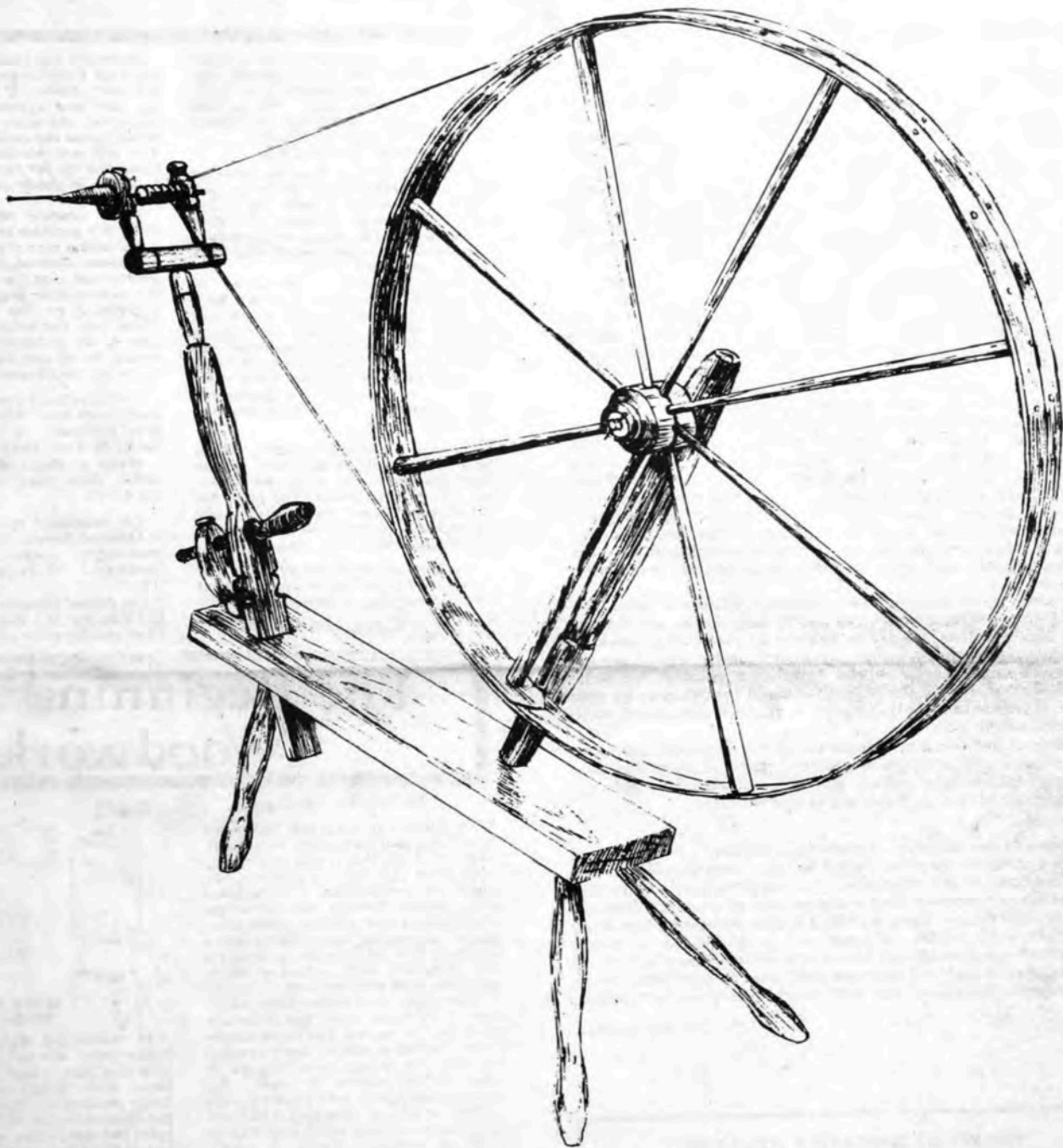


The Woodworker's Journal

VOL. 2, NO. 5

SEPTEMBER/OCTOBER 1978

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In This Issue:

- **Shaker Wool Wheel**
 - **Colonial Plant Stand**
 - **Pine Gun Cabinet**
 - **Contemporary Lantern**
 - **Colonial Wall Shelf**
- and much more...**

Shoptalk

The strident buzzing of cicadas in the tall maples, and the increasing traffic of woolly-bears across back roads are unmistakable signs that another New England summer is coming to an end.

For the benefit of those who are unfamiliar with the woolly-bear, it's a very fuzzy black and brown caterpillar, and folks hereabout claim that the severity of the coming winter can be predicted by the amount of black the woolly-bears display. We've never heard of a conclusive study on the subject, but we do know that as fall approaches, these caterpillars appear in large numbers, crossing roads and always in an apparent hurry to seek shelter before the killing frosts arrive.

In the fall we like those inclement week-ends when the rain pours down and the wind plasters wet leaves against the house. Instead of fretting over the weather, we retire to the workshop which seems a particularly snug retreat then, and as we measure, cut and shape the wood, time passes quickly and peacefully.

In our daily work, most of us, as members of a team, are responsible for only part of a process. Therefore, it's a very satisfying feeling to independently build something from start to finish. If that "something" happens to be a much needed piece of furniture, the benefits are economic as well as psychic.

Then too, we like the fall for it brings an increase in the amount of mail we receive from readers. Some have questions concerning joinery, finishing, or the sources for special tools and hardware; others write of ingenious solutions to vexing problems. Many are just plain proud of something they've designed and built, and want to share their success with other woodworkers.

The term "woodworking" encompasses a huge area of specialized knowledge, and few of us, if any, know all the answers. Nevertheless, we try to answer as many woodworking questions as possible, either by letter or in the "Letters" column. If our research cannot supply an answer, we will publish the question in the hope that some reader may be able to help. If you want a reply, be sure to enclose a stamped, self-addressed envelope.

In response to the many inquiries we've received...yes, we are interested in your original projects, jigs and shop tips, and we do pay for materials used. But please...query us first before sending articles, detailed plans and the like.

Because of our steadily increasing circulation and the need for regularly furnishing the Postal Service with circulation statistics, we have found it necessary to make use of a computer to maintain our records. The arduous task of transferring subscription information from our files to the computer has been completed with, what we hope was a minimum of error. In the event you should receive an untimely renewal notice, or if the expiration date on your mailing label is incorrect, let us know via postcard and we will quickly rectify the matter.

Jim McQuillan

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LETTERS

I am looking for plans for a good woodworker's bench (hardwood top, bench stops, vises, clamping and hold-down provisions, etc.). Would you have any plans or reprints of related articles that I might purchase?
E. B. Schofield, Madison, CT.

Sorry Ed...but we have no plans, at present, for the type of bench you want. Woodcraft Supply Co., 313 Montvale Avenue, Waburn, MA. 01801 sells plans and hardware to reproduce the Ulmia (German) bench that sells for over \$500.00.

Also, the April '78 issue of *Mechanix Illustrated* had a plan for a very good American style bench and *Popular Mechanics* had a plan for an English bench not too long ago. We misplaced our file copy so can't tell you exactly what issue but if you write them, they sell plans for practically everything they've published since the year one.

I have recently completed a Lancaster rocker from plans in the book *Building Early American Furniture* by Joseph Daniele. The plans for the rockers do not work. They make the rocker completely out of balance.
W. Wilson, Rossford, Ohio.

We have the book you refer to, but it's difficult to see the problem without actually building a model from the plan.

Normally, the chair should rest leaning back 7 - 10 degrees off vertical as the photo shows. If the rocker curves are fair and symmetrical, it would seem that the mass of the chair back would cause the chair to sit as shown. You did not mention whether your chair tilts too far forward or backward so we're in doubt as to your specific problem.

We'll venture three suggestions. First, it's possible to alter the bottom curve with a rasp to change the center of balance. Second, it appears from the photograph that the chair is joined to the rockers at an angle of less than 90 degrees. If so, the plan is in error. Third, why not write to Mr Daniele in care of his publisher? If the plan is wrong, we're sure that he would want to correct the situation.

I'd like to build a copy of an old-time wooden ice box. Where can I get suitable hardware such as hinges and latch? B. Finn, Dayton, Ohio

Write to Ritter & Son Hardware, 46901 Fish Rock Rd., Anchor Bay, CA 95445.

I'm interested in building furniture in Oriental design. Can you give me a mail-order source for authentic hardware? M. Friberg, Beacon Falls, CT.

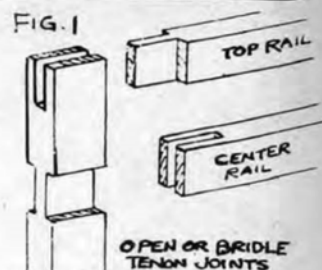
Try Period Furniture Hardware Co., 123 Charles St., Boston, Ma. 02114. Their catalog costs \$2.00.

The Beginning Woodworker

The Mortise and Tenon

It's difficult to establish just when the mortise and tenon joint was developed. We know that it was being used 3,000 years ago, for it is found on furniture recovered from an Egyptian tomb. Down through the centuries, woodworkers have preferred this joint, for the rectangular tenon fitting into a matching slot, or mortise, provides a neat joint that will withstand stress and loads from all directions.

There have been some clever variations of the basic joint, but generally speaking, the mortise and tenon family can be divided into three main groups: the open or bridle joint (Figure 1) which is the easiest to make; the through tenon joint, which can be plain wedged or pinned (Figure 2 ABC) and the blind tenon joint which may also be plain or wedged (Figure 3 A&B). There are some other variations which are occasionally useful which we will discuss a bit later.



In traditional furniture, open or bridle joints are used mainly in constructing frames that will be hidden or faced with better wood. However, much modern furniture, especially in the Scandinavian style, proudly displays the contrasting end grain of open mortise and tenons. The joints, if finely executed, are pleasing to look at. (Figure 4)

Continued on next page

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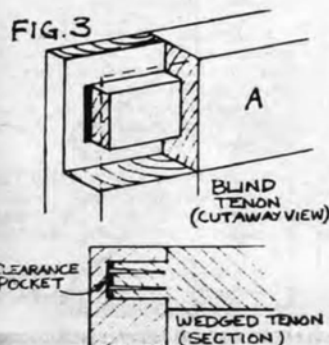
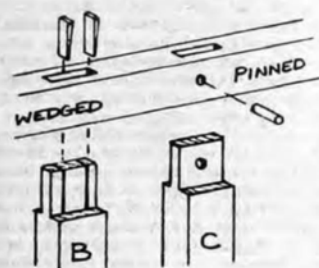
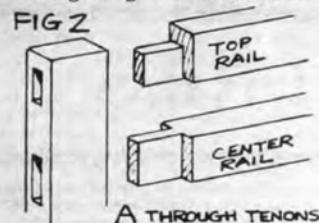
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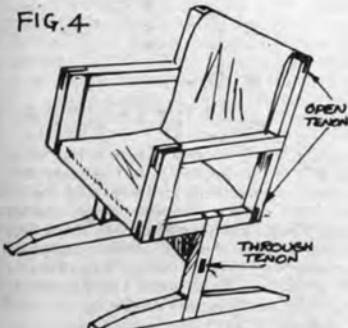
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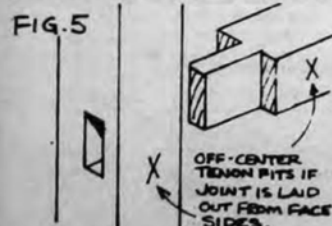
The Beginning Woodworker (Cont'd)



Before rushing headlong into the laying out and cutting of open or other mortise and tenon joints, a couple of points are worth remembering. First, tenons are usually about $\frac{1}{3}$ of the stock thickness or a bit less. Plan on making mortises the width of a standard chisel such as $\frac{1}{4}$ inch, $\frac{3}{8}$ inch, or $\frac{1}{2}$ inch. It's easier to chisel a slot that's the same width as the chisel blade. For most work, a $\frac{1}{4}$ inch wide mortise is fine for stock thickness ranging from $\frac{3}{4}$ to 1 inch.

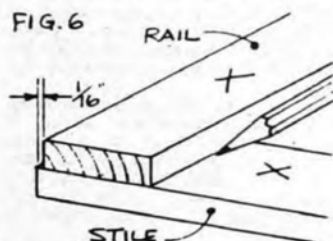


Second, mark the working faces of both parts with an X and use a try square and marking gage to make your layout from the working faces. The reason for this is that it is both difficult and unnecessary to have mortises precisely centered. As long as both mortise and tenon are gaged from the working faces, a mortise cut slightly off center will be matched with a corresponding off-center tenon (Figure 5).



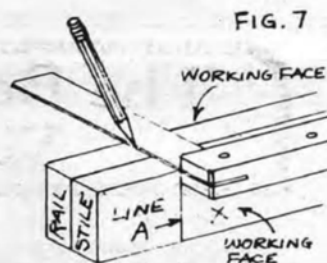
Explicit directions for the layout and cutting of mortise and tenons makes for tedious reading but many beginning woodworkers employ a somewhat haphazard, hit or miss technique in laying out these joints and as a result, develop bad work habits that are usually reflected in the finished product. It's best to develop a regular procedure and use it every time. The layout is not really complicated, but a written description seems to make it so.

First, mark the face sides of both rail and stile with an X. The face side is the side that will show on the finished piece. Now, referring to Figure 6,

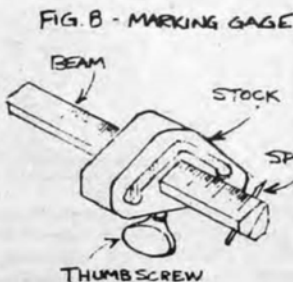


transfer the width of the rail (which gets the tenon) plus 1/16 of an inch, to the stile with a slight pencil mark. Then take your try square and continue this mark across the face of the stile (Line A). Don't scratch or score the wood or you'll just have to sand it out later.

Next, clamp both rail and stile together in the vise, with ends and edges aligned and working faces facing out. Use your try square to carry line A all the way around both pieces (Figure 7).



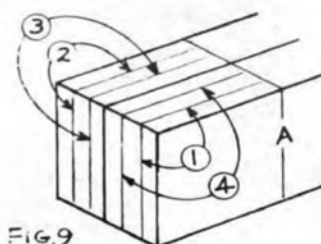
You have now established the bottom of the mortise on the stile, and the length of the tenon on the rail. The 1/16 inch is added to allow for a final neat trimming after the joint is assembled.



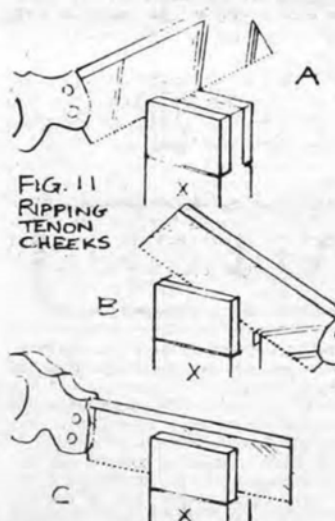
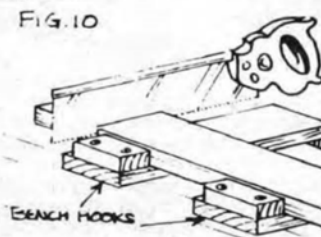
The next step requires the use of a marking gage. (Figure 8) Incidentally, there is a special gage for mortise and tenon joint layout which has two marking spurs instead of one. It saves a bit of time for it marks both sides of the tenon simultaneously, but it's not absolutely necessary.

Align both pieces in the vise and set the moveable stock of the marking gage a distance of $\frac{1}{4}$ inch from the spur. Holding the stock firmly against the working face of the stile, scribe a line from line A to the end of the stile. Continue this line right around and down the edge. Referring to Figure 9, you have just scribed line 1. Now use the gage to scribe line 2 in the same manner, again holding the stock firmly against the working face of the rail.

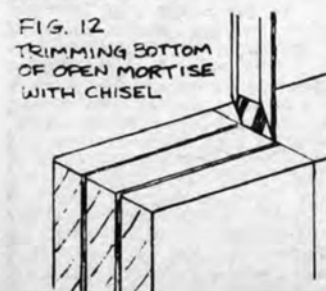
Reset the gage to $\frac{1}{2}$ inch and scribe lines 3 and 4. Remove the parts from the vise and with the gage, continue the scribed lines along the opposite, unmarked edges of both parts. The layout of the mortise and tenon has now been completed.



Cut tenon shoulders first using a fine tooth saw, and keeping the cut grazing the waste side of the line. A pair of bench hooks are very handy for this operation (Figure 10). Tenon cheeks are cut in three stages as shown in Figure 11 A, B & C. It may take a bit of practice before you can saw clean tenons that don't require dressing with a chisel, but stick with it and you will soon develop the necessary skill.



The open mortise, like the tenon, is ripped with the saw cutting in the waste wood and just barely removing the marked lines. The bottom of the mortise is cleaned out with a chisel as shown in Figure 12.



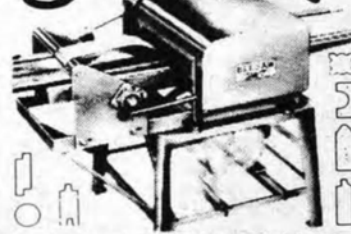
If all has gone well, the joint should fit fairly well with perhaps a little shaving with the chisel. Since we added

1/16 inch to the tenon length and mortise depth, there will be a slight projection on both sides of the joint. These are planed down flush, working from the corner in so as not to splinter the wood.

A circular bench saw will enable you to cut the mortises and open tenons with ease and accuracy, but the experience and skill gained in using the back saw is indispensable to your development as a first rate craftsman.

(Continued on Page 16)

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Pine Wall Shelf

This small shelf unit is a pleasant project and will provide an attractive background for display of pewterware, figurines, plants or perhaps some richly bound old volumes. Construction is entirely of $\frac{1}{2}$ inch white pine, with the exception of drawer bottoms which are $\frac{1}{8}$ inch plywood.

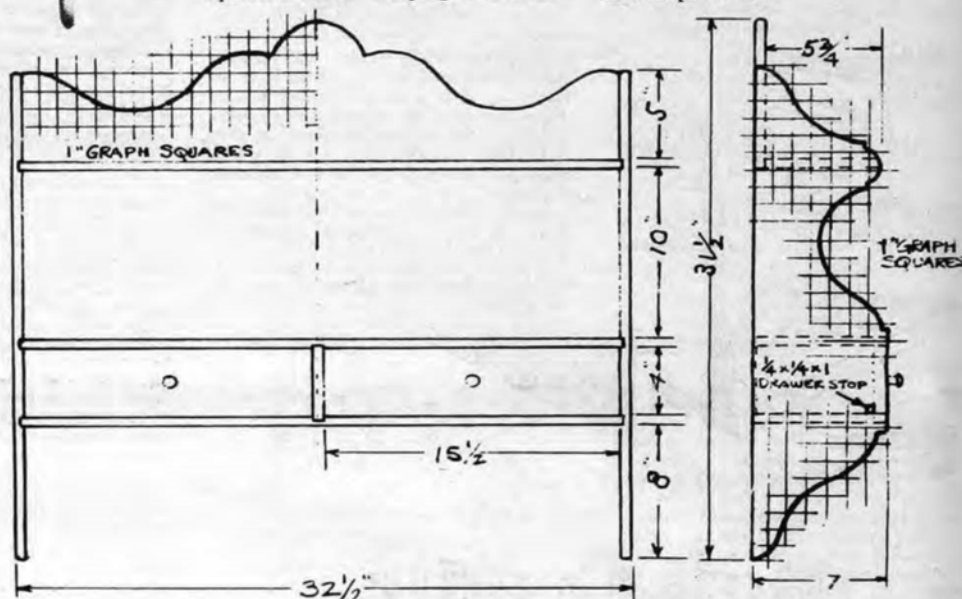
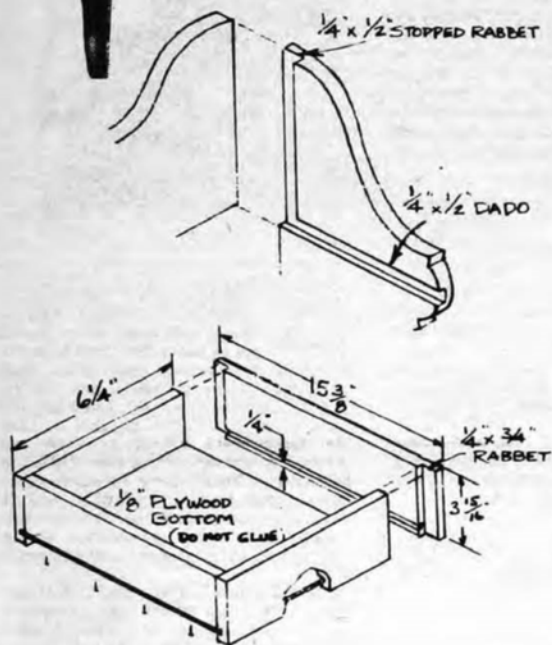
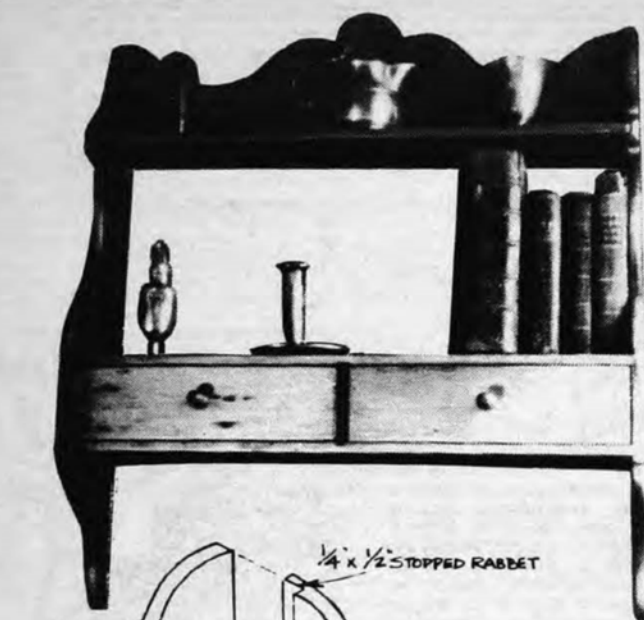
Start by laying out 1 inch squares on cardboard or a scrap of masonite and enlarge the shapes of upper back and shelf sides. Use a jig saw to cut the two templates and then transfer the designs to the pine stock. Cut the sides first and run the three dados across each. The upper back edges are given a stopped rabbet, as shown. A router makes this work easy, but a fine job can be done with a straight-edge and sharp chisel.

Next, cut the two shelves, bottom, scrolled back and drawer divider to finish size. Don't forget to locate and cut dados for the drawer divider. Sand all parts thoroughly before assembling with glue. Be sure to double check for squareness after clamping, and if you

prefer to stain later, remove all glue drippings with a damp cloth.

Although the drawers are small, the woodworker should exercise care in their construction. Short-cut methods, such as nailing the bottom directly to sides, only detract from the quality of your workmanship. The method of construction shown is a good approach for most light-duty pine drawers. Grooves for drawer bottom should be cut wide enough to allow bottom to slide freely. Use glue and finishing nails to join drawer sides to fronts. After drawers are completed, glue small stop blocks in each drawer opening; located so that drawer fronts will come flush with shelf sides. Install $\frac{1}{4}$ inch diameter wooden or porcelain knobs.

Distress the piece a bit and round off all sharp edges before giving it a finish sanding. Apply an antique pine stain, and after 24 hours, finish with a couple of coats of low-luster synthetic varnish. Rub down with 4/0 steel wool to provide an even sheen; then finish off with paste wax.



Restoring Antiques

By John W. Olson

Joints and Glues and Antique Reproductions

If gluing a joint was simply a matter of applying glue to the mating parts and clamping, almost anyone could repair an old loose jointed piece of furniture, but it isn't quite so simple. In fact there is a definite relationship between a joint and the glue that should be used to assemble it. The type of joint and its condition are the factors to consider. For the purpose of this discussion, there are only two types of joints: snug to tight well fitted joints and loose sloppy joints that appear to be beyond gluing.

A primary consideration in any joint repair is cleanliness. A successful bond cannot be made unless all old glue, rags, string, wedges, paint and other extraneous material are completely removed. A successful joint requires that clean wood butt against clean wood with only a layer of glue between.

The quickest and easiest way to clean a joint is with a small hand grinder, a Dremel or similar, and a straight sided $\frac{1}{4}$ " or smaller burr. These grinders are particularly suited to cleaning out mortises, dowel holes, rabbets and similar holes and grooves. The bench mounted disc sander is a good power tool for cleaning tenons, the ends of

spindles and similar work. Sandpaper, knives, chisels or any other tool that suggests itself can be used but, for a busy shop, these two power tools will save time and money. In any case, remove the bare minimum necessary to reach bare wood. Do remove all foreign material on the surfaces of the joint including the thin layer of partially oxidized wood that is often present in really old pieces. Don't be concerned about how tight or loose the joint may be after cleaning.

Glues suitable for antique restorations are those commonly used by woodworkers: fish and animal, plastic resin, white polyvinyl, yellow aliphatic resin and epoxy. The animal and fish glues are not easily used, are not moisture resistant, require extended clamping time, and deteriorate with age. Plastic resin is only slightly handier than animal and fish glues in that it requires no heat only mixing with water, requires extended clamping time, is quite water resistant and must be used within a short time of mixing. White polyvinyl and the yellow aliphatics being liquids are very easy to use, make more than satisfactory bonds and are somewhat moisture resistant. These glues require only moderate clamping pressure and, at 70 degrees F or better, the joint is strong enough to be removed from the clamps within 25 or

30 minutes. The piece may be processed further at this time if no undue stress is put on the joint. The aliphatic resins have the further desirable property of filling small vacancies, to $1/32$ " or so, and of only slightly clogging sandpaper. Epoxies specifically formulated for gluing wood are the most satisfactory adhesives for repairing old, loose-jointed antiques. They will fill vacancies to about $1/4$ " if properly contained and even larger vacancies when mixed with fine sawdust or wood flour. They are also waterproof, cure to a hard plastic that is stronger than wood, have an extended working time, and can be sanded if care is taken not to overheat the work.

Plastic resin, polyvinyl, and fish and animal glues can be used to assemble tight joints, however, the aliphatics are somewhat superior to the others. Tight joints are those in which one member fits within the other so that the faying surfaces are in intimate contact and there is no appreciable side movement.

Joints which readily fall apart and have any vacant space at all should be assembled with epoxy as described below. This is not to say that laps, butt joints and similar should not be assembled with glues recommended only for tight joints but they must be well made, snug fitting joints.

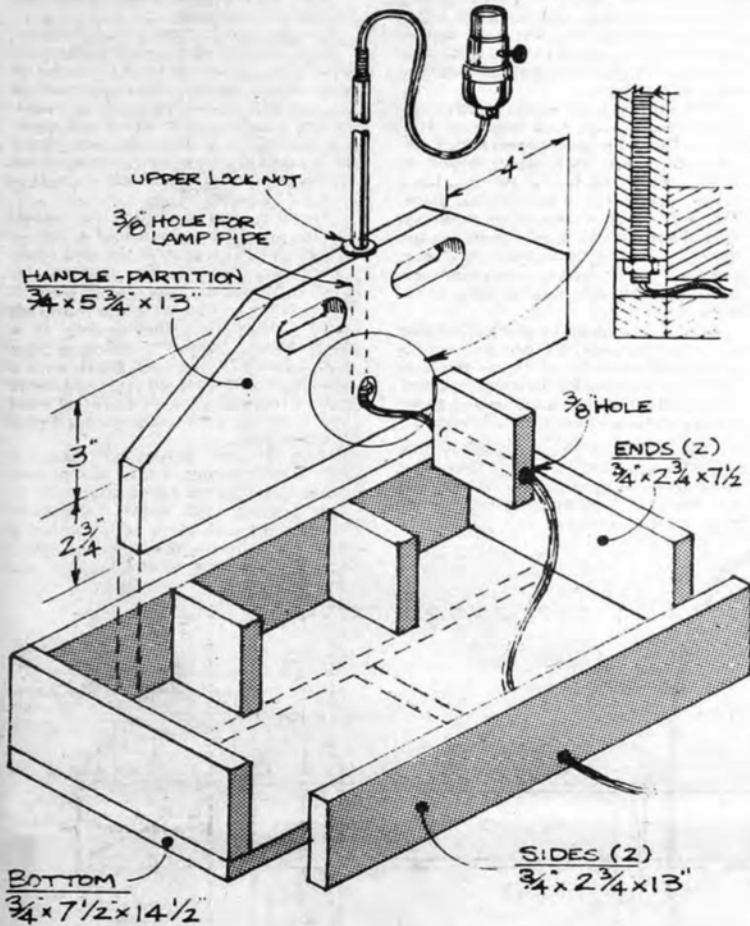
A loose joint is one that readily falls apart and often has easily discernible vacancies between the faying surfaces. The only sure, permanent cure for this condition is assembly with a good epoxy formulated for gluing wood. Careful mixing will assure

success and large vacancies can be corrected by the addition of suitable fillers. Fillers not only extend the epoxy, but increase its viscosity so that the glue stays in the joint. To hold the epoxy in place, dams or covers of masking tape are often useful. Epoxy also enables the restorer to cut to a bare minimum replacement of damaged members i.e. a broken tenon can be extended with a dowel and the resulting vacant space filled with epoxy. It is possible to reassemble broken, splintered, and crushed members with epoxy. Properly done, seemingly unfixable disasters can be made strong and usable again. This type of restoration helps preserve the value of an antique. Each new replacement part detracts from its value.

A word of caution. Do not use epoxy in tight, well-fitted joints. It will not hold. Successful epoxy joints require a definite thick glue line. Consequently, minimum clamping is desirable. In fact, all that is necessary is to prop the piece up so that its members stay in their respective relative positions until the epoxy has set up; about 24 hours in most cases. Most epoxies will set up under almost any temperature conditions, but the higher the temperature, the quicker the cure. In extremely cold weather, set-up time may be several days. Excess epoxy can be cleaned up with lacquer thinner and, where necessary, can be done without harming finishes.



Nail Box Lamp



Woodworkers who enjoy building in Early American style will find the book *Early American Furniture You Can Build*, by Ralph Treves, a gold-mine of interesting projects. The appealing lamp shown in the photo was built, with a few slight changes, from a similar design given in the book. The lamp has generated a lot of favorable comment, and we thought it would be a good project to pass on to those readers who enjoy handtool work.

Copied from an old-time carpenter's nail-box, the lamp is handy for holding small items on a desk. It also provides a nice means of displaying small potted plants.

Start with a piece of 1" x 8" No. 2 pine, and cut the box bottom to the dimensions given, taking care to make the cuts square. Cut both ends and sides, and fasten with glue and finishing nails driven up through bottom and through ends.

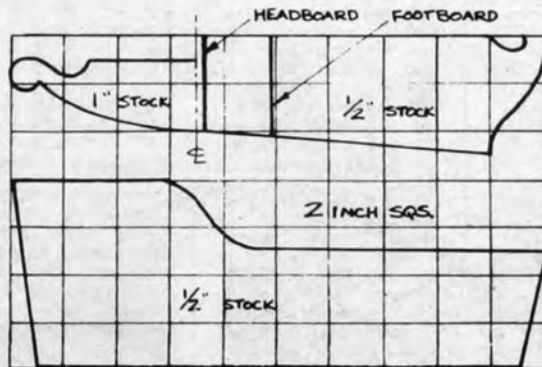
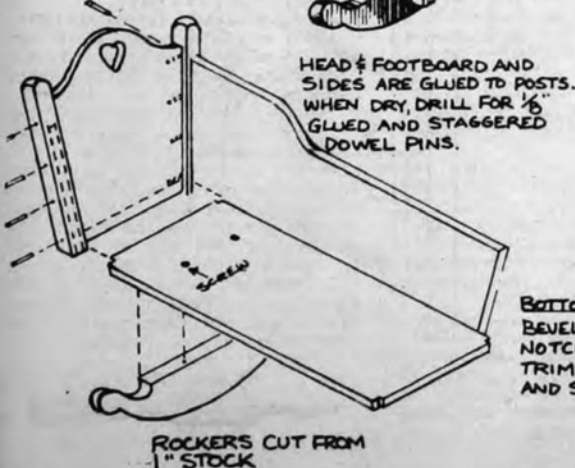
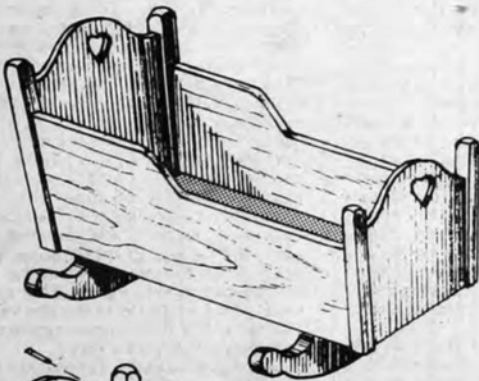
Cut and shape the center partition, locate a center-line and drill a $\frac{3}{8}$ "

hole for the threaded lamp pipe. About 1" up from the bottom, and on the center-line, drill a $\frac{3}{4}$ " hole. Insert a 10" length of threaded pipe into the top hole and secure with brass lock nuts at bottom and top edge.

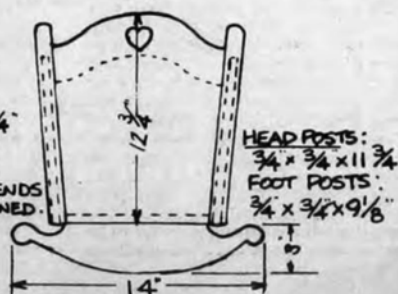
Cut the three small dividers and bore a $\frac{3}{8}$ " hole through one to take the lamp cord which is then led through a corresponding hole drilled in box side. Thread cord through pipe, divider and side. Cover pipe with a length of brass tubing cut so that enough pipe thread protrudes at the top to fasten a harp and standard lamp socket.

Glue dividers in place and set all nail heads. Old nail-boxes are generally pretty beat up so you should take pains to remove the new look by rounding off all edges and distressing the wood. After distressing, sand the outside and top edges again and finish with antique pine stain and several coats of satin varnish.

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Contemporary Candle Lantern

This little lantern was designed to harmonize with contemporary furnishings and yet provide a bit of old-fashioned charm for those who would like the best of both worlds.

The basic design probably dates back to 16th century Northern Europe and so-called Swedish farm lanterns. Similar examples existed in New England in the late 1600's, and were designed to make use of the very small panes of glass available at the time for diamond-pane casement windows.

Since there is no separate hinged door, construction is quite simple, the only problem encountered will be the recessing of the four sides to hold panes of glass. This operation is simple for those who own an electric router but, lacking this tool, the job can be accomplished by rough chiseling of the area to be recessed. The bottom of the recess can be leveled off by sharpening the head of a large flat-head wood screw and driving it far enough into a beam so that the sharpened screw head can plane down the irregularities as shown in the detail.

Begin by cutting the front and back from $\frac{1}{2}$ inch (Net) walnut, cherry or

pine to a finish size of 6" x 10". Lay out the pane openings and, after clamping both pieces together, use a jig saw to cut the openings. Next, cut the two sides to 5" x 10" and again lay out and cut the openings.

The back side of each lantern side must be recessed to a depth of $\frac{3}{16}$ inch to hold the glass panes which are secured either with small brads or short lengths of $\frac{1}{4}$ " x $\frac{1}{4}$ " retaining strips spot glued or bradded in place. The area to be recessed on each side should extend about $\frac{3}{16}$ inch beyond the cut-out all around and the center pane divider should be completely recessed as only one pane of glass is fitted to each side.

Before adding glass and assembling the lantern, sand all parts carefully and round off edges. Stain, paint or other finish should then be applied. Use stain or enamel on pine and penetrating oil finish on walnut or cherry.

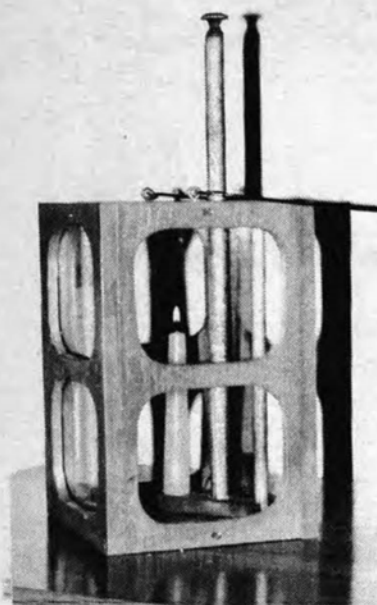
Fasten glass in place and apply glue to the butting surfaces of the four sides and lightly clamp together. When glue has dried, drill all corners for $\frac{1}{4}$ inch pegs which reinforce the joints and

provide a decorative touch if they are of contrasting wood.

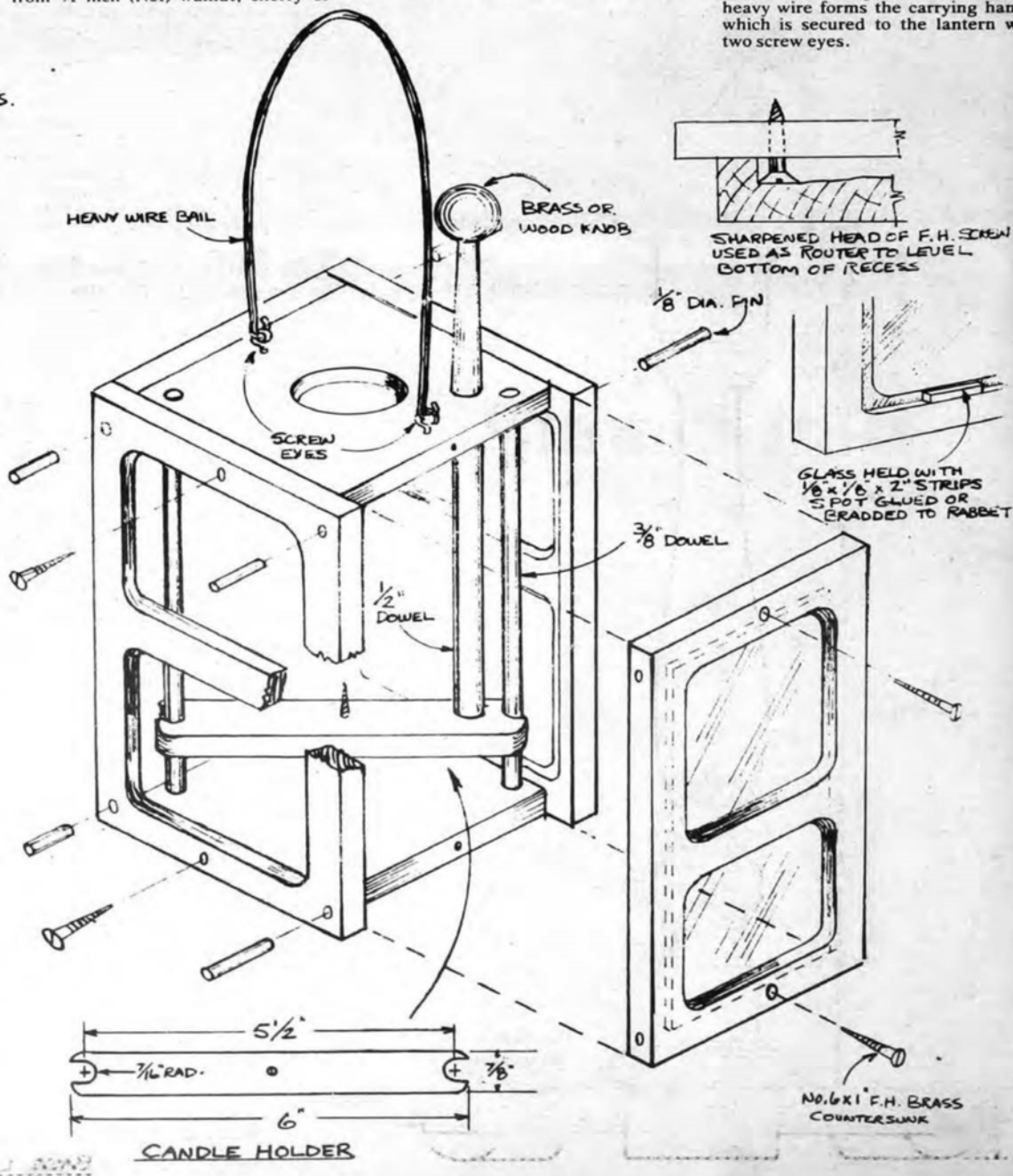
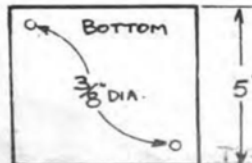
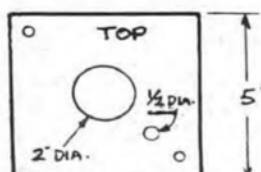
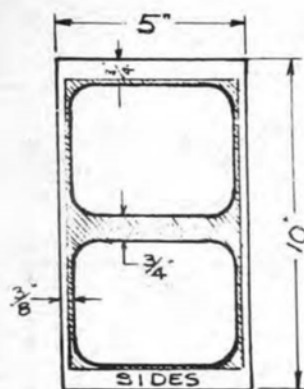
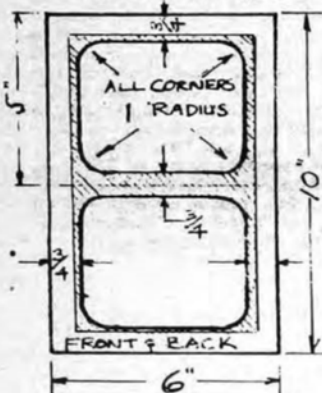
Cut top and bottom pieces to fit exactly between sides and drill the various holes shown on plan. Use the $\frac{1}{4}$ inch corner holes in top and bottom to lay out the exact length of the candle holder which is cut from $\frac{1}{2}$ inch stock. Cut this piece at least an inch longer than needed to prevent splitting when drilling the end holes which are then shaped into slots.

The rod used for lifting the candle holder should be glued into a hole in the holder. The part of the rod which protrudes through the lantern top should be slightly tapered. A brass or wood knob or ball screwed to the top adds a decorative, though not necessary, touch. Sand the rod so that it slides easily through the top hole. The candle is impaled on a small screw driven through the holder...or you can use a small candle cup or a piece of brass tubing.

Join top and bottom with glued in $\frac{1}{4}$ " x 10" corner rods. Add candle holder and fasten entire assembly inside lantern with eight countersunk brass screws. A piece of brass rod or heavy wire forms the carrying handle which is secured to the lantern with two screw eyes.



SHADED PORTION IS ROUTED TO $\frac{3}{16}$ " DEPTH TO PROVIDE GLASS RECESS.



Plant Stand



Woodworkers who enjoy lathe work will find this little Early American styled stand a most rewarding project. They are so useful for plants or as chairside tables that you may want to build a pair. Pine, maple, or cherry can be used depending on whether you prefer the casual look of pine, or the more formal appearance of finely finished hardwood.

It is unfortunate that many American built lathes are not designed to handle large face turnings, either over the bed, or outboard. If your lathe will not swing a 14" disc, the top diameter can be reduced to 11 or 12 inches. The top has a 1/4 inch wide rim which requires removal of 1/4 inch of material from the center out to the rim, but the rim can be omitted leaving the top with a shaped edge.

Start by gluing up two or more 5/4 inch (actually 1 1/4") thick boards to obtain a 14 1/4 inch square. Lay out the 14 inch disc slightly oversize and cut out with jig or bandsaw. Mount disc on a faceplate and use a 1/2 inch gouge to true up the edge and round it off towards the underside. Use a parting tool to cut a groove 1/4" deep and 1/4" in from the edge. Removal of waste from the center to this cut can be done with a 3/4" gouge for the roughing cuts. Finish up with a heavy straight edge scraper. Test the flatness of the top with a straightedge and work carefully until the surface is uniformly flat. Finish-sand the top while lathe-mounted, using No. 1/2 garnet paper wrapped around a padded block. Keep the sanding block in motion to prevent deep scratches. Finish up with No. 3/0 paper.

Next, cut the 4" and 4½" discs which are separate parts of the turned pedestal, and turn them to the profiles indicated. Note that these two parts are later center-bored to fit snugly over 1" diameter dowel tenons at each end of the pedestal. Both surfaces of each disc should be trued for a good joint.

The pedestal is turned from solid or glued up 2½" x 2½" x 22" stock. The dowel can be turned on each end, in

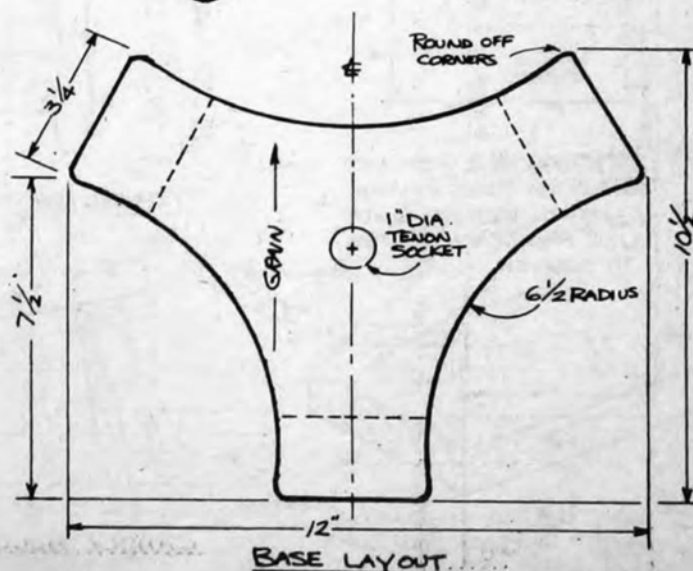
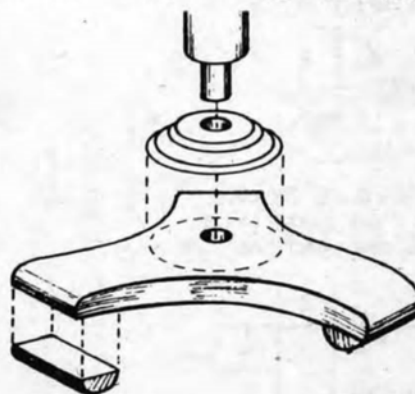
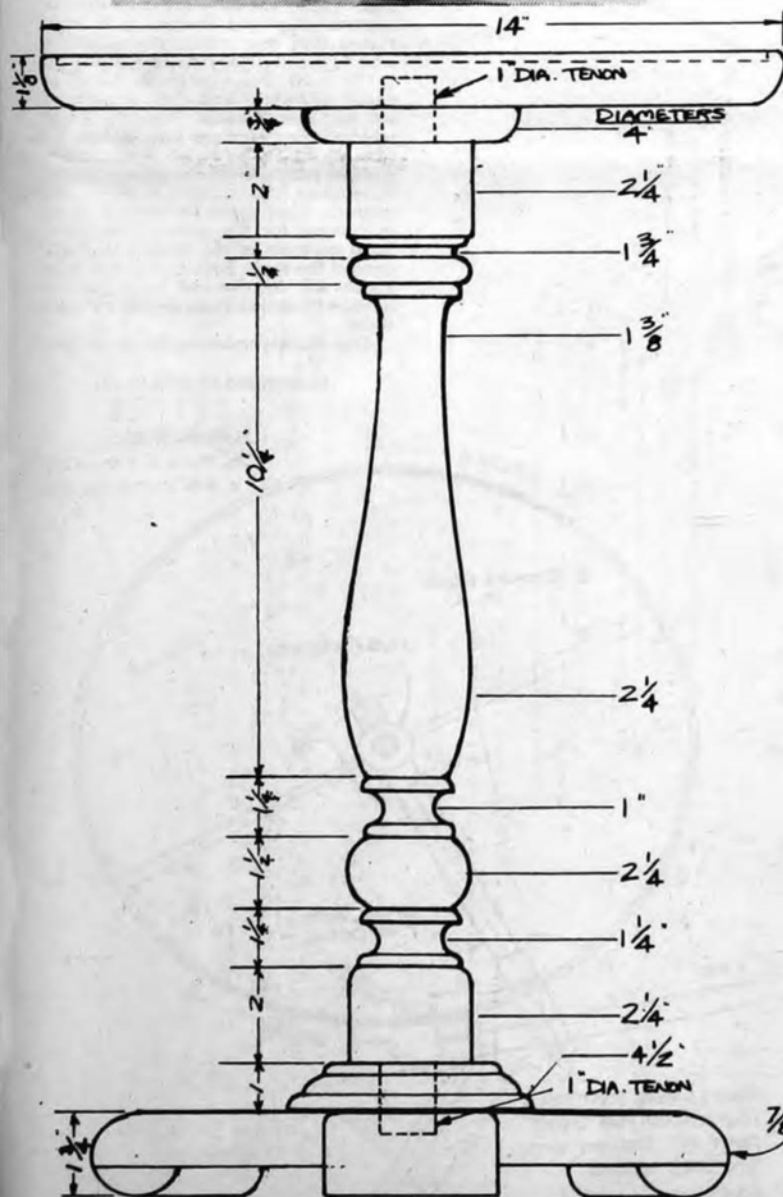
which case allow an extra 3 inches of length; otherwise make parting cuts with a slight undercut to insure good seating of the upper and lower discs. Center-bore 1" holes for separate dowel tenons.

Using a large gouge reduce turning square to a uniform cylinder of about 2 5/16" diameter, then lay out location of various coves and beads and use a parting tool and calipers to cut the various diameters. Complete turning with gouge and skew chisel. Sand the turning (except integral dowels) with folded No. 1/2 garnet paper, keeping the paper moving back and forth. Finish up with No. 3/0 paper.

The graceful base is made from 5/4" stock glued up to form a 10 1/4" x 12" rectangle. Lay out the base and cut to shape. The feet are cut separately from a turned length of 1 3/4" diameter stock which is ripped in half and planed to 3/4" thickness. Glue and clamp feet to base and after glue dries, rasp the base to conform to the curve of the feet. Round off all edges and sand base thoroughly.

The center hole for the 1" dowel is located by placing the 4 1/2" turned disc on the base so that it is equidistant from the three curved edges. Glue and clamp parts together and bore hole through disc and 3/4" into base. Repeat this process for the upper disc and table top, then glue top, pedestal and base together taking care to wipe all glue drippings from the raw wood surfaces.

Before staining, dust the stand carefully. Faceplate screw holes in the underside of top can be plugged or filled. Choose an oil stain to achieve the desired shade and apply with a brush in an even coat. As the stained surface becomes dull, remove the residue with a clean cloth, wiping with the grain. Allow stain to dry overnight before applying several coats of clear sealer such as urethane varnish. Sand with worn finishing paper or 2/0 steel wool and dust carefully between coats. After the final coat is applied, rub all surfaces with a pad of 4/0 steel wool, dust again, and apply paste wax.



Shaker Wool Wheel Part I

by Bud Kronenberg

This type of spinning wheel was used exclusively to spin wool fleece into yarn, and is often called a "walking" wheel because the spinner had to stand and walk to operate it. The yarn it spun was made into warm winter clothing that helped many early Colonists survive the severe winters. It played a much more important role in early America than the smaller treadle wheels which were used to spin flax into linen.

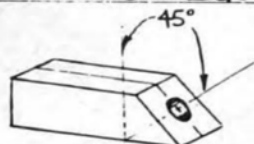
The Pilgrim's ships were small, and the limited stowage space was filled with items of higher priority than the large wool spinning wheels. This meant that after the family shelter was built, and the garden planted, they had to concern themselves with replacing the clothing brought from Europe. Homesteading was hard work and hard on their clothing, and they desperately needed warm woolen yarns. Just as today, not every man had the tools and skill to make a spinning wheel, but the choice of having their family survive or freeze to death created a considerable incentive. They either made a spinning wheel, or bartered to have someone else make one for them. The first wheels were primitive. Often the tables would simply be a log with three sticks for legs, and the spokes would be split from a log or made from round sapling branches. There was some improvement through the following years, but it wasn't significant until around 1780 when the Shakers started settling into communities. Their wheels were superior in workmanship and design. It is estimated that they made thousands of wheels to sell to the outside world.

The next major advance came around 1810 when Amos Minor patented his now famous Minor's Head which is an accelerating device for the spindle. These devices were sold in general stores, and by wagon vendors, throughout the eastern half of the country. They could be used as a replacement for the older direct-drive head on most of the wheels in existence at the time. Both types of spindle heads will be covered later, and in detail with instructions on how to make them.

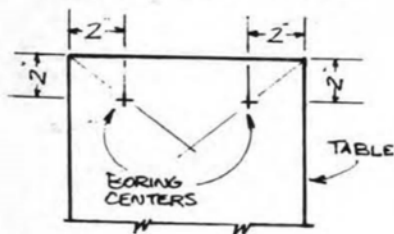
This Shaker spinning wheel project

(Continued on next page)

TO BORE TABLE FOR
SPRAYED FRONT LEGS:

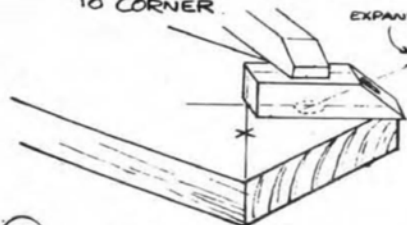


- ① MAKE A $1\frac{1}{2} \times 2 \times 5$ " BORING JIG WITH 1 " DIA. GUIDE HOLE BORED 45° OFF VERTICAL

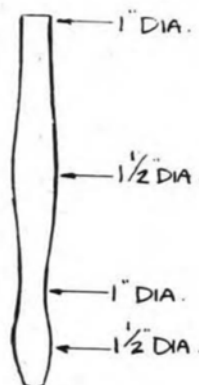


- ② MEASURE IN 2 " FROM END AND BOTH SIDES & MARK CENTERS. SCRIBE GUIDE LINE FROM EACH CENTER TO CORNER.

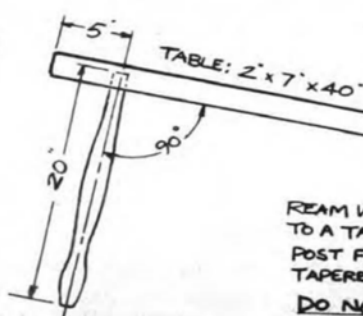
EXPANSION BIT



- ③ LINE UP JIG ON DIAGONAL, CLAMP IN PLACE AND BORE $1\frac{1}{2}$ " DEEP HOLE.

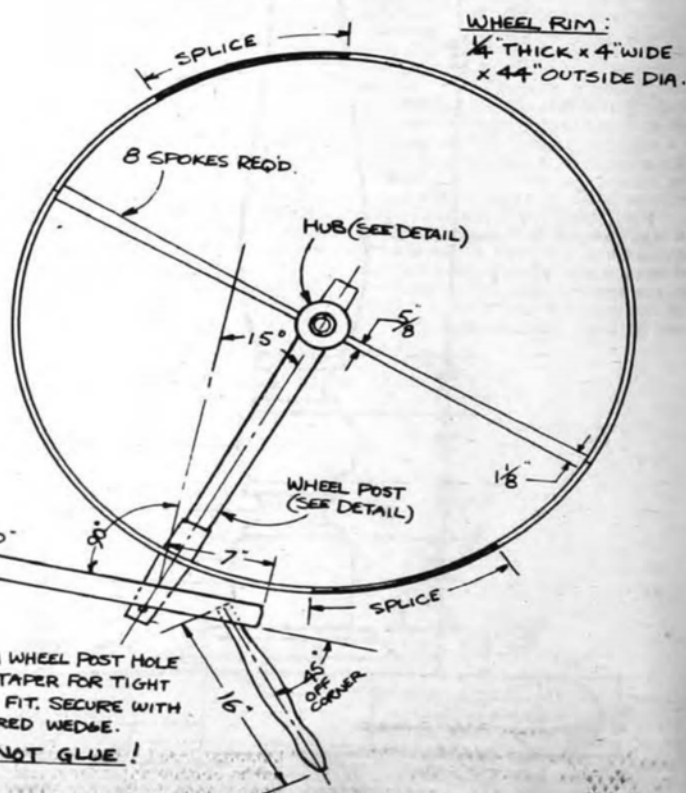


TYPICAL LEG TURNING



REAM WHEEL POST HOLE TO A TAPER FOR TIGHT POST FIT. SECURE WITH TAPERED WEDGE.

DO NOT GLUE!



Wool Wheel (cont'd)

can produce much more than just another decorative accessory for your home. When successfully completed you will have a beautiful spinning wheel capable of spinning yarns that can be knit and woven into an endless variety of valuable things - both attractive and useful. The yarns can be dyed with natural dyes, such as onion skins which give a range of golds and yellows, and yarn sizes can range from very fine to the bulky sizes heavy enough for rugs and wall hangings.

In order to cover this exciting project thoroughly, we will be running the step-by-step and part-by-part instructions in this and the next issue of *The Woodworker's Journal*.

The first part, in this issue, covers the table, legs, great wheel and wheel post. In the next issue we'll cover the spindle and tension devices. Part two will also give some preliminary instruction on actually using the wheel. For detailed spinning information, we suggest either of these books: *Your Hand Spinning* by Elsie Davenport, Select Books, 5969 Wilbur Ave., Tarzana, CA. 91536 (\$5), or *Spinning and Weaving with Wool* by Paula Simmons, Pacific Search Press, 715 Harrison St., Seattle, WA. 98109, (\$9.95). Our intentions are to make this project possible for the novice woodworker and yet offer challenges to the advanced, and to have both categories of results historically authentic.

MATERIALS

Wheel rims were most often made from oak, but also used were other varieties of wood, such as: elm, hickory, ash, and maple. Most of the wood was quarter-sawn, and it appears from the lateral checking that it was often green. Tables were made from quarter-sawn oak, but occasionally pine or maple was used. The most popular woods for the turnings were: maple, fruitwood and sometimes oak. As you know, using different woods in a single piece causes all kinds of problems. I would suggest using one species such as maple or oak.

Metal was in very short supply, in the Colonies, so they often had to use hardwood for wheel axles and spindles. If metal parts are a problem, you can use wood and still be authentic. The wheel shaft won't wear as well, and the spindle won't be as true, but it will still be a good spinner. However, steel rod found in the hardware store is easy to bend and work. You'll need $\frac{1}{4}$ " for the wheel shaft, and $\frac{3}{16}$ " for the spindle. The wheel can be held on the shaft by a brass cotter pin, or threaded for a nut. For a more authentic look, drill a hole in the end of the shaft to receive an old cut nail. A brass washer should be between it and the wheel.

TOOLS AND EQUIPMENT

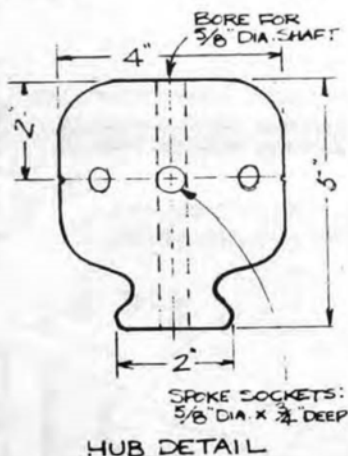
It was pointed out earlier that the Colonists had few tools to work with, and often made wheels using only an axe, saw and hammer. If they could do it so can you, but you'll have to have some of their Yankee ingenuity. To

produce the Shaker wheel pictured here, it will be necessary to have the use of a lathe long enough to produce the turned parts. Next on the priority list of more specialized equipment is a wood threading kit within the range of $\frac{1}{4}$ " to $1\frac{1}{4}$ ". This is not a "must" because there are ways to get around threading which will be explained in Part Two.

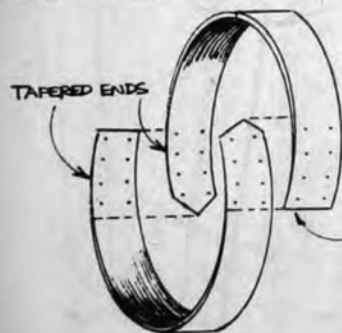
The other tools you'll need are found in the typical homeowners workshop: saw, drills, hammer, etc. If your shop is fully equipped, you'll do the job faster and probably better. The matter of time has probably already come to your mind. If I were to hazard a guess on how long it would take an intermediate woodworker, with a fairly complete shop, my guess would be about twenty hours.

MAKING THE GREAT WHEEL

The wheel, itself, is going to be much easier than you think, but it will be the most time-consuming of any of the parts. Start by turning the hub, and while it is still on the lathe, make a circumferential cut mark in the center of the hub as you face it on the lathe. This will serve as a guideline for locating the spoke holes. Locate the holes by starting with a witness mark and adjust dividers until you "leap-frog" around 8 times locating each hole with an awl impression. Using a V-block, drill the spoke holes to equal depths. If you are proceeding without a lathe, the only difference is that you will have to shape the hub the best way you can, probably by using a rasp and plenty of sanding.



Make the spokes one of these three ways: on a lathe, rounding square stock, or by using $\frac{1}{4}$ inch dowels. If you use dowels, sand a slight flare, because antique spokes were never uniformly round. If your spoke holes are all the same depth and the spokes the same length and well-seated, they will form a perfect circle when in the hub. Don't drill the axle hole in the hub just yet!



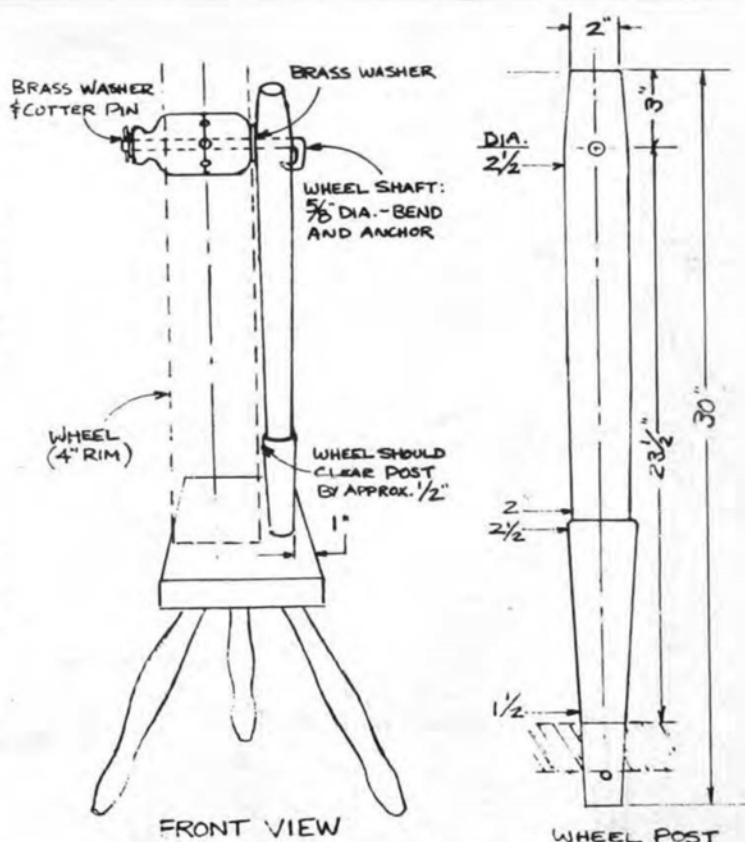
ALLOW FOR APPROX. 1/4" OVERLAP AND JOIN WITH GLUE & COPPER TACKS

WHEEL CONSTRUCTION

SQUARED ENDS ON OUTSIDE

NAIL THROUGH RIM INTO SPOKES

NOTE: MANY WHEELS HAD RIMS NARROWER THAN 4 INCHES. RIMS LESS THAN 3 1/2" SHOULD HAVE A ROUTED CENTER GROOVE TO RETAIN DRIVE BAND.



Dimension the two $\frac{1}{4}$ " rim sections on your circular saw, or with a saw or axe, or let the lumber mill do it for you. They should bend fairly easily. Test a section around the spokes with slow and even pressure. You'll have to use your best judgement. If you think the pressure is too great, there are alternatives. Soak the sections in hot water, or rig up a steam box with a tea kettle and length of steel gutter. I doubt if you find either of these alternatives to be necessary. I've bent 150 year old oak many times and have never had a casualty.

The overlapping rim seams must be feathered out so the rim, when it's together, will be the same thickness all around. Each of the two sections has a vee on one end, and a square cut on the other. The vees go on the inside of the rim. When you know the rim will bend around the spokes, start assembling the first seam. Glue and clamp, then drill small holes to prevent the copper tacks from splitting the rim. Put the tacks in and hammer them over. (Copper rivets can also be used in place of tacks.) You'll have to work right along so the rim is curved before the glue hardens.

Put the hub and spoke assembly on a flat surface. Bring the rim band around it and clamp the joint that hasn't been secured yet. Center the hub laterally and longitudinally, and drill a cut nail hole through the center of the rim seam and into a spoke. Complete the second rim splice with glue and tacks, just the way you did the first. Nail through the seam into the opposite spoke. By working carefully on a flat surface, you should have a wheel as true as most of the antiques.

Adjust the remaining spokes across the width of the rim to true the wheel. Each spoke is then nailed to the rim. It's possible that some of the spokes will not be dead center on the width of the rim. This is common, and a slight deviation is acceptable.

Now, it's time to locate and drill the axle hole in the hub. The center of the wheel may not be the dead center of the hub. It could be off a few 16ths. It is more important to have the axle in the center of the wheel rim than in the center of the hub. Take repeated measurements from the outside of the rim to locate the wheel center, and

then drill the axle hole. The wheel is now complete and the going will be much easier. In fact, it will be a comparative "breeze" and lots of fun.

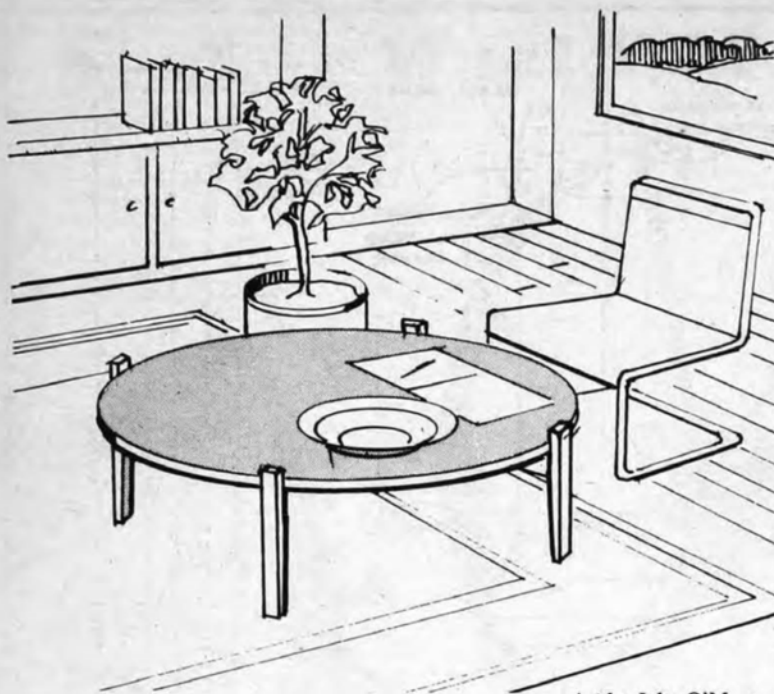
TABLE, LEGS, AND WHEEL POST

The table shouldn't be any problem. Cut it to size and sand. The Shaker tables were plain, but some of the other builders cut a bead molding along the top running its length. This is easy with a molding plane, router, or shaper. Many spinning wheel makers signed their work by branding, stamping, or carving their name or initials in the end of the table.

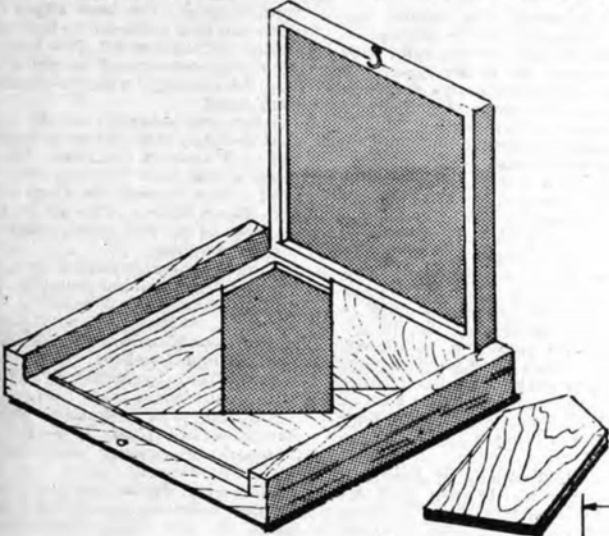
Make the three legs, and drill their holes in the bottom of the table. Take particular pains to get exact angles. If you don't the slope will not be correct, or it may tilt to one side or the other. Make the wheel post, and make it long enough to accommodate the wheel and extend beneath the table to take a wedged pin which holds it securely from turning. DON'T EVER GLUE THE WHEEL POST. Drill the table hole to accept the wheel post, and taper it by filing or reaming for a tight post fit. Make the wheel axle of hardwood, or $\frac{1}{4}$ " hardware store steel rod. Keep the wheel on the axle with a jockey pin, cut nail, or nut. It's a very exciting time when you put the wheel on the axle and spin it for the first time. The more exact and careful you were in making the wheel, the truer it will run. A slight wobble from side to side, of not more than $\frac{1}{4}$ " won't affect the spinning or operation. However, if it's more than that, you'll have to pull the nails holding the spokes to the rim, and relocate them to correct the problem.

Editors Note: Bud Kronenberg is former advertising copywriter who now devotes full time to building, restoring, buying and selling spinning wheels. He lives at Horse Fence Hill Road, Southbury, Ct. 06488.



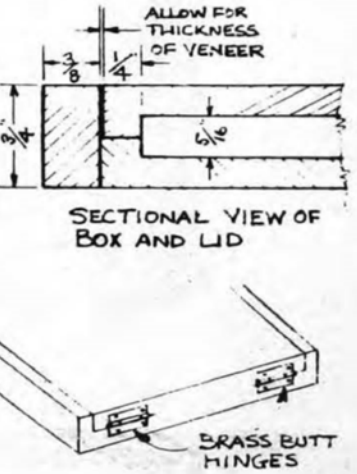
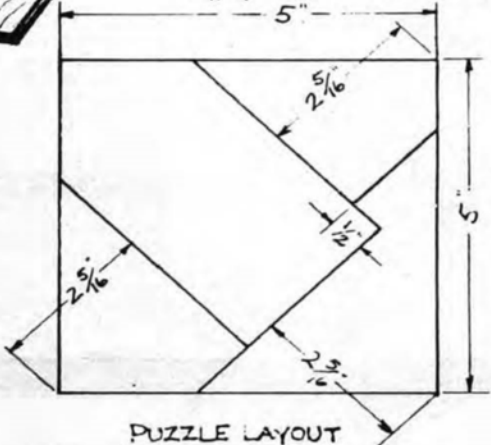
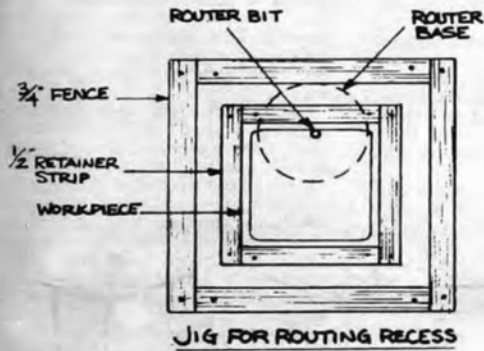


Veneered Puzzle

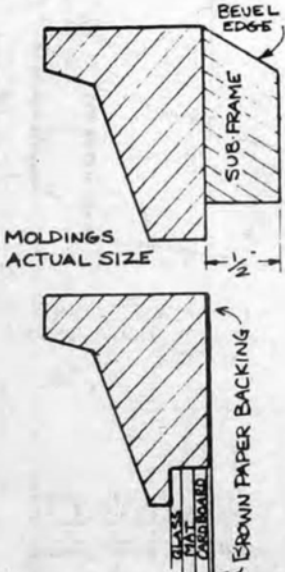


You may have a surprisingly hard time trying to put this simple-looking puzzle together. The parts are scraps of 1/4 inch plywood, covered on one side with various exotic veneers and fitted neatly into an attractive box. The lid is hinged with small dowel pins, and the box is veneered with walnut, rosewood, or whatever nicely figured veneer scraps you happen to have on hand. To make the box, start by cutting two 5/8" x 5 1/4" x 5 1/4" squares of plywood or pine for the bottom and lid of the box. These two pieces are each routed to a depth of 5/32". Make a guide for your router, as shown, by positioning one of the squares on a work surface and tacking strips around it. Nail 1/4" thick strips around the workpiece at a distance that will allow the router bit to cut within 1/4" of the edges of the workpiece. This distance will be determined by the diameter of your router and cutting bit. Run the router around all four edges, then clean out the center. Use a chisel to square up the corners. Repeat the process with the other 5 1/4" square. One side of the lid should be very slightly trimmed to allow for veneer

which is then applied around the edges and then to the lid top. Side strips of 3/8" x 1/4" stock are glued to the bottom square and the ends are trimmed flush. Place lid in position and drill two 1/4" holes through sides and into lid for dowel pins which hinge the lid to box. After inserting pins, apply veneer to all surfaces of the lower box, except inner surfaces that come in contact with the lid. Lay out and cut the puzzle pieces from 1/4" plywood or hardboard. Use a fine-tooth saw, and after cutting, sand edges smooth. Paint or stain the bottoms and edges of the puzzle parts and then apply different unusual veneers to each. Let the grains of the veneers run at different angles on each piece. Sand the routed surfaces of lid and box, and finish the box and puzzle parts with several coats of thinned white shellac.



Drip Cap Picture Frame



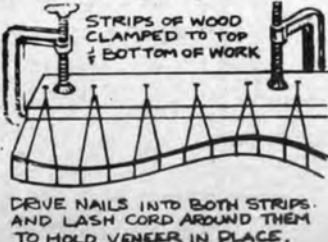
Drip Cap molding, which is available at all building supply dealers, makes an excellent low-cost picture frame. With its flat surfaces, it's particularly effective for the framing of modern artwork. The inner edge of this molding is usually 3/8" thick. Thus a 1/4" x 1/4" rabbet can be cut along the inner edge to hold glass, matted artwork and a thin cardboard backing. If a deeper rabbet is needed, build a sub-frame of stock of the required thickness, miter the corners and glue the molding to it. When choosing lumberyard mold-

ings, sight along the piece to make sure that it is reasonably straight. Warped moldings are useless for framing. Sand all pieces carefully before joining. Spread a thin layer of white glue over miter cuts and allow to dry. Then spread another thin coat and when tacky, join the pieces and clamp. When dry, reinforce each corner with one countersunk finishing nail. Seal completed frame with a couple of coats of thinned shellac before painting.

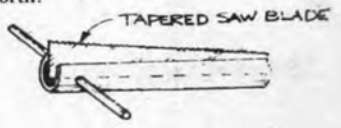
Shop-Tips

When jigsawing intricate designs in plywood, cleaner cuts with less splintering can be obtained by first applying a coat of white shellac thinned 50/50 with alcohol. Allow a few minutes for shellac to dry before cutting. Templates are invaluable for duplicating wood turnings. When you have a turned piece and wish to make a template of it, try setting the turning in front of, and close to a vertical pad of white paper. Place a single bright lamp in line with, and as far from the turning as necessary to cast an undistorted shadow on the paper. Trace around the shadow and use this drawing to produce a template from plywood or hardboard.

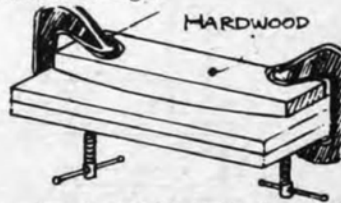
The development of quick contact adhesives has solved a lot of veneer clamping problems. If you don't have this type of adhesive on hand, and need to glue a crossbanding or inlay to a curved edge, try the setup shown below. Attach veneer or inlay with glue and a few pins to prevent it from sliding, and rub down hard with a veneering hammer or roller. Then apply the binding string.



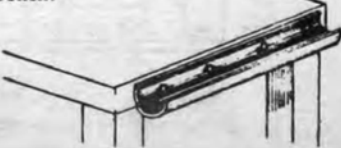
Here's a homemade reamer that will taper fairly large holes in wood. Slit a length of pipe and insert an old key-hole saw blade. Hammer the slot tight, and drill through pipe and blade for handle. Use by twisting back and forth.



Using 2 "C" clamps and a pair of curved beams, great pressure can be applied across wide glue joints. The amount of crown needed varies according to the length of the beam, but a crown of about 5/16" in a 2 foot span will be about right.



A length of rigid plastic pipe of 2" diameter, slit down the center, makes two handy troughs for tools and small parts when screwed to edge of workbench.



Pine Gun Cabinet

This good-looking pine cabinet was designed primarily for the storage of rifles, shotguns and fishing rods, with a lower cabinet for related gear. If you're not inclined to hunt or fish, you will find that with the addition of adjustable shelves, it will serve most admirably as a curio cabinet.

The cabinet is made in two parts; both for ease of construction and for moving. The lower section has a shelf and plenty of storage space, while the upper section is high enough to hold most rifles or shotguns. The plans show a wood frame and glass door which is relatively economical and easy to make. If you are willing to spend about an additional \$50.00, an eight light sash makes a very handsome door and can be ordered through your building supply dealer. These pine sashes are available in 1 1/2" x 24" x 54" and should only require a bit of planing of the lower rail to fit the cabinet as dimensioned.

Start construction with the base unit by cutting the six bracket feet according to the pattern. Four of these are joined in pairs with splined miters to form the front feet. The remaining two are rabbeted and glued to the notched rear pieces.

The base molding is best shaped with a router, though a separate molding can be glued to a length of 3/4" x 2 1/4" stock. This molding is cut into three parts and mitered as shown. Glue base molding to the feet, flush with outer edges, and reinforce the joint with glue blocks.

Next, cut cabinet bottom, sides and top to size, from glued up stock. Rabbet lower edges of sides to fit a

round bottom. The back edges of the sides are also rabbeted to hold the recessed 1/4" back panel. Join parts with glue and countersunk finishing nails. Use 2p common nails to fasten the back panel.

Align this assembly on the base so that the back of the panel is flush with the back ends of the base. The front edge of the base molding should extend 1 inch beyond the front edge of the cabinet bottom. This allows for the addition of the two small doors which are 3/4 inch thick.

Fasten cabinet to base with glue and countersunk finishing nails. Shape the rounded trim from a length of 3/4" x 3/4" pine, mitering the ends and fastening around cabinet top with small countersunk finishing nails. Cut the plywood back panel to size and fasten with small nails.

Cut the rails and stiles for both lower doors. These can be easily tenoned and grooved with the bench saw. The beveled panels are shaped for an easy fit in the grooves. Assemble doors dry to ascertain that all parts fit well before finish-sanding, gluing and clamping. Do not glue the panels in place. They should be left free to move in the door frame grooves. Drill the corner joints to receive a 3/8" square peg which locks the slip joint and provides a decorative touch.

The parts for the upper cabinet are next cut to size, sanded and assembled. Glue and nail sides to top and bottom, making sure that assembly is square as the glue sets. Add the shelf and back panel, nailing at 8" intervals. The panel fits into side rabbets and covers the back edges of cabinet top and bottom. The 1 1/2" filler strip is cut slightly long, nailed to top and sides, and is then trimmed flush with the sides.

Cut a triangular strip and glue it to a 4 foot length of crown molding as shown in the detail. This molding is then cut, mitered and nailed around, and flush with the top edge of the cabinet.

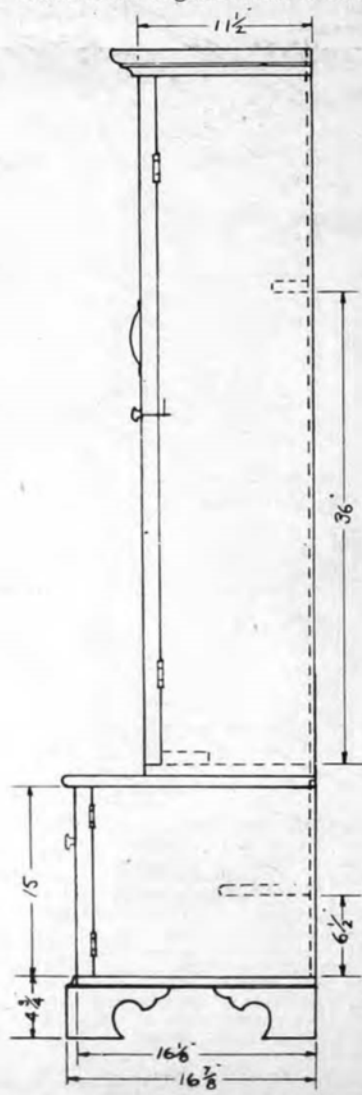
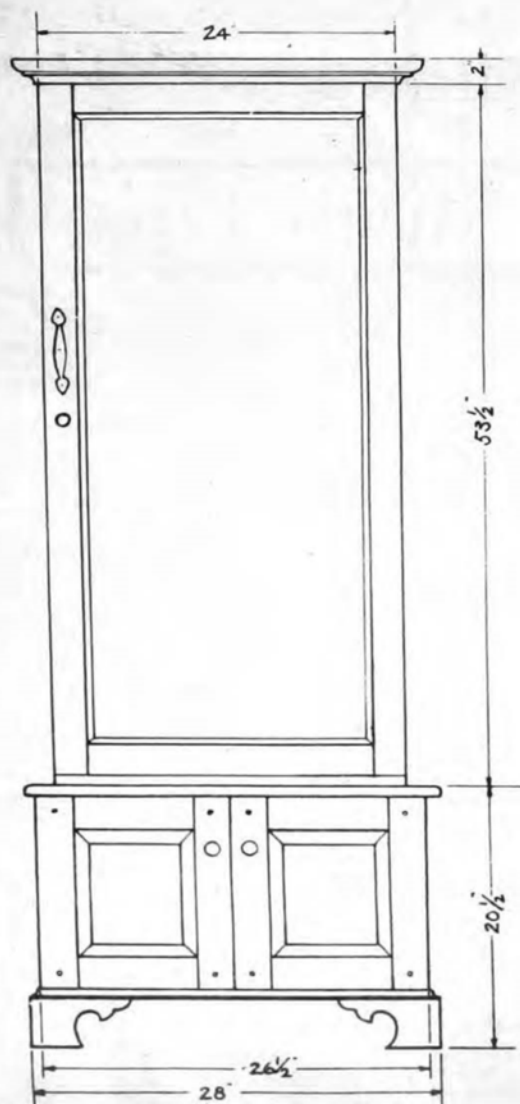
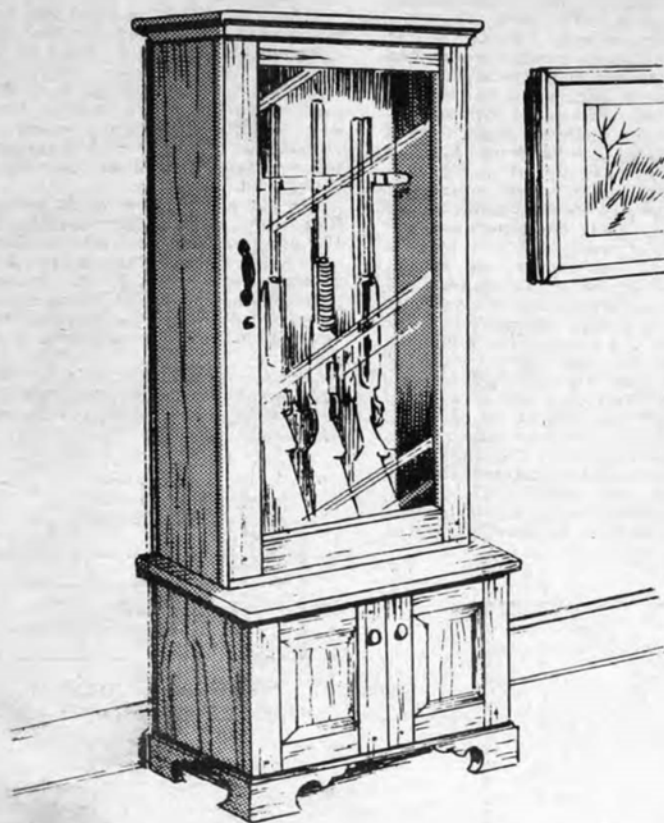
Rails and stiles for the upper door are cut, tenoned and grooved as shown. It's best to take the overall door measurements from the completed upper cabinet, and make the door frame very slightly oversize. It can later be planed to an exact fit. Make sure door is square and flat after gluing joints and clamping. As was done with the lower doors, the corners should be locked by driving in 1/2" square pegs.

The double thickness window glass rests in a rabbet formed by nailing a 1/2 inch quarter round molding to the door frame as shown. The ends of upper and lower moldings should be coped to fit neatly over side moldings.

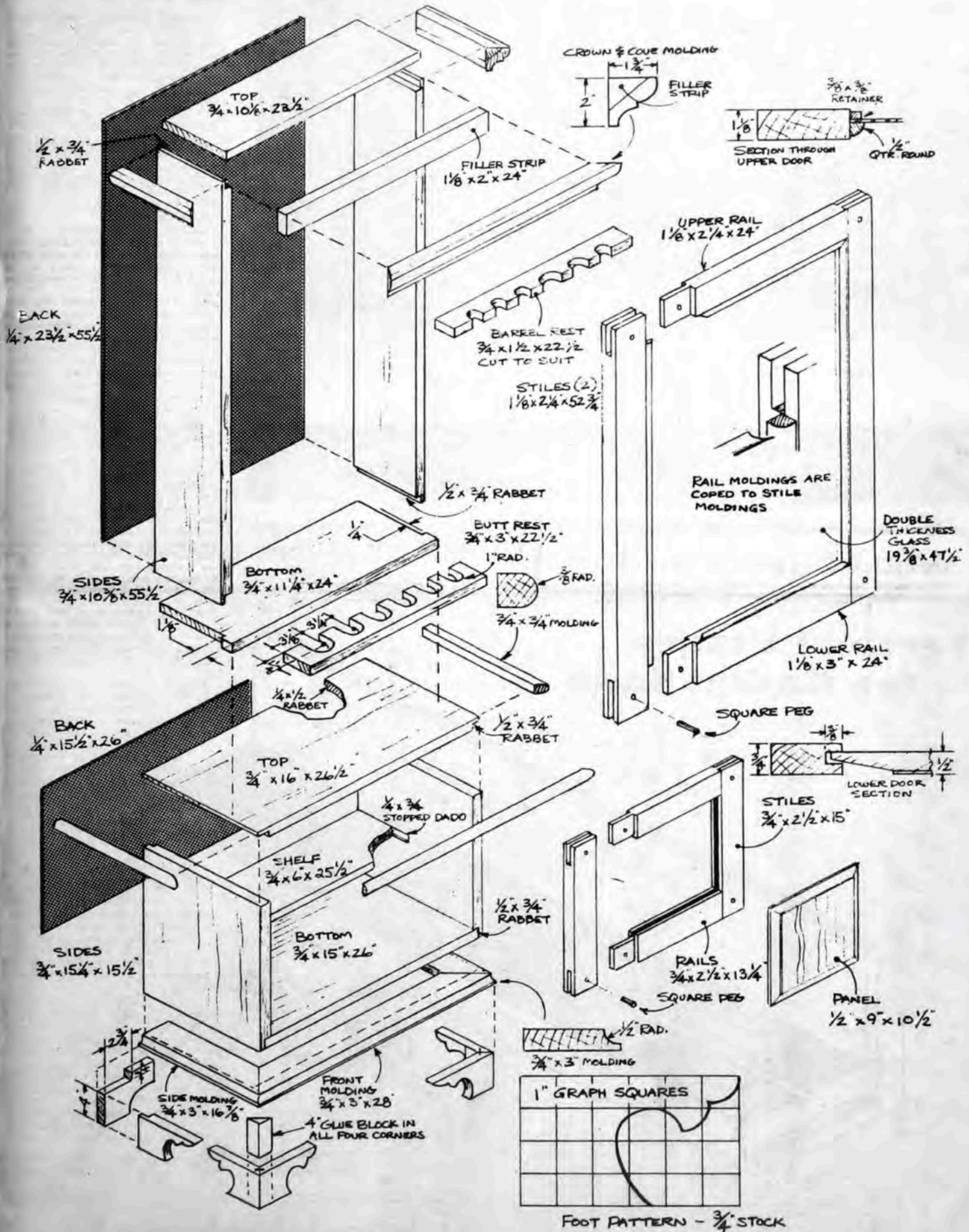
Lay glass in place and add square retainer strips which have had under-size pilot holes pre-drilled in them. To avoid cracking glass, push brads through retainer strips and into frame with long nose pliers. For a neat appearance, strips should be mitered at the corners.

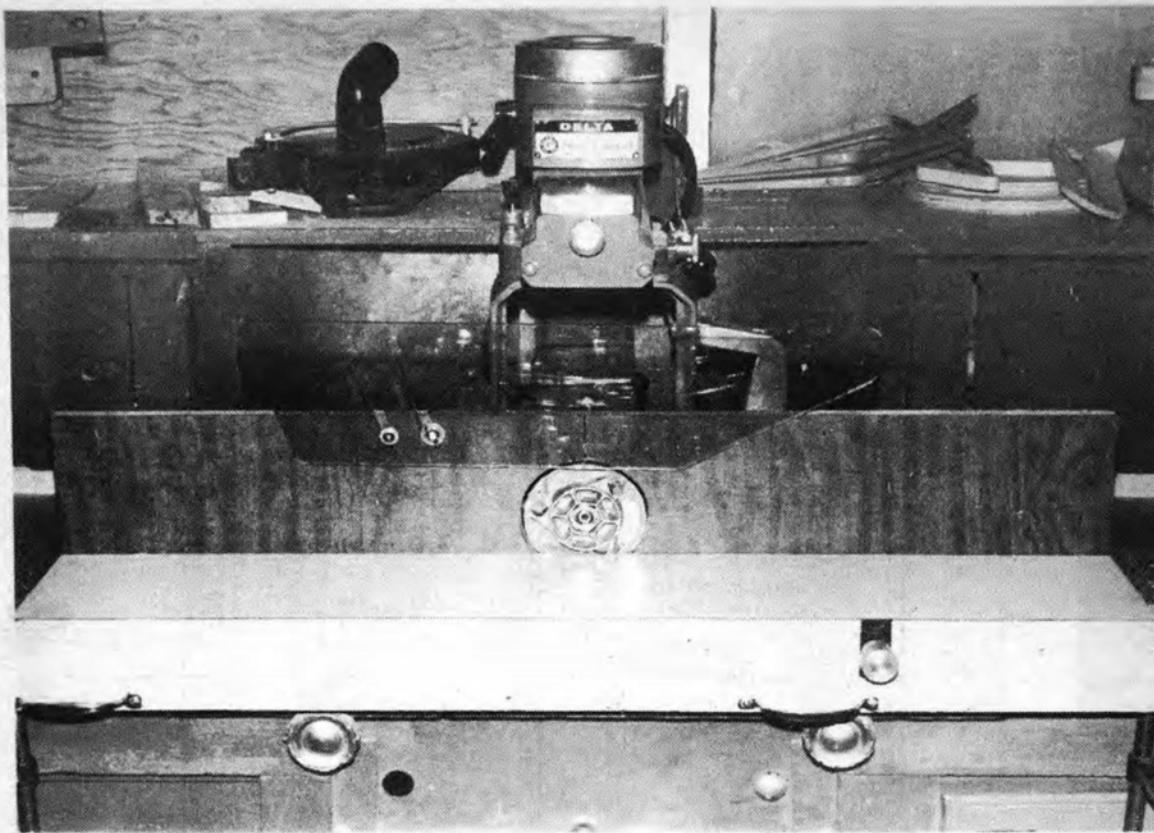
Cut butt and barrel rests and glue them in place. the barrel rest must be cut to suit your particular weapons. Cover cut-out portions of rests with strips of green felt, cemented on to protect butts and barrel bluing. Finish-sand the cabinet and remove all dust before staining interior and exterior. Seal all surfaces with 3 coats of satin varnish, rubbing down each coat with fine steel wool, and using a tack cloth before adding the next coat.

Install magnetic catches for lower doors. A cupboard latch, engaging a slot in cabinet side, can be used for the upper door. If there are children in the house, install a cam type cabinet door lock.



Gun Cabinet (cont'd)





Radial Saw Vertical Planer/Jointer

Probably the most versatile power tool in the woodworking shop is the Radial Saw. By adding attachments, accessories and some jigs, it is able to duplicate most any tool in the shop. Jointing can be done by using a belt drive from the saw arbor to drive a small jointer, but sometimes we find that the cost of a jointer may be too prohibitive for such an operation.

Here is a well-engineered vertical planer attachment that uses odds and ends found around the shop, in cooperation with a 4" rotary planer (Sears 9HT 29513). They sell for about \$15 and work very well for most jointing operations.

Construction is generally a good grade of particle board, faced with a plastic laminate. The table consists of three pieces: (2 pcs. $\frac{1}{4}$ " x 8" x 38" and 1 pc. $\frac{1}{4}$ " x 8" x 40") making a total thickness of 2 1/4 inches. The 40" piece is longer, to provide lugs which can be clamped into position. Once the pieces are glued together, they are carefully trued. The front edge and the working surface are faced with plastic laminate for durability and a slick surface. Using a dado head, groove a $\frac{1}{4}$ " x $\frac{1}{4}$ " slot lengthwise in the facing to accommodate a miter gage. This is not shown on the prototype.

Next, the plastic laminated particle board fence is made. This is $\frac{1}{4}$ " x 8" x 38". Find the exact center and draw a perpendicular line across the board. A measurement of 3 3/4" up from the bottom edge will locate the hole for the cutter head. Using a fly cutter on the drillpress, cut a 4 1/2" hole for the rotary planer, using the center just located. Make a center line on the reverse side (without the laminate) and carefully soften all edges with a veneer trimmer or file.

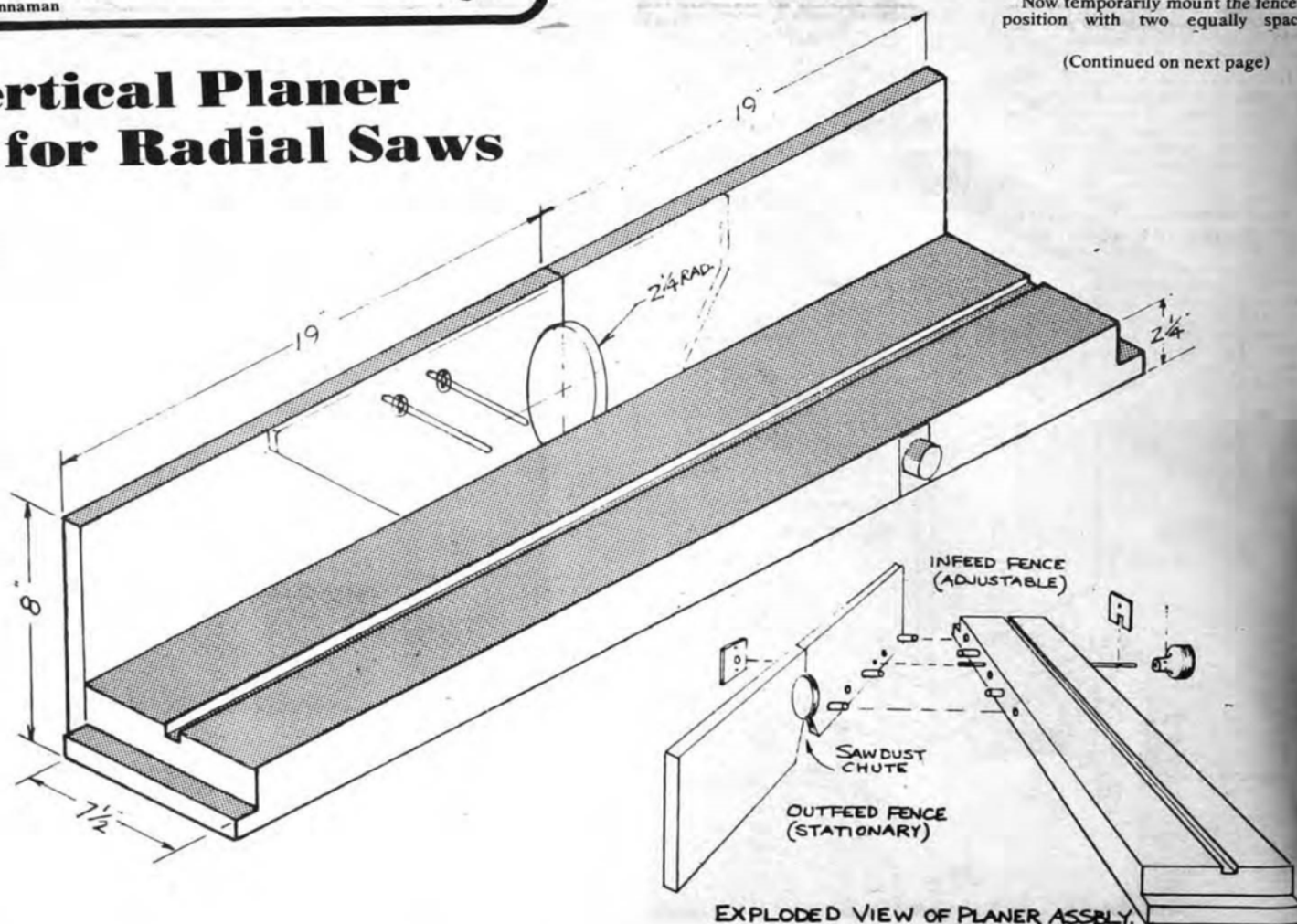
Now temporarily mount the fence in position with two equally spaced

Photos by Ray Carroll

Woodworker's Jigs

Don Kinnaman

Vertical Planer for Radial Saws



(Continued on next page)

Vertical Planer (Cont'd)

screws on both sides of center. Locate five centers on the right side of center, 1 1/4" up and 4" on centers. Bore five 3/4" holes, 2 3/4" through fence and into table, using the centers just located. Carefully lay out another hole 1 1/4" up and 11" in from the right end. Drill a 1/2" hole all the way through the fence and table.

Remove the fence screws and cut the fence into equal halves as shown. A sawdust chute is cut on the center line, and could be made to connect to your shop vacuum for dust removal. Mount the out-feed fence to the table with four 2 1/2" x 12 flathead screws.

Next, cut three 3/4" x 2 1/2" hardwood dowels and glue them in the first, third and fifth holes in in-feed fence. The dowels should protrude from the plastic laminated side. Cut two 3/4" x 3" dowels and glue them in the second and fourth holes in the table. This allows the fence to move parallel to the table for adjustment.

The adjustment mechanism is made from a piece of 1/2" x 10 1/2" cold rolled steel, but 1/2" continuous threaded rod is also suitable. Thread the first 1 1/2" with 1/2" NF threads. On the opposite end a 1/8" x 1/16" slot is filed or machined 7/8" from the end. Locate a piece of 1/4" x 1" x 2 1/2" band iron, center punch and drill three 1/2" holes, centering one hole and drilling the other two 1/2" from each end. Drill and tap the center hole with a 1/4" NF tap.

Locate a second piece of band iron 1/4" x 1" x 2 1/2", cutting a slot to match the slot on the adjustment bar. Now drill and countersink a 3/16" hole on the opposite end. The final part is the adjustment knob which must not extend above the table. It can be made of hardwood, plastic or machined of metal, and is held to the adjustment by a set screw. Rosan nuts and jam nuts could be used with a wooden handle however.

The jig can now be assembled by first applying a liberal coat of paraffin or carnauba wax. If the dowels are first lacquered and sealed, the wax will work better as a slipping surface. Now slide the in-feed fence onto the waxed dowels, making certain that they will slip easily. Slip the adjustment bar into place and secure the homemade nuts just mentioned above. When the special nut has been positioned, secure with 1" x No. 8 screws. Turn the shaft until the slot is next to the table. Slip the retaining on and secure with 1" x 8 screws.

The guard is made of 1/4" clear plastic. Refer to the drawing for shape and dimensions. The guard is secured to the jig with two 1/4" x

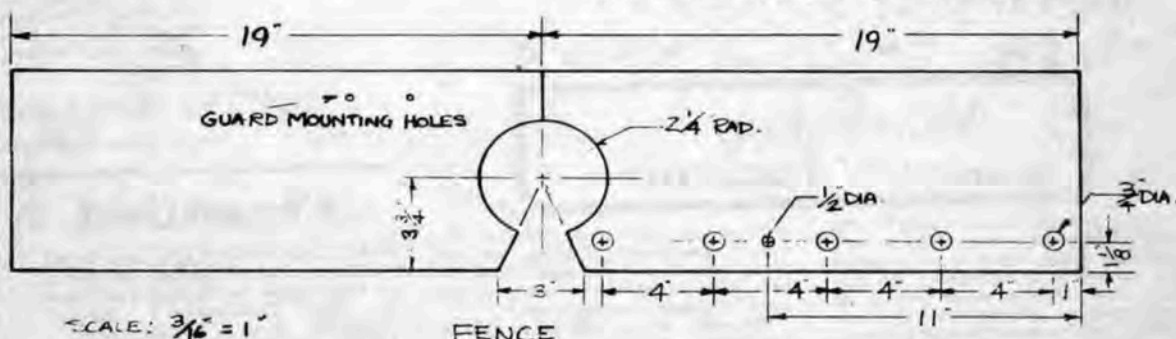
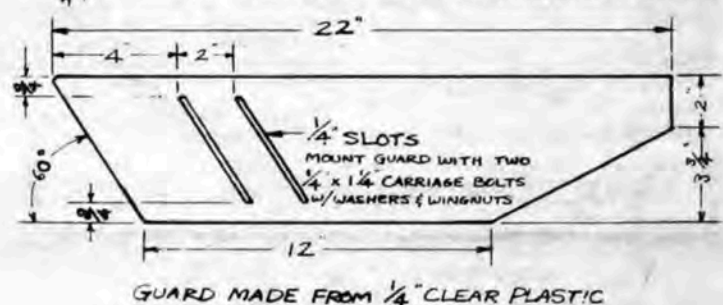
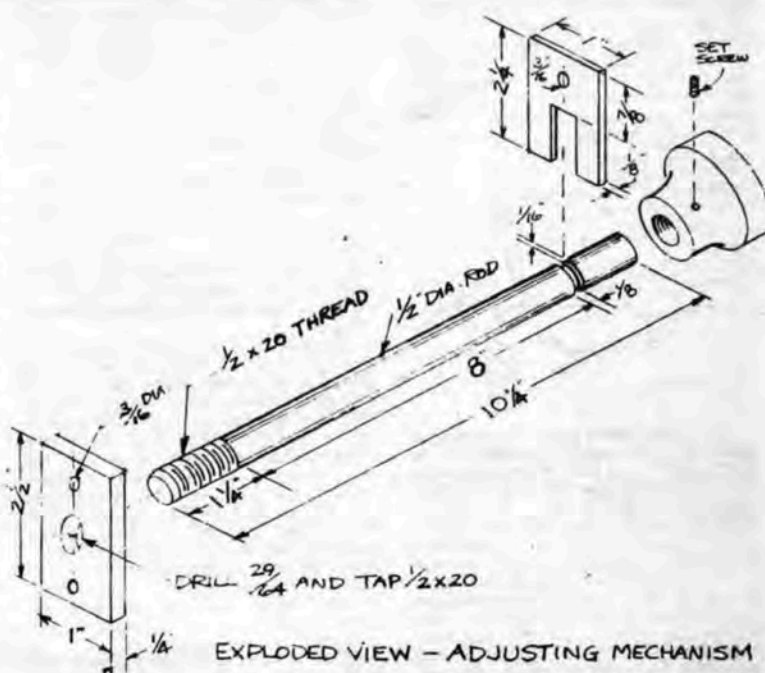
1 1/4" carriage bolts, washers and wing nuts. These slip easily in slots cut in the plastic guard for the purpose indicated.

To set up the jig for operation: remove the saw guard and blade, turn the arbor toward the front of the saw in a ripping position. Install the rotary planer and crank the saw head down to proper level making certain the outer cutting edges are even with the outfeed surface of the fence. Planer head should clear the hole without touching it. The saw head must align perfectly when turned by hand. Make sure all locks are snug and adjustments secure before operation. Clamp the table with "C" clamps or make provision in your table with rosan or "T" nuts. Feed your work from right to left so the cutter head will be turning in a clockwise motion.

Your jig is now ready for operation. It will face plane, joint, end plane and taper. By adding a 45 degree table attachment (to fit the miter slot), you can attain such things as chamfers, bevels, stop chamfers and the like. Get a perfect job every time with one, two, three or four sided tapers. Set up and use as you would a jointer, and do the job for much less money.

Don Kinnaman

The Editor wishes to thank his colleague, Mr. Byron Dombrowski of Phoenix, Arizona, who contributed the design, and built the prototype of the Vertical Planer.



BILL OF MATERIALS

No. Pcs.	Size	Part Name
1	3/4" x 7 1/2" x 40"	Table base
2	3/4" x 7 1/4" x 38"	Table
1	3/4" x 8" x 38"	Fence
1	1/16" x 24" x 41"	Plastic Laminate
3	3/4" x 2 1/2"	Guide dowels
2	3/4" x 3"	Guide dowels
1	1/2" x 10 1/2" cold roll	Fence adjusting bar
1	1/4" x 1" x 2 1/2" band iron	Fence adjusting nut
1	1/4" x 1" x 2 1/4" band iron	Adjusting bar restraint
1	1 1/4" x 1 1/2" Maple dowel	Adjusting bar knob
1	1/4" x 5 3/4" x 22"	Clear plastic for guard
4	2 1/2" x 12	Fence screws
4	1" x 8	Screws for adjustment mec.
2	1/4" x 1 1/4" x 20	Carriage bolts for guard
2	1/4"	Washers
2	1/4" x 20	Wing nuts

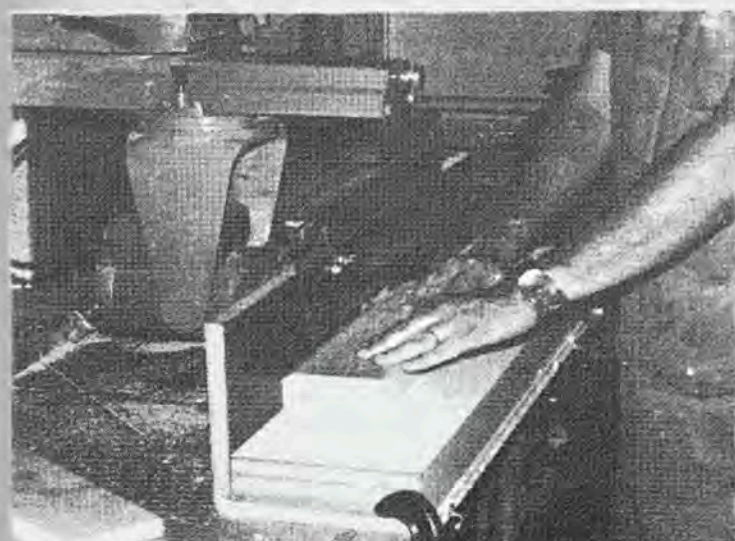
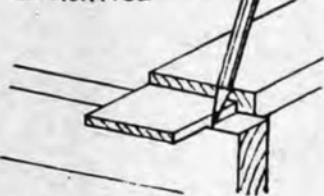


Photo shows the Vertical Planer, clamped to Radial Saw Table, and being used to joint a piece of stock. Note safety guard in place.

The Beginning Woodworker (Continued from Page 3)

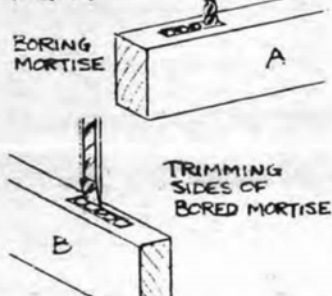
The through tenon is stronger and neater than the open version. As with the open joint, the through tenon is formed differently depending on whether the rail joins the stile at an end or at the center. With this joint, lay out and cut the tenon and use it to mark the top and bottom limits of the mortise (Figure 13).

FIG. 13 USING TENON TO MARK TOP & BOTTOM OF MORTISE



The mortise may be cut by gaging a center line the length of the mortise on both edges of the stile, then beginning at one end of the mortise, bore halfway through the stile using a bit with a diameter a little less than the mortise width. Bore the holes as close together as possible, working toward the center of the mortise, then start at the other end of the mortise and again bore toward the center. Flip the stile over and repeat the process on the opposite edge. Complete the mortise by paring the sides flat with a chisel. (Figure 14 A & B).

FIG. 14



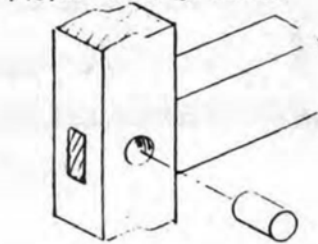
The through wedged tenon is formed the same way but kerfs are cut into the tenon to take wedges which are driven in after the joint is drawn tight with clamps. Never drive wedges running parallel to the grain in mortise stock or splitting is almost certain to result. Apply glue to wedges and drive them in just enough to compress the wood a bit. Later the projecting wedges are trimmed flush. This is a very strong and good-looking joint.

Blind mortise and tenon joints have stub tenons that do not extend through the stiles. This type is common in fine antique furniture reproductions. Generally, blind tenons are cut with a shoulder all around and except in very delicate work, the mortise bottoms are $\frac{1}{4}$ to $\frac{1}{2}$ inch from the outer edges of stiles.

An important point to be aware of in laying out blind mortise and tenon joints is that the tenon acts like a piston entering the mortise, small chips and glue are driven to the bottom of the mortise and if there isn't any clearance at the bottom, to provide for this, the joint cannot be drawn closed without splitting the stile. Therefore, cut tenons about $\frac{1}{8}$ inch shorter than the depth of the mortise. Blind mortises are, of course, bored out from one side only and cleaned up with a chisel. Use a depth gage on your bit to insure that all holes are bored to the same depth and the bottom of the mortise is reasonably level.

Blind mortise and tenon joints can be wedged or "fixed" by inserting slightly long wedges in tenon kerfs. When the joint is clamped together the wedges hit bottom first and are forced into, and spread the tenons.

FIG. 15 PINNED TENON



Open, through and blind tenons are often locked in place with a dowel pin. (Figure 15). This method was, and is, still often used in Early American style furniture. Old time cabinet-makers often bored the pin holes in tenons slightly offset from the shoulder which resulted in a tight joint with a pin that will not be easily driven out (Figure 16).

FIG. 16 CUTAWAY SHOWING OFF-SET TENON HOLE FOR DOWEL PIN

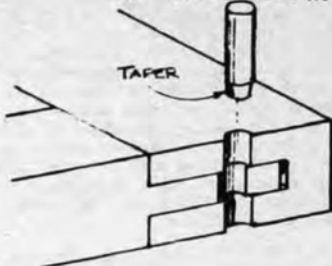
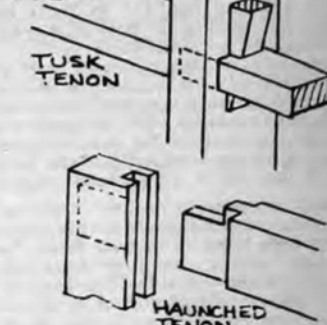


Figure 17 shows some other variations that are very useful in specific situations. The haunched tenon is commonly used when joining rails and stiles that are grooved to receive a center panel. The tusk tenon is a very old and handy variant, having a removable wedge so that parts may be separated when necessary.

FIG. 17



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The Woodworker's Journal
Sunset Lane, Washington Depot, CT. 06794

Workshop Income

Charles Burke

Many woodworkers are able to turn their hobby into cash without ever selling a thing. They've never taken out an ad in a newspaper or anyplace else, they've never printed up any business promotions for themselves, they've never opened a shop or attended a craft show or held a "pine party" or tried to sell at a fair or auction or garage sale or anything like that. In fact, they never make any effort at all to sell...and still their wood-working hobby puts a lot of money into their pockets. How do they do it?

They do it simply by taking advantage of the woodworking hobby's capacity to save them money. When it comes to woodworked products, they don't buy, they make. They make things for their homes, of course, and that saves them money. They also make things that they can give as gifts, and that can save them even more. Between making things for themselves (things they otherwise would have had to pay for) and making things they can give as gifts, competent woodworkers...not fantastically skilled artisans, mind you, but just normally competent woodworkers...can save themselves many hundreds of dollars each year.

Now since saving \$200 or \$500 or \$800 has an even better net effect on your wallet than making \$200 or \$500 or \$800 (you don't have to pay taxes on the saved amounts, whereas you do on the earned amounts)

you should push your I'll-make-it-myself woodworking savings for all they're worth, and you should look for new ways to let woodworking go to work for you as a money-saver.

One way to do this is to barter the products of your woodworking talents for objects and services that you'd otherwise have to pay for. Can you trade a tackle box for a tuneup? Can you get a refrigerator repair by giving a furniture repair? Can you turn turnings into turnips, mortises into mattresses, rabbits into rarebits (or maybe even rabbits)? Then do it. As far as I can see, saving money by trading your woodworking talents for other people's goods and talents can be even more valuable to you than making money by selling what you make. Keeping it in your pocket can be better...lots better...than adding it to your pocket.

Unfortunately, I think that's the way the government sees it, too; you're supposed to declare as income the value of the goods and services you receive in exchange for your woodworking services. Check your situation out with your accountant or whatever. But even if you have to pay taxes on your bartered services receipts, it can still be a good way to get extra income from your shop. And it's an ideal way for the woodworker who doesn't want to get actively involved in the selling game.

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