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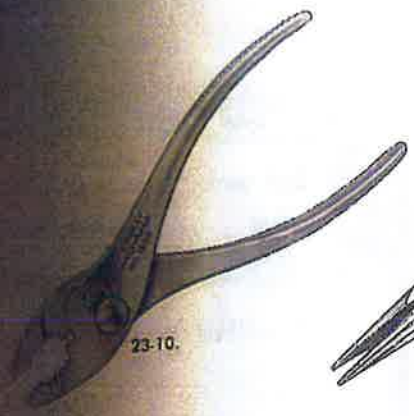

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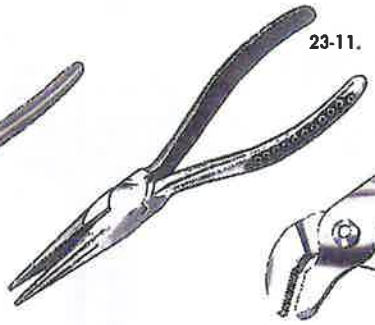

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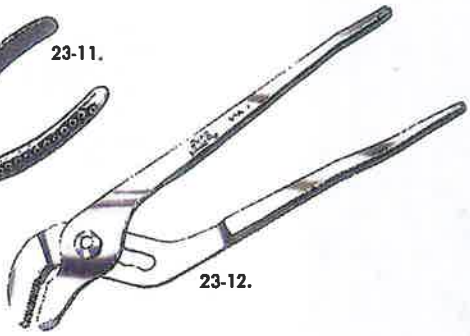


23-12.

Combination Pliers *Fig. 23–10.*	An all-purpose, slip-joint adjustable pliers.	To hold and turn pieces round. Never used on heads of nuts or bolts.
Long, Flat-nose Pliers *Fig. 23–11.*	Pliers with long, thin, flat nose.	To hold and bend thin wire and metal fittings.
Box-joint Utility Pliers *Fig. 23–12.*	A larger pliers with a slip joint at four positions.	To hold and turn large, round parts.

TOOL AND MACHINE MAINTENANCE 24

The experienced woodworker knows the value of sharp tools. Any time taken off for sharpening tools and adjusting machines will be regained many times over in better quality and greater speed.

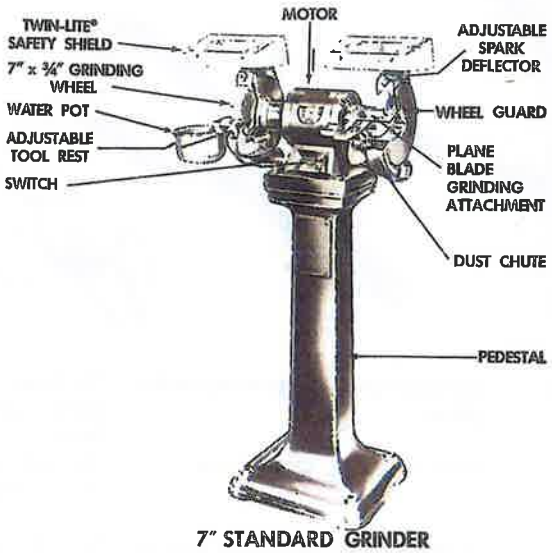
Most tool and knife sharpening can be done by the person who uses the equipment. In the case of certain types of cutting tools, particularly hand saws and the blades of circular saws and band saws, it is better to have sharpening done by a well-equipped professional. Though saw filing and setting can be done by hand, generally this is too time-consuming. Also, some school and cabinet shops are not equipped with saw filing machines and sharpeners.

Grinding should be done when a tool needs a new bevel or when its edge has been nicked. *Honing* alone is enough when the edge is only slightly dull.

Equipment for Sharpening

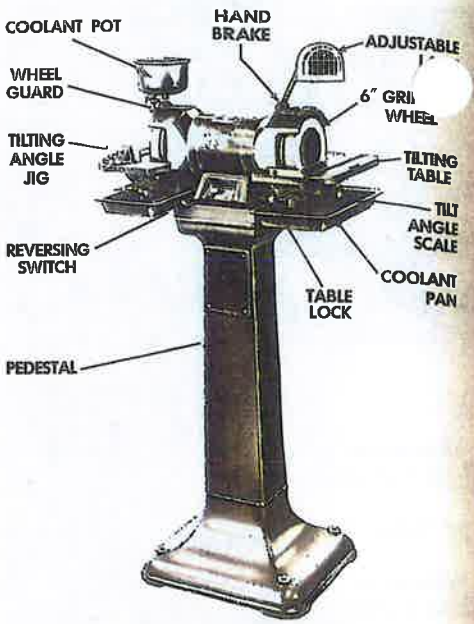
Several types of power-driven grinders can be used for sharpening tools. A *standard two-wheel grinder,* Fig. 24-1, should have a motor speed of 1425 or 1725 r.p.m. For general grinding purposes, the motor usually has a speed of 2850 or 3450 r.p.m. However, at the higher speeds care must be taken because tool edges tend to burn very easily.

Silicon-carbide wheels and stones are used primarily for sharpening high carbon tools and for knives. The harder and tougher grains of aluminum-oxide wheels and stones make them ideal for sharpening hard tool steels. Accessories



7" STANDARD GRINDER

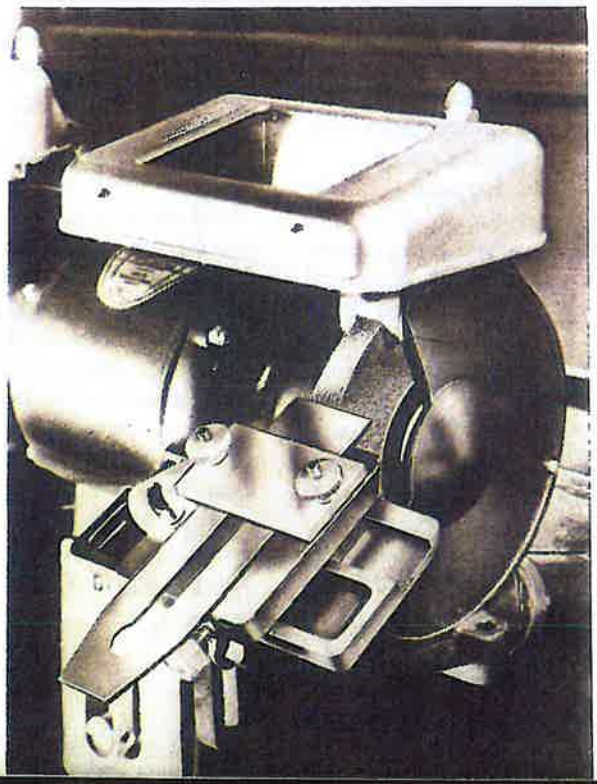
24-1. This standard two-wheel grinder is equipped for most types of tool grinding.



6" TOOL GRINDER

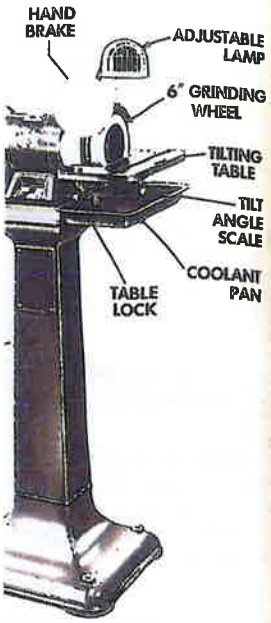
24-3(a). A tool grinder is ideal for many types of grinding. The coolant pot can be placed over either wheel. Note the large pans for catching the coolant when doing wet grinding.

24-2. This plane-blade grinding attachment is ideal for sharpening plane irons, wood chisels, and other single-edge tools. The blade is securely held in place and the attachment adjusted for correct angle. The tool is moved back and forth across the abrasive wheel. Also the tool can be lifted off to inspect the cutting edge or cool it in water.



are available for grinding drills and plane blades on the standard tool grinder. Fig. 24-2.

The *tool grinder* shown in Fig. 24-3(designed for grinding all types and shapes of edge tools. It is well suited for sharpening single-point tool bits that are either carbide-tipped or of high-speed steel. For grinding carbide-tipped tools, a diamond abrasive wheel designed for this purpose is recommended. The tool grinder has a water pot over one abrasive wheel. This keeps the wheel lubricated for wet grinding. It also has tables on both sides that can be tilted 30 degrees in and 45 degrees out to allow for various grinding angles. A *tilting angle jig* that swings 45 degrees to the left and right can also be used. A reversing switch allows either right or left cutting tools to be ground while the wheel turns down towards the



OOL GRINDER

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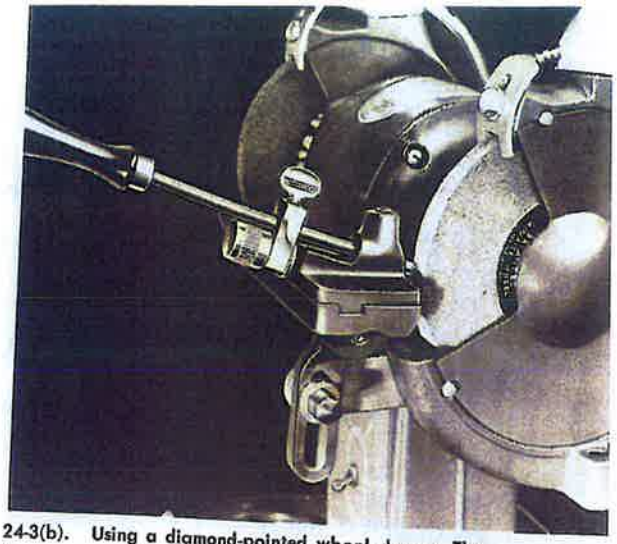
cutting edge. This multiple-purpose machine is larger than the standard two-wheel grinder.

Grinding wheels of the correct *size*, *kind of abrasive*, and *grit*, must be selected. The size of the wheel is determined by the machine on which it is to be used. The thickness and diameter of the wheel and also the arbor-hole size must be specified. The abrasive may be a natural material such as fine white Arkansas stone, or it may be a silicon carbide or aluminum-oxide wheel. See Unit 36. The grit number indicates whether it is coarse, medium, or fine. A 36-grit is a coarse wheel, 60-grit is medium, and 120 is fine. A good selection for a standard two-wheel grinder, for example, would be an aluminum-oxide wheel, 3/4" x 7", with 3/4" arbor hole, either 60-grit or 120-grit. For general-purpose grinding, a 36-grit wheel may be selected.

After considerable use, grinding wheels become clogged with metal and wear down unevenly. They must be cleaned and straightened. While there are several tools for this, the best and simplest is a diamond-pointed wheel dresser. This is a long, thin metal rod with an industrial diamond on one end and a wood handle on the other. The tool is held firmly against the face of the revolving wheel with the rod on the tool rest. Then the face is trued by moving the dresser back and forth across it.

For hand sharpening, there are abrasive stones of all sizes and shapes. Fig. 24-4. Again, these may be either natural stones, such as the Arkansas or Washita, but more often they are artificial. If the stone is artificial, half can be coarse and the other half fine. Artificial stones are oil-soaked at the factory for general sharpening of such edge tools as plane irons and chisels. A cutting oil is needed in many sharpening and honing operations for faster work, a finer edge, and to keep the stone free of chips. A good lubricant can be made of equal parts of oil and kerosene. An 8" taper file and a 10" mill file are needed to sharpen some tools such as hand saws.

24-4. Artificial abrasive bench stones. Their advantage is that a combination stone can be made, one side coarse and the other fine.



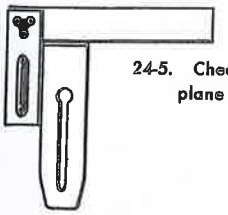
24-3(b). Using a diamond-pointed wheel dresser. The dresser can be placed in a tool holder as shown here or held freehand with the shaft on the tool rest. Press firmly against the wheel, then move the tool back and forth until the face is straight.

Sharpening Hand Tools

Plane-Iron Blade

Remove the double plane iron from the plane and loosen the screw that holds the cap on the plane iron. Separate the two parts. Look at the cutting edge under a good light to see if there are any nicks or if the bevel is rounded off a good deal. If so, both grinding and honing must be done. If the cutting edge is in good condition, only honing will be necessary.

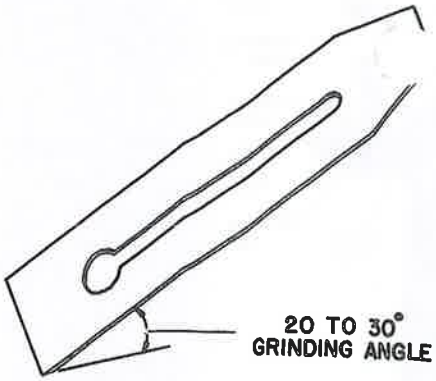
Hold a try square against the cutting



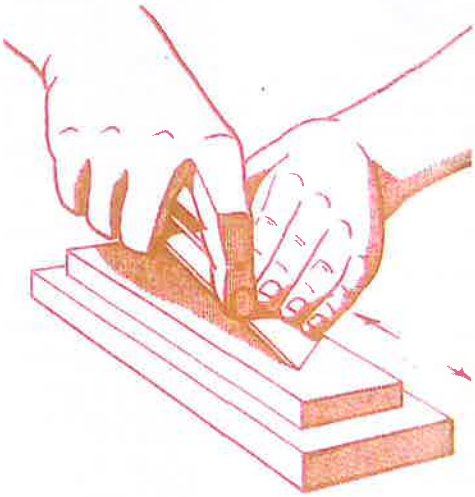
24-5. Checking the cutting edge at a plane blade with a try square.

edge of the plane iron to see if it is square. Fig. 24-5. Grind off the old edge at right angles to the sides until the nicks are removed and the edge is straightened. Move the tool from left to right across the face of the wheel. Dip the tool frequently in water, if using a high-speed grinder. Friction heats the tool and the cutting edge will lose its hardness if it is allowed to get too hot and turn blue. If a grinding attachment is available, fasten the blade to it with the bevel side down. If you don't have a grinding attachment, the blade must be held freehand against the wheel. Fig. 24-6. Use the adjustable tool rest to support the blade. The bevel should be 2 to 2½ times the thickness of the blade to give a 20- to 30-degree angle. Fig. 24-7. Continue to grind the blade until a wire edge (a very thin burr) appears.

Now hone the blade. Apply a few drops of oil or lubricant to the face of an oilstone. Place the blade at a very low angle to the surface, bevel side down. Raise the end slowly until the blade makes an angle of about 30 to 35 degrees with the stone. Fig. 24-8. Note



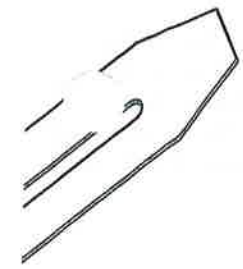
24-7. A plane-iron blade should be ground at a angle of 20 to 30 degrees. The length of the beve should be about 2 to 2½ times the thickness of th blade. For general-purpose planing, the cutting edg should be straight across.



24-8. Whetting a plane-iron blade by moving it back and forth in a straight line.

24-6. Grinding a plane-iron blade without a guide. With this method, hold the blade at the desired angle to the wheel and move it back and forth as it is being ground. This requires considerable skill to keep the bevel even.

24-9. Another method of honing the edge is to move the tool in a figure-eight pattern.



— 20 TO 30° GRINDING ANGLE

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that honing puts a second bevel on the tool. When this honed bevel becomes too long, it is necessary to regrind the tool.

Move the blade back and forth in a straight line or a figure eight. Fig. 24-9. Be sure to hold the blade so the angle will remain the same throughout the stroke. Then turn the blade over and place it flat on the stone. Move it back and forth to remove the burr. Fig. 24-10. Make sure the blade is held perfectly flat. The slightest bevel on the back side will prevent the cap from fitting properly. The chips will get between the cap and the blade, making it impossible to do a good job of planing. Fig. 24-11.

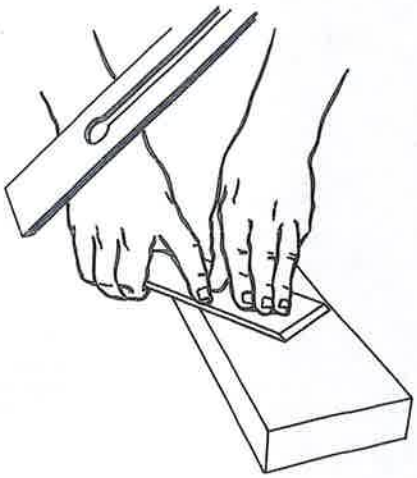
The plane iron can be checked for sharpness in one of several ways. One method is to hold it with the cutting edge down and allow the edge to rest lightly on your thumb nail. As the tool is moved, it tends to "bite" into the nail if it is sharp. If dull, it will slide across easily. Another method is to look closely at the edge. If it is sharp, the edge can't be seen. If it is dull, a thin, white line can be seen. A third method is to cut paper with the plane iron. Fig. 24-12.

Wood Chisel

The chisel is ground and honed in exactly the same way as the plane iron. The angle of the chisel should be from 20 degrees for softwoods to 27 degrees for hardwoods. An angle of about 25 degrees is best for general-purpose work. Notice that plane-iron blades and hand chisels are *hollow-ground;* that is, the major bevel is ground with a slight curve, then a secondary bevel is formed to produce the actual cutting edge.

Auger Bit

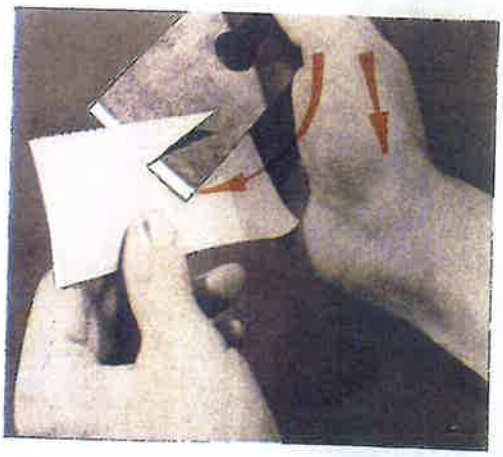
Choose a small flat or triangular auger bit file or a small auger-bit stone. Clamp the auger bit in a vise with the cutting end up, or hold the tool over the edge of a bench. File across the inside of the

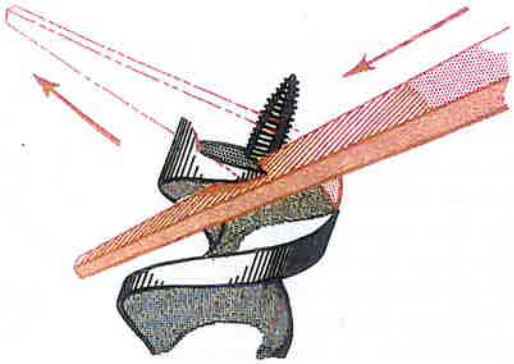


24-10. Removing the burr from the cutting edge by holding the back side of the blade flat on the stone.

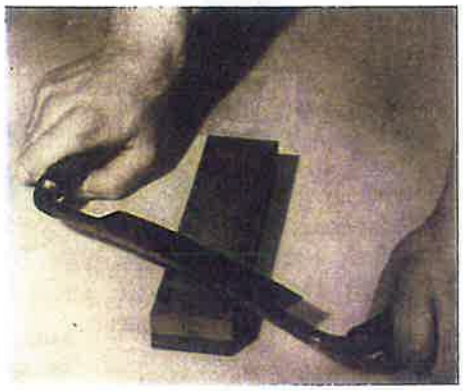
24-11. This is what happens if the back of the blade has a bevel on it or if the cap edge is rounded.

24-12. Testing for sharpness by cutting a thin piece of paper.



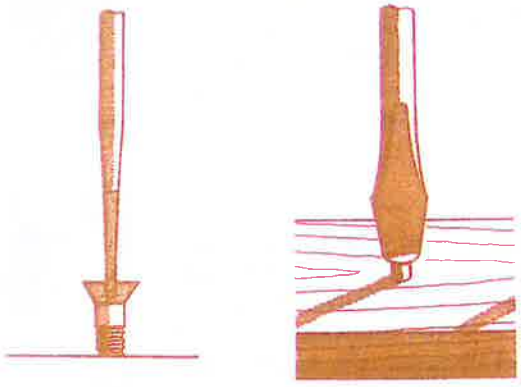


24-13. The auger bit must be sharpened at four points. Note that the file is sharpening the cutting edge and the shadow file is sharpening the spur. This must be done equally on both sides.



24-14. Honing the cutting edge of a draw knife.

24-15. The tip of a screwdriver should look like this. A. Edge. B. Side.



A B

spurs. Fig. 24-13. Never touch the outside spurs as this will change the size of the bit. Also file the lips on the inside or the side toward the shank. Keep the bits in good condition by cleaning off pitch with a solvent.

Draw Knife

If grinding is necessary, the draw knife can be sharpened on a power grinder in the same general manner as a plane iron. The honing can be done in one of two ways. One method is to place a larger stone on the table or bench. Hold the draw knife by its handles at the correct angle to the surface of the stone. Draw it across diagonally so that all parts are equally honed. Fig. 24-14. Another method is to hold the tool with one handle against the top of the bench and the other handle in your hand. Then hold a small oilstone in the other hand and move it back and forth along the bevel at a slightly higher angle to hone a keen edge.

Screwdriver

The screwdriver should be ground with a very light taper on the sides and edges, and the end perfectly flat. Fig. 24-15. A rounded end or sides that are too sharp will cause slipping and burring. The screwdriver can be sharpened on a grinding wheel or with a coarse abrasive stone.

Countersink

Sharpen the faces of the cutting edges. Don't change the shape or angle of the tool by grinding the outside bevel.

Woodturning Tools

The correct shape and grinding angles for each of the woodturning tools is shown in Fig. 24-16. If the tools are to be used for cutting (in contrast to scraping), they must be ground and honed with a flat bevel. Any secondary bevel

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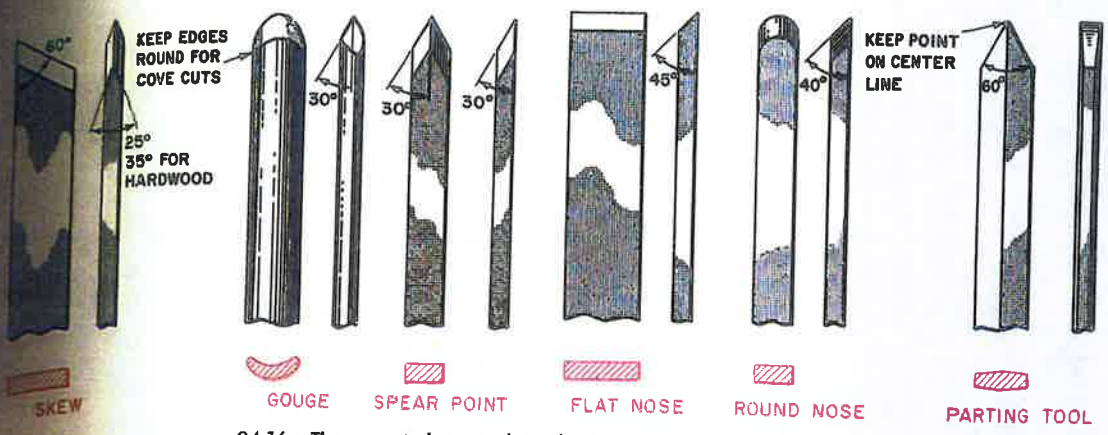
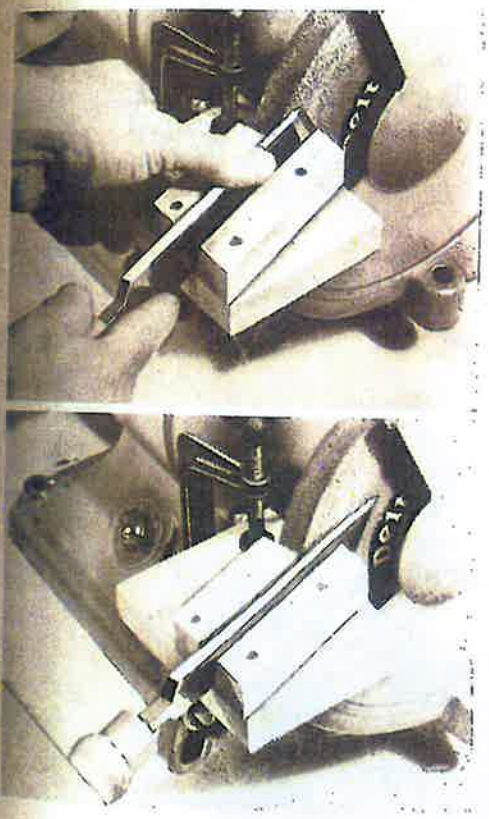


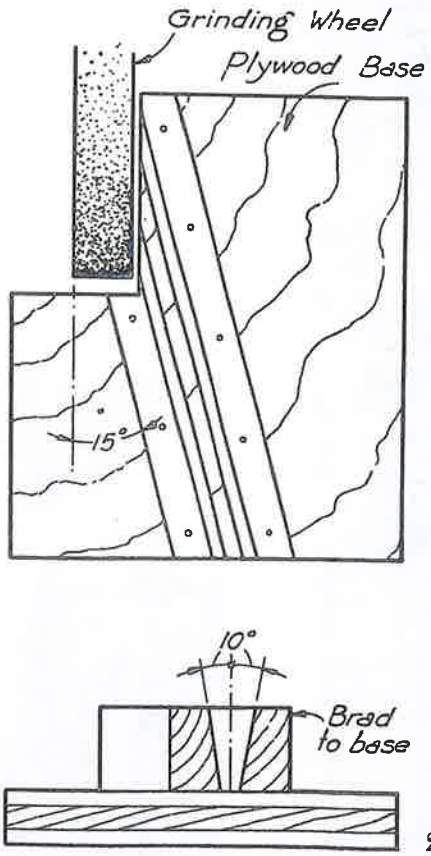
24-16. The correct shape and grinding angles for wood-turning tools.

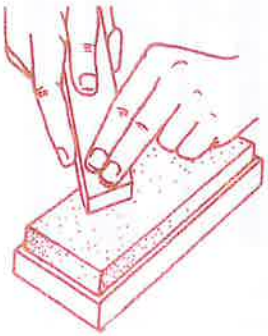
on the skew, for example, will keep it from cutting. This is not important if the tools are used for scraping. The skew can be ground on the side of a straight or recessed grinding wheel. Although the grinding can be done freehand, it is better to use a wood jig. Figs. 24-17 and 24-18. Hold the chisel skew one of the

24-17. The bevels on the skew should be ground flat. This simple wood jig will make the work easier. Be sure to use a *straight cup wheel* designed for grinding on the side.

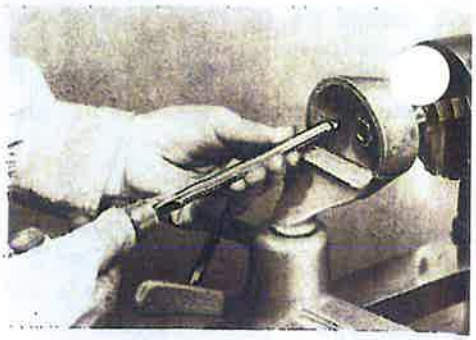


24-18. Plans for a wood jig similar to the one in Fig. 24-17.





24-19(a). Hold the skew at exactly the same angle when honing. Don't hone a secondary bevel, especially if the tool is used for cutting.



24-20. Grinding a gouge on a cup wheel.

beveled guide blocks first and then against the other side. When honing the skew, maintain the same angle. Fig. 24-19.

A gouge can be ground in one of several ways. The best method is to use a cup wheel mounted on a wood or metal lathe. The curved interior surface of the wheel helps to shape the cutting edge and less rolling of the tool is required. Fig. 24-20. The gouge can also be shaped by rolling the tool against the face or side of a standard grinding wheel. Fig. 24-21. The honing is done on a goug slipstone. Hold the stone in one han and place the convex side of the tool i the concave side of the stone. Fig. 24-2 Hone by pushing the gouge forward an rotating at the same time. Keep the stor flat so that the back edge is not bevele Fig. 24-23.

Spear-point, flat-nose, and parting too all require flat-angle grinding and hoi ing that can be done freehand or wit a simple jig. The round nose is sharpene in a similar manner to the gouge.

24-19(b). A fine wheel can also be used for honing.

24-21. Grinding a gouge on the face of a ...ted In this method, the tool must be rolled to keep th same angle of bevel all around the tool.

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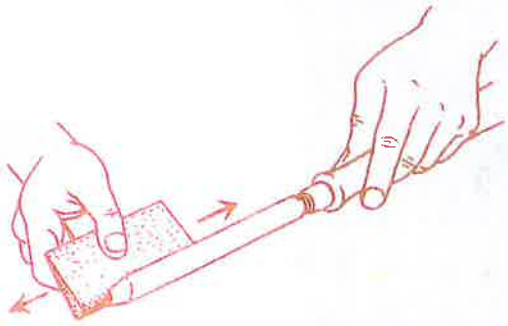
24-22. Honing on outside bevel.

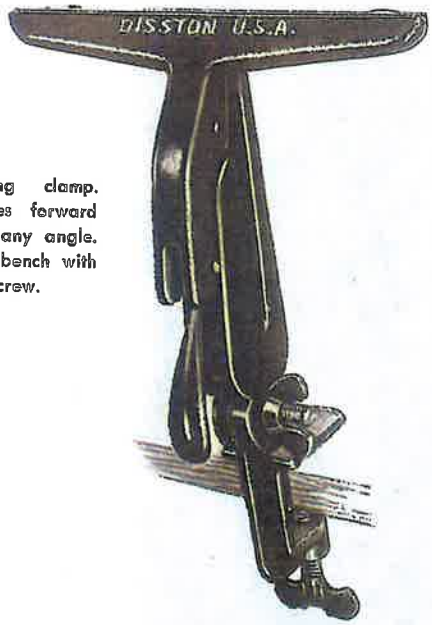
Sharpening a Hand Saw

Jointing means bringing all the teeth to the same height. This needs to be done only when the teeth are uneven and incorrectly shaped. To joint a saw, place it in a clamp, with the handle to the right. Fig. 24-24. Lay a mill file lengthwise, flat upon the teeth. Pass it lightly back and forth along the length of the blade on the tops of the teeth until the file touches the top of every tooth. Do not allow the file to tip to one side or the other. Fig. 24-27.

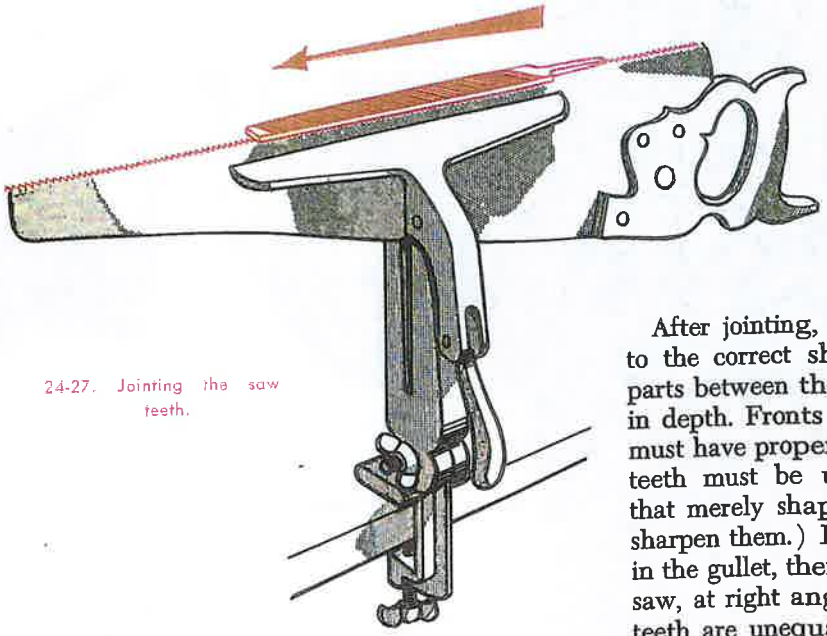
Examine the tooth edge of the saw to see if the teeth are uniform in size and shape and if they are properly set. It is not necessary to reset the teeth of a well tempered hand saw every time it needs sharpening. If the teeth are touched up with a file from time to time as the saw is used, the saw will cut better and longer, and sufficient set will remain to enable the saw to clear itself. Study the shape of the teeth. Teeth of saws for crosscutting should be shaped as shown in Fig. 24-25. Teeth of the ripsaw should be shaped like those in Fig. 24-26. A saw cannot give good service unless the teeth are even and uniform in size and properly shaped.



24-23. Honing the inside of a gouge.



24-24. Saw-filing clamp. This clamp moves forward or backward to any angle. It attaches to a bench with a thumb screw.



24-27. Jointing the saw teeth.

24-28. Saw set. This tool is used to bend the upper half of each tooth to one side or the other to form the set.

24-29. Correct size files for saw filing.

Jointing teeth—8" or 10" Mill Bastard File

Sharpening Teeth—4½, 5½, 6 points—7" Slim Taper

7, 8 points—6" Slim Taper

9, 10 points—5" or 6" Slim Taper

11, 12, 13, 14, 15 points—4½" Slim Taper

After jointing, all teeth must be fil to the correct shape. The gullets (lo parts between the teeth) must be equ in depth. Fronts and backs of the tee must have proper shape and angle. T teeth must be uniform in size. (No that merely shaping the teeth does n sharpen them.) Place the file well dow in the gullet, then file straight across t saw, at right angles to the blade. If t teeth are unequal in size, press the f against the teeth that have the larg tops until you reach the center of t flat top made by jointing. Then move file to the next gullet and file until remainder of the top disappears and tooth has been brought up to a point

The purpose of *setting* the teeth saws (springing over the upper part each tooth, one to the right and the n to the left) is to make the saw cut a l (groove) that is slightly wider blade. Fig. 24-28. This prevent ..c which would cause the saw to bind push hard in the cut. Start the set from the small end (toe) of the s Bend to left and right alternately. I important that the depth of the set no lower than half the tooth. If dee it is likely to spring, crimp, or crack blade. It could even break out a to Particular care must be taken to keep set regular. It must be the same w

24-30. First position for filing a hand saw for cutting.

l teeth must be filed
ɔe. The gullets (low
teeth) must be equal
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hape and angle. The
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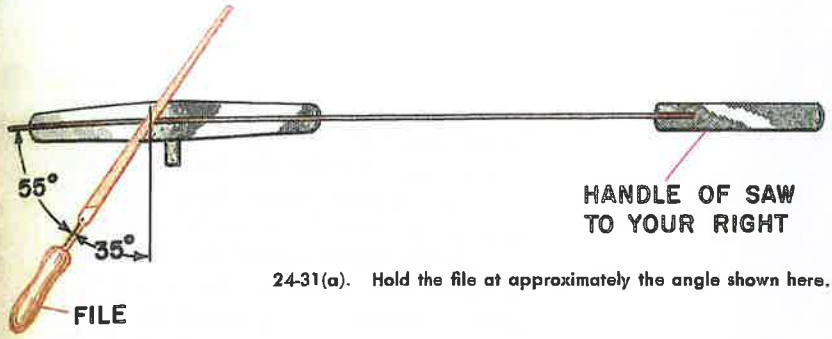
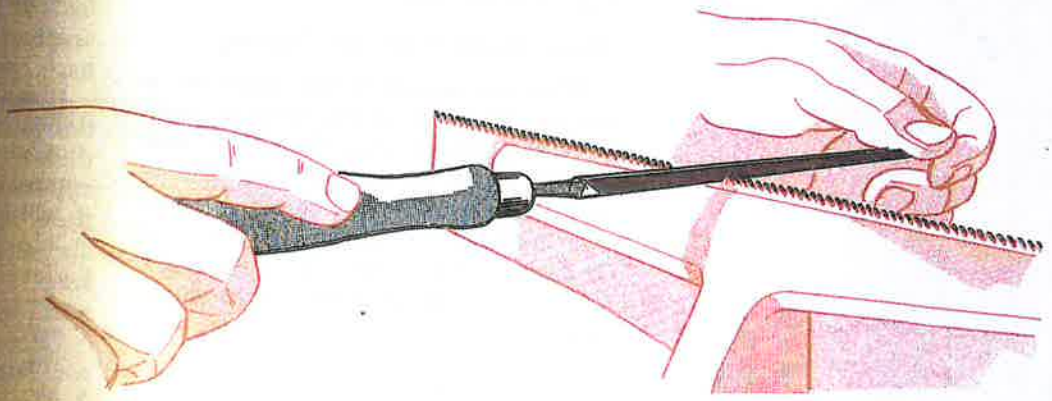
r filing a hand saw for cross-cutting.

HANDLE
ROSS-CUT SAW

HERE



24-31(a). Hold the file at approximately the angle shown here.



24-31(b). Make sure the file is level as the stroke is made.

from one end of the blade to the other, and the same width on both sides of the blade. Otherwise the saw will not cut true. If not properly set, the saw line and the cut will be "snaky."

Filing a Hand Saw for Crosscutting

Place the saw in a filing clamp *with the handle at the right.* Select the correct size taper file. Fig. 24-29. The bottom of the tooth gullets should be 1/8" above the clamp jaws. If more of the blade projects, the file will chatter or screech. This dulls the file quickly.

Stand at first position, shown in Fig. 24-30. Start at the point. Pick out the first tooth that is set toward you. Place the file in the gullet *to the left of this tooth.* Hold the file directly across the blade. Then swing the file handle *toward the left* to the same angle as the bevel. Keep the file at this angle and level. Be sure the file sets down well into the gullet. Fig. 24-31. The file should cut on the push stroke. It files the back of the tooth to the left and the front of the tooth to the right at the same time. Skip the next gullet to the right but place the file in the *second* gullet from the one you just filed. Repeat the operation being careful to file at the same angle as before. Continue this way, placing the file in every second gullet until you reach the handle end of the saw.

Study the second position shown in Fig. 24-32. Turn the saw around in the clamp, *with the saw handle to the left.* Take the second position. Place the file

24-32. Second position for filing a crosscut saw.

in the gullet *to the right of the first set toward you.* This is the first of the gullets you skipped when filing the other side of the saw. Turn the file handle to the correct angle *toward the right.* Now file until the teeth are sharpened to a point. Continue this, placing the file in every second gullet until you reach the handle of the saw.

Filing Hand Saws for Ripping

With one exception this operation is exactly the same as for crosscut saws. This exception is that *the file is held straight across the saw,* at a right angle to the blade. The teeth should be filed to an angle of 8 degrees at the front and 52 degrees at the back. Check this angle with the protractor head of a combination set.

Machine Tools

Machines for cutting wood operate at maximum efficiency only when the cutting tools are sharp. Frequently, a little touch up with an oilstone will help if the tool is basically in good condition. However, when a knife or saw has become dull, it is necessary to have it reground. To avoid excessive sharpening costs and delays, the best practice is to buy high-quality cutting tools in the first place. Whenever possible, make use of carbide-tipped tools so that grinding will be needed less frequently.

More important, however, is to use the machines properly. This will prolong the life of cutting edges more than any other single factor. It takes only one board with a nail in it to ruin a set of planer or jointer knives. If power equipment isn't available for sharpening, saws and knives should be sent out periodically to a shop that specializes in this work. While hand methods of sharpening saws are covered in this unit, they are not recommended except for emergencies.

Refitting Narrow Band Saws by Ha

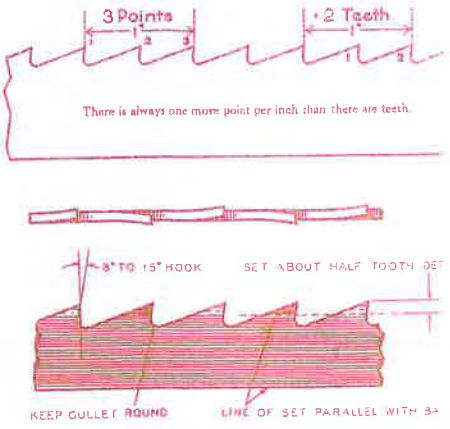
When an automatic filing m ne not available, narrow band saw y sharpened by hand. Place the saw or long bench so that its entire length supported on the same level. Make s the teeth point to the left. The cla will hold a section of approximately teeth at one time. The saw is then mov as often as necessary until all the te have been sharpened.

However, before filing the teeth i the usual practice to *joint* the sect slightly. This is done by lightly runnin mill file over the tops of the teeth to m them uniform in height. Jointing also assist as a guide in filing, and h keep the saw teeth as much like new possible.

Choose taper files for sharpening r row band saws as follows: for saws w 3, 3½, 4, 5, or 6 points—6″ band 7, 8, 9, or 10 points—7″ extra slim ta file.

Hold the file in a horizontal posit File each tooth straight across the at right angles to the blade, raising file on the back stroke. Fig. 24-33. If point of any tooth is not br t

24-33. A standard band-saw blade has teeth sh like a ripsaw. The teeth should be filed straight c with a hook from 8 to 15 degrees.



g Narrow Band Saws by Hand

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½, 4, 5, or 6 points—6″ band file
9, or 10 points—7″ extra slim taper

old the file in a horizontal position
each tooth straight across the saw
ight angles to the blade, raising the
on the back stroke. Fig. 24-33. If the
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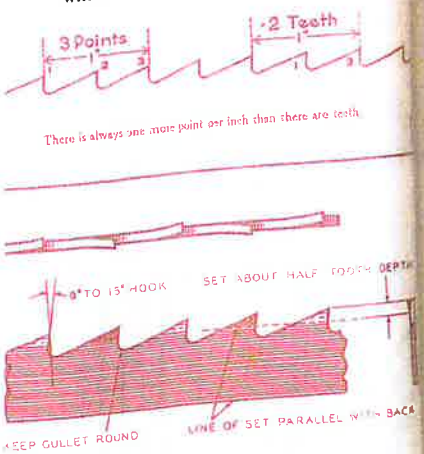
3. A standard band-saw blade has teeth shaped
a ripsaw. The teeth should be filed straight across
with a hook from 8 to 15 degrees.



sharp after the stroke of the file, do not immediately file it again. Instead, continue until you have filed the section you are working on. By this method, each section may require two or three repetitions.

Teeth may be set with a pistol-grip saw set, as hand-saw teeth are set. When setting is necessary, it should be done before the teeth are filed. Remember that if the saw is to do only straight-line cutting, best results are obtained with the least set possible. Greater set is necessary when cutting curved lines.

Repairing a Broken Band-Saw Blade

When a band-saw blade breaks, it must be hard soldered or welded into a continuous piece. If only a small section must be removed during repair, the upper wheel can be adjusted to compensate for this. However, if a bent section must be removed, it is necessary to add a piece of the same kind and size. If the blade is to be hard (silver) soldered by brazing, a scarf joint that is one or two teeth long should be filed. Apply brazing flux and a small amount of silver solder. Place the ends together and clamp in position. Turn on the electricity until the joint becomes red hot and the solder melts. Then turn off the electricity and press the handle down firmly to hold the joint together for three or four seconds. Fig. 24-34. Remember that this should be done immediately after the current has been switched off.

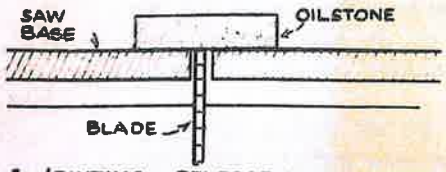
Some large band saws have a built-in electric butt welder for repairing blades. This device squares off the ends of the blade and then butt welds them together. Then a small grinding wheel smoothes the sides to the same thickness as the blade itself.

Sharpening Circular-Saw Blades by Hand

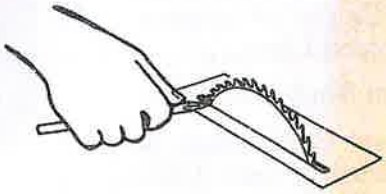
As with the band saw, the best method to keeping circular-saw blade sharp is with automatic saw-filing equipment. However, if it is necessary, hand sharpening can be done to a blade that is basically in good condition. Four basic steps must be followed to put a dull blade back in shape: *jointing or rounding*, *gumming*, *setting*, and *filing*. Fig. 24-35(a).

24-34. A brazer for repairing band-saw blades.

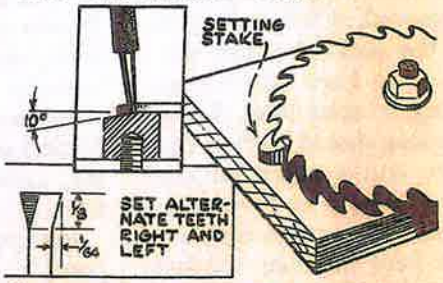
Jointing makes the saw as round as possible so that all teeth are of equal height. Gumming is necessary when the teeth have become shallow after repeated filing, and must be ground deeper. Setting is bending the teeth to the right and left to provide clearance. Filing or grinding sharpens the teeth. This last step is generally the only one that should be attempted by the hand method. In filing, do not reduce the size, shape, or length of the teeth; simply bring them up to a sharp point. Fig. 24-35(b). Have all the teeth the same shape, with gullets of even depth. Filing should be done with the blade held in a blade vise. Use a taper or saw file. Fig. 24-36. Carbide-tipped blades must, of course, be ground with an abrasive wheel.



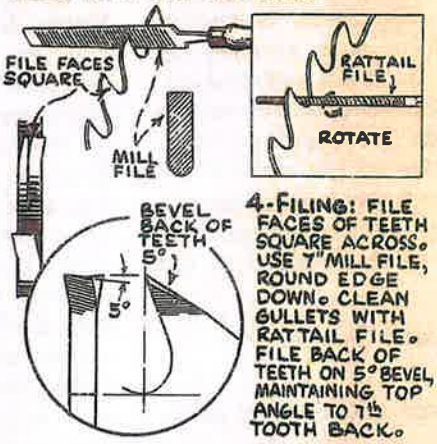
1-JOINTING: REVERSE SAW ON ARBOR RAISE BASE. PLACE STONE IN PLACE AND LOWER BASE UNTIL TEETH STRIKE. DO NOT JOINT ANY MORE THAN IS NECESSARY TO LEVEL TEETH.



2-GUMMING: MAKE PENCIL MARK TO SHOW BOTTOM OF GULLET (1/32" FROM EDGE OF BLADE). FILE OR GRIND GULLETS TO LINE. FOLLOW SHAPE AS SHOWN IN PLAN.

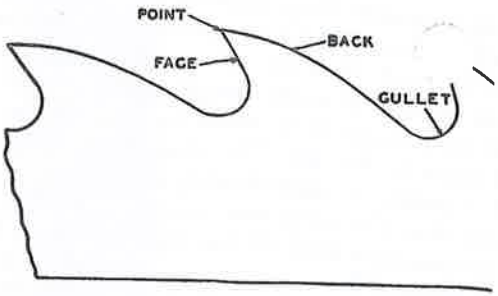


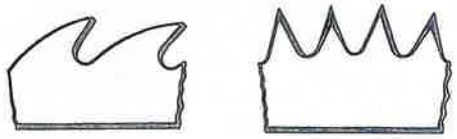
3-SETTING: USE SUITABLE SETTING STAKE OR HAND SET. DO NOT EXCEED AMOUNT OF SET AS SPECIFIED. KEEP SET UNIFORM.



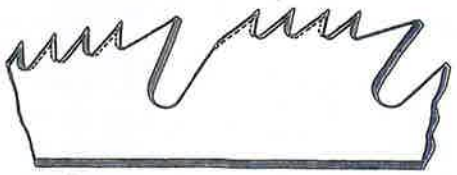
4-FILING: FILE FACES OF TEETH SQUARE ACROSS. USE 7" MILL FILE, ROUND EDGE DOWN. CLEAN GULLETS WITH RATTAIL FILE. FILE BACK OF TEETH ON 5° BEVEL, MAINTAINING TOP ANGLE TO 71½° TOOTH BACK.

24-35(a). Steps in sharpening a circular-saw blade.





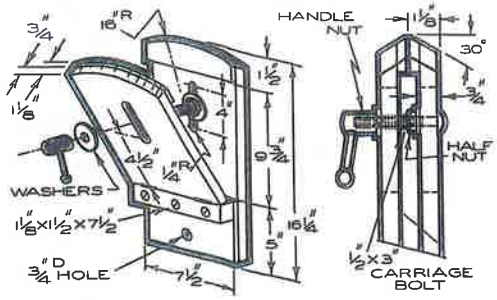
a. b.

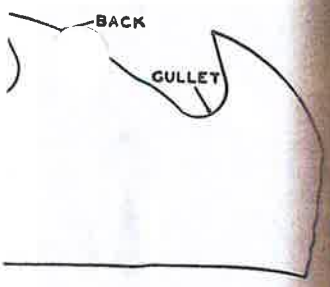


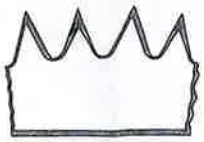
c.

24-35(b). There are many different shapes of teeth on saw blades. Even saws designed to do th e kind of cutting may have teeth of different . The average cabinetmaker is concerned with these three basic kinds: (A) rip, (B) crosscut, and (C) combination. Also shown are the parts of a tooth.

24-36. This circular-saw blade vise is made of hardwood. A standard ½" hexagon nut or a wing nut can be used with the carriage bolt instead of the handle nut shown.







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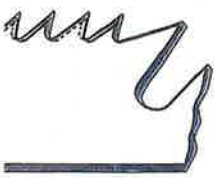

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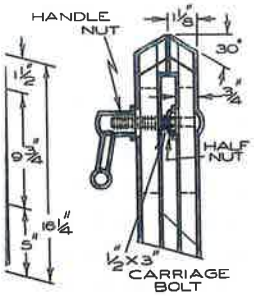
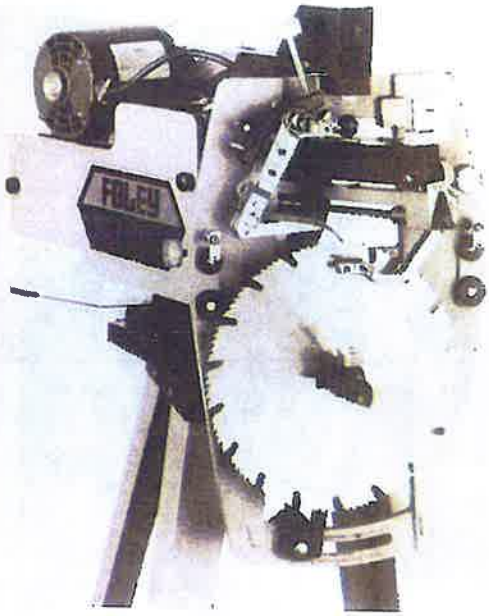




24-37. This automatic saw filer can sharpen hand saws and band saws as well as circular saws. An attachment can be added for sharpening compass and keyhole blades.

Do not file sharp corners or nicks in the bottom of the gullets. This usually results in cracks in the gullets. Bevel the teeth of cutoff saws on both the face and back edges—more on the face than on the back. File ripsaw teeth straight across to a chisel-like edge. Then give a very slight bevel to the back of the teeth. In filing any saw, take care that the bevel does not run down into the gullets. The bevel on both face and back should be about one-third the length of the teeth.

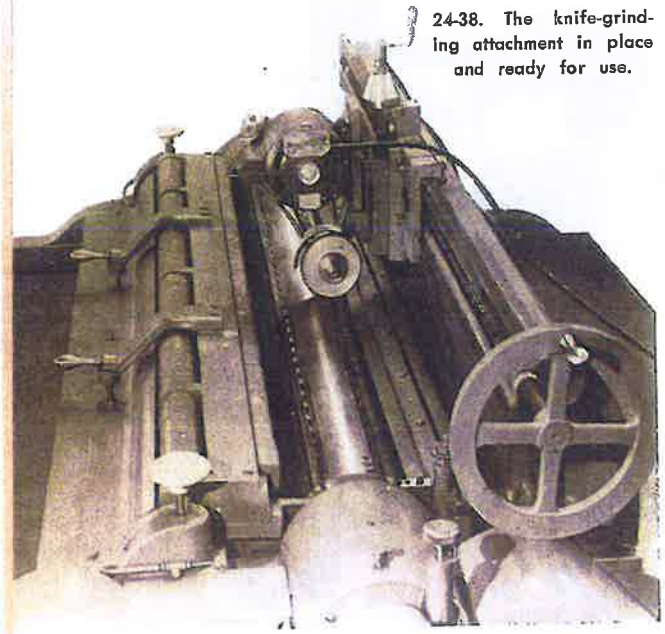
In filing a flat-ground combination saw which crosscuts, rips, and miters, follow the same method used in sharpening a crosscut saw. In sharpening a hollow-ground combination saw, also follow this method, but do not set the teeth as the hollow grinding provides ample clearance.

Some combination saws have rakers, or "cleaner" teeth, to remove material left in the cut by the beveled cutting teeth. The points of these rakers should be filed shorter than the points of the beveled teeth—1/64" shorter for cutting hardwood, 1/32" for softwood. After filing these raker teeth, square the face of each and bring it to a chisel-like edge by filing on the back of the tooth only.

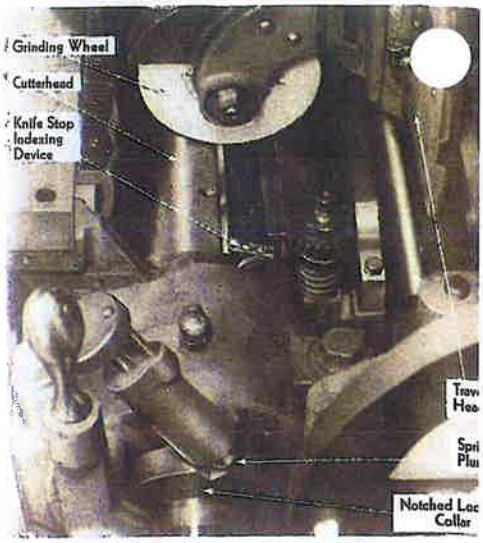
Saw-filing Equipment

Automatic saw-filing equipment not only provides greater accuracy than can be achieved by hand but also adds mechanical precision to the sharpening. A single machine can be used to sharpen blades for circular, band, and hand saws. Fig. 24-37. The basic principles of sharpening must be followed. Each type of saw tooth (crosscut, rip, or combination) requires a different adjustment of the machine. Also, different attachments must be used to hold and move the various saws.

Automatic saw sharpening is a highly specialized part of the cabinetmaker's trade. Some people, such as those working in the tool rooms of furniture factories or operating their own business,



24-38. The knife-grinding attachment in place and ready for use.



24-39. A close-up view of knife grinding. Note the the knife stop indexing device holds the knife in the correct position.

do saw and knife sharpening on a full-time basis. The skilled all-around cabinetmaker and finish carpenter send their cutting tools to a specialist for sharpening. Even more highly specialized equipment is needed for sharpening carbide-tipped tools.

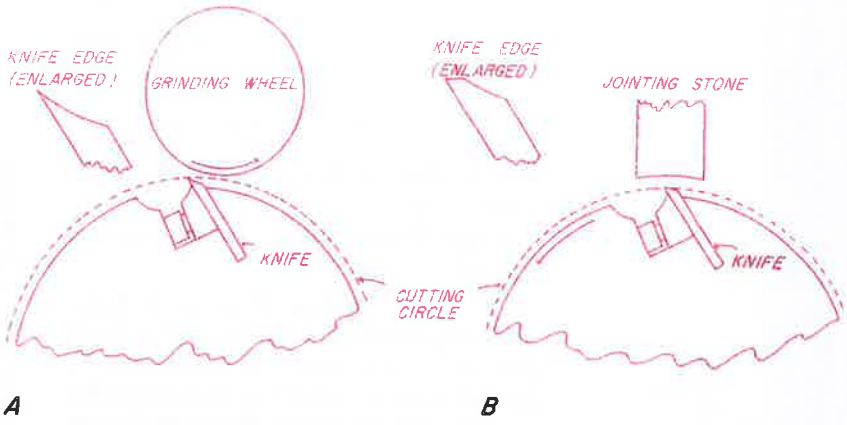
Grinding and Jointing Planer Blades

Before these blades can be sharpened, the exhaust pipe must be disconnected and the dust hood removed from the surfacer or planer. Modern planers, except for the smallest sizes, are usually equipped with attachments for grinding the knives without removing them from the cutterhead. This equipment consists of a small abrasive wheel with its motor. Fig. 24-38. These devices are attached to a grinding and jointing bar above the cutterhead, and are moved back and forth along the knife edges. Knives are ground one by one while the cutterhead is stationary. Fig. 24-39. The bevel that is ground in this way is not a straight line, but conforms to the circumference of the grinding wheel. Fig. 24-40(a).

Knives on a cutterhead often projec unequally and therefore do not cut ever ly. With a four-knife cutterhead, for ir stance, one knife that projects a litt too far may wipe out the marks of th other three knives. As stated earlier, th purpose of jointing is to even up th projection of the knives. In join carrier which holds an abrasive st attached to the grinding and jointin bar, and the cutterhead is then set i motion. The stone is lowered until barely touches a knife edge and is the traversed along that edge. Fig. 24-41(a This is continued until a fine line, calle a *joint* or *land,* appears on the full leng of each knife edge. The knives shou now project evenly. As they gradual become dull, jointing may have to repeated several times for sharpenin However, repeated jointing finally caus a pronounced heel. Fig. 24-40(b). T jointed portion of the bevel is part the cutting circle and therefore has clearance. The wider it becomes beyo certain limits, the more pounding a rubbing take place, resulting in po

of knife grinding. Note that device holds the knife in the ect position.

tterhead often project refore do not cut even- ife cutterhead, for in- that projects a little out the marks of the . As stated earlier, the ng is to even up the knive- In jointing, a ls a- asive stone is grinding and jointing erhead is then set in e is lowered until it nife edge and is then at edge. Fig. 24-41(a). until a fine line, called pears on the full length ge. The knives should ly. As they gradually ting may have to be times for sharpening. l jointing finally causes el. Fig. 24-40(b). The the bevel is part of and therefore has no der it becomes beyond more pounding and ce, resulting in poor



24-40. (a). Note how the grinding wheel sharpens the knife blade to a sharp edge with the bevel in an arc shape. (b). Jointing produces a land or joint (secondary bevel) on the knife. The enlarged edge shows a land that is too wide. When this happens, the knives must be reground.

work. Knives should therefore be reground as soon as the joint reaches a width of about 1/32".

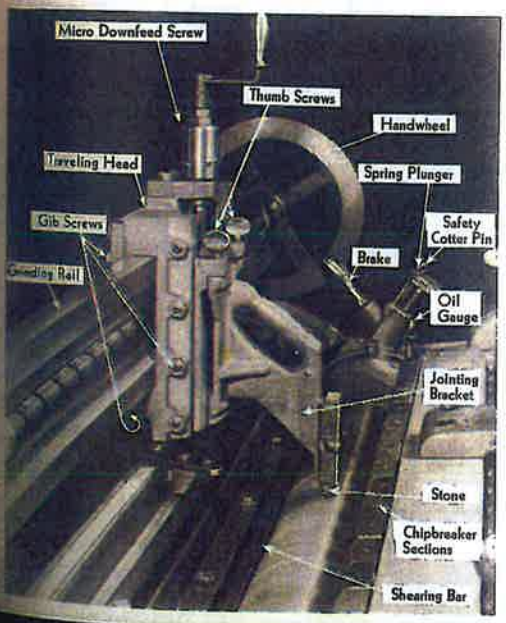
Most manufacturers supply tools for this, replacing the knives when necessary. One such device is a *knife puller* to remove the knife from the slot after the bolts or set screws in the knife bar or throat piece are loosened. Another device is available for setting all the knives in the cutterhead to the same height. The knife and knife bar are inserted in the slot and the set screws lightly tightened with the knife extended a little more than necessary. Put the block in place and strike with a hammer all along the knife. Then tighten the set screws securely. Fig. 24-41(b).

Grinding Jointer Knives

Jointer knives should be ground when:

- The knives are so dull that honing will not put a good cutting edge on them.

24-41(a). Jointing the knives in a cutterhead. The power is on so the cutterhead is revolving at high speed. Great care must be taken when doing this. The stone must just touch each of the blades. The downfeed screw can be moved only a few thousandths of an inch at a time.



24-41(b). Cross section of a cylinder showing the details of a four-knife cutterhead and the method of using the knife puller and knife setting block.