

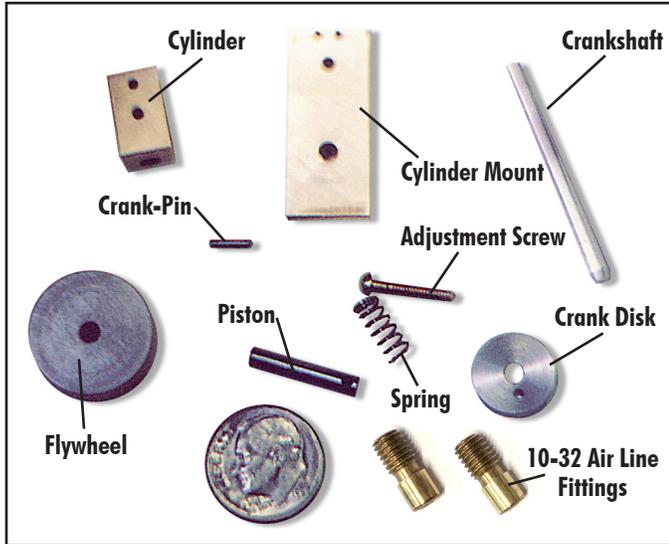


A Little Steam Engine Called "Milly"

A Project from the Pages of Modeltec Magazine

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.

PHOTO: PAM WEISS



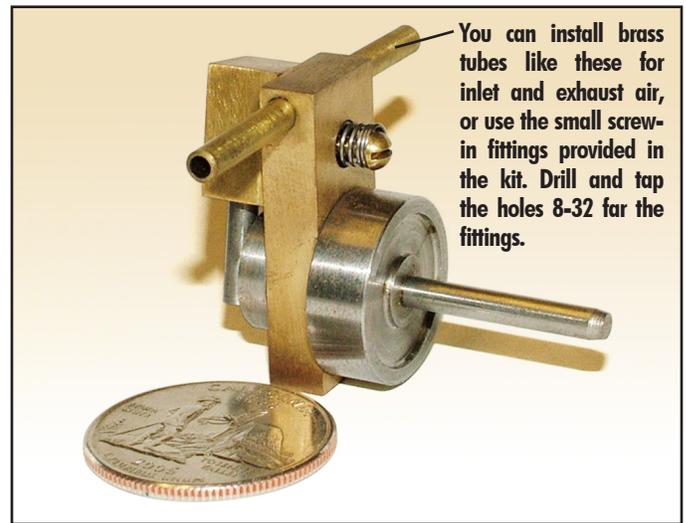
Here are the finished components before assembly. Only eight parts and a spring are needed to make this simple but fun steam engine. Pam chose to leave the dowel pin used for the flywheel shaft longer than in the plan so it could be used to spin the flywheel over by hand with a twist of the fingers,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

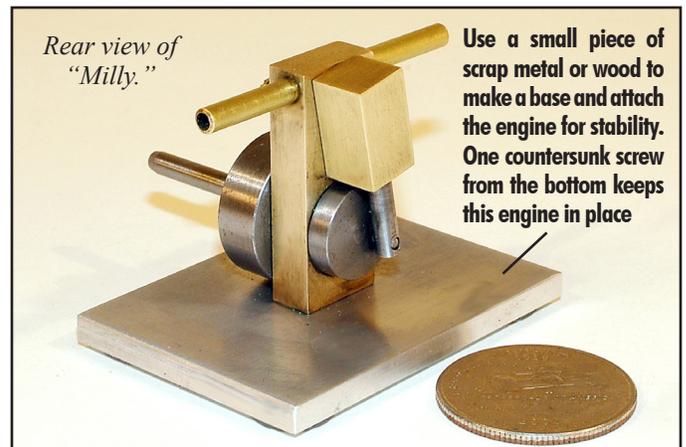
Unfortunately, we can't afford to provide a lot of technical assistance for this project. Please try to work out the setups and procedures for yourself. That's what machining is all about. Have fun!

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.



"Milly" as a completed engine. Pam Weiss made this sample from the plans on the pages that follow. She chose to add brass tubing extensions to the inlet and exhaust to make it easier to attach an air or steam hose to run it, although they are not shown on the plans. We have provided some small fittings that can be used in place of the brass tubing if you prefer, or you can purchase brass tubing at most hobby shops. Depending on which side the air line is attached determines the direction the engine will run. A US quarter is used for size scale.

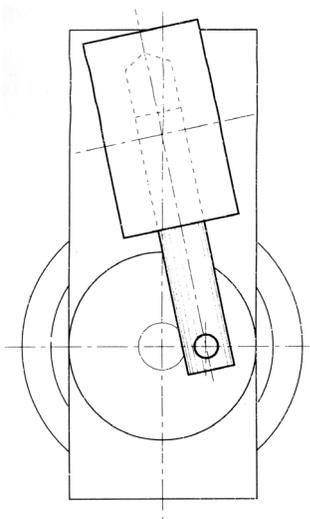


A couple of fun evenings could be spent on
Making Milly Move

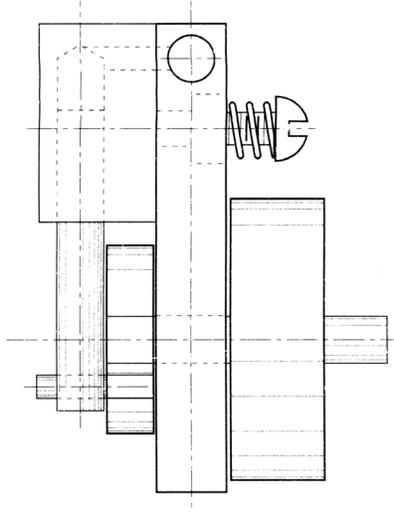
by Ed Warren

Photos by the Author and G. R. Broad

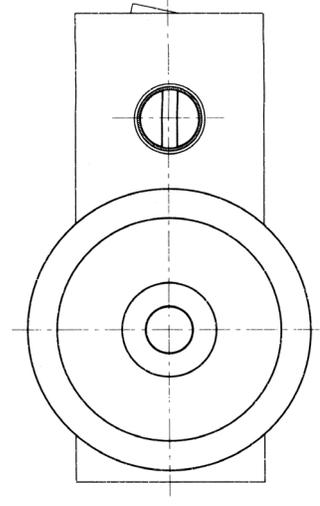
Drawings adapted for publication from CAD originals by the Author.



CYLINDER END



SIDE VIEW

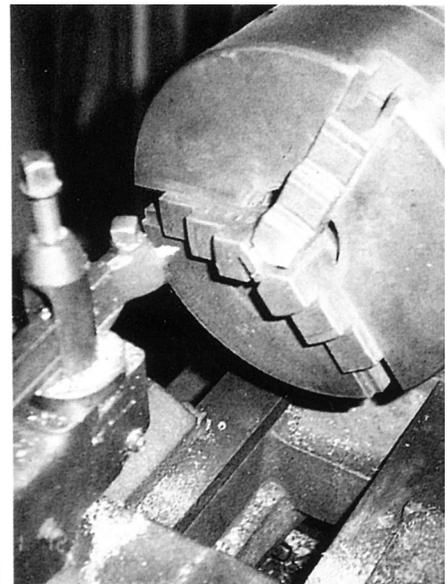
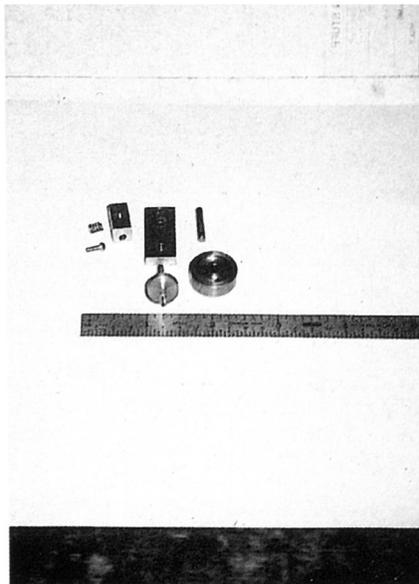
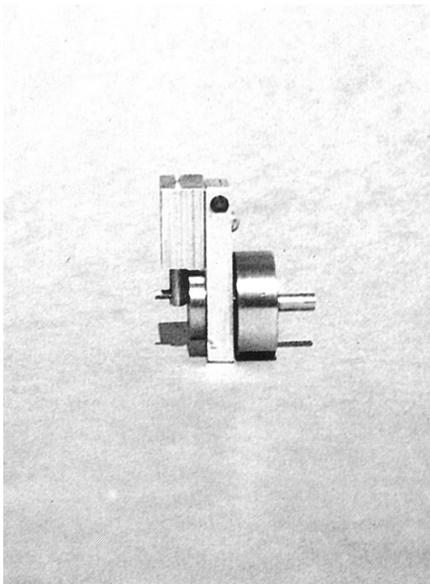


FLYWHEEL END

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.

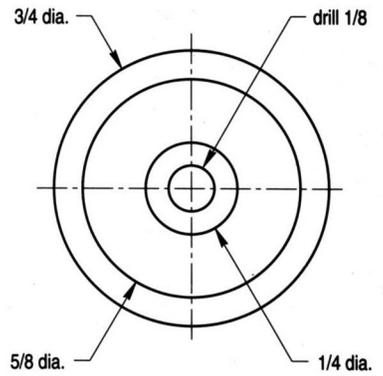
When the hole pivot was drilled in the cylinder for the 2-56 screw, I drilled on into the cylinder bore, but when I tapped the hole, I didn't go all the way through. That was so the incomplete threads would jam the end of the screw and keep it from vibrating out. Yes, it really does work okay this way. 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.

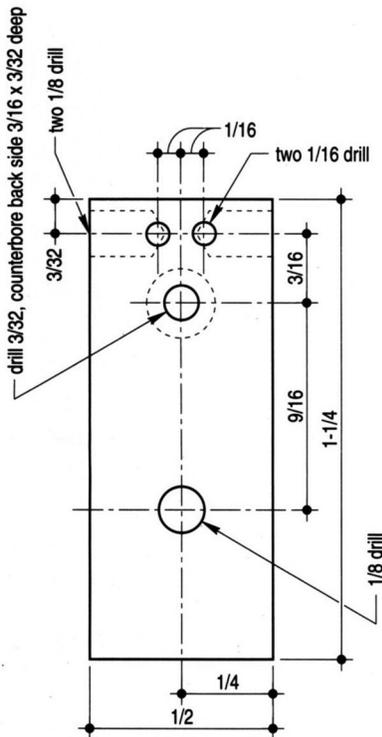
The **Flywheel** will look a lot better if the recesses are turned on both sides. It's made out of stainless steel, also.

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 setscrews small enough.

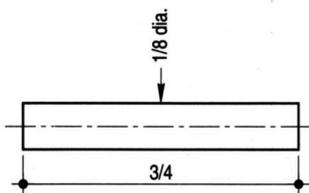
The first time I tried to run *Milly*, she just refused to do anything like run-but don't give up keep trying. Once she gets broken in, she'll take off and *moove*.



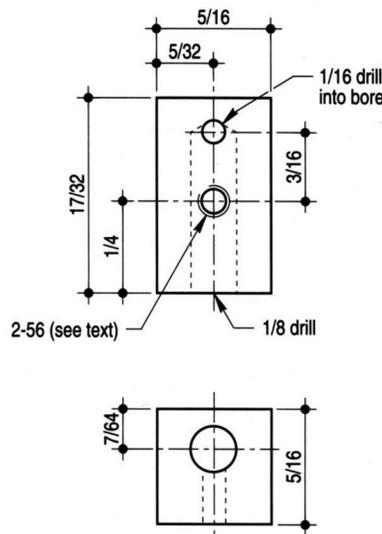
FLYWHEEL
1/4 Steel, 1 Required



CYLINDER MOUNT
3/16 Brass, 1 Required

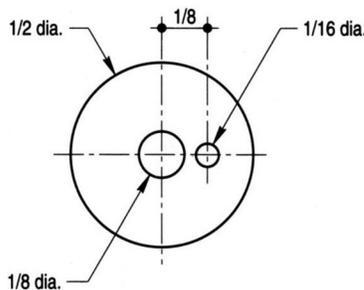


CRANKSHAFT
Stainless Steel, 1 Required

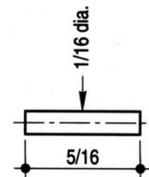


CYLINDER
Brass, 1 Required

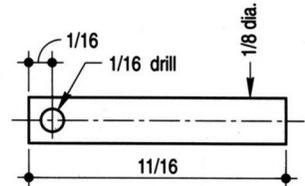
Drawings are twice actual size.



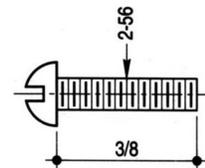
CRANK DISK
1/8 Stainless Steel, 1 Required



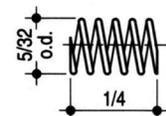
CRANKPIN
Steel, 1 Required



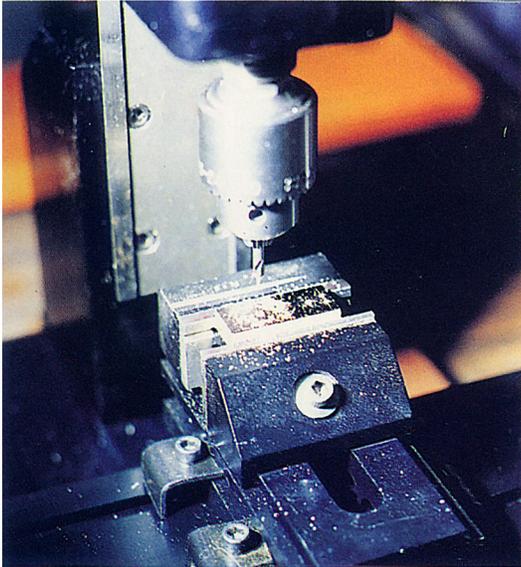
PISTON
Steel, 1 Required



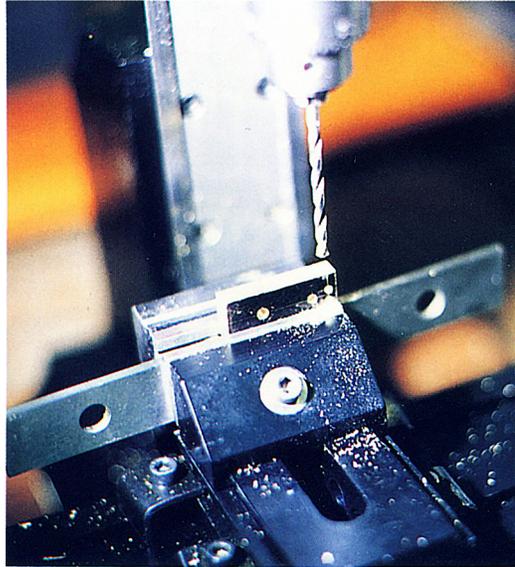
BOLT
Brass, 1 Required



SPRING
.016 or .018 Wire, 1 Required



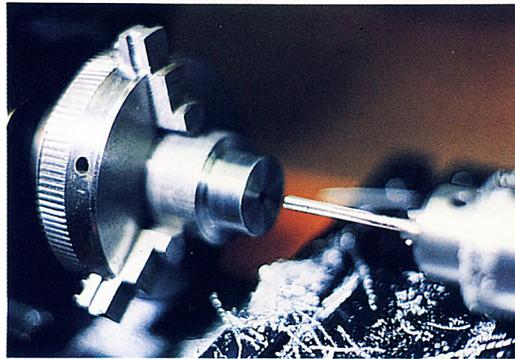
(Left) Center drilling the cylinder mount.



(Right) Drilling the 1/8" holes for input/output tubes.



(Left) Drilling the center of the crank disk.



(Right) Reaming the center 1/8" hole in the flywheel.



(Left) Parting off the crank disk.

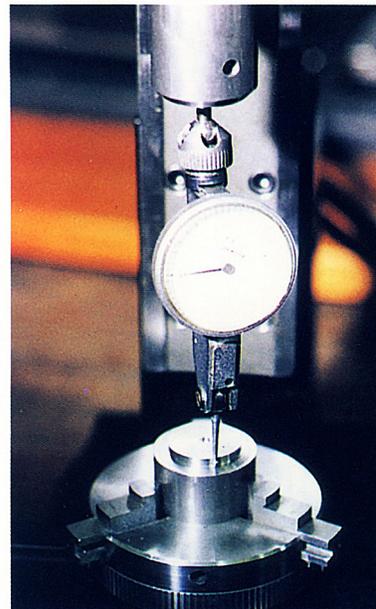


(Right) The completed crank disk.

PHOTOS: PAM WEISS

"Milly" under construction

As built by Pam Weiss



(Right) Indicating in the surface of the flywheel for milling. The part is left in the 3-jaw chuck so it can be returned to the lathe for parting off without recentering.

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.