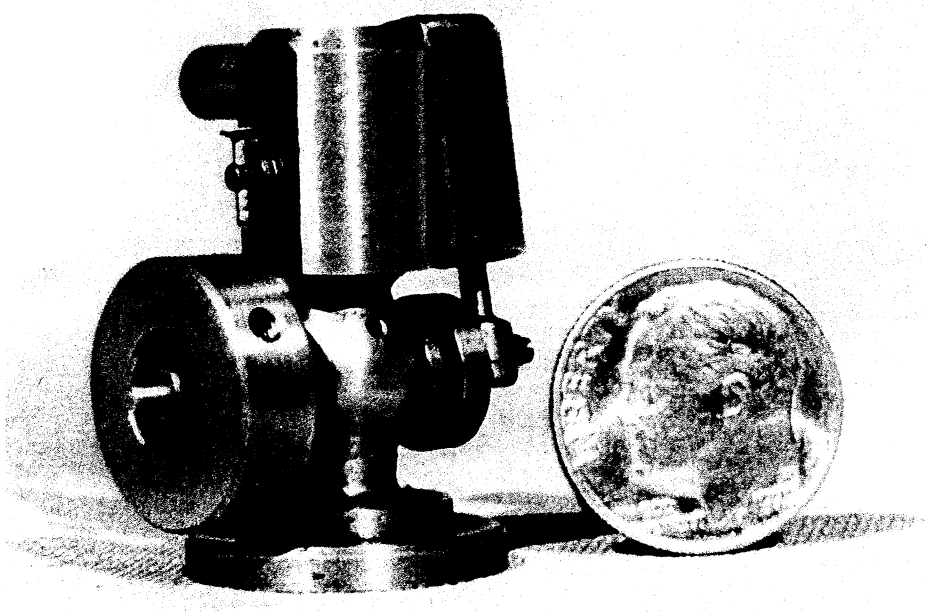
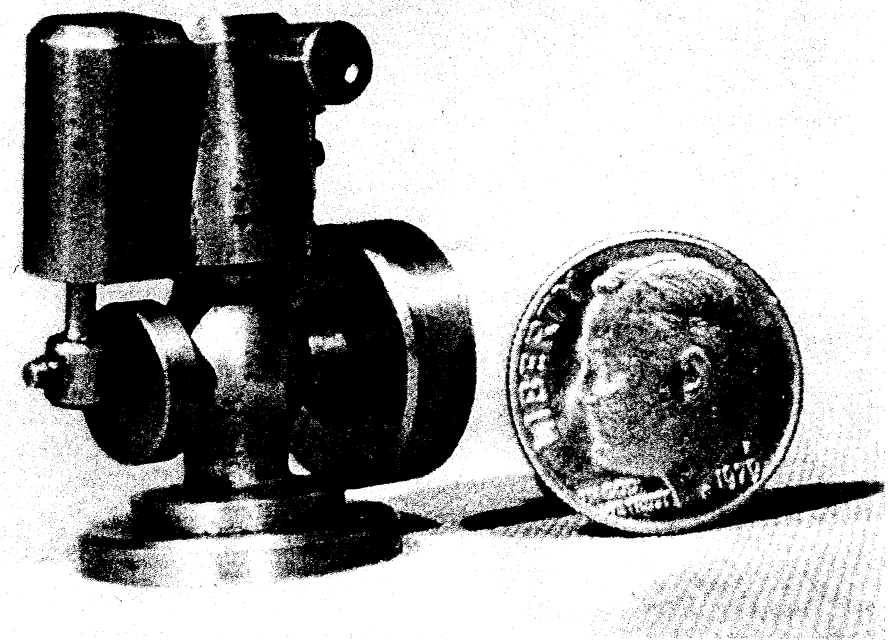
CHAPTER

23 Tiny





This engine is for those who want to try a really small model, but not all the way to tweezer-and-eyeglass size.

The **COLUMN** is made of steel. The best way to start is by chucking a piece of 3/4" diameter x 2" free-machining steel in the three-jaw and turn down to 1/2" diameter for a distance of 1-5/32". The next step is to turn it down to 7/16" diameter for a distance of 1-3/32". Next, cut to 3/8" diameter starting 9/16" from the end and go down to the 1/2" diameter using a round-nose tool bit. Round in the curves, keeping the 3/8" bulge centered 1/4" from the shoulder at the 7/16" diameter. Make a parting cut to length. Make the two flats parallel to each other, lay out and make the Crankshaft hole and the Pivot hole. Make the drill jig and locating pin. Place the jig over a close-fitting pin in the Pivot hole and against the locating pin as shown. Drill a #57 starter hole 1/32" deep and turn the jig over to get the other hole. Remove the jig and anchor the column squarely while completing the port holes. Note — one hole goes through and the other is 1/4" deep.

Transfer the centerline around to the side and make the 5-40 **STEAM CONNECTION**.

Make the **BEARING** out of brass or bronze and set in the Column with Loctite. Add the oil hole and, if you wish, tap up from the bottom for a 2-56 anchor screw.

For the **CYLINDER**, start with a piece of 5/16" x 5/16" x 9/16" brass or bronze. Lay out the bore offset at 3/16" from one edge and prickpunch. Chuck it in the 4-jaw, using a center test indicator, and then use drills and a tiny boring bar to complete the 3/16" bore. Lay out the Pivot center, prickpunch and chuck it in the 4-jaw using a center test indicator and some protection to prevent chuck jaw marks. Make sure the face is parallel

with the face of the chuck. Face, undercut and drill for the brass Pivot Pin. Insert a close-fitting aluminum pin in the 3/16" cylinder bore and solder the Pivot Pin into the Cylinder, using a tiny speck of 430° solder. The solder will not stick to the aluminum.

Rounding the back of the **CYLINDER** is optional. When the Piston and Rod is done, insert the Piston into the Cylinder, place the drill jig over the Pivot Pin and run a close-fitting 1/16 pin through the jig and the hole in the Connecting Rod. Drill the #57 steam port.

The **PISTON AND ROD** is made by chucking a 1/4" diameter x 1-3/8" brass rod in the 3-jaw or collet with about 7/8" projecting. You can make it more if you wish to have tailstock support. This one was made without support by using a long tapered tool bit with about a .010" raidius on the end, honed up keen and by making very light and careful cuts. The Cylinder was used as a gauge. Make the oil grooves with a 90° V-tool and then part to length. Mill the flat and make the 1/16" Crankpin hole.

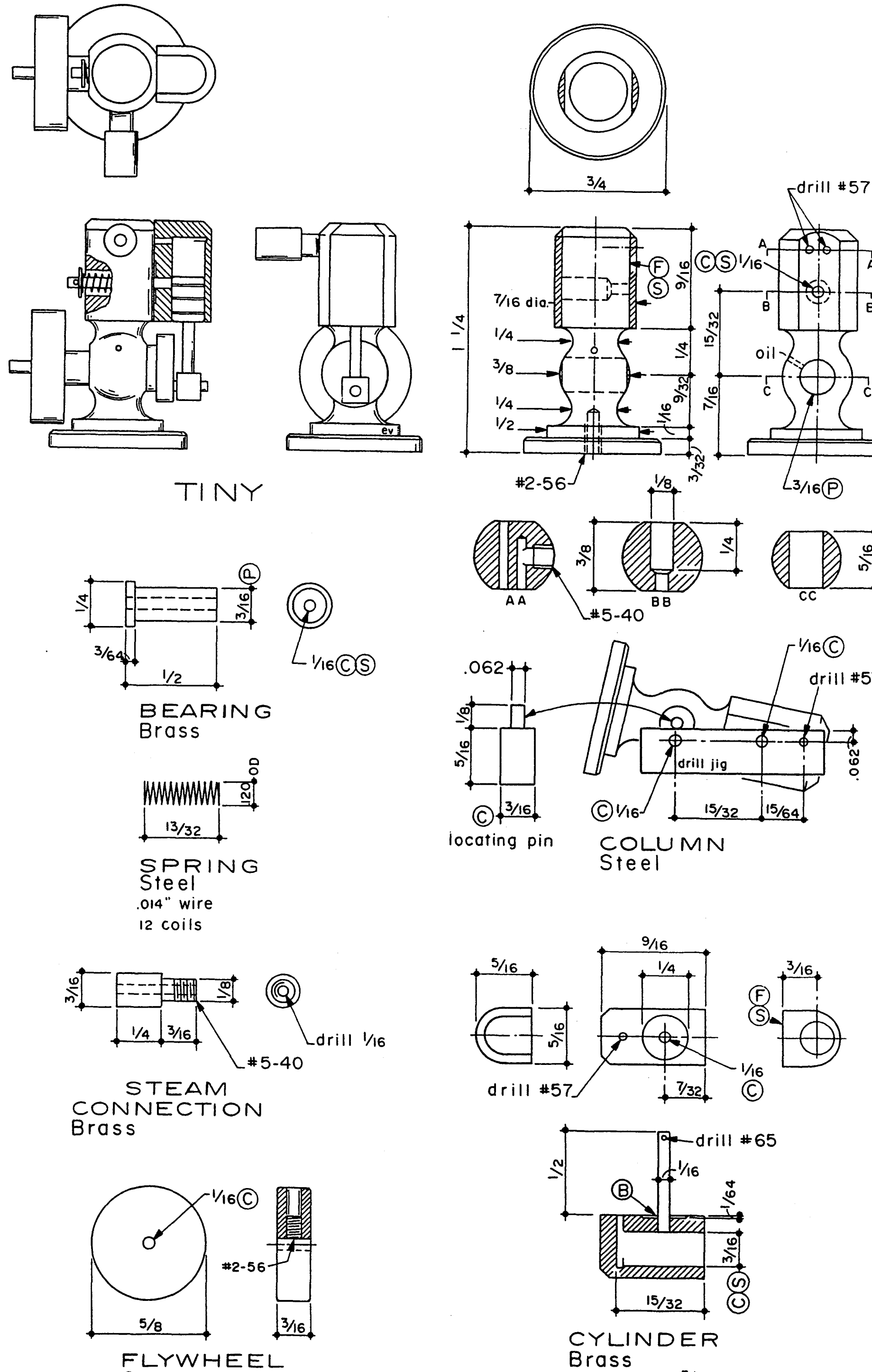
The **CRANKSHAFT** is a simple steel disk and two pieces of drill rod assembled with Loctite.

The **SPRING** is salvage, about the proportions shown, and it seems to do a satisfactory job.

The **STEAM CONNECTION** is brass, made up to take 3/16" plastic tubing. This, also, is optional if you have other plans for attaching an air line.

The **FLYWHEEL** is 5/8" diameter x 3/16" wide of steel fitted with a 2-56 x 1/8" set screw. At assembly, spot the set screw on the same side of the Shaft as the Crank Pin as shown to help counter-balance.

This turned out to be a smooth-running engine. It sounds like a bumble bee on 5 to 10 pounds of air.



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