

Welcome to the Stirling Engine building guide.

The parts:

4 wooden mounts

the support board

the axle hub with mounting holes and 2 ball bearings

ball bearing similar to the one inside the hub

4 threaded metric 10 rods, 13 cm in length

12 nuts for the rods, 3 for each one

4 screws for tightening the wooden mounts

2 copper connectors (rod-piston)

2 screws + 2 nuts, metric 4

copper axle

small 3 mm diameter tube (I cut mine from a radio antenna)

2 aluminum cranks

a flywheel (mine is an angle grinder disc)

2 washers (interior diameter must fit axle)

2 copper sticks (4 mm diameter, 3 cm long)

2 small metal screws for fixing the cranks to the axle

2 aluminum rods

4 rubber tubes. each 4 mm long

one string of copper wire

2 aluminum cylinder mounts

one silicone tube - heat resistant (usually off chainsaws)

2 syringes 5cc each

one chemical tube (must match the syringe diameter or higher)

The tools:

dremel cutting disc and grinding stone

pair of pliers

screwdriver (cross and flat)

2 metric 10 fixed wrenches for tightening the nuts

epoxy glue

perfume bottle or other small glass recipient

Video Transcript

Take the support board and place the threaded rods. You need to tighten each rod with two nuts. Also, make sure they are leveled, so the heights of the rods are equal.

Next, you need to screw down the wooden mounts. Use the screws and the screwdriver.

Next, you have to assemble the hub. It has two ball bearings already forced into place at each end. I made some mistakes when assembling it, so watch the video, and don't rush like I did. It's a learning process all the way.

After the hub is in place you'll have to insert the axle. It must be a tight fit inside the ball bearings. It's not supposed to be loose. Make sure both ends of the axle are equal in length.

Now, you'll have to cut one syringe at the specified value mentioned in the schematics using the dremel and the cutting disc. The syringe must be cut like you see in the video, in a circular motion. Do not attempt to cut it from one side to another because it will crack.

Next you need to cut the chemical tube. The technique is the same as in the syringe, but it will be much easier since it's thinner. Also, you need to measure the stroke of the piston, so it won't touch the head of the chemical tube inside. You have all the measurements in the schematic section, but it's better to measure again yourself.

The aluminum mount for the cut syringe and chemical tube has different sized holes on each side. The difference is slim but necessary for better sealing.

Now you need to cut the tail of the syringe pistons. They are hollow inside, perfect for gluing the copper connectors. The cut must be made right at the bottom of the flat surface. After cutting the flat surfaces, use the grinding stone tool for the dremel and grind the shards off. Test the level of grinding like you see in the video, and do it until the copper connector fits.

You now have to glue the connectors and pistons together using the epoxy glue. Do it like you see in the video. After gluing the parts, place the pistons vertically so it will harden in the correct shape.

Now you have to glue the cylinders inside the aluminum mounts. The cold cylinder is easy to glue, being a single syringe. Apply glue like you see in the video. The only trick is to measure the length of the syringes, on the piston-entry side, so they're equal. (be sure not to push the single syringe too far down the mount).

In order to ensure a perfect match between the two cylinders, the left side of the engine must be assembled and tested for piston stroke. The two cylinder aluminum mounts must be at the same height on the threaded rods, and at the same height as the hub. Assemble them like you see in the video.

Next, put the washers on the axle, and mount the crank. Follow the steps in the video and test the stroke. If at maximum point the tip of the piston does not touch the top of the chemical tube, but comes near at 1-3 mm, it's perfect. If not, you will have to cut another chemical tube. (don't worry, they're 10 cents a piece)

If all is well, here comes the tricky part: Gluing the cut syringe and chemical tube. Here it must be a perfect seal and air tight. First, like you see in the video, check again if the 2 glass parts are in a straight line, so the piston enters smoothly inside the chemical tube. Apply glue like you see in the video (make sure the glue doesn't enter the cylinders, and it doesn't have any leaks, or else, the engine will never work.)

Now, you have to glue the small copper tube (I used one from a radio antenna). Again, it must be a perfect airtight seal, and the glue must not enter inside the cylinder (where the piston passes through) and it must not enter inside the tube. It must touch only the walls and outside around the contact area.

After the glue drying out, assemble the mount on the threaded rod, and continue assembling the engine. First place the copper sticks on the cranks (you can do it by thread or by glue),. Now, tighten the cranks to the axle using the two small metal screws.

There is one trick to the assembly. The hot piston crank (on the left) must be 45 degrees in front of the cold one in rotation. Press the flywheel in place, and tighten the second crank at 45 degrees angle like you see in the video. You'll also find the schematics to this step.

Now, place the rubber tubes on the copper sticks (they are meant to keep the piston rods in a fixed position on the sticks).

Mount the silicone tube like you see in the video. Now the two cylinders are connected. If there isn't any force connecting the piston movement, it means there is a leak somewhere, and compression and vacuum doesn't take place.

Assemble the rods like you see in the video. Make sure not to confuse left to right, because they're at different lengths. The screws that keep them in place on the copper connectors must not be very tight or they'll block the rods.

Now, take a piece of cotton wool and roll it into a fuse. I used alcohol and paint thinner for the test. Alcohol will give you higher revs since it burns hotter, while paint thinner is less powerful. It's best to find a chemical tube a bit thicker so it won't be melted in the flame.

Fill the perfume bottle with fuel and put the cotton wool fuse inside. Let it soak for a few seconds, place it under the chemical tube and light it up.

When using the solar energy with the help of the fresnel lens, you'll have to paint the chemical tube black so it will heat up faster. After lighting the fire, let it heat up for 30 seconds, and then push the flywheel towards the cylinder like you see in the video. It will start spinning using only heat as a fuel.

And congratulations. Your stirling engine is ready to go!