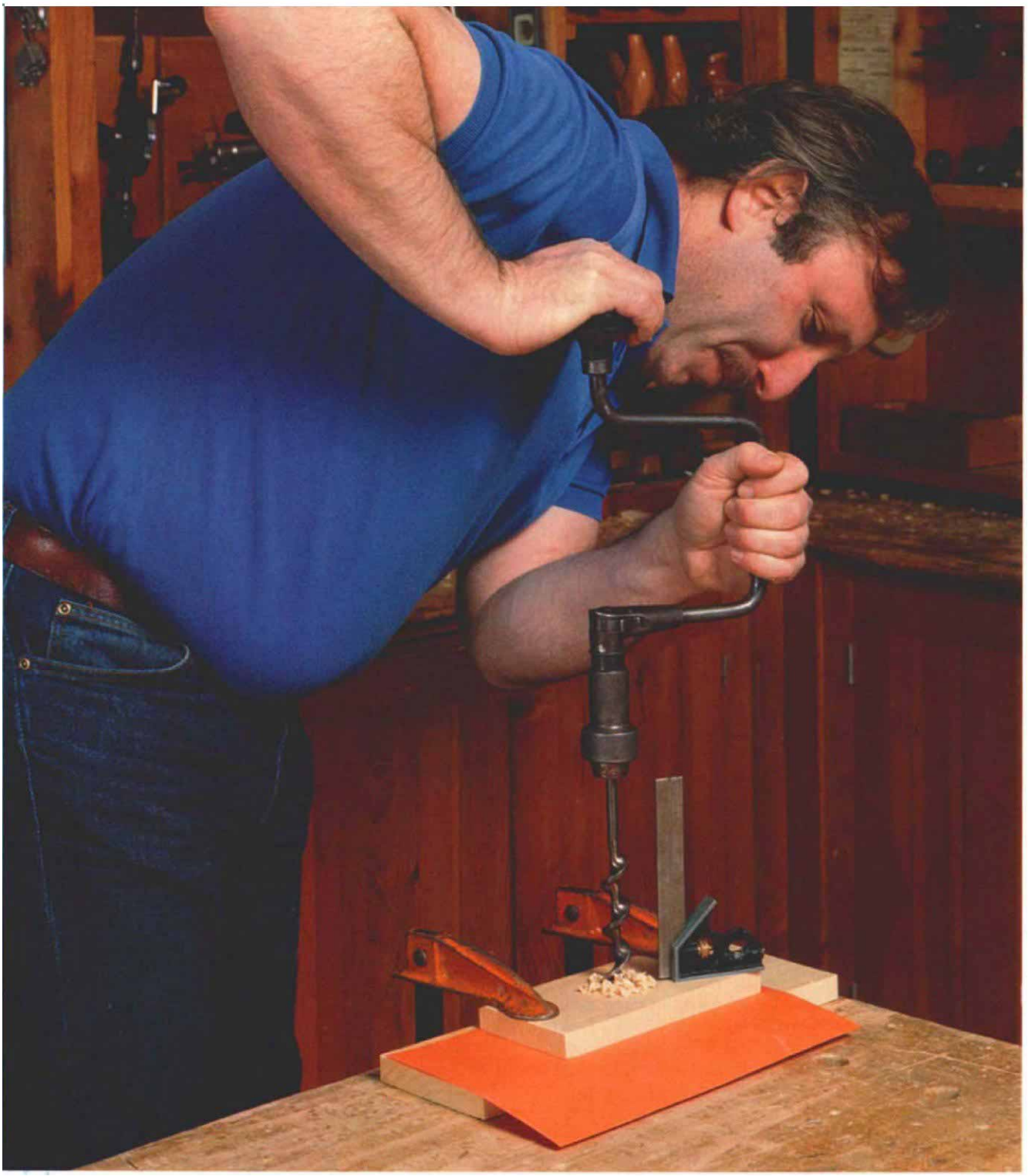

Using a brace and bit is a quiet and efficient, if somewhat antiquated, way of boring holes in wood. Here the author sights the bit against a square as he bores a perpendicular hole. The orange paper tells him when the bit is through the workpiece.

The Brace and Bit

This old standby can do more than just bore holes

by Richard Starr

Despite all the motorized drills available to woodworkers, the old-fashion bit brace is still a useful tool in today's shop. I use mine for boring holes when I don't want to mess with a power cord, and it's fun to use, too. I also use it for driving screws, tenoning, chamfering dowels and doing other jobs you might expect to do on a lathe or with a drill press.

Before the brace was invented, early craftsmen drove large boring bits with a simple cross handle, something that looks like a giant corkscrew. Although the cross handle may still be the most powerful tool to use for boring a big hole, it is hard to steer and the hand-over-hand motion is slow. It's also difficult to apply pressure on the cross handle to advance the bit through a hole. The brace is a surprisingly recent improvement, appearing in Europe only 600 years ago. Its design overcomes the problems of the cross handle by providing a top handle to push down on and another handle to drive the bit around in a circle. A simple crank that multiplies the rotating force of your arm, the brace's sweep (sometimes called swing) is the diameter of the circle your powering hand travels around the tool. To determine the sweep, measure the horizontal distance from the chuck to the handle and double it. The wider the sweep of the brace, the more your efforts are multiplied and the more torque (or rotary force) the brace puts out. Although a wide-sweep brace is more powerful, there is a trade-off: Your hand must travel in a larger diameter circle, so a wide-sweep brace bores slower than a brace with a narrower sweep. Thus, wide-sweep braces bore big holes better, while narrow ones bore smaller holes more quickly.

Unlike cross handles, which have one bit permanently attached to the end of a shaft, braces have an adjustable chuck that allows them to hold and drive different bits of varying shank styles and diameters. Bits used in braces may have round or square shanks, but most have a threaded leadscrew in the center that pulls the bit through the wood during boring. Some braces even feature a ratchet that powers the brace with a short reciprocal stroke instead of a full-sweep cranking motion. This feature is helpful for boring in a cramped location.

Choosing the right brace—In the days when they occupied a more prominent spot in the woodworker's tool chest, braces came in many sizes, and you could find one exactly suited for the job. Braces are still readily available in two sweep sizes: 6 in. and 12 in. A 6-in.-sweep brace is just the ticket when you don't need much torque, such as when boring holes up to ½ in. in diameter or when driving screws. The brace most commonly found in shops today, however, has a 12-in. sweep, which works fine for boring holes up to about ⅞ in. dia. in hardwoods or for forming up to ½-in.-dia. tenons. But you'll get frustrated if you try to use it for driving a large expansion bit. For that job, you'll do better with an old 14-in.-sweep brace. This brace will easily bore a 2-in.-dia. hole in hardwood, or with a hollow auger, will gnaw a 1-in.-dia. tenon on a chair leg. Unfortunately, as far as I know, 14-in. braces are no longer made. You might get a welder to modify a smaller one for you. Just make sure he keeps the alignment of the head and chuck perfectly straight, or the brace won't turn true. Otherwise, you'll have to scour the flea markets for an old 14-in. brace. With luck and for not much money, you may find a tool better made than any today.

Many braces feature a built-in ratchet that's handy in tight spaces where you can't make a full turn with the brace's handle. Located just above the chuck, it works like a mechanic's socket wrench, driving the bit only in one direction, then allowing the handle to return freely in the opposite direction. You can set the ratchet to work in either direction, for instance, to drive or remove screws. The ratchet allows you to use the your arm muscles in their most powerful direction, pulling toward your chest to drive the brace. There's also a tool that's built especially for ratcheting bits called a joist brace, so named because it is designed for drilling holes between joists. Joist braces are available from Woodcraft Supply Corp., 41 Atlantic Ave., Woburn, Mass. 01888; (800) 225-1153, or (617) 935-9278 in Massachusetts; part #01G11. Instead of having a crooked drive handle like a regular brace, the joist brace has a 10½-in.-long nearly straight handle you drive with a back-and-forth ratchet action (see the photo above). Besides allowing you to bore in a tight corner, the joist brace's long drive handle gives you tremendous torque-equivalent to a 21-in.-sweep brace.

A joist brace, with its ratchet action, can work in spots too tight for even an electric drill. The brace's relatively short height allows it to bore even inside a box, and the long drive handle provides exceptional power to drive the bit.

The most important thing to consider when buying a brace is the chuck. A good chuck is one that opens and closes easily and holds a bit securely. Most chucks will easily grasp a square-tang bit, because the bit's tapered, square shank is designed to center and drive without needing a super-tight grip from the chuck. Round-shank bits, however, are harder to grasp and slip more easily than square-tang bits in most brace chucks, and some of the older split chucks can't accept them at all. The chuck used on most modern braces has alligator jaws that are held together at the base by a spring, which spreads them at the open end of the chuck—like a hungry reptile's mouth. V-shape channels on the jaws' inner surfaces taper down at the tip to allow the chuck to engage square-tang or round bits.

If you decide to buy an older brace, you'll be confronted with an astounding variety of chuck designs. In my collection, I have at least eight very different styles ranging from split chucks that tighten with wing nuts to chucks that use ball bearings to reduce friction between the jaws and the collar, making tightening easier. Before you buy an older brace, examine the chuck to make sure its jaws and the collar surrounding them aren't cracked and that the spring that retains and spreads the jaws is in good shape—it can be difficult to replace. The threads between the collar and threaded core (at the end of the brace's shaft) of most chucks are meant to fit loosely to make the chuck easier to tighten, but check to see if they've been damaged from overtightening or worn so they don't tighten at all. But don't necessarily reject a brace just because it has a bad chuck: I once resurrected a hard-to-come-by 14-in. brace by welding on a good chuck from an old junker. My woodworking students now use it every day at school.

The most-abused parts of old braces are usually the wooden handles. Drive handles often split and fall off. Screws that hold

These old braces from the author's collection illustrate the variety of chucks found on older or antique tools you may encounter at flea markets. The split chuck, at far left, will hold only square-shank bits, and it locks them in place with a thumbscrew. The chuck next to it and the one at far right are both more modern designs, with alligator-type jaws with grooved inner surfaces that can hold square- or round-shank bits. Both have rotating locking collars that tighten against the threaded end of the brace, but the chuck at right has ball bearings inside the collar to make tightening the chuck easier. The chuck that's second from the right is a peculiar design in that its jaws project forward of the locking collar and are tightened by rotating the collar outwards—exactly opposite of an alligator-jaw chuck.

the top handle to its collar sometimes wear their way loose, the handle can then fall off and often ends up "missing." Fortunately, new wood parts can usually be turned and fitted. If the brace's handles are in reasonable shape but won't turn freely, a drop of oil may get them moving again. A bent brace can usually be wrestled back into alignment by clamping it in a vise and levering the braces with a monkey wrench with its jaws padded.

A brace should be properly lubricated. There's usually an oil hole in the collar below the top handle, but on better braces, including premium Stanleys, these handles turn on ball bearings, which need lubrication less often. A couple of drops of oil should also be applied to the ratchet mechanism where it meets the chuck shaft and on the pawl pivots. A touch of white grease on the threads of the chuck and on the jaws is also a good idea. The drive handle doesn't usually need lubrication.

Boring a hole—Using a brace and auger bit to bore a hole is smooth, quiet and safe. Regardless of how awkward cranking a brace seems at first, with a little practice, you'll be able to bore as straight and true with a brace as with a drill press. First, chuck up a bit by holding the bit between the chuck's jaws, keeping the locking collar from turning with one hand and rotating the brace to close the jaws with the other hand. Make sure the chuck's jaws are grabbing the bit concentrically as you tighten, because tightening the chuck on a misaligned bit can stress and fracture a jaw or damage the spring. Tighten the collar until it's hard to turn, but never use more than hand pressure.

When boring a perpendicular hole, the bit must be kept aligned in two planes. I set up a square next to the bit and sight along the axis of the bit to the square's edge. I also peek from the side to see that the bit lines up in that direction, and I check both views frequently as I bore. I use the same method for boring angled holes, except I use a bevel gauge instead of a square to align the bit.

Once you've engaged the bit in the wood by the first few turns of the brace, the auger's threaded leadscrew should drag the bit through the wood with very little down pressure as you crank. Hold the brace's head steady while you crank the handle: If you allow it to wobble, the leadscrew may lose its grip in the wood. Some craftsmen prefer to rest their forehead on the hand grasping the brace's top handle, but I like to bend my elbow far enough to let my shoulder bear on that hand (see the photo on p. 46). If you want to bore horizontally, rest the head of the brace on your belly or thigh. If you find it very hard to turn the brace, try one with a wider sweep. Switching to a larger brace for boring a big hole is like shifting your bicycle to a lower gear for climbing a hill—it gives you more mechanical advantage. If you only have one brace, use your pull stroke with the ratchet on to ease the work.

Any bit will leave a ragged exit hole as it bursts through the far side of a board. To avoid this, clamp your stock to a scrap backing board to support the wood fibers as the bit cuts through. A quick way to determine when the bit has gone through the workpiece is by using a backing board of a different color wood or by clamping some brightly colored paper between the boards. Watch for the signal shavings to show you are through. If you're boring at an angle, crank the brace a few extra turns to be sure you are completely through. Another way to ensure a clean exit hole is to bore until the point of the leadscrew protrudes from the other side of the board, then bore back in from that side. You can tell that the screw is through by pulling gently up on the brace when you are nearing the bottom of the hole. If the screw is out, the auger will simply stop boring. When you bore in from the other side, extra pressure is needed on the brace to drive the bit through, because the screw is chewing air, not wood. To bore a stopped hole to a specific depth, stick a tape flag or a piece of a dowel to the bit's shaft. When the tape flag sweeps away the shavings or when the end of the dowel touches, the depth has been reached.

Auger bits—For general hole boring, auger bits are the most commonly used and come in lots of lengths and diameters. An auger bit's main cutters slice away wood at the bottom of the hole. The spiral body of the bit removes chips from the hole with a screw-like action as the boring progresses. The spur cutters, located on the outside edge of the main cutters, shear the wood fibers at the circumference of the hole. For the smoothest holes and easiest boring, all the cutting edges should be kept as sharp as possible. You'll know the bit is dull if it produces crumbly looking dust rather than clean, spiral-shape shavings or if it takes excess pressure to advance the bit. A light touch-up with a file is usually all that is needed to sharpen a bit, filing on the beveled edge of the cutters and the inside edges of the spurs. You can modify an auger bit for boring endgrain by simply filing off the spurs, just don't use the bit for cross-grain boring, because it will leave a very ragged hole. If it takes a lot of down pressure to keep a sharp bit advancing into the cut, the leadscrew probably needs some filing. The screw's tip must be sharp-pointed, and the threads should be clean and unbent. If the threads are

damaged, you may be able to restore them with a needle file. For more on sharpening auger bits, refer to my article in *FWW* #44.

If you accidentally bore an undersize hole, don't just plunge in with an auger bit to enlarge it: The bit won't center properly and will cut eccentrically. Instead, bore the larger hole in a hardwood scrap and clamp it concentrically over the smaller hole. The scrap will keep the larger bit from wandering as you bore, but you'll have to use more down pressure to advance the bit, because the leadscrew won't engage the wood. You can also chuck a regular twist drill—the kind used for drilling metal—in your brace. It has a conical end that will center in the auger hole and bore an enlarged hole that's clean and concentric with the original. The brace's low speed and high torque are helpful here.

Expansion bits—If you want to bore a hole that's larger than any of your standard auger bits or a hole of precise size that falls between standard bit sizes, an expansion bit is the answer. Unlike a regular auger bit, which has fixed cutters and spurs, an expansion bit has a moveable cutter that adjusts in or out to change the diameters of the hole. Setting the bit to an accurate size, especially with a cheap bit, is a trial-and-error effort. Use the scale on the cutter to get into the ballpark, and check each setting by boring a trial hole in scrapwood before doing critical work. Be sure to lock the setting securely so it won't slip.

While boring with an expansion bit, try to keep the brace true and smooth-running. Since the bit has only one cutter rotating around the leadscrew, even a little wobbling at the head of the brace can cause the cutter to dig in and jam. If you're boring a deep hole, stop periodically and clear the shavings from the hole. The expansion bit has no spiral body to lift shavings out of the hole, and if you let them accumulate, you'll have a dreadful time yanking the bit out when you're done. If you bore through the workpiece, you *must* use a backing board. Without one, the leadscrew quits guiding the cutter in a circle before the hole is through, and you're left with half a hole to whittle clean.

Cutting tenons—One job you might not think of doing with a brace is cutting tenons. An adjustable jig called a hollow auger can cut round tenons on the end of sticks for chair legs or rungs. The hollow auger, with its plane-like blade that's adjustable for tenon diameter, cuts tenons quickly and with far less skill than it takes to cut them on a lathe. Unfortunately, hollow augers are becoming increasingly hard to find—even at old tool sales. I wish someone would manufacture them again.

A tool used in the brace that's more commonly available is the dowel pointer. A scaled-down version of the old-time spoke pointer (often used for chamfering the end of a stick before tenoning with the hollow auger), the dowel pointer is a hollow cone-shape tool that works like a kid's school-bag pencil sharpener. You can use it to neatly chamfer the end of a dowel or round tenon—up to about ¾ in. in diameter—to make it easier to insert into its hole or mortise. I usually set the stock in the vise so the axis of the dowel or stick is vertical. Then, I do my best to keep the brace plumb as I shave down the chamfer. (For more information on using hollow augers, see *Woodworking with Kids,* Taunton Press, 1982.)

Driving screws—Although high-tech cordless screwdrivers are rapidly becoming the standard tool for driving screws in the woodshop, many craftsmen prefer using a brace fitted with a screwdriver bit. Unlike a motorized driver, a brace lets you sense just how tight the screw is, and with a little practice, you'll never again snap the head off a screw or have its threads tear out of the wood.

A brace with a 6-in. sweep is ideal for driving screws, because you can turn it quickly and its driving torque is limited. A larger brace will work, but is less sensitive, so use some extra care during those last few turns. A 6-in. brace is also great for boring small pilot holes or for countersinking with a rose-head countersink.

It's best to use Phillips head screws and the appropriate-size screwdriver bit when using a brace, because the bit stays centered in the screw head. If you must drive slotted screws, try to keep the top of the brace aligned with the screw's axis as you crank. You'll also need to put extra down pressure on the brace to keep the screwdriver's blade from sliding sideways out of the slot and gouging the work. □

Driving dozens of screws is a breeze with a small-sweep brace, like the 6-in. model shown here. The brace provides more than enough torque for the job, yet provides a sensitive feeling, so screws can be driven to precise depth.

After chamfering the end of a chair rung with a spoke pointer, fitted in the brace in the foreground, the author uses an adjustable hollow auger to form a tenon on the rung. A plane-like blade on the bottom of the auger cuts the tenon by paring a shoulder around the tenon.

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