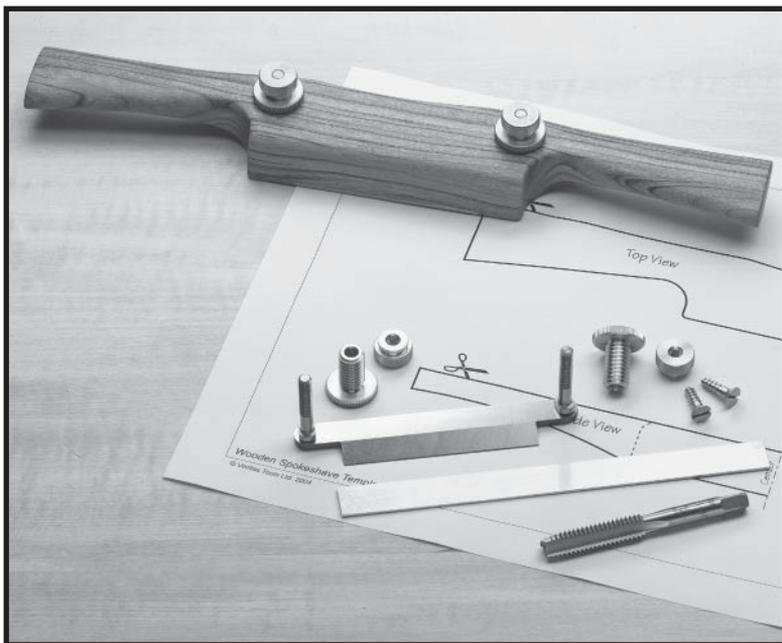


# *veritas*<sup>®</sup>

## Large Wooden Spokeshave Kit



**05P33.30**

U.S. Patent No. 7,216,435

# Introduction

Traditional wooden spokeshaves are still widely used today, even though adjusting the depth of cut on them can be tricky. The components of this kit let you make a spokeshave that incorporates a traditional design with hardware components that will produce a simple, effective depth of cut adjustment that requires neither extra tools nor blade removal.

The following instructions describe in detail how to make one particular spokeshave. Aside from the specifications on fitting the blade and sole, the size and shape of the handles may be changed to suit your preference.

Basic woodworking skills are required. You may find it useful to read the *Tips and Techniques* section before you begin making your spokeshave.

## Components supplied with this kit (see Figure 1):

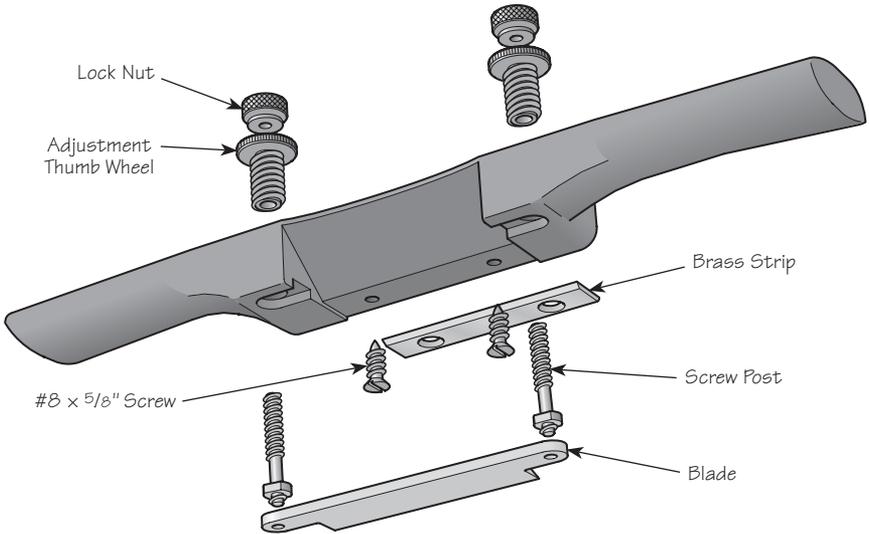


Figure 1: Exploded assembly.

Item	Qty.
A2 Tool Steel Blade	1
Screw Post	2
Adjustment Thumb Wheel	2
Lock Nut	2
Brass Strip, 1/16" x 1/2" x 6"	1
Screw, #8 x 5/8"	2
Template	1
3/8-16 UNC Tap	1

# Unpacking and Preassembly of the Blade

Remove all packaging materials from the blade. Take care not to bend the brass strip. Place the blade bevel up on a flat surface and thread the screw posts into the blade using a small adjustable wrench to firmly tighten the posts. You may find it useful to grip the blade in a vise while installing the screw posts.



**Caution:** *Be aware that the blade is sharp; careless handling can result in serious injury.*

## Required Tools

### Layout

- Pencil
- Square – a 4" adjustable double square is ideal
- Ruler
- Marking/striking knife
- Sliding bevel
- Protractor
- Center punch or scratch awl

### Drilling/Tapping

- $\frac{7}{64}$ " and  $\frac{1}{8}$ " twist drill bits
- $\frac{3}{8}$ " forstner bit
- $\frac{5}{16}$ " brad-point drill bit
- Drill press
- Tap handle (hand vise, vise grips or adjustable wrench may be substituted)
- 82° countersink

### Cutting/Shaping

- Block plane – or other plane as preferred
- Backsaw or dozuki
- Mill file, single cut
- $\frac{1}{4}$ " and  $\frac{3}{4}$ " (or 1") paring chisels
- Gouge, #8 or #9 sweep,  $\frac{1}{4}$ " to  $\frac{3}{8}$ " wide suggested (see *step 9*)
- 120x sandpaper
- Coping saw
- Double cut files, rasps and sandpaper as desired for freehand shaping and smoothing

### Miscellaneous

- Mallet
- Adjustable wrench
- Wax (beeswax, paste or paraffin)
- Slot screwdriver
- Small hammer

Other tools that, while not necessary, could be used if available:

- Router, laminate trimmer style with  $\frac{3}{16}$ " straight bit (see *step 9*)
- Table saw
- Bandsaw or jigsaw
- $\frac{3}{4}$ " or 1" drum sander
- Marking gauge
- Router plane

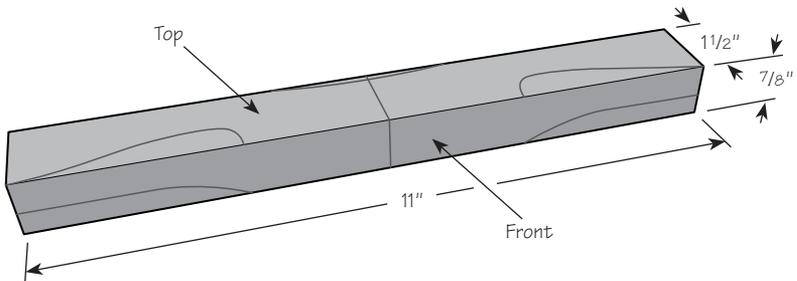
## Required Material

The stock (body) of the spokeshave can be made from any dense, close-grained hardwood. Boxwood, beech, dogwood and hard maple make excellent spokeshaves. Other hardwoods such as cherry and walnut may also be used. See *step 1* (below) for the required size.

## Making the Spokeshave

### Preparing the Blank

1. Select a hardwood blank and cut it to size:  $11" \times 1\frac{1}{2}" \times \frac{7}{8}"$ .
2. Use a pencil to mark the center of the length of your blank and draw a line all the way around the blank, as shown in **Figure 2**, using a square.

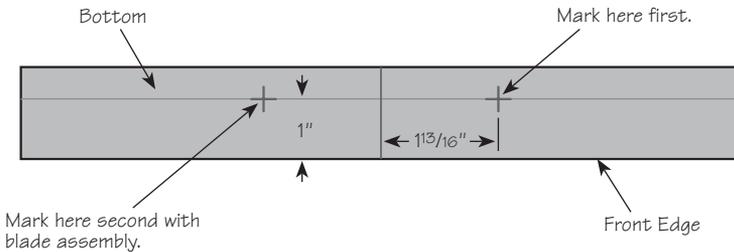


**Figure 2: Label each face of the blank.**

3. Use the included templates to transfer the top and side contours of the spokeshave onto the top and the side of your hardwood blank. If you will be making several spokeshaves, you may wish to glue the template onto a piece of thin plywood, non-corrugated cardboard or similar material and cut it out to make a more permanent template. Align the edge of the template marked "center" with the center of your blank and trace half of the outline onto your blank. Flip the template over to trace the other half. Mark the blank to indicate the top, bottom, front and back side of the spokeshave, as shown in **Figure 2**, so that they can be identified later.

## Drilling the Holes for the Blade

4. Draw a line along the bottom of the blank 1" from the **front** edge. (A marking gauge is useful for this task.) Measuring out from the center line, first make a mark  $1\frac{3}{16}$ " to one side of the center line. Use a center punch or scratch awl to dimple the location. Use the blade (with screw posts installed) to mark the other hole location by placing the point of one screw post on the first hole location and positioning the other screw post on the line drawn parallel to the front edge. Tap the blade with a small hammer or block of wood to mark the second hole location. You will now have a mark on each side of the center line, as shown in **Figure 3**. The holes must be marked and drilled as accurately as possible; otherwise, you will not be able to install the blade.

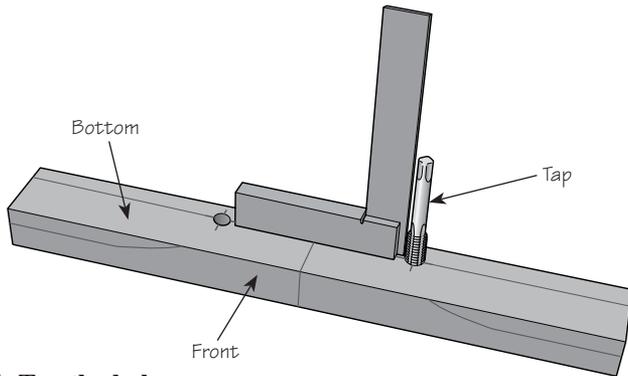


**Figure 3: Mark the holes.**

A drill press is necessary for drilling the holes, as they must be exactly perpendicular to the blank and parallel to each other. Clamp a piece of scrap between your workpiece and the drill-press table. You need a flat-bottom hole, so ideally a forstner bit should be used, but a brad-point bit will also work. Start by drilling a  $\frac{3}{8}$ " diameter hole just slightly deeper ( $\frac{1}{32}$ ") than the thickness of the blade, where marked on the bottom of the blank. The  $\frac{3}{8}$ " diameter of the bit matches the radius on the ends of the spokeshave blade, and these holes will form the ends of the recess into which the blade will later be fitted.

Using the same set-up (without moving or unclamping the blank), use a  $\frac{5}{16}$ " brad-point bit to drill a hole through the blank from the bottom of the  $\frac{3}{8}$ " hole. Repeat for the other hole.

Chamfer the holes at the top of the blank with an  $82^\circ$  countersink to ensure clean exit of the tap. Thread the  $\frac{5}{16}$ " holes from the bottom of the blank to accept the adjustment thumb wheels, using the  $\frac{3}{8}$ -16 UNC tap supplied with the kit. As with drilling the holes, this must be done as accurately as possible. Keep the tap perfectly plumb while threading the holes. Frequently remove the tap handle and place a square against the tap in two locations, to make sure the tap remains plumb, as shown in **Figure 4**. You may find that a 1" to  $1\frac{1}{2}$ " thick guide block (with a  $\frac{3}{8}$ " through hole) clamped in line with the pilot hole in the blank will help keep the tap properly lined up. Partially back the tap out after every other revolution to clear any accumulated wood shavings that will impede the threading progress.

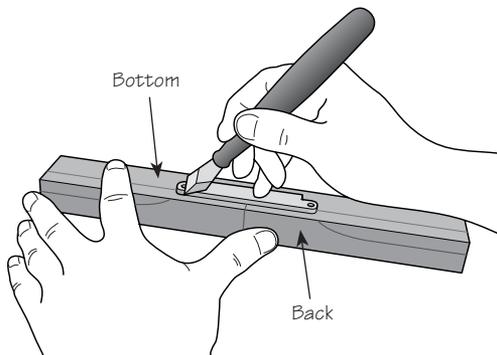


**Figure 4: Tap the holes.**

Thread the adjustment thumb wheels into the top of the blank, taking care not to cross thread them. If they seem to require excessive force to rotate, remove them and run the tap through again, but do not be too aggressive. There should be no free play between the wooden threads and the brass threads. Insert the screw posts and blade (cutting edge toward the front) into the bottom of the blank. Use the locknuts to hold the blade firmly in place. **DO NOT FORCE THE PIECES TOGETHER!** If the blade doesn't fit properly, look for a small burr or other minor source of interference on the blade and file or abrade it accordingly. If the blade will still not fit properly, then the holes have not been drilled accurately enough in the blank. There is no way to correct this problem – start again with another blank.

### Scoring the Recess for the Blade

5. Use a sharp marking knife to score the outline of the blade onto the bottom of the blank, as shown in **Figure 5**. The  $\frac{3}{8}$ " holes that you drilled earlier should perfectly line up with the radiused portion of the spokeshave blade, eliminating the need to mark around the radiused portion of the blade with your knife; you need only mark the straight edges, but not the cutting edge of the blade.



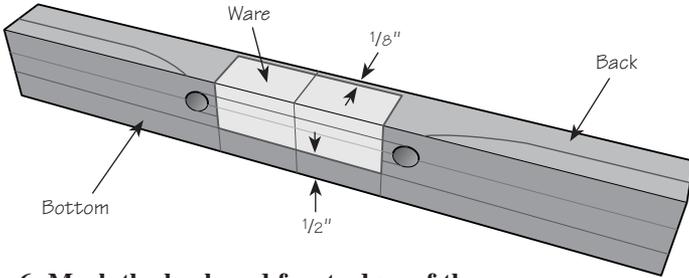
**Figure 5: Trace the blade.**

***Note:** While you may be tempted to use a pencil for this operation, the knife will make a finer mark and will help with getting the best possible fit of the blade.*

## Cutting the Ware

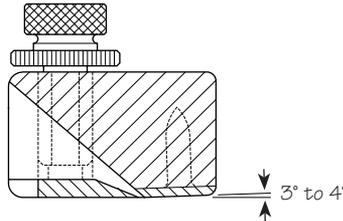
6. Remove the blade and the adjustment thumb wheels. Using a square, extend the straight lines that were scored along the sides of the blade to the back edge of the blank with a marking knife, then down the back side of the blank, as shown in **Figure 6**. These lines represent the outside edges of the ware (the area through which the shavings pass when the tool is in use) that will be cut into the stock.

Mark the back and front edges of the ware, score a horizontal line  $\frac{1}{8}$ " down from the top on the back side of the spokeshave, and another horizontal line on the bottom  $\frac{1}{2}$ " from the front edge, as shown in **Figure 6**.

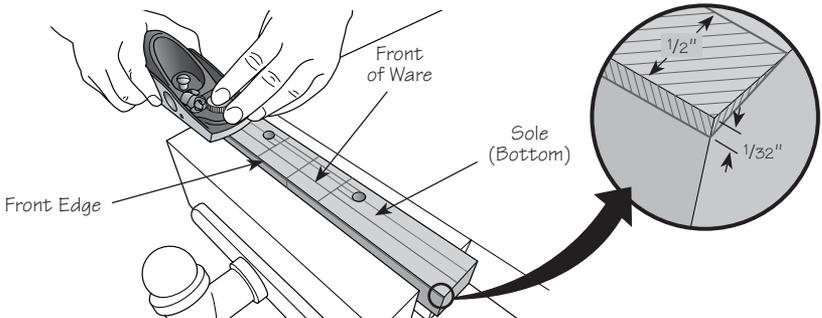


**Figure 6: Mark the back and front edges of the ware.**

7. The spokeshave is rocked forward  $3^\circ$  to  $4^\circ$  in use in order to engage the cutting edge and to accommodate fiber springback. Consequently, the front edge of the sole (bottom) must be angled accordingly (see **Figure 7**). Score a horizontal line  $\frac{1}{32}$ " from the bottom edge of the blank on the front side; then plane down to this line, tilting the plane  $3^\circ$  to  $4^\circ$ . A block plane is ideal for this. Plane only the  $\frac{1}{2}$ " area between the front of the ware and the front edge of the blank (see **Figure 8**).

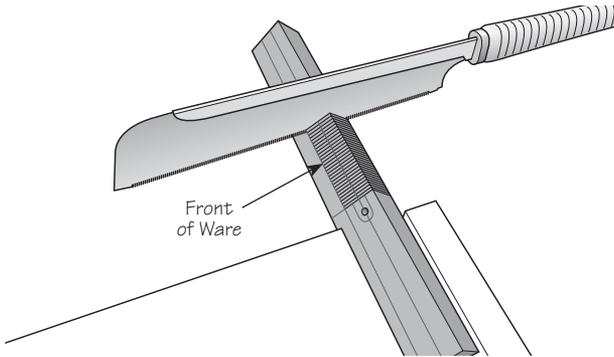


**Figure 7: Cross section showing angle on front edge of sole.**

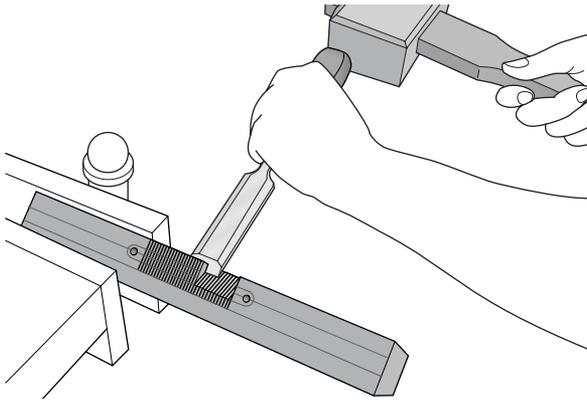


**Figure 8: Bevel the front edge of the sole.**

8. To cut the ware, make a series of parallel cuts from one edge of the ware to the other. A Japanese-style backsaw (dozuki) works well for this, as it makes fine cuts and is easily controlled. Stop the cuts just short of the horizontal lines that were scored on the front and back edges of the ware, as shown in **Figure 9**. Pare out the waste with a sharp  $\frac{3}{4}$ " or 1" chisel, as shown in **Figure 10**, then clean up (flatten) the ware with a single-cut mill file or a sanding block.

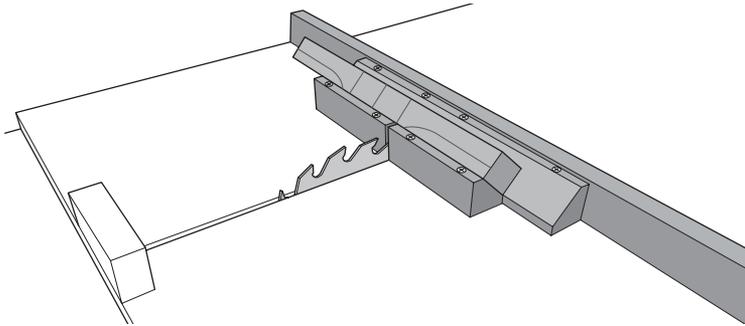


**Figure 9: Cut the ware.**



**Figure 10: Chisel the waste.**

If you are making a number of spokeshaves, you can make a jig for the table saw, such as the one shown in **Figure 11**. To modify a sliding cut-off table, add a cradle to hold the blank at the correct angle, and raise the saw blade until it cuts just short of the front and back edges of the ware. For this operation, you will need to extend the reference marks on the front of the blank with a pencil to define the edges of the ware. Make repeated overlapping cuts from one side of the ware to the other, then pare and clean up the ware as above.

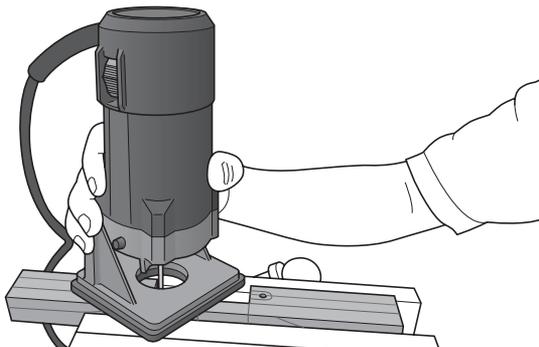


**Figure 11: Cutting the ware, table-saw method.**

### Cutting the Recess for the Blade

9. To cut the recess for the blade, you will need a  $\frac{1}{4}$ " paring chisel. Carefully cut up to the lines that were scored around the blade. If the drilling operation did not produce a radius identical to that on the blade, you can correct this with a carving gouge sized to obtain the required radius. Pare the recess approximately  $\frac{1}{32}$ " deeper than the blade thickness so that the blade can be fully retracted when not in use. (A small adjustable square is useful for checking the depth of the recess as you work; set the gauge on the square to the thickness of your blade plus  $\frac{1}{32}$ ".) Check your progress on the shape and depth of the recess by inserting the blade (cutting edge toward the front) into the recess. Note any areas that need further shaping and mark these with a pencil, then remove the blade and pare as needed.

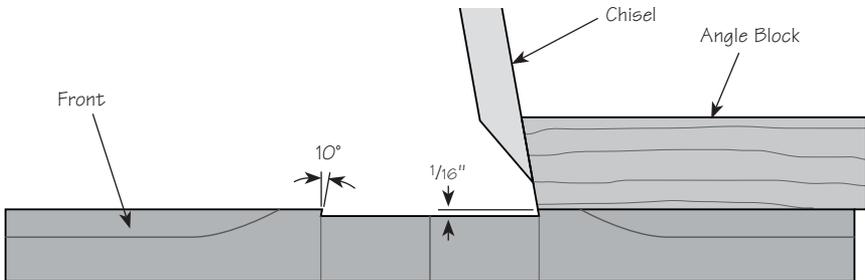
The recess for the blade can also be cut with a router and a  $\frac{3}{16}$ " straight bit. A laminate router is ideal because its small size is easily manipulated. If using a laminate router, orient the base plate diagonally on the blank in order to keep a good portion of the base plate on the blank at all times, as shown in **Figure 12**. If the router is not oriented diagonally, one edge of the base plate will tip into the open ware during the routing process. It is a good idea to clamp a second piece of wood next to the blank in the vise in order to provide a larger base upon which the base plate can rest during the routing operation. Rout just to the inside of the scored lines, then pare up to the lines with a  $\frac{1}{4}$ " paring chisel and a curved gouge.



**Figure 12: Cutting the blade recess, router method.**

## Fitting the Brass Sole

- With a knife, extend the lines from the side of the ware forward on the stock, over the area that was planed to an angle. This will mark the location of the brass sole edges. Score a horizontal line  $\frac{1}{16}$ " up from the bottom of the spokeshave on the front side, then pare the area within the two lines that mark the edges of the brass sole. **Be careful to maintain the sole angle.** Chisel a  $10^\circ$  undercut on both ends of the recess, as shown in **Figure 13**, guiding the cut with a sliding bevel set to  $10^\circ$  held against the stock, or with the angle block described in *step 12*.

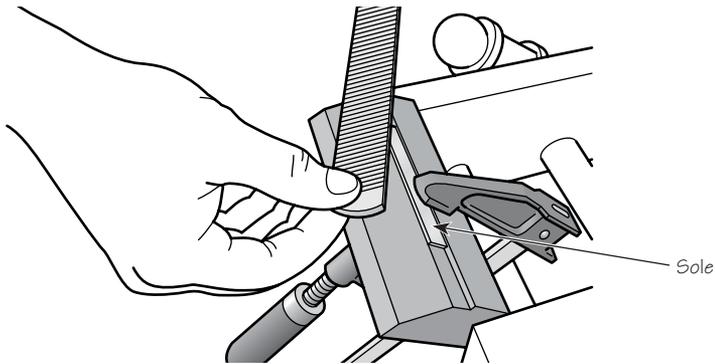


**Figure 13: Bevel the recess for the brass strip.**

The recess for the brass sole can also be cut with a (laminated) router and a  $\frac{3}{16}$ " straight bit set to cut a  $\frac{1}{16}$ " deep recess. If using a laminated router, orient the base plate diagonally on the blank to ensure that both edges of the base plate remain in contact with the blank at all times. Remember that the sole of the spokeshave has been planed to an angle; the router must be held at the identical angle while cutting the recess for the brass sole. Rout just to the inside of the scored lines, then pare up to the lines and cut the  $10^\circ$  undercut at each end with the  $\frac{1}{4}$ " paring chisel as described above.

A router plane may also be used to cut the recess. Be sure to use a pointed blade and work across the grain. Do not try to cut full depth in one pass and be careful to maintain the sole angle.

- Cut the 6" brass strip in half, ensuring that each resulting piece is at least  $2\frac{7}{8}$ " long. (You need only one half; the other piece is a spare.) With a file, bevel one long edge of one strip to  $45^\circ$ . You can make a filing guide by cutting a  $45^\circ$  bevel on the long side of a scrap piece of wood. Clamp the brass strip to the guide block and file until the bevel on the brass matches that on the guide block, as shown in **Figure 14**. The side of the brass strip that has been bevelled to  $45^\circ$  will face the back of the spokeshave when installed. The bevel angle on the brass strip will line up with the angle on the ware.



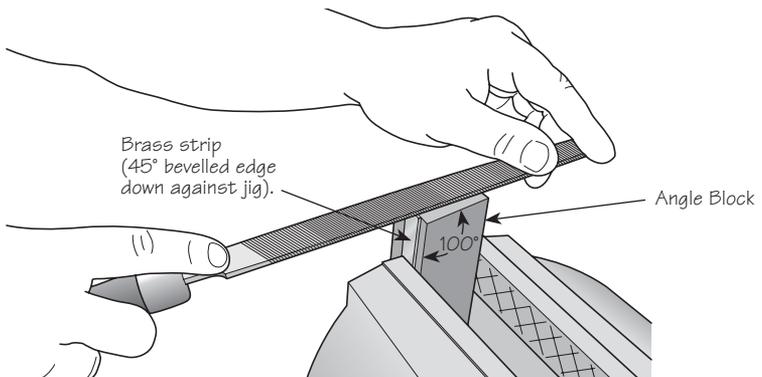
**Figure 14: File the long edge to 45°.**

12. Bevel only one of the short ends of the brass strip to 10° with a file. Make sure that you double-check which way the 10° bevel goes before you start filing. Hold the strip against the spokeshave with the 45° angle in line with the angle of the ware and note the direction of the bevelled ends on the sole.

***Note:** The 10° bevel on the short ends of the brass strip will slide into the ends of the sole recess. It is critical that the fit between the brass and the wood be as precise as possible.*

Place the brass strip over the area of the sole recess and mark the approximate length needed. File the other end of the brass strip to 10°.

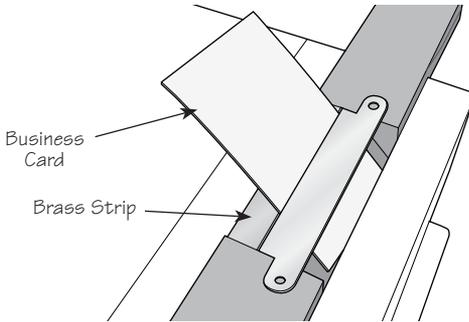
***Note:** It is best to cut the brass strip a bit longer than required, gradually filing it back until you obtain a very snug fit as you slide it into the sole recess. You can make an angle block, such as the one shown in **Figure 15**, to accurately file the short ends of the brass strip to the required angle. Cut a scrap piece of 2" × 4" (or similarly dimensioned wood) to a 100° angle across its width. Clamp the brass strip to the angled end of the wood with about 1/16" protruding. File each short end of the brass strip using the angle block as a guide. This angle block can also be used as a guide for cutting the 10° bevel in the sole recess.*



**Figure 15: Bevel the short ends of the brass strip.**

## Assembling the Spokeshave

13. Thread the thumb wheels into the top of the blank, then install the blade. With the blade fully seated against the adjustment thumb wheels and flush with the bottom of the stock, firmly tighten the lock nuts. Slide the brass strip into the sole recess. There should be a space between the brass strip and the blade equal to the thickness of one business card, as shown in **Figure 16**. When the fit is snug, remove the business card and hold the spokeshave in front of a light in order to sight between the brass strip and the blade. If the thin line of light that is visible is uniform along its length, the brass strip has been inserted evenly into the sole recess. If the line of light is not uniform, readjust the brass strip and test the fit once again with the business card.



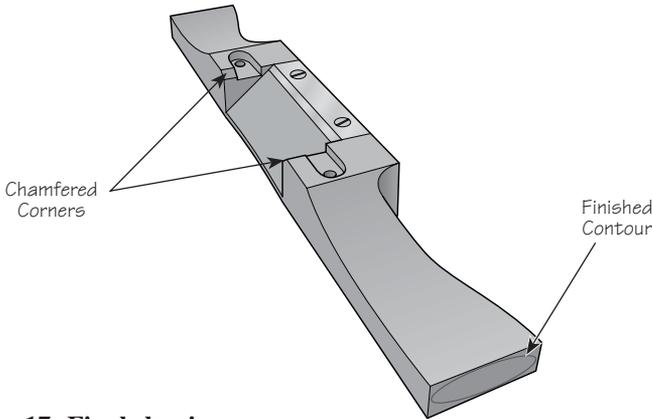
**Figure 16: Fitting the brass strip.**

When a good fit has been achieved, firmly clamp the brass strip to the stock and use a drill press and a  $\frac{7}{64}$ " twist drill bit, to drill two holes  $\frac{5}{8}$ " deep. Follow with a  $\frac{1}{8}$ " twist drill to slightly enlarge the holes to half their original depth. Chamfer both holes using an  $82^\circ$  countersink. It is a good idea to clamp the blank to the table, as twist drills have a tendency to grab thin brass and quickly draw it up the bit, thus boring deeper than desired. Countersink enough for the screw heads to protrude slightly above the brass strip. The hole placement is not critical, but should be symmetrical, both side to side and front to back. A guideline would be  $\frac{1}{2}$ " in from the side edges of the brass strip, and  $\frac{1}{4}$ " in from the unbevelled long edge of the brass strip. Before inserting the screws, you may rub them with a bit of wax to ease their entry into the wood.

14. Lay a piece of 120x sandpaper on a flat surface. Sand the sole of the spokeshave until the brass parts are flush with the surrounding wood. Check your progress frequently to ensure that the sole angle is maintained. You may want to try a few test cuts at this point. Consult *Tips and Techniques* and *Depth of Cut Adjustment* below, if necessary.

## Shaping the Spokeshave

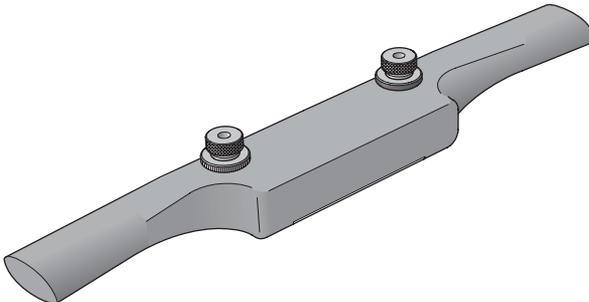
15. Remove all the hardware components (except the brass strip). Use a coping saw, bandsaw or jigsaw to cut the profiles of the handle. Draw the finished contour of the handle onto the end of each handle; it is roughly the shape of an eye, as shown in **Figure 17**.



**Figure 17: Final shaping.**

*Note:* To prevent the rear corners of the ware from getting worn and rounded in use, you may chamfer them, as shown in **Figure 17**.

16. Shape the spokeshave to its final form, using rasps and files for initial shaping. A  $\frac{3}{4}$ " or 1" drum sander in a drill or drill press is ideal for sanding the tight inside curves at the point where the handles and main portion of the stock blend together. Use sandpaper for final smoothing. Avoid removing too much material from the top of the stock; its thickness and the length of the adjustment thumb wheels are matched to create a depth of cut limitation and to avoid excessive protrusion of the locknuts and thumb wheels when the tool is complete. Apply finish (e.g., polymerized tung oil, lacquer, polyurethane) and wax as desired. Reassemble the hardware components as outlined above (*step 13*).
17. If the points on the screw posts protrude, you may abrade them flush with the top of the locknuts.



**Figure 18: Complete and assembled.**

## Tips and Techniques

1. If the tap is crooked after a couple of turns, do not continue to turn the tap. Back the tap off and realign it to square before continuing to tap through.
2. If you have minor tear-out or other undesired small voids, they may be filled with a combination of glue and sawdust from the wood being used for the spokeshave. Mix some fine sawdust with a small amount of glue and fill the unwanted recess. Allow to dry and then sand.
3. Sometimes, if the brass strip is left too long and then forced into the sole recess, the blank will split at the 10° dovetail. In this case, gently pry the split apart and inject some glue into the crack, then clamp until set. Shorten the brass strip and try the fit again, until snug.
4. If the brass strip is too short, use the spare and retry to achieve a snug fit.
5. If the brass strip has shifted and is not parallel to the blade after it is screwed in, note which end of the strip is too close to the blade and file the 45° bevel on the brass strip to achieve the desired parallel gap. If the gap cannot be reduced to the thickness of a business card, the blade recess in the wooden blank may have to be deepened accordingly.
6. If a brass screw snaps off while being inserted, it may be possible to remove it with a screw extractor. If not, file the projecting brass flat with the sole recess. Using a drill press, clamp the spokeshave securely and bore directly into the remaining brass with a twist drill bit larger than the screw. The resulting hole can then be filled with a dowel or suitable piece of hardwood whittled to fit the hole. Glue the plug into the hole, cut the projection flush with the sole recess, allow to dry, then re-drill to install another screw.
7. If the spokeshave cannot be adjusted to take a very fine cut, it is likely that the blade recess is not deep enough. Remove the blade and check around the edges of the recess (at the intersection of the recess walls and bottom) to see if there are any areas that were not properly cleared. If the entire recess has been evenly cut, then the entire recess needs to be deepened. This can be done with a chisel and gouge or by setting the router bit slightly deeper and then cleaning up by hand. The recess should be deep enough that the blade can be fully retracted. Another cause may be interference with the brass sole. This may be the case if the mouth opening appears to be too small when the blade is advanced for a heavy cut or if the cutting edge appears to overhang the sole when viewed looking straight at the bottom. Remove the blade and use a file to open the mouth by filing the trailing edge of the sole at 45°. Reinstall the blade often to check your progress.

8. If the spokeshave cannot be adjusted to take a cut as heavy as desired, the stock is probably too thick. Remove the blade and adjustment thumb wheels. Reshape the stock by removing material from the top. Check your progress frequently by reassembling the tool and adjusting the blade to achieve the maximum depth of cut. Take care not to leave a rough surface that must be smoothed after you have attained the desired stock thickness.
9. If you discover free play between the brass threads of the adjustment thumb wheels and the wooden threads of the stock, you may tighten them up with a few drops of automotive antifreeze. Remove the blade and thumb wheels and use an eye-dropper or small syringe to place two or three drops on the threads in the wooden stock. Allow to soak in for a few minutes, then reassemble the shave. If some play still exists after 2 hours, dismantle the tool again and apply one or two more drops of antifreeze. Allow to dry, then reassemble. Exercise caution when handling automotive antifreeze and avoid contact with your skin and eyes. Keep antifreeze out of reach of children and pets.
10. After repeated sharpening of the blade, you will eventually find that the mouth opening has widened excessively. This may be fixed with a new sole. Fit the spare brass strip to the sole recess, following *steps 10 to 13* in *Making the Spokeshave* above. Replacement brass sole strips are also available from Lee Valley Tools (see *Accessories*). You will probably find that too much material was removed from the heads of the brass screws to reuse them on the new sole. Any #8 × 5/8" flat-head brass screw should work in their place; however, screws with cut threads and slot drive are most suitable (see *Accessories*).

## Depth Of Cut Adjustment

As you will have noticed during construction of the spokeshave, the depth of cut is adjusted in four steps:

1. loosen the lock nuts,
2. turn the adjustment thumb wheels to either advance or retract the blade,
3. retighten lock nuts, and
4. sight down the sole and take a few test strokes to ensure that you have attained the desired depth of cut. Repeat *steps 1 to 3* as required.

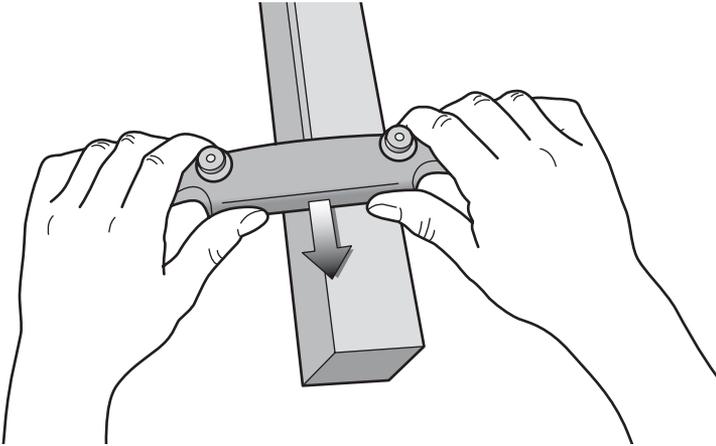
## Sharpening

The blade comes with a finely ground 20° primary bevel and a 25° micro-bevel. This configuration provides a strong, long-wearing edge that can be quickly honed many times before the primary bevel needs to be reground. Additional honing will improve performance. The finely ground blade face can be readily lapped to a mirror finish. The screw posts may be removed during sharpening for ease of handling.

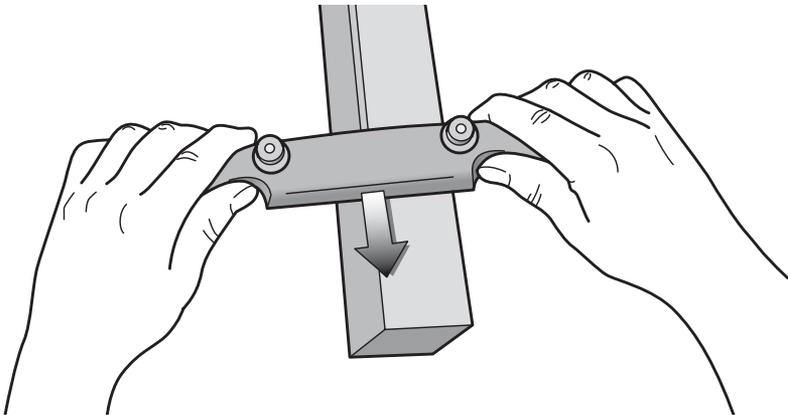
# Instructions For Use

This tool is designed to either pull or push. This allows you to always work with the grain, which is particularly important with a low cutting angle. On more complex shapes, this may involve frequent changes of direction as required to avoid tear-out.

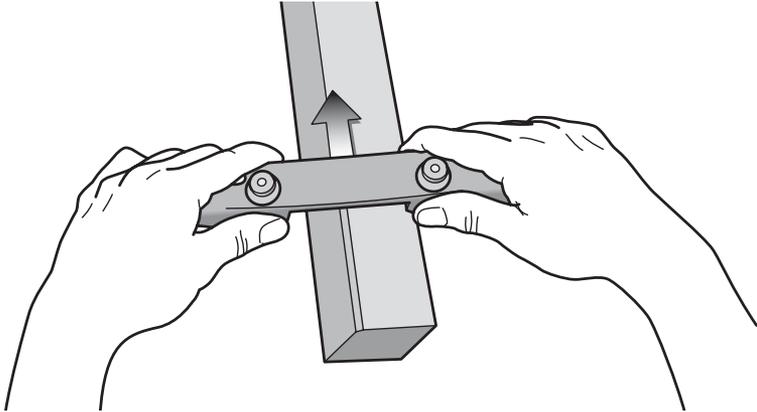
Grip the spokeshave with both hands as shown in **Figures 19, 20, 21** and **22**, or as desired. Note that the spokeshave is primarily gripped with the index finger and thumb on the central portion of the stock. The other fingers rest lightly on the handles and are not usually used to pull or push. The exception to this would be when the power grip is used for quickly removing a lot of material, although it is more difficult to control.



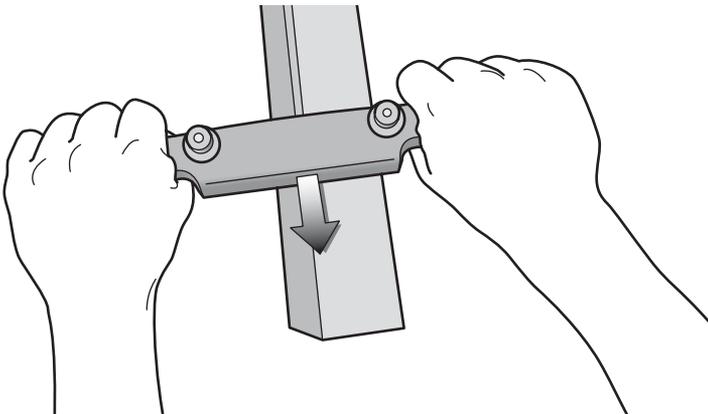
**Figure 19: Pulling grip.**



**Figure 20: Alternative pulling grip.**



**Figure 21: Pushing grip.**



**Figure 22: Power grip.**

The orientation of the blade relative to the workpiece is controlled with the wrists. As with any blade, a relief angle is required between the surface of the workpiece and the bottom of the tool (in this case, the bottom of the blade), due to fiber springback. Set the spokeshave flat onto the work surface. Tilt the spokeshave slightly forward until the brass strip of the spokeshave is resting against the work surface. This will engage the blade at the proper angle. Skewing the cut, or holding the spokeshave askew or rotated with reference to the path of travel will yield the best results on end grain. This orientation lowers the effective cutting angle and adds a slicing force to the cut.

# Notes



# Accessories

<b>05P33.31</b>	Replacement Blade
<b>05P33.32</b>	6" × 1/2" × 1/16" Brass Strip
<b>91Z08.04X</b>	#8 × 5/8" Flat-Head, Slot-Drive, Brass Screw, pkg. of 10

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