The Journey from *Penturning to Penmaking*

by Kurt Hertzog

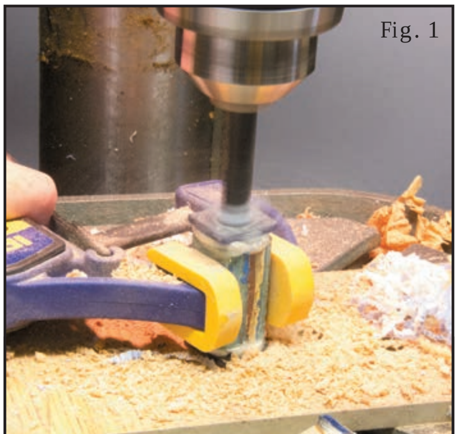
Questions from the Mailbag

It is probably time for a "Questions from the Mailbag" column; it has been a year since the last one. E-mailed questions are usually answered directly to the sender as discussion without images; however, I always save some questions so that I can share them with the readership at large if they are relevant. There are sure to be many who have the same or similar questions, so sharing them will help those who might have been too bashful to ask. Also, by answering them here, I am able to take the time for photography to illustrate the answers with some images that might help to further explain things. There are many topics, but this time I've decided to focus on those regarding drilling and related drilling problems. Space prevents covering them all, so there will be a column dedicated to the topic of drilling in a future issue. (*Note:* Questions are paraphrased for space.)

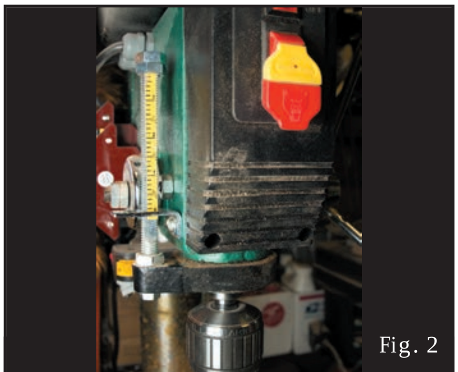
I can't drill all the way through pen blanks with the drill press that I have; what do you recommend?

There are many solutions to your problem of insufficient spindle (often called quill) travel. Let's set the baseline as drilling through each half of the standard 7mm pen blank so that there is some framework of reference. Drilling through half of a pen blank requires a spindle travel (or how far you can advance the drill bit from the top stop to the bottom stop) of a little over 2". This is in a perfect world with the drill in close proximity to the top surface and the bottom of the blank not resting on a sacrificial breakout block. Larger drill presses can have enough spindle travel, but smaller drill presses, particularly inexpensive or bench-top models, have much less travel. The solution to this problem falls into several categories.

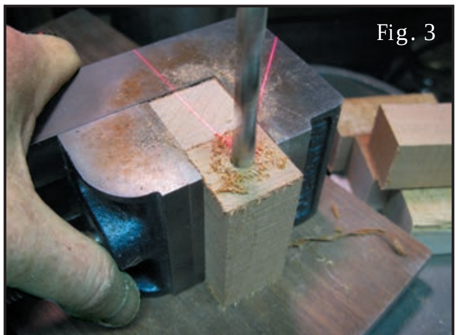
A drill press that has sufficient spindle travel could be purchased—perhaps not the most cost-effective solution, but it's certainly something to think about the next time you are planning an equipment purchase. Nearly all the major brands will list spindle travel in their specifications (see Fig. 1). However, if you are purchasing used or can't locate the specification sheets, spindle travel is easily measured. The simplest method is to place a 6" scale on the table of the drill press so that you can measure the bottom of the drill chuck at the highest point of travel and then measure again with it moved to the lowest point of travel. The difference between the two numbers is the quill



Regardless of physical size and floor-vs.-bench mount, one of the limitations to be aware of is spindle or quill travel.



When shopping for new equipment, check the manufacturer's specification sheet for spindle travel. Buying used will require measuring, but the drilling depth-stop mechanism often gives the answer.



When drilling with a limited travel drill press, drill as you normally would and then turn off the motor. As the spindle retracts, raise the work to keep the drill engaged, which allows for a spacer to be inserted underneath.

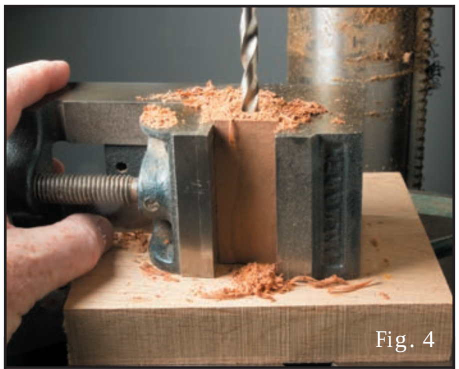


Fig. 4

Insert a spacer underneath the workpiece and clamping mechanism that will shim the currently drilled hole high enough to allow for the drilling completion. It is key that the spacer be uniform in thickness to prevent any cocking of the work.

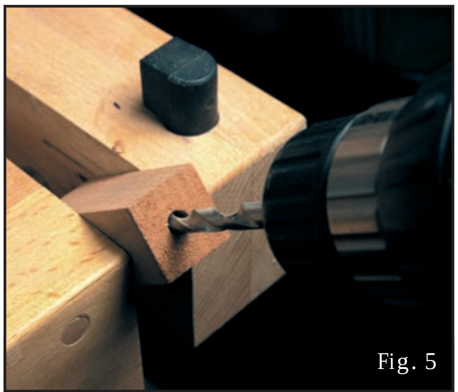


Fig. 5

A pistol drill can be used to drill pen blanks. A bench vise works nicely to secure the blank at a comfortable angle for drilling. A good starter mark from a prick punch will keep the drill from wandering as you start.

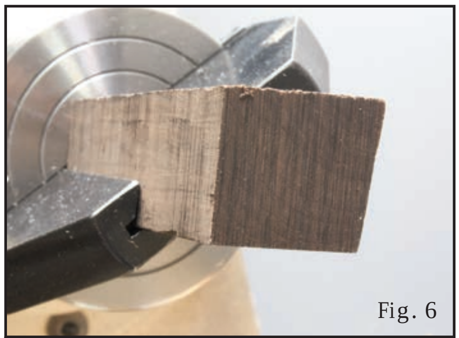


Fig. 6

A pen-drilling vise for a lathe has several advantages, with the most important being the ability to grasp a workpiece of nearly any shape. With two corner clamps, it can hold not only round shapes, but also square, rectangular, and trapezoidal, or nearly anything else with two corners.

travel. Be certain that the drill depth stops haven't been set and artificially limiting your stroke (see Fig. 2).

Another option is to do a two-step drilling. With the part properly clamped, perform the first drilling in the normal manner. That means marking, including a center punch starting location, and then turning off the drill press. Leave the work engaged with the drill as you return the quill to the up position (see Fig. 3). Insert a spacer, previously selected and placed within easy reach, that will shim up the bottom of the workholding mechanism—which can be anything from a drilling vise to a quick clamp holding the blank on top of a breakout board. The spacer must have several characteristics. First, it needs to be large enough to safely support the workholding device so that drilling can be safely done in step two. Second, it needs to be uniform in thickness so that the upward spacing doesn't cause any canting of the blank in any direction (see Fig. 4). Both the top and bottom of the spacer needs to be parallel so that no error is introduced into the subsequent drilling. With the spacer in place and the drill still engaged in the previously drilled hole, the drill press can be turned on again and the drilling can proceed to a deeper depth, depending on the thickness of the spacer block.

Another common method of drilling involves using a pistol drill. Though I don't typically use this method, it certainly is an option. The blank is prepped as usual with the starting point marked, and then clamped in a bench vise. The desired drill bit of sufficient length can then be used in a pistol drill. The drilling process still needs to be done with correct speeds and feeds along with breaking the chip. Done properly, this method can produce a quality hole, though the clamping mechanics present some backup-board issues (see Fig. 5). Of course, it does take some care to keep the drill traveling in the right direction, since there is nothing keeping things lined up except your own skills.

The best option I can offer is to use the best drilling device that you already have—the lathe makes an excellent drilling machine that will perform as well or better than a drill press. There are two methods that can be used when drilling on a lathe; either will allow you to drill with no real quill travel limitations—the only depth limitation will be the drill length. The only additional equipment that might have to be purchased would be a drill chuck on a Morse taper sized to fit your tailstock and a pen-drilling chuck (see Fig. 6). However, both are extremely handy tools that are modestly priced and will find plenty of use over the long haul.

The first lathe-drilling method is to use the lathe in the same manner as the drill press. Fix the blank in the headstock with a blank-drilling vise. The drill is mounted in a drill chuck with the proper Morse taper into the tailstock. A starting point can be marked effectively using a drill center (see Figs. 7 and 8). This will provide a good starting point for the drill, while minimizing any center wandering (see Fig. 9). The tailstock is moved forward until the drill is near contact and it should be locked at that point. Drilling is performed by advancing the tail center quill. If a deeper depth is needed, the quill is retracted and the tailstock is advanced with the drill still in the current hole. The tailstock is locked in this forward position and the quill is advanced again, drilling deeper. This process can be repeated until the depth desired is achieved or the maximum length of the drill is reached. Of course, proper speeds and feeds are particularly important using this method.

Another method for using the lathe for drilling involves not locking the tailstock in place or using the quill advancement. This process slides the tailstock forward slowly until the drill tip contacts the blank to be drilled, and then the tailstock is pushed forward to perform the drilling (see Fig. 10). The feed rate is controlled and the chip can be broken the same as with any other method by relaxing the advance force and then starting the forward force again. A center drill start point will help here as well.

Fig. 7

A center drill, basically a rigid short drill point, is a modest-priced method for creating a drill starting point on a lathe. Sets are available at discount auto and machinery suppliers.

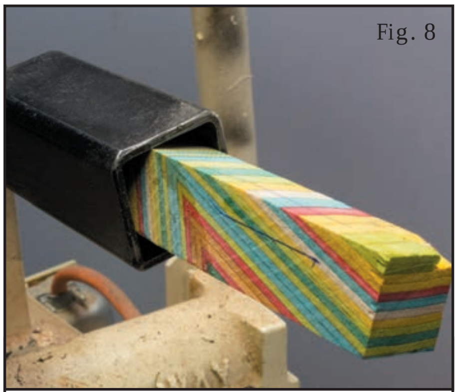


Fig. 8

A starter drill is extremely helpful with materials that are not perpendicular, vary in density or hardness, or are just irregular on the end to be drilled.

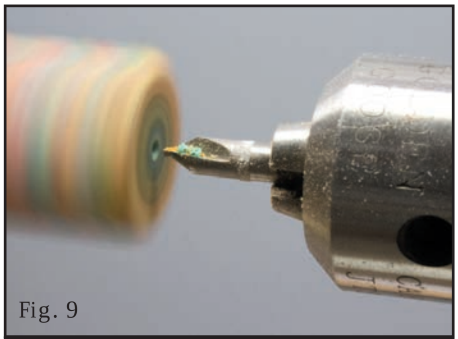


Fig. 9

It is very handy to have an inexpensive chuck with a center drill always mounted for quick and convenient use. It only takes a moment to create a good starting point that will prevent drill wander when starting to drill a hole.

Fig. 10

When drilling with the tailstock unfastened, the drill will find the path of least resistance as it drills. Speeds and feeds along with breaking the chip still apply. It is key to hold the drill chuck for safety throughout the process.

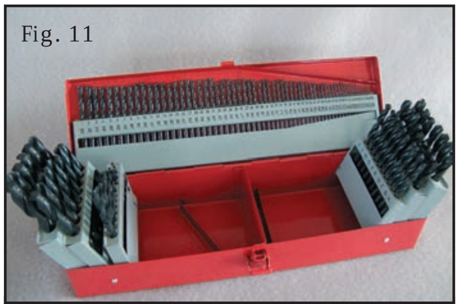


Fig. 11

In order to have maximum flexibility not only to select your size but also to overcome the drill size variability, it is helpful to have a number, letter, and fractional set of drills. A combination of all these can be bought on sale for a reasonable price.

Fig. 12

Whether high priced or economy priced, the indicated size on the drill is rarely the actual size. All have a manufacturing tolerance, with some more than others. Here a 7mm drill actually measures 0.272".

Caution must be used to ensure that the drill chuck remains safely engaged in the taper during the drilling operation, especially when retracting the tailstock.

I don't get a good fit with drilled holes; what am I doing wrong?

There are several causes for poorly fitting holes and the first obvious answer could be that your drill is not the size you think it is. For example, if you desire a 7mm hole and are using a 7mm drill, are you certain it is 7mm? Drills, just as other manufactured products, have a tolerance that can be tight, loose, or nonexistent (see Fig. 11). Especially with inexpensive drills, the size stamped on the shank is the nominal size, but perhaps not the actual size. I recommend measuring the tube that you plan to use and then measure the drill bit—the drill diameter should be appropriately larger than the tube. Select the drill from your index that, when measured, provides the desired clearance, regardless of the size indicated on the drill shank (see Fig. 12).

Even when the drill is measured, be aware that measuring the shank isn't going to indicate the final hole size, because the shank isn't really doing any of the work—the drill nose and flutes are doing the work. Measuring the shank is far quicker and easier than measuring across the flutes, but be aware that the flute dimension is usually a bit larger than the shank dimension (see Fig. 13).

Another variation in the drilling process is the material being drilled. The varied species of wood and alternate materials will often yield different results, even when drilled

Fig. 13

Measuring the shank is only a ballpark measurement. You don't drill any holes with the shank; the business end of the drill controls the hole size. That same drill creates a hole closer to 0.277" or five-thousandths larger than the shank measurement.

Fig. 14

Speeds, feeds, drill sharpness, material being drilled, debris discharge, and drilling mechanism all interact with the drilled hole size and quality. Wood, plastic, stabilized, burl, and straight or off-axis grain materials will each yield a slightly different result.

Fig. 15

Regardless of what the instructions say, I recommend that the hole be tailored to the dimension you want. Depending on what you desire, pick what gets you the final result. Test drillings in a scrap of the same material are helpful.

Fig. 16

Selecting the drill size based on your experience with all the variables will allow you to control the hole clearance. It can make the difference between squeegeeing off all the adhesive or having the appropriate amount of clearance for insertion and adhesion.

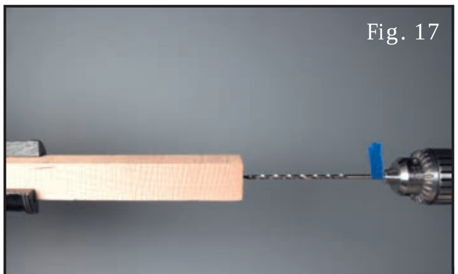


Fig. 17

Though the standard 7mm hole doesn't present a lot of challenges, others can. Here, a 0.125" hole needs to be drilled to a depth of 4.5" for a desk pen inkfill. A good starting point is key along with speeds, feeds, and breaking and clearing of chips.

Fig. 18

Drills themselves have huge variability. Error in center-point location or grind, as well as uneven or variations in the sharpness of the wings, can cause problems. If your drill isn't performing properly, either resharpen it or replace it until it works as desired.

with the same drill (see Fig. 14). The materials react to the drill differently, and the speeds and feeds that are used will somewhat impact the final hole size; therefore, if the hole size is critical, drill a test hole in the same material using the same method that you will use in the final piece. Don't be afraid to size the holes appropriately; regardless of the drill size required, select a drill that will create the size hole you want in the material being used (see Figs. 15 and 16). Test the result and continue until the desired diameter is achieved; then you will be able to drill the "good" piece with confidence that the final result will be what you need.

My holes wander off-center when I drill; what is the problem?

When a drill first contacts the material, it can have the tendency to wander. Unless there is a center point, made either by using a punch or a center drill, the drill is at the mercy of the material, the surface (both in consistency and perpendicularity), the flexibility of the drill (length and diameter), and the speed and feed. With all those things impacting the operation, it is surprising that holes wind up where they belong as often as they do. Even with the proper start, drilling will follow the path of least resistance, and depending on the material and grain orientation, length of drilling, size of drill, and the speed and feed, the actual resulting hole can deviate from the plan considerably (see Fig. 17). With all these potential causes of problems, you'd think there wouldn't be anything else, but there is—the actual drill geometry itself. Any deviation from the proper design, i.e., manufacturing flaws or improper sharpening, can cause all kinds of problems. Uneven wings or variations in the sharpness of the cutting edges will cause the drill to wander around even after a proper start (see Fig. 18).

CLOSING THOUGHTS

Though most folks believe that drilling holes is a "no brainer" and requires minimal attention, I disagree. Drilling a properly sized and placed hole isn't difficult, but it does take a bit of attention. Sharp drills that are properly selected for size are key. Providing a good start location is necessary so that the drill centers exactly where you want. Without the proper speeds and feeds, a quality hole is rarely achieved.

As for anything, practice makes perfect. Would you be wasting time practicing drilling to perfect your technique? I don't think so. Would you do well to develop a process flow that includes drilling a center mark on a lathe or using a prick punch for a drill press? Absolutely. In my opinion, the fundamental difference between the penturner and the penmaker is attention to detail. Though drilling a hole might seem unimportant, I'd suggest that doing it properly doesn't add any time, but does require much more attention to detail. Make it a rote skill in order to achieve the desired result in the proper location so that you can focus on the other details that will help separate you from the masses.