Wood Gear Clock Building

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What do I need?

- Patience…. Lots of patience
- Good clock plan
  - Start simple
- Drill press
- Scroll saw
- Disk sander
- Band saw (optional but very helpful)
Getting Started

- Accurate copies of the clock plan
  - Spares for when you make mistakes
  - Make sure copy scales perfectly
- Clean work area with lots of space
- Very good lighting
- Familiarize yourself with the parts of the clock and how they fit together
Materials

- Baltic Birch plywood for gears
  - Very easy to work with
  - Less tendency for teeth to break
- Hardwood for frame
- Repositionable spray adhesive
  - 3M 75
- Fine tooth blades
- Good drill bits
Cutting the gears

- Round gears are critical!
- Two methods
  - Larger gears
    - Glue pattern to wood
    - Mark exact center of arbor hole with sharp pick, then drill hole
    - Use disk sander to sand gear diameter to just beyond the edge of the teeth (1/8 inch)
  - Small gears
    - Drill arbor hole
    - Use disk sander to make gear blank just larger than gear diameter
    - Very carefully attach pattern
Cutting the gears
Cutting the gears

- Cut inside contours first
- Drill any remaining holes
- Very carefully cut the teeth
  - Cut just so the line disappears
  - Take your time
Cutting the gears

- Sand gear teeth down to exact diameter on disk sander
- Round each tooth over to avoid hard edge
Cutting the gears

- Escape wheel is the most critical
  - Very little tolerance for error

- Cutting small pinion gears
  - Good support under the gear on the saw
  - Take your time
Cutting the gears

- Add to Center arbor with Allen Screw
- Cut 3 of these to Great Wheel
- Cut 22 of these
- For Extra, Third and Intermediate (60T) Wheels
- Take your time and
  Drill all the holes slowly and carefully,
  ESPECIALLY the 1/16" holes.
  ANY misalignment of these and the mechanism will not run.

Wax gear
1/2" Stock

Larger Wheel
1/4"

3rd
1/16
C3 Hole

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Arbors and Spacers

- Steel arbors and brass tube spacers
  - Hobby shops an excellent source
- Cut arbors to length
- Chuck them in the drill press and polish at high speed
  - Fine grit sandpaper (e.g. 800)
  - Polishing compound
  - Paper grocery bag
- Polish half, turn around in the press and polish the other half
- Round off edges of arbor
Building the Frame

- Area of the most creativity
- Variety of woods
- Drilling arbor holes
  - Critical step
  - If possible, attach front and back frame together to drill holes so they line up perfectly
- Arbors and frame must be at right angles
Building the Frame
Assembling the Clock

- **This process is absolutely critical!**
- Start with the great wheel (weight wheel)
  - Make sure it runs smoothly in the frame by itself
- Remove great wheel and insert next wheel
  - Check for smooth running
- Put both wheels back in frame and see that they run smoothly together
  - You should be able to blow on one of the gears to make the other one turn
- Find any spots that bind and correct them
Assembling the Clock

- When you have them running smoothly, put a timing pencil mark on the back of the gears where they meet.
- Move on to the next pair of gears that mesh.
- The closer in the movement you work toward the escapement, the less forgiving friction becomes.
Assembling the Clock

- When all of the wheels have been processed in this way, install all of them in the frame using the timing marks made earlier.
- Check for smooth operation of the entire movement.
- Fix any spots that bind.
- This is the greatest opportunity for patience.
Assembling the Clock
Running the Clock

- Mount the clock where you can easily work on it
- Apply weight and attach pendulum
- Adjust the pallet for even “tick tock”
- Don’t panic when your clock stops
  - Find the areas where there is a bind or excessive friction
  - Start at the escapement and work backwards
- More / less weight may be needed for good running
Finishing the Clock

- Keep finish off of any surfaces that run together
  - Arbor holes
  - Gear teeth
- I typically don’t finish the gears
- Danish Oil on frame
Miscellaneous Tips

- Cut pendulum longer than is necessary
  - It’s easy to shorten… not so easy to lengthen
- Wood shrinks and expands
  - Clocks may not run on humid days
- Weight cord
  - Kevlar fishing string works great
- Graphite powder to lubricate arbor holes
- Did I mention patience?
Sources of Clock Plans

- Clayton Boyer’s Clocks
  - http://lisaboyer.com/Claytonsite/Claytonsite1.htm

- Marc Tovar’s Wooden Clockworks
  - http://wooden-clockworks.com/

- The Clock Mechanics
  - http://www.clockplans.com/
Questions?