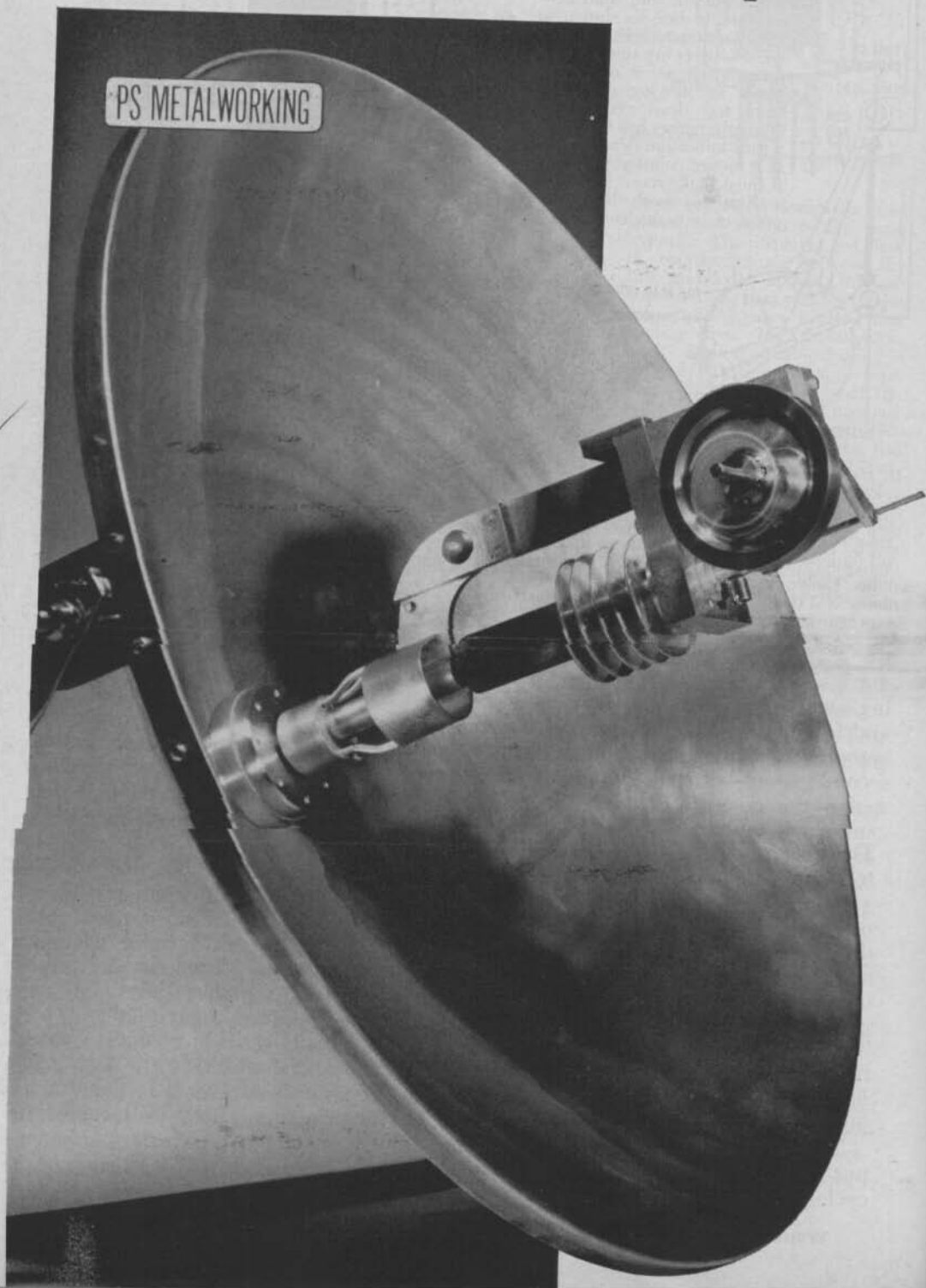


Amazing No-Fuel "Space"

PS METALWORKING



Engine You Can Build

By Harry Walton

FOCUS sunlight on this model engine, and it runs at full speed, fueled by the biggest nuclear reactor in the solar system—the sun.

Power is ample to drive a midget water pump or spin a display turntable. For indoor exhibits, such as in Science Fairs, a heat lamp can replace the sun. As a mantel-piece model, the engine can be operated on paper matches, alcohol, or fuel tablets.

If you have no lathe, you can buy all parts machined in a kit. With a small lathe, you can make the engine of common materials: electrical conduit, brass tubing, a metal cigar tube, 1/2" dural plate. A kit of materials is also available.

Mount stock for the engine frame in the lathe and bore the cylinder recesses as shown in the step-by-step drawing. Recesses and cylinders may be threaded, but it's easier to make them push fits and cement the cylinders in.

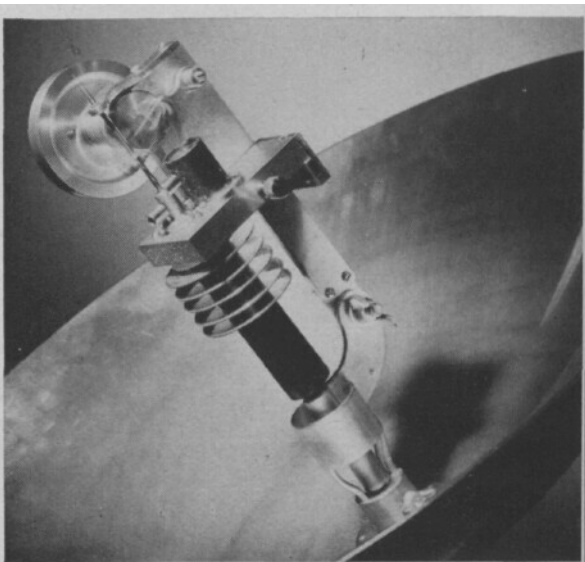
Boring the displacer recess breaks through the port to the power cylinder. Don't forget to drill and tap the hole for the gland before removing the piece. Bore the bearing

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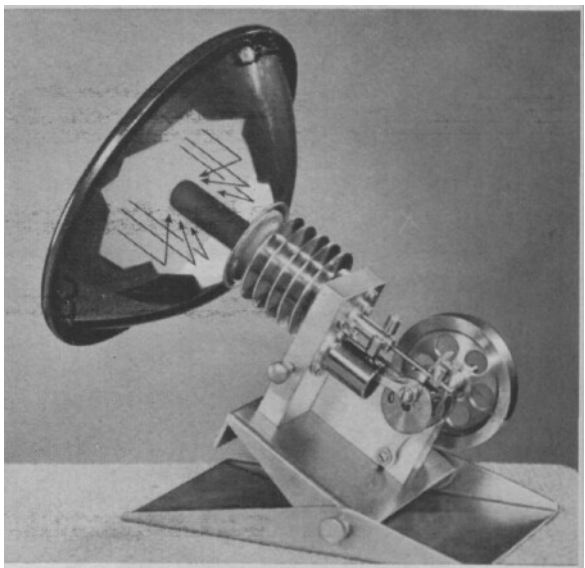
A PS reader showed us how to harness the sun

First published in PS in 1961 for alcohol firing, this model Stirling engine has been built by many readers. One of them, Mr. Valmer Nixon of Ottawa, Canada, a technical officer of the National Research Council, added such refinements as a sliding block for the crankpin to turn in, and an outboard displacer-rod bearing.

Intrigued by the idea of operating the engine on solar energy, he did so with both an 8" auto-headlight reflector and a spun-aluminum reflector (photos at right).



Mounted inside an 18" reflector so that sunlight is focused on the end of the displacer cylinder, the engine runs at full tilt. Wear dark glasses to protect your eyes from the hot spot.



Setup is reversed for an 8" auto-headlight reflector, which operates engine at moderate speed with kerosene used as a lubricant. A tilt base facilitates aiming reflector at heat source.

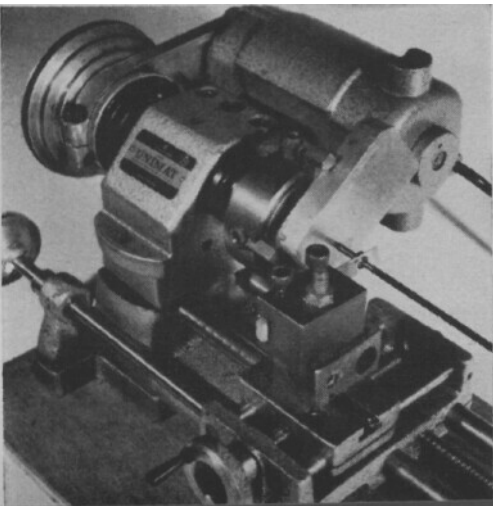
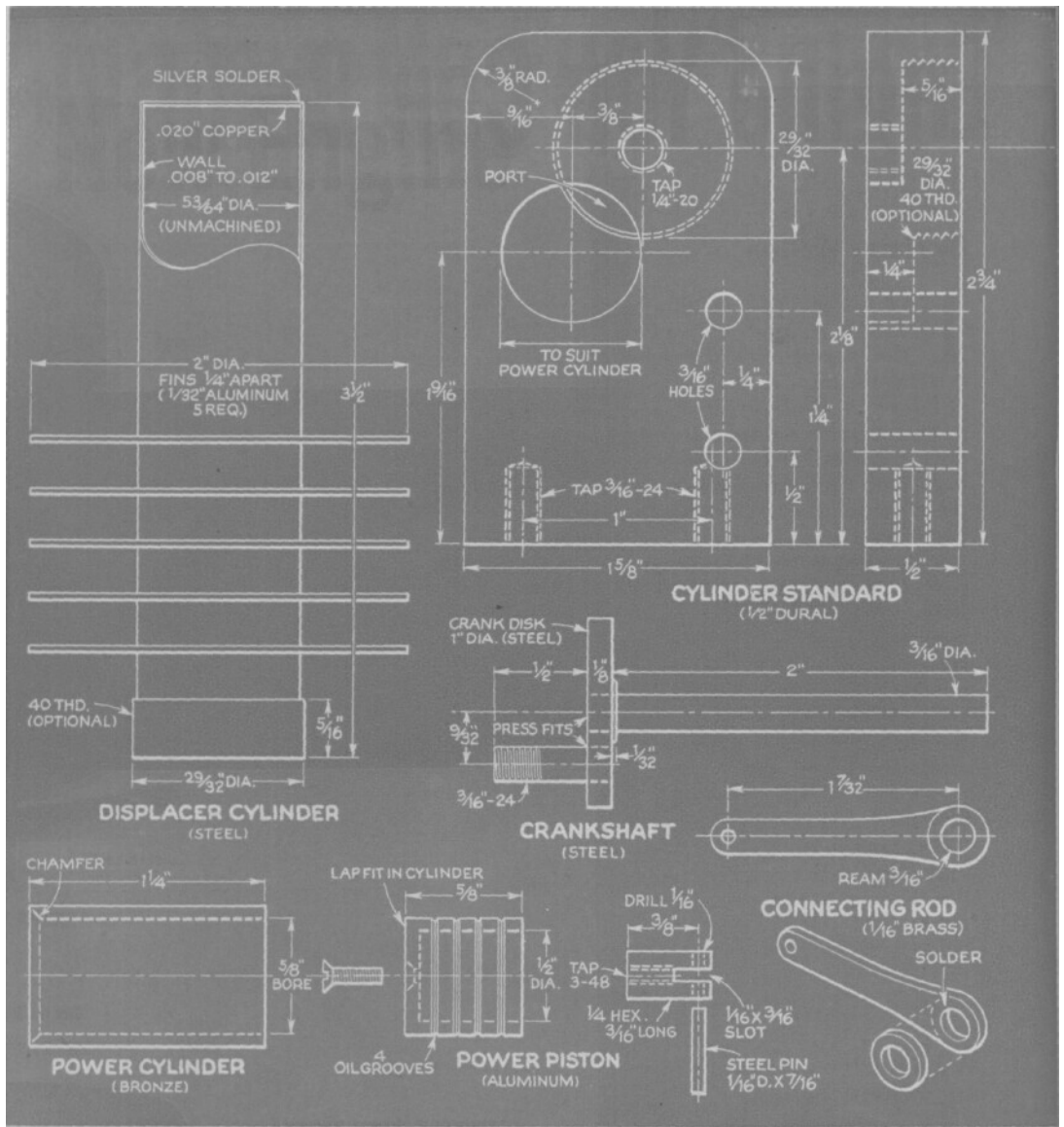
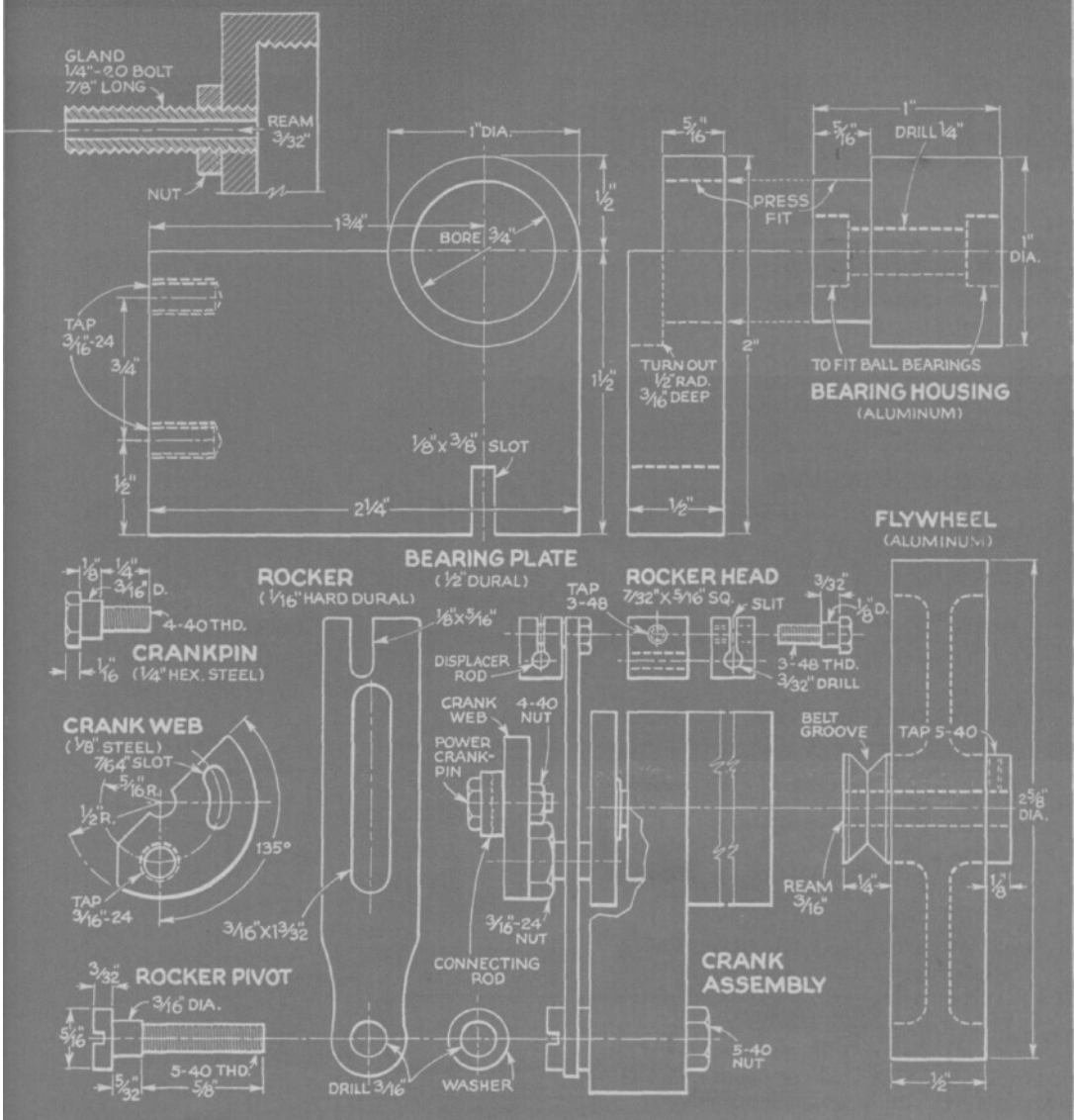


plate as shown. After boring the housing, press it squarely into the plate.

Drill tapping-size holes through the cylinder standard into the plate for two 3/16" bolts. Ream out the holes in the standard to clearance size; tap the others.

To align the crank disk, shaft, and crank-pin, follow the sequence shown. After cutting off the disk, chuck it by the shaft and face the outside. Support it on the

Use a center finder—a rod with a ball driven on near one end—to locate centers for boring cylinder recesses. By filing off bottom corners of the workpiece and using a raising block under the headstock, it becomes possible to do the machining job on this small lathe.



ends of the chuck jaws to press the crankpin in with the tailstock feed.

The *displacer cylinder* is made of thin-wall steel conduit. Twist a 3/2" piece onto a tight-fitting arbor center-drilled for tailstock support. Turn down all but 5/6" of its length to leave a wall less than 1/64" thick. Leave the 5/16" unturned portion at one end the original diameter.

To close the thinwall end of the cylinder, first solder a bit of sheet copper to a scrap of tubing you can chuck. Turn the copper to a close fit in the cylinder. Melt the disk free and silver-solder or braze

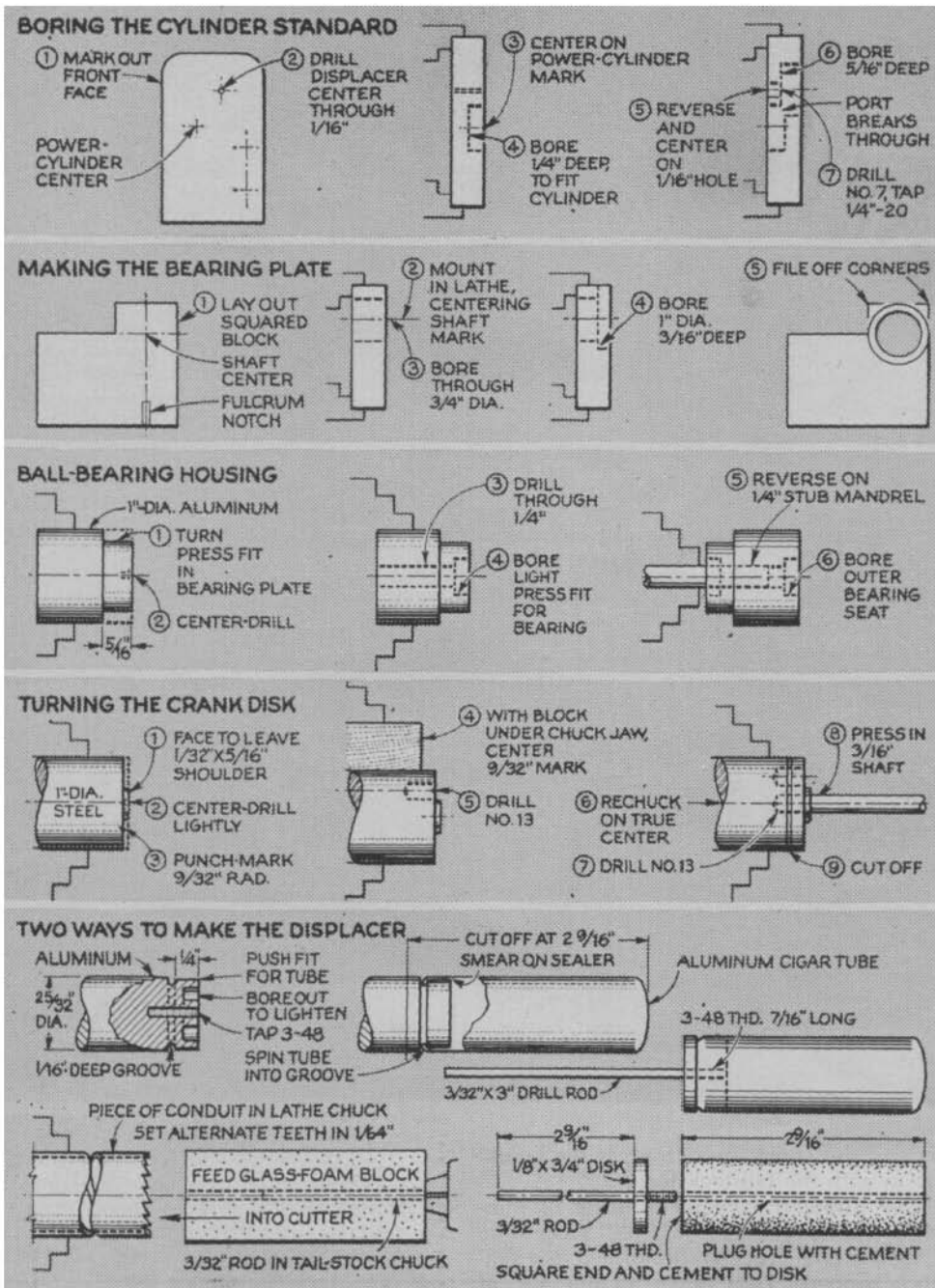
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Where to order engine kits

Machined engine parts and an 18" reflector with engine mount can be ordered (by number) from Techni-Kits, Dept. S, 350 Broadway, NYC 10013.

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| 705 Machined engine kit..... | \$19.95 |
| 706 Reflector and mount | 7.95 |
| 707 Machined engine kit, reflector, and mount | 24.95 |
| 708 All materials for machining engine, ball bearings, fly-wheel casting, glass foam | 9.95 |

For postage and handling, add to the above prices 50 cents east of the Mississippi, \$1 west of the Mississippi.



it into the cylinder. Soft solder won't do. Check for air leaks by blowing into the open end with the joint under water.

Cut fins out with a circle cutter. Chuck them and bore to a slip-on fit on the displacer cylinder. Cement them in place.

The displacer must be loose in the cyl-

inder to let air pass it, but not so small that it leaves much air und displaced. Coat the turned head and the inside of the cigar tube with cement before joining them. Put cement on the threads of the rod before screwing it in. Hold the finished displacer

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under hot water. Bubbles will rise from any leaks, which must be closed.

Cellular glass foam, sold in the form of abrasive blocks, makes a displacer that cannot leak. File teeth on a piece of cylinder stock, drill a foam block $3/32$ ", and feed it on a rod against the rotating cutter.

To assemble the crankshaft, first drive a ball bearing up against the disk (use a piece of tubing to press against the inner race only). Insert the shaft in the housing, set the crank disk on a solid support, and press the second bearing into place, pushing against both races.

Make the power cylinder from seamless brass tubing or a $5/8$ " bushing. Polish the bore with abrasive cloth on a dowel. Bore the piston; then, on an arbor, turn it to a tight fit in the cylinder. Finally, hone it with a fine stone to a free but reasonably airtight fit. With one end of the cylinder held shut, the piston should resist entering, air behind it acting as a spring.

Mount the rocker on its pivot pin with the crankpin in its slot. Turn a nut onto the crankpin, screw on the crank web, and lock it concentric with the crank disk by jamming the nut against it.

Cement the power cylinder in with auto-body solder or a good metal-to-metal cement. Look through the port to see if the piston comes almost to the bottom of the recess. If not, add a washer behind the wrist-pin fork. If it hits, file a bit off the end of the fork. Put cement on the fork screw before tightening it.

Adjust the displacer rod in the rocker head so that the displacer moves full stroke without hitting the recess or the end of the cylinder. Check this while holding the cylinder in place. The displacer stroke can be varied by raising or lowering the rocker pin in its slot. Cement the cylinder in only when you're certain that the displacer action is correct. Take care not to clog the port with cement.

You should now feel compression as you turn the shaft and push the piston in. If you don't, check cylinder joints, gland, and piston head for leakage.

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