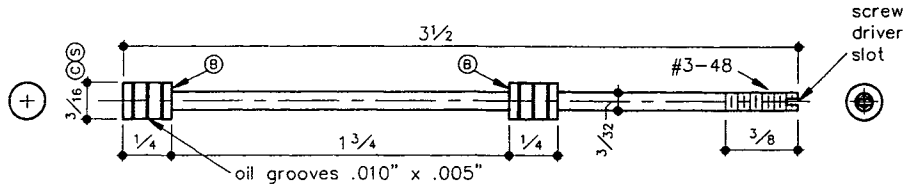
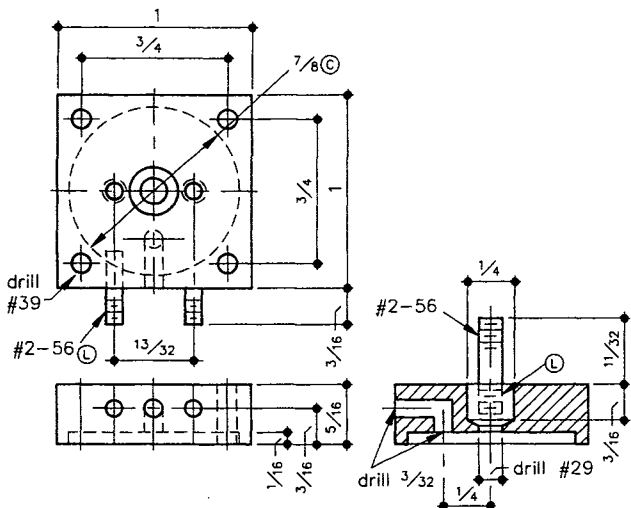


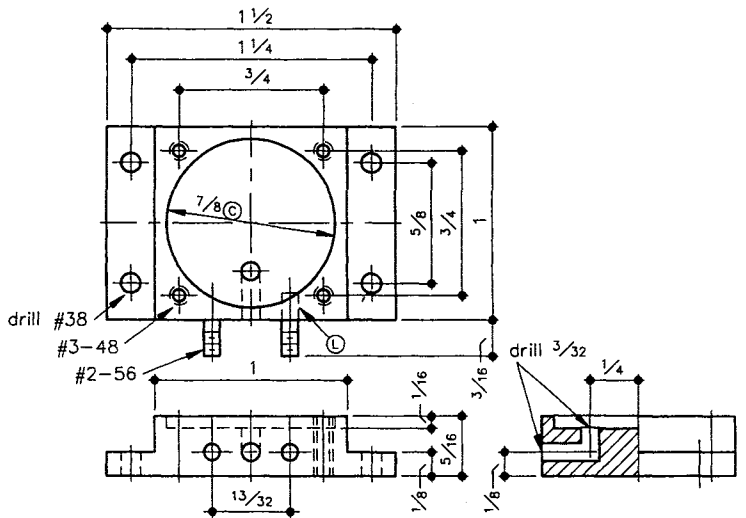
PISTON AND ROD
Brass



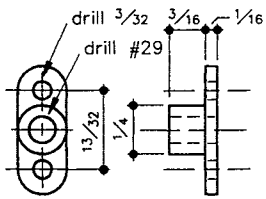
VALVE
Brass



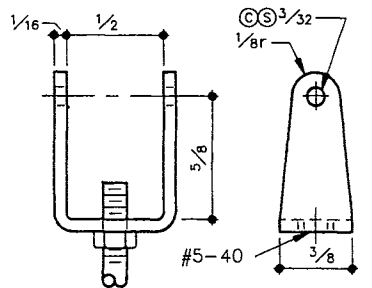
CYLINDER HEAD
Brass



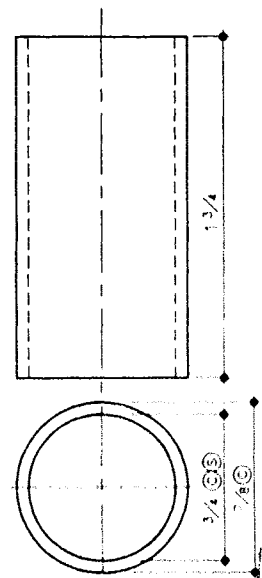
CYLINDER BASE
Brass



GLAND
Brass

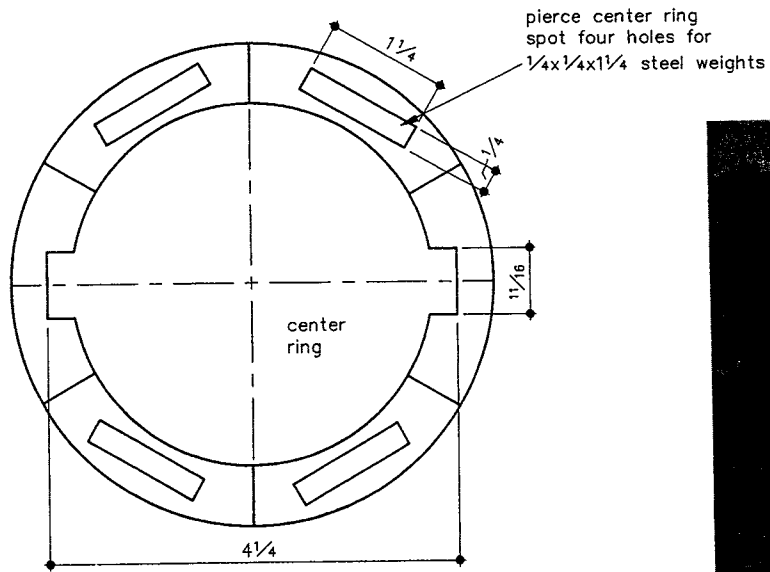
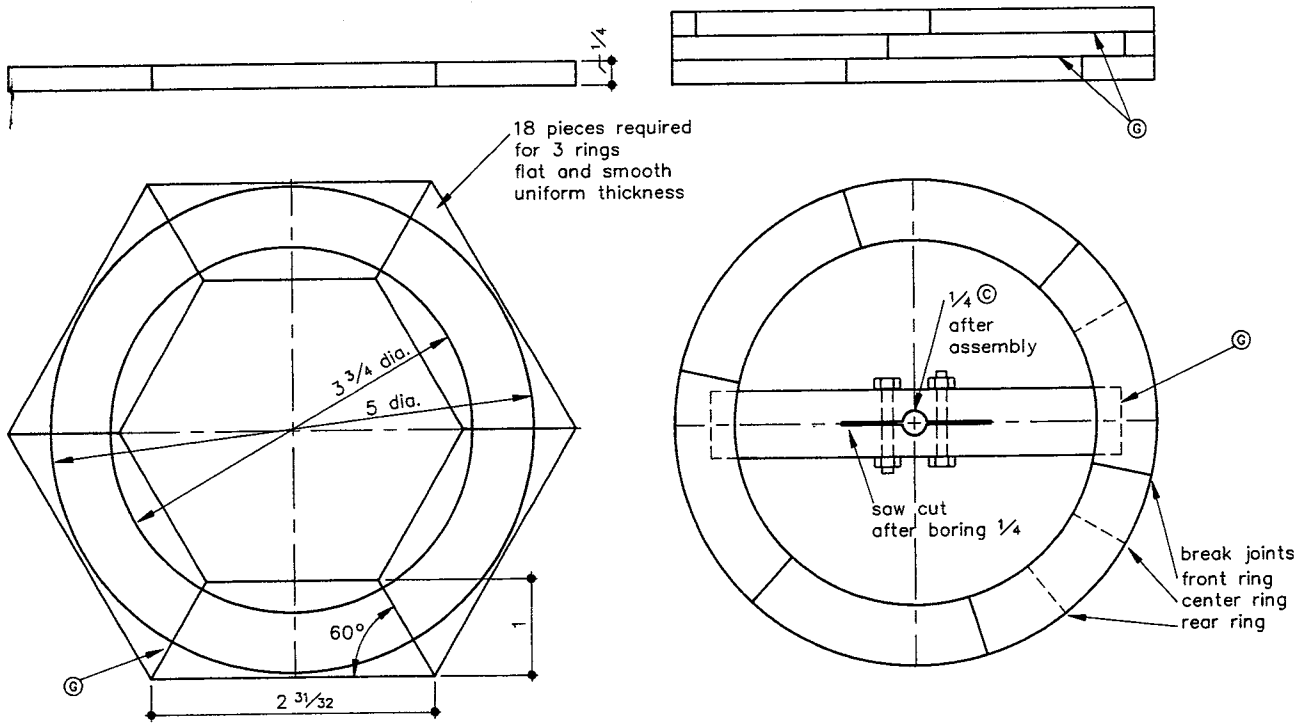


PISTON ROD CLEVIS
Brass

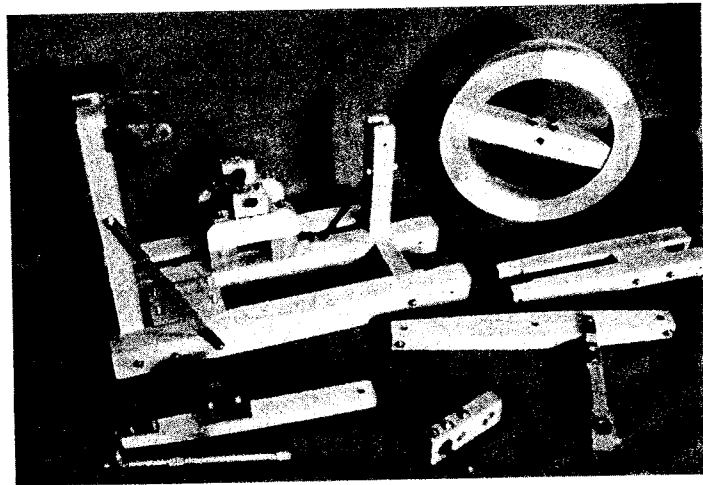


CYLINDER
Brass

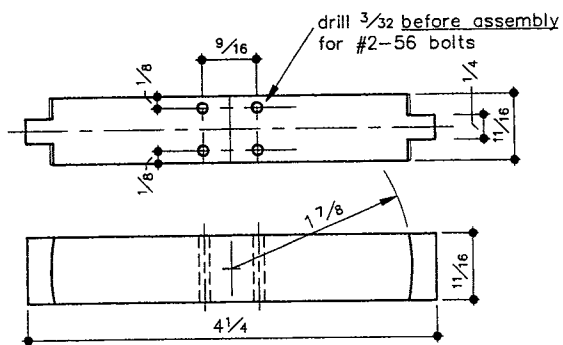
- | | |
|---|--------------------|
| ⓐ | close fit |
| Ⓢ | smooth |
| ⓑ | braze or solder |
| Ⓛ | set with "loctite" |
| ⓧ | epoxy glue |
| ⓐ | wood glue |



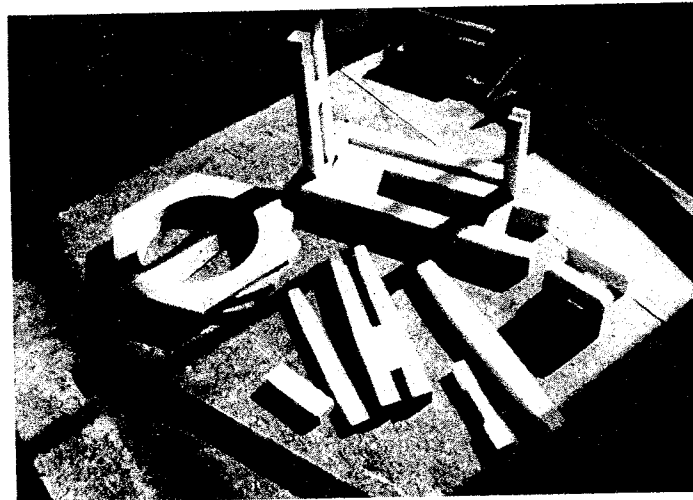
FLYWHEEL
Hard Maple or equivalent
1 Required

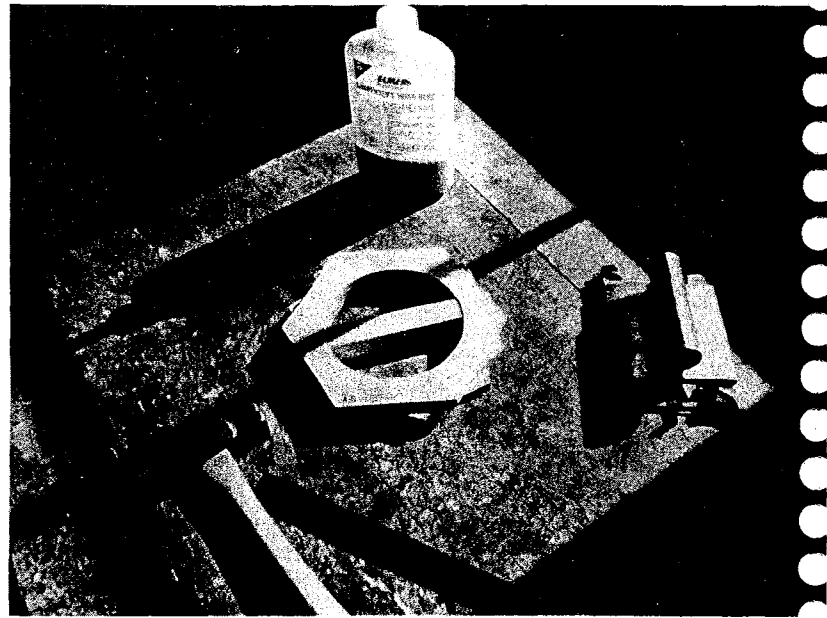
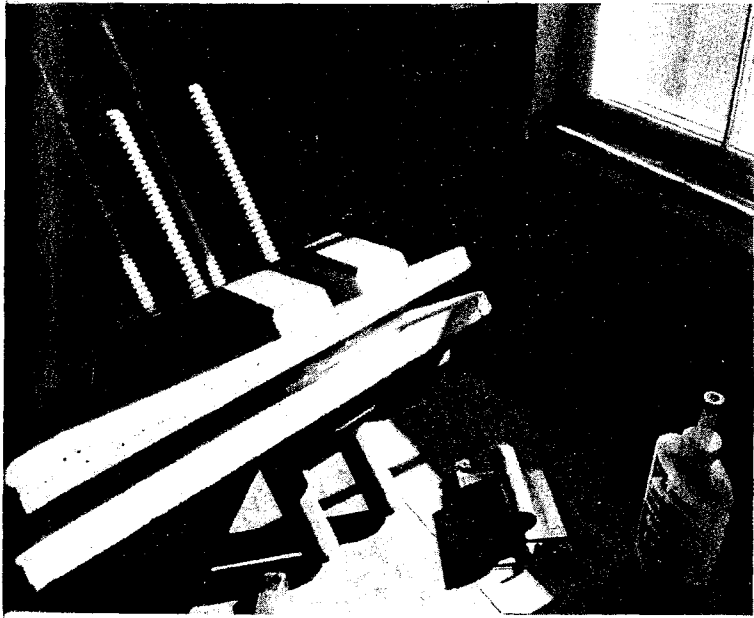


The sub-assemblies of the Wooden Grasshopper are pictured above, while the wooden parts of this engine are shown below.



HUB





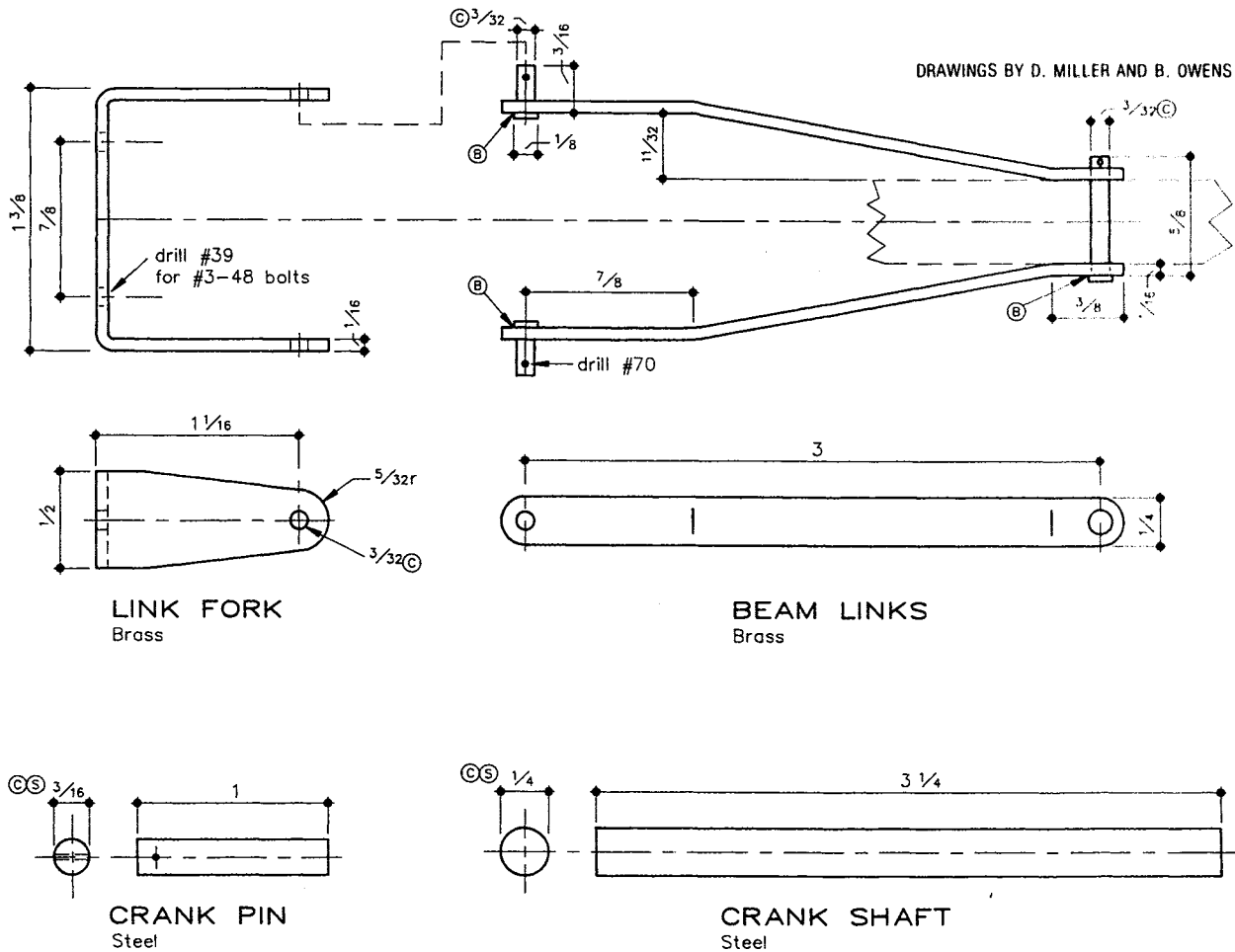
Above left. The flywheel rings are held in clamps while the glue sets. Above right. The flywheel is shown ready to be jigsawed and turned. The bench shown here was used in a Grand Rapids, Michigan, furniture factory 60 to 75 years ago. The hammer was used by my grandfather, a ship's carpenter, about 125 years ago.

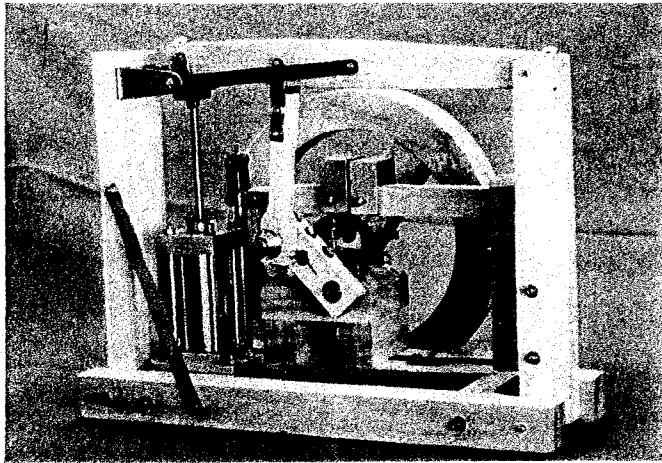
At this point, we begin the metal working section of this project. Basically, this portion is straightforward machine practice with only a few

pointers to be offered to, hopefully, make your work easier.

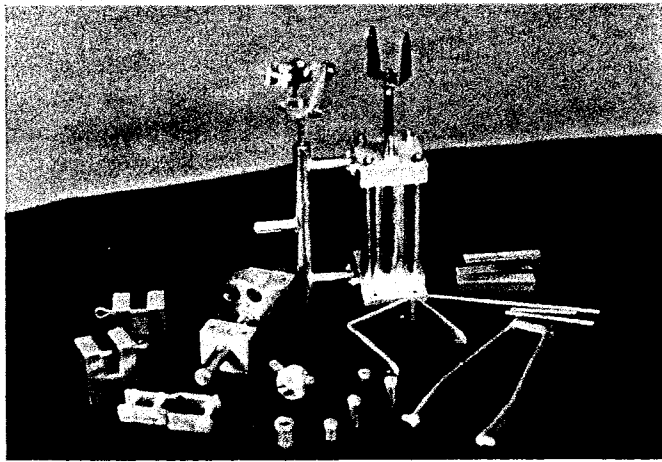
Spot the setscrew in the **ECCENTRIC** on the centerline through the

Shaft and offset. The Allen wrench in the setscrew helps in timing the engine. At assembly, with the **CRANK** at midstroke, the setscrew

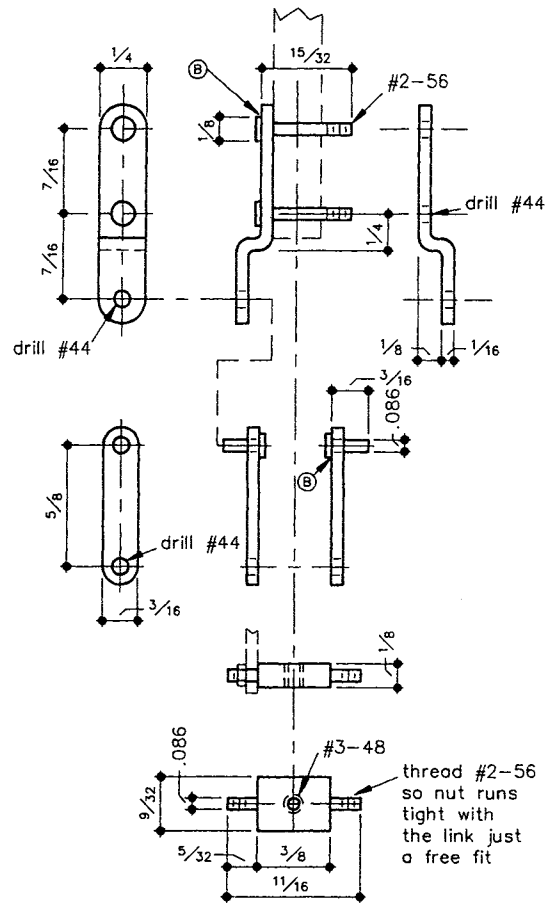




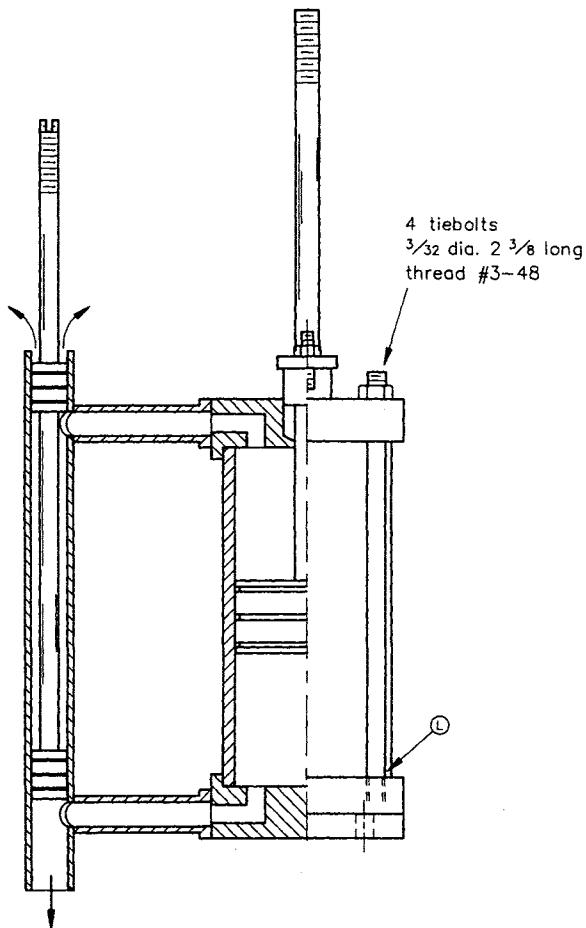
Side view of the
Wooden
Grasshopper
Engine



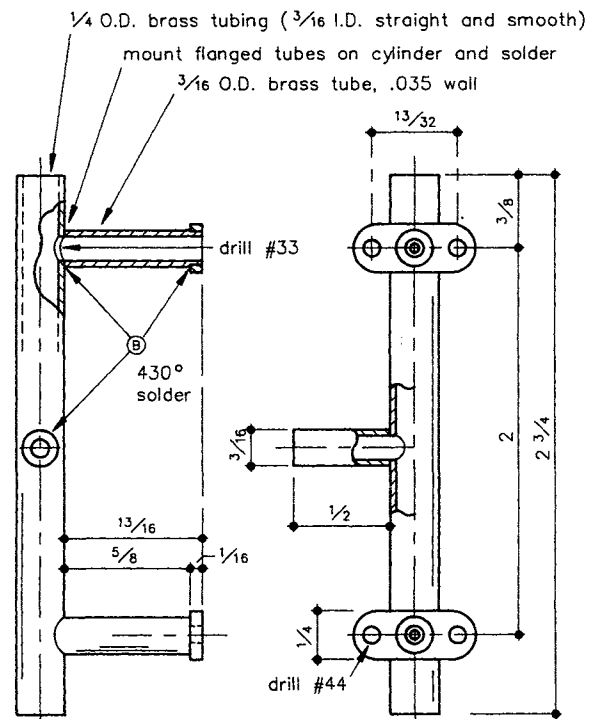
The metal parts
for the Wooden
Grasshopper
Engine



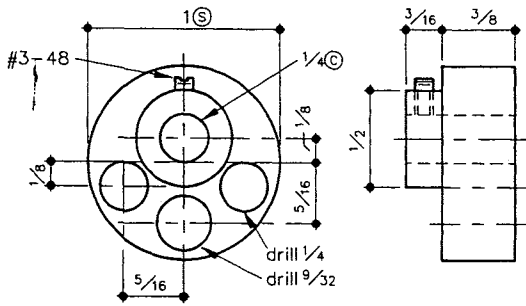
VALVE LINKAGE
Brass



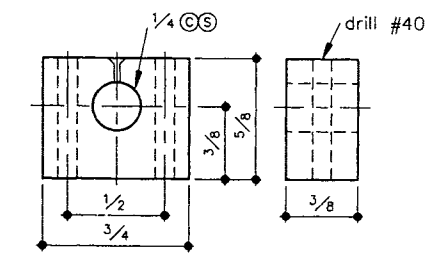
VALVE & CYLINDER ASSEMBLY



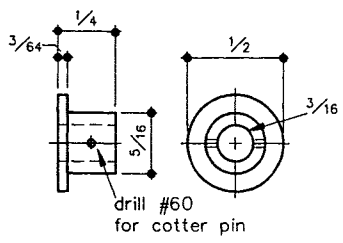
VALVE HOUSING ASSEMBLY
All Brass



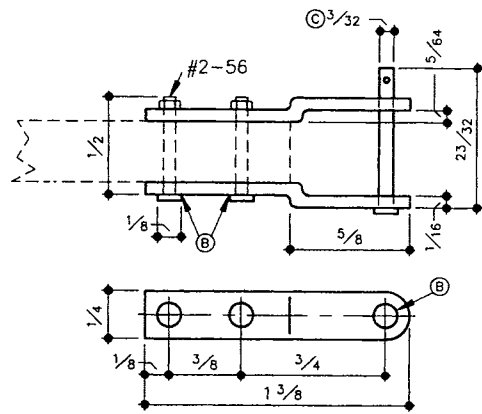
ECCENTRIC
Steel



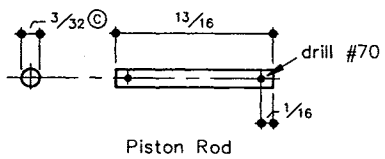
CRANK SHAFT BEARING
Brass
2 Required



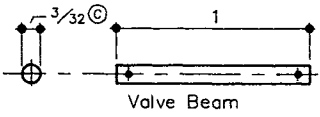
COLLAR
Brass



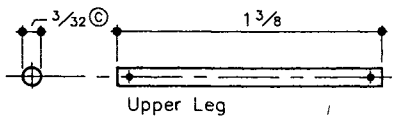
CONNECTING ROD, CLEVIS
Brass



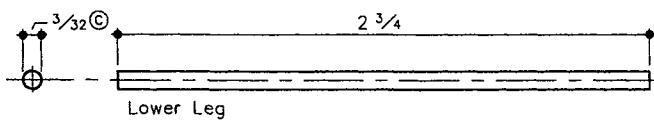
Piston Rod



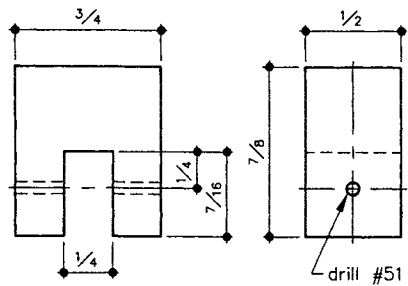
Valve Beam



Upper Leg



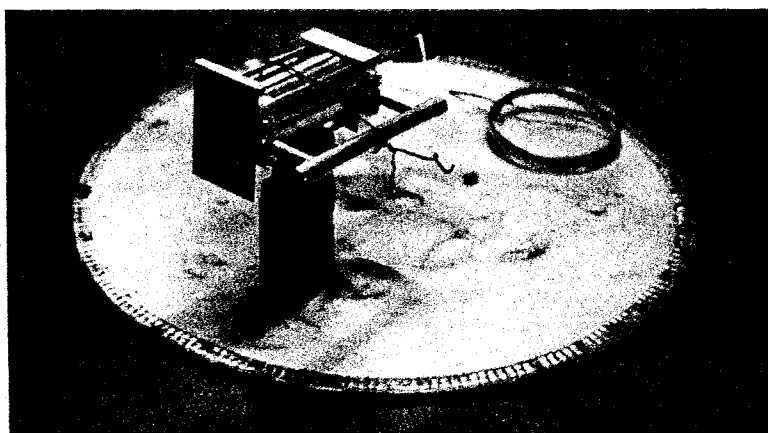
Lower Leg



WEIGHT
Steel
2 Required

PINS
Brass

Soldering the valve tube to the cross tubes.



should be on the vertical centerline. If the **CRANK ARM** does not grip the smooth shaft tight enough, a bit of epoxy glue can be used or a light, fine knurl added to the Shaft for a more positive drive.

The **CYLINDER** and **PISTON** are straight machine work and pretty well covered by the drawings. Use your favorite Packing.

The **VALVE ASSEMBLY** is mostly tubing. The flanges are soldered to the Cross Tubes and mounted on the Cylinder. The Valve ends of the Cross Tubes are filed to fit around the Valve Tube. The Valve Tube is held against the Cross Tubes by soft wire while soldering. Drill through the Cross Tubes into the Valve Tube and remove the burrs inside. Make sure the Valve slides smoothly and not too sloppy in the Valve Tube. A three-cornered scraper made from a small file is handy for this job.

The 1/2" long **STEAM INTAKE TUBE** is made with the end fitted around the Valve Tube. Clamp together and solder. If there is a threat that the heat will soften the soldered joints already made, dip pipe cleaners in water and wind around the Valve Tube each side of the intake near the Cross Tubes. They will absorb the heat. Drill through and remove burrs. The important area to keep in fine condition is at the Cross Tubes where the Valves operate.

This engine will run on very low air pressure. The slot in the end of the Valve Stem will help you fine-tune the engine using a jewelers screw driver. Until the Valve is centered, the Piston will tend to go to one end and stay there. Adjust until you get a nice even sound at each end of a stroke.

Try to run as slow as possible. A large engine of this sort would hardly run 25 rpm.