

3D Printed Tailstock Quill Impeller for Wood Lathes

Original Concept Credit: This design is based on an idea originally developed by Jim Duxbury. Thank you, Jim, for the creative inspiration!

Attached are STL files that allow you to 3D print an impeller that attaches to your lathe's tailstock handwheel. This device lets you rapidly advance or retract the quill using compressed air.



Printing Recommendations

- **Material:** I printed my impellers in PLA, which has worked well.
- **Good alternatives:** PETG is an excellent choice for better durability and heat resistance.
- **Other option:** ABS will also work but is more challenging to print due to warping and adhesion requirements.

Impeller Design

The impeller consists of two separate pieces that assemble together around the handwheel hub:

- **Headstock-side piece**
- **Tailstock-side piece**

Two versions are provided for the headstock-side piece:

- One sized for the **Powermatic 3520** (1 9/16" outer diameter hub)
- One sized for the **Laguna 1836** (1 7/16" outer diameter hub)

The **tailstock-side piece** is identical for both lathes.

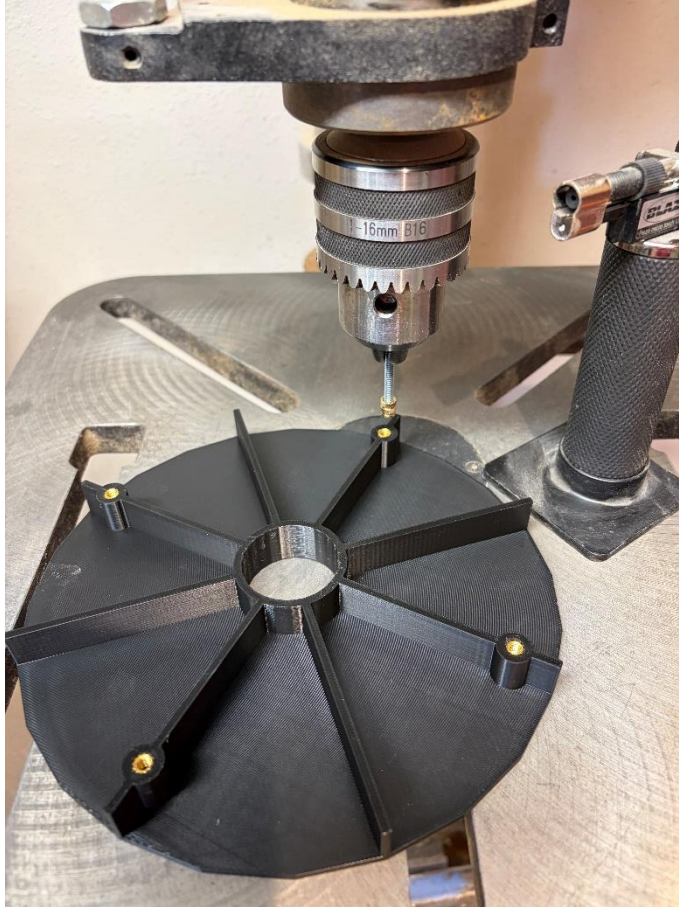
Other lathes may have different hub diameters and may require scaling or modifying the STL files.

Required Hardware

- **Powermatic 3520:** Replace one 1/4-20 set screw with a 3/4" long 1/4-20 set screw.
- **Laguna 1836:** Replace the single 5/16-18 set screw with a 3/4" long 5/16-18 set screw.
- Four **#8-32 heat-set inserts** (primary method) **or** longer screws and nuts (alternative method)
- Four **#8-32 × 3/8" screws** (for heat-set insert version)

Note: The STL files do not include holes for the set screws. You will need to locate and drill these after test-fitting.

Installing Heat-Set Inserts (Headstock-Side Piece)



The headstock-side piece has four molded bosses designed for #8-32 heat-set inserts.

Recommended Installation Method (for straight, accurate results):

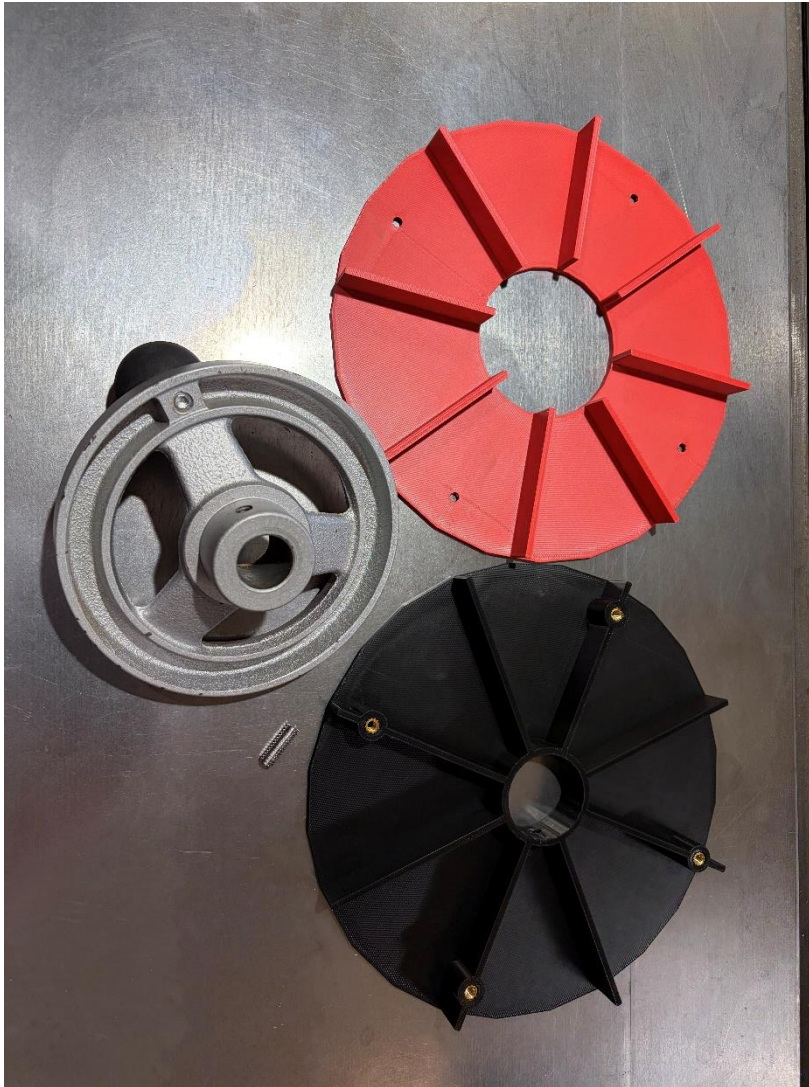
1. Thread one heat-set insert onto a short piece of all-thread rod.
2. Chuck the all-thread rod into your drill press (**do not turn the drill press on**). This holds the insert perfectly vertical.
3. Quickly heat the insert with a small butane torch for just a couple of seconds until it is hot enough to melt the plastic.
4. Lower the drill press handle to press the heated insert straight into the boss.
5. Hold it in place for a few seconds until the plastic cools and grips the insert.

Caution: Avoid overheating the insert. Excessive heat can cause the insert to shift sideways or allow molten plastic to flow into the threads.

A conventional soldering iron can also be used, but the drill press method generally produces straighter results.

Alternative Fastening Method (No Heat-Set Inserts): If you prefer not to use heat-set inserts, you can drill straight through the four bosses on the headstock side and bolt the two halves together using #8 × 1" or #10 screws with nuts on the headstock side.

Assembly Instructions



1. Prepare the headstock-side piece using either the heat-set inserts or the alternative screw-and-nut method.

2. Slide the **tailstock-side** piece onto the handwheel hub first.

3. Slide the **headstock-side** piece onto the hub and align the two halves. **Do not fasten them together yet.**

4. Install the handwheel (with both impeller pieces loosely in place) onto the quill rod. Ensure the quill is fully retracted into the tailstock housing.

5. Install the set screw(s) using a long Allen wrench:

- On the Powermatic, install the short original set screw first, followed by the longer one.

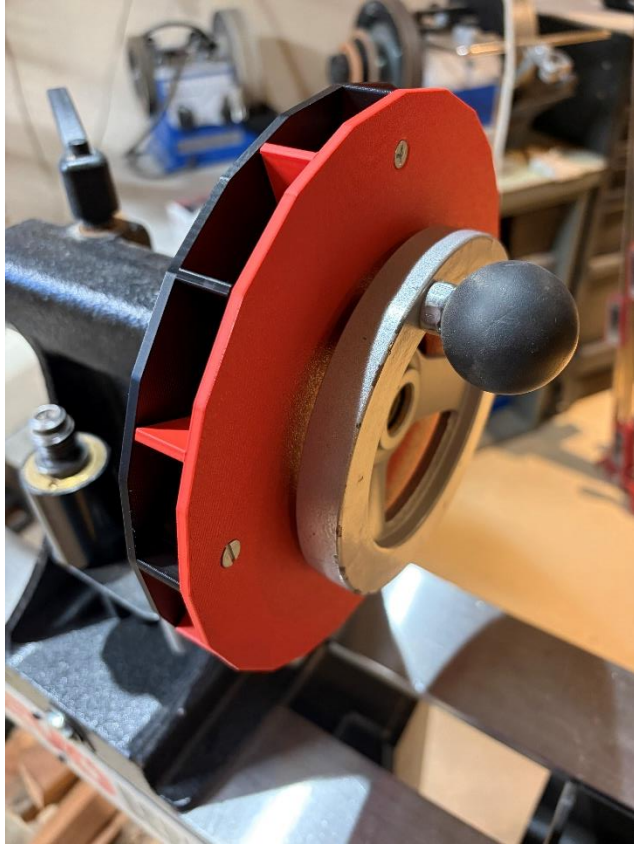
- The long set screw

clamps against the quill rod and locks the impeller in place.

6. Verify that the impeller spins freely and does **not** rub against the tailstock housing.

7. Once the set screws are secure, fasten the two impeller halves together.

Using the Impeller



Aim a stream of compressed air at a **shallow tangent** to the impeller vanes (a steep angle is much less effective). When adjusted properly, the handwheel will spin rapidly.

Important Safety Notes:

- Do not allow the quill to slam into either end stop at high speed. This can eject accessories from the quill or jam it tightly into the tailstock.
- Keep hands and body clear of the spinning handwheel and impeller.