A Little Steam Engine Called “Milly”

There are a number of magazines on the newsstands that offer information for those wishing to make projects of their own. The Home Shop Machinist, Machinist’s Workshop, Live Steam, Model Engine Builder and, in England, Model Engineer and Model Engineer’s Workshop all cater to those wishing to build working projects in metal. Modeltec magazine ceased publication in 2004, but publisher George Broad and author Ed Warren were kind enough to let us reproduce this 2-page article from the May, 1997 issue of Modeltec for your enjoyment. The engine shown here was built on Sherline tools. We have included a few photos of the project as it was being completed on page 4. For the spring, it was found that a ball point pen spring that was cut to length worked just fine.

Here are the finished components before assembly. Only eight parts and a spring are needed to make this simple but fun steam engine. Pam chose to leave the dowel pin used for the flywheel shaft longer than in the plan so it could be used to spin the flywheel over by hand with a twist of the fingers, but you could cut it shorter as shown in the plans if you prefer.

These plans are also included in the book Tabletop Machining by Joe Martin. The book is available through Sherline as P/N 5301 and includes 350 pages of valuable advice for the beginning model engineer and machinist.

Unfortunately, we can’t afford to provide a lot of technical assistance for this project. Please try to work out the setups and procedures for yourself. That’s what machining is all about. Have fun!

About the Milly Kit

This kit includes enough material to make at least one of each part for the engine. Not included is the spring that is used to adjust the friction between the cylinder and the base, but a ballpoint pen spring will work. Tightening it will improve the seal but also increase friction. Adjust the spring screw until you get smooth operation.
A couple of fun evenings could be spent on

Making Milly Move

by Ed Warren

Photos by the Author and G. R. Broad

Drawings adapted for publication from CAD originals by the Author.

Viewed from the side, everything but the spring is visible. The hole facing the camera is for the steam (air) supply—or else the exhaust, depending on which direction you want Milly to move.

The parts for Milly, laid out on Ed Warren’s workbench. The 6” rule demonstrates the small size of this engine. That and its simplicity would make it a great project for introducing a young machinist to the hobby!

Ed is facing Milly’s cylinder after using the natural offset derived from chucking a four-sided piece of stock in a three-jaw chuck to locate the cylinder bore for drilling and reaming.
Over the years I’ve seen teeny weeny steam engines and always wanted to build one. I should have done that a long time ago, when my eyes were a lot younger, as it would have been a lot easier. Now I have to use glasses to see close up. Otherwise, everything is blurred.

Whether you have to squint through glasses or not when you mark out the lines, be very careful when you center punch them so the holes are in the right place. The smaller a steam engine is, the more accurate your work needs to be.

Starting with the Cylinder Mount, lay out the holes and drill them. Next do the Cylinder. Here’s a tip you can use. Whenever a square piece of material is put into a three-jaw chuck, the center of the square will be offset. I use this to my advantage in drilling and reaming the bore in the square stock. The offset leaves enough room between the back of the piston and the cylinder mount plate to put the crank disk between them. That’s how Milly’s cylinder was made.

When the hole pivot was drilled in the cylinder for the 2-56 screw, I drilled on into the cylinder bore, but when I tapped the hole, I didn’t go all the way through. That was so the incomplete threads would jam the end of the screw and keep it from vibrating out. Yes, it really does work okay this way. If you don’t break into the cylinder with the drill, then be sure to use a bottoming tap.

For making the Crank Pin and Crankshaft, use stainless steel and polish them up a bit.

The Flywheel will look a lot better if the recesses are turned on both sides. It’s made out of stainless steel, also.

This engine is so teeny that when it was assembled, Loctite was used to hold the flywheel and crank disk on the crankshaft instead of trying to find any set screws small enough.

The first time I tried to run Milly, she just refused to do anything like run—don’t give up keep trying. Once she gets broken in, she’ll take off and mooove.

Drawings are twice actual size.
“Milly” under construction
As built by Pam Weiss
This kit will require both lathe turning and milling machine operations to complete. If a milling machine is not available, a vertical milling column accessory for the lathe can be used.

**Material list for Milly**

1. (1) 1" round x 1" long, 12L14 steel for the “Flywheel”
2. (1) 1/2" Square x 2" long, brass for the “Cylinder Mount” & “Cylinder”
3. (1) 1/2" round x ±1" long, 12L14 steel for the “Crank Disk”
4. (1) 1/8" round x 1-1/2" long, ground dowel pin for the “Crank Shaft”
5. (1) 3/16" round x 1-5/8" long, 12L14 steel for the “Piston”
6. (1) 1/16" x 5/16" long, ground dowel pin for the “Crank Pin”
7. (1) 2-56 x 3/8" long, round-head slotted screw
8. (2) 3/16" I.D. air line fittings with a 10-32 thread for the intake and Exhaust

**Notes:**

1. The spring is not supplied in this kit. A spring from a ball point pen works well.
2. The 1/2" square brass piece is used to make two different parts. You can cut it with a hack saw if you don’t have a bandsaw.
3. It may be necessary to make a washer for the 2-56 screw in order to contain the spring if the spring diameter exceeds that of the screw head.
4. If you use the air fittings supplied in the kit you will need a length of 3/16" tubing from your compressed air source to the engine.
5. The 1/8" dowel pin is hardened. If you prefer to shorten it to the length shown in the plans you may need to use a grinder to cut it. We just beveled the end a little and left it full length, as it gives you an easy way to turn the engine over to demonstrate its movement.
6. The aluminum base plate shown in the photos is not supplied. You can use wood or any scrap material you have on hand. We drilled and tapped a hole from the bottom to attach it.
7. The air supply line can be attached to either air fitting depending on which direction you want the engine to run.