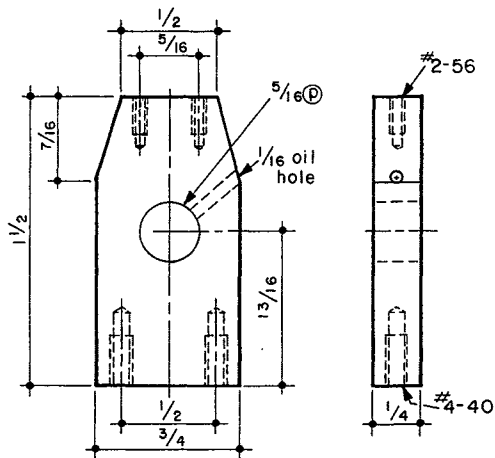
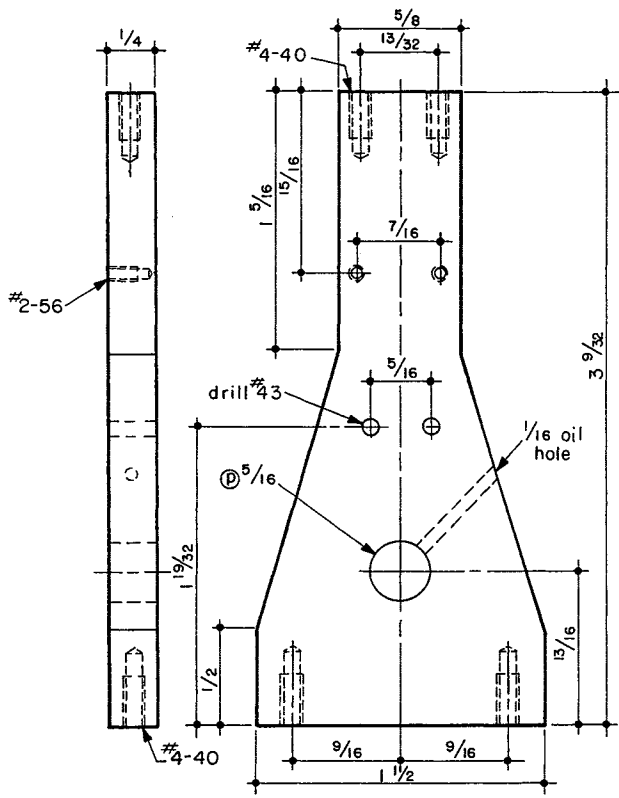


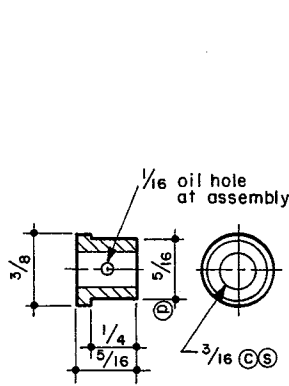
**LEVER GUIDE**  
Aluminum



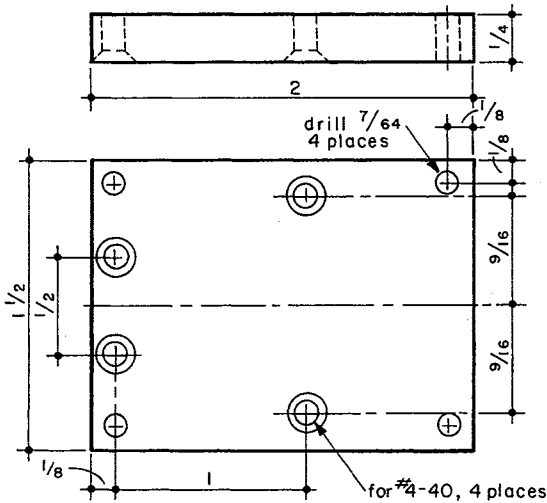
**BEARING**  
Aluminum



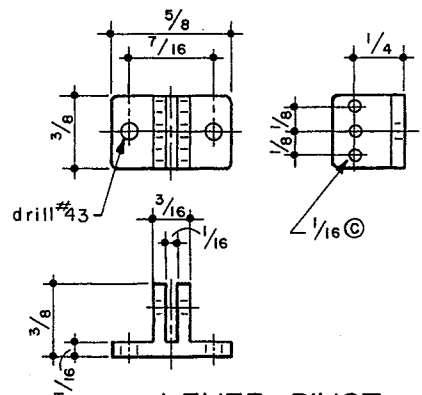
**COLUMN**  
Aluminum



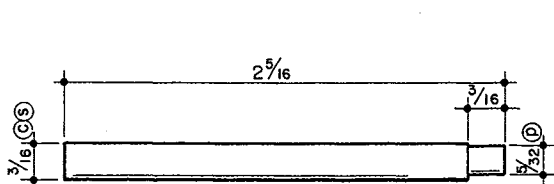
**BUSHING**  
Bronze  
2 Required



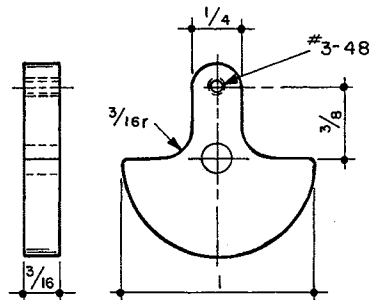
**BASE**  
Aluminum



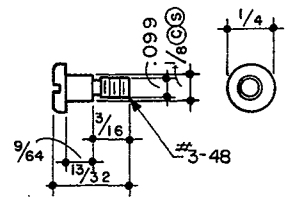
**LEVER PIVOT**  
Brass or Aluminum



**SHAFT**  
Steel



**CRANK DISK**  
Steel



**CRANK SCREW**  
Steel

# 14

## Wobble Plate Engine

This isn't a model of any large engine and it doesn't have the usual construction and appearance of small steam engines. Bernard Leahy told of a model he saw with a cylinder made from the tube of a bicycle tire pump and fitted with a valve across the end. This is a showoff engine using this idea and an unusual valve mechanism. You surely can see a lot of action.

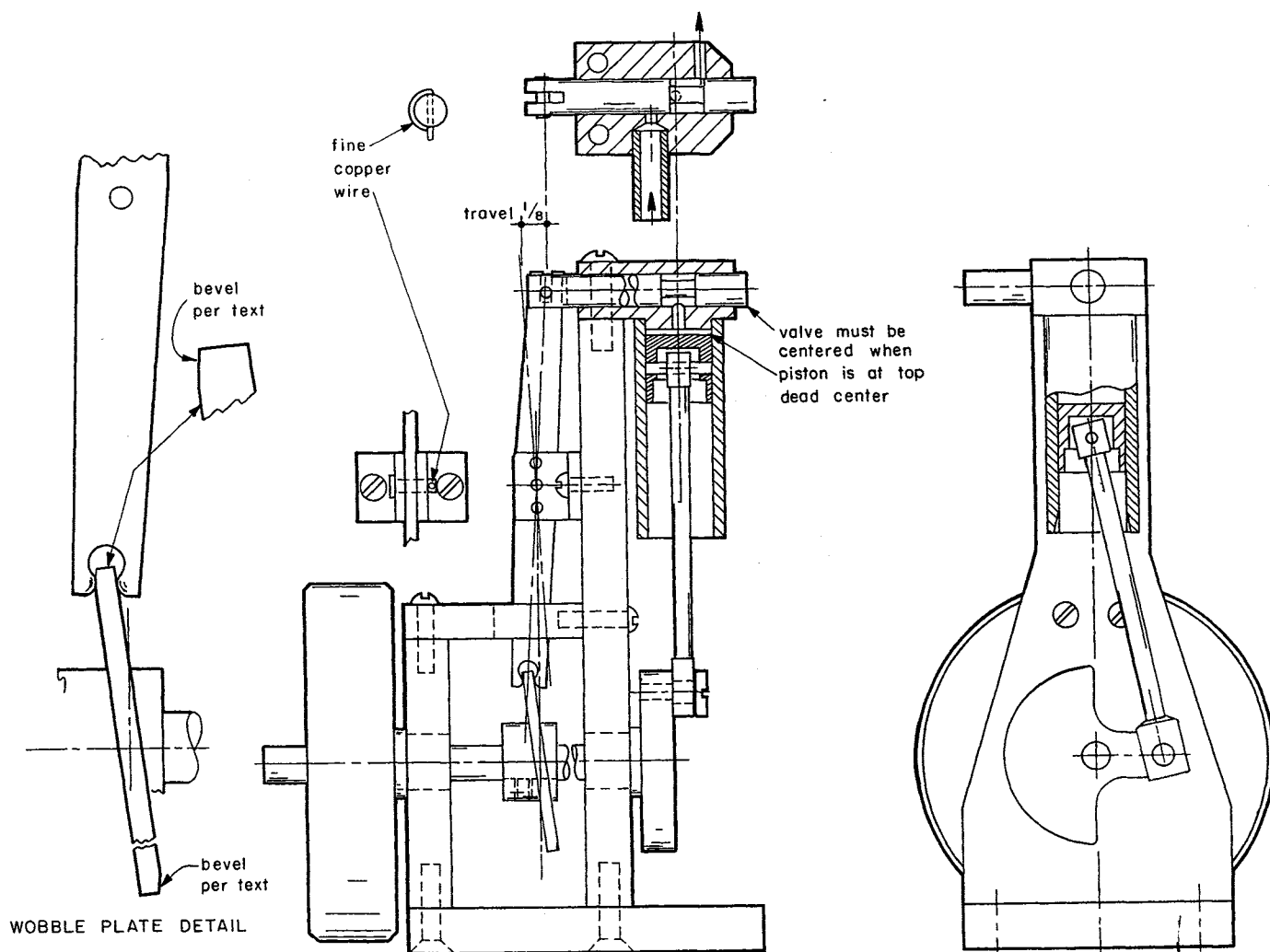
The construction is not difficult. It is important to avoid too much looseness in the valve linkage. Getting 1/8" of travel in the wobble disk is important and requires a bit of care-

ful soldering. The bar from the bearing over to the column serves to back up the valve lever against the disk thrust and it adds support to the tall slender column. We hope this small model appeals to the owners of 3 and 5 inch lathes. If all the dimensions are doubled it makes a good model for those who don't like to work quite so small. Most of the parts are straight machine shop practice.

On the **COLUMN** it is good to have the 13/32", 7/16" and 5/16" hole spacing accurately straddle the centerline. This applies to the bolt spacing on the **BASE**, **LEVER GUIDE**,

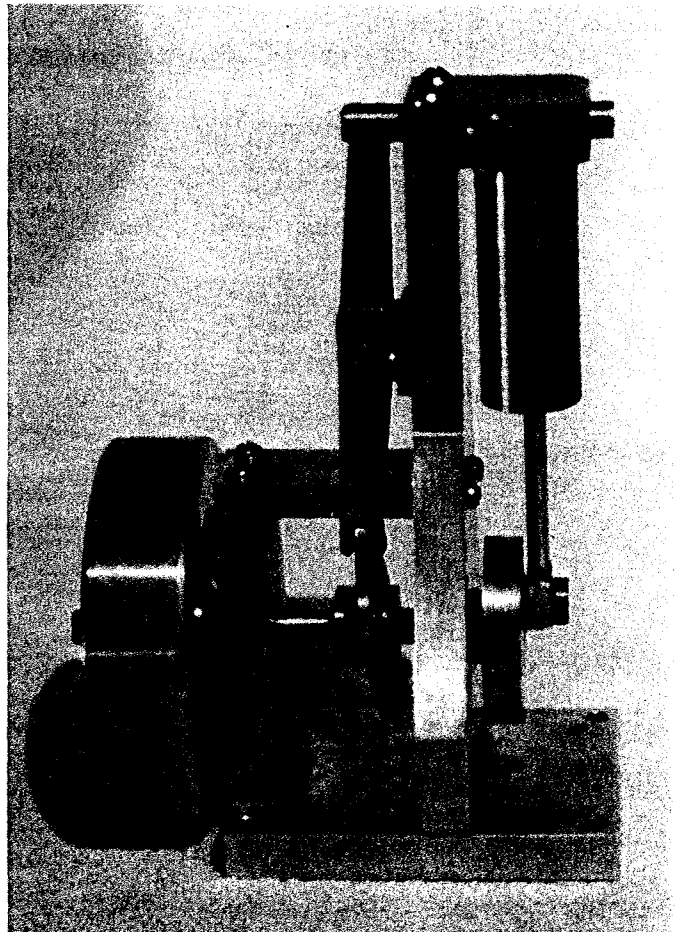
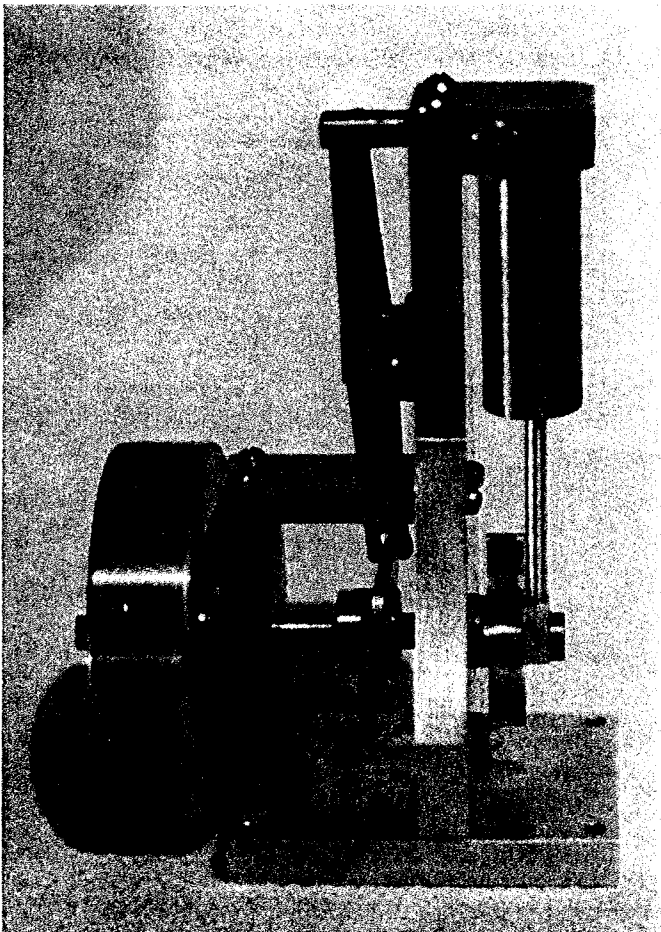
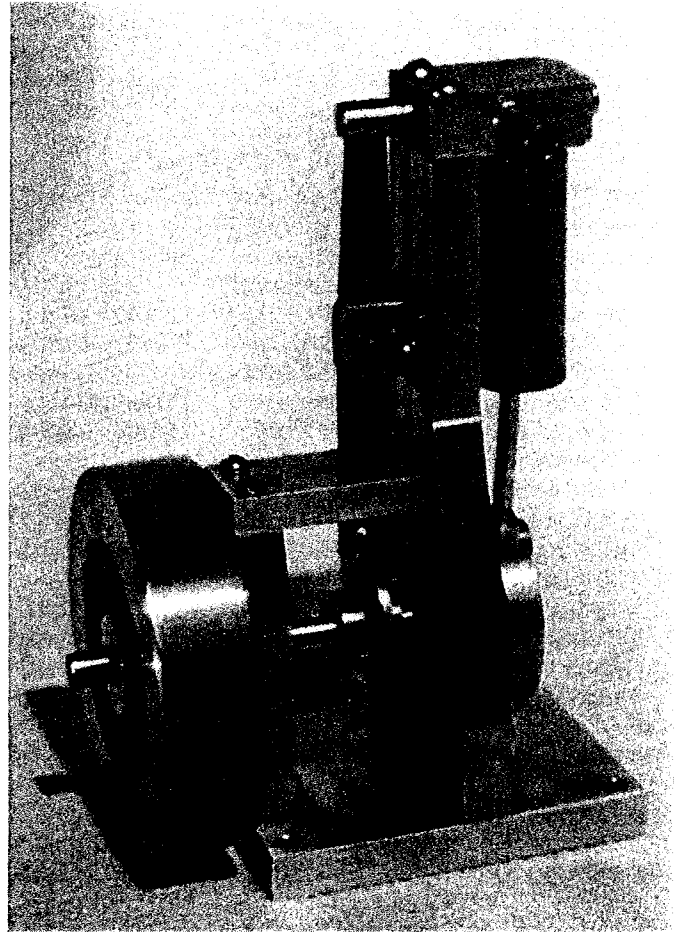
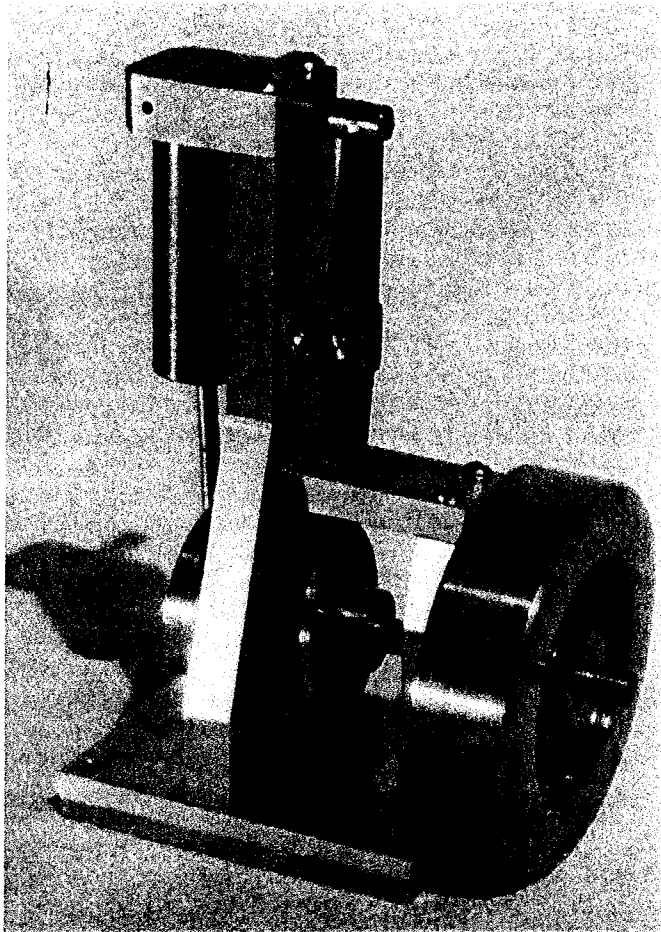
**LEVER PIVOT** and **VALVE BODY** which are all related and affect the alignment and freedom of the **VALVE LEVER**.

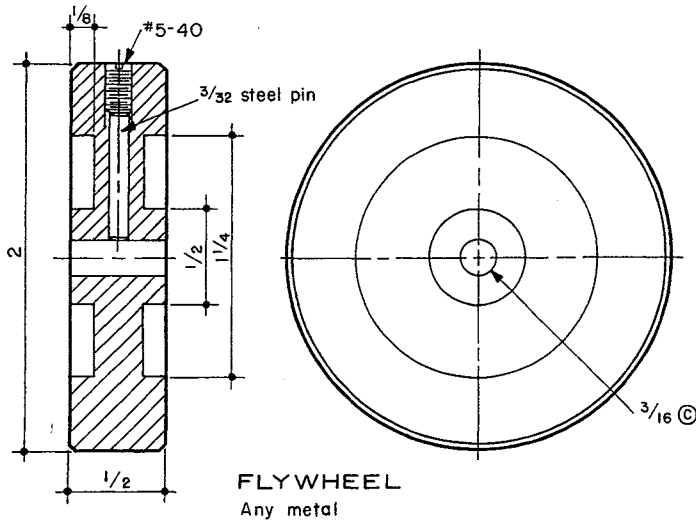
The **VALVE LEVER** and **LEVER PIVOT** are made with three pivot holes. If you lack a bit of valve travel, mount the pin in the lower holes. If there is too much travel, use the upper pivot holes. The valve travel is centered by moving the **WOBBLE PLATE** along the shaft. By watching close in the ports you can see the edge of the 3/16" neck in the Valve as it passes each port. One extreme position of the Valve is shown in the top view of the



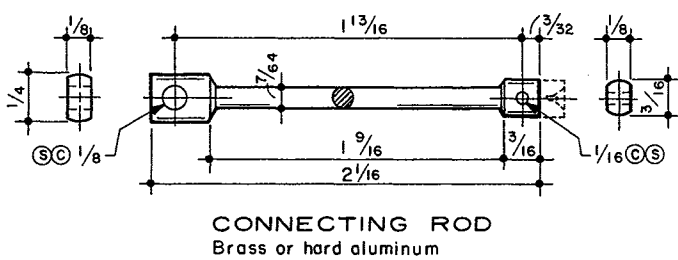
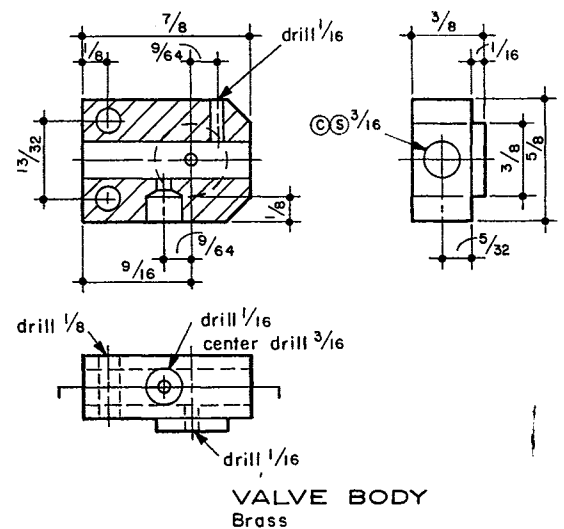
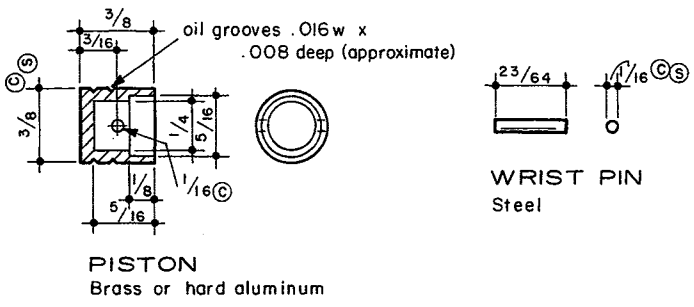
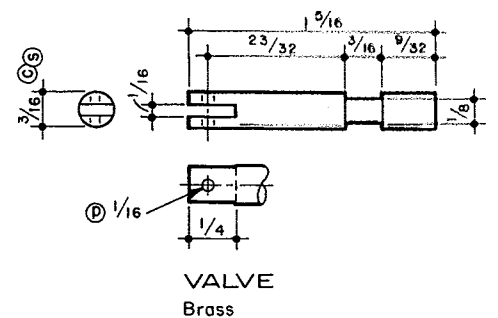
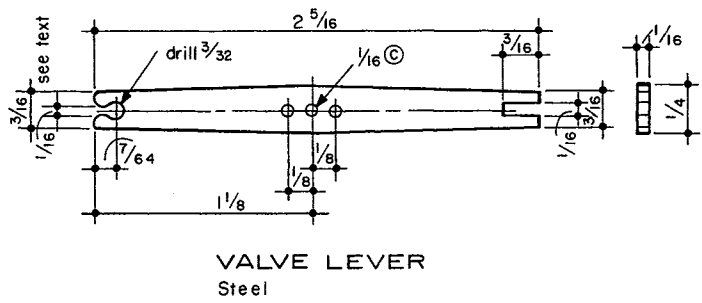
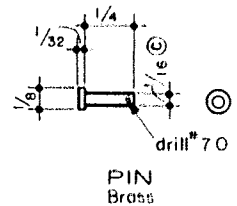
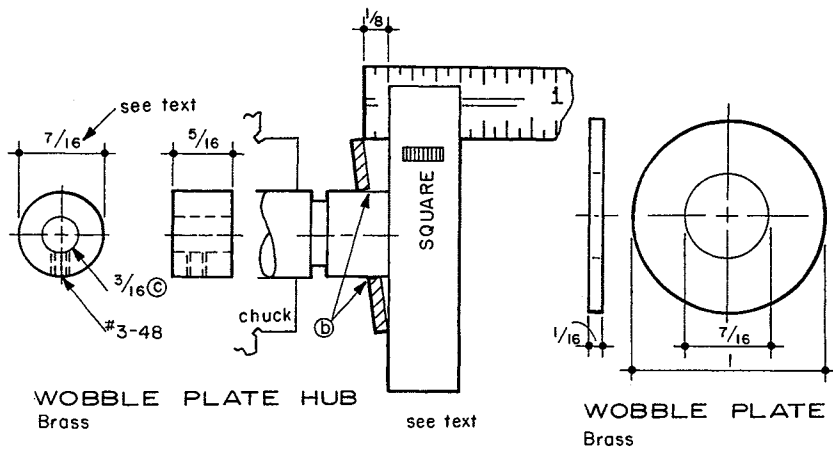
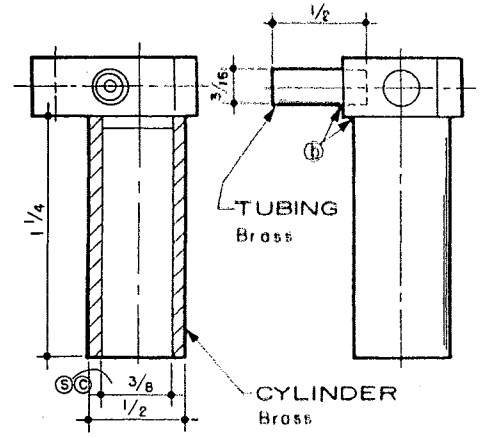
WOBBLE PLATE DETAIL

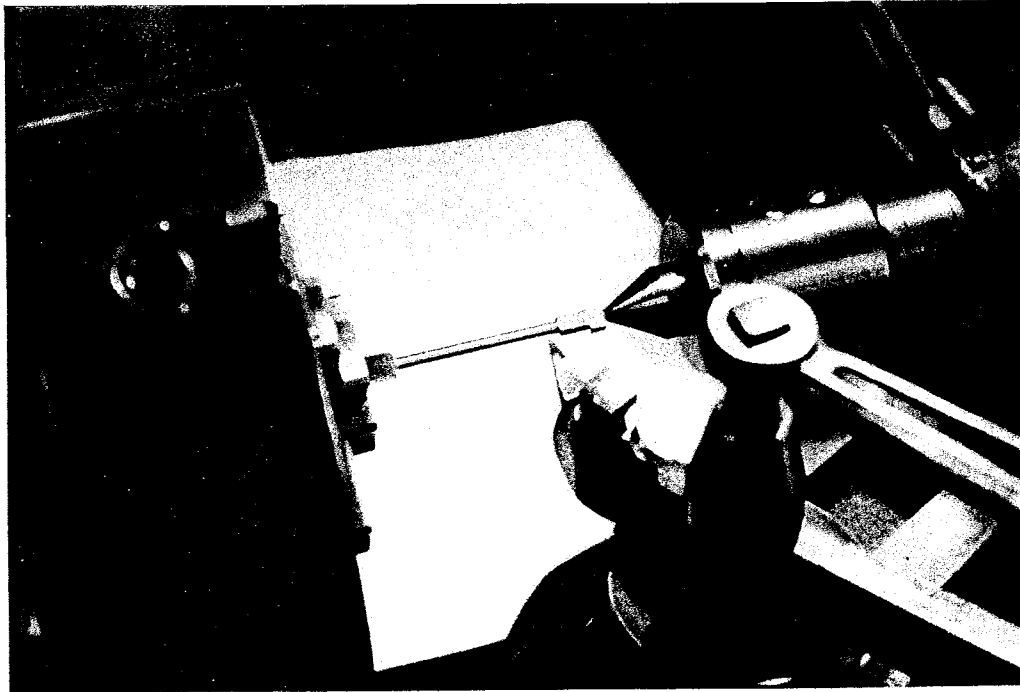
WOBBLE PLATE 3/8 Bore





- (C) close fit
- (S) smooth
- (b) broze or solder
- (D) press fit or "loctite"





Turning the connecting rod for the Wobble Plate Engine.

engine assembly. Notice that the position of the Wobble Plate and Lever apply to this top view. The break in the Valve in the main view is related to the **PISTON** position shown. The Wobble Plate is 90° out of position on the main assembly drawing.

The Wobble Plate is made first with a clean, sharp 7/16" hole. The **WOBBLE PLATE HUB** is turned until it just enters this 7/16" hole. By reducing the diameter a thousandth and trying the disk each time, you repeat until the 1/8" dimension is reached as shown. This diameter is approximately .432". With pliers in one hand, twisting the disk as far as it will go and measuring, you can produce a wobble close to 1/8". Hold the disk with the pliers in this same way when soldering them together. When soldering, it is not important that the one edge of the disk be even with the end of the Hub. It can be as much as 1/32" from the end, leaving room for the setscrew. Use a small piece of soft sheet copper or aluminum in the pliers to prevent nicks at the rim of the disk.

The **VALVE LEVER** is not too difficult. When making the lower forked end, drill the 3/32" hole first and then form the surfaces as near spherical as you can by eye. Try for the closest

possible fit on the disk that you can get. You will need tiny needle files for this job. Hold the 1/16" dimension close. You will assemble and disassemble several times before you are satisfied. The center of the disk should be the same distance from the column as the hole in the lever pivot during these trials. Notice the enlarged view at the left of the assembly. It shows how two slight crescent-shaped flats are filed and polished on opposite edges of the disk. Now, if necessary, a few thousandths can be added to the 1/16" space in the fork. Make many light passes with fine file and emery cloth until the disk runs free for a whole revolution. As you make trials you will see where to file. At final assembly, load the fork and rim of the disk with light grease that will cling and not drip off. Also add a bit to the slot in the **LEVER GUIDE**.

Start with about a 3" length of 1/4" x 1/8" stock for the **CONNECTING ROD**. Prick punch the exact center of one end and chuck in the 4-jaw with about 1/4" projecting. Center with a center test indicator and make a tiny center hole for tailstock support. Loosen two adjacent jaws and extend stock out from the jaws for about 2-1/2". Tighten these two jaws and bring the tailstock up for sup-

port. Turn the 7/64" diameter starting about 5/16" from the end. Make parting cuts at 3/16" on one end and at 2-1/16" for total length. Lay out and make the 1/8" and 1/16" holes. These holes can be made before turning while the stock is square and easier to lay out and hold. Plan so the lathe center hole can be cut away later.

The **PISTON** is mostly straight turning. At final assembly, insert the **WRIST PIN** through the Piston and Rod. Using a prick punch, flow a bit of piston metal over the ends of the pin to keep it centered so it will not score the cylinder wall. Lightly dress away any raised metal with a small fine oil stone. Peen or prick punch the ends of the pin in the Valve if you do not use Loctite.

The model shown has a brass **FLY-WHEEL** which is a bit heavy but it turns out that the weight is beneficial. A flat can be added to the shaft if you wish since the setscrew pushes against a soft pin. Common taps are too short to reach the shaft.

Time this engine as noted above and apply 5 to 10 psi air. Add a couple drops of oil to the intake to lube the valve and piston.

It is fun to make this engine and it is a good conversation piece.