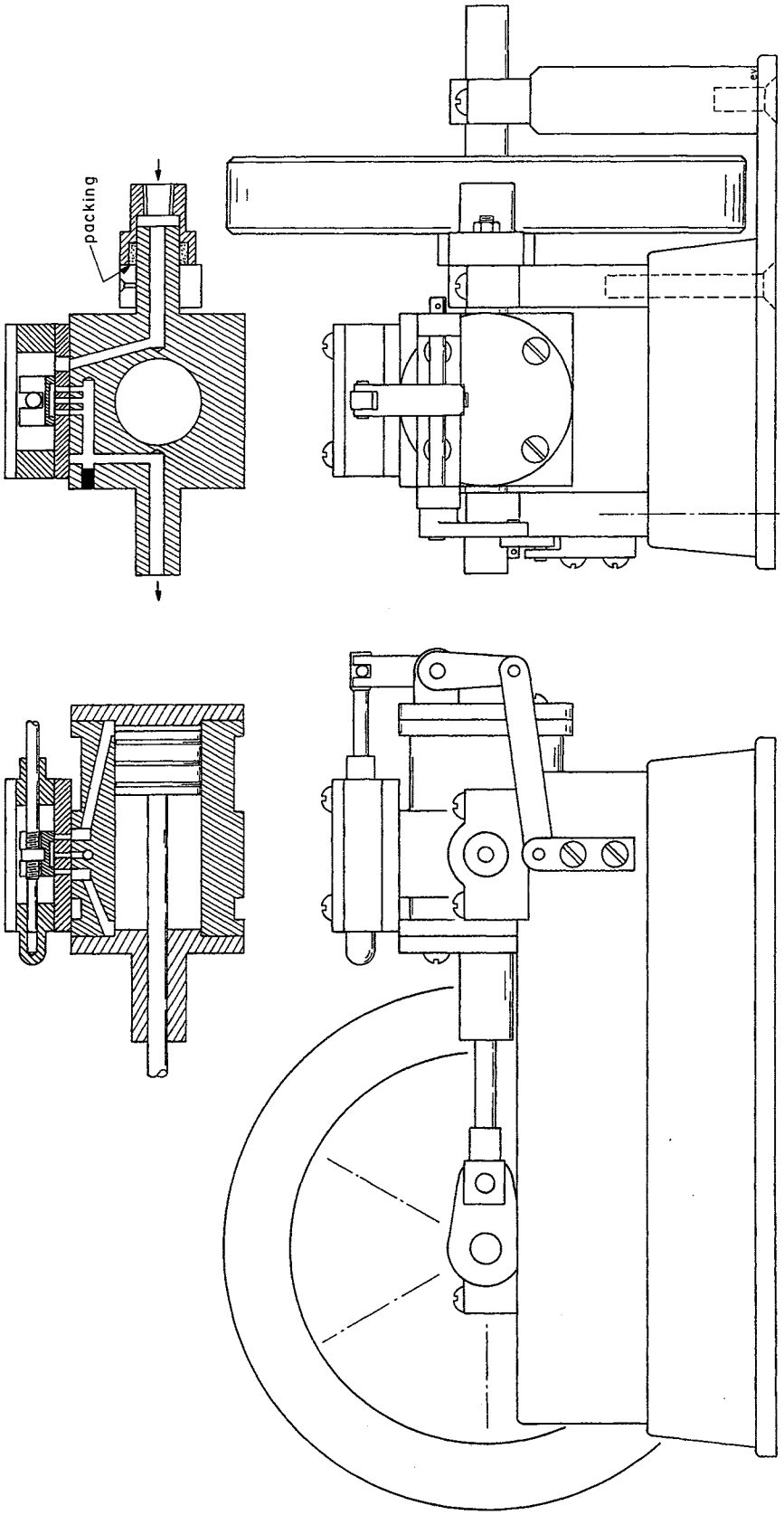
CHAPTER

42 Oscillating-Cylinder Engine



OSCILLATING-CYLINDER ENGINE

The idea for this engine was submitted by C. W. Sleppy of Troy, Ohio. He sent a photograph of an illustration in an old book and this is a miniature patterned after it. There were no details, but the principle was pretty well shown and the result is quite an interesting engine. It is an oscillator, but it has a conventional slide valve.

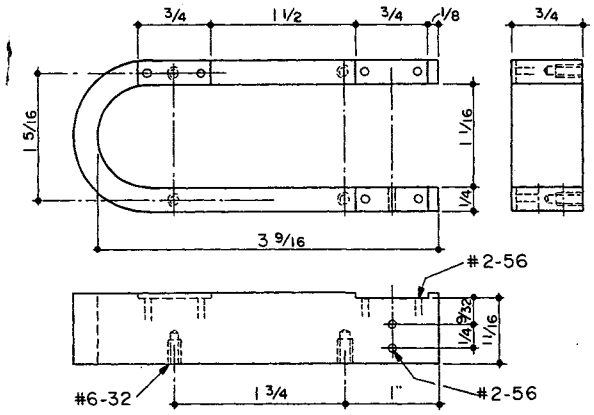
The material used in the model shown is aluminum for the Sub-Base, Base, Frame, Flywheel, Steam Connection, Steam Chest, Outboard Head and Bearing Bracket. They can all be made of other material, such as steel. The Flywheel and Base could be cast iron. A 3" cast iron Stuart-Turner H10 Flywheel from Cole's Power Models is excellent for this engine. The Crankshaft and Spacer are steel. All the other parts are brass or bronze.

The **SUB-BASE** is simple, straight and no problem. The **BASE** is shown tapered as most cast bases are for easy molding in the foundry. This draft or taper is optional.

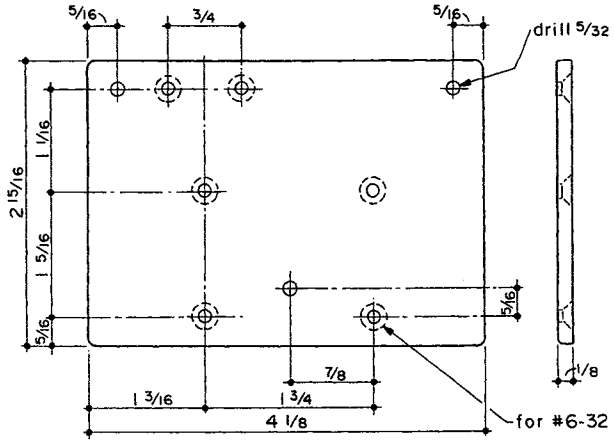
The **FRAME** on the model shown is aluminum. The illustration shows a closed "keyhole" shape for the Frame. Here it is simpler and uses less expensive metal. The aluminum was an industrial grade and quite hard to bend. It was heated with a torch and bent around a 1" diameter bar. Steel might be easier to use by heating to a red heat and then bending. Start with a piece about 9-1/4" long and trim after bending. Dress the top and bottom flat. Make the notches for the Bearings 11/16" from the bottom. Your cleanup may have made the height less then 3/4"; no problem. The **BRACKET** is simple and should match the 5/8" height of the Base plus the 11/16" on the Frame.

The **FLYWHEEL** can start out as a square or a round plate. The spoke-type is an interesting layout and filing job, using the drawings and instructions found in the Appendix .

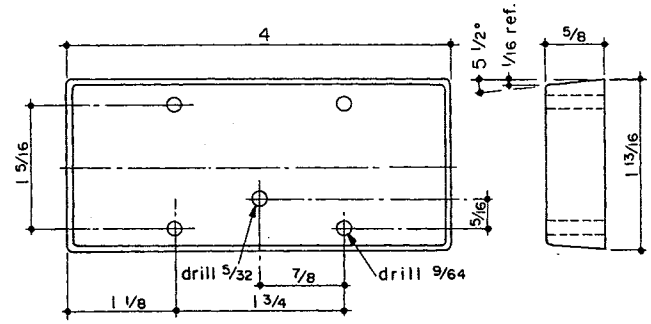
Make the **CRANKSHAFT** of steel. The **PISTON** and **ROD** require no comment except that concentricity is important. The **CRANK END** is a soldering job. The four **BEARINGS**



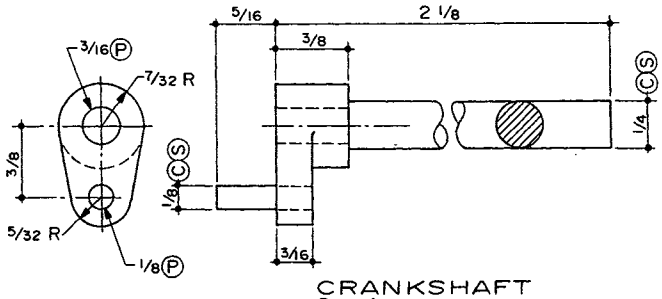
FRAME
Aluminum



SUB-BASE
Aluminum



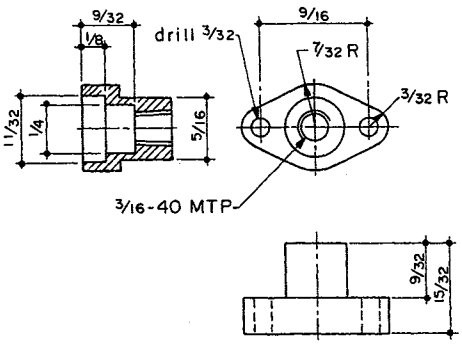
BASE
Aluminum



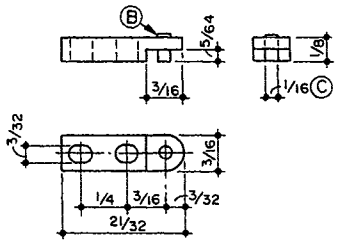
CRANKSHAFT
Steel

are alike except one is fitted with threaded rods or studs. Since the engagement is so little, these are soldered in place. The **STEAM CONNECTION** uses 1/16" strands of graphited asbestos packing. The **VALVE LINKAGE** is simple, requiring a bit of soldering. The **INBOARD HEAD** is two pieces soldered to avoid making chips out of valuable metal. Turn a shoulder on the 5/16" hub and a matching hole in the disk, then solder and finish turning and boring.

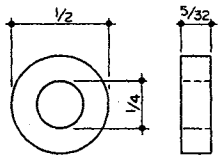
The **CYLINDER** is probably the most difficult part to make. Square up a block of brass 1" x 1" x 1.260" long. Lay out the pivot hole in the block making it 15/32" plus about .010" from the end. Make the 1/4" diameter hole for the Pivot Pin about .003" to .005" larger than the Pivot Pin and use a pyramid punch to raise four burrs at each end of the hole. Make light trial punches until the Pin is a push-fit past the burrs. wDon't make them so high that they score the Pin which is a bearing surface at the outside. Take care on all future operations that this pivot surface is not damaged. Solder, using tiny bits of solder, applying heat with a torch



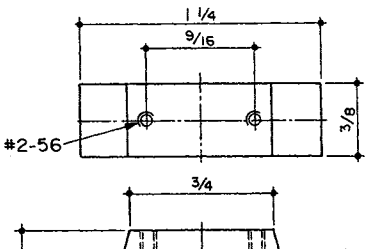
STEAM CONNECTION
Aluminum or Brass

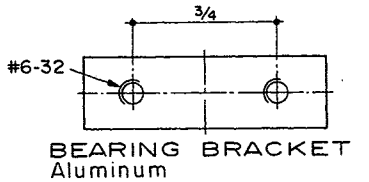


LINK PIVOT
Brass

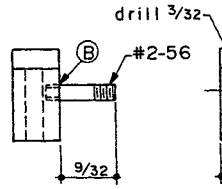


SPACER
Brass

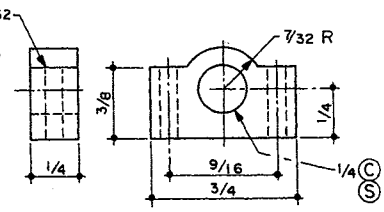




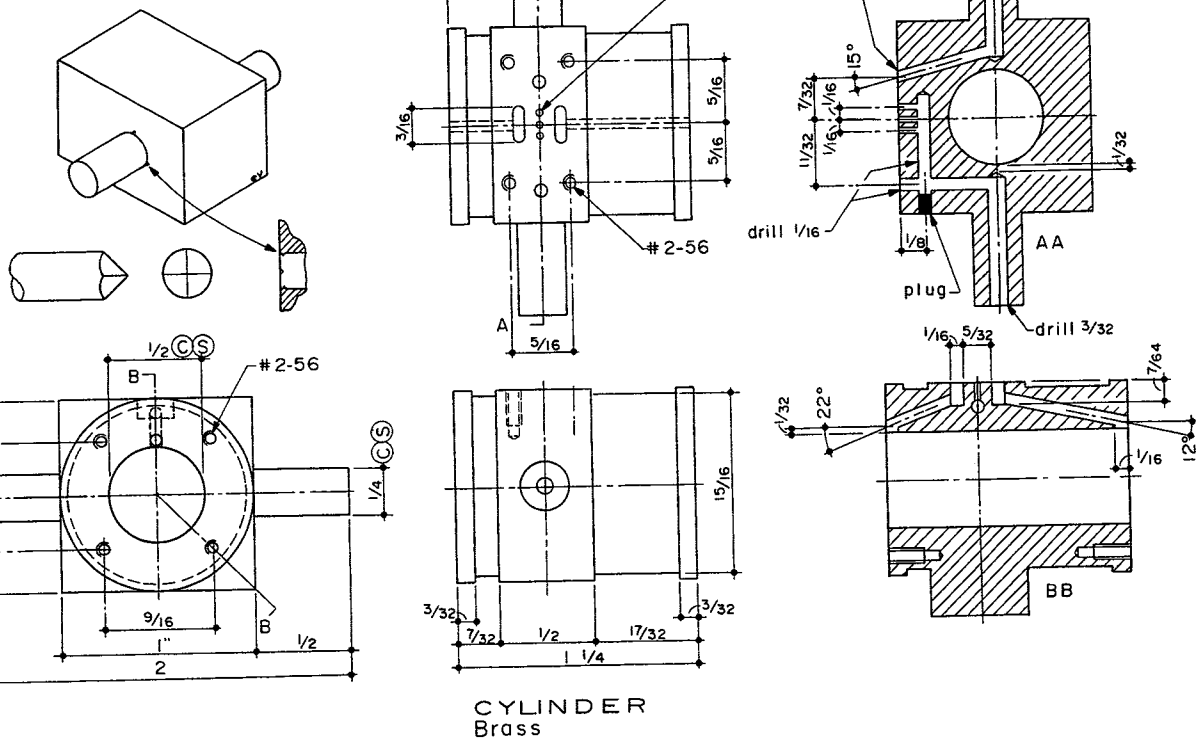
BEARING BRACKET
Aluminum

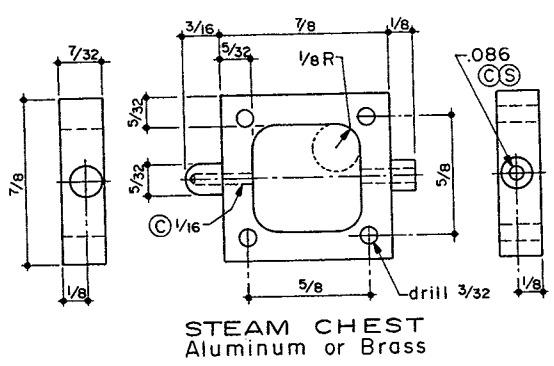


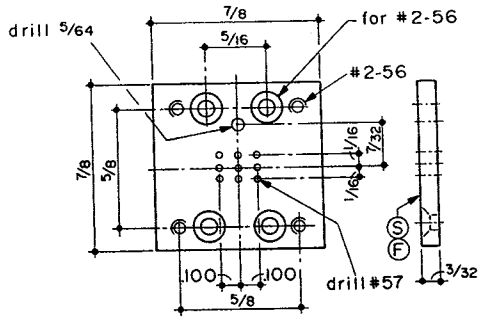
Add 2:#2-56 studs to one bearing spot from steam connection

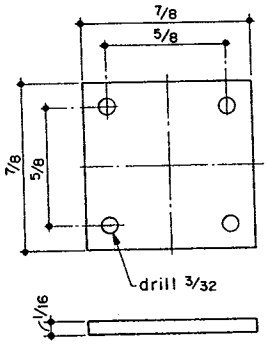


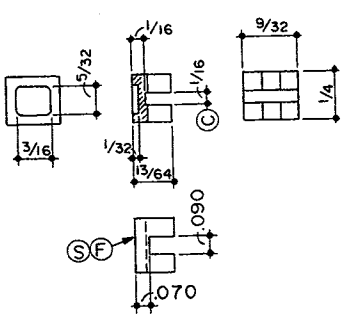
BEARING
Brass
4 Required

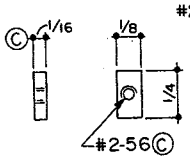


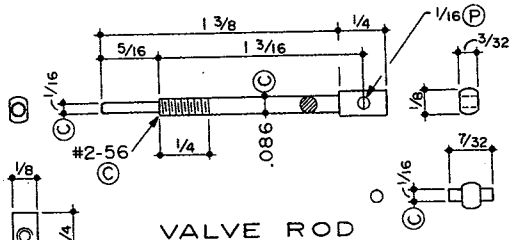


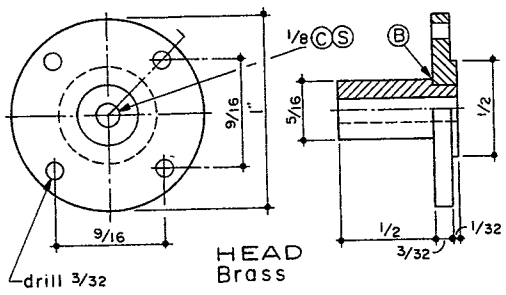


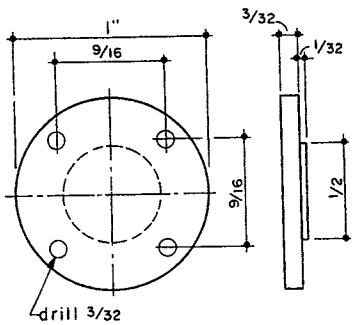






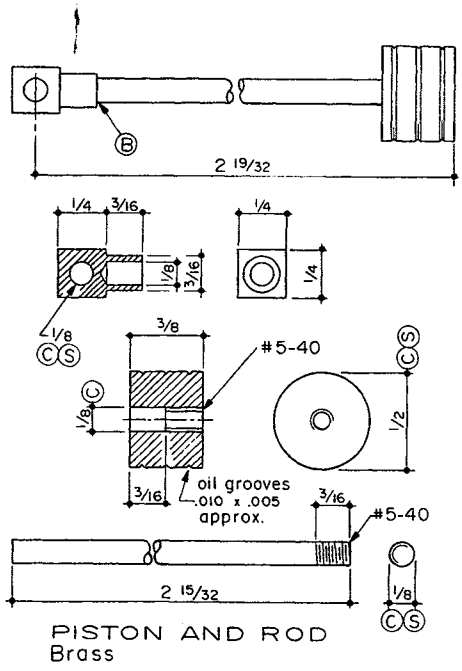




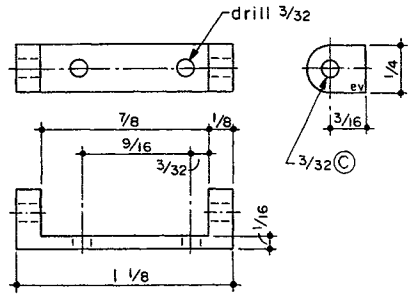


onto the block. The solder will flow into this clearance formed by the burrs. Apply the solder at both ends.

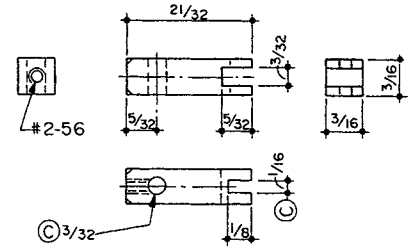
Chuck the workpiece on the long end and bore and ream 1/2", face of about .008" to .010" on the end and turn the flange O.D. and neck. Reverse in the chuck and turn the flange and neck on the other end. This is probably a place to use an arbor, but take care not to score the finish in the bore. On the model shown, thin copper was wrapped around the jaws of a 4-jaws and the block gripped on the corners. Light cuts were used to form the flange and neck. No cut was made on the end since there is no alignment problem. Brighten the face that is to be the Valve area and lay out all the holes. Drill and tap the



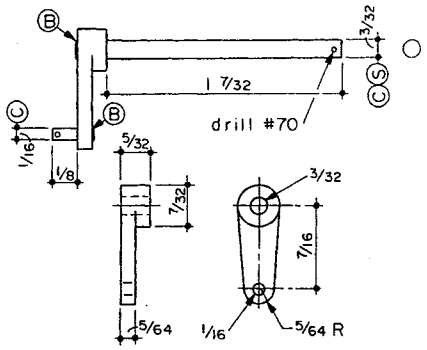
PISTON AND ROD
Brass



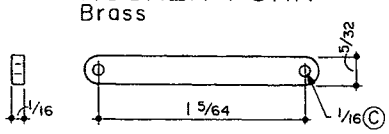
ROCKER BRACKET
Brass



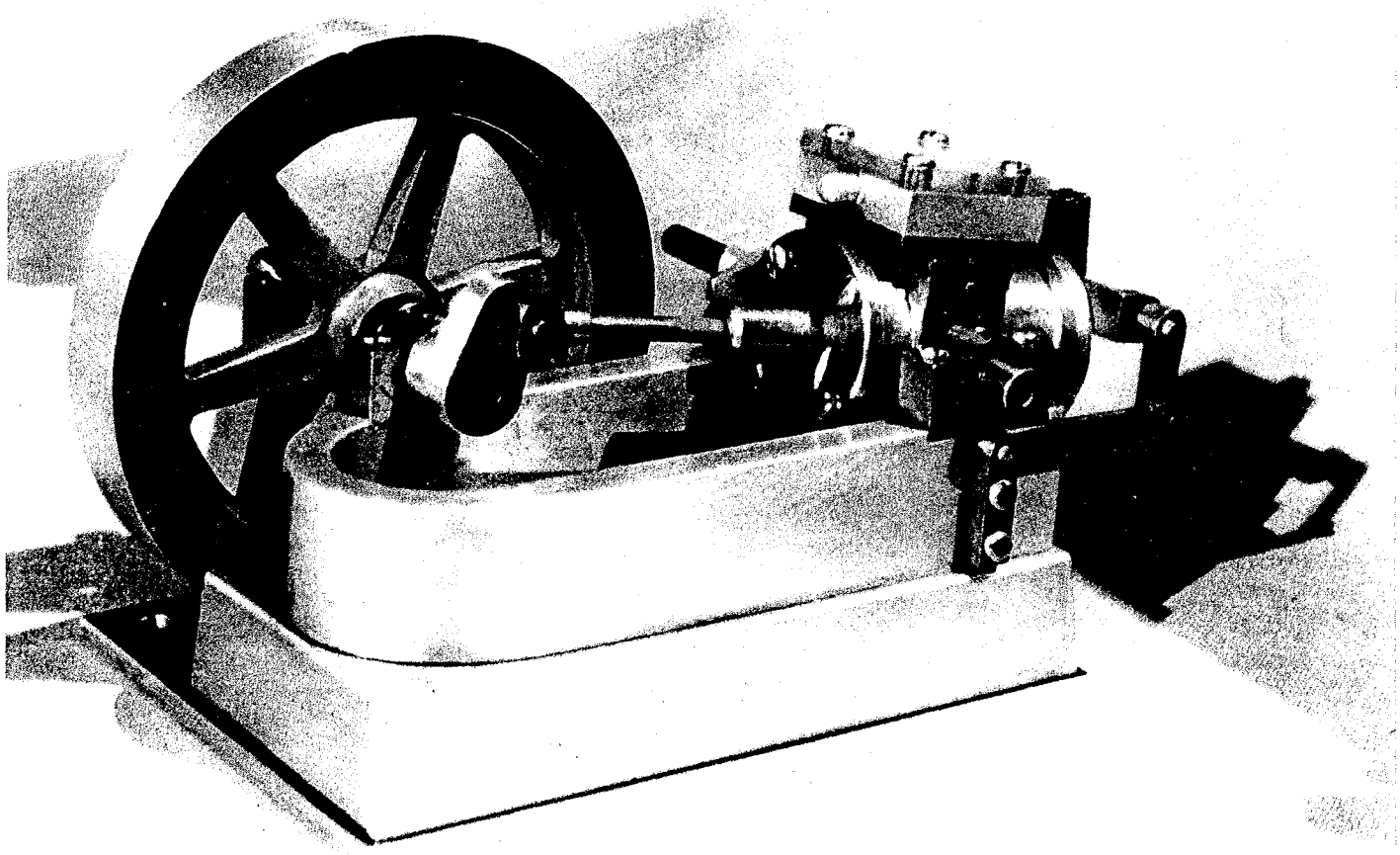
ROCKER FORK
Brass



ROCKER SHAFT
Brass



LINK
Brass



four 2-56 holes. Chuck on one pivot projection using thin copper to avoid jaw marks. Drill the steam passage on the opposite side. Reverse and repeat. Drill the 1/16" intake hole at 15°. Drill the three #57 holes later, using the Valve Plate as a jig. Drill the 1/16" exhaust holes at 11/32" and 1/8". Add the plug after final cleanup. Mill the two 1/16" x 3/16" x 7/64" deep recesses and drill 1/16" at 12° and at 22°. Mill the connecting notch to the bore 1/16" deep. Lay out the 2-56 holes for the Heads or use the Heads as jigs. Dress the Valve surface flat with fine emery paper on a flat surface.

The **VALVE PLATE** and **COVER** are straight layout, drilling, countersinking, and tapping operations. The important things are flatness and the careful location of the 9 #57 holes.

For the **STEAM CHEST,** start with an accurate block 7/32" x 7/8" x 1-3/16". Lay out the end bosses and prick-punch. Note that they are offset 1/8" from one face. Chuck in the 4-jaw, centering with a center test indicator, and turn the blind boss. Do the same with the opposite end, making an accurate 1/16" hole 1/32" short of breaking through. Enlarge this to .086" about half-way through the block. Lay out and drill four 3/32" holes. Lay out four centers for a drill to provide the 1/8 radius in the center opening. Start with a 7/32" drill and, if it doesn't reach the layout lines, enlarge with a 15/64" or 1/4" drill.

Make the **VALVE, VALVE ROD** and **NUT** of brass. This Valve should float on the Valve Plate. The steam pressure holds it down. That is, there should be a few thousandths freedom to rise off the Plate with close clearances in the fit of the Nut in the Valve and on the Rod threads. There should be no binding between the Valve and Valve Plate or Valve Rod, and a minimum of play at the Nut. The Valve Rod is made of 1/8" stock, long enough to add a center hole for tailstock support (later cut off) and to grip in the chuck.

On each side of the Cylinder, about three plastic washers were added to center it in the Frame. These were punched from a plastic billfold calender card to 1/4" I.D. x 3/8" O.D. If live steam is used, these should be metal. More or less than three can be used as needed.

Small bits of fine copper wire can be used in the #70 holes in the Linkage. Set up so there is no binding of the Valve Rod in the Steam Chest. In fact, the Rocker Shaft should float and not bear tight against the Valve Rod, with minimum clearance between the 1/16" pin and the fork, without binding.

At assembly, the Valve should be located so as to give equal exposure to the three #57 Valve holes at each end of the stroke. The enlarged holes in the Link Pivot permits some fine adjustment at this point.

The model shown ran good on as little as five pounds of air.

If you feel as one reader does, a PackNut can be added to the inboard head — thread the hub head 5/16-40 or tap out at 1/4-40. The hub on the Steam Chest should be longer if you plan on a PackNut here. The Nut would be made of 1/4" hex brass threaded a modelmakers 5/32-40.