Turned Pens and Pencils

A retractable ballpoint

by Richard Elderton

After my second ballpoint pen broke in half, I noticed the flimsy plastic joint between the metal top and the plastic bottom. The thin plastic joint doomed the pen to a short life. To avoid this fate, I decided to clothe my two naked Parker refills with suits of wood,

The design is simple and functional—a wooden cap and barrel, shaped on the lathe and bored out for the refill and the trigger mechanism that advances the pen point for writing. The cap slides onto a sleeve turned on the barrel, and the two pieces are held together by a pin in the cap, which twists and locks in an L-shaped groove routed in the barrel. So far, I've resisted suggestions to add inlays or other adornment, partly out of laziness and partly to retain the basic quality of the rosewood and other exotics I use.

The first step is to rip blanks about ¾-in. square for barrels, ⅜-in. square for triggers and 3/16-in. square for pins, then crosscut the cap and barrel blanks as shown in the drawing, or to fit your refill, plus an extra 3/16 in. I don't cut off the trigger and pin blanks until after these tiny pieces are shaped.

Turning techniques—I use a 3-jaw chuck for the turning and boring operations. By inserting the blank deeply into the chuck and gripping it tightly, I can do all the boring and end-grain shaping without the piece vibrating or whipping. First, I turn the ¾-in. blanks to cylinders that can be gripped in the 3-jaw chuck without being damaged. After chucking each cylinder in the 3-jaw, I square both ends with a skew chisel.

The cap and barrel must be bored in stages. I mount a Jacobs chuck in the tailstock to advance different-diameter bits into the spinning cylinders. To hollow the cap, I begin with a ⅜-in.brad-point bit to bore the main hole to about ½ in. from the top of the piece, then complete the bore with a 7/32-in. sleeve drill. The sleeve drill, which centers the second hole in the first, is made

Tired of plastic pens breaking, the author made a two-piece rosewood housing for his ballpoint refills. The tiny trigger on the top makes the pen retractable. A boxwood pin fit into the top locks into a groove in the barrel to hold the pieces together.

with a drill rod and twist drill. I bore a deep axial hole in the center of the drill rod, again using the 3-jaw and Jacobs chucks, and epoxy in the twist drill. The barrel is hollowed in the same way as the cap, but this time I bore with a ¼-in. brad-point bit, followed by a 7/64-in. sleeve drill.

I rechuck the barrel with about 1¾ in. of the open end protruding from the jaws and turn down a shaft, ⅜ in. dia. and 1⅛ in. long. This shaft slides into the hole bored in the cap, which I deburr by sanding with 220-grit paper rolled into a cylinder. Then I gently push the cap onto the slightly oversize rotating barrel just enough for the burnishing action to indicate high spots to be removed with light skew cuts. Once the cap goes halfway on under power, test fittings are done with the lathe stopped, and the surfaces are sanded with 320-grit paper until everything fits.

To avoid breaking the barrel when it's shaped, a short section of ¼-in.-dia. rod is inserted in the sleeve before the piece is clamped in the 3-jaw. A ball-bearing tailstock center is also snugged up into the small hole at the end of the barrel to steady and center it precisely as I turn the shape with a roughing gouge and skew. The next step is to mount the cap on a ⅜-in.-dia. rod. A piece of rubber tubing wrapped around the cap end prevents slippage in the jaws. Again, a live center provides end pressure for stability. Shape the cap, then try it on the barrel and adjust the pieces as needed. Do final sanding with the grain while the lathe is stopped.

A spring about ⅝ in. long makes the pen retractable. If you can't find a 3/32-in. OD spring, you can make one by wrapping 0.014-in.-dia. piano wire tightly around a piece of 7/64-in. drill rod clamped in a vise. Remove the spring from the rod and stretch it until it has about 14 turns per inch, then cut it to size. Once the spring is made, I can put it on the refill, assemble the parts I've made so far and calculate the dimensions of the trigger mechanism in the cap.

Calculating part sizes—The math here may seem a nuisance, but it avoids the wasted time and frustration of trial-and-error methods. To begin the calculation, I insert the depth gauge of a vernier caliper through the hole in the cap and use it like a trigger to depress the refill until it protrudes the correct amount from the barrel. I record this reading to the nearest 1/32 in., then proceed as shown in figure 3.

The oversized, square trigger stock can now be mounted in the 3-jaw, with just enough for one trigger protruding. I turn the whole section to 5/16 in. dia., then cut the steps shown, taking care to make the length of each step correct. The 7/32-in.-dia. section is

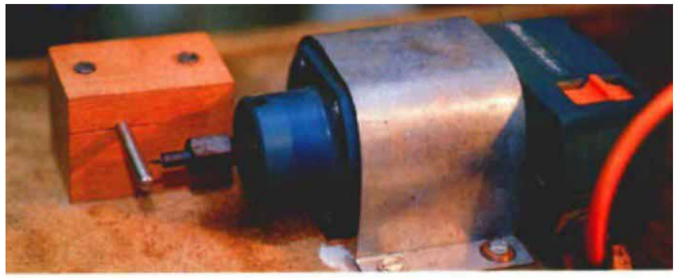
Photos this page: Michele Russell Slavinsky

crucial—if it's too slack, the trigger will slip; too tight will make it difficult to retract the refill.

After parting off the trigger from the square blank, I remount it with the chuck gripping the -in. section and turn a rounded point. I'm now ready to put the trigger in the pen and test the mechanism. If it doesn't work, I recheck the dimensions and adjust as needed.

Routing grooves—I used to hand-carve the twist lock, but the simple router jig shown at right simplifies the process greatly. First, I drill a 5/64-in. hole about 3/16 in. from the open end of the cap, perpendicular to the pen's long axis. I like to recess the hole with an 1/8-in. counterbore to make a flat-bottomed socket for the pinhead. I made my counterbore from 1/8-in. rod, just as I did the sleeve drill, but filed in the tiny teeth before epoxying in the 5/64-in. pilot. The next step is to mount the 3/16-in.-square stock in the chuck with about 1 in. protruding. I turn it down to 1/8 in. dia., then reduce the diameter of the first 1/8 in. to create a square shoulder and 5/64-in.-dia. shaft. A small 1/4-in. skew made from an old screwdriver or drill rod works well here. After test fitting the pin, I adjust its length to fit the thickness of the cap, form the rounded head and part the piece off. The pin must protrude about 3/64 in. into the cavity to lock into the routed groove.

To cut the groove, I take out the pin, assemble the cap and barrel, then rotate the pieces until there's a good grain pattern



Cutting the groove for the locking pin is simple with this router arrangement. The pen barrel is pushed onto a guide rod, which fits snugly inside the barrel, as the bit cuts the groove. Twisting the barrel creates the final skewed section of the groove.

Fig. 1: Wooden ballpoint pen

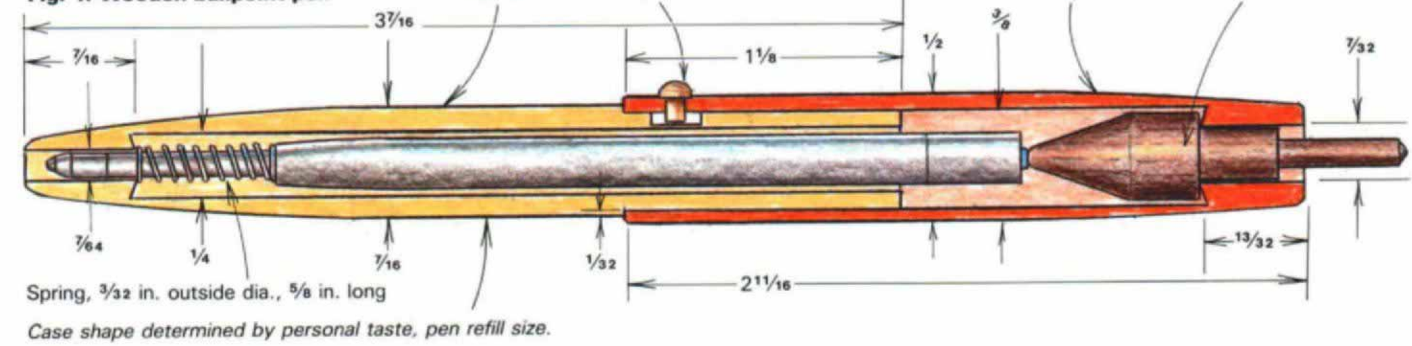


Fig. 2: Turning sequence

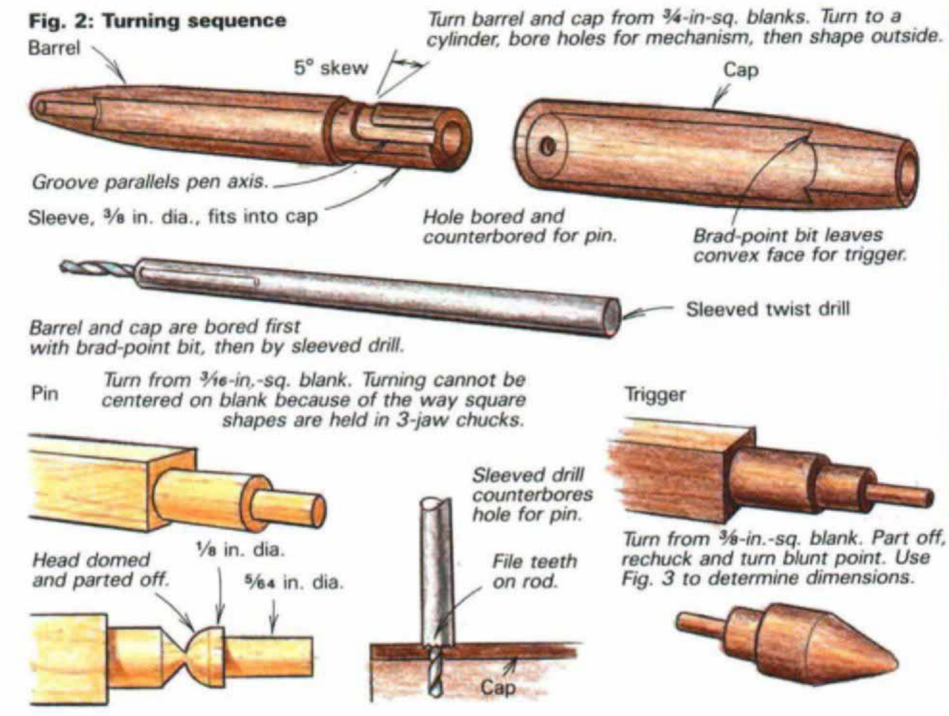
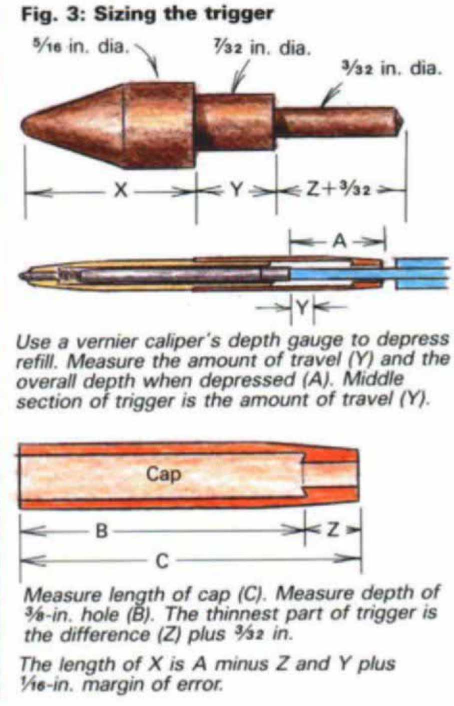


Fig. 3: Sizing the trigger



down the length of the pen. After marking the hole location with a pencil dot, I remove the cap and sketch a pair of lines about 3/32 in. apart and flank the dot at a 5° angle, skewing away from the joint. After drawing a line parallel to the axis from the top of the skewed lines to the top of the barrel, I switch on the router, mount the barrel on the rod as shown and push the barrel forward, cutting down to the skewed lines. At the skew, I twist the barrel and push it to follow the angle. My 5/64-in.-dia. router bit is ground from a 1/4-in. drill rod; I set the depth of cut with a feeler gauge inserted between the mounting rod and bit. After refitting the pin and filing it down so it doesn't bottom out in the groove, I secure it with a spot of white glue. I finish the pen with wax or shellac after the glue dries.

After wrestling with making the pen, you may be disappointed to discover that few people will see beyond the pen's pleasant shape and glistening finish to realize it is actually made of wood. Perhaps my wife has a case when she says the pens need a little embellishment. □

Richard Elderton is a cabinetmaker in Hawkley, England.

A mechanical pencil

by Earl C. Kimball and Cynthia A. Kimball

Turned wooden casings let you customize mechanical pencils to your hand and show off your turning skills. The pen, above, is turned from walnut and maple.

We enjoy the clarity of line produced by 0.5mm mechanical pencils, but dislike the plastic models sold in art and department stores. Wooden pencils feel better in the hand, so we decided to fit the self-contained lead cartridge of a mechanical pencil into an all-wood housing.

Any good hardwood can be used for the casing. We usually begin with a walnut, ebony, mahogany or maple blank, bore a hole lengthwise through the center, then slide the blank on a mandrel that can be mounted in a Jacobs chuck and turned on the lathe. We prefer Pentel 0.5mm and Pilot 0.5mm pencils, but other brands might work; adapt the measurements shown in the drawing to fit your pencil. The first step is to remove the innards from the plastic, usually by unscrewing the tapered tip from the lead cartridge.

The original plastic sleeve becomes a rough model for determining the size and shape of the wooden case. For our pencils, we started out with a 3/4-in.-square hardwood block, about 2 in. longer than the desired pencil. The excess length is used to hold the blank on the mandrel and will be discarded after turning. We make sure our original blocks are square in section, then draw diagonal lines from corner to corner. We drill through this mark with a 7/32-in., brad-point drill, which isn't deflected by slanting grain as much as a high-speed steel bit. I use the horizontal boring feature on my Shopsmith Mark V multipurpose machine to drill the blanks. You could also clamp the blank upright in a vise or against a high fence on a drill-press table. To bore through the 6-in. to 8-in. blanks, we generally drill in from one end with an extra-long bit. If you can't find long bits, you can drill in from both ends with regular-length bits. It's fine to have a hole at each end, because the top hole will be plugged with the eraser.

The pencil point must be reinforced so that pressure from writing won't split the wood. We use soft aluminum tubing (available from model airplane stores) with a 7/32-in. OD as a sleeve. Bore out the inside diameter to accept the lead cartridge. The tube should be inserted about 3/32 in. into the blank, then epoxied in place before being cut off about 1/8 in. longer than the wood blank.

Our turning mandrel is a custom-shaped, mild-steel mandrel with shoulders to fit the inner shape of the pencil. It can be turned on the lathe or mounted in a drill chuck and filed to shape as it is rotated. We epoxy the block to the rod at both ends to prevent spinning, so it's not necessary to make a tight-fitting mandrel.

The blank is mounted on the lathe by fitting the mandrel at the pencil's top into a Jacobs chuck and the other end into a drilled wooden plug in the tailstock. Turn to any desired shape. Note the pocket clips (salvaged from old felt-tipped pens) fit in shallow rabbets turned on the pencils. After sanding the pencils, we finish with tung oil. Finally, we carefully cut the pencil from the block with a skew. We saw through the excess tubing with a jewelers' saw, then remove the mandrel. If the reinforcing ring isn't securely fastened, we reglue before inserting the pencil mechanism. □

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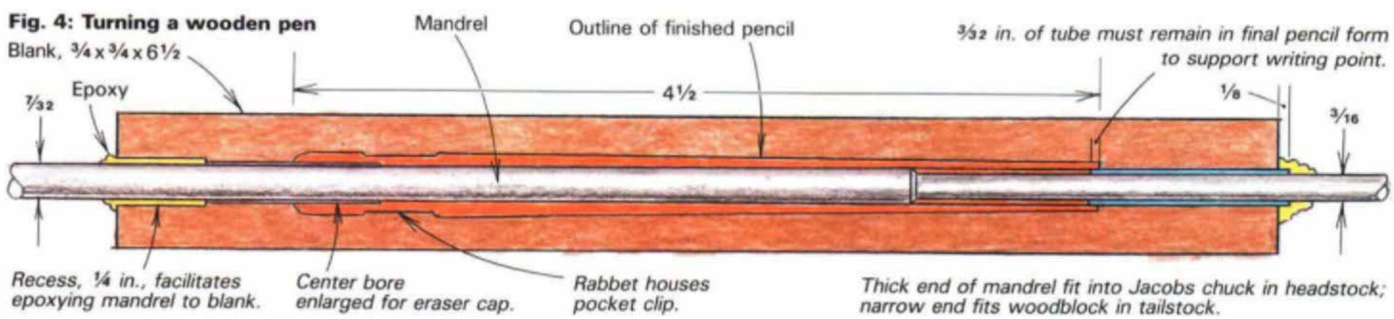

Photo: Michele Russell Slavinsky