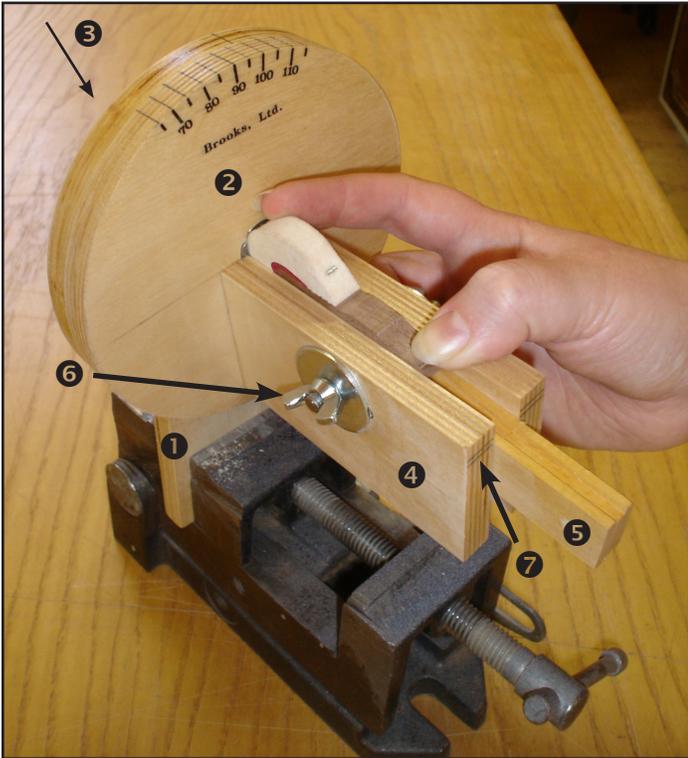




# THE BROOKS LTD HAMMER BORING JIG *by Wally Brooks*

*This technical worksheet is courtesy of Brooks LTD Piano Products  
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## JIG PARTS & FUNCTIONS

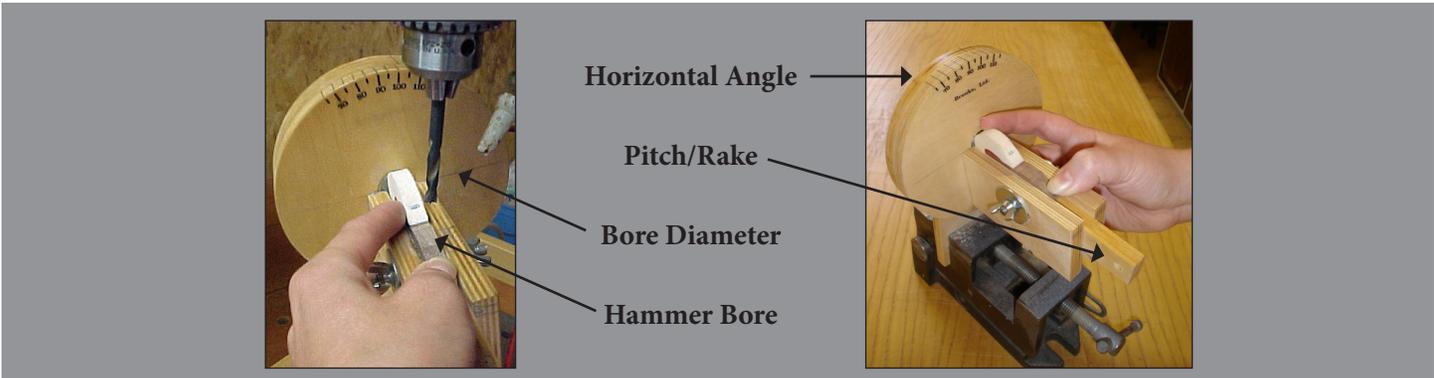


*Brooks LTD Hammer Boring Jig Parts*

- 1 Jig Foot** - This extension of the jig body is for securing the jig into the vise clamps. The vise (not included) will hold the jig steady during use.
- 2 Adjustable Horizontal Angle Disc** - This disc rotates to the left and right to allow for distinct and gradual horizontal angle changes in boring. The angle disc is marked in 5° increments, from 65° to 115°.
- 3 Angle Disc Clamp** - A wingnut and screw attach the angle disc to a second stationary disc. This clamp on the backside of the adjustable disc will loosen and tighten to allow for angle adjustments.
- 4 Hammer Guide** - Two stationary extensions can be found on the front of the jig. These extensions are parallel guides to assist in keeping the hammer steady while boring. These are not adjustable.
- 5 Hammer Guide Insert** - The hammer guide insert is adjustable forward, backward, up and down. The forward and backward adjustment allows for a snug and consistent fit for the hammer head in the guide. The up and down movement allows for pitch angle adjustments.

**6 Hammer Guide Clamp** - A wingnut and screw on either side of the hammer guide can be twisted in opposite directions to loosen or tighten the hammer guide, allowing for adjustment to the hammer guide insert.

**7 Pitch Angle Marks** - Two lines can be found on the front of either side of the hammer guide. The top mark represents 90°, the bottom 88°. Use these marks to assist in setting the guide to the correct pitch angle. *Note: This angle may differ between bass and treble hammers. Please refer to your sample measurements.*



## SETTING UP THE JIG

1. Place the jig foot in a flat-type drill press vise with jaws set 90° to drill press table. A cross vice is recommended, as you can adjust your hammer bore distance and center the bit in the molding. The foot of the jig should sit flat and square with the bottom of the vise.
2. The Hammer Guide Insert should be adjusted so the hammer felt is clearing the inside edge and only the molding is lying flat. The Insert is adjusted by loosening the wingnuts and sliding forward or backward.
3. Install drill bit in the drill chuck.
4. Set the drill press table so that the end of the drill bit is approximately ¾" above the sides of the hammer guide on the jig.
5. Set the drill press stop so the end of the bit protrudes approximately 1/16" into the groove of the maple insert when fully depressed. More than 1/16" will cause excessive wear to the insert. Inserts may be reversed and turned over. Replacements are available by calling (800) 326-2440.
6. The drill press can be set at any desired speed. We find a fast speed is best.
7. Bolt the vise to the drill press table through the center hole or the index slots in the table. Use a machine bolt or bolts and wing nuts. If your table does not have indexes, you will have to use clamps.

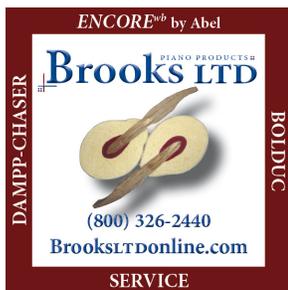
## USING THE JIG

*Please refer to Specification Guidelines for Custom Hammer Boring and the accompanying Boring Worksheet.*

1. Mark the hammer bore: Using a sample hammer from the bass and tenor/treble, measure the hammer bore and mark a line on the molding side you will drill.
2. Select the correct drill bit and install in the drill chuck. NOTE: The bored hole should need to be reamed for grands and allow room for glue on uprights.
3. Align your hammer placement: Place a bass hammer in the hammer guide, tail pointing toward you, hammer strike point against the center bold head. Adjust the maple insert by loosening the wing nuts on the sides of the hammer guide so only the molding is laying on the insert with the hammer felt laying over the edge. When drilling the bass hammers, keep the hammer against the left side of the guide when centering the bit. When drilling the tenor/treble hammer align the hammer to the right side of the guide.
4. Set the hammer bore: Slide the jig in the vise until the drill point is in line with the hammer bore line and centered in the middle of the hammer molding. (Horizontal angle must be at 90° for accurate alignment.) Clamp or bolt the vise in place. Clamp or bolt vise in place.
5. Set the pitch: There are two lines on the front of the hammer guide. These represent pitch. The top line is 90° to the shank, the bottom is 88°. Using these guides, loosen the maple insert set the pitch. Confirm your angles with a protractor and tighten the wing nuts on the hammer guide.
6. Set the horizontal angle: loosen the wing nut on the back of the jig and turn the hammer guide to the bass horizontal angel. Tighten the wing nut on the back so that it holds snugly while boring, but loose enough to easily adjust the horizontal angle.
7. Drill Bass hammers: Drill all hammers in the Bass section according to your measurements.
8. Drill Tenor/ Treble hammers: align sample hammer to left of guide, reset hammer bore, re-center jig, adjust pitch if necessary, set horizontal angle. Fasten vise. Adjust horizontal angle as necessary for hammers. At 90° confirm your angle with a protractor.

NOTICE: This hammer jig is designed for use by PROFESSIONAL piano craftspersons. Brooks LTD TAKES NO LIABILITY FOR THE USE OF THIS JIG.  
If you have any questions about setting up your new jig, please call (800) 326-2440.

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# SPECIFICATION GUIDELINES FOR CUSTOM HAMMER BORING

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These instructions are intended to give you a guideline for boring hammers. When boring hammers for a quality piano with original samples in good condition, copying the original measurements is recommended. If the original hammers are not available or the hammers do not regulate properly, take the *whole* piano into consideration when making adjustments.

When custom boring piano hammers, use a worksheet similar to the following example (*Fig. 1. Boring Worksheet*) to collect necessary information. A blank worksheet can be found at the end of these instructions.

*Fig. 1. Boring Worksheet*

<b>Make</b> _____	XYZ	<b>Model (length)</b> _____	6'	<b>Serial #</b> _____	54321		
<b>Hammers #</b>	<b>Angle</b>	<b>Hammers #</b>	<b>Angle</b>				
<b>Bass:</b> 1-20	101°	40-41	83°	<b># of bass hammers:</b>	20		
<b>Tenor:</b>		42-43	84°	<b>Bore diameter:</b>	0.215		
		44-45	85°	<b>Degree of pitch:</b>	92°		
21-26	78°	46-47	86°	<b>Hammer Bore:</b>	<b>Keybed to strings:</b>		
27-30	79°	48-49	87°			<b>Bass:</b> 2 1/4"	<b>Bass:</b> 7 3/4"
31-33	80°	50-51	88°			<b>Tenor:</b> 2"	<b>Tenor:</b> 7 1/2"
34-36	81°	52-53	89°			<b>Treble:</b> 1 15/16"	<b>Treble:</b> 7 7/16"
37-39	82°	54-88	90°				<b>Keybed to shank center:</b>
					<b>Note #88:</b> 5 1/2"		

1. **Bore Diameter:** Using a micrometer, measure the end of the shank. Select a drill bit close in size to the shank diameter. Test your measurement by boring an extra hammer or piece of maple. Insert the shank into the bored hole and adjust your bit size as needed. For upright hammers, the shank should turn in the hole without friction, leaving room for glue and minor adjustments. For grand hammers, the fit should be snug to allow for reaming.
2. **Bass hammers:** Separate your unbored set into Bass and Tenor/Treble hammers. Bass hammers have longer moldings than the Tenor/Treble hammers in a grand set, and the opposite on an upright set. Bass and Tenor/Treble bore distances are typically a minimum of 1/4" different.

3. **Hammer Bore:** Determine the distance from the center of the hammer shank hole to the crown (top) of the hammer, allowing for wear (see *Fig. 3a. Bore*) Or, calculate the difference between the string height and the center pin height. (see *Fig. 3b. & 3c.*) Example:  $7\frac{1}{2}'' - 5\frac{1}{2}'' = 2''$  hammer bore.
  - a. Measure the distance from the keybed to the bottom of the strings in the center of the three sections (as in setting up for a grand action for regulation.)
  - b. Measure the distance from the keybed to the center of the hammer shank center by placing the action (stack on keyframe) on a flat bench and measuring from the bench up to the center pin on note #88.

On quality pianos that play well in regulation, it is safe to duplicate the existing hammer bore. Many piano and action manufacturers may vary from this measurement, adding or subtracting  $1/8''$  for filing and wear or to get more power from the action. Having the wrong hammer bore mostly effects the regulation of the action. When in doubt, bore a sample hammer and regulate one note out.



*Fig. 3a. Bore – shank center to crown*



*Fig. 3b. Bore – string height*



*Fig. 3c. Bore – centerpin height*

4. **Horizontal Angles:** Clean off glue collar from the bottom of the hammer. Place the bottom of the hammer squarely against the flat edge of a pad of paper. Trace a line against the side of the shank. (see *Fig. 4a. Angle*) Square the protractor against the edge of the pad and match the traced line with the long arm. The line angle measurement is your horizontal angle. (see *Fig. 4b. Angle*)

The bored hammer may match the angle of the strings, however we do not recommend boring more than  $15^\circ$  from  $90^\circ$  to avoid passing problems. The boring angle may need to be reduced from the string angle if it exceeds  $15^\circ$ .

Most bass hammers will be bored the same throughout the section. Start the tenor section matching the angle of the string. Identify the first straight hammers, then straighten every few hammers  $1^\circ$ - $2^\circ$  at a time. (See *Fig. 1. Boring Worksheet*)



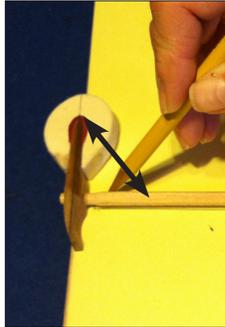
*Fig. 4a. Angle*



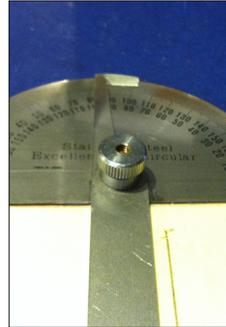
*Fig. 4b. Angle*

5. **Pitch or Rake:** Many hammer sets are not 90° to the shank. They may be tilted down against the shank as much as 6° and away from the shank as much as 3°.

Measure this angle by drawing a line down the center of the hammer molding. Align this center line parallel to the edge of a pad of paper. Trace a line along the side of the shank. (see *Fig. 5a. Pitch*) Use a protractor to measure the degree of the line angle. This is the angle of pitch. (see *Fig. 5b. Pitch*)



*Fig. 5a. Pitch*



*Fig. 5b. Pitch*

### BORING WORKSHEET

Use this blank worksheet to collect your necessary measurements:

Make \_\_\_\_\_ Model (length) \_\_\_\_\_ Serial # \_\_\_\_\_

Section	Hammers #	Angle	Hammers #	Angle				
<b>Bass:</b>					<b># of bass hammers:</b>			
<b>Tenor/ Treble:</b>				83°	<b>Bore diameter:</b>			
				84°	<b>Degree of pitch:</b>			
				85°	<b>Hammer Bore:</b>		<b>Keybed to strings:</b>	
		78°		86°	<b>Bass:</b>		<b>Bass:</b>	
		79°		87°	<b>Tenor:</b>		<b>Tenor:</b>	
		80°		88°	<b>Treble:</b>		<b>Treble:</b>	
		81°		89°	<b>Notes:</b>		<b>Keybed to shank center:</b>	
		82°		90°			<b>Note #88:</b>	

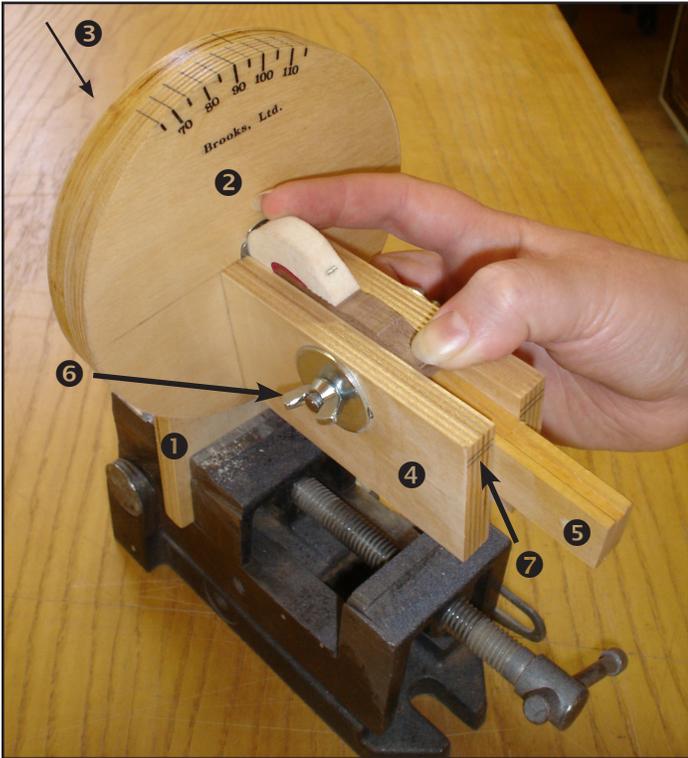
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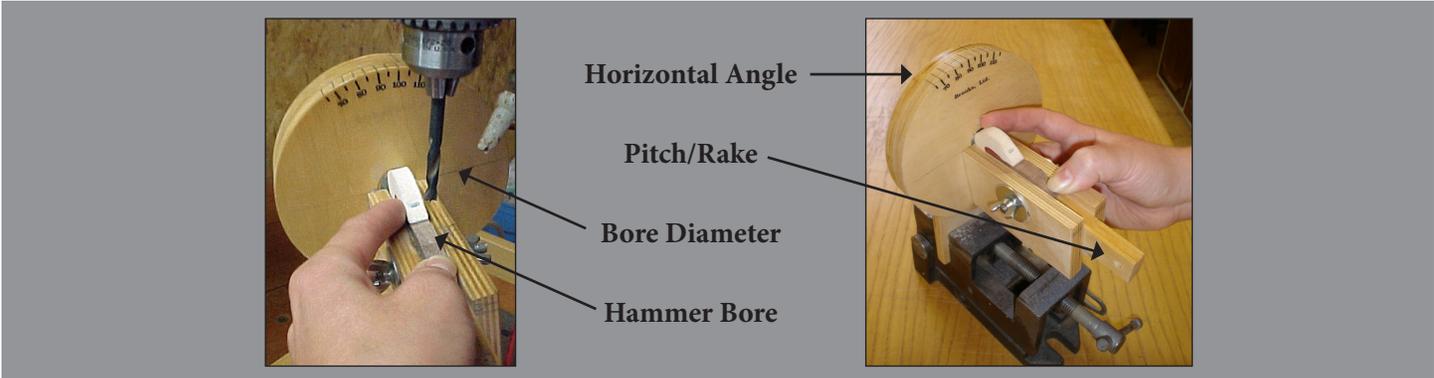
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3. Install drill bit in the drill chuck.
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Make \_\_\_\_\_ Model (length) \_\_\_\_\_ Serial # \_\_\_\_\_

Hammers #	Angle	Hammers #	Angle		
Bass:			83°	# of bass hammers:	_____
Tenor:			84°	Bore diameter:	_____
			85°	Degree of pitch:	_____
	78°		86°	<b>Hammer Bore:</b> Bass: _____ Tenor: _____ Treble: _____	<b>Keybed to strings:</b> Bass: _____ Tenor: _____ Treble: _____ <b>Keybed to shank center:</b> Note #88: _____
	79°		87°		
	80°		88°		
	81°		89°		
	82°		90°		

Notes:

Make \_\_\_\_\_ Model (length) \_\_\_\_\_ Serial # \_\_\_\_\_

Section	Hammers #	Angle	Hammers #	Angle
<b>Bass:</b>	1-20	101°		
<b>Tenor/ Treble:</b>			40-41	83°
			42-43	84°
			44-45	85°
	21-26	78°	46-47	86°
	27-30	79°	48-49	87°
	31-33	80°	50-51	88°
	34-36	81°	52-53	89°
	37-39	82°	54-88	90°

<b># of bass hammers:</b>		20	
<b>Bore diameter:</b>		0.215	
<b>Degree of pitch:</b>		92°	
<b>Hammer Bore:</b>		<b>Keybed to strings:</b>	
<b>Bass:</b>	2 1/4"	<b>Bass:</b>	7 3/4"
<b>Tenor:</b>	2"	<b>Tenor:</b>	7 1/2"
<b>Treble:</b>	1 15/16"	<b>Treble:</b>	7 7/16"
<b>Notes:</b>		<b>Keybed to shank center:</b>	
		<b>Note #88:</b>	5 1/2"