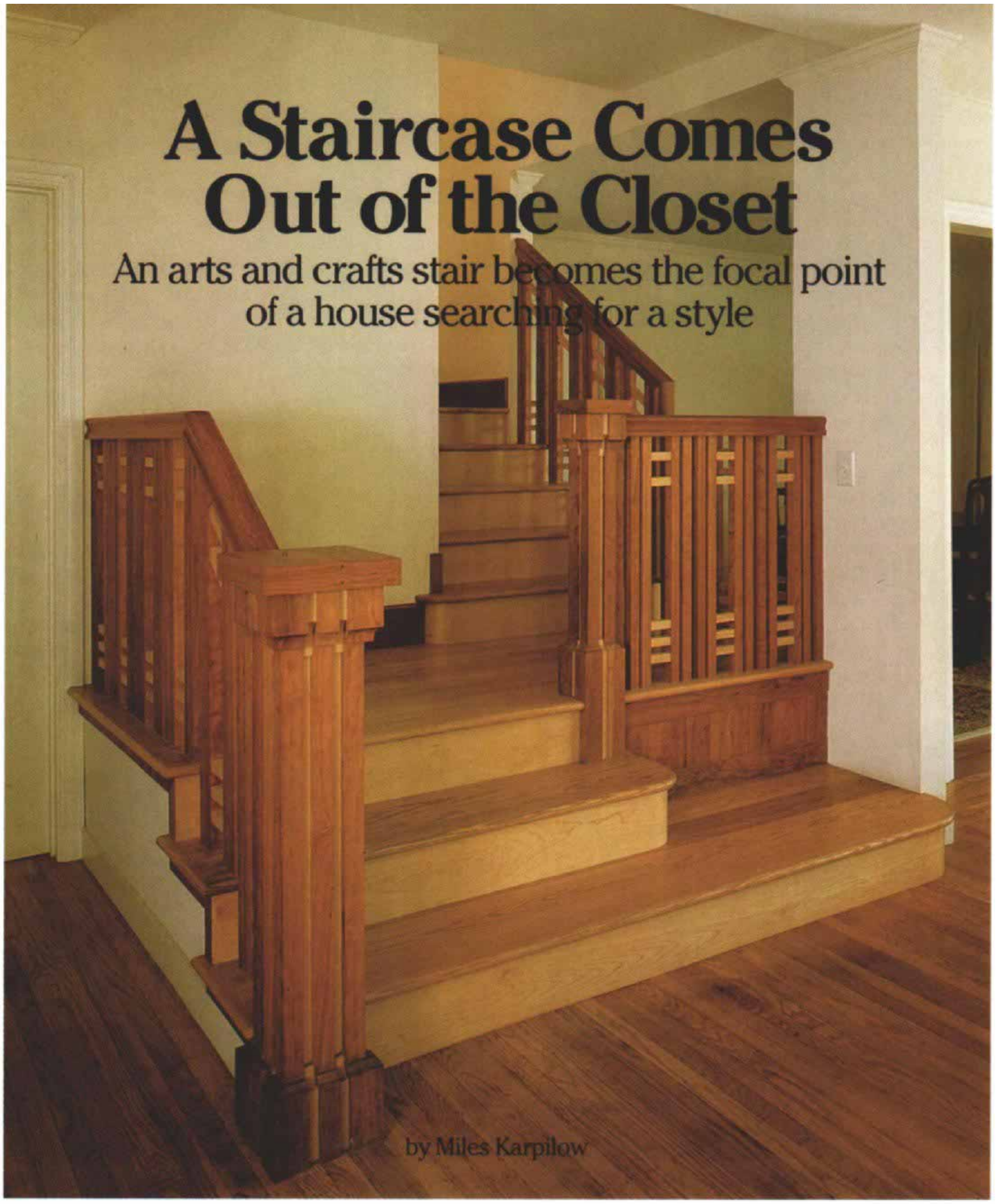
A Staircase Comes Out of the Closet

An arts and crafts stair becomes the focal point of a house searching for a style



by Miles Karpilow

Sometimes the appearance of an entire house can be altered by a single change. A good example of this phenomenon is the effect that a new staircase (shown in the photo above) has upon Jane and Henry Hewitt's house in Berkeley, California.

The original stair (photo at right) began in a narrow corridor between the front hall and the kitchen and wrapped around a closet with a water-heater vent running through it. Anyone climbing its three cramped flights would be met by a blank wall at the top landing. The stairs were intended to serve an area designated on the original blueprints of this 60-year-old house as "future bedrooms." In addition, the 6-ft. 2 in. clearance between the ceiling header and the second flight made the stair an awkward experience for anyone over 6 ft. tall. This was painfully evident to Mr. Hewitt, who, at 6-ft. 5 in. tall, had learned in a Pavlovian manner to duck every time he neared the header. After 15 years, he was getting tired of it. The Hewitts were ready to remodel the house or move to another one.

With its walls partly removed, the original stair climbs rapidly on its 8-in. risers toward a 6-ft. 2 in. clearance at the first landing.

The "future bedrooms" had been added sometime around 1940 and were very much in use by their two teenage children. The Hewitts' remodeling plans included an upstairs master bedroom and bath, so the stair would be asked to handle an increased traffic load. While the house was pleasing on the outside, its interior volumes and detailing lacked visual interest. It was basic bland—devoid of character and the kind of craftsmanship that the Hewitts' appreciated.

When Murray Silverstein and Bill Savidge from Jacobson, Silverstein & Winslow Architects began work on a remodeling plan, they realized that the crux of the problems was the claustrophobic staircase. Silverstein is one of the coauthors (along with Christopher Alexander) of the book, *A Pattern Language* (see *FHB* #36, pp. 51-55). The stair concept expressed in the book suggests adding to a stair-

Tup photo by John Hauf

way's utility by making it a stage-like platform that opens onto a social area, thereby inviting people to sit, stand and lean on it. *A Pattern Language* also recommends that the staircase be visible from as many rooms as possible, so that it can act as a transition that unites levels rather than cuts them apart.

Following this advice, the architects redesigned the staircase so that it would open into the rest of the house by removing the wall between the living room and the old stairwell, and by bringing the stairs literally into the living room with two steps and a large landing (drawing, below right). In addition, they made the stair visible from the dining room by removing a 75-in. wide portion of the wall.

With the staircase out in the open, style became critical. The rest of the interior could be a collection of simple drywall planes, but the staircase had to be a piece of carefully detailed craftsmanship. The architects found inspiration in the work of Louis Christian Mullgardt, a Bay Area architect who migrated from Missouri to California in 1905. Though he isn't as well known as his contemporaries Julia Morgan and Bernard Maybeck, Mullgardt designed distinctive homes with a flare for the dramatic and an eye for detail. A photograph of a staircase detail in *California Design 1910* (Anderson, Moor and Winters, eds., Peregrine Smith Press Books, Salt Lake City, Utah, 1980; out-of-print) became their starting point. It showed a carefully articulated newel and balustrade made of redwood, with reveals that emphasized its vertical lines.

Silverstein asked me to bid on the job after another stairbuilder seemed reluctant to take on something so unconventional. I had built a loft ladder for a client of his a couple of years ago, and I guess he thought I was ready to move up to a real staircase. I am primarily a furnituremaker with a special interest in Arts and Crafts design, but I didn't have enough confidence in my carpentry skills to take on a project of this scale without some strong support. Ivan Rainer has over 30 years of experience as a carpenter, and even though he claims limited stairbuilding knowledge, I felt he could help with any problems. He did, including some that I created.

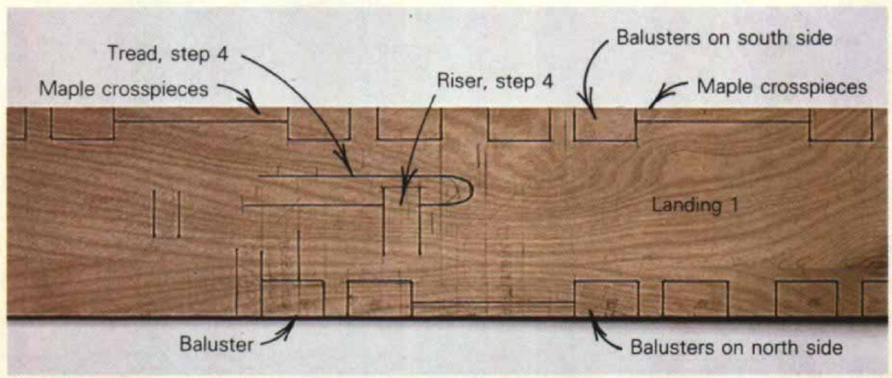
Mutual respect between architect and craftsman encourages a flow of ideas. For instance, prior to construction the architects hadn't decided on what woods should be used, so I suggested oak for the steps and landings because the floors were oak. But the newels and balustrade could be made of any kind of wood. The design lent itself to two woods (in addition to the oak). I suggested cherry, with maple as an accent for the core of the newels and the horizontal bars between the balusters. Because maple went well with the oak, it also seemed a good choice for the risers. The main part of the newels, the balusters, the handrail and the carriage would be cherry.

I also recommended adding two smaller newels—one at the railing that begins on the first landing and another at the top of the stairs—instead of a simple terminal baluster. I could imagine an exuberant teenager flying down the stairs, banking at the landing and extending an arm to pivot off the handrail. This vision underscored the need for sturdy newels that would take the force of a sudden sideways tug.

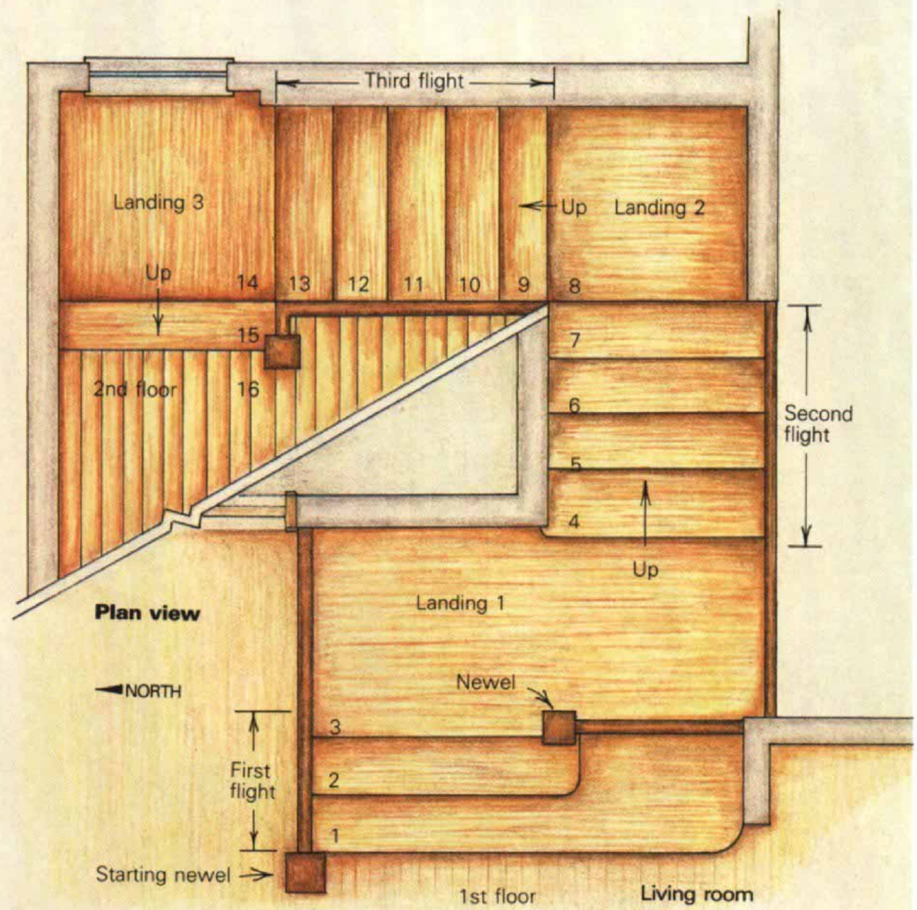
I brushed up on traditional stair construction, and since there were no curved handrails or winders, or any of the other forbidding geometrical problems that make stairbuilding a challenge, I could concentrate on the details. When I first looked at the job, the remodeling project was well under way. Since the family was living in the house at the time, the old stairs were still in place, but the contractor, Les Shipnuck, and his crew had already framed in the three new landings and removed the wall between the stair and the dining room.

Layout—The building code specified a minimum headroom of 6-ft. 6 in. from the nosing of each tread to the ceiling, and the new plan had to take it into account. By increasing the number of steps by two, the rise could be reduced by 1 in. to 6$^{15}/_{16}$ in. This meant that tread 4, the step that now falls under the header, was 4 in. lower than the old one and therefore within the required headroom.

I made extensive working drawings of all the details, particularly the three inside cor-



Karpilow used story poles to lay out the horizontal positions of the various elements in this stair. Here is a fragment taken from the east/west story pole, showing the relationship of tread 4 to the adjacent balusters, baseboard, drywall and framing.



Drawing: Michael Mandarano

ners, the newel bases and the open-ended steps that would be seen from the dining room. I also made a full-size model of the dovetailed balusters, the maple crossbars that connect them and the stair treads with exposed ends. This not only clarified a few problems for me but gave me something to show the Hewitts.

The next step was to make two full-size story poles—one for the north/south axis of the stair, and one for the east/west axis. For these I used 4-in. wide strips of ¼-in. plywood, overlapped and glued at the joints. As shown in the photo on the previous page, a lot of information can be packed into the story pole. All the important horizontal measurements are contained in this reference tool. I took my baluster spacings for router templates off the story poles in addition to using them for laying out the stair parts.

Along one edge of the north/south pole, I laid out the first landing by marking the starting newel, the length of the two bottom steps and the balustrade along landing 1. Along the other edge, I marked the length of the steps on the second flight, landing 2 and the run of the steps on the third flight. In the center of the story pole, I laid out the balustrade of the second floor. On the east/west story pole, I laid out the run of the two bottom steps, the depth of landing 1 and the balustrade on the northern edge. On the other side I marked the run of the second flight and its balustrade. In the center I placed landing 3 and the step to the second floor.

Laying out the stair on a story pole allowed me to tinker with baluster spacings, using nothing more than a pencil and an eraser. One problem that this allowed me to solve was the run of the second flight of stairs.

In order to maintain the same spacing of the balusters on the landing and on the steps visible from the dining room, I needed to adjust the length of the run on the second flight. Normally the stairs would have been built to conform to the wall on the left, with tread 4 beginning a fraction of an inch shy of the north/south wall at landing 1. But to make the baluster spacing work out, I needed to extend the run by 4 in. Fortunately, this adjustment brought the run of flight 2 closer to that of flight 3. The curved riser now required below tread 4 didn't hurt, either. It softened the shift across the landing and helped relate the second flight to the bottom steps.

I then made a vertical rod dividing the floor-to-floor height equally into 16 spaces and indicating landings, newel and baluster heights. I rechecked all the measurements at the site. Satisfied with the layout's accuracy, I began work on the individual stair parts.

Cutting the carriages—The third flight of stairs is housed on both sides; the second flight is housed on the left and is open on the dining-room side. I made the housed carriages from 1-in. thick cherry. The mortises for treads and risers are ½-in. deep, and they hold both tread and riser with the help of glued-in-place wedges (photo, below right).

I made a template for the mortises out of ½-in. particleboard and sized it for a ¾-in. straight-flute router bit with *a* bearing on the top. With this kind of a template, the bearing follows the template contours and cuts the identical shape in the workpiece. To make an accurate template, I drilled a 1-in. hole for the nosing radius, clamped a fence along each of my cut lines and used the bearing-over bit to cut the mortises in the template. I used this template for all three housed carriages, clamping it on the layout lines, routing the mortise, then sliding it to the next layout. For the opposite carriage I simply flopped the template.

I cut my wedges on the tablesaw from ½-in. maple. I set the saw's miter gauge at one-half the angle of taper, and flipped the maple stock after each cut. The result was a stack of wedges with the full angle of taper. They are about 8 in. long, and ½ in. thick at the fat end.

Carriage installation—To install the housed carriage for the left side of the second flight of stairs, Ivan set it against the wall and screwed it to the framing with 2½-in. #12 screws at each stud. The contractor had built a sloped wall to support the carnage on the right side of the stairs. Unfortunately, the wall

Much of the new stair is supported by housed carriages screwed to the wall framing. In the photo to the left, one of the carriages can be seen just to the left of the ladder. On the dining-room side of the second flight, the ends of the treads are exposed to view. They bear on the 2x blocks shown here as they're being installed by Ivan Rainer. In the photo above, Rainer taps home a freshly glued wedge to secure a tread on the second flight.

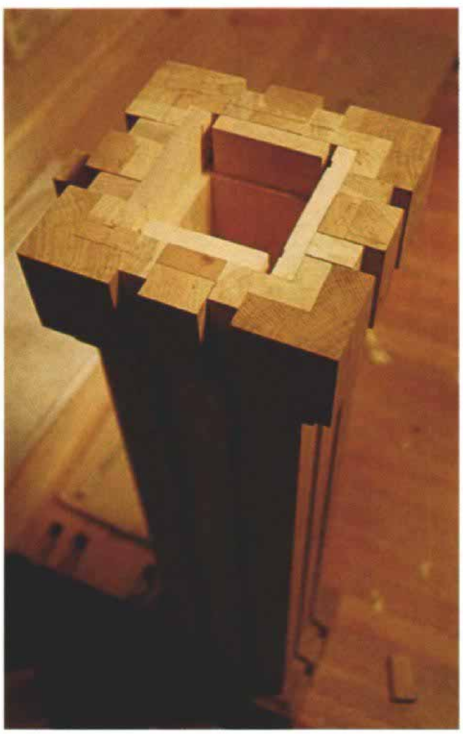
was on the same pitch as that indicated in the plans, which we had modified to suit the baluster spacing. To make up for the discrepancy, Ivan cut triangular blocks from 2x12 stock and affixed them to the top of the wall (photo facing page, left). In place, the leading edge of each block is plumb, and the top is horizontal. To position them, Ivan used a level and a straightedge to transfer the coordinates of the treads and risers from the housed carriage.

Curved risers—I made the risers out of ¾-in. thick maple. Most of them are straight, but three of them have a curve at one end, each with a different radius. Two of the curved risers fall under the treads that extend into the living room. The third is under tread 4.

After researching different techniques for bending the risers, I came up with a method that best suited the technology readily available—a steam iron. I began by calculating the circumference of the circle that coincided with the riser radius. For instance, riser 1 has a radius of 6 in. Using the formula pi x diameter, I found the circumference to be 37.7 in. I needed a 90° arc to make my curve, so I divided the circumference by 4 to get 9.43 in. This equalled the width of the channel (visible in the photo, top right) that I needed to take out of the backside of the riser.

I used a dado head on my tablesaw to make a series of ⅝-in. deep cuts. I would need some leverage on the riser when it

Using an electric iron, the author applies heat to moist rags as he bends a piece of ¾ in. thick maple for a riser. The curved portion of the maple is a scant ⅛ in. thick, but it will be permanently backed by the curved block used here to anchor the clamps.



With its cap off, the large newel at the base of the stair awaits final installation (above). A steel plate will bear upon the rabbeted edge inside the newel. A threaded rod affixed to a block in the joist framing will then extend through the plate, and a nut tightened against it will anchor the newel to the floor. Rainer drills the newel on the first landing to accept a pair of lag bolts driven into the framing (right).

came time to bend it, so I left extra wood on the end. After making the cuts, I carefully planed the backside of the riser because scarring from the dado head might have telegraphed to the finish side, making it tough to achieve a smooth, unfaceted bend. I also found that slightly rounding the inside corners of the cuts made a smoother transition from the flat to the curve.

Next I cut a hardwood block with an outside radius ⅛ in. less than the finished curve. I clamped this block to the inside of the riser cutout and applied pressure while I steamed it with the iron and a wet cloth (photo previous page, top). As the riser curved around the block, I added more clamps until I had completed the curve. I left it clamped for an hour or so, then removed the clamps, glued the block in, reclamped, and left it overnight.

The newels—I made the newel posts hollow to accommodate any bolted connections or concealed structural members. They are made of ¾-in. maple, fastened with barefaced tenon joints (a barefaced tenon has a shoulder on one side only). Over the corners are pieces of right-angle stock that I milled from 2-in. and 3-in. cherry (photo previous page, bottom left). They are coved at the top and bottoms of the newels, where they read as capitals and plinths. Between the corners are strips of maple flanking another piece of cherry. The owner was pleased with the complex pattern of end grain created by this assembly and wanted the cap left loose so he could, from time to time, enjoy the composition.

The two smaller newels were designed to extend into the face of the riser below for added strength. They were lag bolted to the framing (photo previous page, bottom right), and the bolt heads were concealed behind the blocks.

Where balusters support angled sections of handrail, they were inserted as single members or in pairs. Their bases were dovetailed to correspond to the slots cut into the ends of the treads. To anchor the tops of the balusters, angled blocks will be glued into the groove on the underside of the railing. Note the mitered ends of the risers. When trimmed, they will be capped with mitered bands of cherry. After marking the profile of the handrail on the wall (left), Rainer excavated a hole in the drywall to accept the end of the rail. Then he drilled a hole into the framing for a ½-in. dowel. Here he slips the rail onto the dowel, while simultaneously aligning the tenoned ends of the balusters with the mortises in the underside of the rail.

Balusters—I used 6/4 cherry to make the balusters, which finished to 1¼ in. square. Their crosspieces were 1-in. square maple and were mortised and tenoned into the balusters. Wherever straight runs occurred, I glued up the balusters in sets in the shop. They were tenoned into oak nosings that matched the flooring. When we installed them, we nailed them to the subfloor and splined them at mitered corners to adjacent pieces of flooring.

Where the balusters fit into a rising handrail, they were inserted as single members or in pairs (top photo, left). In the six places where the ends of treads are exposed, I routed dovetail slots into the end of each tread. Once the dovetailed ends of the balusters were locked in place, we filled the remaining dovetailed grooves with corresponding oak blocks. Then we capped the ends of the treads with mitered nosings.

Handrail and trim—I milled the handrails on a shaper from 3-in. by 3-in. cherry. It took me two passes over a three-wing cove cutter to get the cuts to the right depth. I also used the shaper to round the rail's top, and I touched up rough spots with a hand plane. To house the balusters, I cut a ¼-in. deep by 1¼-in. wide channel in the bottom of the handrail. Where the rail is on an angle, the balusters butt into the channel and are held in place with small blocks glued into the channel between the balusters. I cut 1-in. tenons on the balusters and mortised them into the handrail for the horizontal sections of rail.

The handrail meets the wall in five places. One of these connections was made by driving a screw at an angle through the side of the rail and then plugging the hole; one was secured by a bolt through a wall into a nut let in to the underside of the rail; the others were blind doweled (bottom photo, left). In each case the handrail extended through the drywall to the framing, and the wall was patched with joint compound.

We trimmed the wall under the exposed treads with 2-in. wide bands of cherry. Where the treads meet the risers, a beveled piece of cherry trim makes a 90° mitered turn, capping the exposed end grain of the risers. The final touch was a small ogee molding atop the landing baseboard and the carriage. It matches a detail found throughout the house. □

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