HERE'S AN ALTERNATE WAY TO FIRE THE BOILER

If you'd rather not use a blowtorch to heat the coils, you can make an efficient alcohol burner from another pipe nipple and a few fittings, as illustrated above and below. It'll cost you about $3. The nipple is cut away and capped at both ends; the end that goes into the firebox is closed with a coupling and plug, since a pipe cap would be too big to pass through the coil.

Stuff this cut-away assembly with cotton—all the way to the end of the pipe cap, to make contact with the feed line. The shut-off cock provides fuel control. The perforated flame jacket, slipped over the coil before the boiler is set in the firebox, increases the heater's efficiency nearly 100 per cent. It needn't be removed if you switch to blowtorch operation.

To operate the burner, prime the trough with about two oz. of alcohol. (The shut-off cock is left closed.) When the burner is inserted through the coil, the fit is snug enough to hold the reservoir suspended, without additional support. Whenever the fire starts to die from lack of fuel, open the shut-off cock for a second or two, then close it tightly. This avoids refilling the trough outside the firebox—which could be dangerous while the burner is hot.
STEAM ENGINE

Last month we detailed the simple machining of the engine itself. Now, add the blowtorch-fired boiler—literally a "pipe" to assemble

By Manly Banister

A DOUBLE-CAPPED PIPE nipple with an underslug coil of copper tubing forms the boiler for the working-model steam engine described in the January issue. This assembly, suspended within an aluminum-sheathed asbestos firebox and fired with an ordinary propane torch, produces a head of steam in about two minutes to set the midget engine whirring.

The boiler's designed to be one of the fastest things you ever built. Its parts are all plumbing supplies available at hardware stores—including standard brass compression fittings for 1/4-in. o.d. copper tubing. Before coiling the tubing, attach a fitting to one end and flare the tubing with a flaring tool. Then wrap the tubing four times around a length of 1 1/4-in. dowel held in a vise, cut off the other end and attach the second flare fitting. The photo and sketch on page 199 show that when it's assembled to the boiler, one end of the coil is higher than the other; this is easily achieved by making the lead to one end shorter. This higher end is located at the rear of the firebox, as it's there that steam is generated. Water passes into the coil at the front end, which is relatively cool compared to the end at the flame tip.

The skewer, lying on the deck next to the firebox in the photo at left, above, is used occasionally as a slice bar to knock off scale that accumulates on the coil. Formation of scale can be minimized by proper firing: Keep the flame off the coil and never let the coil turn red hot. Scale tends to insulate the tube from the heat, so knocking it off the coil raises the steam pressure and speeds up the engine.

To assemble the boiler parts, put pipe-joint compound on all threads, and turn them up tight. Don't neglect to install a safety valve, as detailed on page 199. The plug is the head end of a plated wood screw, and its hole in the boiler is drilled with a numbered drill only a thousandth or two larger in diameter. File or spot-mill around the hole to make a tight seat under the screw head. The "modern Chinese" curve to the safety-valve arm (in the photo [far left] isn't a decoration: When you trim off a narrow piece of thin
brass with shears, that's the shape it takes. This arm pivots on a pin through the slotted end of a \( \frac{3}{32} \)-in. brass rod screwed tight in a tapped hole.

If you get careless with the blowtorch and generate too high a head of steam, this simple, positive-acting safety valve will prevent a serious accident.

Three sheathed asbestos panels are folded to form a box, as shown below. The boiler (with coil attached) is suspended inside by means of two machine screws into each pipe cap. The inner cap is also cradled on the contoured edge of the end panel. This assembly is then set on the bottom asbestos panel, which is positioned next to the engine on a platform, as shown in the photo at left. This platform is a 9½-by-11-in. piece of \( \frac{3}{4} \)-in. plywood, with four \( \frac{3}{4} \)-in.-dia. dowels glued into holes in the underside. The platform shown has been covered with the same type of aluminum used to sheathe the firebox. This protects the plywood from flame and steam.

To fire the boiler, pour 10 to 12 ounces of water into the filler hole and screw in the plug. Attach a heavy-duty nozzle to a

**KEEP THE ENGINE OILED**

Until the engine gets thoroughly hot, frequent oiling is required. With a squirt-type oil can, apply a few drops of 20-weight crankcase oil on the eccentric as shown. Also keep the bottoms of the pistons lubricated, so that oil is pumped up into the cylinders. The excess will run down the rods to lubricate the crankpin. Continue oiling every few minutes.
propone torch and set a medium flame.
Prop the torch in a small cradle of wood so that the nozzle rests on the first ring of the coil. In about two minutes, steam should start coming out of the engine. Spin the flywheel several times to pump out the condensation and to heat the engine block.
Once the engine is hot and puffing, no throttle is needed to control its speed. Merely adjust the valve on the blowtorch. You can “pour on fuel” by opening it—then damp the fires by turning it down. For longest engine life, however, keep the flame turned down so that the engine lugs along at about 1200 r.p.m. At this rate, boiler filling lasts up to 20 minutes.

**Spacing Parallel Cuts**
Want to make a series of parallel cove or reed cuts with a molding head on a bench saw? After each cut, hold the work in position while you shift the fence enough to insert a block the same thickness as the width of the cut or space. Clamp the fence, remove the block, and you're set for the next cut.—Daniel Bousha

**Post-Hole Digger**
You can save yourself a lot of unnecessary digging when setting 4 x 4 fence posts if you make this rig to chop square posts only slightly oversize. Two lengths of steel angle lag-screwed to the end of a 2 x 2, with one set at an angle by means of a tapered wedge, trap the dirt in the end so it can be pulled up out of the hole.