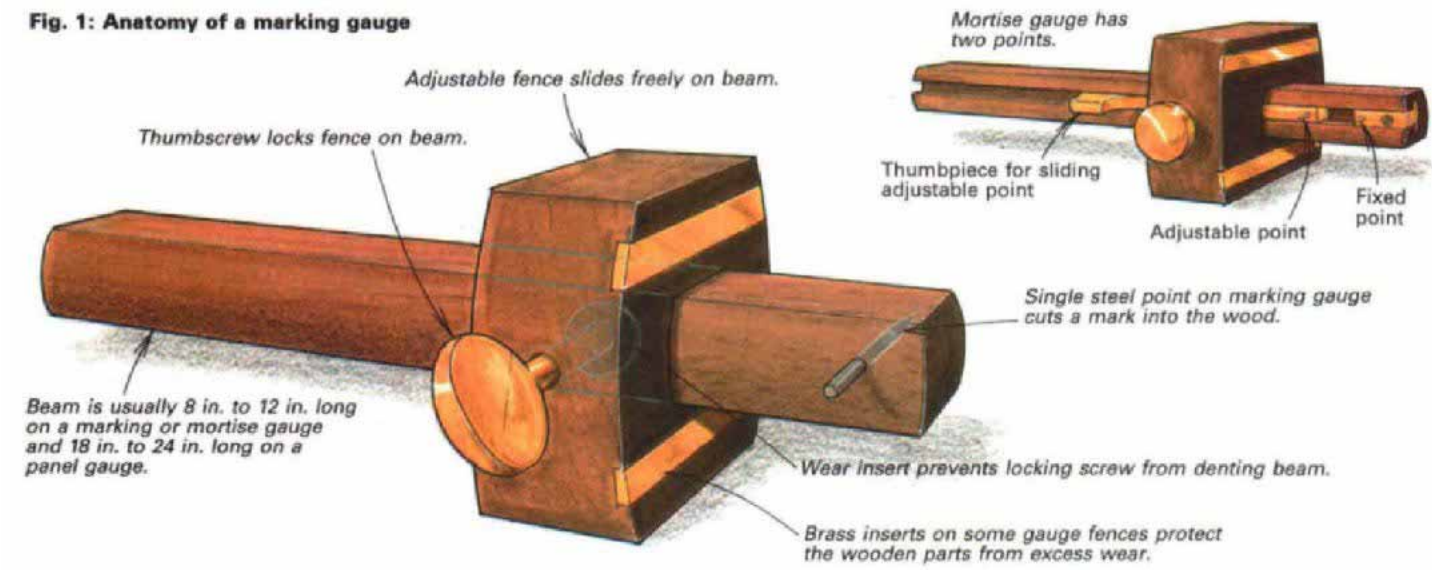
Marking Out



Using the Marking Gauge

by Frank Klausz

When I want to cut some dovetails or make a *few* mortise-and-tenon joints by hand, the first tool I reach for isn't the saw or the chisel-it's the marking gauge. A marking gauge is the fastest and most accurate way I know to lay out lines for cutting joints and to mark stock to be edged, jointed, thicknessed with a handplane or ripped to width with a handsaw.

A basic marking gauge consists of a sharp steel point set into a stick called a beam. A block with a hole in it, called the fence, slides on the beam and locks firmly to it with a thumbscrew or cam lock (see figure 1 above). In use, the fence rides against the edge of the stock being marked while the point scratches a thin line. The distance from the point to the fence determines how far from the edge the line is scribed. Marking can be done with the grain, across the grain or on the endgrain of a workpiece.

The advantage of using a marking gauge instead of a pencil to mark a layout line is that the scribed line is much thinner than a pencil line, so it can be placed on the workpiece with pinpoint accuracy. This is essential if you want to cut precise joinery. When you saw or pare to the relatively wide pencil line, it's easy to make a mistake and produce a loose or too-tight joint. Further, the marking gauge scribes a consistently thin line, whereas a pencil line changes in thickness depending on whether the pencil point is sharp or dull. A disadvantage to scribing layout lines with a gauge is that if you make a mistake, you can't, erase the etched-in line—it has to be scraped or sanded out.

Types of gauges—I keep several kinds of marking gauges handy in my shop: a regular marking gauge, a mortise gauge and a panel gauge. Each has a specific use. The marking gauge has a single point and a beam that's 8 in. to 12 in. long. It's used for many layout jobs, from marking stock that's to be dressed to locating the position of a row of holes to marking the depth of dovetails. The panel gauge is also single pointed, with an 18-in.-long to 24-in.-long beam. It looks like a longer, bigger version of the marking gauge. It's great for marking boards or panels to be ripped to exact width or for doing marking jobs on boards too wide for a regular marking gauge. The mortise gauge also looks like the marking gauge and has a 8-in. beam, but it has two points and can mark out two parallel lines at once. This is essential for good mortise-and-tenon joints.

Marking and mortise gauges are readily available from tool shops, or you can make a gauge yourself (see accompanying article on p. 76). Panel gauges are uncommon, because most people do their ripping on the tablesaw instead of by hand. You'll have to find a panel gauge either at an antique tool sale or make one. Regardless of type, most gauges have nail-like points, which scratch the surface of the workpiece instead of cut it cleanly. A nail point that just scratches will make a fuzzy line when used across the grain and is likely to follow the grain and veer off when working along the grain. For best results, the point of a gauge should be refiled to a knife-like profile. Remove the point from the gauge before filing; otherwise, the beam of the gauge will be scratched. After filing the point to the knife shape, shown in figure 2, reset the point into the beam so the leading edge of the knife points away from the fence about 5° to 10° When you pull the edge toward yourself during marking, the skewed leading edge will pull the fence tighter against the workpiece. On mortise gauges, both points are filed and set as above. Set the points to protrude from the beam the same amount so they'll make equally deep marks.

The marking gauge—When I use my marking gauge for a layout job, say marking the depth of dovetails on a set of drawer sides, I first set the position of the gauge's adjustable fence. Because the distance from the gauge's fence to the point must match the thickness of the drawer sides, it's easiest to set the position by holding the gauge against a drawer side for direct reference instead of measuring the side with a ruler and then transfering the distance to the gauge. With the gauge's fence in position, tighten the

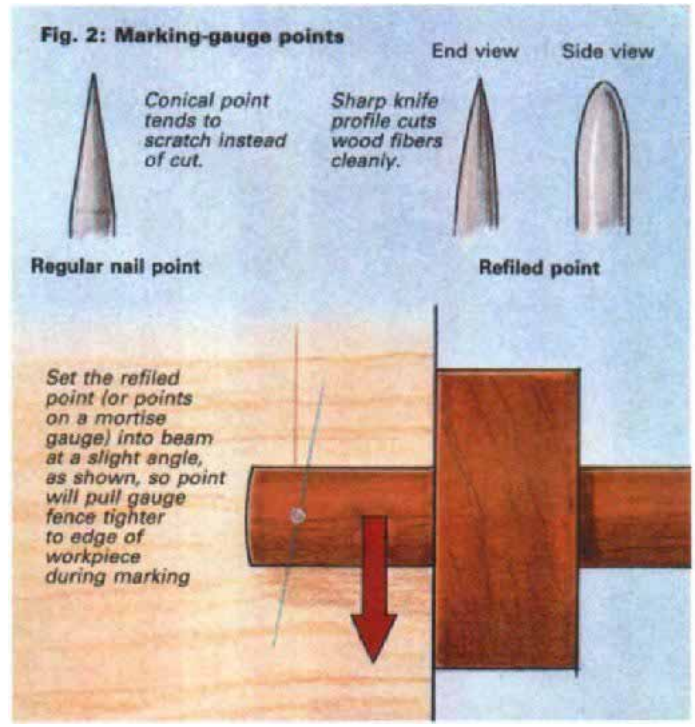
fence's locking screw enough to secure the fence on the beam. Don't overtighten the screw; otherwise, its point may dent the beam. Before I begin marking, I stack all the pieces to be marked on top of one another with their ends overhanging as shown in the photo at right. Holding the top drawer side firmly with one hand, I bring the fence of the marking gauge against the edge of the drawer side and, with light pressure, score a line across the end. I apply pressure at a 45° angle as I pull the gauge toward me—to press the fence firmly against the stock and engage the point so it'll scribe a light line. When I finish all the pieces, I flip the stack over and do the other sides. Then, I turn the stack end for end and repeat the process. This way there's no wasted motion and less chance that an end will miss getting marked.

A marking gauge will score endgrain as cleanly as it scores across the grain. When cutting half-blind dovetails on a drawer front for instance, the dovetails' depth must be marked on the endgrain as well as on the sidegrain of the drawer front. If you have trouble holding the piece steady while you mark the end, support it in a vise or hold it firmly under your armpit. Also, the scored line may be harder to see on the endgrain, so highlight it with a pencil if necessary.

You have to be a bit more careful when marking along the grain, because the grain may cause the gauge's point to veer off. To prevent this, refile the point as described on the previous page and keep the fence firmly against the work. Also, it's best to take a couple of light passes with the gauge rather than one heavy one, especially on an unplaned surface. I often use my gauge along the grain to size and thickness a square chair or table leg by hand. I first square two adjacent sides of a piece wider and thicker than the finished leg with a jack plane and try square. These two sides provide reference surfaces for marking and planing the other two. I then set my marking gauge to the final size and scribe a line down the length of one squared-up side and the unplaned side parallel to it, with the fence bearing on the second squared side. With the leg clamped down on the bench, second squared side down, I use a jack plane to chamfer the top edges at about 45° down to the scribed lines. Then, with a smooth plane, I plane down the leg's thickness until the chamfers are gone—a sign that I've reached the scribes. Repeat this process to square the remaining unplaned side.

The panel gauge—The panel gauge works just like the marking gauge, except you must use two hands—one to hold the fence against the edge of the workpiece and the other to press the scribing point to the stock. Square one edge of a board and use it as a reference surface to mark the board's width on both sides with the panel gauge. The board can then be ripped (or trimmed by the chamfer method above) to the same width from one end to the other. This is especially important if you're gluing up several boards for a large rectangular tabletop and want the top's final dimensions even.

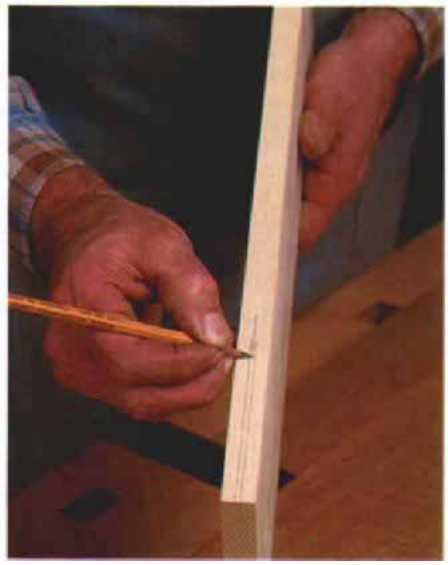
Although marking gauges are best for scribing straight lines, I occasionally need to mark around the top of a round table for edgebanding or scribe along the length of a serpentine leg or table apron. Since the fence of a regular marking gauge is straight, the gauge will wobble as you try to work around a curve. On a single radius concave edge, you can keep both ends of the fence firmly seated as you scribe. A convex edge gives the fence only one point of contact in the middle, so you must wrap your fingers around the ends to act as shims and keep the gauge's beam pointed toward the radius center. This is very difficult if you try to scribe more than 1 in. to 2 in. from the edge. A better method is to shape an auxiliary fence to fit the curved edge and



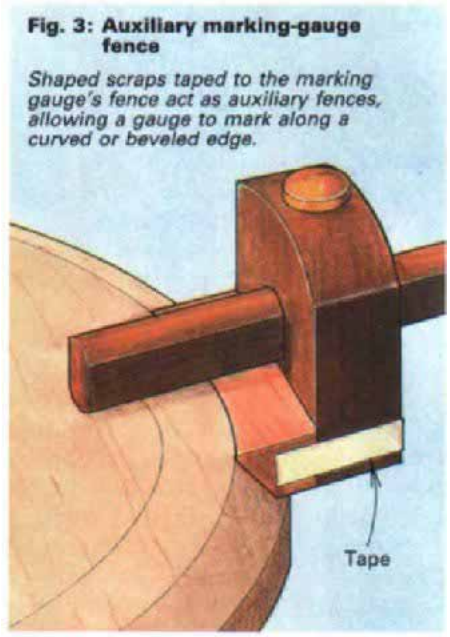
To make marking a set of drawer sides quick and orderly, stack the sides and mark your way down through the pile. Mark each set of ends in sequence to minimize the risk of mismarking similar pieces or skipping a piece.

Although it's an uncommon marking tool, the panel gauge is handy for marking a panel or a wide board to be handsawn to consistant width. Two hands hold the long-beamed gauge for stability and to get a clean scribe line.

The mortise gauge scribes two parallel lines for marking mortise-and-tenon joints or grooves to be plowed out with a multiplane. The distance between the points is adjustable, as is the position of the fence on the beam.



Using a tightly held pencil as a marking gauge, Klausz marks the board's edge from both sides to find its center.



tape it to your gauge. This can also be the solution if the edge you want to scribe is mitered or beveled and the gauge's fence can't contact it solidly.

The mortise gauge—Mostly used for laying out mortise-and-tenon joints, as shown in the photo above, left, the double-pointed mortise gauge can be used to mark grooves and slots as well. One of the two points is fixed and the other can be moved up and down on the beam. Before marking out a mortise-and-tenon joint, I set the distance between the two points to match the width of the chisel I'll use to chop the mortise. I hold one edge of the chisel's blade against the fixed point's tip, then slide the other point until it just touches the blade's other edge. Then the fence is set so the two points will scribe at a set distance from the stock's edge. Locking the fence also locks the movable point on many gauges.

Mark the mortise first, then use the same gauge adjustment to mark the tenons (if the faces of the two frame members will be flush). Remember to saw to the outside of the scribed line; otherwise, your tenon will fit too loosely in the mortise. I start at the tenon's base and mark with the grain, moving the gauge around the end and then finishing at the base on the other side, marking all three sides in one motion. If you have several sets of mortises and tenons to mark, lay the pieces side by side and mark them in order. Just as with the dovetail depth marking, this makes the layout process faster and more orderly.

Marking without a gauge-If you don't have a marking gauge, you can easily mark lines with a sharp pencil, as long as the lines aren't more than an inch or two from an edge. Grasp the pencil firmly with your thumb, middle and index fingers and use the middle finger's nail as a fence, as shown in the photo above. Be sure to mark with your fingers pointing away from the direction you move your hand, lest you get a splinter under your fingernail. You can find the center of a board's thickness by grasping the pencil and marking a line you estimate to be centered along the edge of the board from one side. Then, without changing your grasp on the pencil, mark the edge from the other side. The difference between the two lines will be the exact center. □

Frank Klausz makes furniture and restores antiques at his shop in Pluckemin, N.J.

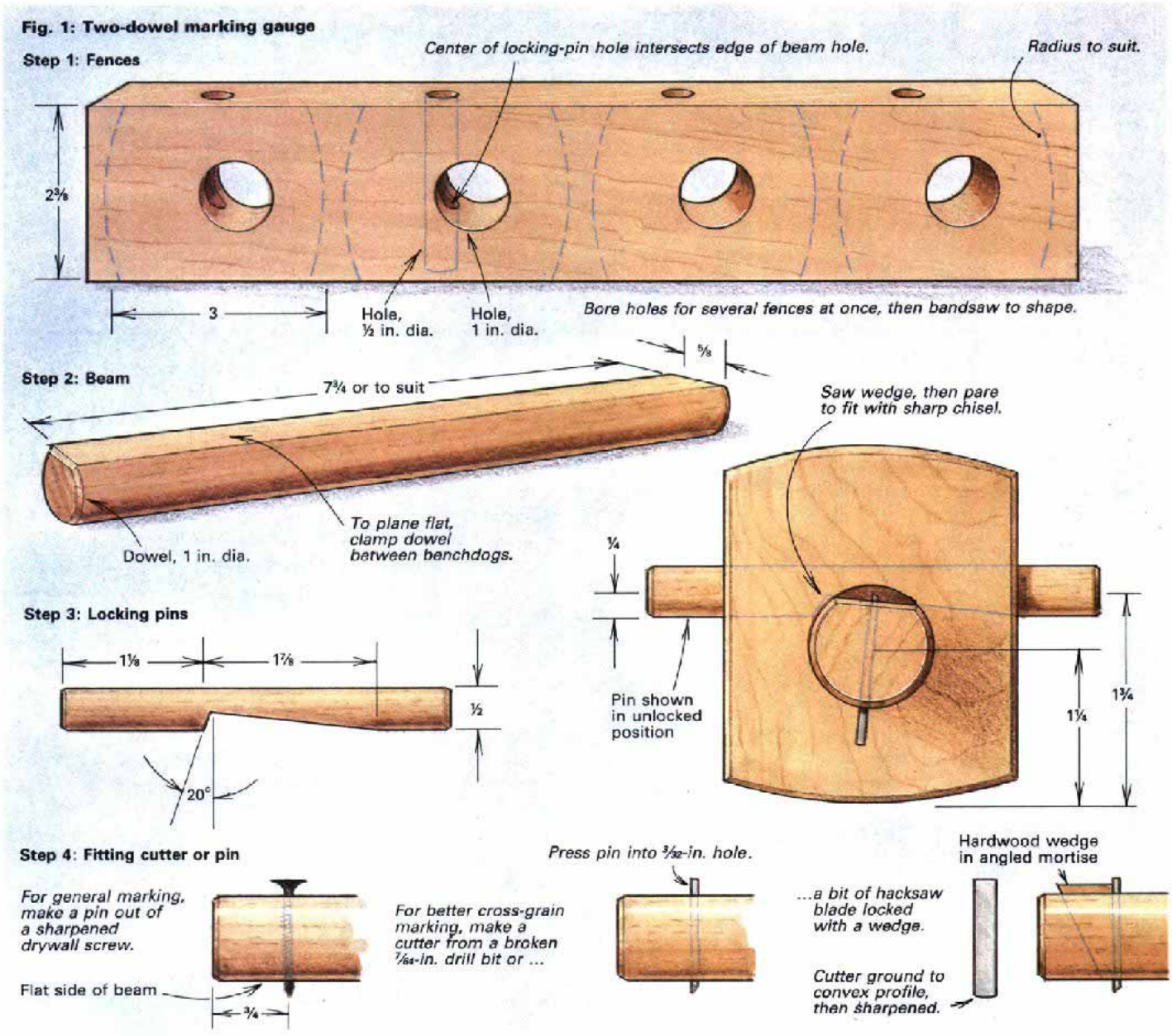
Shopmade Marking Gauges

by Fred Palmer

I got the idea for this two-dowel marking gauge while trying to simplify a more complex gauge. The tool couldn't be much easier to make: It's nothing more than two short lengths of dowel and a piece of scrap for the fence block. Unlike traditional gauges, the locking mechanism requires no thumbscrews or clumsy wedges, just the two dowels sliding in intersecting holes. The larger of the dowels, the beam, carries the pin or blade that does the marking. The smaller locking dowel has a wedge cut into it, which presses against a flat on the beam, locking the gauge setting.

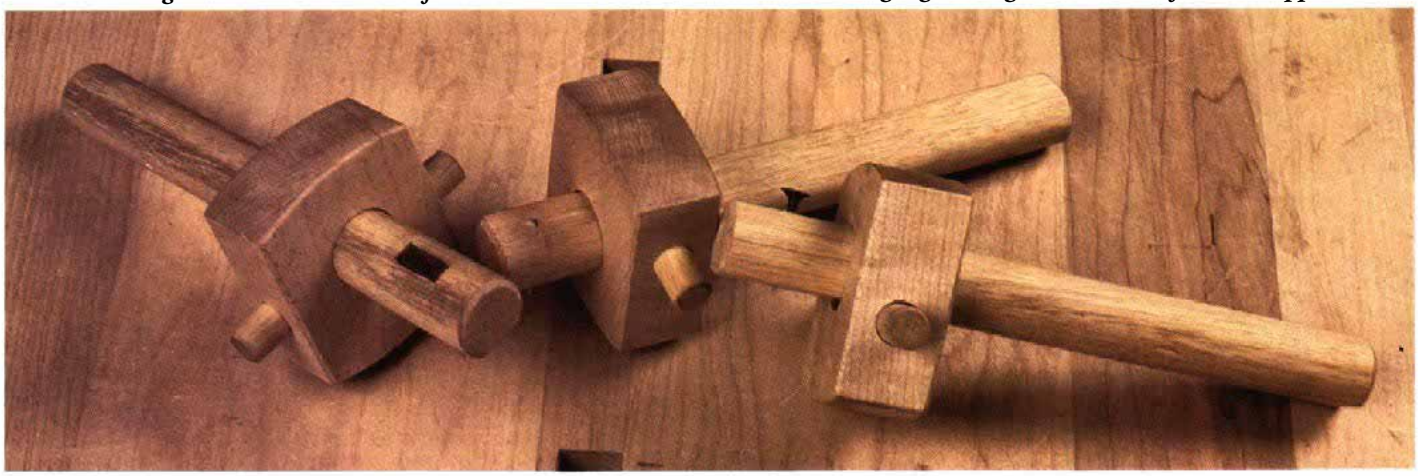
Figure 1 shows the sequence of construction. I prefer maple for the fence because it's cheap and durable, but any tight-grained hardwood will do. For the beam and pin, you can turn your own hardwood dowels or buy them at your local hardware store. I recommend making several fences at once from a single piece of stock—it'll be easier to clamp the stock for hole boring, preferably with a drill press. After boring, bandsaw the fences to shape and sand their edges smooth.

The dowels for the beam and locking pin should be turned or sanded slightly undersized so they'll slide smoothly in their holes without binding or sticking. The beams shown here are 7¾ in. long, but this dimension can be altered to suit. I handplaned the flat on each beam by clamping the dowel between dogs on my bench. The flat should be about ⅝ in. wide and uniform from end to end. The low-angle wedge cut into the locking pin is the



Made from a pair of dowels and a scrapwood fence, each of these gauges is fitted with a different type of cutter. At left, a hardwood wedge holds a cutter made from a hacksaw blade.

A broken drill bit sharpened and fitted into the center gauge's beam is good for general marking, and the drywall screw in the gauge at right works well for most applications.



secret of the gauge's quick adjusting action. To fit the pin, saw the deep end of the notch with a backsaw, then pare out the notch with a chisel until the beam slides easily through its hole with the pin fully unlocked A tad of looseness is okay, but too much play will allow the beam to rotate, making the gauge cantankerous to adjust. To lock the gauge, simply press the pin with your thumb. The pin should travel less than ¼ in. before firmly engaging the beam's flat.

If the locking action works to your satisfaction, mount a pin or blade in the beam, as shown in step 4. With a drywall screw or a drill point as a scribing pin, the gauge is excellent for general marking work; but for cleaner cross-grain cuts, say for tenon shoulders or dovetail layouts, file the point to a knife edge to serve as a cutting gauge. Although the three cutters shown in the drawing work well, the cutter made from a hacksaw blade held in place by a hardwood wedge is easiest to remove and sharpen, even if it is more work to make. A couple of coats of oil or wax will make the beam slide smoothly and protect the gauge against dirt. □

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Large-Scale Layout

by Percy Blandford

I've spent a lifetime woodworking, mostly building boats and dealing with large sheets of plywood and other materials. Before a boatbuilder even touches a stick of wood, he must loft the boat's curved lines, that is, draw a full-size layup on the shop floor that serves as the actual template for the boat's parts. The layup is drawn on a precise grid of straight lines, with crossings at exactly 90°. Errors in the basic grid could lead to inaccurate measurements and consequent difficulties in building the boat.

Cabinetmakers too need to mark out large surfaces accurately, yet tool manufacturers haven't provided squares, bevels and straightedges large enough for this sort of work. They seem to assume we never want to mark out or test a right angle greater than 12 in. The solution is to make your own marking tools and refresh yourself on those geometric constructions you did in school with a compass and paper.

For short lines up to 48 in., I use a steel straightedge; for longer lines, I use wooden straightedges. Note the plural. I have two 8-ft.-long straightedges—enough to span a plywood sheet. Having two means one can test the other. Mine are made from straight-grained spruce, but you could just as easily use a hardwood like ash, which would better resist damage along the edges. When I first made them, I had to replane the edges every few weeks until the sticks settled to the shop atmosphere enough to retain their straightness indefinitely. My straightedges have a chamfer on their working edge and a curve planed in their back edge. There are two reasons for the curved back: It gives stiffness and resistance to bending at the center, but just as important, it stops me from using the wrong edge. To get the edge straight, joint the stick on a jointer with at least a 4-ft. bed or simply plane the edge with a try plane, sighting as you go and correcting any quick bends or flat spots.

As with squares, a line longer than 8 ft. is never marked by successive moves of a straightedge. For longer lines, the solution is a chalkline, but not the rather coarse string carpenters use-this leaves a line ⅛ in. wide, much too wide for a cabinetmaker. Instead, use crochet cotton, which is fine, strong and whiskery enough to take up the chalk dust. I keep my line on a reel I turned. The reel has hollows for thumb and finger, so it revolves easily. For the other end of the line, I made a little awl with a point out of a steel knitting pin. For chalking most surfaces, I use ordinary school chalk; for a darker line on a light surface, charcoal will do nicely.

To strike a line, push the awl through a loop in the line and into the wood. Hold the reel so it revolves easily, then walk back from the awl, using the other hand to rub chalk on the line. When you have the distance you want, stretch the line without jerking it and hold it to the surface being marked. If the length is not more than 15 ft., reach out as far as you can and lift the line a few inches while maintaining tension. Let it spring back to deposit a line of chalk. If the line is longer, get an assistant to lift the string near the center to strike it. It is important that the lift be square to the surface; otherwise, the struck line will not be true.

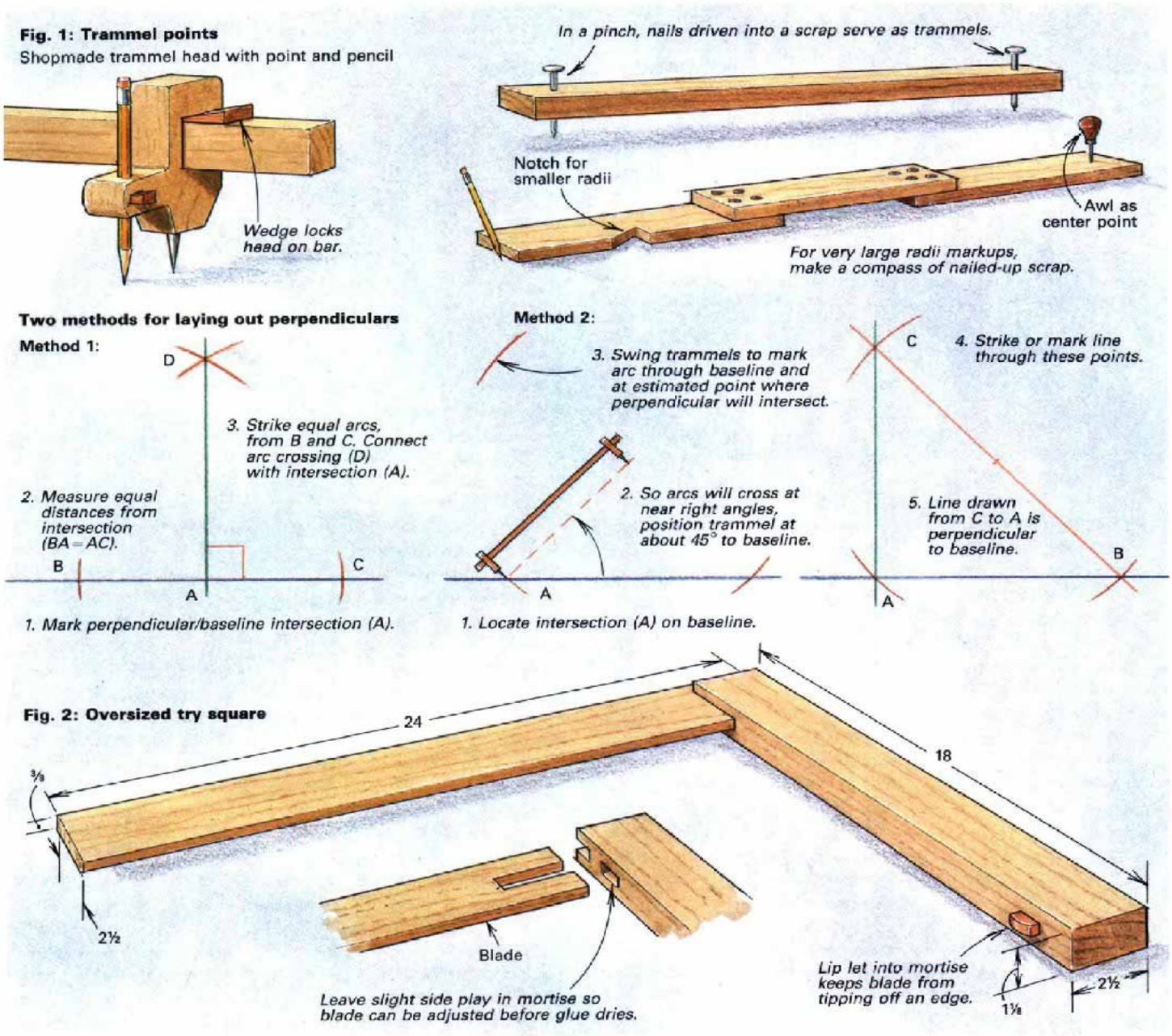
Deposited chalk is not very permanent. If you need a more permanent line, put pencil marks at intervals along the struck line, then use a straightedge and pencil to go over the line between the marks.

There are several geometric methods for drawing one line square to another. At small scale, this is easily done with a compass, but when the measurements involve feet rather than inches, you will need a pair of trammel heads attached to a long stick of wood. If you don't have these tools, you can get by with nails driven through a strip of wood or several strips nailed together. But it is not difficult to make a pair of trammels secured to a bar with wedges, as shown in figure 1. The dimensions are not critical, but if you make the heads to fit a 1-in. by 2-in. bar, use ¼-in. steel rod secured with epoxy for the marking points. At times, a pencil is preferable to a steel point-one can be put through a hole in the trammel head and held with a wedge.

The simple way of using trammels to erect a perpendicular is shown in method 1. If your work demands great accuracy, there are two considerations. It is difficult to be certain of the exact crossing point of the arcs at point D if they meet at a shallow angle, which is the result of too narrow a baseline. Therefore, proportion your trammel settings so the arcs at point D will cross at near 90°. Second, have the arcs at point D crossing farther from the baseline than the final length you want the perpendicular line to be; otherwise, you might introduce error by extending the line past the intersection with a straightedge.

Very often the perpendicular must be marked near a corner and the method just described will not work. In this case, use the technique described in method 2, which relies on the fact that any triangle whose base is the diameter of a circle and whose apex is on the circumference of the same circle must have an apex angle of 90°. As with the first geometric method, choose a size that puts the arc crossings farther from the baseline than the most distant point on the perpendicular.

When you need really large sizes, a trammel becomes rather unwieldy. It is possible to use a steel tape measure, marking the



distance with a pencil while the center is held with an awl by an assistant. A more accurate method, however, is to improvise a compass from scrapwood temporarily nailed together. An awl provides the center, and the compass length is cut to the intended radius. If shorter radii are needed, cut notches in the compass, as shown in figure 1.

Geometry takes care of the very large constructions, but it can be unnecessarily tedious when working with pieces 18 in. wide to 48 in. wide. If you often work within these sizes, it is worthwhile to make your own large squares. I have two and would feel lost without them. The first is simple. It is just a giant plywood drafting square cut as large as a standard plywood sheet will allow. It is made of marine-grade mahogany plywood, which is stout enough to be stiff without being very heavy. The square is laid out using the geometric method described above. The center is cut out for lightness.

I also have a wooden try square made of oak, mainly because that was the wood I had at the time. Any straight-grained species will do just as well. The square is difficult to adjust if the wood warps after you have made the square, so prepare the pieces some time in advance and keep them in the shop for a month or so to give them time to acclimate to the shop's humidity. Construction is straightforward, but sizes and assembly have to be accurate. In particular, edges must be straight, square and perfectly parallel. Give the mortise and tenon very slight sideways clearance, then as you assemble with glue in the joint, set the blade to a line marked square to the edge of a plywood sheet. Try the blade both ways, then leave the glue to harden. The little lip mortised into the handle prevents it from tilting in use. The lip is acceptable, because the square is used mainly for surface work and not for testing over edges—a small square does that. □

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