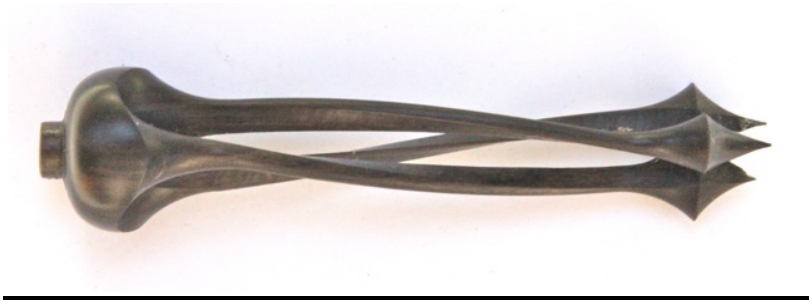
Straight Finial



Finial with a twist

Triple Finials

Version 1

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Triple Finial

The following document describes the steps in making a finial, which has three separate but connected finials. Recognition should go to Gorst DuPlessis from providing instructions and guidance. The rose engine used in the project is a Lindow Rose Engine (LRE), and its accessories.

Equipment used:

1. Leveling Chuck
2. Holding Chuck
3. Universal Cutting Frame (UCF) with the triangular cutters.
4. Universal Cutting Frame with the 3/16" round cutter.
5. Hardinge Slide Rest
6. Rosette (P3 – 175) or Rosette (D3 – 440)
7. 'T' Rubber
8. Dial Indicator

This document also refers to the supporting document 'Lindow Rose Engine Alignment Procedures' (Version 2) available from Lindow Machine Works.

1. Preparing the wood blank for the finial

a. Cut a round piece of wood approximately 3/4″ diameter and 5" long, plus extra to hold in the Holding Chuck. Cut a shoulder to fit the Holding Chuck. The finial should be about 2/3 of the height of the composition with the bottom section being 1/3.

2. Setting up the Lindow Rose Engine

Note: *If the rosette used* is ***P3 – 175*** *the cutting frame is installed on the right side of the spindle. Alternatively, if the* ***D3 – 440*** *rosette is used the cutting frame is installed on the left of the spindle.*

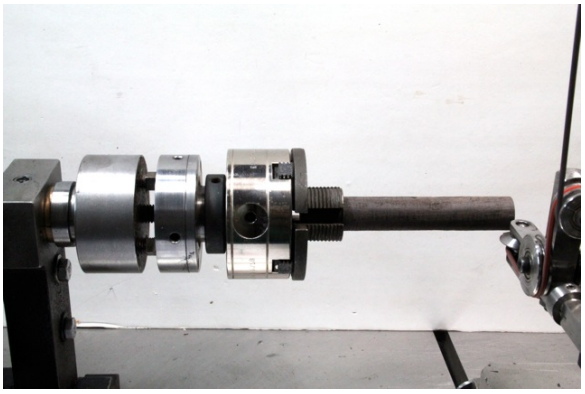
In this document the ***D3 – 440*** *rosette is used.*

a. Install the Hardinge sliderest on the left side of the spindle. Ensure it is square to the LRE top.

b. Install the Leveling Chuck and Holding Chuck.

c. Install the Universal Cutting Frame with the triangular cutters on the sliderest, and align the cutting head to the center of the spindle. Refer to 'Alignment Procedures' document **Section - 2 2.0**

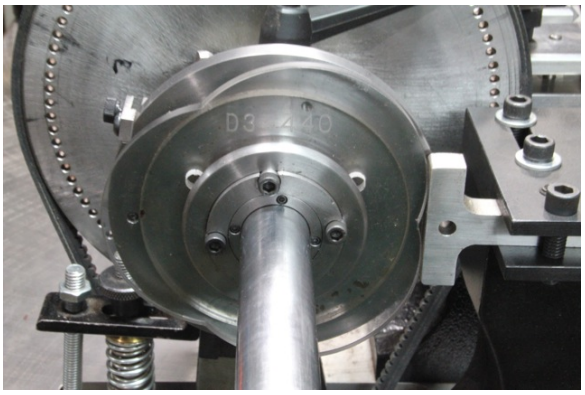
d. Clamp the wood blank in the Holding Chuck.



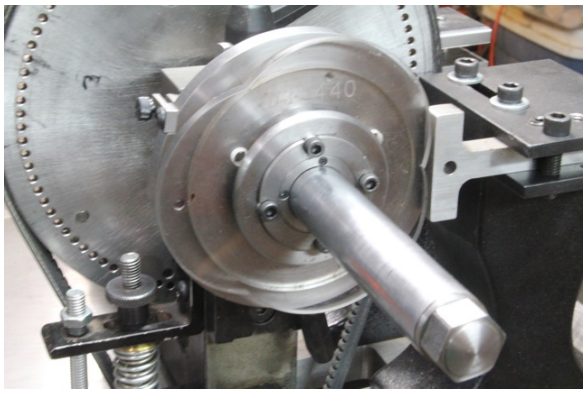
e. It is important to ensure the three finials are cut equally so use a dial indicator to check the wood blank radially. Refer to 'Lindow Rose Engine Alignment Procedures' document **Section 3 – 3.4a**.

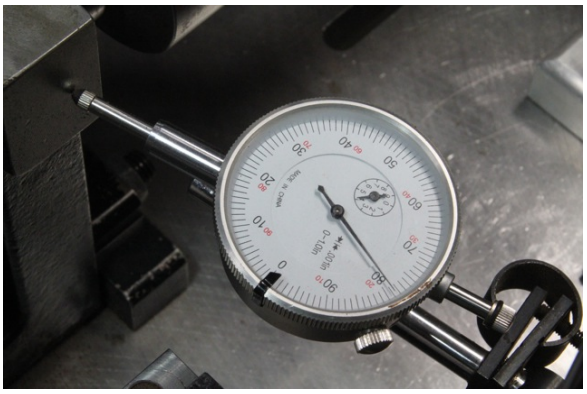
f. Set the Hardinge top slide on an angle of 1 degree (for a 2 degree inclusive angle). This angle allows the diameter of each shaft of the finial to get larger as the cutter moves down the finial.

g. Install the D3 – 440 rosette and the 'T' Rubber and ensure the movement is smooth when the wood blank is rotated. Align the headstock so there is equal movement of the headstock both sides of top dead center. Refer to 'Lindow Rose Engine Alignment Procedures' document **Section – 1 1.2.**



h. To limit the amplitude slightly, and to keep the cutting head from having so much tool pressure at the bottom of the cut, use the headstock limiter/lockout knob i.e. the knurled knob that is at the back of the LRE, to keep the rubber from going all the way into the valley of the rosette. For this adjustment install a dial indicator against the headstock and move the rosette so the 'T' Rubber is against the lowest part of the rosette. Rotate the knurled knob moving the rubber away from the rosette by about 0.020" on the dial indicator.





3. Cutting the finial

Note: *To get a smooth finish it is imperative to move the cutting head down the finial slowly. Do not go back and re-cut a completed area on the finial. On the last cuts slow the LRE down to ensure a good finish*.

First cut ---

i. Position the cutting head at the top of the wooden blank so that the sharp edge of one of the cutters is inline with the end of the wood blank. Move the cutting head out a further 0.050" (50 on the dial).

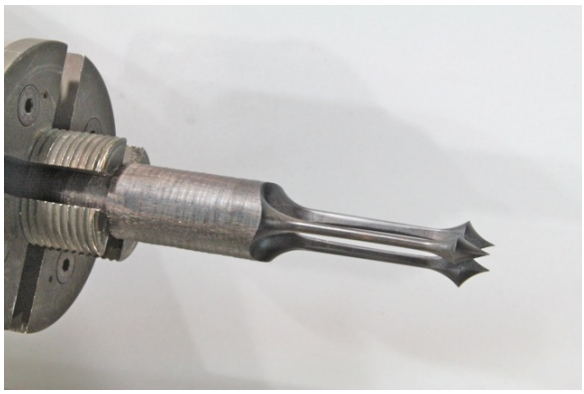
ii. Ensure the wood blank is moving in a counter-clockwise direction. This will prevent the Leveling/Holding Chuck from becoming loose on the spindle.

iii. Start cutting the three heads of the finial. Move the cutting head in slowly, once there is a point on each of the three heads move the cutting head away from the wooden blank. The depth of the top is about 3/8".

Second Cut ---

i. Position the cutting head just below the bottom of the finial head by moving the cutting head down 8 1/2 turns of the sliderest dial (0.85”). Start rotating the wood blank slowly and move the cutting head in until the center of the three finials is removed. The thickness of each of the three finials should be about 0.150”. It is not necessary to touch this dial again.

ii. Move the cutting head slowly down the wood blank cutting the three sides of the finial until the correct length of finial has been cut. Finally, slow down the speed of the LRE to burnish the shoulder.



Third Cut ---

i. After completing the finial:
Either -

i. Remove the Holding Chuck and finial from the LRE and install on a plain turning lathe.

ii. Turn the base of the finial round and cut a 5/16” spigot. Use 300 to 600 grit waterproof sandpaper to sand and polish the three finials and base. Apply wax and polish with a soft cloth. Hold the finial loosely when parting off the finial.

Or -

i. If the finial is left on the LRE use 300 to 600 grit waterproof sandpaper to sand and polish each of the three finials both inside and out. Apply wax and polish with a soft cloth.

ii. Install the Universal Cutting Frame with a flat 3/16” cutter against the wood blank.

iii. Cut the outside of the finial base round, then cut a 5/16” spigot. Use 300 to 600 grit waterproof sandpaper to polish the base. Apply wax and polish with a soft cloth. Carefully remove the finial from the wood blank.

4. Completed Finial.

5. Alternative finial design

The finial described above can be cut with a twist along its length. The worm on the Auxiliary Rosette Holder or Crossing Wheel is used to phase the rosette, and the amount of twist depends on how much the worm is turned.

a. To calculate the number of turns of the worm for a given twist:

Auxiliary Rosette Holder (used in the project)

Step 1 – decide on the length of the body of the finial. In this project the length is 3". Also, determine the amount of twist, which should be somewhere between 120 and 180 degrees.

Step 2 – in this project the cutting head was moved down the body of the finial in increments of 0.030" before the worm was moved. Therefore, using 3" as the length of the finial it was necessary to make 100 cuts.

Step 3 – Each complete turn of the worm moves the phase by **3** degrees. To determine the amount of twist:

i. ¼ turn = 0.75 degrees multiplied by 100 cuts equals 75 degree twist.

ii. ½ turn = 1.5 degrees multiplied by 100 cuts equals 150 degree twist.

iii. 3/4 turn = 2.25 degrees multiplied by 100 cuts equals 225 degree twist.

Moving the worm by 1.5 degrees (1/2 turn) is a good compromise.

Crossing Wheel (using the same requirements as above)

Step 1 – the length of the body of the finial is 3". The amount of twist should be somewhere between 120 and 180 degrees.

Step 2 – the cutting head was moved down the body of the finial in increments of 0.030" before the worm was moved. Therefore, using 3" as the length of the finial it was necessary to make 100 cuts.

Step 3 – Each complete turn of the worm moves the phase by **2** degrees. To determine the amount of twist:

i. ¼ turn = 0.5 degree multiplied by 100 cuts equals 50 degree twist.

ii. ½ turn = 1 degree multiplied by 100 cuts equals 100 degree twist.

iii. 3/4 turn = 1.5 degrees multiplied by 100 cuts equals 150 degree twist.

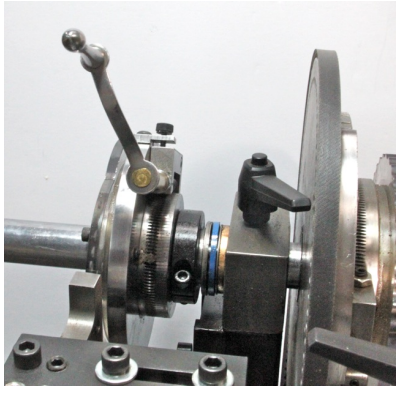
Moving the worm by 1.5 degrees (3/4 turn) is a good compromise.

b. Cutting process:

i. First step is to repeat sections 1 and 2, and in section 3 repeat Step 1 and only part i. of Step 2. These instructions are described above when making the original finial.

ii. Stop turning the finial, but leave the cutting head turning. Set the top slide dial to zero.

iii. Turn the handle of the worm by ½ turn.



iv. Start turning the finial, and let the cutting head cut each third of the finial.

v. When complete move the cutting head down by 0.015” (15 on the dial) and let the cutting head cut each third of the finial. Repeat the process by moving the cutting head down another 0.015” (15 on the dial).

vi. Stop turning the finial.

vii. Repeat step iii. thru vi. above until the required length of the finial is cut.

viii. Complete the finial as required.

c. Completed twisted finial.