A Pair of Panel-Raising Planes

Two is more than twice as good

by Robert Bourdeau

In a recent project, a Louis XV armoire for my daughter, I used the shaper to raise the many panels for the doors and case sides. I was disappointed with the results—especially with tear-out both across and along the grain. Quite a bit of sanding was required to eliminate the pits and gouges; further, the crisp look and feel of cleanly cut wood was gone.

When it came time for me to begin work on my son's roll-top desk, and I wanted to raise its panels with double bevels, I discovered that the appropriate shaper knives would have to be custom-ground at a high cost. There had to be a better way, so I decided to make myself a pair of panel-raising planes, a left-hand and right-hand, which would allow me to plane in the direction of the grain regardless of the side of the panel I might be working on. This meant that I could keep tear-out and splintering under control, minimizing the amount of sanding I'd have to do.

I had never made a plane before, but after studying K.D. Roberts' *Wooden Planes in 19th Century America* and reading Norman Vandal's "Paneled Doors and Walls" *(FWW* #18, Sept. '79) and Timothy Ellsworth's "Hand Planes" *(FWW #1,* Winter '75), I felt I could make the pair of panel-raising planes by laminating the bodies. I began with a full-

Tear-out from planing against the grain, always a problem when using a single panel-raising plane, is minimizedby having two, a left-hand and a right-hand model. No matter how the grain runs, one plane or the other can follow it.

Photos: Yvon Bourdeau

scale sectional drawing of the panel I wanted (figure 1); the double bevel would form a tongue on the panel's edge and make for a nicer fit in the frame grooves than would an unrelieved wedge. Using ¾-in. stock, I divided the thickness of the panel into even thirds and decided to cut a ¼-in. by ⅜-in. rabbet along the back edge of each panel to form the backside of the ¼-in. tongue. When captured in the grooves, there's a resulting ⅛-in. wide gap between the vertical shoulder of this rabbet and the inner edges of the frame. This means that the panel can expand a full ¼ in. before it exerts any pressure against the frame, a sufficient allowance for most panels, unless they are exceptionally wide or made from an unstable wood. For a pleasing appearance, the back edges of the panel can be chamfered or slightly rounded over, as can the inner edges of the frame.

Since the profile of the panel's field, shoulder and bevel is the exact complement of the plane's sole, it was an easy matter to draw the plane in section atop the panel (figure 2) just as though the plane were making its final pass down the edge. By laminating the body of the plane with two sides, or cheeks, and a three-part core (a front block, an adjustable shoe and a rear block), the task of shaping the sole to the required angles was made much easier and simpler than would have been the case had I tried to make the entire body from a solid block in the traditional way. I beveled the bottom of the inside cheek at 6 ° off perpendicular and did the same to the outside cheek, the only difference between the two being that the outside cheek projects below the sole, while the inside cheek does not. See figure 2 for an elevation view of these parts. This arrangement determines the angle of the bevel and the final depth of cut, though these can be varied by altering the thickness of the shim, which is clamped to the bench along the edge of the panel and which stops the cut when the bottom edge of the outside cheek contacts it.

I set the two cheeks aside and turned to making the blank for the three core pieces. I laminated the blank from face-glued lengths of ½-in. thick maple. When the glue was dry, I dimensioned the blank 14 in. long by 2 ¼ in. high by 1 13/16 in. wide, this last dimension being final and the other two slightly oversize. Since a ¼-in. strip along the outside edge of the sole must be beveled at 6°, I set my jointer fence at 84° and took a few light passes until the jointed surface was exactly ¼ in. wide. This is the part of the sole that conforms to the second bevel, the face side of the tongue.

I reasoned that the iron should be skewed at 30° in the body of the plane and that its cutting angle should be 35°, though 45 ° is common on traditional planes of this type. This meant that the face of the rear block that would support the iron would have to be cut on a compound angle as shown in figure 4—60° in the horizontal plane, 35° in the vertical. You can make this cut by angling the miter gauge and tilting the arbor on the table saw, or by setting up the radial-arm saw for cutting a compound angle. From the toe of the angle to the rear of the blank should be about 9 in. You must orient the blank correctly when cutting; its 1 13/16-in. width is a finished dimension. The height and length will be trimmed after the body is glued up. The inner face of the forward block must also be cut at a compound angle—120° in the horizontal plane (to complement the 60° skew angle of the rear block) and 65 ° in the vertical plane. Since the core blank is about 3/16 in. too high, you can rip off a ¾-in. thick slice from the beveled sole to produce the adjustable shoe. Make a smooth cut, so that the sawn surfaces will mate uniformly.

As a final step before gluing up the body, cut a ½-in. wide tapered dado in the inside cheek about 1 in. forward of the mouth. I also cut a ½-in. wide dado 3/32 in. deep in the corresponding place on the side of the forward core block. When the parts were glued together these two dadoes formed the tapered slot for the scribing spur and its wedge. The purpose of the spur, which I made from a length of ordinary hacksaw blade, is to score the wood in advance of the cutter when planing across the grain, thus to eliminate tearing the stock.

Now the body can be glued up (with the movable shoe left out). Be sure to position the rear and forward blocks so that if the angled face of the forward block were extended, it would intersect the face of the rear block at the surface of the sole. The acute angle on the adjustable shoe will be pared back at a later time to make room for the extended iron (figure 4, detail A). And the throat opening can always be enlarged by adjusting the shoe. Be careful about positioning the cheeks in relation to the core blocks when gluing up. You may want to use pins to help locate the parts and to keep them from swimming out of alignment under clamping pressure.

When the glue has set, plane the top edges of the core blocks flush with the top surfaces of the cheeks. The movable shoe is secured by means of a ¼-in. machine screw that passes through a slotted hole (⅜ in. by ¼ in.) in the forward block and screws into a T-nut set in a plugged Counterbore in the shoe. You can make the slotted hole easily by boring two ¼-in. dia. holes and chiseling out the waste between. The washer can either be let into the block or sit proud of the surface.

I made the handle to fit my hand and working posture. The angle between the handle and the body of the plane (and also its point of attachment) determines how efficiently your muscular energy is transmitted to the cutting edge, so it's a good idea to experiment with several angles and shapes before making a final decision on the handle design that's correct for you. The handle is attached to the body by a long ¼-in. screw or bolt that extends through a hole bored through the full length of the handle and is screwed into a T-nut in the rear block. This T-nut, like the one in the movable shoe, is retained in a plugged Counterbore.

The cutter has to be ground to conform exactly with the profile of the sole. This is critical. To ensure this conformity, I inserted the iron blank in the body and traced the profile of the sole with layout dye onto the steel and then traced again with a sharp machinist's scribe. I used a jig for grinding (see photo, next page) and I made periodic checks, re-inserting the iron into the body, to make certain the shape was being properly formed. I ground the bevel on the iron to 30°, which provided a clearance angle of 5 °.

I made the chip breaker from ⅛-in. mild steel, which I first hacksawed and then filed to the final shape that is shown in figure 3. I used a small, round file to form the groove across the face of the chip breaker where it bears against the steel retaining pin. I drilled and tapped the upper part of the chip breaker to receive a ¼-in. thumbscrew. A square, steel pressure plate, countersunk to receive the end of the thumbscrew, presses against the iron when the screw is tightened. Even greater pressure is levered against the toe of the chip breaker where it contacts the iron just above the cutting edge. You may want to use the traditional wedge here, which should exert uniform pressure along the length of the iron.

The iron should be 1/16 in. narrower than the opening in

Fig. 1: Panel in section

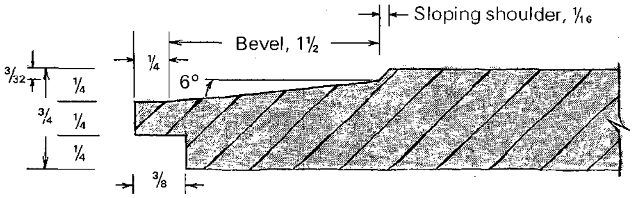


Fig. 2: Front elevation of plane and panel

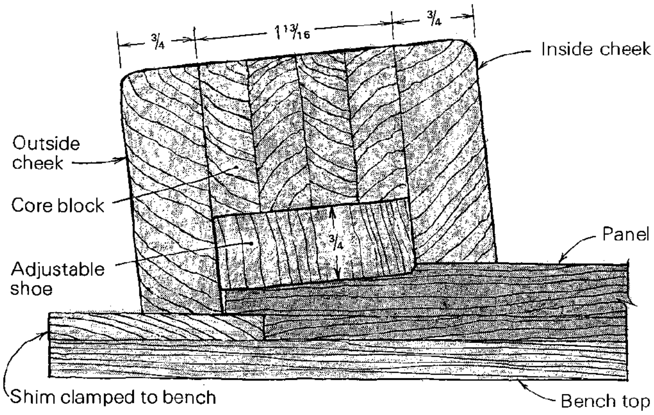


Fig. 3: Chip-breaker/cutting-iron assembly

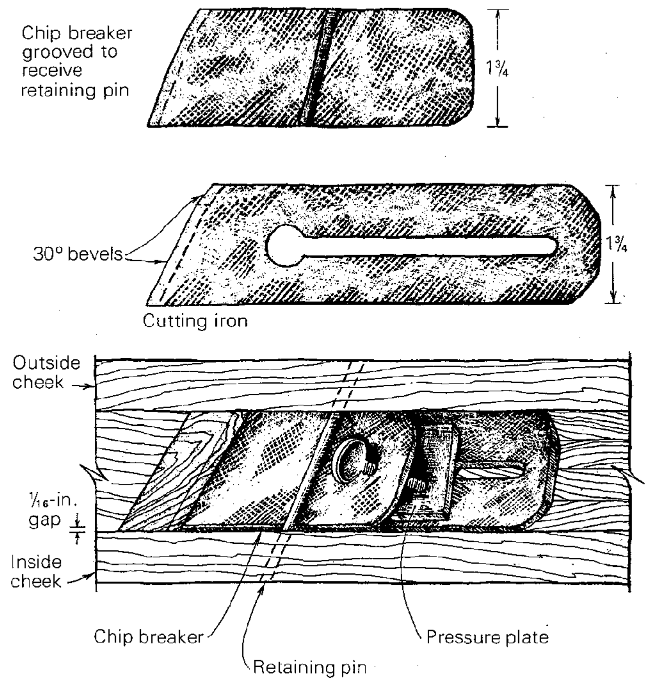
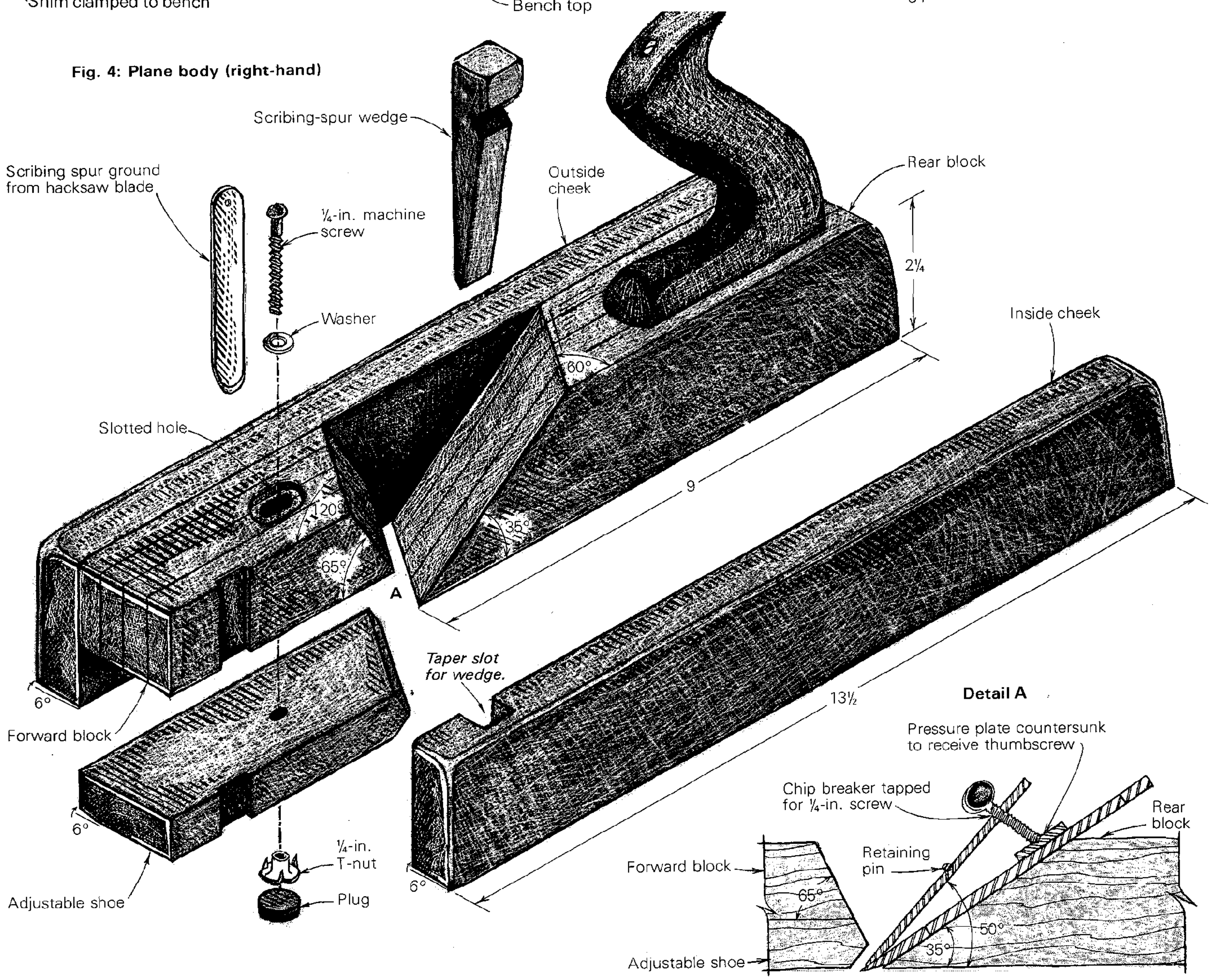
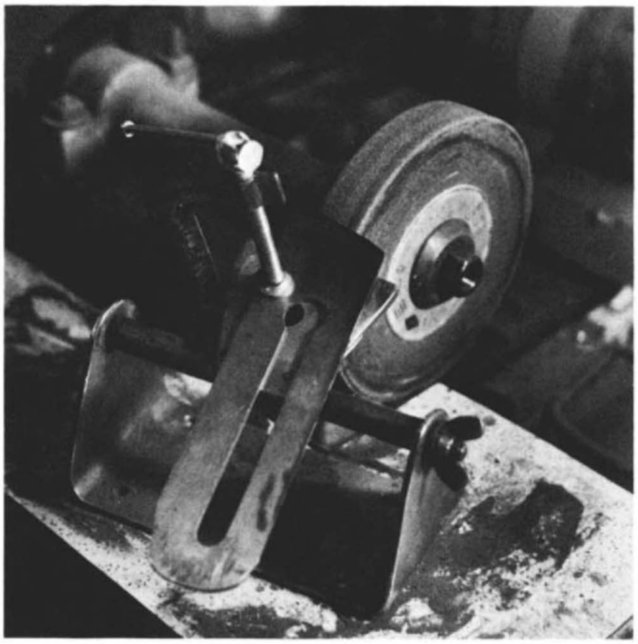
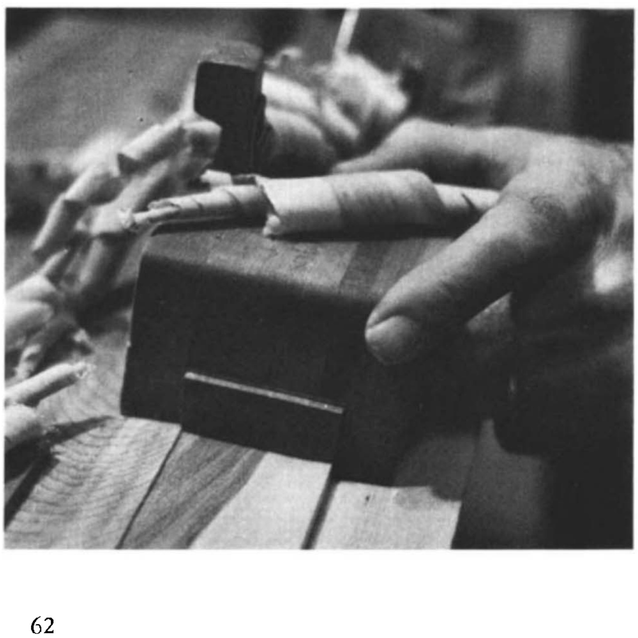


Fig. 4: Plane body (right-hand)







Author's grinding jig holds the iron at a fixed angle (top photo), yet its base is unattached, allowing the profile to be shaped freehand. In raising the panel, the plane is first canted to the outside to take several narrow shavings (center photo). Then it's canted to the inside for several passes, and then several cuts are taken down the middle of the bevel. Only when making the last two or three passes is a cut taken the full width of the iron (bottom photo). This method reduces the chance of tearing the grain and is less tiring than taking a full cut with each pass.

which it rests, and it should fit snugly against the inside of the outside cheek. This leaves a 1⁄16-in. gap between the iron and the inside cheek, which makes room for the sloped shoulder to be formed. Looking back at figure 2, you will see a small triangular space between the edge of the panel and the inner edge of the outside cheek. Imagine the plane just beginning to make its first pass along the flat edge of the panel. The plane's body would be oriented at 90° to the panel's surface. With each successive pass and the removal of a single shaving, the plane's body cants more and more to the outside of the panel, and with each pass the cutting toe of the iron changes its attitude and its distance from the original shoulder line. The triangular space between cheek and panel edge widens and deepens as the bevel is cut. As the plane's body cants and the iron is pulled more to the outside, the sloping shoulder is formed.

I ground the scribing spur to a round-nose shape only after experimenting with several other cutting configurations. The round-nose spur need not be inclined forward in the body as shown in the photos. Care must be taken to set the spur at the exact depth of the iron. If set even slightly deeper than the iron, it will leave ugly lines in the sloped shoulder; if set higher than the iron, it will not sever the tissue through to the depth of cut, and tear-out and splintering could result.

The left-hand plane is made exactly like the right-hand one, only everything is reversed as in a mirror. The iron, of course, must be ground to precisely the same profile as on the other plane, as you may very well be planing the same bevel with both planes, since the grain direction can reverse in the middle of a board.

In use, I have learned that long, uninterrupted strokes are best, beginning at one end and going right through to the other. The outside cheek should always be kept snug against the edge of the panel when planing. To save your strength and to proceed at a workmanlike pace, begin cutting first to the outside, removing several narrow shavings (center photo, at left). Then cant the plane to the inside for several passes; then take a couple down the middle. Don't try to take a cut across the full width of the bevel until you make the last several passes (photo, bottom left). In a dense wood it uses a lot of energy to take a cut 1¾ in. wide, and I can now understand why in the old shops two people—one pushing, another pulling—were required to manage a large plane.

I have learned quite a bit from the experience of making these two planes, enough to realize that much lies ahead, for now I've got plans to make all of my planes for molding, rabbeting, jointing and other tasks. For those woodworkers who have never tried making planes, I would add that given a reasonable amount of technical reading, careful measuring and thoughtful joining, the plane's secrets unfold like the story in a good book. □

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