

Instructions for Assembling “The Radial Engine” MechaniCard™

Thank you very much for purchasing “The Radial Engine” MechaniCard™ kit! This is the very first in my series of mailable kinetic sculptures. The parts in this kit are identical to those which I put together, for sale as completed works. Everything you need is included, except glue and tools. Please, follow these instructions, and study the accompanying diagrams, carefully, to successfully complete your working, MechaniCard™ model.

1. Gather the tools and materials you will need:

High Viscosity Type Cyanoacrylate Glue (Gap-filling Super Glue for wood/paper) – the quick-setting type is not recommended. **WARNING!** Cyanoacrylate glue aggressively bonds skin. Exercise caution when applying, or when handling freshly glued assemblies.

Safety Glasses

Small Forceps

Magnifier

Toothpicks

Razor Blade/Hobby Knife

Small Wire Cutters

Scissors

Needle nosed pliers (or similar)

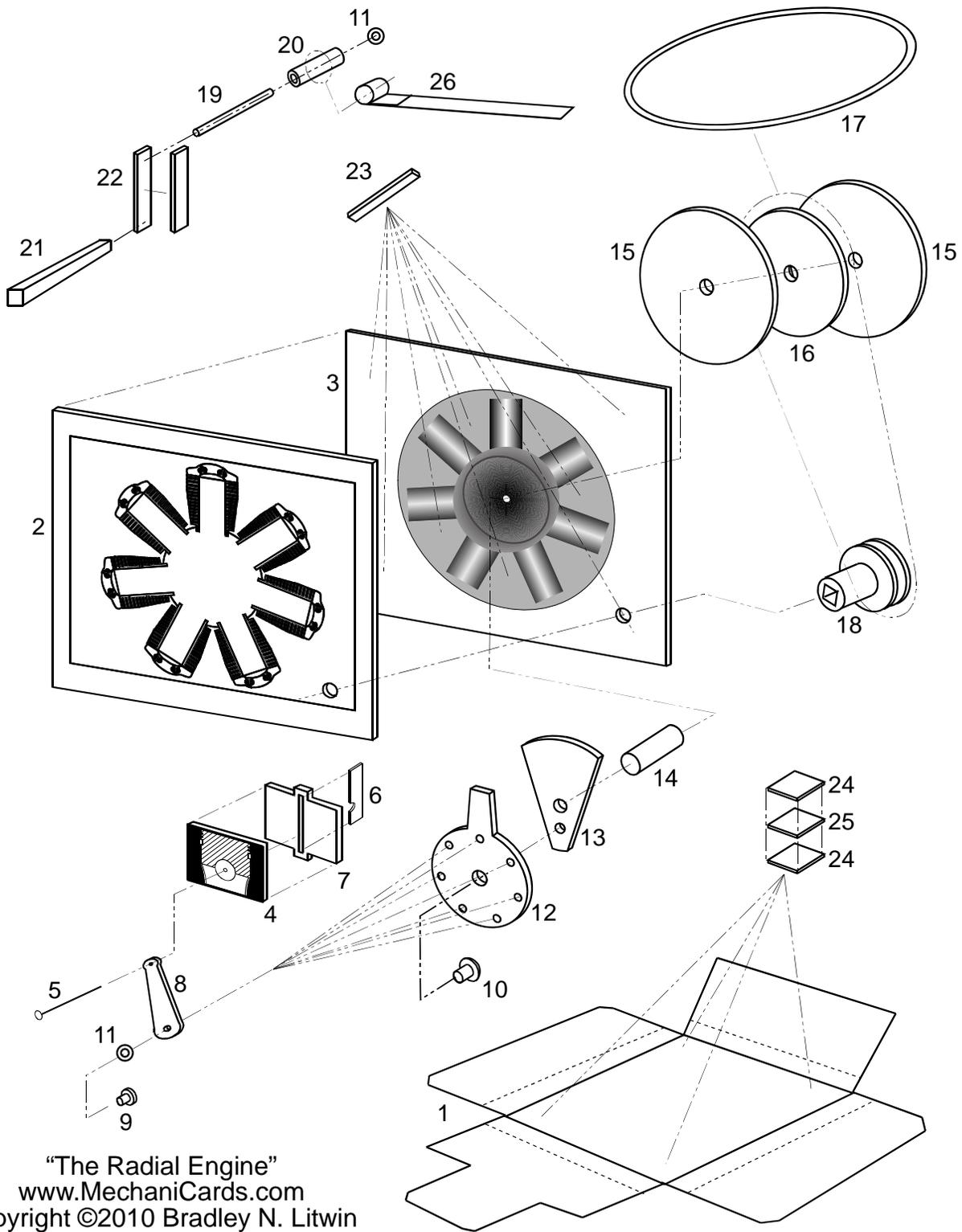
Waxed paper

Fine sandpaper (120-150 grit)

2. Familiarize yourself with all of the parts (diagram on next page):

- | | |
|--------------------------|-------------------------|
| 1. Mailer/Box | 15. Pulley Flanges (2) |
| 2. Top Plate | 16. Inner Pulley |
| 3. Back Plate | 17. Drive Belt |
| 4. Pistons (7) | 18. Crank Pulley |
| 5. Straight Pins (7) | 19. Small Dowel |
| 6. Piston Splines (7) | 20. Crank Handle |
| 7. Piston Backs (7) | 21. Square Shaft |
| 8. Connecting Rods (7) | 22. Hardwood Strips (2) |
| 9. Con-Rod Rivets (7) | 23. Spacer Strips (8) |
| 10. Hub Rivet | 24. Foam tape |
| 11. Con-Rod Spacers (8)* | 25. Cardboard Strip |
| 12. Crank Hub | 26. Crank Strip |
| 13. Counterweight | |
| 14. Crankshaft Dowel | |

* Note: Some editions of this kit do not require spacers for the connecting rods, and have been omitted. One is still included for the crank assembly.

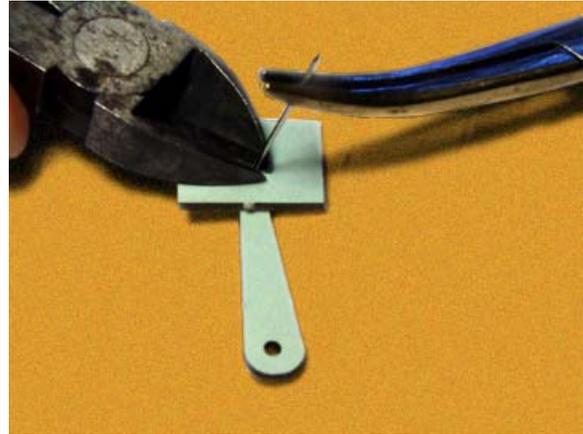
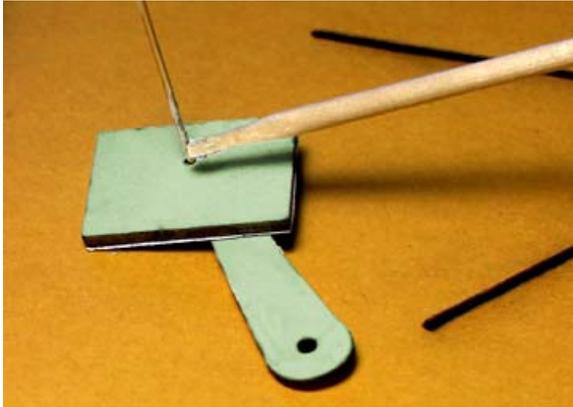


"The Radial Engine"
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Drawing Not To Scale

3. Piston Assembly – Part I

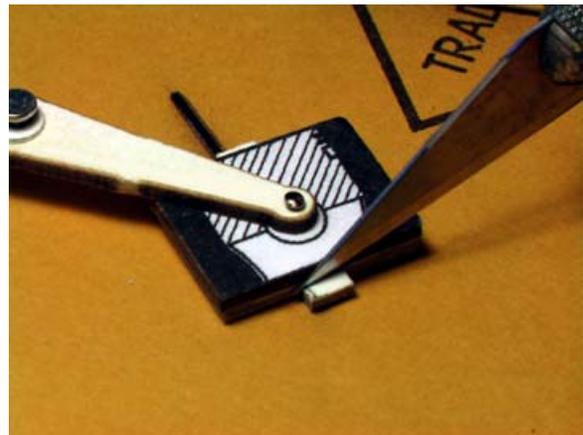
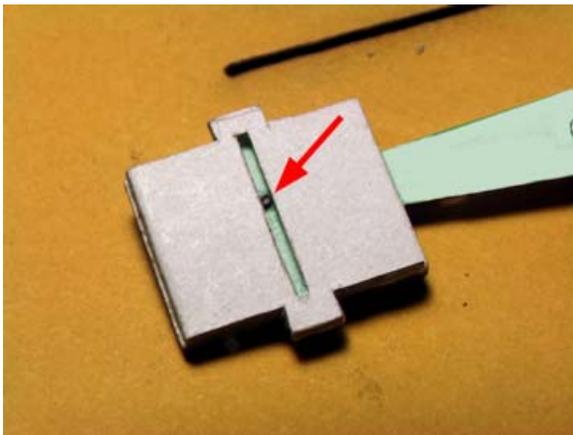
From the white side of the part, insert Straight Pin (part #5) through the smaller hole, in the end of Connecting Rod (8), and then the graphic side of the Piston (4). Apply a sparing amount of glue to the pin shaft, where it emerges from the back side of the piston. Pull the pin back into the hole, slightly, in order to work some glue inside it. Avoid getting glue on the pin, where it goes through the connecting rod. Pull pin head snug against the connecting rod, and allow glue to dry, thoroughly. Repeat procedure with the other pistons.



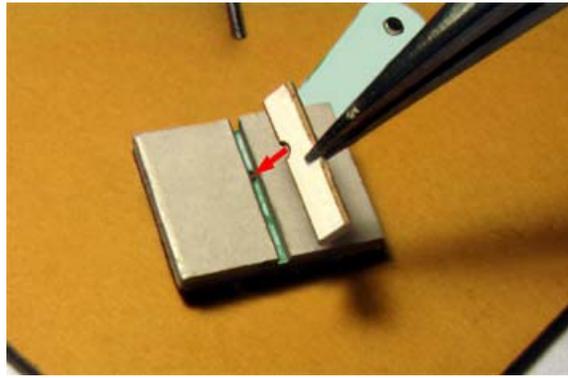
4. Piston Assembly – Part II

After the glue has dried, clip off the pin shaft, close to the back of the piston. **!!! DANGER - WARNING!!! Cutting off the pin, will send it flying! Hold onto the pin with pliers or similar tool. Wear safety glasses. Aim the pin away from yourself and others, preferably into a waste basket.** If the remaining pin comes loose from the piston, it should be re-glued, before moving on.

Apply a thin coat of glue to the face of piston back (7), align and affix in position on the back side of the piston. The pin stub should be within the slot. When the glue has dried, cut off the retaining 'ears' from the piston back, flush with the edges of the piston.



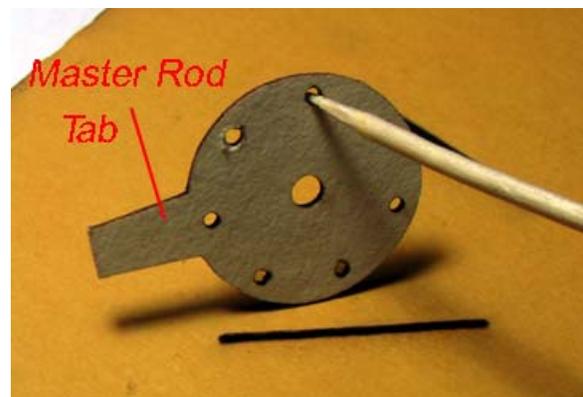
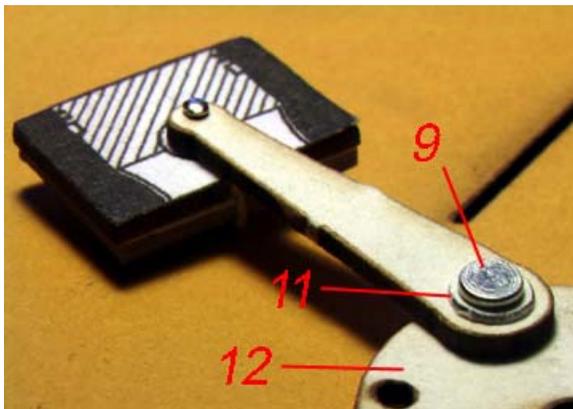
Vigorously rub the piston bottoms on waxed paper. This will inhibit glue from unwanted sticking in subsequent steps, and provide some lubrication. Apply glue to the notched edge of the Piston Spline (6) and insert it into the slot of the Piston Back, lining up the notch over the pin stub (shown on next page). Wipe away excess glue. Repeat for all pistons.



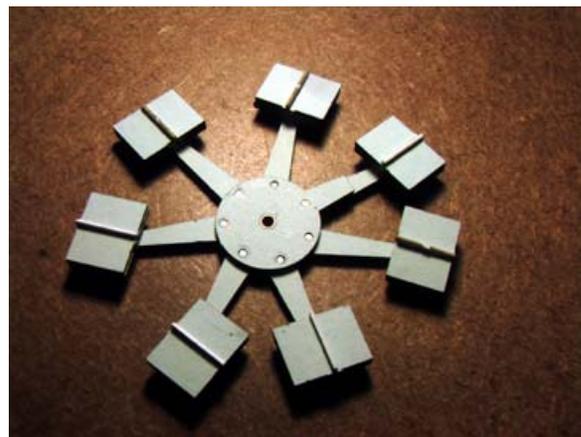
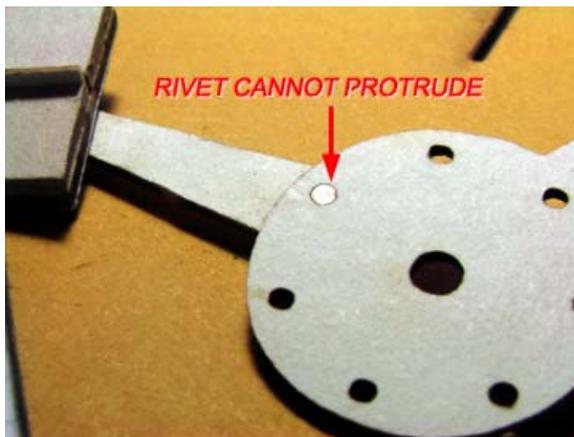
5. Connecting Rod & Hub Assembly

Insert Rivets (9) through Spacers (11)* and then through the larger hole in the Connecting Rods.

* Note: Some editions of this kit do not require these spacers, and have been omitted.



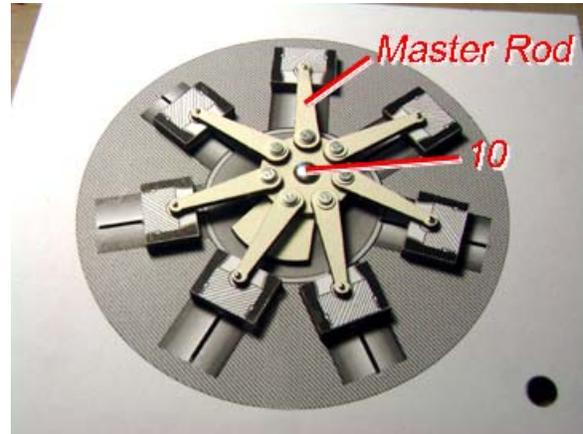
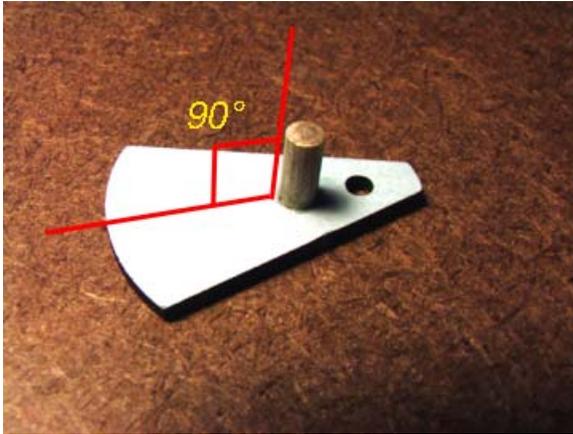
Rub front and back of Crank Hub (12) on flattened waxed paper. With a toothpick, coat the inside of a small, outer hole in the hub with glue. Skip the hole in the tabbed area, reserved for the “Master Rod.” Press the end of the Rivet into the hole, until it is barely flush with the back side of the hub. Insure that Connecting Rod continues to rotate, by gently exercising the joint, while the glue sets up. Hold until set, and repeat procedure with only 5 more piston assemblies.



The remaining “Master Rod” does not rotate on the hub. Apply glue to the face of the tab. Align and affix its connecting rod, while using its rivet hole as a placement guide. The rivet is merely decorative, in this instance. But, if you omit it, someone will surely point out that something is missing. Allow the glue to dry thoroughly, before proceeding.

6. Crankshaft/Counterweight Assembly

Rub both sides of Counterweight (13) with waxed paper. Apply a small amount of glue in the larger hole and insert the Crankshaft Dowel (14). Tap the dowel down to the work surface, insuring the end is flush with the face of the Counterweight. The dowel must be square with respect to the counterweight. Wipe off any excess glue.

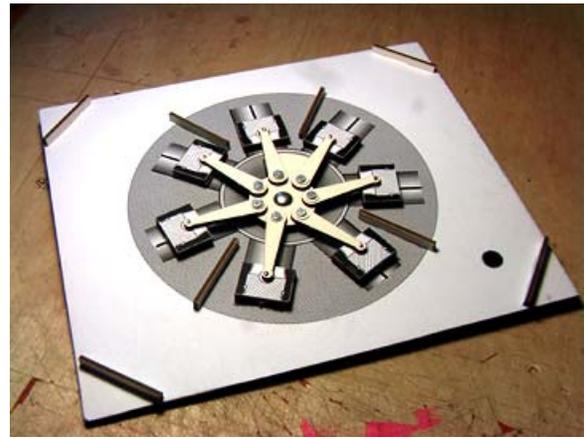
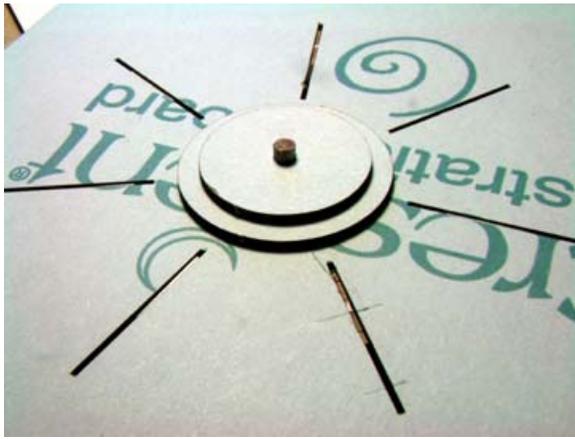


Insert the Hub Rivet (10) through the top side of the Crank Hub (shown above). Apply glue to the inside of the smaller Counterweight hole. Press the Hub Rivet into the Counterweight until its end is barely flush with the back side of the Counterweight. Wipe away excess glue, and gently exercise Crank Hub joint to insure it continues to rotate, as the glue sets. Allow glue to dry thoroughly, before proceeding.

7. Main Assembly I

Test all of the rotating joints in the Crank Hub – Connecting Rod – Piston assembly. All should rotate freely. Make adjustments as necessary, before proceeding.

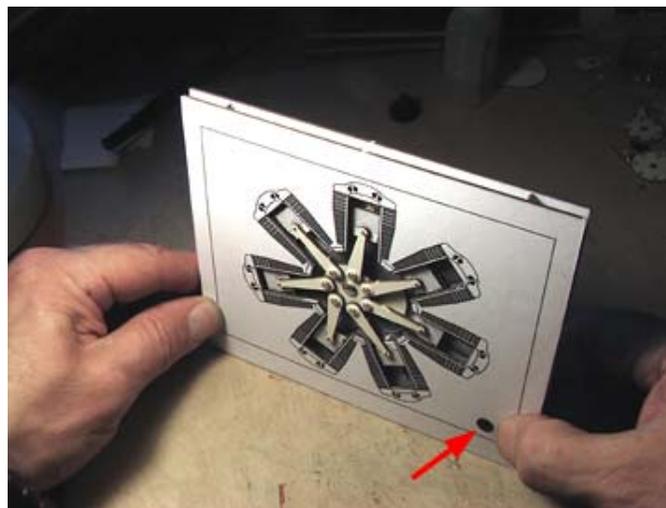
Install the mechanism assembly, inserting the crank shaft dowel through the central hole in Back Plate (3) until the Counterweight rests against it. Align the non-rotating “Master Rod” piston at the 12 O’clock position, as shown above, and set all the pistons with their splines engaged in their respective slots. Be sure to orient all piston “skirts” toward the hub. Piston splines must run freely in their slots. Use fine sandpaper to clean out slots, as necessary. Rub wax paper on one side of Pulley Flange (15) and push onto the Crankshaft (waxed side down) until it is snug against the underside of the Back Plate. There should be little or no end-play of the Crankshaft. Apply a small amount of glue to the shaft and flange. When dry, you can gently exercise the mechanism, by turning the Flange. If any parts are binding, check for frozen joints, tight fits, or misaligned pistons, and adjust as necessary.



Apply glue to one edge of each Spacer Strip (23) and affix as shown in the diagram (above). Keep spacers clear of the paths of the moving pistons. Allow to dry thoroughly.

8. Main Assembly II

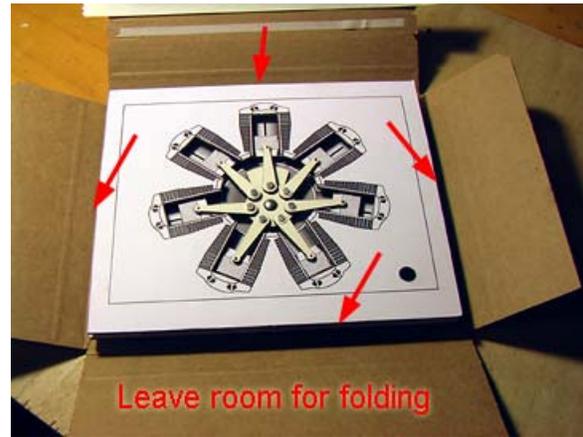
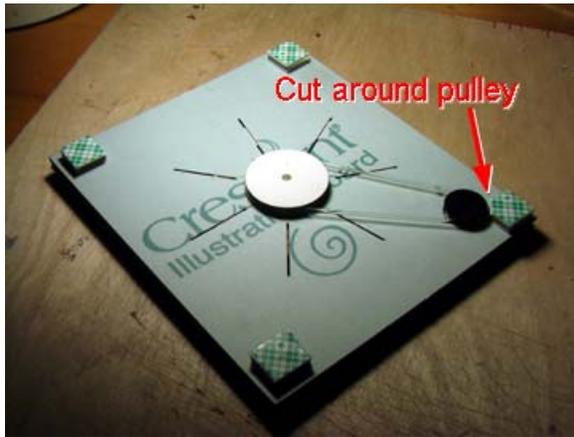
Insert the Crank Pulley (18) through the Back Plate hole, as shown. Apply glue to the tops of the Spacer Strips. Using the Crank Pulley as an alignment guide, assemble the Top Plate (2) onto the spacers, while standing both Top and Back Plates on a flat surface. Press Top Plate into full contact with Spacer Strips, squeezing each joint long enough for the glue to grab. The resulting assembly should be flat. If necessary, weigh down assembly while glue dries, completely.



Apply glue to one side of the Inner Pulley (16) and press down over Crankshaft, into uniform contact with the Pulley Flange. Repeat with remaining Pulley Flange (15). Be sure to wipe away any excess glue. Allow to dry thoroughly. Install Drive Belt (17) over Crank Pulley and the assembled engine pulley. Initially, the belt might not seat fully down, inside the larger pulley groove. This is normal, and will work its way in, with use.

9. Final Assembly

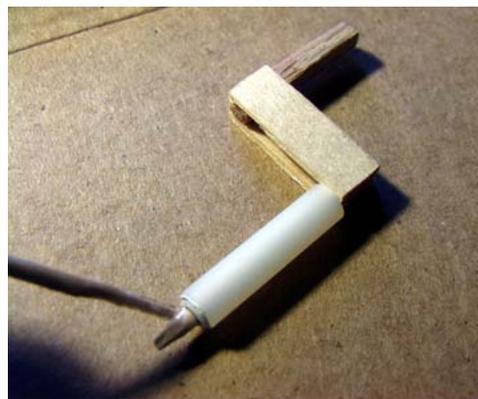
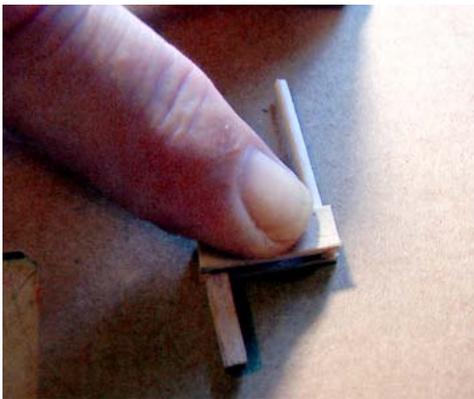
Cut Cardboard Strip (25) into four $\frac{1}{2}$ " (13mm) squares, and sandwich with Foam Tape (24) on both sides of each. Affix sandwiched assemblies to underside of Back Plate, as shown. One sandwich will have to be cut off at the corner, to accommodate the crank pulley.



Assemble the Back Plate to the inside of Mailer Box (1), as shown.

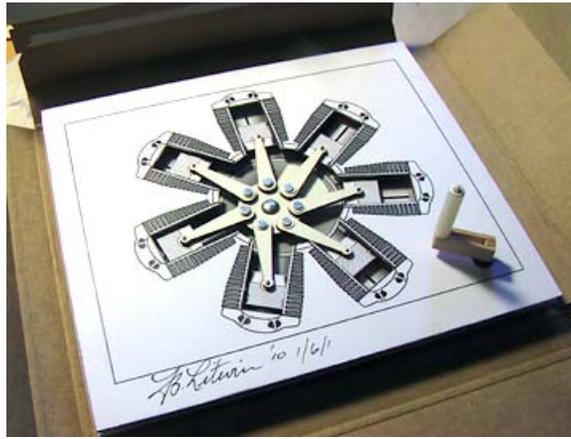
9. Hand Crank Assembly

Check and lightly sand for ease of fit, inserting the Square Dowel Shaft (21) into its receptacle in the crank pulley. Apply glue to Hardwood Strips (22), sandwiching Small Dowel (19) and the square shaft into right-angle 'Z' configuration, as shown. Allow to dry thoroughly.



Install Crank Handle (20) on Small Dowel. Place remaining Con-Rod Spacer (8) onto Dowel, snug up against the end of the Crank Handle, affixing with a small drop of glue. When dry, trim dowel. Crank Handle should spin freely.

Place the square shaft of the Hand Crank Assembly into the square hole of the Crank Pulley, to operate sculpture. Crank may be safely stored in the space between the Back Plate and Mailer Box. Put the crank handle through the Crank Strip 26, leaving the pink end sticking out, for easy retrieval.



Please, remember! Though this little sculpture is fairly robust, it is nonetheless made of paper. Wear and tear is a sure to follow, as you pass it around. So, enjoy it while it lasts.

Bradley W. Litwin

For more MechaniCard™ and kinetic sculpture fun, visit MechaniCards.com and BradLitwin.com