

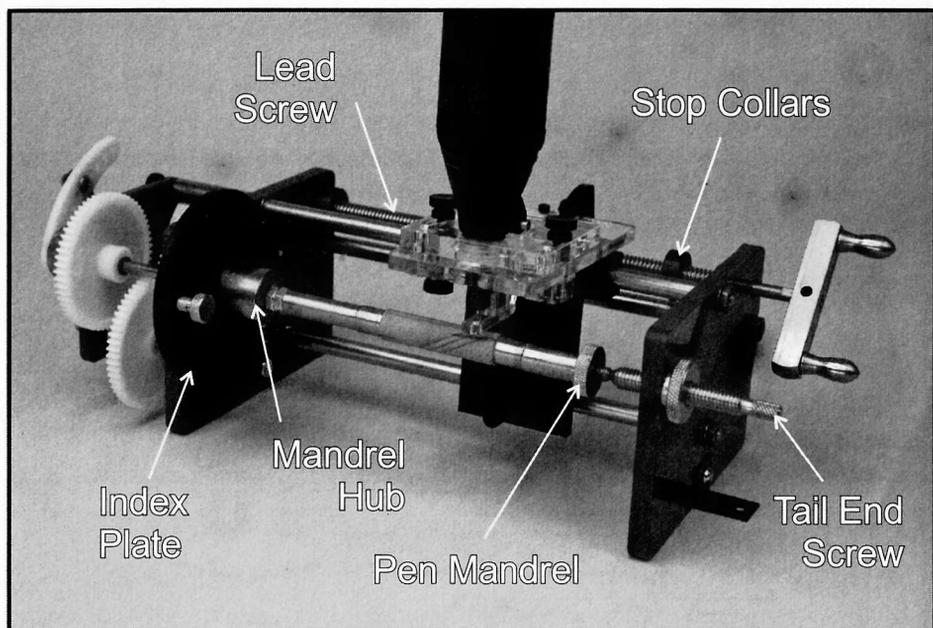
The  
Beall PEN



WIZARD  
Ornamental Pen Lathe

# The Pen Wizard Ornamental Pen Lathe

## Operating Instructions



### Starting Out

First turn a pen blank to shape on a standard lathe, then transfer the pen blank and mandrel to the Pen Wizard for further enhancement. A Dremel tool or a flexible shaft machine (like a Foredom) is used to make the ornamental cuts and the Pen wizard is designed to hold either of these tools. Any of the Dremels will work and some others, like the Foredom, Proxon or Black and Decker will work as well. A special holder is available for the Proxon and must be ordered separately. Take care to insure that the pen mandrel is tight in the mandrel hub, since vibration caused by the cutter could loosen it. 1/4-28 lock nuts are provided for this purpose and will fit either the A (included) or B mandrel. Tighten the tail end screw until it is just snug. Too much torque could warp the end plate.

Two stop collars are positioned on the lead screw and should be tightened with an Allen wrench. This will limit the travel in both the left and right directions. Install the rotary cutting tool and adjust its depth with the screw beneath the cutting tool plate. This will work for straight pens, but the special depth guide (included), must be used for curved or tapered pens. Very shallow cuts are usually best until you have gained experience with the tool. The bits most useful are round nose bits, called core box or

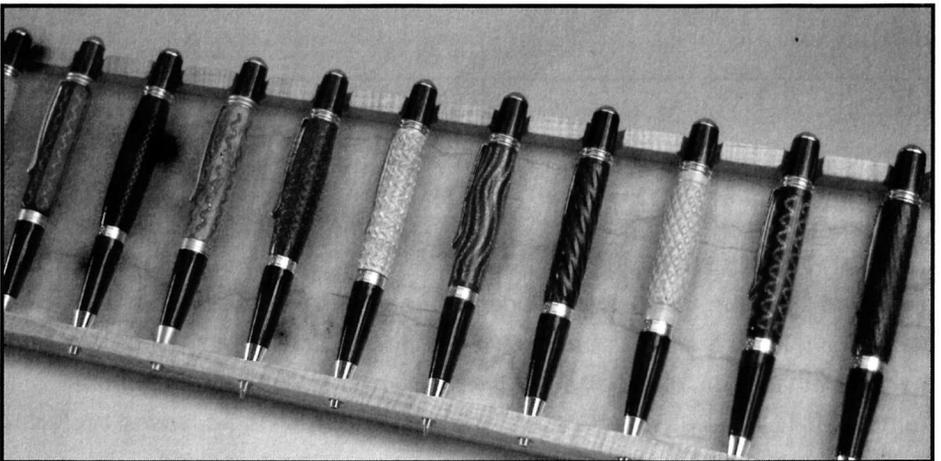
ball-end, and the sizes of 1/8 or under are most popular. We sell a variety of such bits to fit machines with 1/8" collets. Square-end and pointed bits are also used to make cuts which can be filled with epoxy and glitter or Inlace.™

## Cutting the Design

When you've chosen a design and set up the gear box, you can begin cutting. It's important to make sure that the mandrel hub is locked on the index plate with the spring plunger firmly in place. We suggest that you do your cutting from left to right. After making the first cut, lift the cutter and return to the starting end. Next, rotate the indexer the desired number of holes before making your next cut. Since the index plate has 24 holes, you can make any number of passes which will divide into 24: 2, 3, 4, 6, 8, 12 or 24.

It's probably best to cut in one direction only. If the cutting tool is left on and run back over the cut, the cut will become slightly wider due to the small amount of backlash in the gear train. If you employ a foot switch, you can easily turn off the tool during its return. This will save wear on the tool as well as on your nerves.

The Pen Wizard can make simple spirals in seven different pitches and may be reversed to do them in the opposite direction, as well, allowing you to produce cross hatch patterns, if you desire. It can also create *guilloche* or wave patterns which are unique to the Wizard and cannot now be obtained on any other machine.

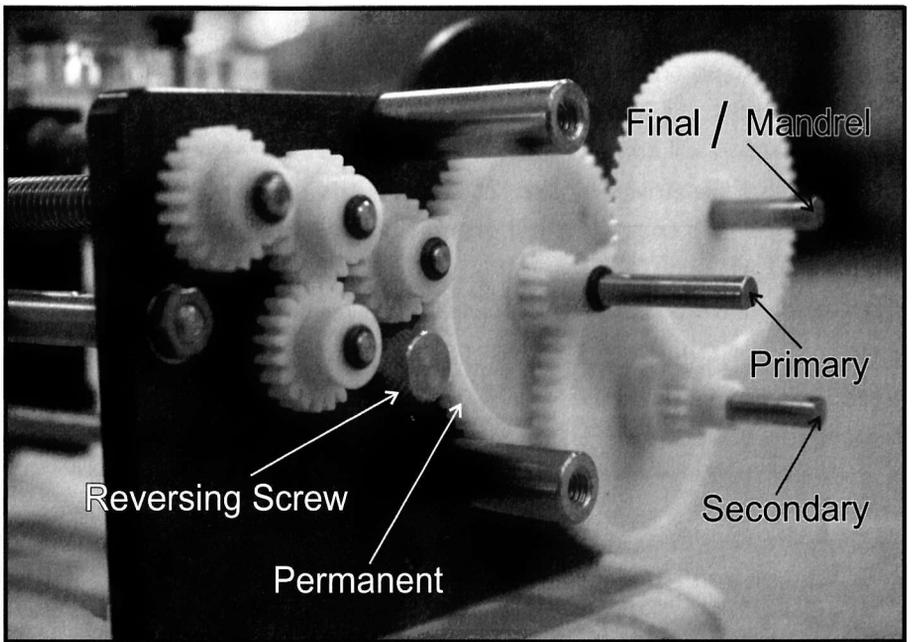


You can accomplish inlaid patterns like the ones shown on the preceding page by cutting grooves in your piece with a square-bottomed cutter and then filling them with Inlax<sup>™</sup> or epoxy and glitter. Then, return them to your standard lathe and turn or sand them smooth. (All the samples here were polished with the Beall Wood Buff, using no other finish.)



## Creating Polygons

Polygonal pens can best be produced by using a 1/8" cutter and positioning it so that it comes down beside the pen instead of at the top. It will be better to take 2 or 3 light passes rather than one deep one. Remove one of the drive gears and the cutter can then be moved back and forth, using the index plate to make as many flats as desired.



## Gear Box

*The “Gear Box” section describes how to set up the machine for different types of cuts. It will be useful, before starting on an actual pen barrel, to experiment with different gearing configurations.*

This photo shows the Pen Wizard’ s gear box with its outer plate removed. The four small, 20t gears on the left are all part of the primary drive and reversing mechanism and are never changed. The three 1/4" D shafts on the right are for the change gears. They are all equidistant from one another so that gears on any shaft can drive gears on any other. This allows you to obtain a wide variety of gear ratios, and, therefore, the maximum variety of ornamental effects.

The three ‘D’ shafts are designated as follows: Center is “primary”, lower right is “secondary” and upper right is “final” or “mandrel”

The 60t gear furthest in on the primary shaft is never changed since it must engage the 20t gear from the reversing mechanism. The smaller gear which sits on top of it can be a 12, 22 or 32t and it can drive either

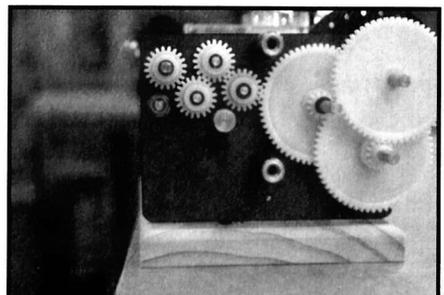
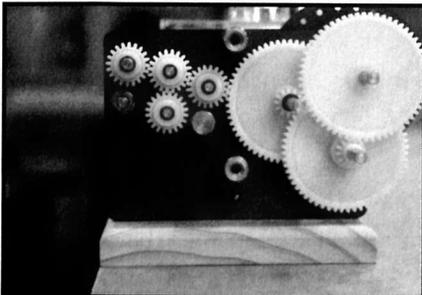
the secondary shaft or the mandrel shaft. In this picture, a 12t is driving a 60t on the secondary shaft and a 12t is driving a 60t on the final shaft. All the change gears are supplied in pairs with tooth numbers which will combine to make 72. If the 60t gear on the mandrel shaft is driven by the 12t gear on the primary, bypassing the secondary shaft entirely, it will dramatically increase the speed of the mandrel shaft.

The table shows the different speeds and travels of the gears supplied. The smaller of the gear pairs should always drive the larger, unless they are very close to the same size.

PRIMARY SHAFT	SECONDARY SHAFT	MANDREL SHAFT	Turns Per Inch
12	60-12	60	.12
22	50-12	60	.35
32	40-12	60	.64
12		60	.8
22	50-32	40	1.4
22		50	1.76
32		40	3.2

*These are the seven pitches possible with the supplied gears.*

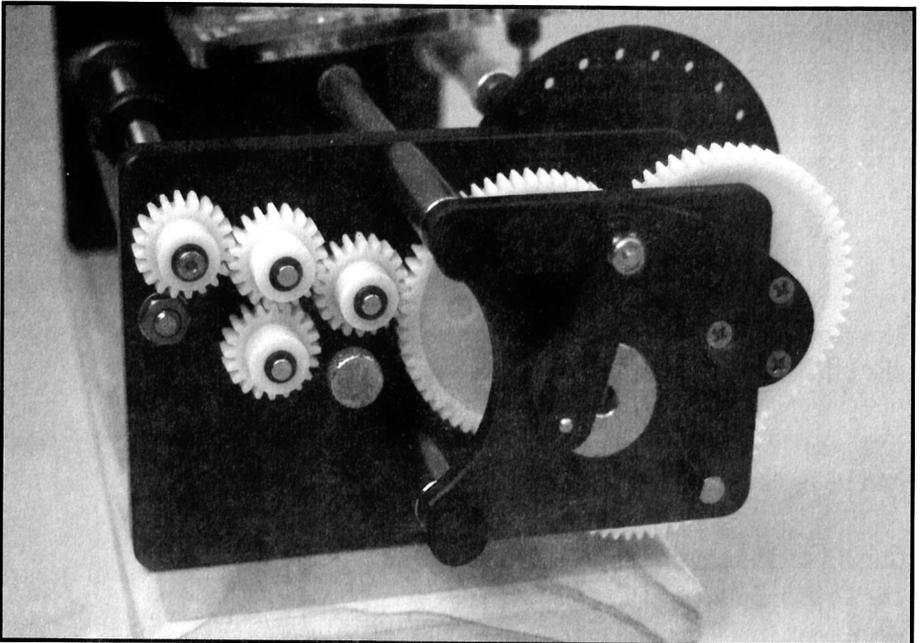
The reversing mechanism allows the mandrel to run either clockwise or counter-clockwise so that you can do cross hatching and checkering. To change the direction of the mandrel, loosen the reversing screw a few turns and move the unit up or down to allow the drive gear to engage either the upper or lower reverse gear. Then tighten the screw again to lock it into place. (There are holes in the plate to properly position the reversing screw.)



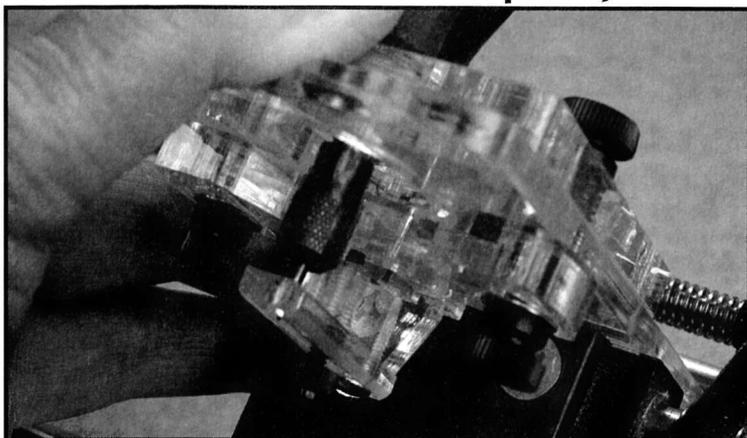
## The Guilloche Attachment

The guilloche attachment is nothing more than a crank assembly that attaches to the mandrel shaft and one of the other two drive shafts and produces a wave pattern by turning the mandrel back and forth as the cutter travels along it. A row of holes has been drilled in the crank arm, and by moving the connecting arm to different ones, you can change the amplitude of the wave. Just as you do when making spirals, you can also vary the frequency of the wave by altering the gear ratio.

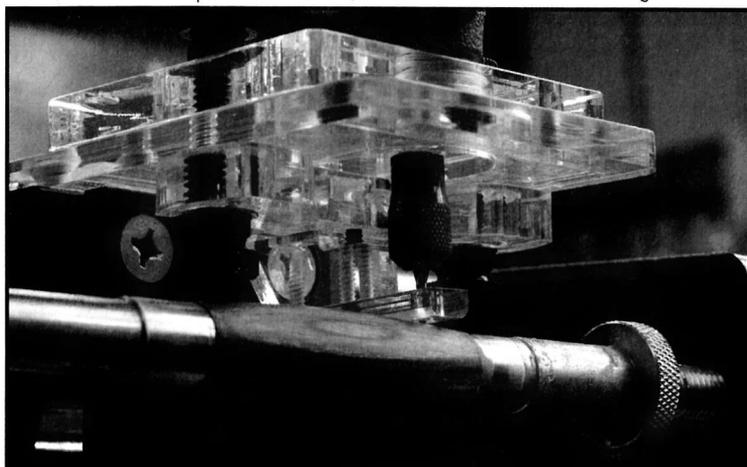
The picture shows the crank arm attached to the mandrel shaft where it always remains, and the connecting arm attached to the primary shaft. This configuration will produce a fast oscillation. If the connecting arm is moved to the secondary shaft, much longer waves will result. Changing gears will produce further variations in the length of the waves. If the connecting arm is attached to the outer end of the crank arm, a short length of back and forth movement will result. As the connecting arm is moved further in towards the hub, increasingly higher waves will be produced. The crank and connecting arm hubs are both secured with set screws which can be tightened with the provided Allen wrench.



## The Pen Wizard Depth Guide



View of the bottom of the top plate with the depth guide attached. The two standard black 1" nylon thumb screws have been replaced with 1 1/2" thumb screws and two black nylon thumb nuts. The bit should extend below the Dremel collet nut by 1/4" to 3/8". The small black adjusting screw will provide enough movement for fine adjustments.

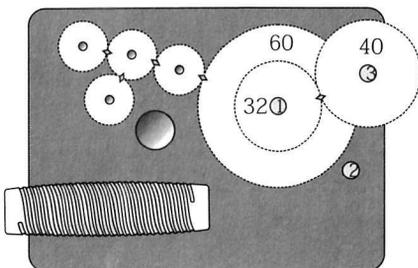
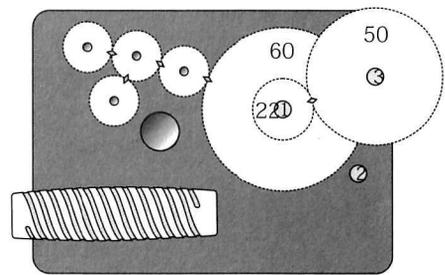
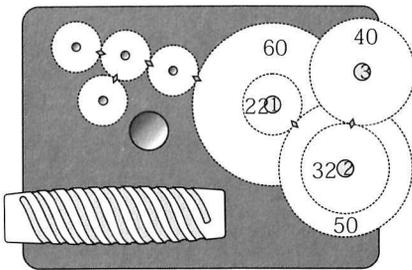
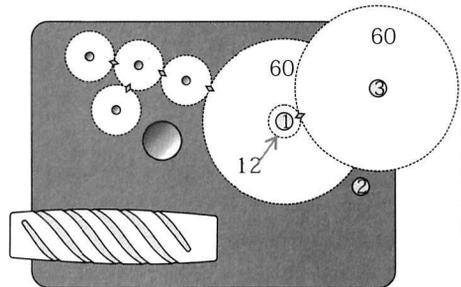
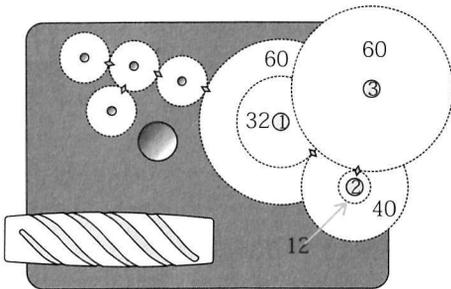
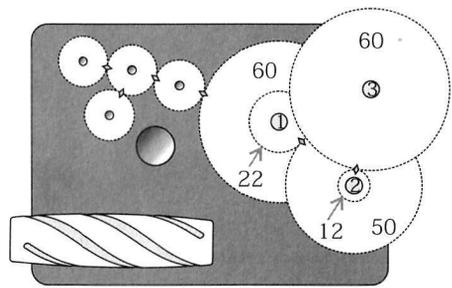
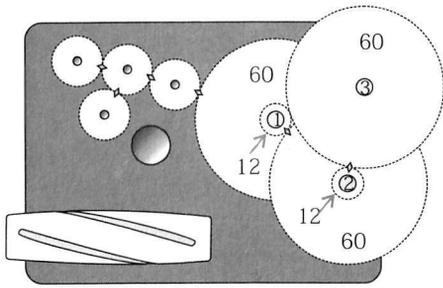


The slotted acrylic foot will ride on the pen blank and prevent the bit from going deeper than it is set for.

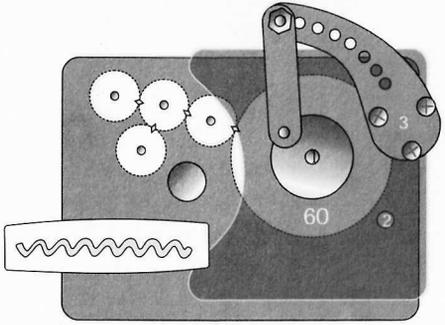
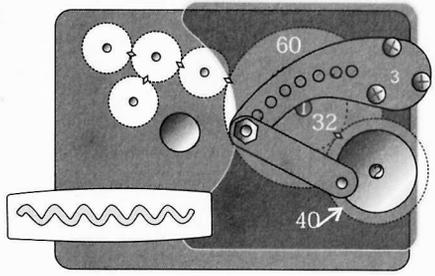
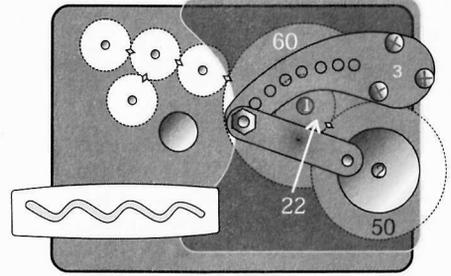
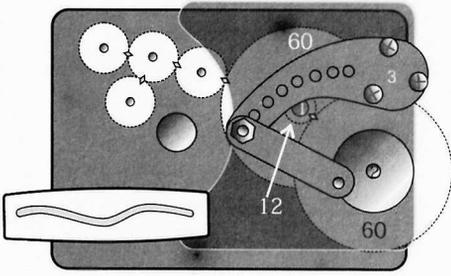
The depth guide will only work with bits that are 1/8" or less but the foot can be replaced with a shop made substitute for larger sizes.

Curved or tapered pen parts can be cut to uniform depths with the Depth Guide and you will find that very shallow settings work best for filling and relief cuts.

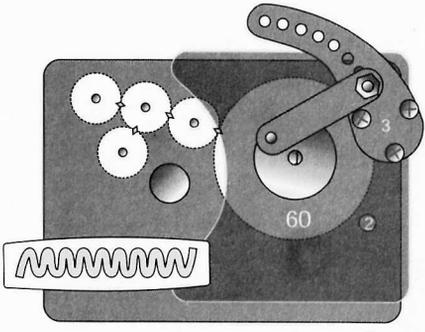




Motion can be reversed to create cross hatch designs.



Min Amp.  $\updownarrow$



Max Amp.  $\updownarrow$

Amplitude may be changed in any of the patterns by moving the crank connection to a different hole.



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