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Staircase Renovation

Loose, tilted flights signal trouble underfoot, but even major problems can be fixed with screws, blocks and braces

by Joseph Kitchel

There seems to be a great deal of reluctance among renovators to tackle any kind of stair rebuilding. I have seen many beautifully renovated homes with sagging staircases, loose balusters and makeshift railing supports. People who wouldn't think of leaving cracked plaster cracked or sagging floors unshored will put up with staircases so crooked they would make a sailor seasick, and squeaks so loud they wake the whole family at night.

Procrastination and lack of understanding of the mechanics of stair construction are at fault here. No one seems to know quite where or how to start, or who to call to do the job. To be sure, attacking an ailing stair takes courage, resolution and perseverance. It is one of the dirtiest and most disruptive renovating jobs.

The stairway is the spine of the multistoried row house. It links the sometimes minimal area of individual floors into what can be a spacious and accommodating floor plan. Because changing the stairway can seriously affect the physical flow of people and spoil the aesthetics of the whole interior design, it is far better to renovate than redesign or reposition.

Parts of a stair—Each step consists of a riser, the vertical portion that determines the height of each step, and the tread, the part on which you step. The dimensions of steps must be consistent within flights, though they may vary from one flight to the next. Variation within the flight will break the stair-user's physical rhythm and cause tripping. Tread widths may vary in the bottom two or three steps of the main flight for aesthetic purposes, and at the top of a flight, where pie-shaped steps are needed to negotiate a curve. Riser height, however, must not vary.

The newel post, usually decorated with paneling or carving, supports the railing at the bottom of the flight. Though it gives the impression of being heavy and sturdy, after years of being swung around by ebullient children, it has probably loosened enough to sway from side to side or lean out toward the hall. The vertical supports of the railing, aligned more or less behind the newel post and marching upward with each successive step, are balusters or spindles, which are dovetailed into the treads.

Keeping the balusters from slipping out of their joints on the open side of the staircase are the noses, continuations of the molding that forms the front edge of the treads. These noses are removable and not part of the tread itself.

On each side of the stairs are the stringers, which hold the risers and treads. The stringer attached to the wall is usually routed or plowed out to receive the steps; this is called a housed stringer, and it produces a strong, dust-tight stairway. The outside stringer may be open or closed. Stringers may be simple, laminated with other pieces to form the curves of the stairs, or partially concealed by decorative filigree.

Were you to remove the plaster under the staircase, you might find two or three 4x4s or 4x6s running the length of the flight—one nailed to the inside of the outside stringer, one centered beneath the steps, and perhaps another nailed to the inside of the stringer attached to the wall. These are the carriages, the members that add extra support. At the bottom, the carriages ideally rest on top of the stairway header, a joist that frames the stairwell end. They are sometimes attached to the inside face of the header. (This was the cause of failure in one flight I repaired. The weight of the stair forced out the toenails holding the carriage.) At the top, the carriages attach to the face of the upper-story header joist or, in the case of a curved flight, to angled braces running from notches in the wall to the upper floor joists.

Photos: Jeff Fox

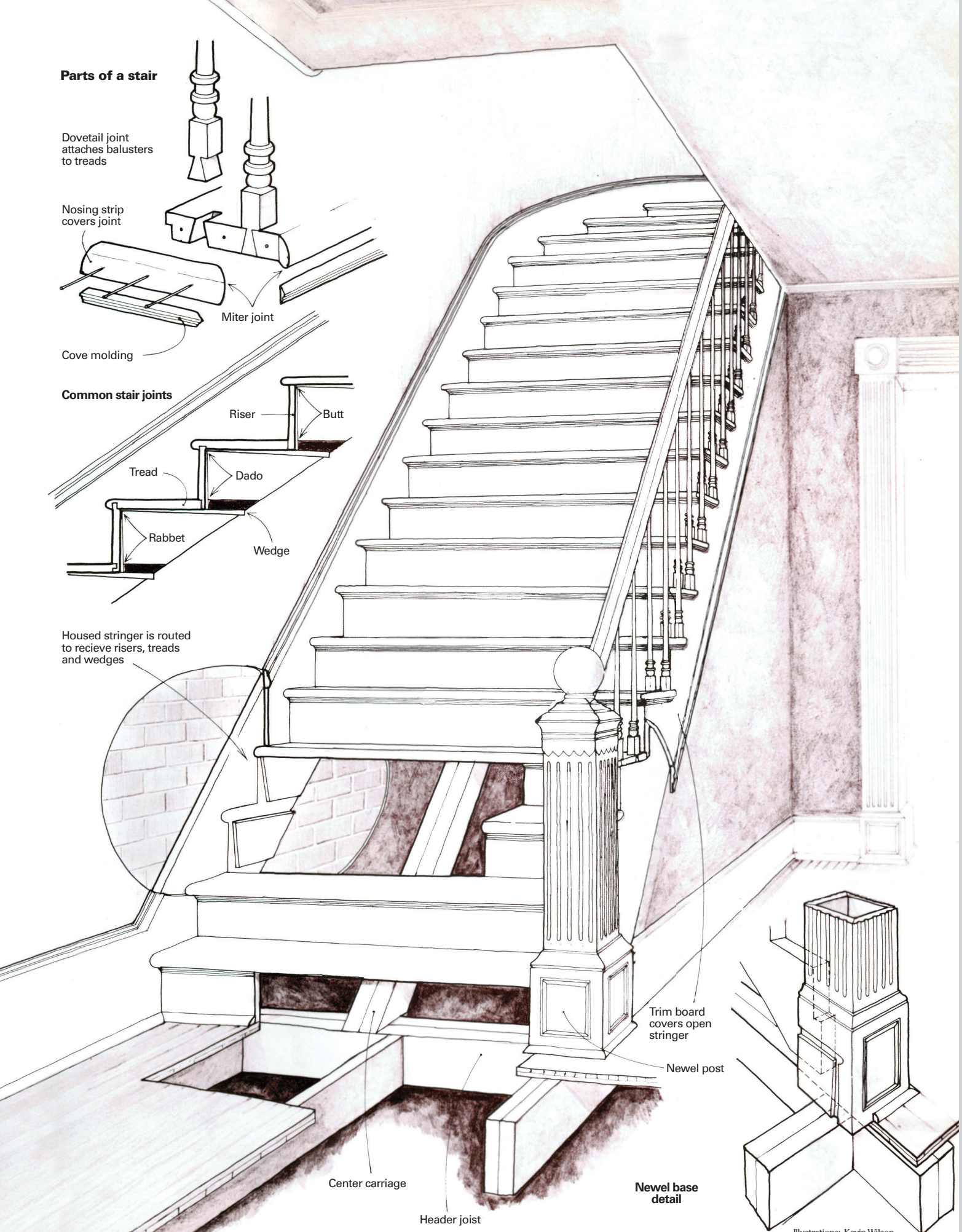
Other elements of stair construction visible from beneath the flight are the wedges or shims driven between steps and stringers. Tapping these wedges tight or adding wedges made from shingles or building shims can do a great deal toward tightening up a staircase.

Diagnosis and dismantling—Problems with stairs fall into two categories. The simpler ones concern the railing, balusters, newel post and railing supports—the superstructure. Trouble here, though relatively easy to repair, can be symptomatic of more serious problems in the steps, carriages and stringers—the substructure.

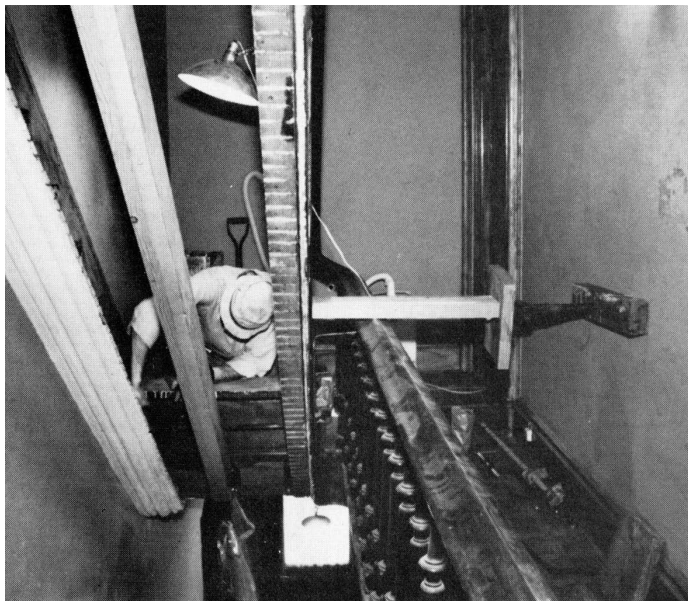
Before you remove any plaster, explore the failings of the flight. If the steps are loose and tip toward one side, then the carriage or stringer on that side has weakened. The cause may be rotting, breaking, warping and splitting, or the carriage may have separated from the stringer.

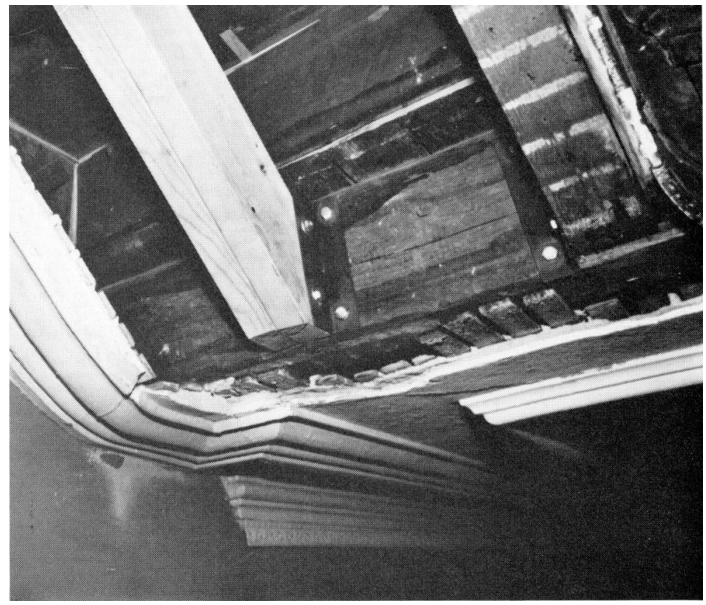
Another symptom of major deterioration is a series of gaps or cracks along the ends of the treads or risers where they fit into the stringer. These rifts may occur on either side of the stairs, but are most often on the wall side, suggesting that a center or outside carriage has shifted downward, skewing the flight toward the center of the stairwell.

Large cracks in the plaster at the top or bottom of a flight are a good sign that the carriages have come loose from the headers. However, cracks generally parallel to the carriages or crisscrossing their length may indicate that vibration has caused the plaster to loosen and the keys to



Illustrations: Kevin Wilson





Substructure repairs are major problems and should be tackled first. To correct a distorted stringer, author Kitchel, above left, strips stairs of treads and risers. Plaster has been removed from beneath the stairway previously, and the resulting debris cleared away for a dust-free work area. The jack between wall and stringer provides lateral support until the stringer has been repositioned and reattached, and all steps have been renailed. Above, a carriage pulled away from the joist can be reattached with an angle iron made from ⅛-in. plate attached to the header with ⅜-in. bolts. The carriage usually rests on top of the stairway header, but occasionally it is attached to the inside face. Left, support blocks of ¾-in. plywood fastened with Sheetrock screws minimize deflection.

break off, which is a much less serious repair.

If your stair has a decorative plaster molding running along its wall side, a continuation of the ceiling cornice, don't despair. This can be saved if it is not badly damaged and is still attached securely to the wall. To dismantle, carefully cut through the plaster and lath along the molding with a masonry blade in a circular saw, cutting parallel to the stair edge of the molding, leaving the molding intact. Plan this cut so that plaster or Sheetrock can be rejoined to this edge.

To further assess causes of stair failure, remove nearby plaster and lath. You may not have to remove all of the ceiling covering if the plaster isn't bad and if the problem is localized. Take time to clean up all the resulting plaster dirt. Debris allowed to accumulate on the flight below makes moving your stair platform difficult and dangerous, and will also worsen the spread of dust throughout the rest of the house.

If necessary, remove noses and balusters, but label all parts first. Assign each step a number (I usually start at the bottom) and tape this number to the outside of the step and to its adjacent nose molding and spindle.

Using a screwdriver or chisel, gently pry the noses away from the stringer. They're usually finish-nailed in two or three places. You'll see the dovetail joint that connects the spindle to the tread. Tap the spindles out at the bottom and pull them down out of the railing.

Examine the joint between riser and tread to judge how to handle repair of squeaks or gaps. The joint may be a dado, a rabbet or simply butted and nailed. Past repairs, such as wedges driven into the gaps between riser and tread, fillers in the spaces above the treads along the wall stringers, or braces along the railing or spindles, may have been purely cosmetic. Remove them so that all parts of the stairs may be properly aligned.

Substructure repair—You should now know the causes of your stair failure; tackle the bigger ones first. If a carriage is rotted out or cracked, tear it out and replace it. If it is intact but springy, it may be undersized; laminate a new beam or a steel reinforcing plate onto it. Solutions at this point must be as individual as the problems. But by far the most common failings are bolts and nails which have worked loose, allowing carrying elements to pull free from walls and header. In this case, mending plates made from ⅛-in. steel work well.

If you must raise or remove carriages, first free them from each riser and tread; otherwise, the attached superstructure will loosen as the skewed members are jacked up. To remove treads and risers, pry them apart at joints or cut through the nail shanks if pulling is impractical.

For major repairs, jack the stringers or carriages into place in a manner that won't damage the superstructure and will keep it from damaging you. To give the jack or brace a level bearing surface, attach angle blocks cut to the slope of the stairs with clamps or screws.

If the wall stringer has come loose from a masonry wall, reattach it by raising it to its proper position and nailing it with cut-steel masonry nails of sufficient length to go well into the wall. Wear goggles. A better method is drilling through the stringer and into the masonry with a carbide bit, and tapping in a lead sleeve; a lag bolt and washer expand the sleeve and tighten the stringer to the wall. If it's a frame wall, lag screws alone will hold stringers to studs.

If the outside stringer has twisted or warped, and is pulling the treads out of the wall stringer opposite, remove the treads and risers and force the stringer in toward the wall. Get the necessary leverage by temporarily bracing from the outside of the stringer toward the partition wall opposite. Screwing or bolting the stringer to the accompanying carriage will correct matters.

With the supporting members repositioned, now attend to the steps. Repair split treads and risers by removing them, lapping a piece of plywood over the back of the split, and gluing and clamping overnight. If you glue and screw the lapping piece you may forego clamping, and can replace the piece immediately. If the very edge of the nose is split, insert dowels from the edge to reattach it, being careful not to split the riser's dado or rabbet joint.

After you've corrected stringer and carriage problems and each tread and riser is back in place and renailed to the outside stringer, strengthen the steps by nailing step blocks to the center carriage. Why this wasn't done originally has always puzzled me. From a piece of ¾-in. plywood cut a step block to fit under each tread, and place it firmly against the back of each riser. Nail or screw the blocks to the side of the carriage, and then nail through the face of the tread and riser into the edge of the blocks. Trim the bottom edges of the blocks to conform to the angle of the carriage. I usually alternate the blocks on opposite sides of the carriage, but they all may be attached to the same side if the staircase is narrow and you can't get between the center carriage and the wall. Nailing blocks on both sides of the carriage is overkill, but add them wherever extra support is needed.

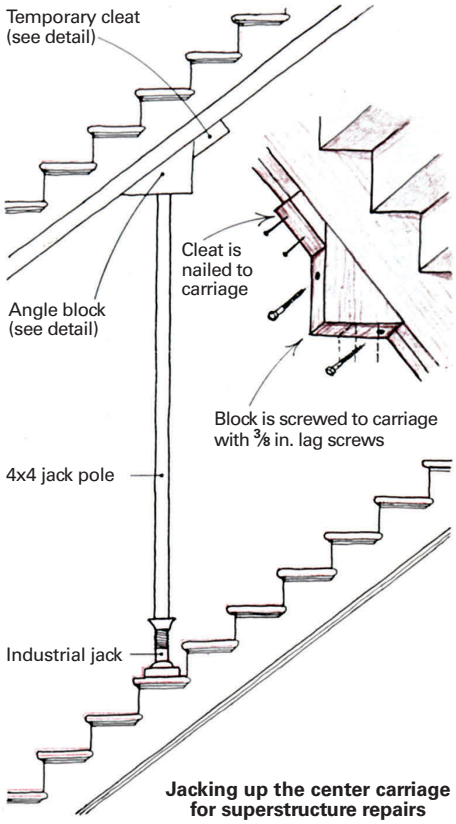
At this time a test run up and down the stairs will tell you where additional nailing and bracing are needed. For all face nailing in treads and risers, I use 6d or 8d finish-head, spiral flooring nails. For nailing where it doesn't show, I prefer 6d or 8d rosin or cement-coated box nails. I find 1½-in. or 2-in. Sheetrock screws driven with a variable-speed drill useful where hammer space is limited. Screws often add more strength than nails, because they pull things together and don't require pounding, which may disturb the alignment of nearby areas.

If risers, treads or stringers are to be refinished separately from the spindles, consider doing this now. Stripping, sanding and painting are easily done with the upper parts out of the way. Before finish is applied, set and fill all nails.

Superstructure repair—Newel-post problems are best dealt with after all other structural problems are solved. Although removing or loosening the newel post may be necessary to work on the carriages or stringers, it can usually be left in place to support the railing.

Newels are usually attached to the bottom step with a threaded rod, and to the railing with a hanger bolt. (Hanger bolts have wood-screw threads on one end and machine-screw threads on the other.) On the machine-screw thread of the hanger bolt is a star nut, which can be turned through the access hole with a screwdriver or needlenose pliers after the bolt is in place. (A plug fills the access hole later.) For extra strength screw into the railing from the inside of the newel post.

Straighten or tighten a shaky newel post by shimming under its bottom edges and renailing or screwing it to the floor. For greater support, try one of these repairs using a threaded rod. First, remove the newel post. Bolt a threaded rod to a bracket or wooden block so that the bolt fits flush with the bottom of the block. Screw the block and rod assembly to the floor, then slip the newel post over them and reattach it. To repair the post without removing it, attach two brackets under the tread of the first step as



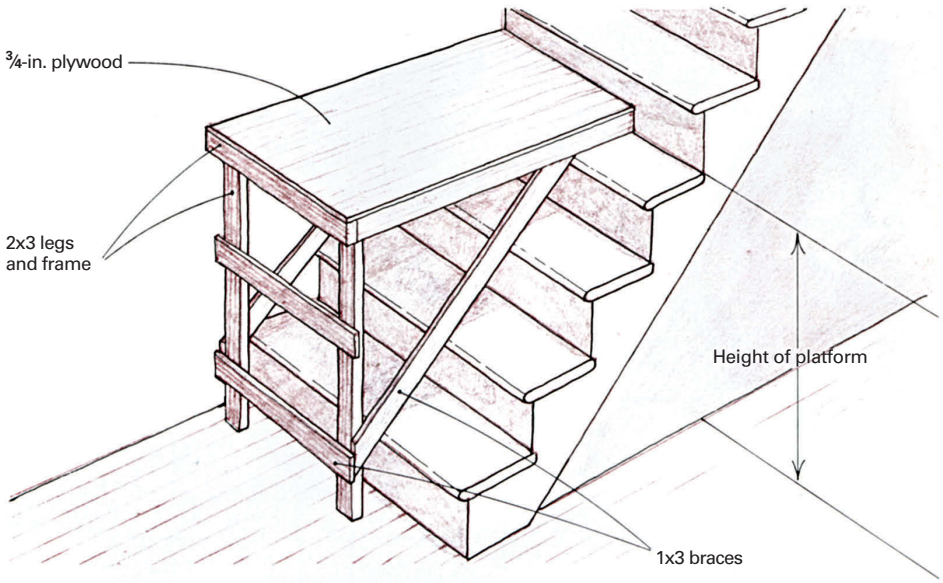
Jacking up the center carriage for superstructure repairs

Building a Stair Platform

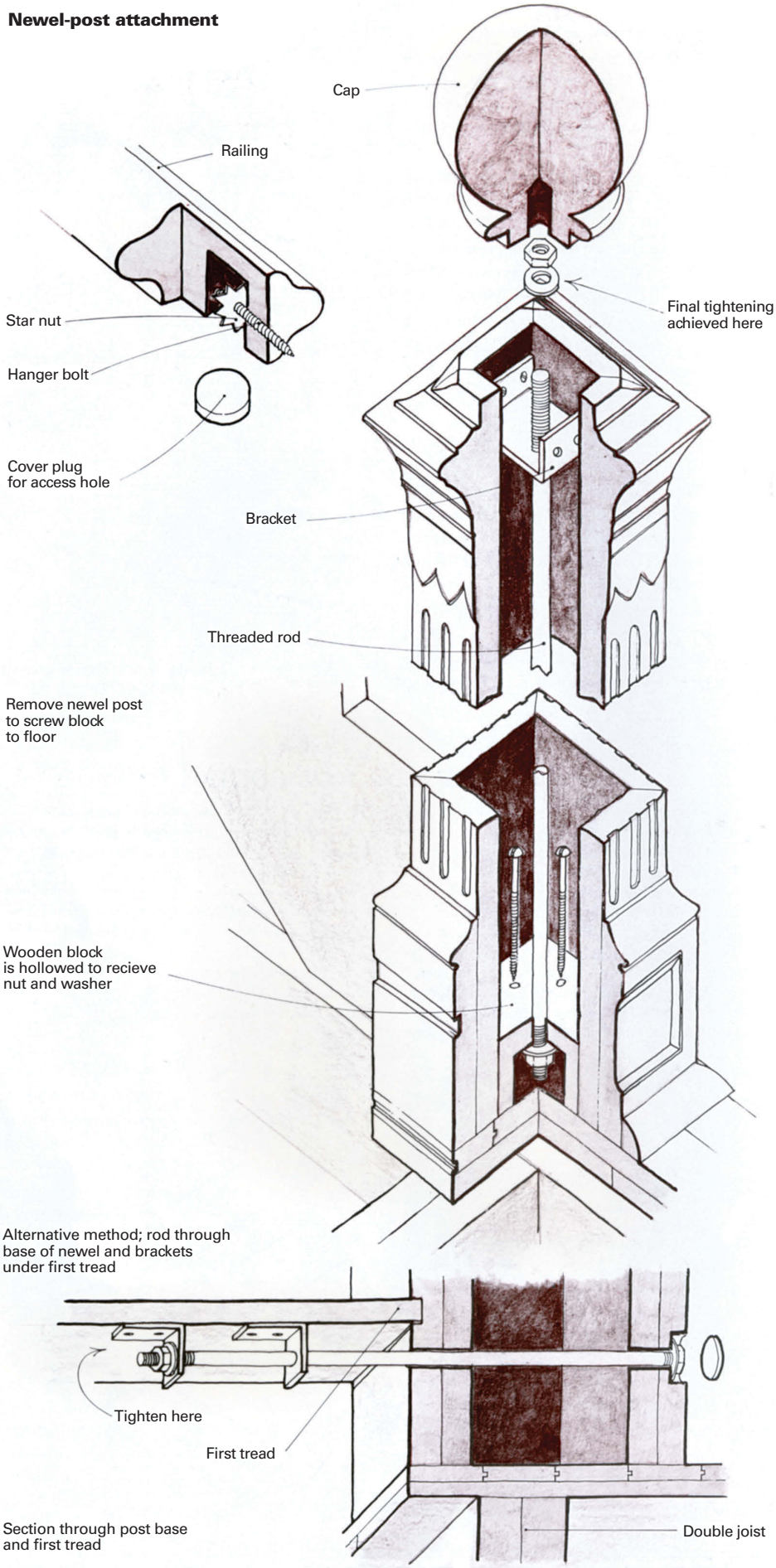
Before you renovate your staircase, you'll need to build a stair platform. Part of the reason stair repair is so difficult is that there is no place to stand, no way to get up to the job.

The exact dimensions of the platform depend upon your stairs. To make the platform, set a straightedge, level, on the fourth or fifth step from the bottom of your main staircase. The height of the platform is the distance from that step to the floor; its length is the distance from the back of that step to the front of the bottom step. Check these dimensions at different locations on various flights of your staircase. Sometimes rise and tread dimensions or angles of incline vary from flight to flight, but not usually. Then cut and attach legs and braces as shown in the drawing.

The platform should be wide enough to hold your stepladder comfortably, but narrow enough to allow passage on the stairs when it's in position. The platform will probably fit your neighbor's stairs, and you can use it when repainting your own stairwell; it is therefore a tool to retain after renovation. You might consider making it collapsible for easier storage. —*J.M.K.*



Newel-post attachment



shown at left. Drill a hole through the base of the newel post to align with the holes in the brackets. Insert a threaded rod through the holes, bolt at both ends, and fill the access hole with a plug.

To replace the spindles, first coat both ends with white glue. Insert the top end of the spindle into the railing underside first, then slide the dovetailed end into its tread slot. Shim the joint wherever necessary, from underneath or from either edge, securing it with a finishing nail through the dovetail into the end of the tread. I find a rubber mallet useful when replacing spindles, because it will not mar the finished surface of the wood.

As you proceed from bottom to top, occasionally check the alignment of the railing and make adjustments by trimming or lengthening the spindles. Temporary braces hold the railing in place until all spindles have been installed and the glue is dry.

You can lengthen spindles (or adapt spindles from another stair) by adding a short piece of dowel. Drill into the top end of the spindle, and glue and nail the piece of dowel in. When the glue is dry, rasp and sand the dowel to the contour and taper of the spindle tip. Stain to complete the match.

When the final spindle has been inserted, the small bracket that originally connected the top of the rail should be reattached, or a new one made to fit. This prevents lateral movement of the rail and will hold the spindles in their correct positions as the glue dries.

Refinish the noses before you attach them. If you remove old nails by pulling them through from the back with a pair of nippers, you'll avoid the splitting that usually occurs when the nails are pounded back through and pulled from the face. Glue the noses and nail them twice along the side and once through the miter where nose meets tread molding.

Replacing the ceiling under the flight is the final step: use lath and plaster or Sheetrock. If your stairs curve, use short sections of wire lath to recreate the original curve.

Take care to keep all nailing surfaces in the same plane. This can be done with two straightedges; one the width of the ceiling area, from the outside of the stringer to the wall, and the other as long as possible to run the length of the flight. Use building shims where necessary to keep furring strips in the correct plane. Determine your plaster line in relation to any plaster molding along the wall and to the bottom edge of trim pieces that adorn the outer carriage. I usually let the beaded or molded edge of this outer trim protrude below the plaster line. Existing pieces of plaster or plaster molding to be replaced may be drilled and secured with screws before touch-up spackling or painting.

At time of writing, Joe Kitchel was a prop builder, cabinetmaker and renovator from Brooklyn, N.Y.