

THE LIBERTY ENGINE.—Vertical section through crank-case, showing method of bearing support and oil distribution.

I-beam connecting rods are used, the connecting rod length being 12 in. between centres. The piston pin is a seamless steel tube, the tube being a drive fit into the bosses on the aluminium piston. The tube is of 1½ in. outside diameter, and is surrounded by a bronze bushing, upon which the upper end of the rod bears. The rod has a solid head and its lower end is either solid or forked, depending on whether it is for the left or right cylinder. The left rods are forked and the right plain. In assembly, the connecting rods are stamped with the serial number of the crankshaft to which they are fitted and also with the number of the cylinder in which they belong. In this way, it is possible to reassemble the Liberty engine and be certain that the rods are returned to the proper cylinders.

The clearance between the lower connecting rod bushings and the crank pin varies from .003 in. to .004 in. The allowable end play is from .010 in. to .020 in. The plain rods have two cap bolts and the forked rods have two for each side, or four.

Bearings Between Halves of Case

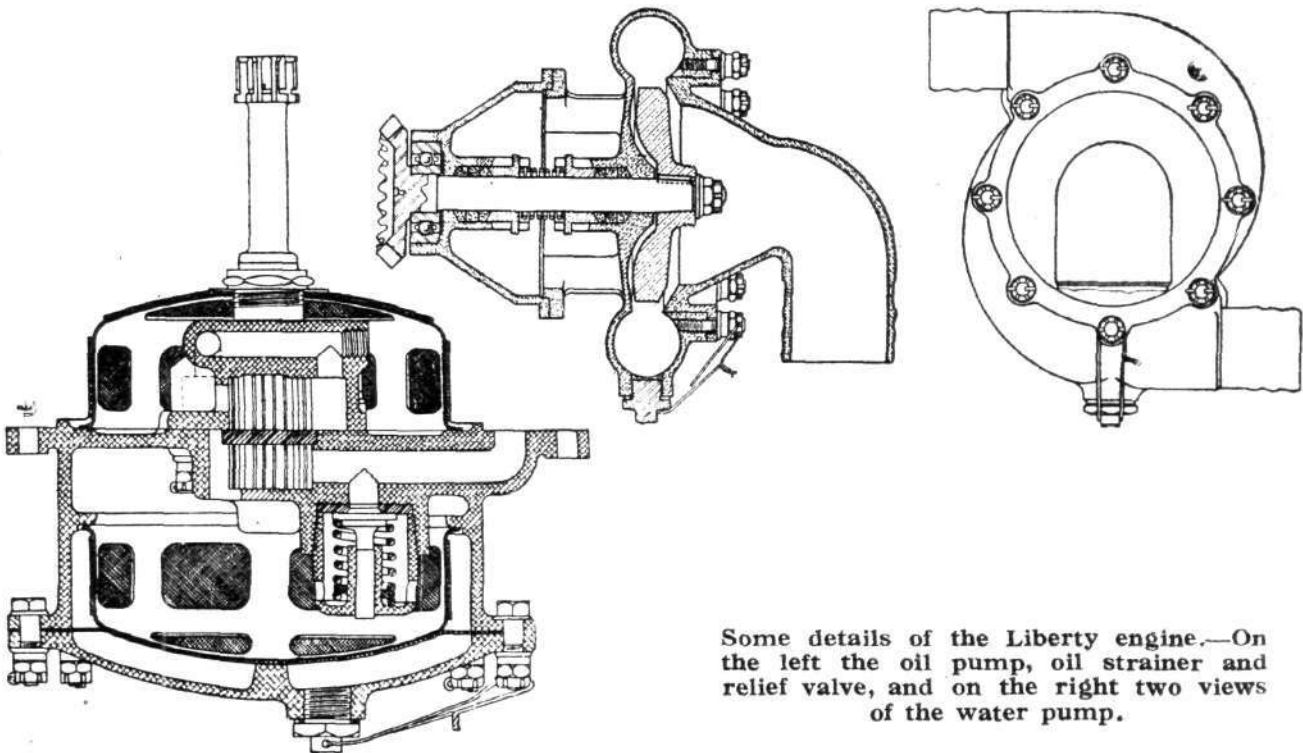
A drop-forged seven-bearing crankshaft, 2½ in. in diameter, is used. The shaft carries a propeller hub at its forward end and at the rear end carries a bevel gear for driving the valve mechanism. A double row thrust bearing at the propeller hub end of the crankshaft takes the end thrust on the shaft. The shaft is drilled for oil passage, the openings being drilled through the crank cheeks through the crank-

pins. The propeller hub is lapped to a fit on the shaft, the end of the crankshaft is tapered and when the hub is fitted on it should be about .001 in. tighter at the large end of the taper than at the small end. In addition to the taper fit, there is a key in the end of the crankshaft to take the propeller hub.

The crankcase is in two pieces, both of which are aluminium castings. The crankshaft bearings are on a line with the split in the crankcase, the lower halves of the crankshaft bearings being held in the lower half of the crankcase and the upper halves in the upper half of the crankcase. The two halves are tied together by long bolts or studs which pass through the upper half of the crankcase, through bosses, the nuts being at the top of the upper half of the case. This gives an accessible construction which is at the same time rigid. A careful joint is made between the two halves of the crankcase in order to secure the desired alignment at the main bearings, the joint being lapped.

Valve Gear

The valve drive is arranged as follows: From the bevel gear on the end of the crankshaft motion is transmitted to a vertical shaft located on the distributor end of the engine, or the end opposite from the propeller hub. This shaft has an intermediate gear which engages with the two cam driving shafts running parallel with the centre lines of the cylinder blocks. The vertical shaft which carries the lower bevel gear and the intermediate gear is carried on a



Some details of the Liberty engine.—On the left the oil pump, oil strainer and relief valve, and on the right two views of the water pump.