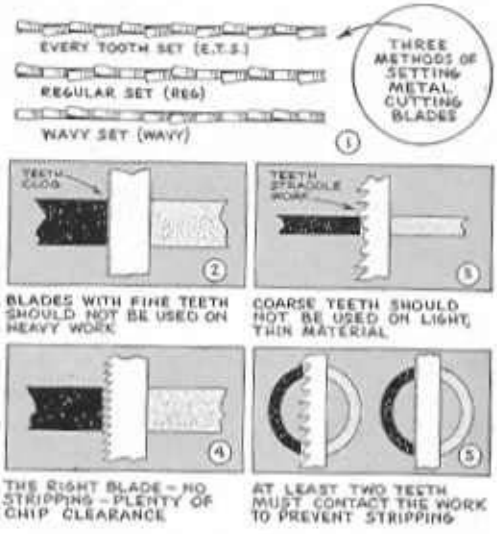
METAL *Cutting*



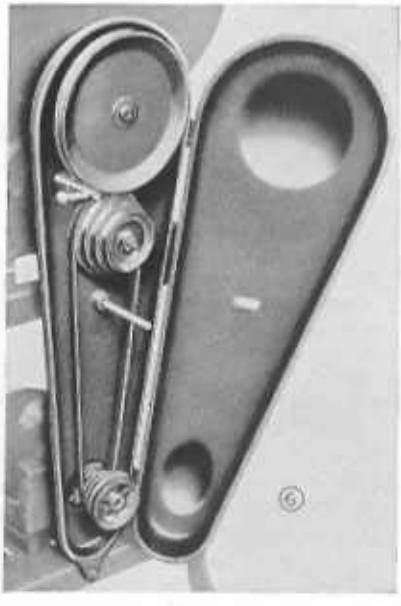
ONCE considered only a wood sawing machine, the band saw has gradually worked into metal cutting operations and is today recognized as one of the best tools for this purpose. What is more, the two operations can be readily handled on the same machine—all it takes is a change of blade and speed to suit the work being done.

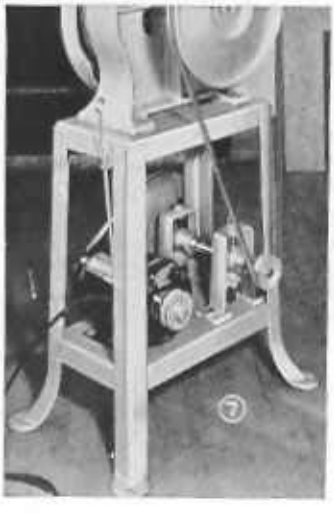
Metal Cutting Blades.—Blades for metal-cutting are much finer-toothed than blades for cutting wood. A good selection for the small shop would be saws with 14, 18 and 24 teeth to the inch. The coarser toothed blades are excellent for the softer metals, such as copper, brass, aluminum, etc., while the 24-tooth blade is better for cutting thin sheet stock in any metal. Most metal blades are hardened and tempered, making it impossible to resharpen them with any equipment within the reach of the small shop. The life of a new blade, however, is quite long. When dull, the blade should be discarded.

Three different styles of set, as shown in Fig. 1, are commonly used for metal cutting blades. Blades with every tooth set, alternating right and left, are similar to wood-cutting blades. This style of set can be used for cutting all of the softer metals. "Regular" or "raker" set blades have one unset raker tooth to each pair of set teeth, the raker tooth serving to keep the cut clean. This style of set is used for cast iron, steel, monel metal, etc. The "wavy" set blade has teeth set in groups, one set of teeth forming a wave to the right, while the next set forms a wave to the left. This style of blade is extensively used for cutting thin metals, such as pipe, metal tubing and radiator cores. For general work in sawing all kinds of materials, the regular or raker set blade is the best.



Above, proper use of metal cutting blades. Photos show slow speed units for metal cutting.





The blade must be selected with regard to the sharpness of curves which it must cut. The limits are somewhat higher

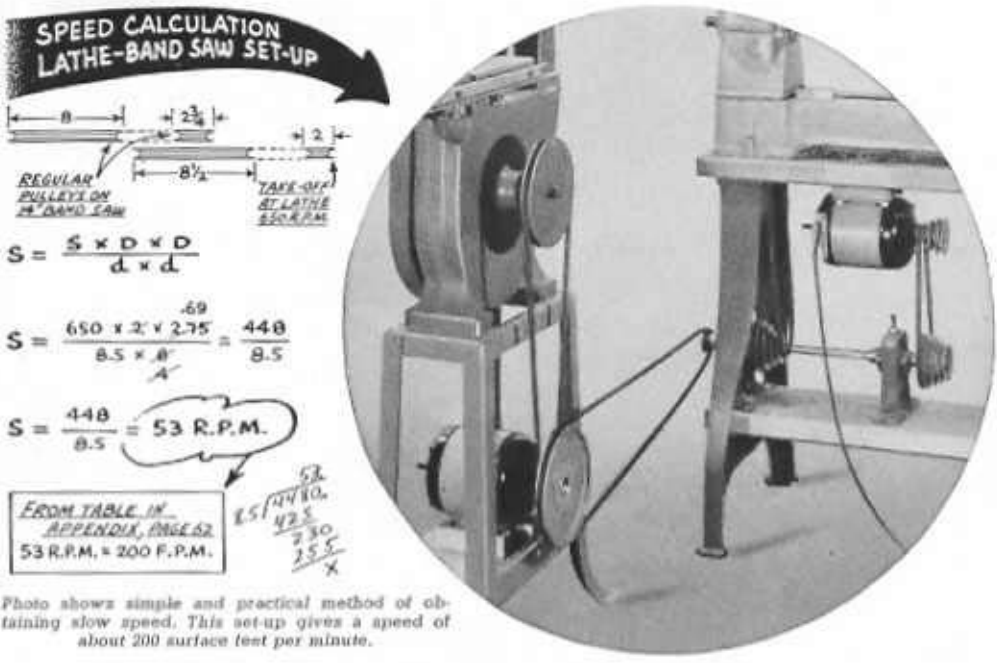


Photo shows simple and practical method of obtaining slow speed. This set-up gives a speed of about 200 surface feet per minute.

than for corresponding blade widths used for sawing wood. A ½ in. blade can not cut a circle less than about 6 in. diameter; a ¼ in. blade will cut a radius of about 1 in. (2 in. diameter). It must be said that the cutting of sharp curves depends to a great extent on the amount of blade set and the skill of the worker in manipulating the job; no table of radii capacity can be accepted as other than an approximation. Since most metal cutting is in the form of straight lines or mild curves, the best all-around blade is ½ in. wide.

An important consideration in blade selection is the number of teeth per inch. As shown in Fig. 2 on the opposite page, too many teeth in contact will cause clogging, while not enough teeth in contact, Fig. 3, will lead to stripping of the teeth. The general rule is that two or more teeth must be in contact with the work at all times. For general work, 14 or 18 teeth per inch will be found most satisfactory. Combining all of the items previously mentioned, it can be seen that the best all-around blade is ½ in. wide, 18 teeth per inch, regular (raker) set. Reference should be made to the table on page 63 in selecting a blade for a specific material.

Slow Speed Essential.—Slow speed is needed for metal sawing. An exception to this is the friction sawing technique which makes use of a high velocity blade speed, but for conventional sawing the blade speed should be in the neighborhood of 200 surface feet per minute for average work. Steel requires a slower speed than soft metals, and thick sections demand a slower speed than thin sections. When the blade speed is too high, the teeth are not given time to bite into the metal. The result is a skidding, rubbing action which fails to cut the metal and also leads to rapid dulling of the blade.

Several different methods are used to obtain the required slow speed needed for metal cutting. The back-geared band saw, Fig. 6 on opposite page, is especially designed for sawing metals, and has a built-in gearing system combined with a 4-step pulley drive to give speeds of 125, 175, 250 and 340 f.p.m. By changing belts and driving to the large pulley seen at top, the normal wood cutting speed of 2200 f.p.m. is obtained. The countershaft drive, Fig. 7, can be set up for a speed of about 225 f.p.m. by using a 2:10 and 2:12 reduction. With this set-up, an efficient wood cutting speed is obtained by driving direct from the motor, using the same belt.

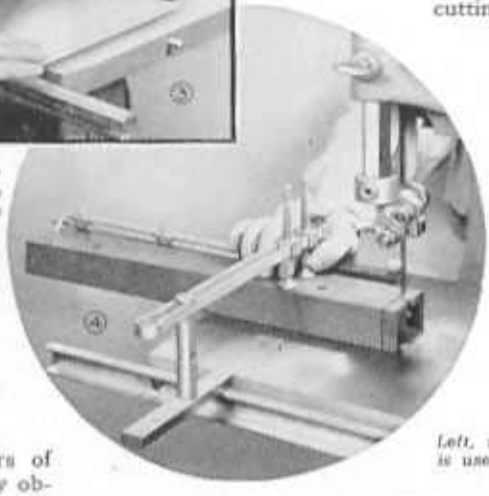
For occasional work, a simple method of reducing speed is to drive from the wood lathe countershaft, as shown in the photo above. The calculation is worked out and can be readily applied to other sizes of pulleys. The 8½ in. pulley which is fitted to the band saw motor shaft can be left in place permanently provided it is well balanced. In use, the band saw motor is not in operation—it simply provides a jackshaft to carry the pulley. The belt for this set-up should be about 75 in. long. Under normal conditions the two machines involved will stay put under their

Above, using an auxiliary wood table under work to prevent burring of thin sheet metal.

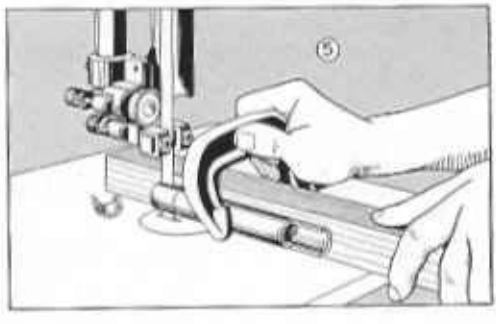
own weight. However, if heavy cutting is being done, it is best to make up a spacer board and span this between band saw and lathe to keep the machines from walking. Owners of metal lathes can easily obtain extremely low speeds by using a drive from the lathe spindle turning at low speed. Other speed-reduction drives are obtained by the use of gear boxes. While these are excellent for the purpose, they do not readily combine with the higher speed needed for wood sawing.

Cutting Thin Metal.—Despite the use of a fine-tooth blade, thin metals will invariably burr on the underside of the cut, as shown in Fig. 1. This is especially noticeable when the softer metals are being cut, and is caused by the light body of metal being improperly supported at the point of cutting. This burring can be avoided and clean cuts made if an auxiliary wood table, through which a saw cut is run, as shown in Fig. 2, is used. When the metal is cut on this table, as shown in Fig. 3, it is fully supported at the point of cutting and the underside of the work shows a clean edge. The principle is very much the same as that used in backing up holes in drilling with the drill press. Other methods are employed to the same end. The metal can be glued to a wood base or sandwiched between two boards to obtain the necessary support. This method of backing is impossible when thin-wall tubing is being cut, and in this case it becomes necessary to plug the tubing with dowel rod if clean cutting is required. It is usually simpler, however, to let the work burr and then clean out the opening with a reamer.

Methods of Clamping.—Clamping is used extensively in cutting metal. This is sometimes absolutely necessary, such as in cutting tubing or pipe, while in other cases clamping is employed only to simplify the work. Metal cutting is comparatively slow work, and very often a simple clamping device will eliminate the strain of holding the work for freehand cutting. As in cutting wood, good use can be made of both the ripping fence and miter gage, together with the stop rod and miter gage clamp attachment. Fig. 4 shows a typical operation where a length of channel iron is being cut to exact size. The stop rod sets the length, while the use of the clamp attachment relieves all operating strain as the cut is being made. An-



Left, miter gage clamp attachment is useful for holding work. Below, method of slotting pipe.



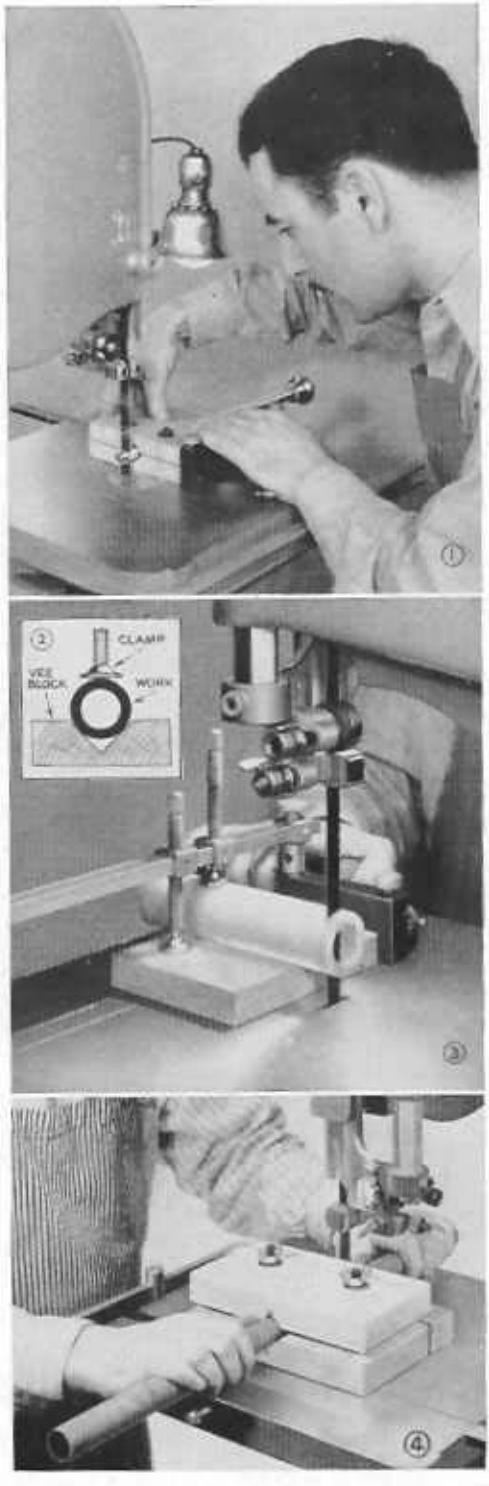
other example of simple clamping is shown in Fig. 5 where a section is being cut out of the end of a piece of pipe. The cross cuts are made first, using any of the holding devices shown on the opposite page, after which the work is clamped to a square piece of wood for the lengthwise cuts, as shown.

Cutting Round Material.—Round material, both solid and tubular, including plastics, pipe, thin tubing, etc., should always be clamped securely for sawing. This applies especially to tubing, which is almost impossible to hold freehand against the constant drag of the saw. A simple vee block, in some form or other, is the most com-

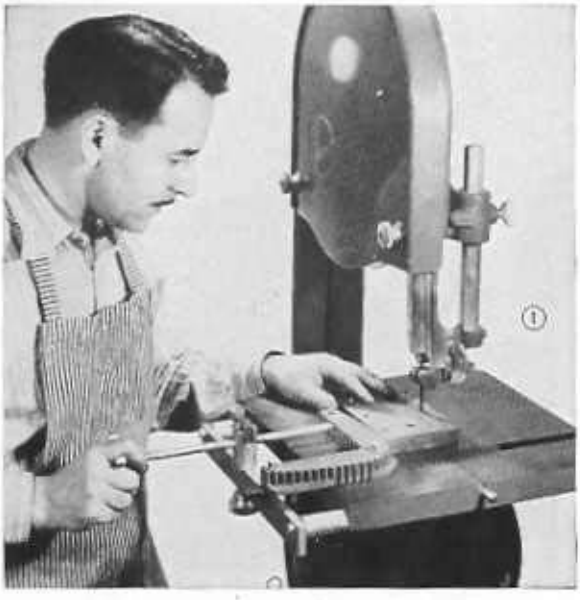
monly used clamping device. Fig. 1 shows a double vee block provided with through bolts for clamping the work in place. This style of block can be made up to accommodate a wide variety of sizes, and it possesses the advantage of permitting a freehand feed which is sometimes necessary because of the shape of the work. A single vee block used in combination with the miter gage clamp attachment is shown in Fig. 3 and diagrammed in Fig. 2. A double vee block is shown in Fig. 4. This is somewhat similar to Fig. 1 except it has its own guide bar screwed to the underside of lower block. Bolts and wing nuts provide the required clamping tension and also make it easy to adjust the blocks to suit various sizes of work. The same set-up can be used for square stock.

Auxiliary Clamping Table. — Odd-shaped work often defies any conventional method of clamping and must be held by special fixtures. A simple and useful device of this kind is a sturdy wooden table with a slot cut half way across to accommodate the saw blade, as can be seen in Fig. 5. The work is fastened to the wood table, using carriage bolts with the heads countersunk on under side to clear the band saw table. As many bolts, blocks and clamp bars as needed can be fitted to hold the work secure. The work should be positioned so that the required cut is in line with the slot cut in the wood table. Once solidly mounted, it is a simple matter to manipulate the work into the blade. The table can be saved and used for other jobs requiring special clamping.

Wood clamping table shown in photo below can be used for a wide variety of odd-shaped work which cannot be clamped by conventional methods.



Various methods of clamping round work. It is almost impossible to feed metal cylinders without clamping since the work tends to roll under sawing pressure.



Screw feed attachment takes the hard work out of feeding work to the saw blade. Photos show various ways to make the feed.

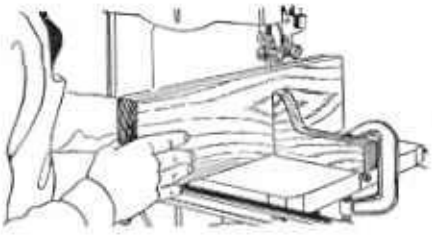
pressure as needed to guide the cut.

When using the screw feed, a uniform feed should be employed. This will depend on the thickness of the work, but is easily determined in all cases by the feel of the cut. Screw feed is a muscle saver and produces better work in most cases than hand feeding. However, the hand feed is faster, more convenient and more sensitive; it should be used for all short cuts in thin work.

Feeding with the use of a weight is one of the most practical methods of making cut-offs, and is particularly suited for production runs. The set-up is shown in Fig. 4. The work is supported by the miter gage fitted with clamp attachment. A block clamped to the table sets the proper length of the cut-off, and another block stops the forward travel. The rest of the set-up consists of a flexible wire running over a pulley screwed to edge of table. Weight should be about 15 lbs. for average work.

Mechanical Feeds.—The job of holding a heavy piece of work in contact with the blade takes just as much effort as bearing down on a hack saw when sawing by hand. In order to eliminate this strain, various mechanical methods are used to make the feed. The screw feed, as shown in Figs. 1, 2 and 3, is a simple and inexpensive gadget for this purpose. The pivot block is fastened to a bar which slides in the band saw table slot. The block can be fastened to the bar in either of the two positions shown, Figs. 1 and 2, or it can be detached from the bar entirely. The latter set-up is used when it is desired to use the screw feed for cutting a curve, as shown in Fig. 3. The feed screw has a quick release, Fig. 2, and this, combined with the serrations on pivot block, permit changing the line of

Weight feed shown below is excellent for cut-off work. A weight of about 15 lbs. is satisfactory for most work but can be increased as needed.



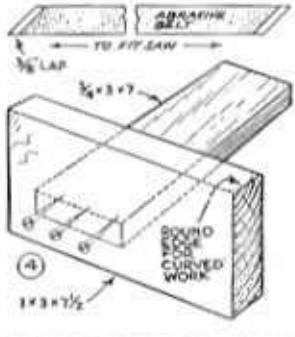
Band Saw SANDING

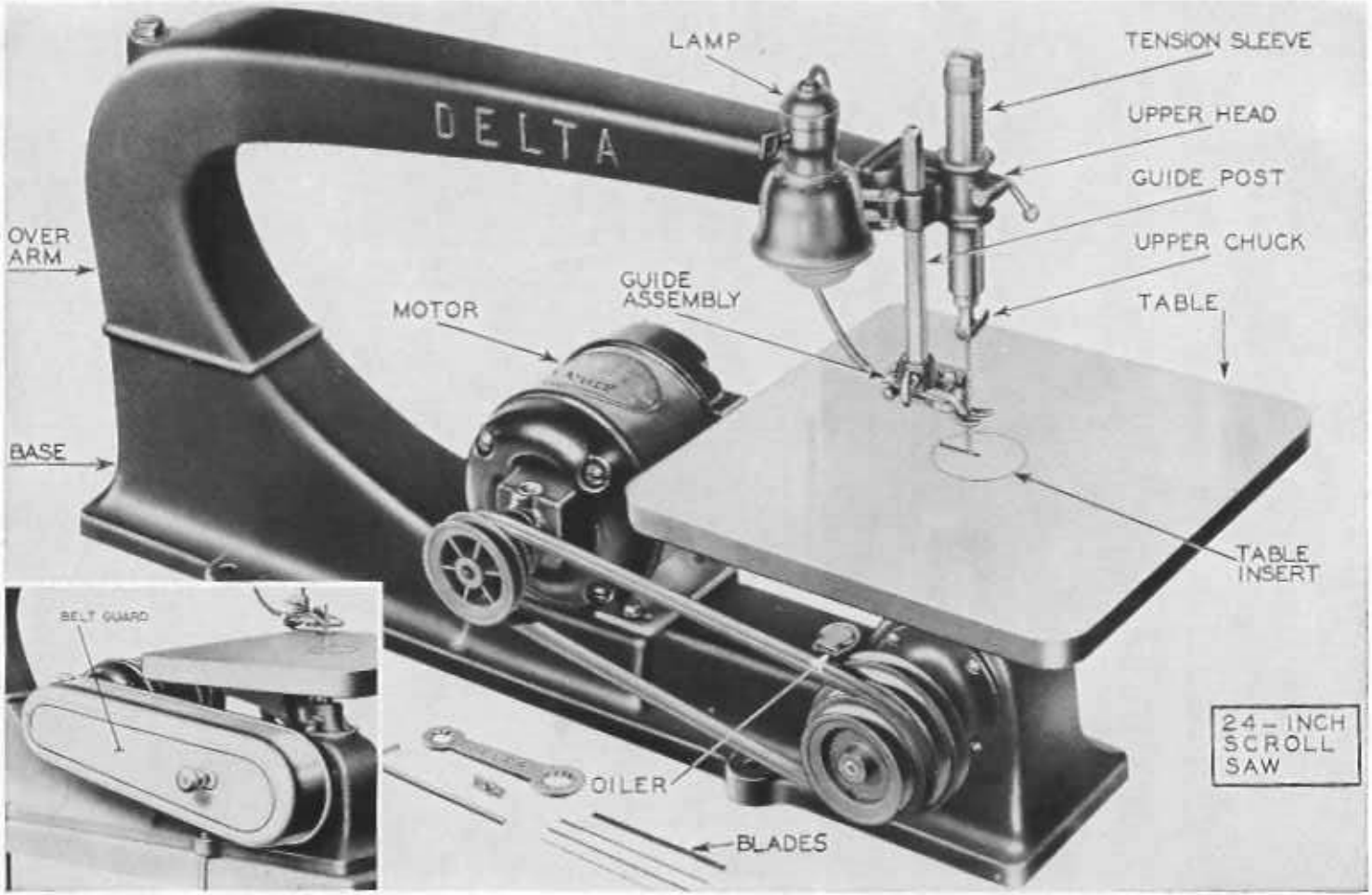
SANDING on the band saw with 1 inch wide belts offers an excellent method of finishing edges and rolling curves. Belts can be purchased in standard grits or made up in any grit as desired. For general work, 80-grit aluminum oxide is recommended for metal, while garnet belts of 60-grit will handle most work in wood.

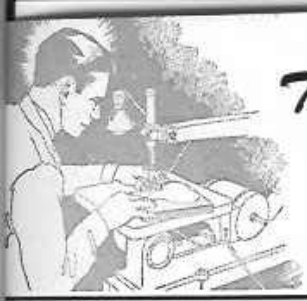
Making Belts.—Abrasive belting is purchased in rolls of 50 yards. It is useful for general shop work as well as band saw sanding. A belt for a 14-inch band saw will require about 3 yards. The ends of the belt are cut at an angle of 45 degrees after figuring the exact length needed, allowing for a 3/8 inch lap. The abrasive should be removed from both ends of the belt to make the joint. This is usually done dry with an abrasive block, Fig. 2, although the job can be speeded-up somewhat by dampening the surface slightly with water applied with a toothbrush. The belt is then bradded along a straight edge, Fig. 3, and the splice is glued and clamped. Thin glue should be used. If you use some standard brand of ready-mixed glue, it is best to thin it about 30 percent with water. Thick, heavy glue will make a definite hard spot which will bump.

How to Sand.—The belt is fitted in place just like a blade, using just enough tension to pull the belt tight. Special guides are available for use with belt, but if you do not have this equipment you can do nice work with a wood guide, Fig. 4. This is positioned behind the belt, as can be seen in Fig. 1, the arm being clamped to the band saw table. The roller supports and the right hand guides, top and bottom, should be backed off. It is also practical to use the belt without a support, and this method of working is recommended for rolling curves, Fig. 5. Where a semi-rigid backing is required, a block of felt nailed to a board does nicely. Sanding is done at the regular wood cutting band saw speed. The slot in table insert will take belts up to 1 inch wide. However, when the work is large, it is just as well to remove the insert entirely.

Either special factory-made guides or a simple wood backing block can be used for belt sanding on the band saw.




DELTA
LAMP
TENSION SLEEVE
UPPER HEAD
GUIDE POST
UPPER CHUCK
TABLE
OVER ARM
GUIDE ASSEMBLY
MOTOR
BASE
TABLE INSERT
BELT GUARD
OILER
BLADES
24 – INCH SCROLL SAW



The Mechanics of the SCROLL SAW

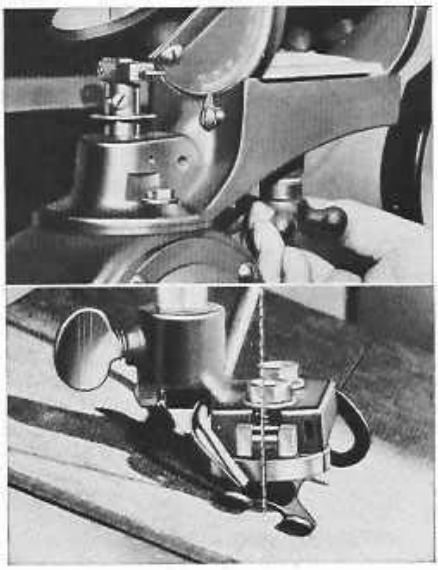
THE heart of the scroll saw is the crankshaft—an ingenious mechanical arrangement that converts "round-and-round" into "up-and-down." This part of the machine must be precision-balanced if the machine is to run at high speed without excessive vibration. Apart from the driving mechanism, the scroll saw resolves itself into a quite simple machine by simply attaching a blade to the moving plunger and fitting a table around the blade upon which the work can be supported. Although many saws will cut up to 2 inches thick, the main use of the scroll saw is the cutting of intricate shapes in thin stock. Internal cuts can be made as readily as external; the outstanding feature of the scroll saw is its ability to make the inside cuts on pierced work.

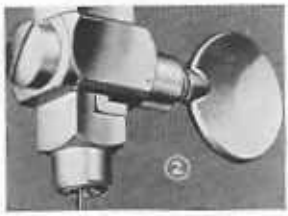
Size.—The name size of the scroll saw is generally expressed in terms of the throat opening, that is, the distance between the blade and the support for the upper arm. Thus, 24-inch scroll saws measure 24 inches from the blade to the front edge of the upper supporting arm. A machine with 24-inch throat capacity will cut to the center of a 48-inch circle, while provisions are made on some saws for extension arms which permit the handling of much larger work. Another important index to size is the cutting capacity—the thickness of stock which can be cut on the machine. This generally averages about 2 inches, which is as heavy as the mechanical structure of the saw can cut successfully.

Power and Speed.—Very little power is required to operate the scroll saw. A good ¼ HP motor is ample for average cutting, while ⅓ HP will give plenty of power for heavy, continuous duty. In either case, the motor should be constant speed, 1725 RPM. Properly coupled with cone-pulleys, the saw will have four speeds approximating 650, 1,000, 1,300, and 1,750 RPM. Some of the better scroll saws are fitted with multi-speed drive worked by expanding vee pulleys controlled by a crank, as shown in Fig. 5 on following page. With this arrangement, any speed from 650 to 1700 RPM can be obtained by simply turning the crank.

Table Adjustments.—The table of the modern scroll saw has two main adjustments—it

The scroll saw is the ideal tool for intricate cuts, internal or external. Below, tilt table control and view of hold-down tilted to match.





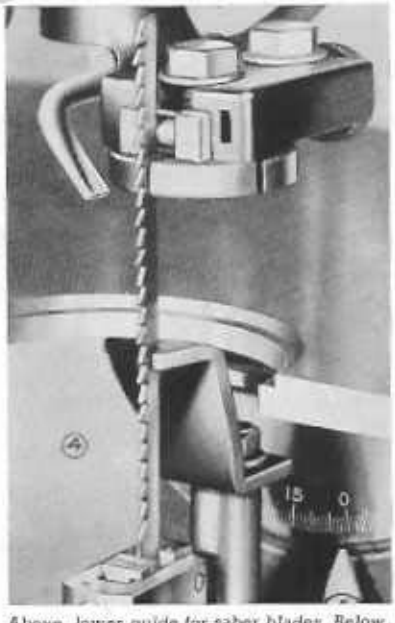
Above, self-centering chucks are convenient for mounting fine blades. Right, a set of individual guides for the scroll saw.

can be tilted to permit bevel cutting, and, it can be rotated to give clearance space when handling large work. The most-used of these adjustments is the tilt, usually controlled by a knob under the table, as shown in the center photo on previous page, which is loosened to permit the table to swing on trunnion mountings. A scale is usually provided, which, after once setting at zero with the table perfectly square with the blade, will accurately register any degree of tilt up to 45 degrees either right or left. This same picture shows in the foreground one of the two capscrews which are loosened to permit the entire table mounting to be swivelled through 90 degrees. No arrangement is made for tilting the guide to match the tilt of the table, but an adjustment is provided, as shown in the lower photo on the previous page, for tilting the spring hold-down so that it will contact the work evenly.

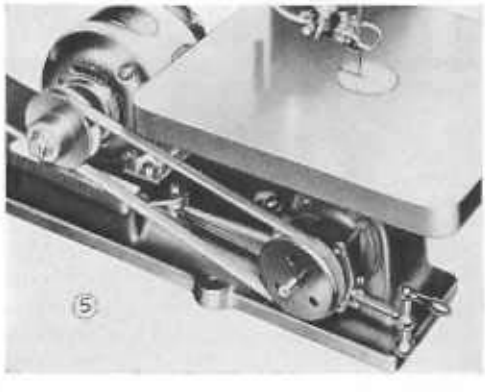
Special Chucks.—The chuck is the small vise which is attached to the plunger, its purpose being to clamp the blade in position. The average machine has two chucks, one on the end of the driven plunger, and another on the end of the upper plunger. Some blades are held at either end in both chucks, others are held by the lower chuck only. In addition to the standard chucks, self-centering chucks for both upper and lower plungers, Figs. 1 and 2, are frequently useful where fine blades are used extensively.

Special Guides.—While the universal guide will successfully handle practically any blade, special guides designed to fit one particular blade are often useful. Complete sets of these guides, as shown in Fig. 3, are available for most saws and are preferred by many workers. Another special guide is shown in Fig. 4. This guide is fitted below the saw table, its purpose being to support saber blades. Used in conjunction with the upper guide, it enables perfect straight-line work to be done, as there is no opportunity for the blade to spring. In some special cases, but only where an extremely stiff blade is used, the lower guide can be used alone as a support for the blade.

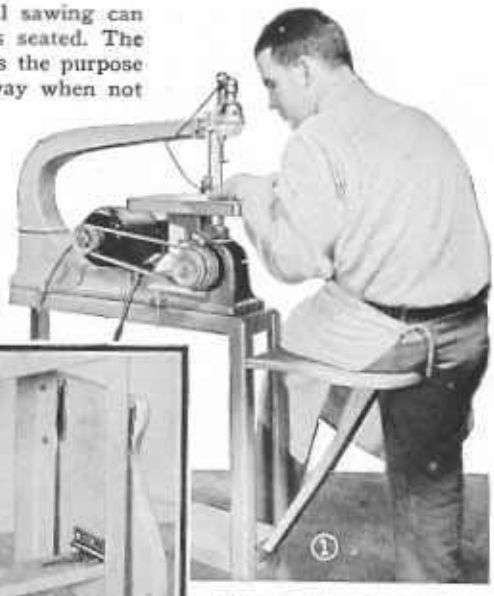
Multi-speed Drive. — The multi-speed drive with belt guard removed is shown in Fig. 5. It is the ideal way of making speed changes on the scroll saw, not so much on the basis of infinite speeds but the fact it eliminates belt changing. Any speed from high to low can be obtained by merely turning the crank. About 25 full turns are needed to cover the full speed range, and this fact can be used in roughly estimating the speed at which the saw is running. However, any operator using this equipment quickly acquires a "feel" for speeds, and will automatically set the speed to suit the work being sawed.



Above, lower guide for saber blades. Below, multi-speed drive gives variable speed.



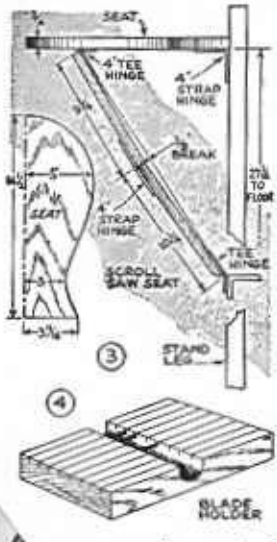
Scroll Saw Seat. — Many operations in scroll sawing can be done more conveniently if the operator is seated. The simple unit shown in Figs. 1, 2 and 3 answers the purpose fully, yet can be readily swung out of the way when not in use. Looking at the construction, the most important thing is the "break" in the supporting arm, about ⅜ in, as shown in Fig. 3. This serves to hold the seat rigid, eliminating any possibility of the seat collapsing when in use. Ordinarily the operator straddles the seat. The "side saddle" position shown is intended simply to better show the seat in use.



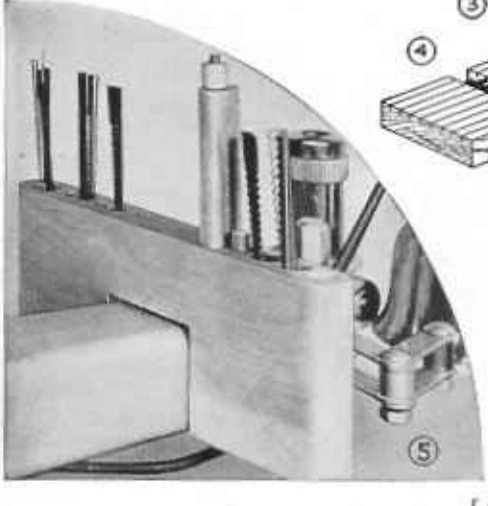
This simple scroll saw seat can be easily swung out of the way when not in use.

Blades. — Many different sizes and styles of blades are supplied for the scroll saw. All blades, however, readily classify themselves into one of two main divisions — (1) blades which are gripped by both upper and lower chuck, commonly known as jeweler's blades, and (2) blades which are held in the lower chuck only, known as saber blades. The jeweler's blades are useful for all fine work where short curves predominate, while the saber blades are faster-cutting tools for heavier materials where curves are not too abrupt. Jeweler's blades can, of course, be used successfully in heavy material up to the full capacity of the saw. The larger sizes of jeweler's blades are very near to the same dimensions, in both gage and width, as the smaller sizes of saber blades.

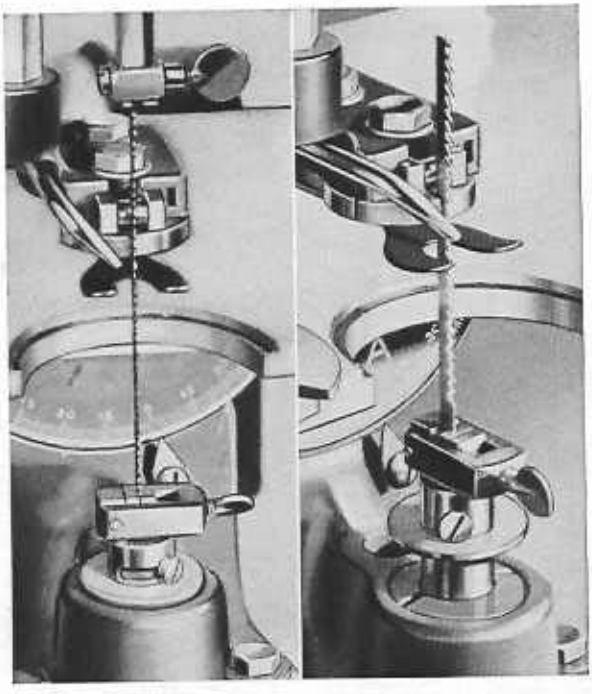
Blade Racks. — Because of frequent change of blades, some form of rack to hold the commonly used sizes is a great convenience in scroll saw operation. A suitable blade holder for bench use can be easily made by running a number of saw kerfs through a suitable piece of ¾-inch stock, as shown in Fig. 4. Another form of rack consists of a length of ¾-inch stock, notched to fit over the upper arm, and drilled with a number of holes to receive the various blades and accessories, Fig. 5.



Below, blade holders for both machine and bench use are easily made to hold a variety of scroll saw blades.



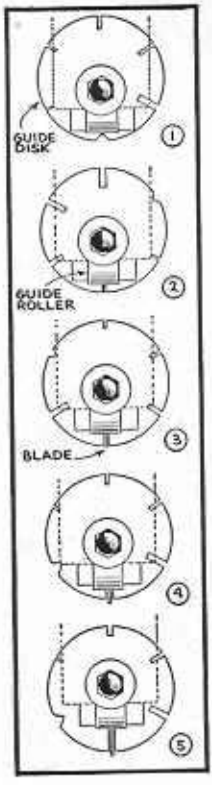
Fitting Blades. — Jeweler's blades are held between the flat jaws of both upper and lower chuck; saber blades are held between the vee jaws of the lower chuck only. The exact method of mounting should be apparent from the photos shown at the top of the following page. It will be noted that when saber blades are used, the lower chuck must be turned around. This is easily done by loosening the set screw which holds the chuck, swinging the chuck over, and then retightening. The saber blade will naturally align itself in relation to both table and guide, but there is some chance of mis-alignment in mounting jeweler's blade. This can be avoided and the blade mounted quickly if a guide block is used, as shown in the photo in circle. This consists of a wood



Jewelers blades are held in both upper and lower chucks as in left photo above, while saber blades are held in the lower chuck only and always between the vee jaws of the chuck.

block in which is cut one or more saw kerfs. With the block held on the scroll saw table and the blade held in the kerf, proper alignment in both upper and lower chucks is assured. With a little practice, perfect blade setting can be made without using the guide block.

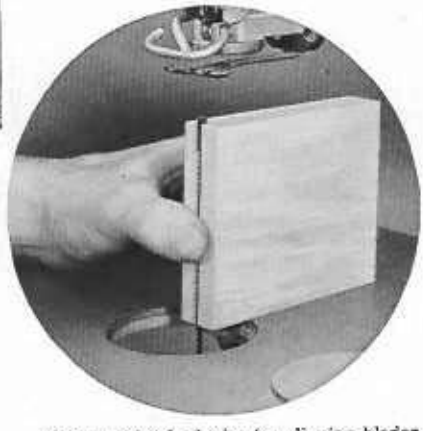
Adjusting Guide. — The universal guide consists of two parts: (1) a disk which guides the blade, and, (2) a roller which supports it. Both of these parts can be seen in the two upper photos. The disk has a number of slots around its rim, these being of different widths to fit various blades. The slot selected should be neither too loose nor too tight. The disk is adjusted to bring any slot to the front by loosening the screw which holds it in place and turning the disk to the required position. In regards to the width of the blade, the guide is set so that the forward edge of the disk is just behind the bottom of the blade teeth. The roller support is worked independently, and



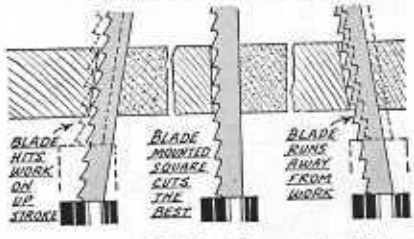
should be moved forward until it just **lightly** touches the back of the blade.

No matter what the thickness or the width of the blade, a slot and a roller position can be found that will guide it correctly. Figs. 1 to 5 illustrate this point clearly. The vee notch on the rim of the disk is used for very fine blades, as shown in Fig. 1. Blades of such small size work just as well without a guide, and the guide is often removed entirely, the tension of the blade itself being sufficient to guide it. The vee notch, if used, is not really a guide but simply a back support since the very fine blade is not wide enough to afford any appreciable rudder.

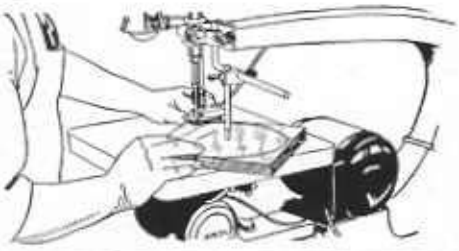
Blade Alignment. — The drawing below tells the story of right



Above, a simple device for aligning blades. Diagram below shows effect of misalignment. Left, various settings of the universal guide to suit different blades.



and wrong blade alignment. When viewed from the side, the blade should move straight up and down when the saw is running, as shown in center diagram. If the blade slants forward or back, it will cut with a jerky action, moving the work on each stroke without cutting it. Always make it a point to check blade alignment when mounting a new blade.



Scroll Saw OPERATIONS

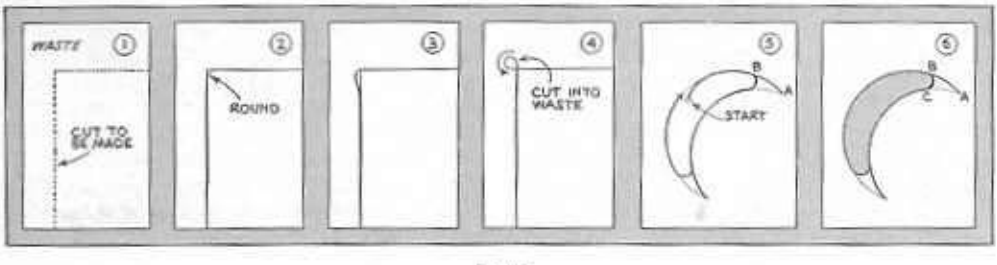
NUMEROUS jobs can be done on the scroll saw, but as far as the actual technique of cutting is concerned, there is very little to learn. As a matter of fact, if you fit the saw with a regular ⅛ in. wide blade, you can turn it over to any ten-year old and he will be sawing like an expert in less than an hour. Safe, too—this machine has the best safety record of all power saws.

Position of Operator.—In average work, the operator takes a natural position, either standing or sitting, at the front of the table, with the blade facing toward him, as shown in the upper photo. Where the work is of such a length that it will strike the upper arm before the cut is completed, cutting from the side is necessary. Side cutting requires that both the upper and lower chuck be turned around, this being easily done by simple adjustments on most machines. On some machines, the table also must be rotated so that the groove in the table insert will center around the blade. For occasional long work, however, the insert is usually laid aside and the table used in its regular position.

Technique of Cutting.—The technique of cutting with scroll saw blades follows much the same practice as used on the band saw. Because of the fine blades used, however, there are a few additional points worth noting. The first of these concerns the cutting of an inside square corner, as shown in Fig. 1. In one method of cutting, the fine blade is turned directly at the corner, as shown in Fig. 2. This gives a very slight round to the corner, the degree of rounding depending upon the size of blade used. Turning in this manner is often necessary in some work, and the slight round is usually no detriment. In another method of cutting, the cut is slightly jogged at the corner, as shown in Fig. 3. This

For average scroll saw work the operator takes a sitting or standing position at the front of the table, with the teeth of the blade pointing towards him.

Above, using a side feed for cutting long work. Drawing below shows technique of cutting inside corners.



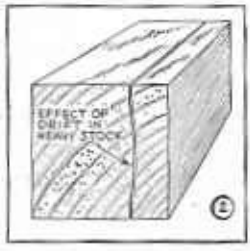
Above, useful circle jig is made from standard shaper hold-down parts.

permits a perfectly square corner, but has the disadvantage that the bulge must be later smoothed by sanding or filing. Fig. 4 shows yet another method, where the blade is run out into the waste stock and turned completely around so that the blade can enter at right angles to the first cut. All of these methods are good, the selection depending upon the nature of the work.

Fig. 5 shows a variation in scroll saw technique in the cutting of acute corners. The cut is started at any inside point, as shown in Fig. 5, and proceeds to point A. The blade is then back-tracked to B to permit running over to the other line, this being the same technique used in band saw cutting. The difference comes in cleaning out the corners, as shown in Fig. 6. Where the band saw worker would clean the corner by cutting directly from C to A, the scroll saw worker often prefers to back into the cut from B to A, until the back of the blade comes to A, and then cut from A to C. This system gives a perfectly clean corner, whereas the meeting of two cuts often shows a ragged point.

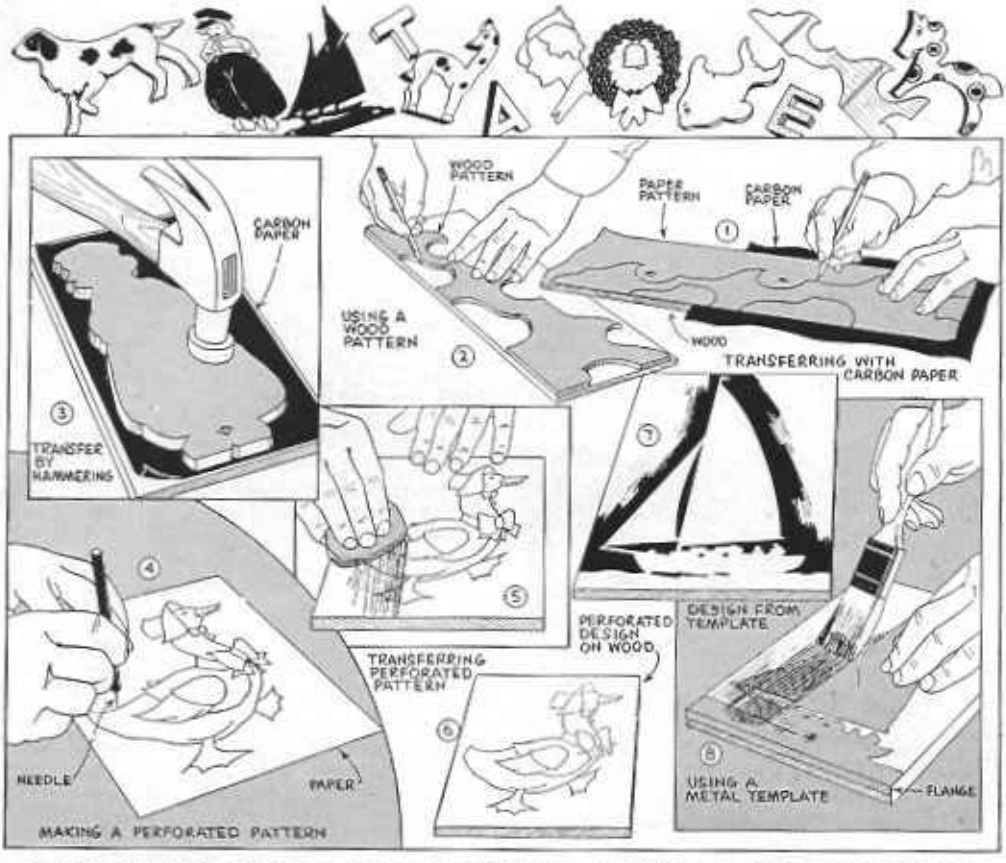
Circle Jig.—Circle jigs for the scroll saw can be made like any of the styles previously described for the band saw. One additional model, which fits the mechanics of the saw, is shown in Fig. 1. Parts used are standard shaper hold-down parts. The bent post is fitted in the extra hole used for holding the scroll saw guide post. The bracket and straight post allow adjustment of the pivot point. Like band saw work, the pivot point must be in line with the blade. Because the scroll saw blade is less stiff and has less support, it will tend to drift sidewise if the pivot point is not correctly located. Thin blades will also sometimes show a tendency to drift within the work itself, as shown in Fig. 2. This latter difficulty can be corrected by applying more tension to the blade or using a different blade in a wider width and with more teeth per inch.

Ripping Fence. — While intended primarily for curve-cutting, the scroll saw can be used successfully for ripping when the shop is not fully equipped. Fig. 3 shows how the standard band saw fence can be fitted for such work. Holes must be drilled in the table, of course, to permit mounting the guide bars.



Transferring Patterns.—The first and one of the most important steps in cutting any shape from wood is the job of marking the pattern shape on the wood stock. In any method of working, it is first necessary to make a full-size paper pattern of the work, either by the common method of enlarged squares or by the use of a projector. This paper pattern can sometimes be mounted directly on the wood as a guide. Where this is not practical, the simplest method of transferring is with carbon paper, as shown in Fig. 1 on opposite page. The sawed outline can then be used as a pattern in marking other pieces, as in Fig. 2. Where the work is small, the transfer can be quickly made by hammering a wood pattern over the work, with a sheet of carbon paper between, as shown in Fig. 3. This gives a clean outline for several impressions, but is only useful for small work.

Diagram shows how a thin blade may drift in thick stock. Above, jig saw table with band saw fence for ripping long work.



A number of different methods can be used in transferring any required pattern to the wood stock. Carbon paper and wood patterns are used for short runs, while perforated patterns and metal templates are best for long runs and production work.

Where many similar pieces must be cut, tracing each piece becomes too slow and some faster method, such as the perforated pattern, must be used. A perforated pattern is made by first pencilling the design on a sheet of thin, tough paper, and then going over the entire design with a fine needle, punching holes at intervals of from $\frac{1}{16}$ to $\frac{1}{8}$ inch as required, as shown in Fig. 4. The pattern is then placed on the wood stock and the transfer made by rubbing with transfer ink on a cloth pad or sponge, as shown in Fig. 5. Another stain which can be used is asphaltum paint. This should be quite thick, being picked up and diluted as required with a sponge dampened with benzine. Transferring can also be done with a powder composed of two parts of powdered rosin to one part of dry lamp black. This is beaten through the perforations in the pattern by patting with a piece of hard felt. Application of heat is necessary to melt the rosin and thus fix the pattern. This method is used extensively for making up a number of duplicate paper patterns, which are, in turn, gummed directly to the work. Fig. 6 shows how a perforated design looks after transferring to the wood.

Another production method is the use of a thin metal template. This is usually fitted with flanges or tabs so that it can be easily located on the work. Transferring is done by blacklead or graphite, either dry or wet. The color is spread or rubbed into a piece of soft wood, a rub of the brush over this lifting enough color to do the marking. Fig. 8 shows the pattern being transferred to the work; Fig. 7 shows how the work looks after the transfer has been made. The black areas, of course, represent the portion of the work which is to be cut away. Usually when a transfer is made in this manner, a thin line of black is left standing all around the design in the cutting operation. Metal templates are sometimes used in reverse, that is, they are actual stencils of the desired cutout. In this case, the transfer is commonly made by spraying lacquer through the stencil, which both marks the outline and provides a ground coat for the cutout.

Perforated pattern cut in celluloid makes a bold outline when rubbed with japan color. Photo below shows a pattern transferred direct to work with the use of enlarged squares.

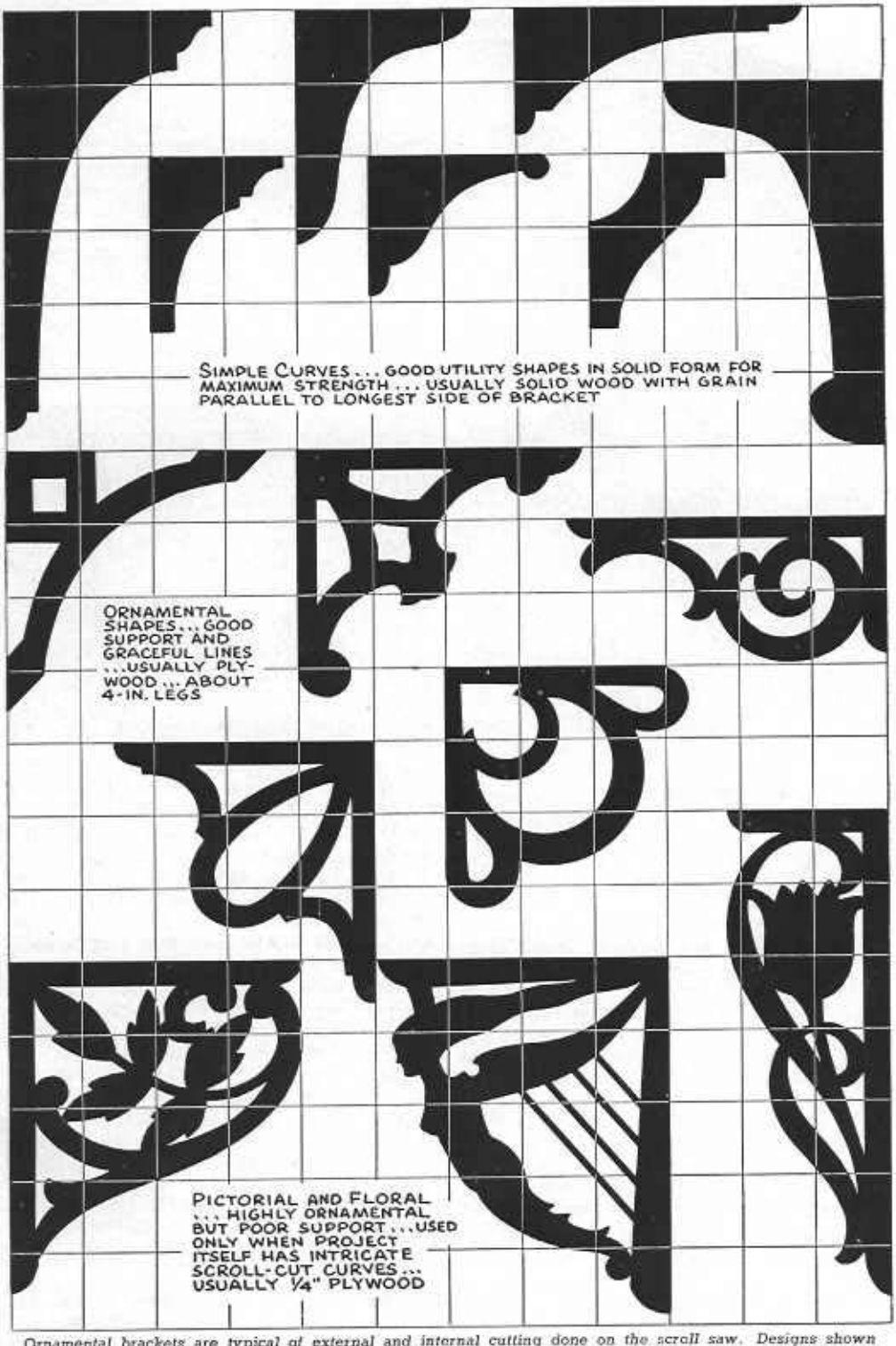
A somewhat bolder design than the needle-marked perforated pattern is often desirable. This can be made of thin celluloid, with the holes drilled with a $\frac{1}{16}$ in. drill, as shown in Fig. 1 above. Coach colors in japan can be used for transferring, using the paint at tube consistency and applying with a tooth brush, as shown in Fig. 2.

Fig. 3 shows a job being scroll cut after direct sketching with the use of enlarged squares, which can be seen on the work. The photo at right shows the popular projector method of enlarging small magazine drawings. Unit shown here magnifies to eight diameters and has a 45-degree mirror which projects the image right side up. For most work, however, it makes no difference whether the picture is reversed or not so that the average craft projector is usually simplified and made without the reversing feature. Lenses and plans for shop projectors can be obtained from Edmund Salvage Co., 101 E. Gloucester Pike, Barrington, New Jersey.

It can be seen that cutout work involves two distinct operations. There is, first of all, the job of getting a full-size pattern from the small magazine drawing. This is done with the projector or by enlarged squares, as previously described. The second and often most important stage is the transfer of the design to the work, and this is often worked with stencils and by masking so that it becomes a part of the final painting operation. The methods given barely touch on the possibilities. For production work, it is probable that silk screen stencils (see "Practical Finishing Methods") offers the best method of painting and outlining cutouts.

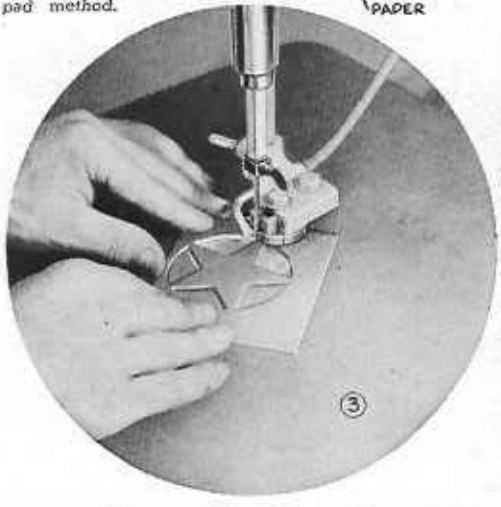
Ornamental Brackets.—The sawing of ornamental brackets is typical scroll saw work. Several good designs are shown on the opposite page. The patterns are shown on the conventional background of squares and can be readily enlarged freehand by plotting the curves on larger squares. Most graph patterns are plotted to enlarge properly on 1 inch

An opaque or postcard projector is handy for projecting small magazine drawings. Unit shown here enlarges to eight diameters and shows the picture right side up by use of 45° mirror.



Ornamental brackets are typical of external and internal cutting done on the scroll saw. Designs shown can be enlarged to any required size by drawing larger squares and then plotting the design freehand. A projector, as shown on opposite page, is useful for blowing-up designs.

Fifty to one hundred paper cutouts can be cut at one time by using the pad method.



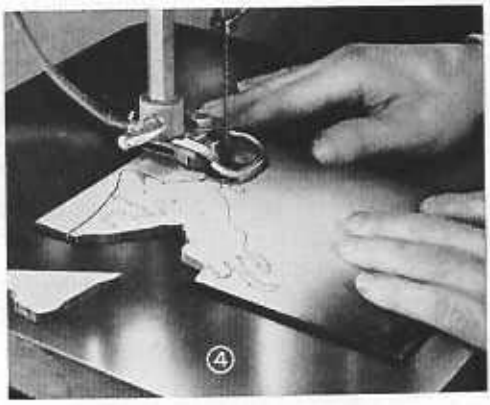
squares. However, if a larger figure is required, the squares can be made 1⅛ inch, 1¼ inch or any other size as needed to arrive at the desired size of figure.

Paper Cutouts.—Paper cutouts, an example of which is shown in Fig. 1, can be perfectly cut on the scroll saw by using the pad method of sawing. The whole secret of this work is to clamp the paper sheets tightly between outside boards of ⅛ or ¼-inch plywood, as shown in Fig. 2. The various sheets of paper thus become equivalent to one solid block and can be cut without the slightest fraying of the edges. The blade used should be of a size to make the necessary curves, and teeth should not be too coarse. On the other hand, a very fine blade will quickly become clogged with the paper particles and will burn the work.

Cutting Cloth.—Cloth can be cut on the scroll saw in pad form, much the same as paper. Here, again, it is exceedingly important that the cloth pieces be tightly clinched between supporting boards on each side. Cloth demands a somewhat finer tooth blade than paper. For production work on oilcloth, a knife is often used to eliminate tearing.

Cutting Metal.—In general, metal cutting on the scroll saw follows the same technique as used on the band saw. Fine teeth are necessary to prevent stripping. Thin sheet metal should be worked over a wood base or should be shellacked to a wood base to prevent burring on the underside. Cuts in iron and steel are practical up to about ⅛ inch thickness; over that, the cutting speed is very slow.

Sawing Plastics.—The first craft plastics were in the phenolic group.



Slow speed should be used when sawing metals. Plastics in the phenolic group can be sawed at high speed but acrylics must be worked slower.

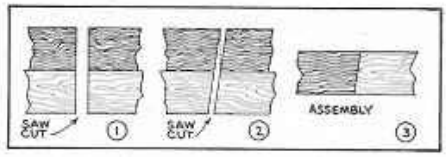
These materials saw easily—about like hard wood—and offer no difficulties other than a tendency to chip on the underside. Blade recommendations given on page 61 are for phenolics, such as Catalin. The newer acrylics, such as Lucite and Plexiglas, take a coarser blade and slower speed. The general situation here is that high blade speed or lack of clearance will cause heat, and the heat will melt the plastic. This is not a factor when working stock up to about ¼ inch thick, but it must be considered when sawing heavy stock. Plastics in the polystyrene group (Plax) saw about the same as the acrylics. Cellulose acetate plastics (Tenite) are also on the soft side and tend to clog and jam when sawed with a fine-tooth blade at high speed. When sawing any of the thermoplastics mentioned, the skip-tooth blade (Delta Nos. 85, 86, 87, 88) run at slow speed will usually make a clean cut.

Many sheet plastics are masked with paper. This provides a good surface for pencil marks and also protects the plastic. The paper should not be removed until cutting is complete.

When working dark-colored phenolics not masked, it is often advisable to spray a coat of white lacquer on the work to provide a marking surface, Fig. 4. Alternately, a paper pattern can be attached with rubber cement. A polished sheet of plastic will not take pencil or carbon paper marks, but can be marked if needed with a china marking pencil sharpened to a fine point.

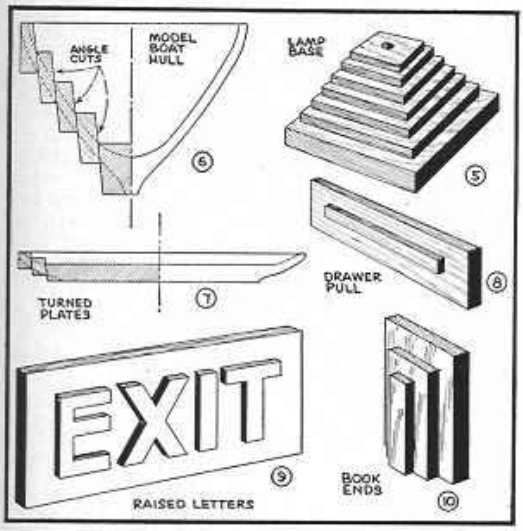
Angle Sawing.—Inlays are often cut with the table tilted at an angle of from 1 to 10-degrees. This is done so that the pieces, when assembled, will not show the saw cut opening at the joints but will fit tightly together. This is clearly shown in Figs. 1, 2 and 3. When cutting on an angle, the work must at all times be kept on one side of the blade. If the work is swung completely around the blade, the bevel will change directions and the pieces will not fit. The most convenient working position is to keep the work below the blade, that is, a piece which is to fit inside another piece must be on the lower side of the table. The angle of table tilt will vary with the thickness of the work and width of the saw kerf, and is best determined by making test cuts on scrap stock of the same thickness. The angle cut is used to some extent in making inlay pictures (see following page), but it must be kept in mind that the angle must be changed constantly depending on whether the piece cut out is to fit in the second, third, fourth or lower layer of the pad.

With a little experimenting, angle cuts can be made in heavy stock so that any piece cut out of a larger piece will jam tight when pushed through the larger piece. Fig. 4 shows

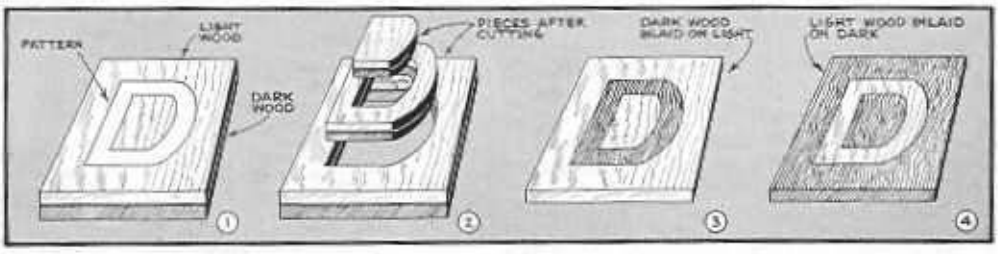


Above, angle cutting eliminates the seam formed by the saw kerf. Photo shows angle-cut lamp base sawed from single piece of wood.

Left, angle sawing can be applied to a variety of projects.



a single piece of ¾-inch stock which has been angle cut into a number of rings of decreasing diameter. Each ring jams tightly inside the next larger one to make a neat lamp base. This simple principle can be used to good advantage in the making of model boat hulls, wood dishes, book ends, raised letters, etc. A few typical applications are shown in the drawing. Fig. 6 shows a model boat hull which has been so cut that the various pieces pull out to form the complete rough shape of the boat. Fig. 7 shows how angle sawing can be used to advantage when making deep turned plates or bowls, at the same time removing a lot of the waste stock. Raised letters, as shown in Fig. 9, are very effective when angle cut so that the letters project above the surface of the base piece. The letters can be readily dropped out of the base to permit painting for color contrast. This system of sawing has a couple faults: (1) Starting holes are needed and will show on the finished work, (2) the cut edges cannot be sanded. The first fault can be partly overcome by using the very smallest possible drill for starting holes; second fault is not too serious if a smooth-cutting blade is used.

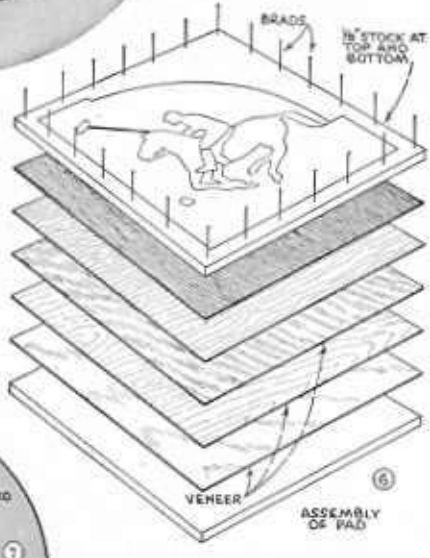


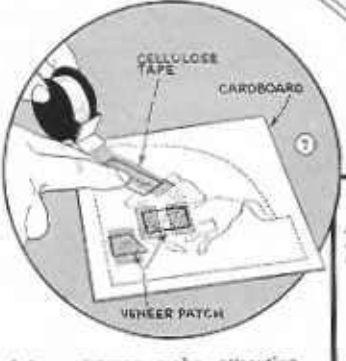
Drawing above shows in simplified form the principle of inlaying. Photo shows a finished inlay.

Inlay Pictures.—The making of inlay pictures or designs is fascinating work, not difficult, and provides excellent decoration for trays, book ends, novelties, etc. The simple principle involved is shown in Figs. 1 to 4, where it can be seen that if a dark and light piece of wood are scroll cut at the same time, any piece from one will fit the corresponding hole in the other. A typical pictorial example is the book end shown in Fig. 5. In making this inlay, the picture is first transferred with carbon paper to a piece of ⅛-inch plywood. Another piece of ⅛-inch plywood makes the bottom of the pad. Bradded between the two pieces are the various layers of veneer, as shown in Fig. 6. Different colors and grains in the veneer stock provide contrast to make the picture effective.

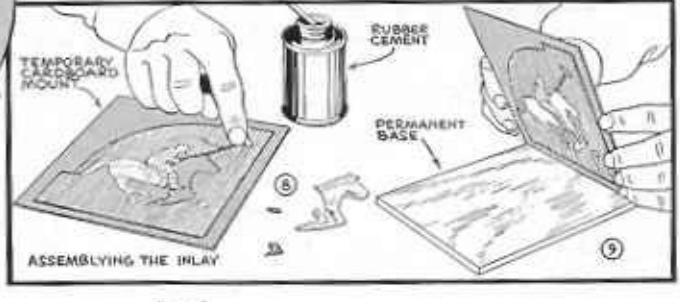
A full sheet of veneer is not required for each inlay area since small sections can be patched in. This can be done on a full sheet of inexpensive veneer or on cardboard the same thickness as the veneer (1/28 inch). Fig. 7 shows the mallet, boot and ball of the picture patched in. Sawing should be done with Delta Nos. 81, 82, 83, or 84 blade. These blades are very thin so that the saw cuts in the assembled picture are almost invisible. No. 84 would be a logical selection for the example shown. The sections are cut away one at a time.

After cutting out, the pieces are assembled face down on a sheet of cardboard, using rubber cement or starch paste,





Inlay pictures make attractive decorations. The drawings show various steps in making the pad and assembling the pieces for the book end shown in photo.

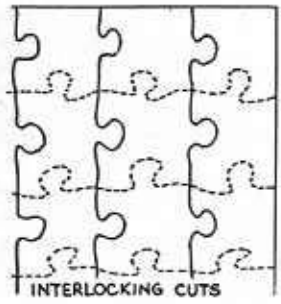


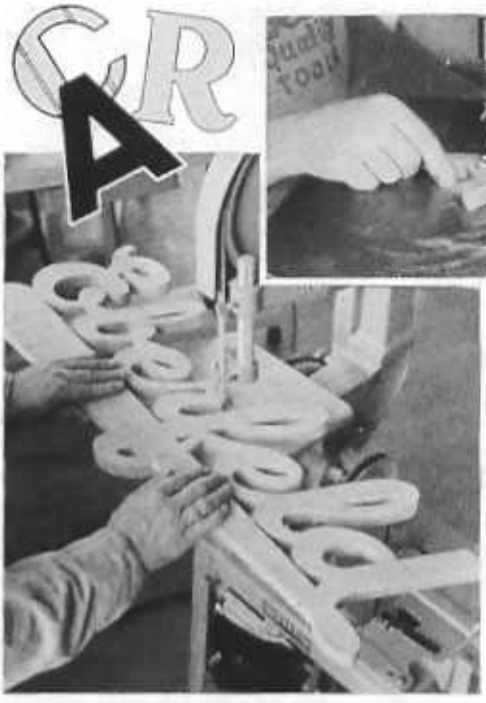
A good example of inlay picture or marquetry cut on the scroll saw. Photos and diagram below show cutting of interlocking jig saw or picture puzzle.

as shown in Fig. 8. The assembly is then permanently glued to the backing, Fig. 9. After the glue has dried, the cardboard is stripped off.

While the pad method of sawing is preferred by most craftsmen, some workers prefer to cut each of the various pieces individually. The advantage of this method is that the important element of grain direction can be controlled without waste; also, it is simple to make up several of the same picture in one sawing. Like the conventional pad assembly, the work is sawed several thicknesses at a time after being nailed into pad form. Each part is in a separate pad and must be cut exactly to pounce pattern lines for a perfect fit. If desired, the two systems can be combined; see also angle sawing method on page 53. Several of the craft supply houses furnish veneers and patterns.

Jig Saw Puzzles. — Jig saw or picture puzzles are made by first gluing the picture to ⅛ inch thick plywood, as shown in left photo below. After the work has dried, the picture can be divided into four sections for easy handling, center photo. Of various methods of cutting, the simplest is to cut the picture into strips about 1 inch wide with interlocking joints about 1 inch apart, as shown in diagram. The strips are then cut into squares, as shown by the dotted lines. All cutting is done freehand without guide lines.





Letters and signs are usually made with a combination of band saw and scroll saw cuts. Scroll saw is essential for internal sawing and sanding.

Letters and Signs.—A wide variety of cutout letters and signs in wood, metal and plastics can be cut and sanded on the scroll saw. When the work is large and not too intricate, it is usually faster to run all outside cuts on the band saw, reserving the scroll saw for internal cuts only. In some instances of script lettering, as in photo above, the size of the work prevents complete band sawing and it may be necessary to do some of the external cutting on the scroll saw. Individual letters are easily cut on either the band saw or scroll saw. The pad method of sawing is often used, and in this way several copies of the same letter can be cut in one operation. Wood signs and letters are usually worked in poplar or white pine since these woods saw easily, resist warping and are easy to paint and glue to wood backings. Plywood is also popular. Use is sometimes made of angle sawing, page 55, to make raised letter signs. Some novel and attractive effects can be obtained with metal inlays. Work of this kind is done in the same manner as making a wood inlay, as described on page 54, the sheet metal stock making up a part of the pad.

The actual work of sawing the letters is simple, and about the only difficulty the average crafter will have in doing this kind of work is concerned with the layout. Two simple alphabets are shown on the opposite page, and others can be found in any good book on commercial lettering or poster work. A projector is useful in enlarging the small letters to any required size, but this can often be done quite easily by a system of scaling the letters. For example, in the two alphabets shown, the width of all letters is indicated in units of one-sixth of the height. In making up any layout, first determine the height which the letters will be. Mark this length on a straight edge and divide the distance into six equal parts. Then, lay off three or four additional one-sixth space units. This scale is used in laying out the width of any letter. Stem widths can be taken from the letter "I," but can be varied to suit. The upper alphabet is best cut from ¾ inch thick lumber. Black lines indicate grooves cut to a depth of about ⅛ inch, these cuts being run in while the work is in-the-square. The lower alphabet can be made in any thickness from ⅛ inch up. After one letter has been sawed out, it can be used as a marking pattern for duplicate copies, or it may be used for direct sawing with pattern, as described on page 30.

Using Saber Blades.—While most scroll saw work is of a delicate nature best done with fine jeweler's blades chucked at both ends, the heavier saber blade should not be overlooked. In making wood letters, for example, there is no particular need for a fine blade. By using the saber blade, which is chucked in lower chuck only, it is a simple matter to jump from one opening to another in pierced work. The wider width of the saber blade makes it easy to saw a straight line; coarse teeth and heavy set give the needed chip clearance for cuts in heavy stock. The saber blade is excellent for cutting thick sheets of thermoplastic, such as Tenite. In fact, on work of this kind 1½ inch or more in thickness, it is the only blade which has enough clearance to cut without clogging and jamming in the cut.

Using Band Saw Blades.—If you break a band saw blade, cut it up in 5 inch lengths for use in the scroll saw. These blades can be chucked at one or both ends as desired, but are commonly chucked in lower chuck only, like a saber blade. Widths over ¼ inch should be ground down to ¼ inch wide at one end to fit the chuck. Hack saw blades can be used in the same manner. When extra capacity is needed for cutting thick materials, it is sometimes practical to use an over-length homemade blade chucked in lower chuck only.

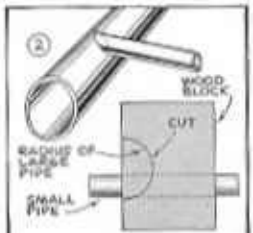
Two simple alphabets for making cutout wood letters. Enlargement to any desired size is easily done with a projector, or, the letters can be drawn freehand with the aid of a scale divided into units of one-sixth the height of the letters.

Knife Blade is Handy.—From an old hacksaw blade you can make a knife blade for cutting cloth, cardboard, paper and other materials that tend to tear when sawed with a toothed blade. It is also useful for slicing operations in wood, that is, any kind of work you would do with a pocket knife. The edge must be razor sharp.

Magnifier.—Some of the work done on the scroll saw is of a very delicate nature. Good light plus a magnifying glass, as shown in Fig. 1, will help you to do fine, accurate work

Magnifying glass is handy for fine detail. A 3 inch diameter reading glass permits two-eye vision.

without eye strain. A 3 inch diameter reading glass is excellent for this purpose although some workers prefer the oblong type about 5 inches long for better two-eye vision. The power need not be more than 2x, which will be obtained with a glass of 12 to 14 inch focal length when used at normal eye distance shown in the photo.

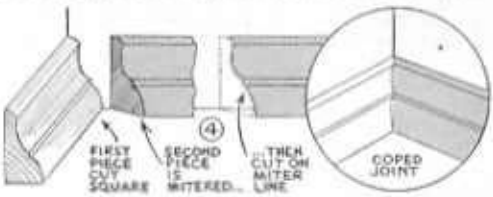


Tubular Joints.—A useful idea for cutting metal tubing where one pipe is to be brazed or soldered to another at an angle is shown in Figs. 2 and 3. A block of wood is required. On the top side of this is marked a circle of the same radius as the size of the tube on which the joint is to be made. Using this pencilled circle as a guide, a hole is drilled through the block, this hole being of the same size as the second piece of tubing and drilled at the same angle as required for the joint. The tube is now placed inside the hole and cut off, using the pencil circle as the sawing line, Fig. 3. If the work has been properly marked, the tube which has been cut will be a perfect fit against the other. The end of the cut tubing can then be used as a pattern to mark the size and shape of the hole which must be drilled in the first tube to complete the joint. A similar technique of enclosing round work in a square wood block can be used for round-end slotting, as shown on page 19.

Coped Joint.—Instead of using a miter joint when fitting moulding to an inside corner, some workers prefer a coped joint. In this style of joint, one piece of moulding is cut square across at the end and is butted directly against the corner, as shown in left diagram, Fig. 4. The end of the second piece is then sawed to the same profile shape as the moulding being used. In order to obtain the proper profile shape of the second piece, the end is first cut as a plain miter joint, making the work the same exact length as would be required for a miter joint. This part of the job can be done on the circular saw or in a miter box. The edge of the miter cut now forms a guide for cutting the cope cut on the scroll saw. This cut is made square, that is the work rests flat on the table while the saw cuts on the curved line formed by the edge of the miter. When accurately cut, the second piece will butt perfectly against the first. Since a perfect fit is required on the inner edge only, it is the usual practice to undercut the coped end slightly. This can be done while sawing, or the wood behind the edge can be roughly backed off with a coarse file or by sanding.

Gang Blades. — When a thick saw kerf is required to make a slot, it is often more convenient to use two blades mounted together rather than cutting both sides of the slot with a single blade. Blades can be temporarily

Tubular joint at any angle is accurately cut by enclosing tube in wood block. Below, coped joint is cut on scroll saw after mitering the end of work.



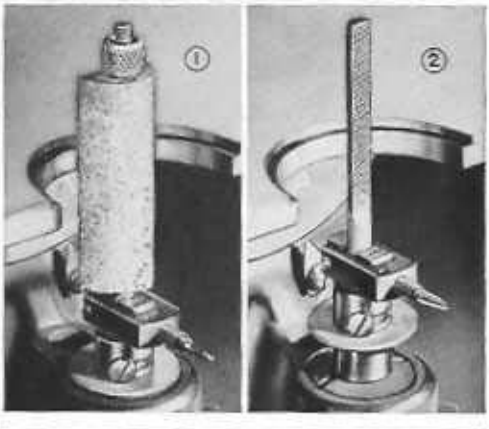
held together with a dab of glue or wrapped with fine wire or thread near the top and bottom. The combined blade is then treated as one blade and is mounted in the scroll saw chucks. If the cut is in thin stock, cleaner work can be obtained by offsetting so that the teeth of one blade will come between the teeth of the other. Various modifications of this idea can be used—four or five blades in a gang makes a good coarse file; two blades with a spacer between can be used for cutting curved inlay strings.

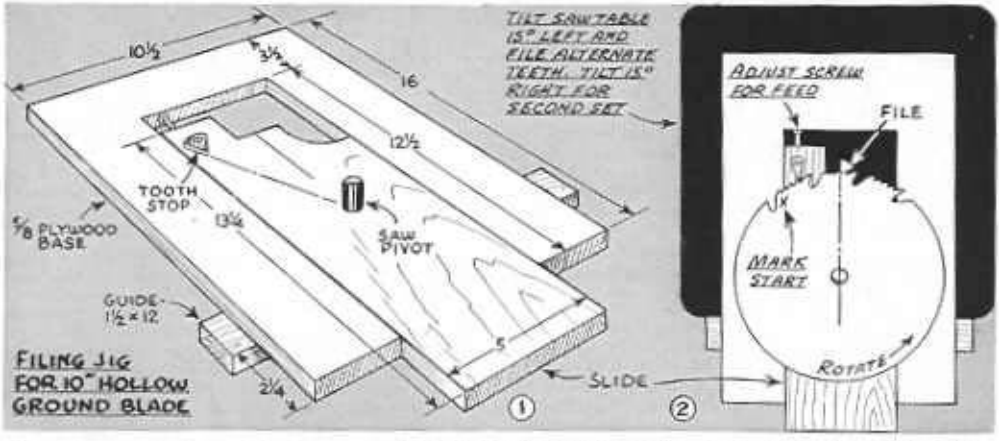
Sanding and **FILING**

STANDARD accessories for most scroll saws include a sanding attachment and a variety of machine file shapes. The sanding attachment has a semi-circular body, making it suitable for sanding both curved and flat surfaces. The attachment takes round sleeves of the same size used on the small drill press drum, the shape being easily altered to fit the semi-circular shape of the scroll saw attachment. Machine files are available in both ¼ and ⅛-inch shanks, and in a wide variety of shapes including square, triangular, round, pillar, knife, etc., as shown in diagram. All files, as well as the sanding attachment, are held between the vee (not the flat) jaws of the lower chuck. The cutaway views, Figs. 1 and 2, show clearly how these accessories are mounted. No guides or supports are used. The work is usually fed from the front, but the chuck can be swung over for side feed if desired. Side feed is often useful since it permits aligning the table exactly square with the file or sanding attachment being used.

Speed of Operation.—Both sanding and filing should be done at low speed. If worked too fast, a machine file will simply scrape the work without cutting, while the sanding sleeve will quickly glaze over and be of no further use. The finer the file is cut or the finer the abrasive particles of the garnet sleeve, the slower the speed should be. Coarser abrasives can be operated faster. Even as cutting with a scroll saw is much slower than cutting with a band saw, so, also, are sanding and filing slower operations as compared with the speed of machines especially designed for this work. These operations on the scroll saw are useful for fine, delicate work. Nothing is gained by speeding up the machine in an effort to get a faster rate of cutting. High speed should be used only in connection with coarse files working on a soft material.

Table Inserts.—It is usually necessary to remove the metal table insert when doing sanding and filing in order to permit passage of the abrasive unit being used. This is of no disadvantage on most work, but





where the work is small, the supporting area immediately around the file becomes of considerable importance. The required support can be obtained by using an auxiliary wood table, cutting a hole in this of the proper size to admit the file or sanding attachments being used. In the same manner, blank inserts can be cut away to suit, as shown in Fig. 4 on previous page.

Holding Devices.—Small oilstones and abrasive sticks can be mounted in the scroll saw by fitting the stone in a suitable wood block with ¼ inch metal shank attached. A 1 x 4 inch stone fitted in this manner is useful for fine honing edged tools. Round abrasive sticks can be mounted by making a cylindrical metal holder for the stick, cutting out one side of the cylinder to expose the working portion of the stone.

Hollow ground blade is easily sharpened by filing with a three-square file. A 15 degree table tilt gives the proper face and back tooth bevels when positioned as shown.

Filing Circular Saws. — Planer blades and others of similar tooth shape can be filed with the use of an auxiliary wood table to hold and guide the blade. The table shown in Fig. 1 is dimensioned for a 14 x 14 inch saw table and a 10 inch saw blade. The general idea is readily grasped; dimensions can be changed to suit job variations. The scroll saw table is tilted 15 degrees to the left, and the wood table is clamped in place so that the centerline on the slide will line up with the edge of a 6 inch, three-square file. In this position, two teeth in each group can be filed. Then, with the saw table tilted 15 degrees to the right, the jig is reclamped to bring the centerline of the slide again in line with the edge of the file. In this second position, the two remaining teeth of each group are filed. The file, tooth spacer and screw controlling infeed are not changed. Rakers are ground square across, this part of the job being best done on the grinder.

With slight variations, the same set-up can be used with a round file for gumming rip and combination blades. In all cases, only the minimum amount of metal should be removed. The best practice is to go around a saw blade two or three times rather than attempt to make a complete job in one pass. Files for the job will have to be made up special since the usual range of files supplied for the scroll saw do not have sufficient face width. The job of adapting a file is not difficult—you simply grind the tang to an approximate ¼ inch diameter round to permit fitting in the scroll saw chuck. Any excess length is removed by breaking the file.

APPENDIX

DECIMAL EQUIVALENTS

1/64 = .015625	**1/4** = .250	**1/2** = .500	**3/4** = .750
1/32 = .03125	17/64 = .265625	33/64 = .515625	49/64 = .765625
3/64 = .046875	9/32 = .28125	17/32 = .53125	25/32 = .78125
	19/64 = .296875	35/64 = .546875	51/64 = .796875
1/16 = .0625	**5/16** = .3125	**9/16** = .5626	**13/16** = .8125
5/64 = .078125	21/64 = .328125	37/64 = .578125	53/64 = .828125
3/32 = .09375	11/32 = .34375	19/32 = .59375	27/32 = .84375
7/64 = .109375	23/64 = .359375	39/64 = .609375	55/64 = .859375
1/8 = .125	**3/8** = .375	**5/8** = .625	**7/8** = .875
9/64 = .140625	25/64 = .390625	41/64 = .640625	57/64 = .890625
5/32 = .15625	13/32 = .40625	21/32 = .65625	29/32 = .90625
11/64 = .171875	27/64 = .421875	43/64 = .671875	59/64 = .921875
3/16 = .1875	**7/16** = .4375	**11/16** = .6875	**15/16** = .9375
13/64 = .203125	29/64 = .453125	45/64 = .703125	61/64 = .953125
7/32 = .21875	15/32 = .46875	23/32 = .71875	31/32 = .96875
15/64 = .234375	31/64 = .484375	47/64 = .734374	63/64 = .984375

SCROLL SAW BLADES

Material or Operation	General Features of Blade	Blade to Use (Delta Nos.)	Operating Speed (RPM)
HARDWOOD ¾ in. stock	Medium temper, set teeth, Not over 15 teeth per inch.	91. Also 92, 93, 94, 60, 61. Saber 703, 704.	1000 to 1750
HARDWOOD ¼ in. stock	Medium temper. Teeth need not be set.	85. Also 86, 87, 88, 91, 59, 60, 61.	1750
SOFTWOOD ¾ in. stock	Medium temper, set or wide-spaced teeth. Not over 10 teeth per inch.	92. Also 91, 93, 94. Saber 703, 704.	1750
SOFTWOOD ¼ in. stock	Teeth need not be tempered or set.	87. Also 81, 82, 83, 85, 86, 88.	1300 to 1750
PUZZLES, INLAYS, MARQUETRY	Not tempered; not set. Blade must be thin.	84. Also 81, 82, 83.	1300 to 1750
SOFT METALS (over ⅛ in.)	Medium hard temper; set teeth.	65, 59. Also 58, 60, 61, 64, 91.	650
SOFT METALS (under ⅛ in.)	Medium hard temper; set or not set.	96. Also 95, 97, 98.	650 to 1000
IRON AND STEEL	Hard temper, set teeth.	58. Also 59, 60, 61, 64, 65.	650
PLASTIC, BONE, IVORY (rough cut)	Medium temper, set teeth.	91. Also 59, 64, 65.	1000 to 1300
PLASTIC, BONE, IVORY (finish cut)	Medium temper, with or without set.	85. Also 86, 87, 88, 96, 97, 58.	1000 to 1750

BAND SAW BLADES*

Width	Teeth	Minimum Cut Radius	Working Cut Radius
⅛ inch	6, 7	¼ inch	½ inch
⅜ inch	5, 6, 7	½ inch	1¼ inch
¼ inch	5, 6, 7	⅜ inch	1¾ inch
⅜ inch	4, 5, 6	1 inch	2¾ inch
½ inch	4, 5, 6	1¼ inch	3½ inch
¾ inch	3, 4, 5	1¾ inch	5 inch

*for wood

FILE SIZES

Tooth Spacing	File
8-point and finer	6-inch Taper, Extra slim
7-point	7-inch Taper, Extra slim
6-point	7-inch Taper, Extra slim
5-point	7-inch Taper, Slim
4-point	8-inch Taper B. S. Reg.
3-point	10-inch Taper B. S. Reg.

BAND SAW SPEEDS IN F.P.M.*

Motor Pulley	Dia. of Bandsaw Wheels	Machine Pulley Diameter					
		5"	5½"	6"	6½"	7"	8"
2½"	10"	2210	2015	1846	1703	1573	1378
	12"	2635	2402	2201	2030	1875	1643
	14"	3145	2867	2627	2423	2238	1961
	15"	3315	3022	2769	2554	2359	2067
	16"	3570	3255	2982	2751	2541	2226
2¾"	10"	2418	2210	2028	1872	1742	1508
	12"	2883	2635	2418	2232	2077	1798
	14"	3441	3145	2886	2664	2479	2145
	15"	3627	3315	3042	2808	2613	2262
	16"	3906	3570	3276	3024	2814	2436
3"	10"	2652	2418	2210	2028	1898	1664
	12"	3162	2883	2635	2418	2263	1984
	14"	3774	3441	3145	2886	2701	2368
	15"	3938	3627	3315	3042	2847	2496
	16"	4284	3906	3570	3276	3066	2688
3½"	10"	3094	2808	2574	2340	2210	1924
	12"	3689	3348	3069	2790	2635	2294
	14"	4403	3996	3663	3330	3145	2738
	15"	4641	4212	3861	3510	3315	2886
	16"	4998	4536	4158	3780	3570	3108
4"	10"	3536	3224	2938	2730	2522	2210
	12"	4216	3844	3503	3255	3007	2635
	14"	5032	4588	4181	3885	3589	3145
	15"	5304	4836	4407	4095	3783	3315
	16"	5712	5208	4746	4410	4074	3570
4½"	10"	3978	3614	3302	3042	2834	2470
	12"	4743	4309	3937	3627	3379	2945
	14"	5661	5143	4699	4329	4033	3515
	15"	5967	5421	4953	4563	4251	3705
	16"	6426	5838	5334	4914	4578	3990
5"	10"	4420	4030	3692	3406	3146	2756
	12"	5270	4805	4402	4061	3751	3286
	14"	6290	5735	5254	4847	4477	3922
	15"	6630	6045	5538	5109	4719	4134
	16"	7140	6510	5964	5502	5082	4452

*Feet per minute. Based on 1725 r.p.m. motor speed and calculated for rim diameter of pulleys.

R.P.M. TO F.P.M.*

R.P.M. at Machine Pulley	Diameter of Band Saw Wheels					
	10"	12"	14"	15"	16"	18"
10	26	31	37	39	42	47
15	39	47	55	59	63	70
20	52	63	73	79	84	94
25	65	78	92	98	104	117
30	79	94	110	118	126	141
35	91	110	128	138	147	164
40	104	126	146	157	168	188
45	117	141	164	177	189	211
50	131	157	183	196	209	235
55	144	173	201	216	230	258
60	158	188	220	236	252	282
65	171	204	238	256	273	305
70	183	220	256	275	294	329
80	209	251	292	314	336	376
90	236	283	328	354	378	423
100	262	314	366	393	419	471
110	288	346	402	433	461	518
120	316	377	440	472	503	565
130	341	408	476	512	545	612
140	368	440	512	551	587	659
150	393	471	549	589	628	706
160	419	503	586	629	670	753
170	445	534	622	668	712	800
180	472	565	658	708	754	847
190	498	597	694	747	796	894
200	524	628	732	786	838	942
225	589	707	824	884	942	1059
250	655	785	915	982	1047	1177
275	720	864	1006	1080	1151	1294
300	786	942	1098	1179	1255	1413
350	917	1100	1281	1375	1464	1648
400	1048	1256	1464	1572	1676	1884
500	1310	1570	1830	1965	2095	2355

*Feet per minute — figures in body of table give surface speed of blade in feet per minute.

BAND SAW BLADE AND SPEED RECOMMENDATIONS

Material	Work Thickness								Remarks
	Under 1/8"		1/8" to 1/4"		1/4" to 1"		Over 1"		
	Teeth	F.P.M.	Teeth	F.P.M.	Teeth	F.P.M.	Teeth	F.P.M.	
Aluminum	18	2200	14	2200	6	340	6	340	Thick work requires coarse teeth to prevent clogging.
Asbestos Sheets	24	2200	14	340	14	340	10	340	Straight cuts can be scored and broken.
Babbit-Lead	14	2200	14	2200	6	340	6	340	Use coarse teeth for thick work.
Brass	18	2200	14	340	14	340	8	250	Fine blades up to 32 teeth can be used for thin work.
Bronze (Soft)	18	340	14	340	10	250	8	175	Use coarse teeth for heavy work.
Bronze (Hard)	18	340	14	250	14	175	10	125	Often very hard—use slowest speed if in doubt.
Brake Lining	14	2200	14	340	10	340	8	250	Use coarse teeth.
Builders Board	14	2200	10	2200	3-7	2200	3-7	2200	Cuts like wood.
Copper	18	340	14	340	10	250	8	175	Thin work can be cut at high speed with coarse teeth.
Fiber	18	2200	14	2200	14	340	10	340	Use fine teeth for smooth cutting.
Hose (Canvas and Rubber)	24	2200	18	2200	18	2200	10	340	Fine teeth prevent digging-in, climbing.
Iron (cast)	18	250	14	175	14	125	10	125	75-100 fpm is best speed for work over 1 inch thick.
Iron Sheets	24	340	18	175	14	125	10	125	Friction sawing is excellent for work up to 1/8 in.
Magnesium (Dow Metal)	18	2200	14	2200	6	2200	6	340	Cuts easily at high speed with coarse teeth.
Plymetal	24	340	24	340	18	340	14	340	Metal and wood—can often be cut at high speed.
Pipe	18	340	18	340	18	175	14	125	Do not use coarse teeth.
Plastics (Thermo-setting)	24	2200	14	2200	10	2200	8	2200	Fine teeth cut slower but reduce chipping.
Plastics (Thermo-plastic)	18	2200	10	2200	8	2200	6	2200	Reduce speed or use coarser teeth if blade clogs, binds.
Radiator Cores	—	—	—	—	—	—	18	340	Wave set is best. Teeth not coarser than 18.
Rubber (Hard)	18	2200	14	2200	14	340	10	340	High speed cutting can be done on thick sections.
Slate	32	340	24	250	18	175	14	125	Avoid coarse teeth.
Steel (Free Machining)	18	250	18	175	14	175	10	125	14 teeth, regular set is best all-purpose blade.
Steel (Carbon)	24	175	18	175	14	175	10	125	Annealed.
Steel (Alloy)	18	175	14	125	14	125	14	125	Tough and hard. Slower speed needed for thick work.
Thinwall Tubing	32	250	18	125	—	—	—	—	Wave set is best. Do not use coarse teeth.
Wood	4-7	2200	4-7	2200	3-7	2200	2-6	2200	Wood blades. Higher speeds can be used with more power.

Regular set, metal-cutting blades unless noted otherwise.

Teeth marked 4-7, etc. indicate wood blade. Work requiring tooth spacing finer than 18 pitch is usually done best with wave set blade. Speeds are matched to Delta metal cutting band saw.

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