Five Bearing Crankshaft Important Feature of New Lycoming Engine

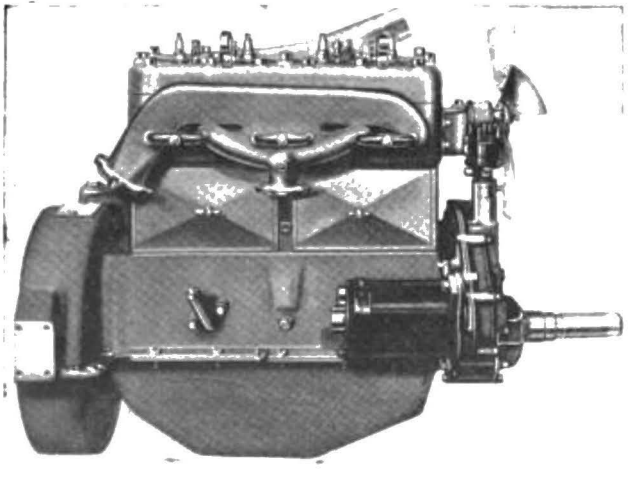
Smooth operation obtained by use of long connecting rods and light reciprocating parts. Special type force feed lubrication used. Bore 3½, 3⅝, or 3¾ in. and stroke 5 in. Lynite or cast iron pistons optional. Performance good in power and flexibility.

By Donald D. Blanchard

UNUSUALLY smooth operation at all speeds has been secured in the new Lycoming four-cylinder engine through the use of long connecting rods and light reciprocating parts. In addition to freedom from vibration, the performance of the new engine is highly satisfactory from the standpoints of power and flexibility. For test purposes the engine was installed in a five-passenger phaeton weighing about 2700 lbs. and with a rear axle gear reduction of 4.8 to 1. It is claimed that a speed of 65 m.p.h. has been attained with this car and that it will accelerate from 5 to 25 m.p.h. in 8 seconds. A stiff five-bearing crankshaft and a system of force feed lubrication, in which the pressure is controlled by the throttle, are important constructional features of the new engine which will undoubtedly contribute much to its durability.

The new engine will be known as the Model C Series and is offered with 3½, 3⅝ or 3¾-in. bore and 5-in. stroke. It may be had with either Lynite or cast iron pistons.

The cylinder block, the upper half of the crankcase and the detachable cylinder head are all gray iron castings. The water jackets are integral with the block. Water passages are provided around all valve ports, spark plug bosses and over the combustion chambers. The block is attached to the crankcase by eleven 7/16-in. studs. The cylinders are rough bored, tested under 100 lbs. water pressure, finish bored and ground to size. The crankcase is stiffened by the webs which carry the main bearings. The flywheel housing is an integral part of this casting. The cylinder head is fastened to the block by eighteen ½-in. studs.



Lycoming engine. Intake and exhaust manifolds integral

The crankshaft is drop forged of .40-.50 carbon steel and is heat treated. The flywheel is attached by means of six ½-in. bolts to a 6-in. flange forged integral with the crankshaft. All bearing surfaces are ground and the crankshaft is drilled for force feed lubrication to main and connecting rod lower bearings. The finished shaft is tested for dynamic balance.

The crankshaft is carried in five main bearings. These bearings are 2⅛ in. in diameter. The front and rear main bearings are 2⅝ in. long, the center bearing is 1 13/16 in. long and the two intermediate bearings are 1 5/16 in. long. The connecting rod bearings are 2⅛ in. in diameter by 1 13/16 in. long.

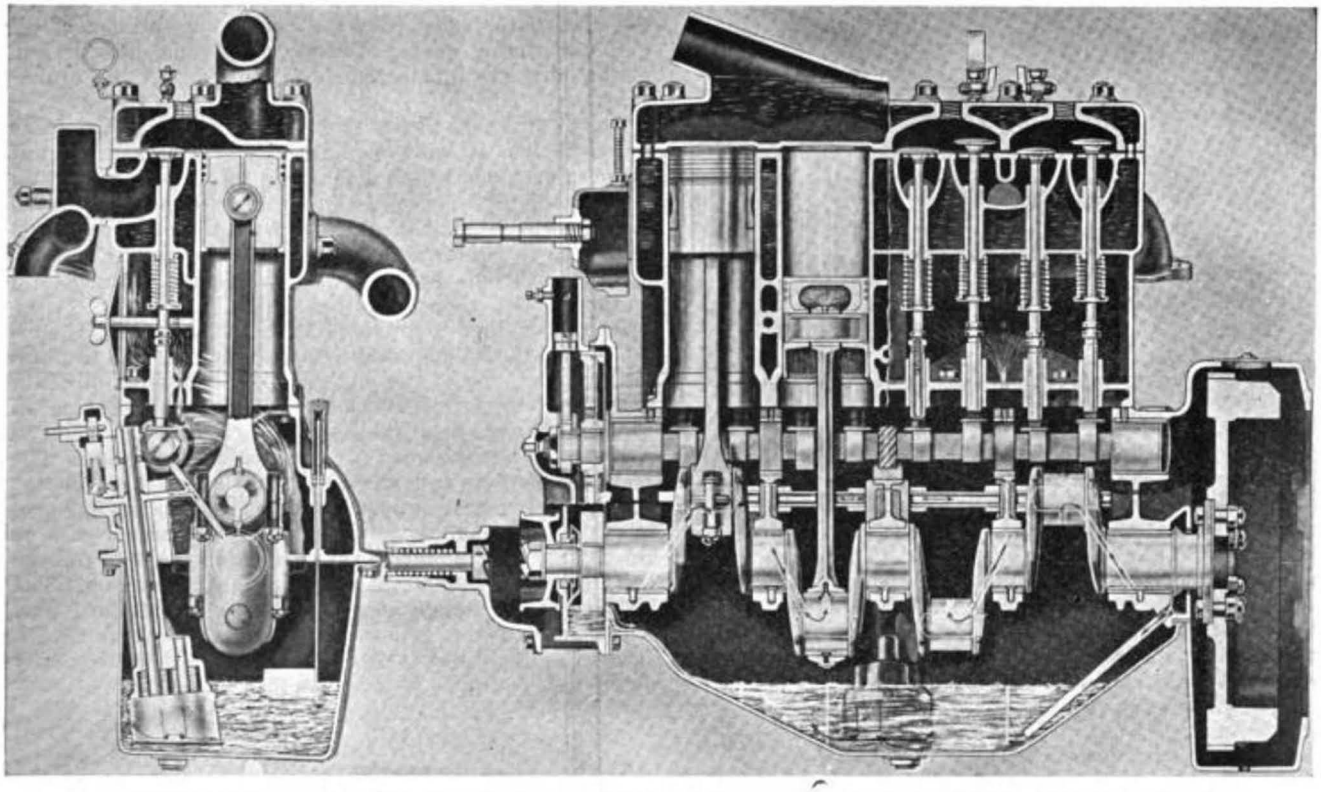
Piston Equipment Optional

Either Lynite, an aluminum alloy, or cast-iron pistons may be had with this engine. Both types are fitted with .003-.004 in. clearance at the first land. The Lynite pistons are of the split-skirt type. Three piston rings are used, all located above the piston pin. Two of the rings are ⅛ in. wide and the third is 3/16 in. The piston length is 4⅛ in. The piston pins are 1⅛ in. in diameter and 2 29/32 in. long. They are made of case-hardened steel, drilled hollow and ground.

Full floating piston pins are used in the Lynite pistons, endwise movement being prevented by snap rings in the piston pin bosses. The connecting rod is bronze bushed. When cast-iron pistons are used, the piston pin is clamped in the connecting rod, the bearing being in the bosses.

The connecting rods are of I-beam section, drop forged of .40-.50 carbon steel and heat treated. The length from the center of the piston pin bearing to the center of the crank pin bearing is 12 in. Bronze backed, babbitt-lined bearings, ground to size, are used in the big ends. The cap is held in place by two 7/16-in. nickel steel, heat-treated bolts. The main bearings are also bronze backed, babbitt lined. No shims are used to fit the bearings. They are fly cut and line reamed to a clearance of .0015 in. to allow for the oil film.

The valves are interchangeable and have cast-iron heads electrically welded to steel stems. The valve lift



Sectional views of new Lycoming engine showing pressure lubrication system, water jacketing, and manifold construction

is 11/32 in. and the effective working diameter is 1⅝ in. The tappets are of low carbon steel, case hardened, ground and fitted with hardened steel adjusting screws and lock nuts.

The camshaft is a .15-.25 carbon-steel drop forging and is case hardened and ground. The cams are tested for a scleroscope hardness of from 75 to 90. The camshaft is carried in four removable bronze bushings. The camshaft diameter is 1⅛ in. and the bushing diameters and lengths are respectively: Front bearing 2 1/32 x 2⅛ in., second bearing 2 x ⅞ in., third bearing 1 3/32 x ⅞ in., and rear bearing 1 15/16 x 2 in. A spring-operated plunger bearing on a hardened steel button on the front end of the camshaft takes the end thrust and automatically adjusts for wear in the timing gears, which are helically cut. The crankshaft and generator gears are fiber and the camshaft gear is cast iron. Removal of the timing gear cover renders these gears easily accessible.

Semi-Steel Flywheel

The flywheel is of semi-steel. It is machined all over and tested for dynamic balance. Teeth for the starting motor are cut in the periphery of the flywheel.

The intake and exhaust manifolds are an integral casting which is held in position by clamps. Proper alignment between the intake manifold and the intake ports is secured by means of steel sleeves fitted into the intake ports. A hot spot is provided to assist in the vaporization of the fuel. The 1-in. S. A. E. carbureter flange is for a carbureter top outlet.

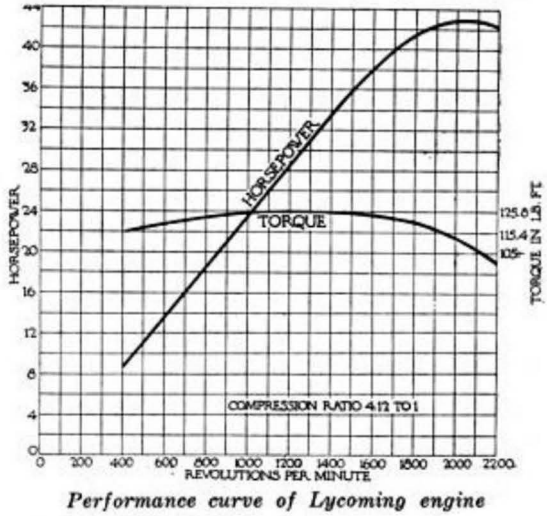
Cooling is by thermo-syphon. The fan drive pulley is mounted on the front end of the crankshaft, and there is ample clearance for removing and replacing the fan belt. The belt is a 1¼-in. flat type. The fan is carried on an adjustable supporting bracket which is fastened to a pad on the front end of the cylinder block. The fanshaft is ¾ in. in diameter and is threaded into the fan bracket for easy adjustment.

Provision is made for mounting the ignition unit at the front end of the gear case over the timing gears. It is driven off the camshaft gear by a spiral gear. The mounting is adapted to take any standard make of distributor. The rotation of the distributor is clockwise when looking down on it from above the engine.

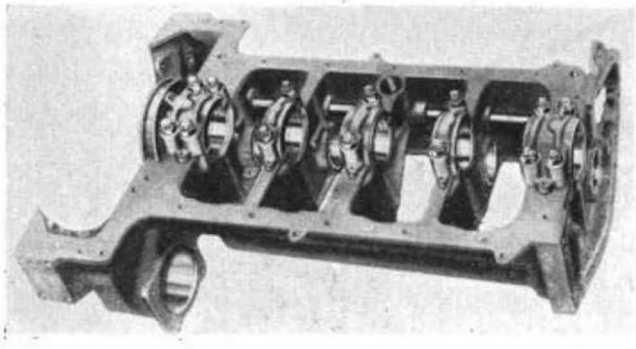
The lower half of the crankcase is pressed steel. A cork gasket is provided between oil pan and case to prevent oil leakage.

Pressure lubrication is used. Oil is carried under pressure to all main, connecting rod big end and camshaft bearings. The entire circulating system is contained in the upper half of the crankcase.

The gear type of oil pump is driven at camshaft speed



Performance curve of Lycoming engine



Five main crankshaft bearings of new Lycoming engine

by spiral gears located at the center of the camshaft. It is supported by the upper half of the crankcase but extends down into the oil reservoir. This construction permits removal of the oil pan without interference with other parts of the lubrication system. The pump intake is always immersed in oil and requires no priming.

The pump discharges directly into a distributor tube cast into the upper half of the crankcase. This tube is connected by holes drilled through the webs to all camshaft and main bearings. A nozzle on the front end of the distributor tube directs a continuous stream of oil onto the timing gears. Valves, push rods, pistons and piston pins are lubricated by oil thrown off the crankshaft.

The oil pressure varies from 2 to 5 lbs. at idling speeds up to 25 lbs. at wide-open throttle. A pressure relief valve is provided which discharges into a bypass leading back to the oil reservoir. This relief valve is connected to the throttle control. In this way, the oil pressure is regulated to conform to the load on the engine. Maximum pressure is secured with wide-open throttle and minimum with closed throttle.

An oil strainer is provided at the pump inlet. The oil level indicator is operated by a cork float and is in plain view on the side of the engine. The combined oil filler and breather is constructed with suitable baffles to prevent the escape of oil.

The engine is designed for three-point suspension. The front support is a trunnion on the crankshaft center line. The two rear support pads are cast on the flywheel housing. The bell housing flange is either a No. 3 or No. 5 S. A. E. standard size. Provision is made for the installation of a two-unit starting-lighting system. The starting motor flange is a No. 1 S. A. E. standard type outboard and the generator flange a No. 2 S. A. E. standard. Provision is made for governor mounting only on engines equipped with magneto ignition.

Gardner was the first to use the Lycoming model C engine.
For Gardner it was the model CE and had more HP than the other series C engines.
When Gardner discontinued the 4 cyl model the CE engine was then used by Elcar starting in June 1926.

The options used by Gardner included:
Aluminum Pistons
Bore of 3 11/16" 213.6 CID