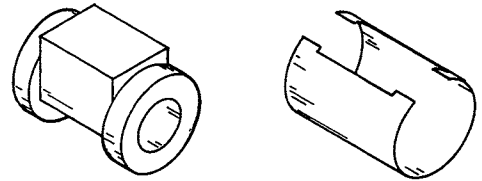
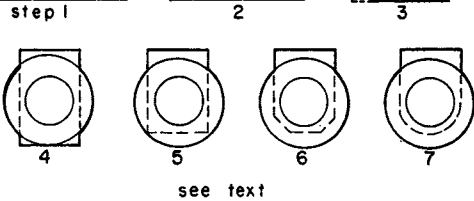
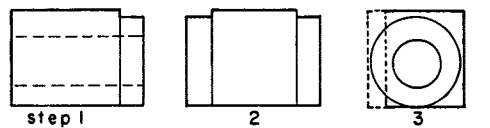
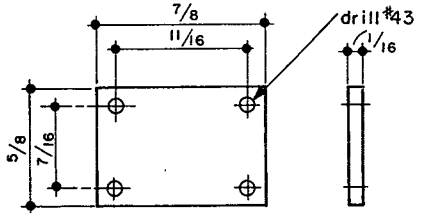


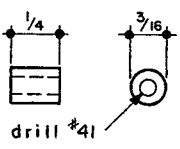
CYLINDER
Aluminum



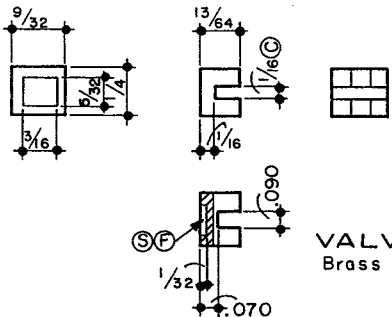
LAGGING



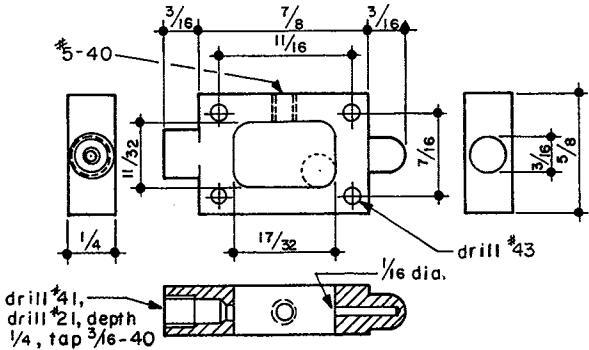
COVER
Brass



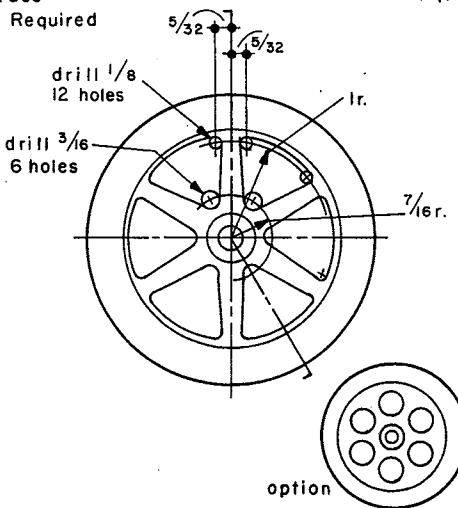
SPACER
Brass
2 Required



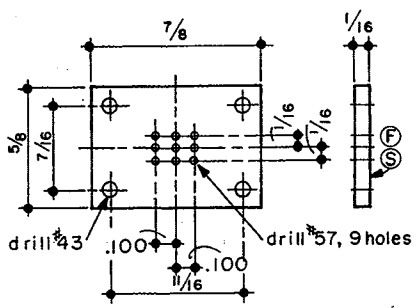
VALVE
Brass



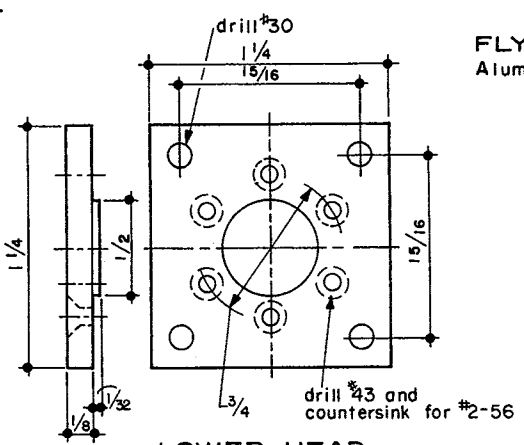
STEAM CHEST
Aluminum



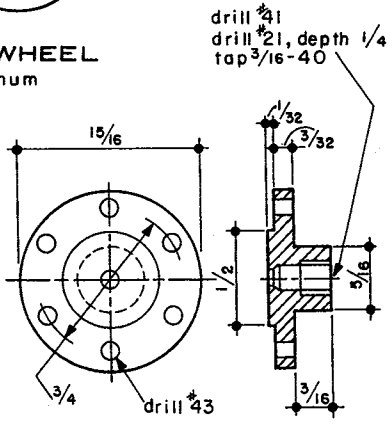
FLYWHEEL
Aluminum



VALVE PLATE
Brass



LOWER HEAD
Aluminum



UPPER HEAD
Aluminum

37

Grasshopper Engine

This engine is a beam type with linkage suggesting the looks and motion of a grasshopper. The layout here is a simplified version and quite easy to build. One important thing about this is that the Links must equal one-half the distance between the end holes in the Beam. The centerline of the pivot holes for the Links at the Column Fork must be on the Cylinder center. A few items will be mentioned to help get you going.

When making the **BASE**, take care at the notch made to take the **LEG**, and in drilling the two pin holes in the Leg. If you have made close fits all around but the milling and drilling are not quite square, the Beam may not center in the Fork. Opening the holes a few thousandths may be all you need. If the "off-center" is greater, a solution, (which good machinists hate to admit) is to mount the Leg in the vise and, using a wrench with padding, give the leg a few thousandths twist. The few are amplified about 4-1/2 times so it won't take very much.

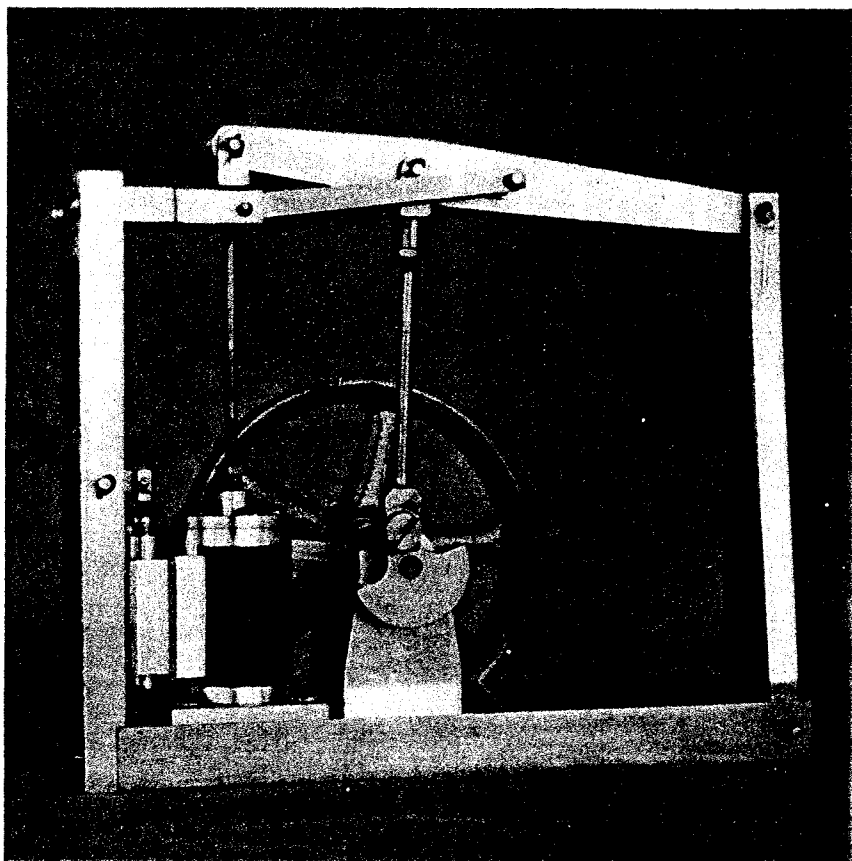
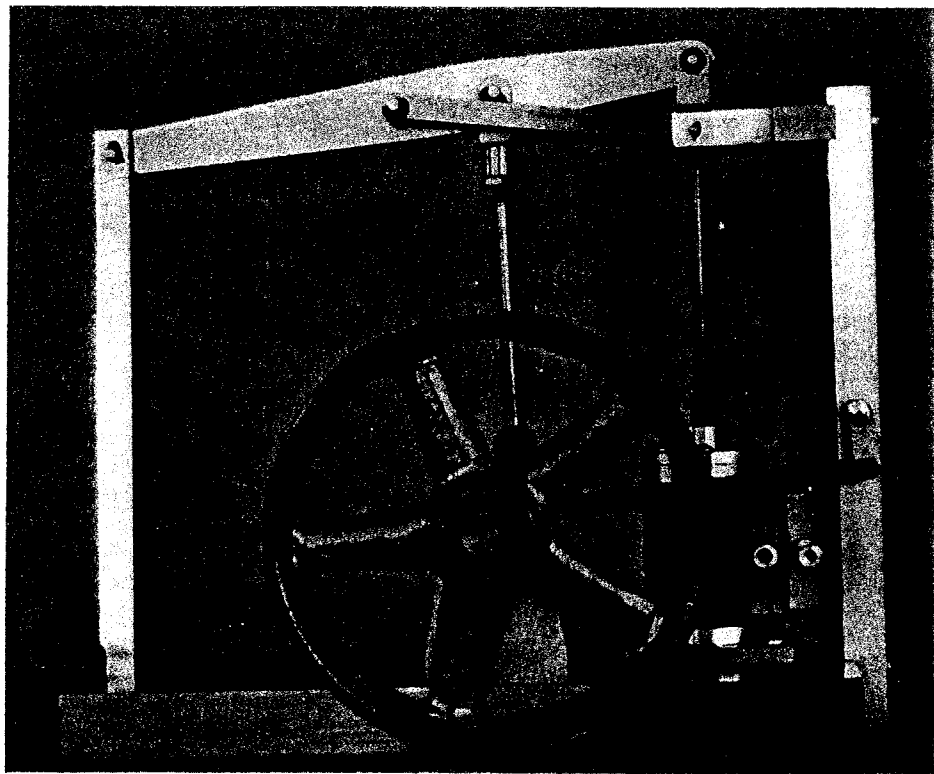
The **BEARING** Blocks are tapped 5-40, and the Shaft center laid out and center punched on one piece. Both Bearings are squarely mounted on the Base and this assembly squarely mounted in the milling vise. The Shaft center is picked up with a wiggler, drilled in easy stages and finally line-reamed to size. Bushings are optional here. Mark so each Bearing can be returned to the position it had when reamed.

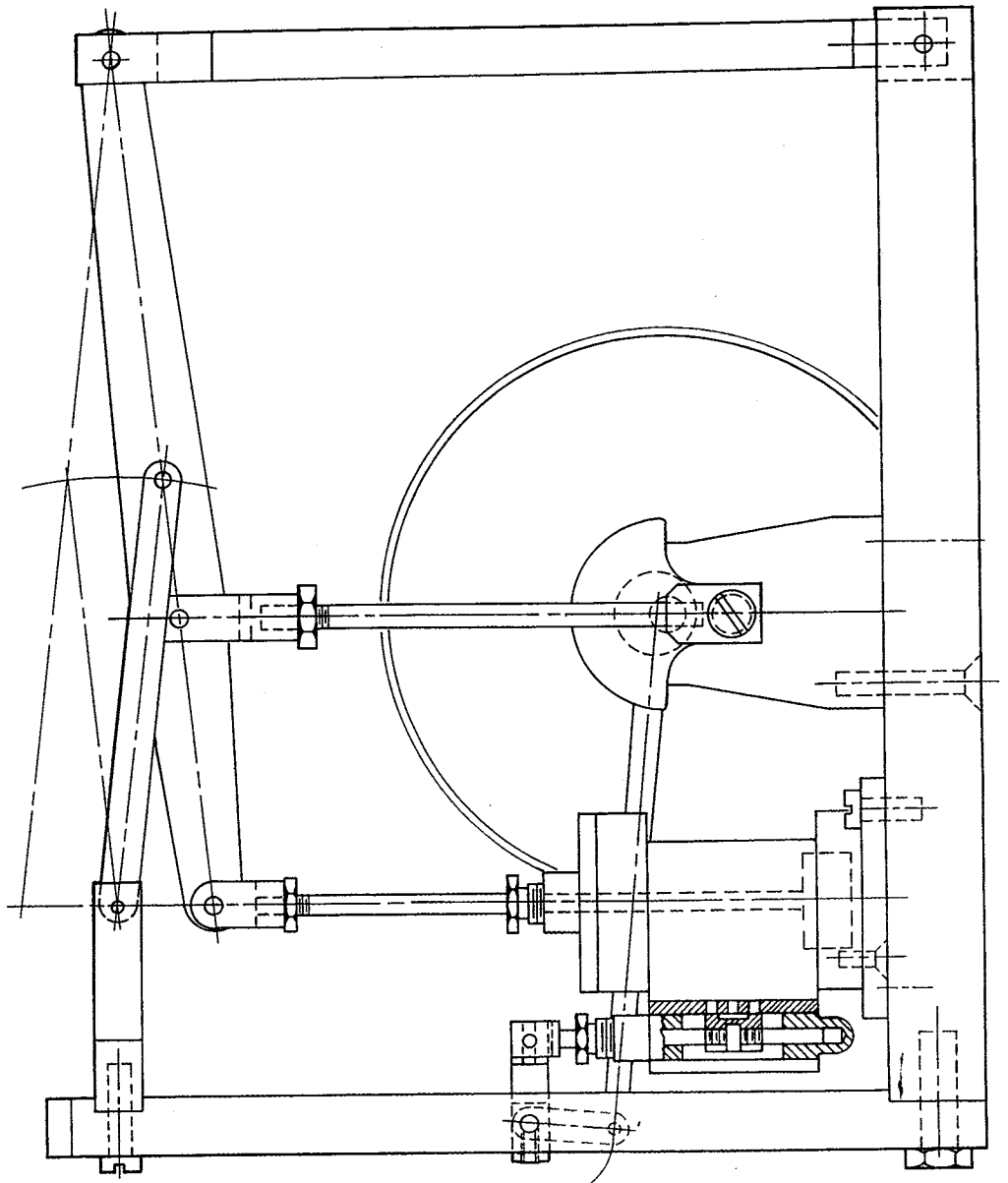
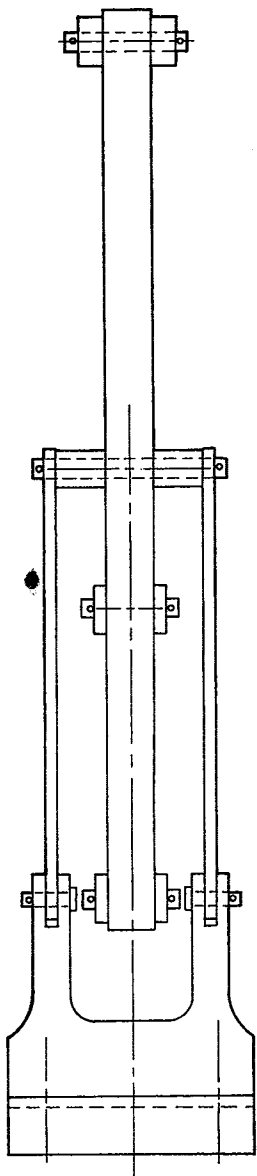
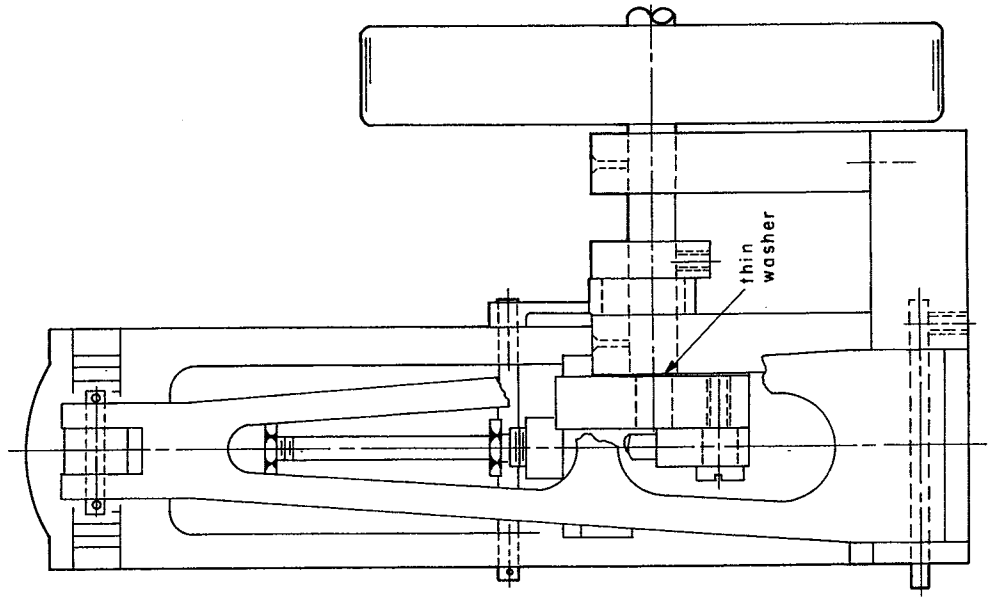
Construction of the **CYLINDER** (Type F), the **STEAM CHEST**, **VALVE**, **ECCENTRIC**, and **FLY-WHEEL** are described in the Appendix.

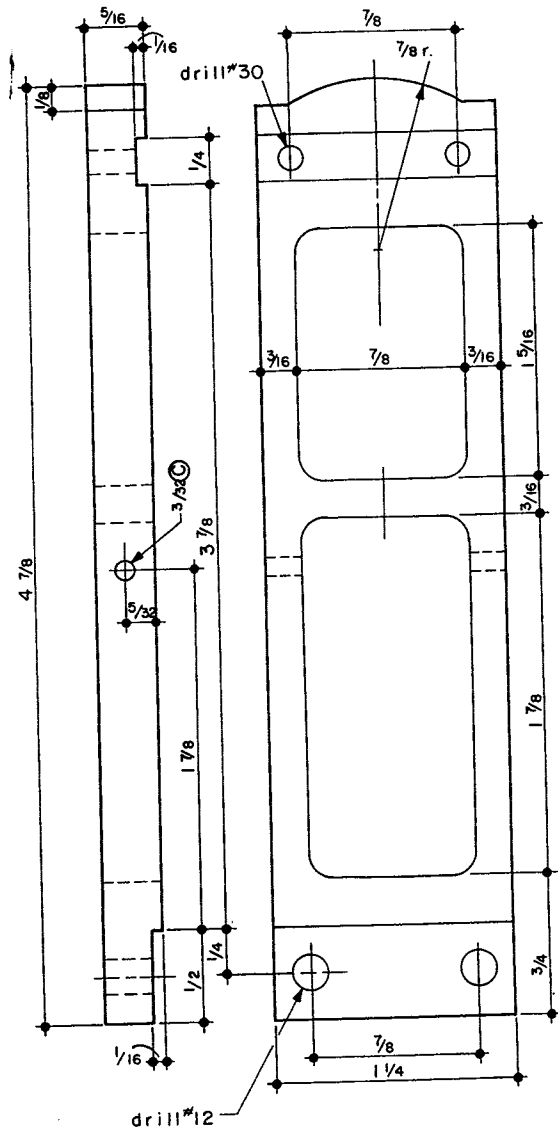
The **LAGGING** is thin stock traced from a heavy paper pattern made by cut and try. Roll the metal to a diameter smaller than the flanges and carefully spring into place.

Both **CONNECTING ROD** and **PISTON ROD** are provided with adjustment to make the Piston travel midway in the Cylinder length.

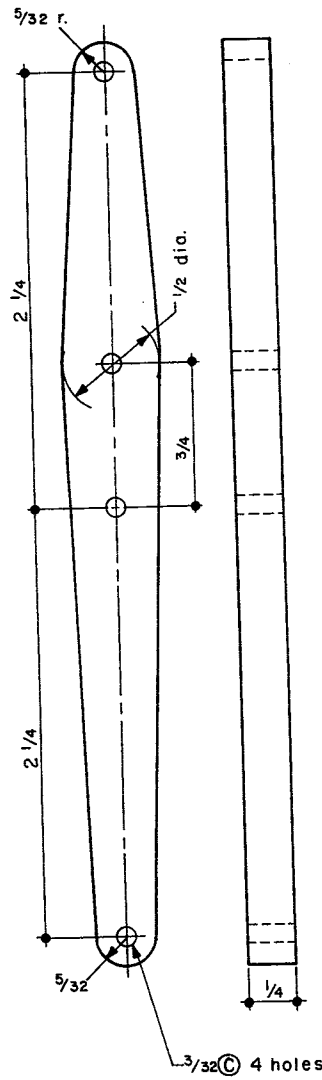
The **PACKING** is 1/16" strands unraveled from braided asbestos



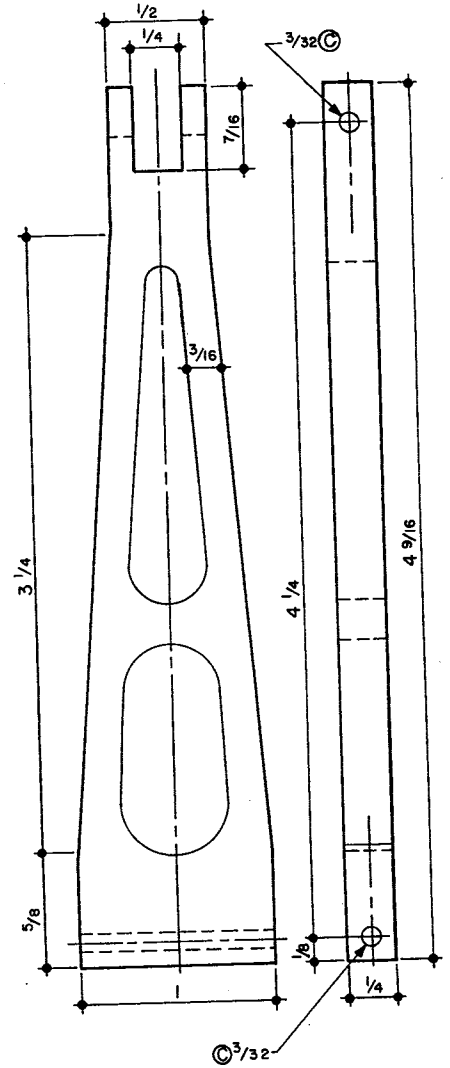




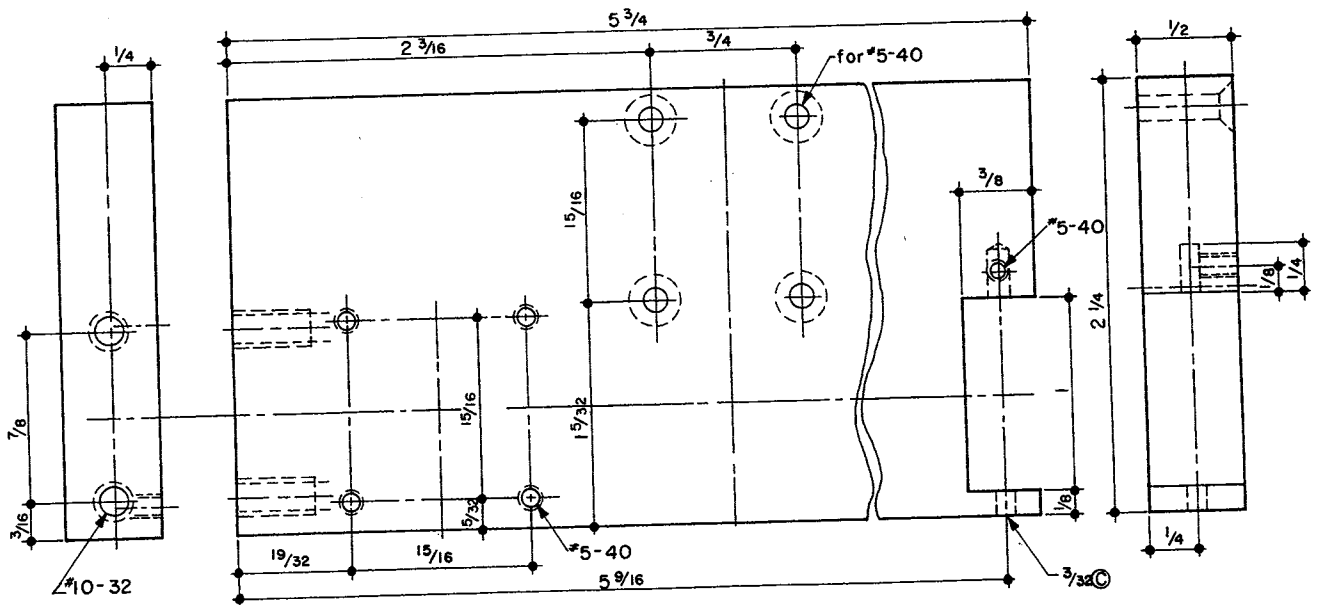
COLUMN
Aluminum



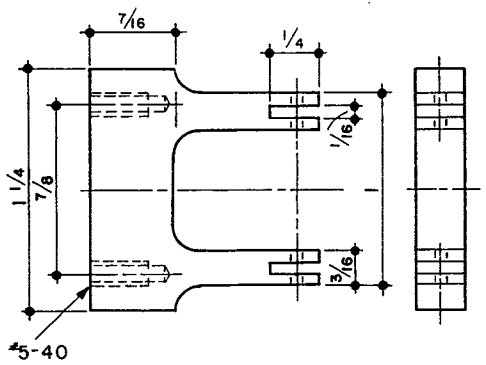
BEAM
Aluminum



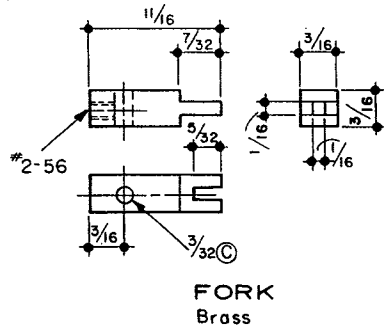
LEG
Aluminum



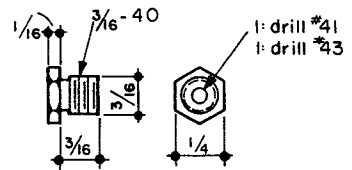
BASE
Steel



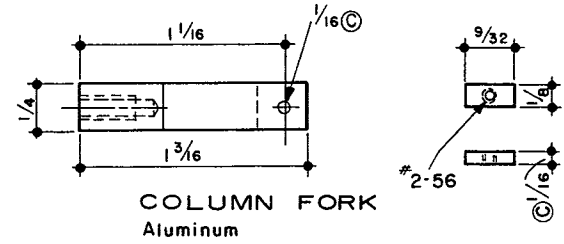
COLUMN FORK
Aluminum



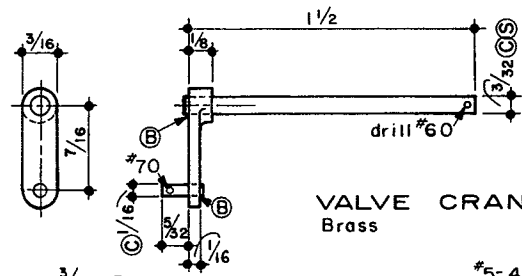
FORK
Brass



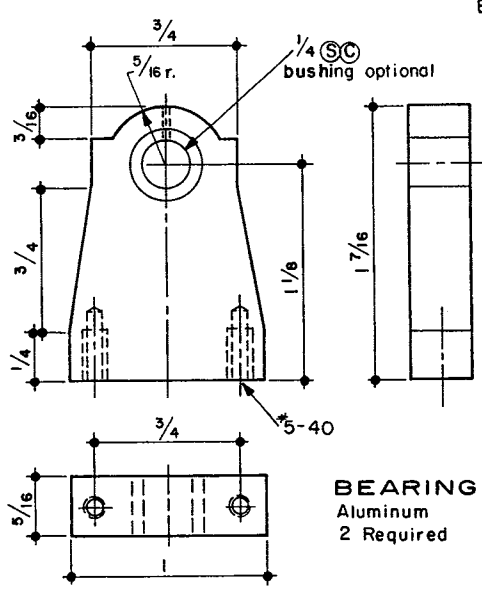
PACKNUT
Aluminum
2 Required



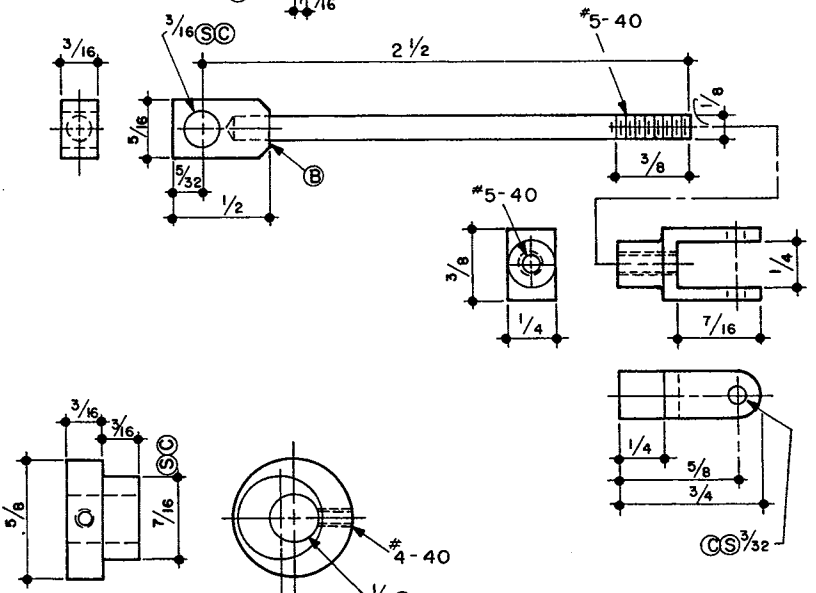
NUT
Brass



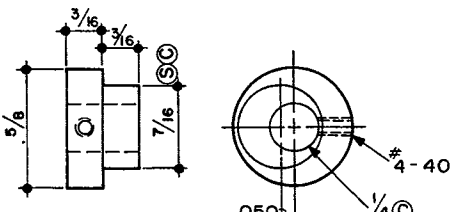
VALVE CRANK
Brass



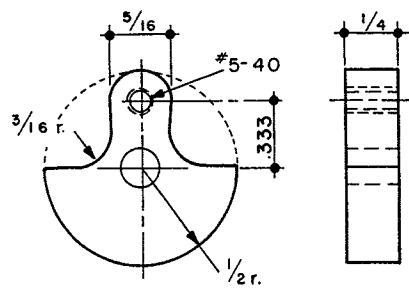
BEARING
Aluminum
2 Required



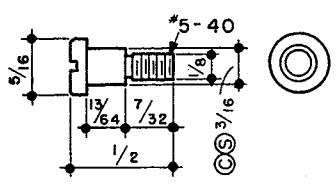
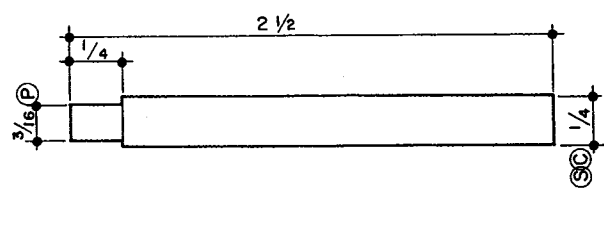
CONNECTING ROD
Brass



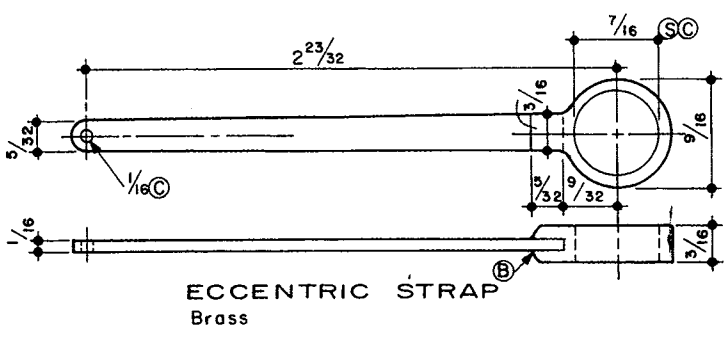
ECCENTRIC
Steel



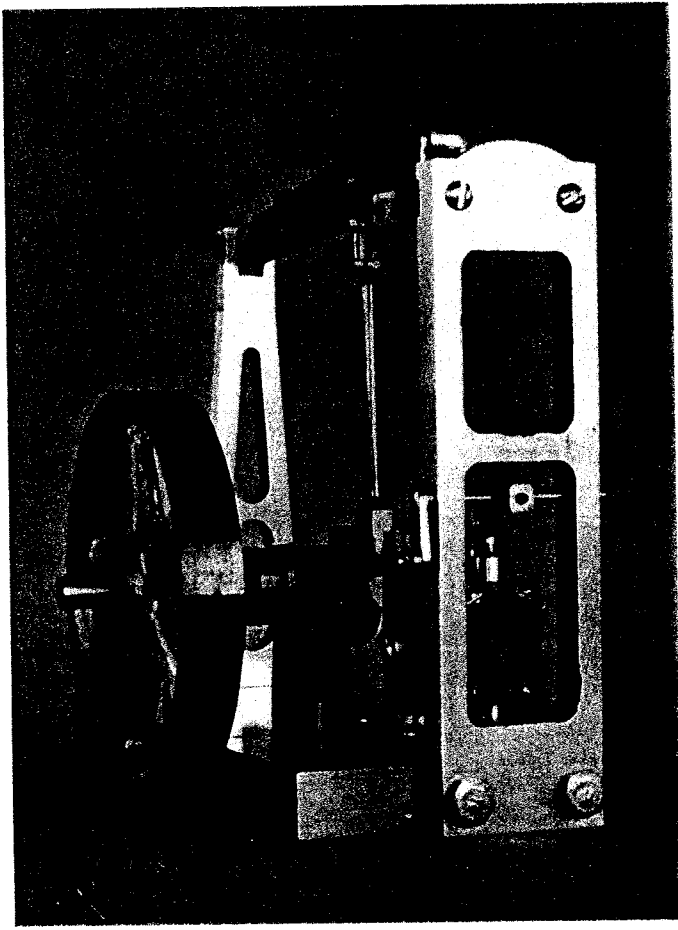
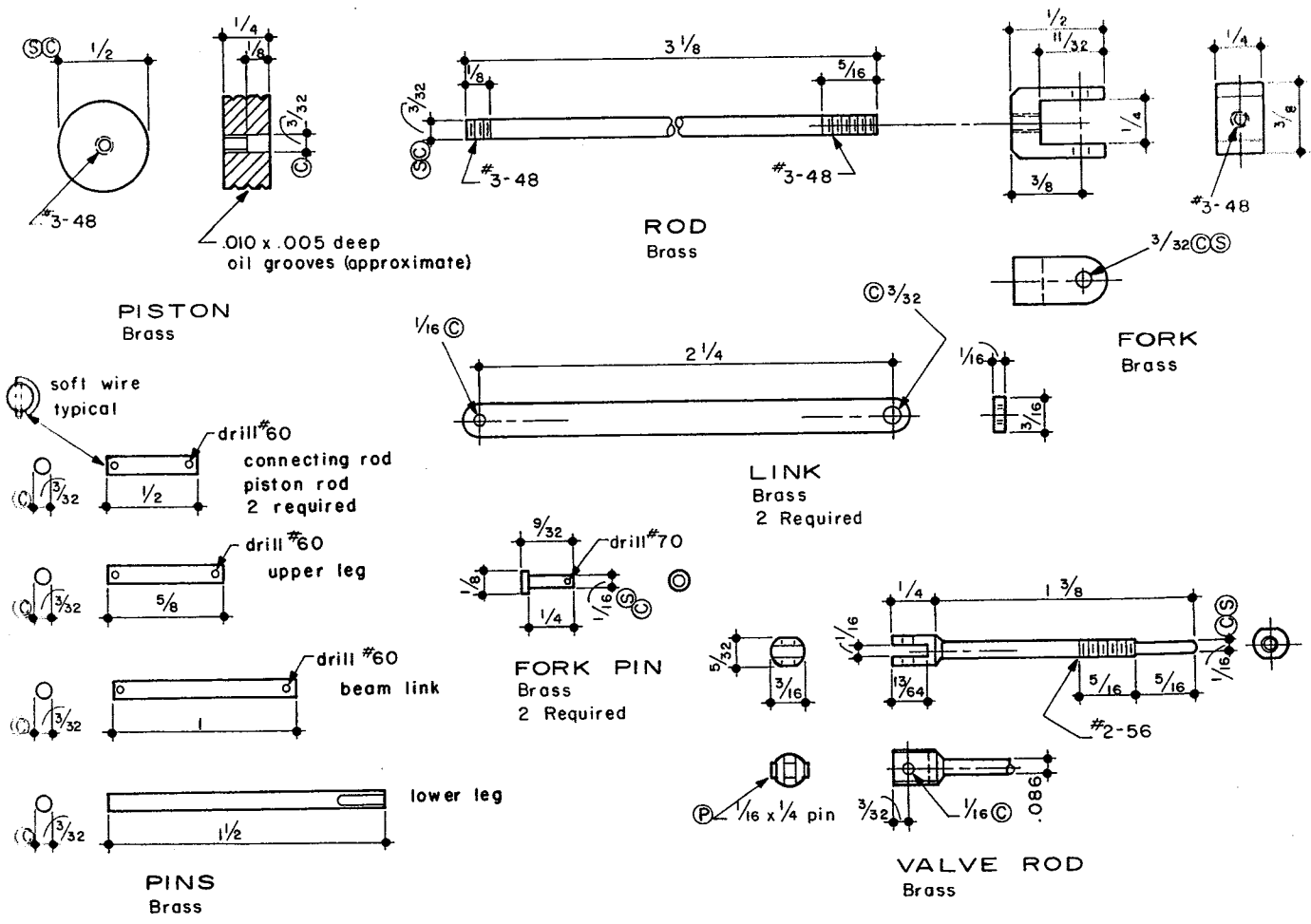
CRANKSHAFT
Steel



CRANK SCREW
Steel



ECCENTRIC STRAP
Brass



graphite packing. Do not turn the packing nuts too tight. Turn them in lightly with the fingers. It is not strictly necessary to use this type of packing.

At **ASSEMBLY**, spot the Piston at one dead-center position. Temporarily fasten the Steam Chest to the Cylinder with cover removed. The centerline through the Eccentric should be 90° from the centerline of the Eccentric Strap as shown. The Valve should close off all the Valve intake holes. Now fine-tune the Valve by rotating the Crank and adjusting the Fork so the Valve holes are equally exposed at each end of the stroke.

This engine is fun to watch while it is running and will reward your hours in building it with years of pleasure.