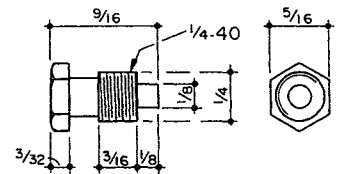
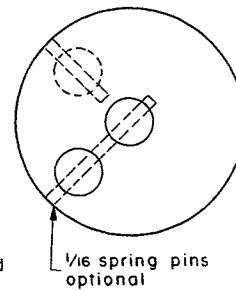
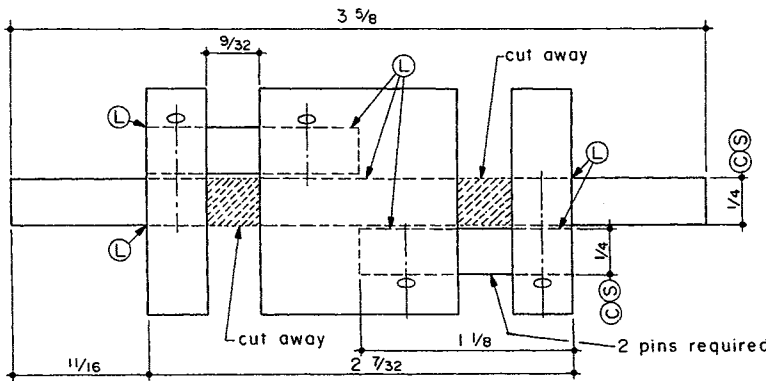
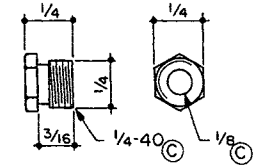


optional design

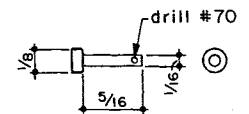
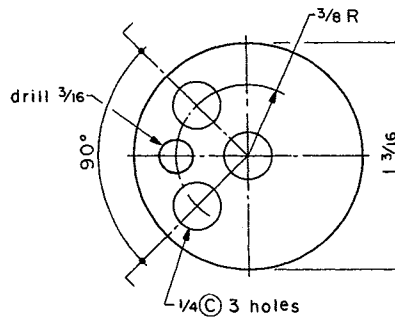
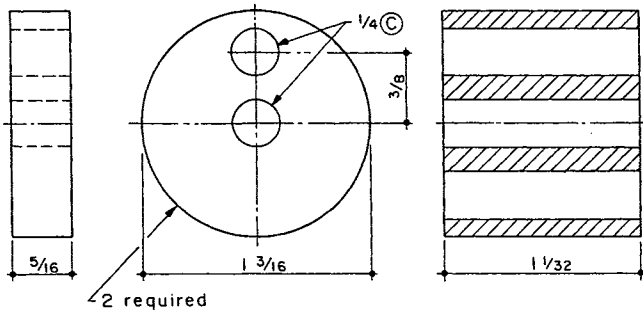
CYLINDER RETAINER  
Aluminum



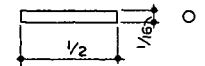
SCREW  
Brass  
2 Required



PACKNUT  
Brass  
2 Required

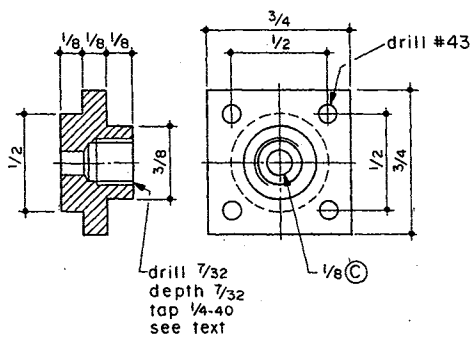


PIN  
Brass

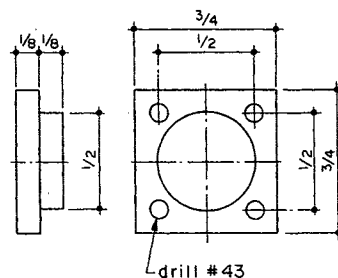


PIN  
Brass

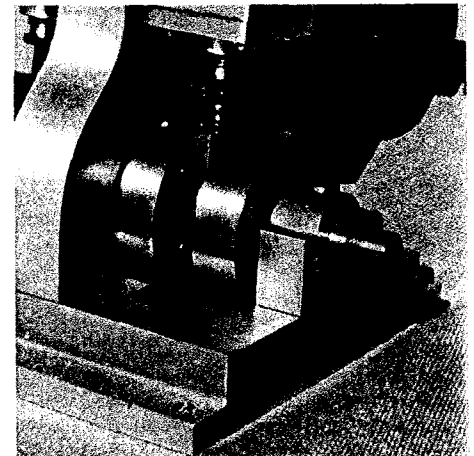
CRANKSHAFT  
Steel



HEAD  
Brass  
2 Required



HEAD  
Brass or Aluminum  
2 Required



# 52 Reversible Vertical Twin Wobbler

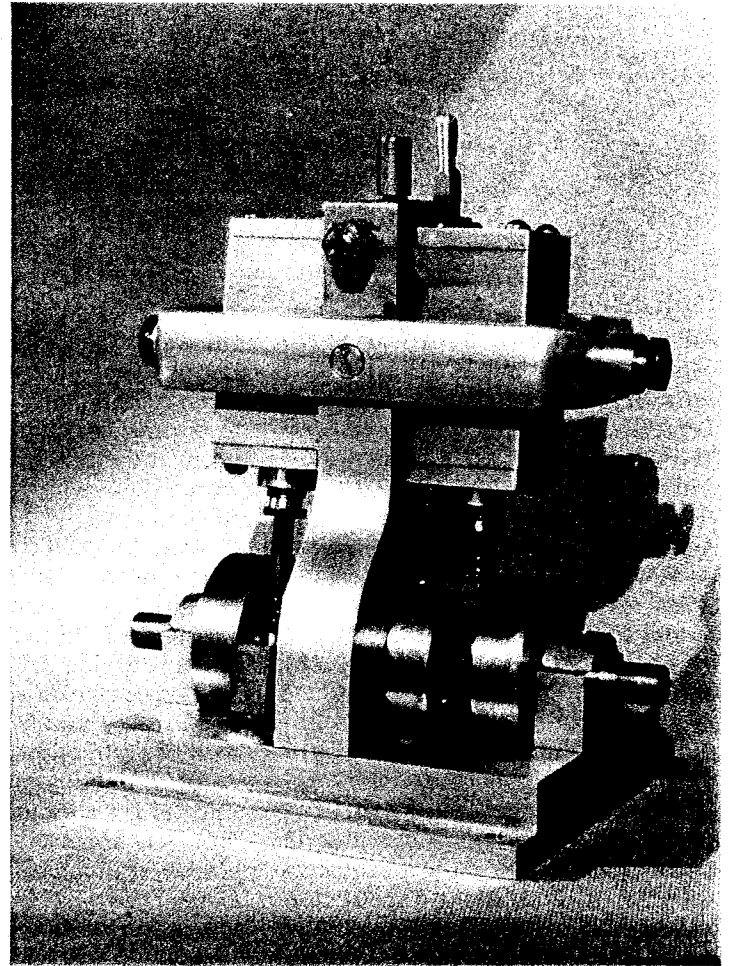
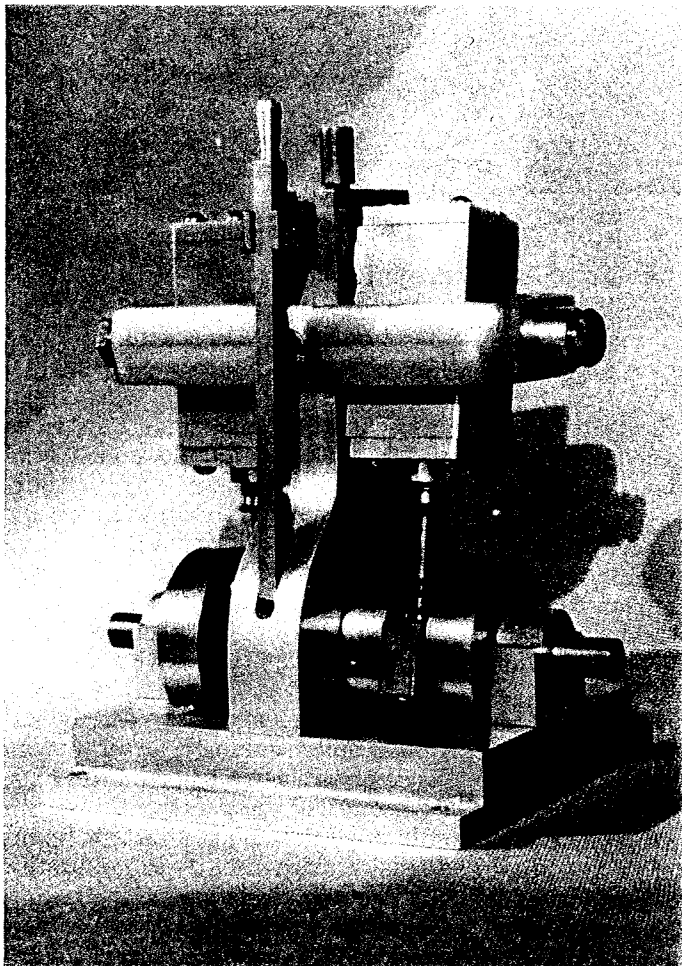
This could be a good engine for a boat. Efforts were made to keep it compact and light weight. Experienced boat builders will have to tell us if it is suitable. It is a combination of ideas from other engines. The Wobble Cylinders are common practice but with a different type of Spring pressure to hold them against the Valve surface. The Crankshaft serves as a Flywheel. The Column requires some careful layout and machining. Several steam passages are drilled and finally the ends plugged in order to get the ports in the proper location. The Reversing Valve is cylindrical and close fitting without Stuffing Box. There is no control for the exhaust. The Cylinders are double acting and the engine is self-starting.

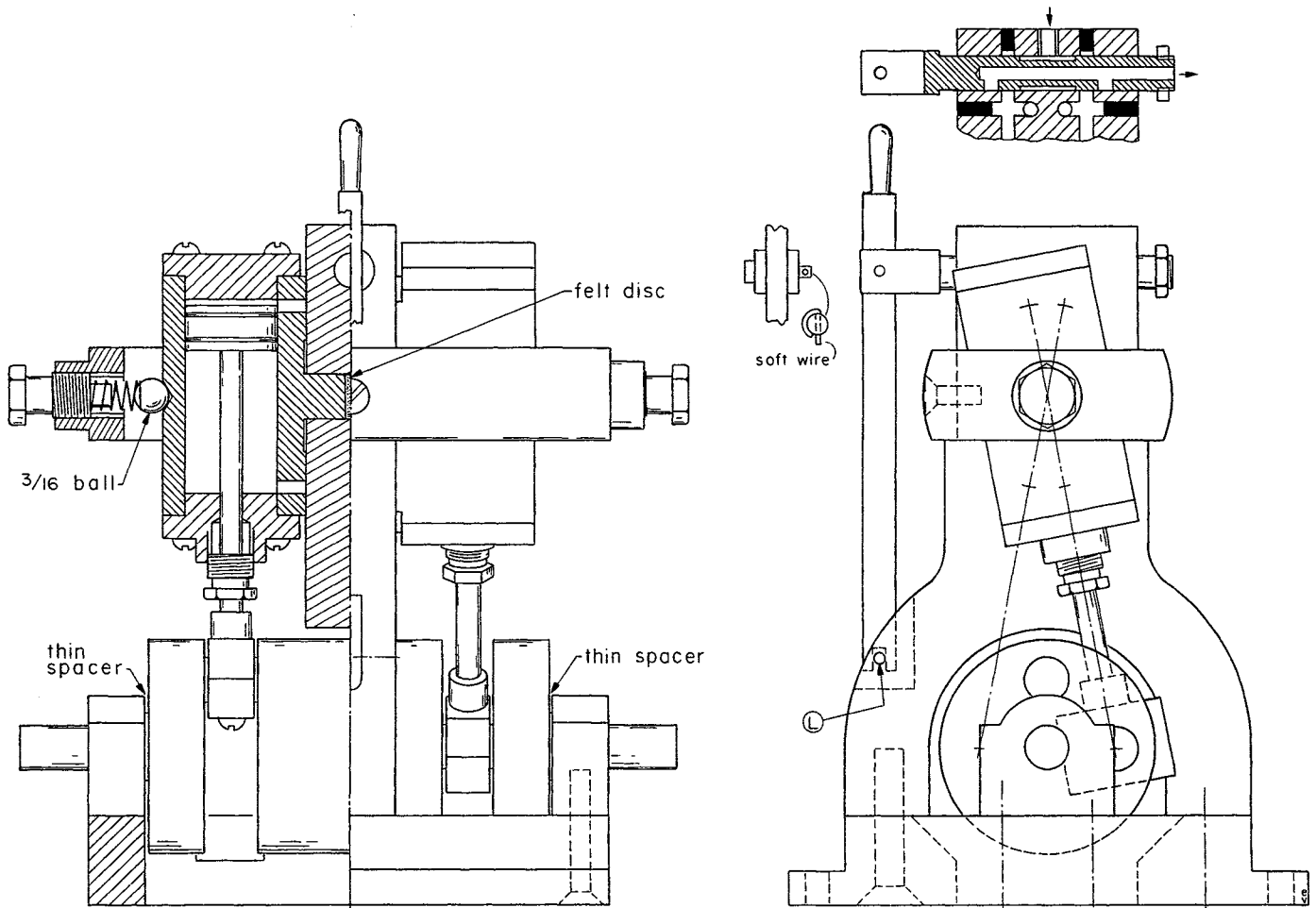
The **BASE** is simple and no extra

remarks are needed. As usual, on these engines, you can use your own ideas such as rounding some corners and cutting away the flange between the anchor holes forming four rounded lugs.

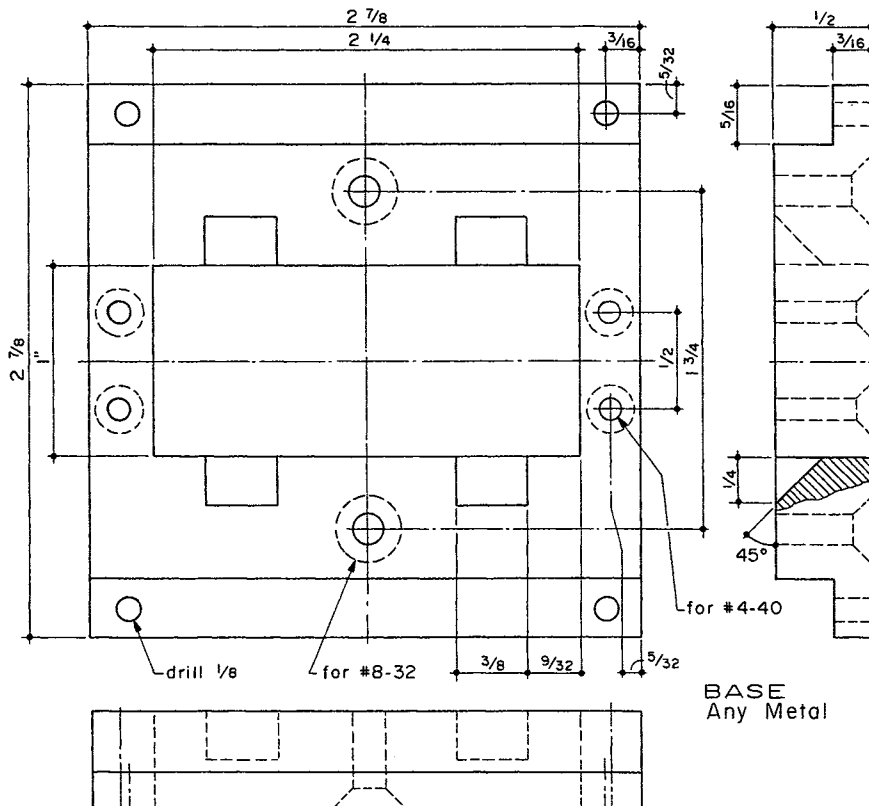
The **COLUMN** is about the most complicated part. Start out with an accurate 1/2" x 2-1/4" x 3-5/8" block. Lay out all the outlines and hole centers except the steam ports and oil hole. Bore and ream the two 1/4" holes. If the engine is to get some hard usage, the Pivot hole may be bushed. Make the drill jig. The jig is placed over the Pivot Pin and against the Pin at the Crank center. Drill the four holes **P** using the jig. Cut to the outline on two surfaces **Q**. Leave the lower end solid for now. Transfer the port hole centerline around to the

sides and drill four holes **S**. Transfer the centerlines of the **S** holes up over the top and drill two holes **T**. Drill two holes **U** for the retainer. Do not break through into the steam passage. This will require a bottoming tap. Make the 3/16" Valve bore **W** close fitting and smooth. Drill and tap 1/8" steam connection at **V**. Chuck in the 4-jaw and bore the 1-5/16" hole at **X**. Complete milling to shape at **Y**. Next, tap the 8-32 mounting holes. Mill the Lever pivot slot and drill 1/16" at **Z**. Drill 1/16" oil hole at 20°, both ways off horizontal and vertical as shown in special view "lubrication". Avoid breaking into a steam passage. A close plug in the 1/4" bore will prevent drill breakage. Blow all chips and dirt out of steam passages and plug as shown, either press fit or Loctite.





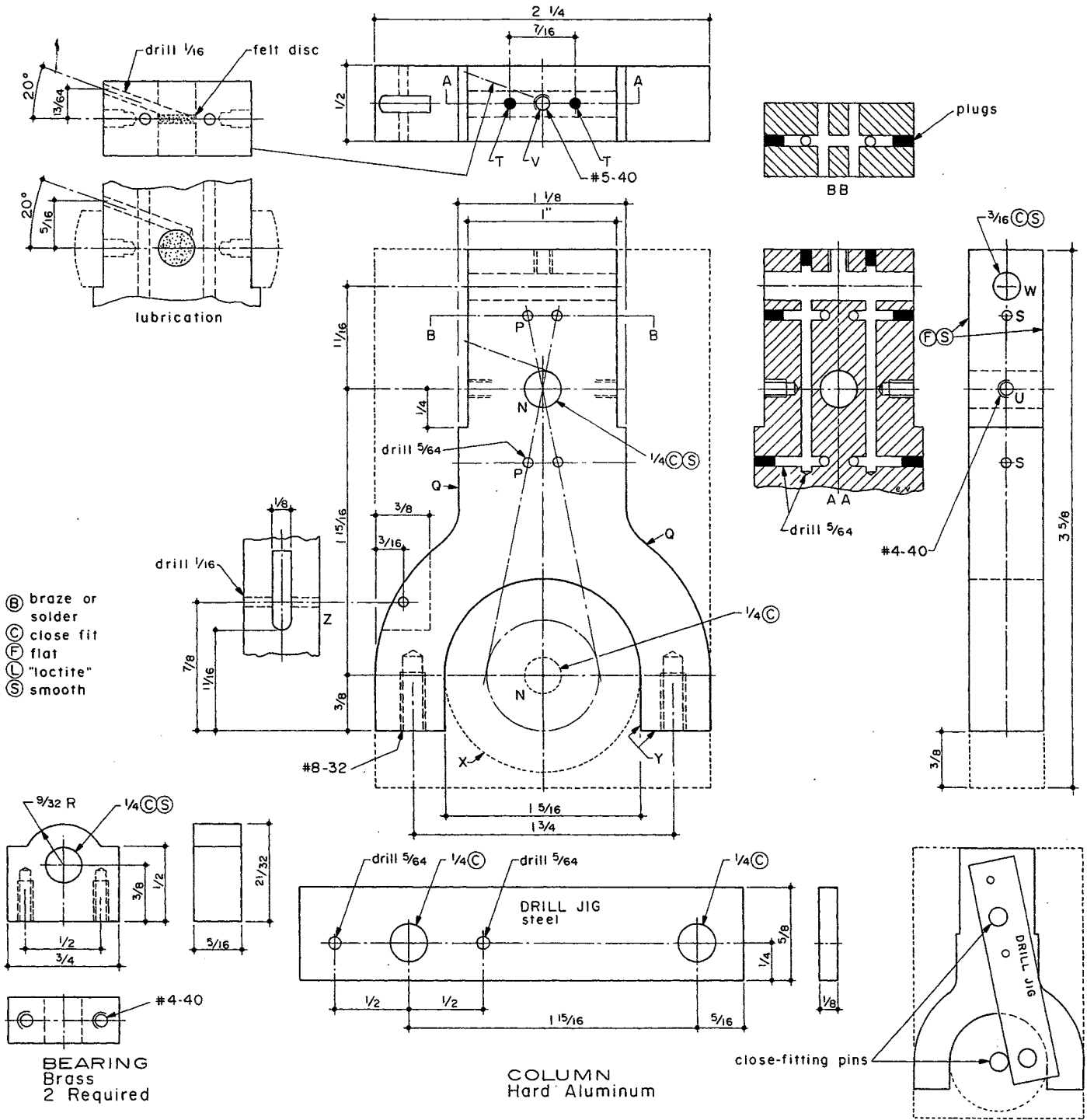
RVTW  
REVERSIBLE VERTICAL TWIN WOBLER



Punch out a 1/4" diameter **DISK** from 1/16" felt for the lubrication at the Pivots. It will slowly feed the oil to the Pivots.

The **BEARINGS** need no explanation except bushings may be added if this engine may get some hard usage.

The **CYLINDER RETAINER** is perhaps more fussy than need be, though it adds a bit to the appearance, and is a dandy little exercise in turning. The drawing tells the story pretty well. First, on a 1/2" x 1-3/8" x 3-1/4" block, lay out all the outlines and centers. Drill the four 1/4" holes for the 1" x 2-1/2" center opening. Saw and file to shape. Drill lathe center holes in each end. Drill #32 the center holes in the side. Counter-sink later. Turn one end. Reverse and turn the second end. The diameter across 1-3/8" is simple, but making the rounded corners is not so easy. The one shown was roughed out with



the lathe using fine cuts until it looked good, then brought to a final shape with a file and emery free handed out of the lathe. An option is to set the compound at 45° and make a simple bevel. Another is to make the Column wider and use rod and end pieces to retain the Cylinders. Countersink the 4-40 screw holes. Drill and tap the ends 1/4-40.

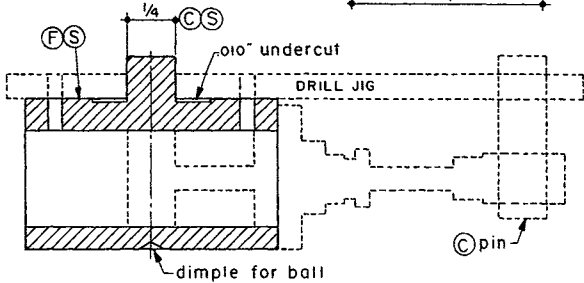
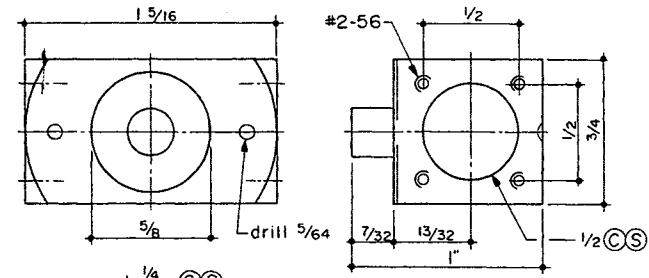
The **CRANKSHAFT** is pretty well covered in the drawings. A few notes will help. The short Shafts reach only half way through the center pieces. The open portion plus the

3/16" hole are an effort at counterbalancing. Loctite the short Shafts into the end pieces and allow to cure. After curing, assemble onto the long Shaft taking care with the spacing at 9/32" and 2-7/32". After final curing, add the spring pins if you wish and cut away the Shaft as shown.

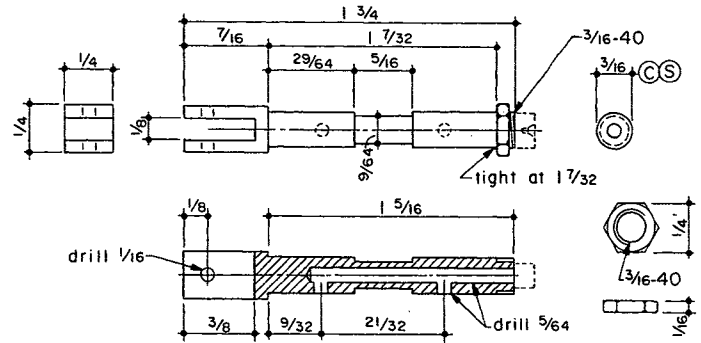
The **CYLINDERS** on the model shown are aluminum. This has aluminum running on aluminum which is not the best. Brass Cylinders would probably be better. Lay out all lines and centers on an accurate 3/4" x 1" x 1-5/16" block. Center in the 4-jaw

and make the 1/2" bore smooth and accurate. Chuck in the 4-jaw, centering for the 1/4" pivots. Use protectors on the ends. Turn and make the .010" undercut. Use the drill jig as shown on the assembled Cylinder, Piston and Rod and Head, using close fitting Pin in the Rod Bearing and drill the port holes. Next, make the dimple for the 3/16" ball.

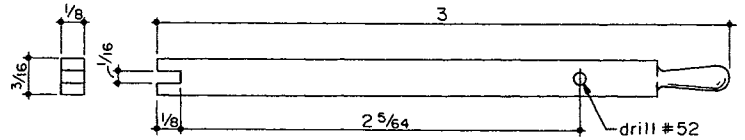
Make the **HEADS** and use them as jigs for spotting the Head capscrew holes. When making the Stuffing Boxes, try for good concentricity and a close fit on the Shaft and the Pack



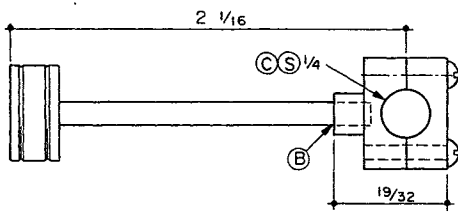
**CYLINDER**  
Brass  
2 Required



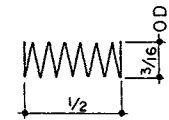
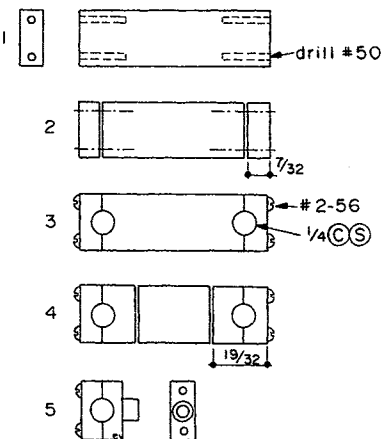
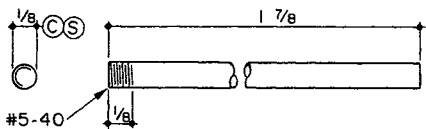
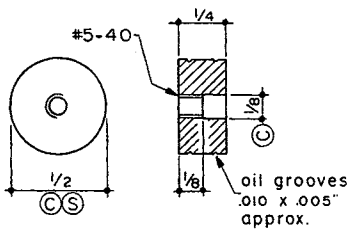
**VALVE**  
Brass



**LEVER**  
Any Metal



**PISTON AND ROD**  
Brass  
2 Required



**SPRING**  
Steel  
Wire dia. .025"  
2 Required

Nut. When making the **PACK NUT**, open the die a wee bit to make a close fit at the 1/4-40 thread. The reason being that, since there are no guides, the Piston, Head and Pack Nut must take all the forces that keep rocking the Cylinder.

The **PISTON AND ROD** are pretty well covered by the drawings. Try for good concentricity at the Piston and Rod. A five-step layout shows how the Bearing ends of the Rod were made. After assembly, the 1/4" holes were centered on the joint. Next, the 19/32" assemblies cut off the ends are chucked in the 4-jaw and the hub turned and bored 1/8".

Make the 3/16-40 **NUT** for the Valve.

The **REVERSING VALVE** calls for some close fitting and spacing. Center some 1/4" stock in the lathe chuck with about 2-1/4" projecting. Make a small center hole and bring up the tailstock for support and turn the 3/16" diameter to the closest free fit in the Column that you can make. Make

the 5/16" x 9/64" neck very close to dimension. Now, turn the 3/16" diameter down to about 11/64" at the end, 1-5/16" from the shoulder. Then mount the 3/16-40 die in the tailstock and thread it so the Nut runs tight at 1-7/32". This may take several "cut-and-tries". Drill 5/64" steam passage. Trim off the stub end at the 1-5/16" dimension and carefully lay out and drill the two 5/64" holes at 9/32" and 21/32". Cut off at 1-3/4" and make the 1/8" slot parallel to the two 5/64" holes you just made and make the 1/16" pin hole.

The **SPRINGS** used had the dimensions shown. Try some from your collection. You will get a feel for the drag and know when the tension is right. A hard steel ball coated with grease will serve well under the Springs.

Make sure that everything runs free and is well lubricated, and try on 10 psi air. The model shown ran on only a few pounds, just barely turning over and reversing easily.