WOODWORK

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Reflections On Design

BY CHARLES PROWELL

I have always enjoyed the work of Charles Renee Mackintosh, the Scottish architect/designer/artist who gained international notice in the early 20th century for his unlikely union of forms that bridged the worlds of Art Nouveau and the new Modernism. His work, which included private residences, public buildings, furnishings, and interiors, was often characterized by the blending of square patterns together with long sweeping arches and fanciful curves. He created both order and complexity through the richness of this motif, often setting up relationships among the squares in a piece while highlighting the sensuous lines and the spaces in between.

Incorporating the influence of an admired master into your own work, however, can be frustrating at times. Other considerations, such as the function of the object and the demands of the space it will occupy, must often be met and resolved before addressing the form of any work. The hierarchy of these three concerns changes from project to project. At one end might be, for example, an entertainment cabinet, where constraints on both function and space can relegate its form, or design, to an almost auxiliary role. At the other end, a wonderful opportunity to explore design where the demands of function are less restrictive is the mirror.

The top photograph on the opposite page shows a straightforward walnut frame with Mackintosh squares inlaid across the bottom rail and a hint of purfling along the top. Mounted above a mantle, this mirror serves mostly as an embellishment. The mirror as an integrated part of a piece of furniture can be seen in the dresser pictured opposite. The stand-up mirror shown on this page is a work that was driven predominately by design. It seemed the perfect opportunity to join a Mackintosh-inspired blend of square patterns and sensuous free-flowing lines into a single project.

ALL PHOTOS BY CHARLES PROWELL EXCEPT AS NOTED

LAYOUT

There are a few elements to consider when laying out a stand-up mirror: the viewing distance, the overall size of the mirror, its height off the floor, and the angle of incline. Stepping back from a mirror produces a diminishing image; tilting the mirror slightly forward or backward, the image expands or contracts accordingly. Setting the bottom of the mirror low to the floor requires you to stand closer, while higher off the floor requires a progressively more distant viewing.

I consider a distance 5'–6' back as a standard from which a stand-up mirror is comfortably addressed. The inside dimension is typically between 42"–48" in height and 18"–22" in width. If the mirror begins 6"–8" off the floor, then the tilt angle in this instance is about 7° back from vertical.

The figure below illustrates an earlier stand-up mirror over 6' in height, designed primarily to ground the empty corner of a spacious dining room. Its viewing area extends to nearly 25 feet! Although it serves its purpose, that height is cumbersome for the more common master bedroom usage.

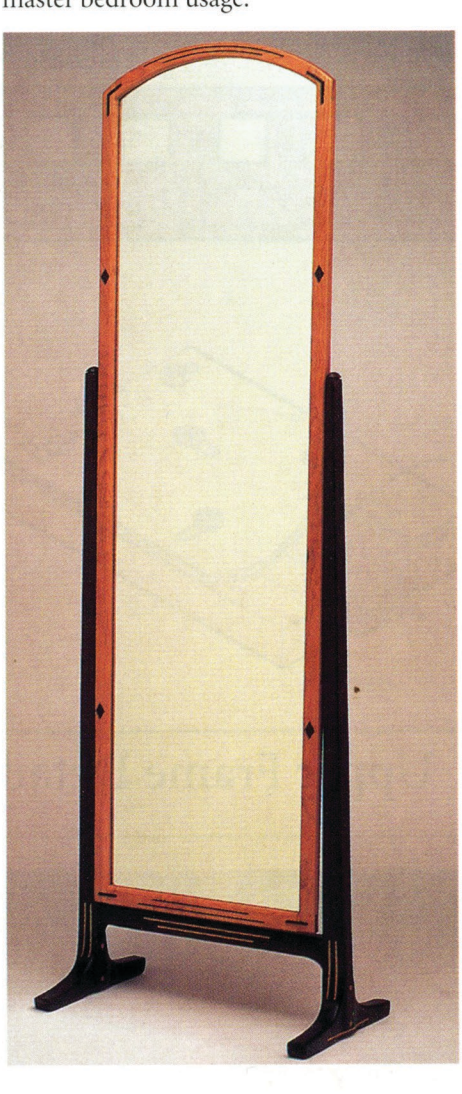


PHOTO BY DON RUSSELL

CLOCKWISE FROM UPPER LEFT—
"Mantle Mirror" (1998); 33" x 23"; Peruvian walnut, ebony inlay squares, banded purfling.
"Stand-up Swivel Mirror" (1988); 14-1/2" x 24" x 75"; wenge, cherry.
"Kadell Dresser Mirror" (1989); central frame: 26" x 22", side wings: 8" x 21-1/2"; padauk, ebonized maple.

CREATING THE SQUARES

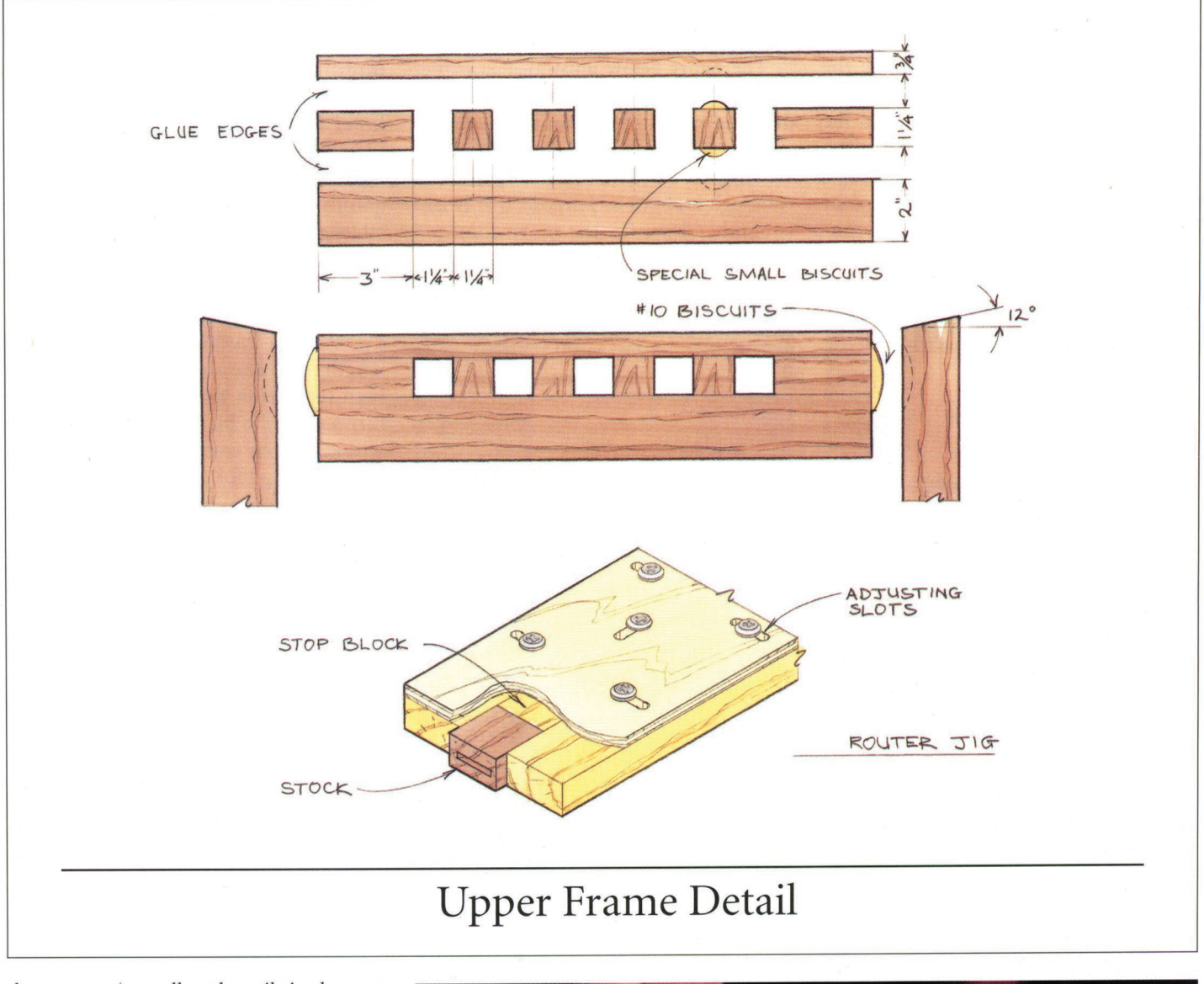
Mackintosh continually adapted and returned to his patterned squares motif throughout his long and varied career. The square patterns appearing within the top rail of my stand-up mirror are a simple facsimile which still creates the desired effect. The construction of the top rail is detailed in the drawing on the next page.

It is a four-part assembly; three horizontal components of the rail—the upper, middle, and lower lengths—and the intermediate squares. The upper and lower lengths are ripped and jointed to their finished width. Because the intermediate squares are arranged with their grain running vertically, I use a special tablesaw set-up to insure that the finished width of the middle lengths is exactly the same as the length of the squares. Mount a block of wood to the saw's fence, set at 1-1/4" from the blade. Rip the middle lengths and the squares to width, and then reposition the block on the fence forward of the blade and use the same setting to safely crosscut the squares.

My method for joining the squares to their rail components has been simplified by the recent availability of a new generation of biscuits. Developed for joining narrower stock (less than 1-1/2" width), the Itty Bitty™ biscuits from Woodhaven **[501 W. 1st St, Durant, Iowa 52747-9729; (800) 344-6657]** use a special 3-wing slotting bit that makes a more circular cut (5/16" deep x 15/16" long) than for the more common #0 biscuit. The carbide bit comes in 1/4" and 1/2" shank diameters. The biscuits are 1/8" thick and made of fiberboard. Take note that a standard 3-wing slotter acquired elsewhere is not compatible with the Woodhaven biscuit.

It is important, when slotting the small squares, to use a router table/fence set-up and a simple jig that houses the squares, allowing your fingers to maintain a safe distance from the cutting bit. The jig is built from two 12" lengths of stock the same thickness as the squares you'll be mortising. The two pieces of stock are set snugly on each side of a square and are then attached to an overlapping piece of 1/4" plywood, which houses the square flat to the table surface. By routing slots in the 1/4" plywood rather than simply screwing it to the stock, the jig becomes adjustable for varying widths of squares. Between the two 12" lengths there is a stop-block, also screwed to the 1/4" plywood, which prevents the squares from being pushed within the jig by the 3-wing slotting bit. The stop block can be any length but should be set so the square sits proud of the jig by about 1/4". The router fence is set so the jig aligns the cutter centerpoint to the squares. Slot both ends of each square, remembering to keep the same face of all

PLANS AND PATTERNS



Upper Frame Detail

the squares (as well as the rails in the next step) down to maintain a reference surface and insure flushness.

The corresponding slots in the mating rail components are accomplished by clamping an adjustable stop-block to the router fence and then, holding one end of the rail against the fence and block, pivoting the rail and plunge-feeding the stock at the layout marks. (Woodhaven conveniently illustrates this procedure in their catalog.)

One last detail, before the mirror frame is assembled and glued together, is the addition of a pattern of 3/4" x 3/4" bubinga inlays along the two frame stiles, thus creating a strong geometry of squares centered by the rectangular form of the mirror itself. Another recent innovation has made this process considerably easier: an inlay template guide with removable collar. The guides are similar

A shop-made jig is used to safely hold each of the small squares as it is plunged into the three-winged cutter, creating a slot for the specialty biscuits.

to standard router template guides that fit to the router base, with two exceptions: they come in only one diameter suited to a 1/8" spiral bit, and there is a removable brass collar that fits over the bushing. **[An 1/8" spiral bit and inlay guide are available as a kit from Rockler, 4365 Willow Drive, Medina, MN 55340 (800) 279-4441]** Carefully cut a template, from plexiglass or other suitable material, 1/4" larger than the desired inlay (to allow for the bushing plus collar thickness). This is clamped to the work. With the removable collar in place, rout out the field of the square inlay using the 1/8" bit set 1/8" deeper than the template. The bushing/collar acts as a guide, traveling against the perimeter of the template.

To create a mating bubinga square, rip or plane a piece of bubinga to 1/8" thickness. Adhere it temporarily to a piece of plywood with a hot glue gun. Clamp the template over the bubinga. Remove the brass collar from the bushing (by hand or, carefully, with pliers—the collar is brass). Now rout out the perimeter of the square with the bit depth unchanged. (It's best to set the bushing against the template with the bit raised above the bubinga at first, securing your position before lowering the bit into the wood and routing along the perimeter.)

Repeat the procedure, re-clamping the template along the length of bubinga until you have routed out the desired number of inlays. Lift the squares from their hot-glued plywood substrate and you have the mating partner. You can lightly file or fine-tune the square if necessary. The last step on inlays, once they've been glued, clamped, and sanded flush to the walnut, is filling any hairline voids. I keep several dozen small containers filled with fine, sanded dust of various woods. Apply a dab of clear, quick-set glue over the hairlines and immediately rub in a pinch of bubinga dust and sand smooth.

THE LEG ASSEMBLY

The leg assembly consists of a foot joined to a vertical upright by means of a lapped joint. My experience with quartered Peruvian walnut is that there is very little wood movement in this joint. I dado the half-laps on the table saw while the stock is still square, and then proceed to shape the parts. To do this, I first draw profiles of the parts on a template of 3/4" melamine. The patterns are then penciled onto my walnut stock and roughed out on the bandsaw. The shape is further refined by clamping the template to the roughed-out walnut and routing the edges with a 2-1/4" x 1/2" flush-cutting bearing bit.

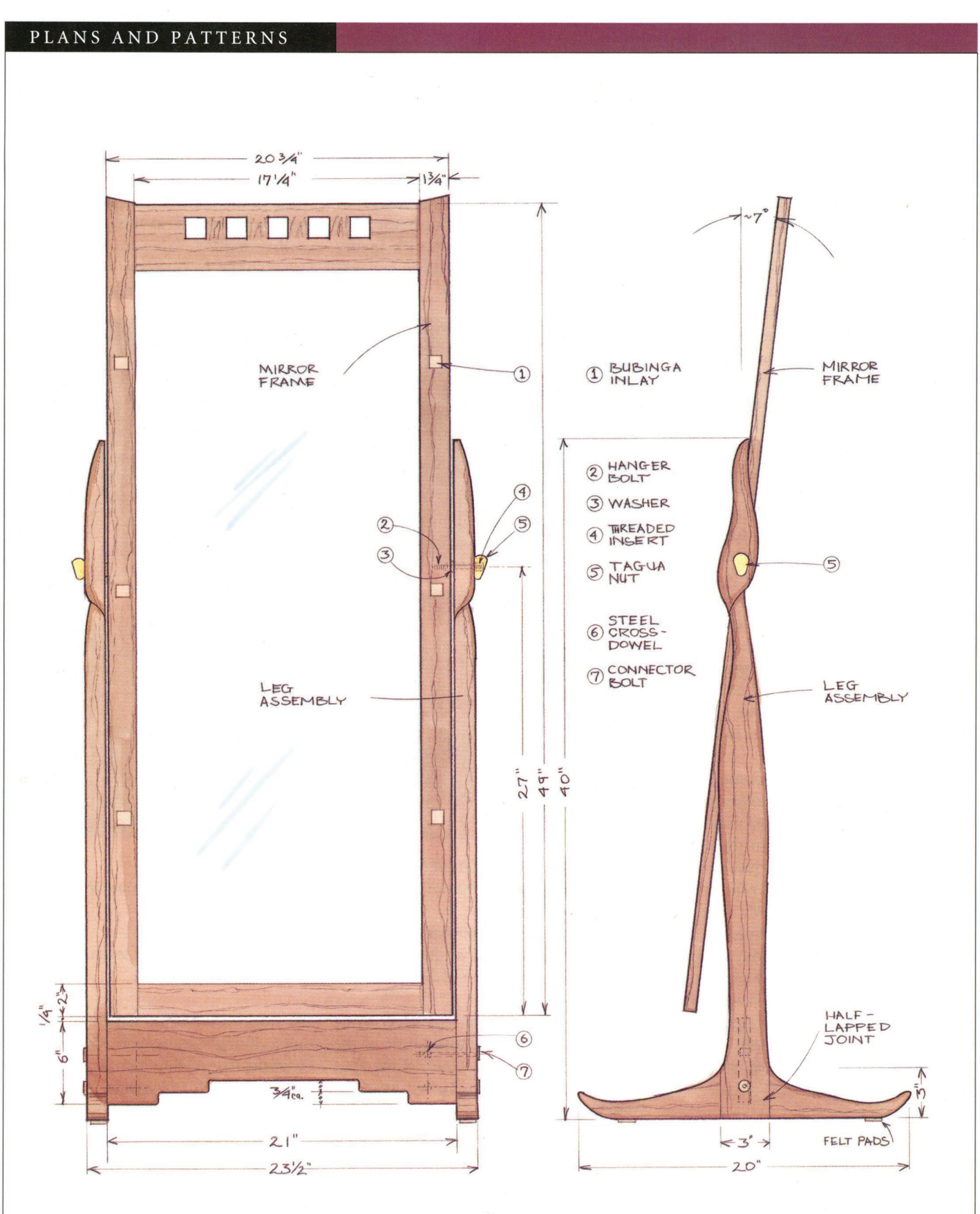
The profiled leg is then ready to be worked by one of the oldest tools in woodworking. The drawknife in my shop—passed down for three generations—has a cutting blade 11-1/2" long of steel so densely forged that sixty-some years of honing has removed little of the original cutting edge. Controlling that cutting blade is accomplished by completely different methods than all the previous work on the frame parts. In fact, compared to those earlier procedures, where precisely sized pieces were produced with templates and router jigs or careful tablesaw set-ups, using the drawknife might seem like tight-rope walking without a net.

With the leg secured to a bench clamp, begin pulling the drawknife toward you to create the oversized chamfers along the backs of the leg. It's important to take shallow cuts, working with the direction of the grain. The change in dimension near the top of the leg is handled by first cross-cutting with a fine-tooth tenon saw to approximately 1/8" depth and then working the drawknife to this edge. (You might be tempted, at this point, to turn to the smaller, safer spokeshave, but spokeshave blades are recessed and unable to cut to a flush edge). Recreating the work on a second leg is not as difficult as it might seem; work shallow draws to avoid irreversible mistakes, and have leg #1 nearby for reference. I shape both pieces to withing a few inches of my lap joint, making sure not to lose the squareness of those surfaces. I glue up my half-laps before final shaping near the joint.

Between the flat, inside planes of the two leg carvings facing the mirror frame, a bottom rail serves to complete the leg assembly, providing both lateral stability and an opportunity to add another design element: the stepped line, seen in some of Mackintosh's early furniture

CLOCKWISE FROM UPPER LEFT—
Shaping the legs with a drawknife is itself a dramatic contrast to the router and template work on the squares.
A view of the curved outer frame and the tagua nut locking mechanism.
The feet and bottom rail are joined together with bronze connector bolts, making the mirror easy to assemble and disassemble.

PLANS AND PATTERNS



Stand-Up Mirror

designs and most notably in the work of his American contemporaries, Charles and Henry Greene.

The legs are joined to each end of the bottom rail with two 3-1/2" bronze connector bolts, mating into steel cross-dowels inserted in the rails. This has two advantage over a glued joint: it makes for easy shipping and crating; and, more importantly, it allows the mirror frame itself to be built separate from the leg assembly.

To install the bolts, clamp the legs and bottom rail in place and bore a 1/4" diameter hole through the leg and into the bottom rail to a total depth of 3-3/4". Use a square to transfer the centerpoint of the bore onto the back side of the rail. At a point 3" from the outside of the leg, bore a 10mm hole in the back of the rail. **[This hardware and drill bit are both available from Rockler.]** To gauge the depth of this bore, set the cross dowel against the bore in the rail ends so the threaded hole is aligned with the first 1/4" hole. Use a stop gauge on the 10mm bit to insure depth accuracy. The bolt is now placed through the leg and into the bottom rail. The cross dowel is slipped into its hole and as the bolt threads through the dowel, the leg-to-rail joint tightens.

At the height that you have chosen for your pivot point, hanger bolts are threaded into pre-drilled holes in the mirror frame stiles. The hanger bolts are mated with corresponding holes through the legs that allow the mirror to hang approximately 1/4" off the bottom rail of the leg assembly. The mirror frame is fitted within the leg assembly by using an Allen wrench to loosen the connector bolts from their respective dowels just slightly, allowing the legs to open to a width that will allow the hanger bolts on the mirror frame to slip within the corresponding holes and eventually be fitted with handles.

Finding inspiration within the designs of others, past or present, can often help develop one's own sense of style. And nurturing an ongoing interest and curiosity in the history of furniture design can help provide an archive of possibilities otherwise not available. The result, simply, is an expansion of accessible and serviceable ideas.

Charles Prowell makes furniture in Sebastopol, California.

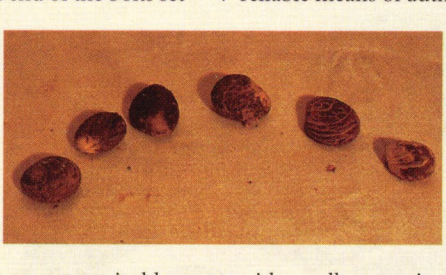
MATERIALS

Holding Mechanisms

In earlier stand-up mirrors I mounted the mirror frame to the uprights by means of roto-hinges. Two-sided cylindrical hinges separated by a center washer, the roto hinge provides a smooth bearing pivot that allows the mirror to tilt forward or backward. Unfortunately, however, the roto hinge has no locking capacity, forcing the viewer to stand at arm's length holding the mirror at the desired tilt.

Far more practical, though somewhat less snazzy, is a simple hanger bolt assembly, with the threaded end of the bolts set into pre-bored holes in the mirror frame at the proper pivot points. The pivot point setting is important, since a setting too low results in a top-heavy mirror that may, conceivably, flop over like a 180° handstand, while a pivot-point too high creates an imbalanced weight distribution. The mirror frame in discussion is 49" in length, with the pivot at 27" from the bottom. If this frame dimension changes in your own design, a general rule of thumb is that pivot points are at approximately 55%–60% of the overall frame length. This can be further tested by simply holding the mirror with two awls at the prospective pivots.

The machine-threaded ends of the hanger bolts slip through oversized holes bored through the carved legs with the frame and legs separated by a single brass washer. Maintaining a desired tilt requires tightening the legs to the frame by the use of threaded knobs. Not a standard handle, nor even a wing nut—both capable, certainly, but hardly befitting the refinement of the design. Single knob drawer pulls with machine threads are an improvement, but still, set against the more organic form of the sculpted leg, they appear, well, uneventful. Until the mid-1970's, I utilized elephant ivory for the occasional embellishment. At some point, however, I came to realize that ivory was not only scarce, but hard on the elephants as well. I have since turned to a more ethical substitute.



There are a number of substitutes—each with its own problems or limitations—such as cattle jawbone (dense, but not commercially available); Corian™ (a hard-to-carve inorganic granite-like grain); cast polyester rods (1-3/8" x 5") **[available from Constantine's, (800) 223-8087]**; ivory micata **[from Texas Knifemaker's, (713) 461-8632]**; or the (to my mind) equally questionable fossilized ivory, most commonly from walrus, as well as from elephants. (Besides carbon-dating, there is no reliable means of authenticating its fossilized status, which is perhaps why it's illegal in California.)

The tagua nut (pronounced *tah-wah*) is an affordable substitute with excellent carving properties **[available from many mail-order suppliers or through Bouget Brothers (800) 828-3024]**. It is a sustainable resource, harvested from the ivory palm trees (*Phytelephas macrocarpa*) of Central and South America with the renewable regularity of any annual nut crop. In the rough, it varies in size from an irregular 1-1/2 to 2" diameter, with a thin outer layer of bark that easily sands or carves. I have, on occasion, soaked them in water for two or three days to improve their malleability, but of course they must then be allowed to dry several days before applying any kind of oil finish to enhance the luster.

The bottom is belt-sanded to a flat surface. Brass threaded inserts (with threads mating the hanger bolts) are fitted into pre-bored holes. To shape the nut into a knob with finger-seats, I relied on the Dremel Moto-Tool with a flex-shaft attachment and a variety of carving burrs. The nut was then smoothed with 120-grit sandpaper and polished with steel wool, working from #00 to #0000. A wipe-on oil finish produces a low satin luster. The brass threaded inserts previously installed are now mated to the machine threads of the hanger bolt. Tightening the nuts secures the mirror tilt to any desired angle.—*C.P.*