FASCINATING to watch and instructive to build, this combination unit comprises an alcohol-fired boiler fitted with a safety valve, a piston-type engine and a turbine. All of these may be mounted on a single base, as in Fig. 1, so that it will be an easy matter to connect the rubber tube on the steam supply line to either engine or turbine. Simplicity of construction and the use of stock material enable anyone to make these engines.

The piston-type engine shown in Fig. 2 is detailed in Figs. 3, 4 and 5. It is an engine of the single-acting or single-admission type, that is, there is only one power stroke instead of two as in the double-acting type. This means that the flywheel must be comparatively heavy to store up sufficient energy for maintaining a steady and uniform speed. Looking at the left-hand sectional detail in Fig. 4, the valve is open and live steam from the boiler is rushing through the steam chest into the cylinder. The piston has just started
the outward, or power stroke. While the piston is completing this stroke with the steam pressure forcing it outward, the valve is moving in the opposite direction. Just before the piston reaches the back dead center, the valve closes the live-steam port and by the time the piston starts the return or exhaust stroke the valve has moved into the position shown in the right-hand detail, Fig. 4. This allows the exhaust steam to pass out through a port drilled in the body of the valve. Thus the cycle is completed, the one opening into the cylinder acting as both inlet and exhaust port.

An alloy solder with a high melting point, 500 to 550° F., must be used. Ordinary tinner's solder will not do. However, before assembly all bearing surfaces of cylinder, piston, valve and steam chest must be tin-plated. This is necessary because contact with live steam produces an oxide film on brass, making the surface rough. Sprinkle pure tin salts on the surface to be tinned, apply heat until the tin is liberated and spreads over the surfaces. While a batch of lead is melting in an
iron ladle, turn the wood mold for the flywheel, Fig. 7. Although the wheel is shown separate from the shaft in Fig. 3, it is actually shrunk onto the shaft by simply placing the latter upright in the mold before the metal is poured. This done, the engine is put together complete, except the crank which is pressed on the shaft but not soldered. Connect the engine to an air line furnishing about 10 lbs. pressure. Then move the crank on the shaft until you find the point where the engine runs best, and solder the crank in place.

In the turbine, a jet of steam is directed against buckets on the rim of a disk wheel