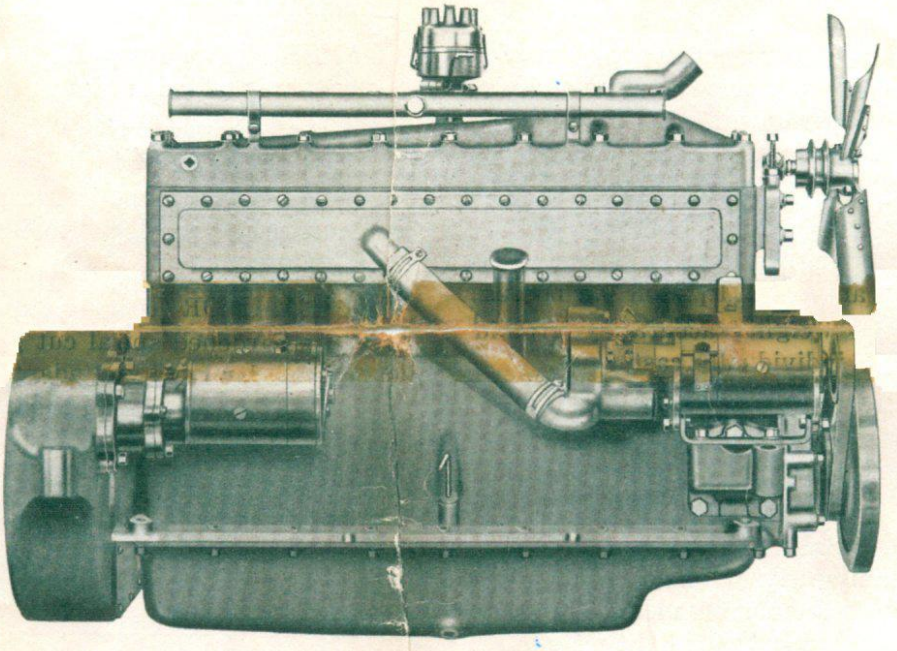
INSTRUCTIONS for the Care and Operation of the

Lycoming Model "G" Series 8-in-Line Engine



LYCOMING MANUFACTURING CO.

WILLIAMSPORT, PENNA.

General Description
Lycoming Model "G" 8-in-Line

CRANKCASE: Cast integral with cylinders of special grade gray cast iron. Integral water jacket extends around barrels and provides large water passages around valves. A large opening on the side of the jacket extending nearly the full length of the block facilitates setting of cores and cleaning, and also insures uniform water passages and uniform wall thickness of cylinder barrels. The lower part of the block is thoroughly ribbed to give maximum strength and rigidity. A one-piece flywheel housing is bolted to the rear end of the block and this is amply ribbed to take the weaving strains of the car frame. The oil pan of pressed steel is bolted with cork gaskets to insure an oil tight fit.

CYLINDER HEAD: Close grain gray iron, detachable, permitting easy access to valves and pistons, thoroughly water jacketed. Combustion chamber shape is of special design allowing a high compression pressure to be used without detonation.

PISTONS: Lycoming design; cast iron, reinforced at open end and around piston pin bosses; remarkably light in weight; accurately ground and fitted with four individually cast rings.

PISTON PINS: Made of case hardened steel drilled hollow, hardened, accurately ground, lapped and held stationary in rod by a special locking device.

CONNECTING RODS: Drop forging; 30-40 carbon steel; I beam section; double heat treated to insure strength, refinement and toughness of materials; designed especially for light weight.

CRANKSHAFT: Drop forging; 40-50 carbon steel; double heat treated. All bearing surfaces are accurately ground and drilled for force feed lubrication. Vibration dampener securely keyed to front end effectually eliminates torsional vibration of the shaft.

BEARINGS: Connecting rod bearings are cast directly into the large end of the rod by a centrifugal process, which insures proper density of the bearing metal and perfect bond between the bearing and rod. Main bearings are die cast bearing alloy.

Camshaft bearings are renewable bronze bushings pressed into place.

VALVES: Exhaust valves are of Silcrome, an alloy steel developed especially for exhaust valves. It resists burning and warping, insuring freedom from valve leaks, and rendering frequent regrinding of valves unnecessary.

Intake valves are of special alloy steel particularly adapted for this use. Seats and stems of exhaust and intake valves are subjected to a special heat treatment which gives the proper degree of hardness to resist wear.

VALVE TAPPETS: Mushroom type; fitted with hardened steel adjusting screws and lock nuts. Tappet guides are arranged in easily removable clusters.

CHAIN: The camshaft is driven by a silent chain 1-1/4" wide with the distance between crankshaft and camshaft sprockets so close that the free portions of the chain are short enough to eliminate all tendency to whip.

CAMSHAFT: Drop forging; cams integral. Every cam is tested for hardness, and accuracy of timing. A special cam contour has been developed to give quiet operation.

FLYWHEEL: Cast iron completely machined and perfectly balanced, provided with teeth for starting motor.

DISTRIBUTOR DRIVE: Driven from camshaft by hardened spiral cut gears. Mounted on top of cylinder head and adapted to any standard make distributor. This mounting is ideal, being accessible and reducing the wiring to a minimum.

LUBRICATION: Full force feed. Entire lubricating system contained in upper half of crankcase. An automatic pressure relief valve maintains proper oil pressure at all times.

COOLING SYSTEM: Centrifugal water pump mounted in readily accessible position on side of the end of the generator. The water inlet to the cylinder is taken through a pressed steel plate attached to the side of the cylinder. The water is forced between all the cylinder barrels to the valve side insuring uniform cooling of all cylinders and valves. Fan is mounted on an adjustable bracket. Fan drive is by 5/8" "V" Belt.

OIL STRAINER: Rectangular type. Removable for cleaning.

OIL PUMP: Gear type; mounted in upper half of crankcase extending into oil reservoir. Lower end of pump always immersed in oil and requires no priming. This construction permits oil reservoir to be removed without interfering with any part of lubricating system.

INTAKE MANIFOLD: Swan design assuring complete vaporization and equal distribution of gases.

Instructions for Care and Operation Lycoming Model "G" Series 8-in-Line

PISTONS: The pistons are readily removable without taking off the cylinder head. Proceed thus:

1. Drain off the oil from oil pan.
2. Remove all cap screws and bolts holding oil pan to crankcase.
3. With starting crank turn crankshaft until piston will slide by the crankshaft.
4. Assemble cap to connecting rod in the same position it originally was.

When fitting new pistons the clearance in the cylinder bore must be such that a feeler shim .0025" thick and 1/2" wide placed in the bore on a line at right angles to the piston pin can be easily pulled from under the piston, while one .003 in thickness cannot be withdrawn.

CONNECTING RODS: The connecting rod cap must be replaced in exactly the position that it was originally. For example, No. 1 connecting rod and cap have a "1" stamped on the sid of the rod and also on the cap. This number must be on the same side.

The large end of the rod is offset 1/4". In replacing rods care should be taken to see that they are replaced with the offset on the same side as they were originally. The short side of the rod is assembled nearest to the main bearing in every case. Rods 1-3-5-7 have the short side toward the front of the motor and rods 2-4-6-8 have the short side toward the rear of the motor.

The connecting rods are of the shimless type. The babbitt is cast directly into the rod by the centrifugal casting process. The clearance between the bearing and the shaft is set at the factory .0015". This clearance is checked by using a piece of paper .0015" thick and 1" square. The paper is assembled between the shaft and the bearing and the nuts drawn up tightly. The rod with the paper in place, should support its own weight on the shaft, but it should be possible to move it with very little pressure. The side clearance should be from .004" to .008" as checked with feeler gage.

Adjustment should be made when wear of .004" or more has taken place. The work of adjusting the connecting rod bearings should be undertaken only by an expert mechanic in a properly equipped service station. Adjustment can be made by filing off the face of the cap. Care must be taken in filing to see that the surface is kept straight.

A loose connecting rod bearing is usually most noticeable on a hard pull and an experienced mechanic can usually determine which bearing is giving the difficulty by listening closely or by removing the oil pan and noting any looseness in the cap. Pressing against this cap and at the same time rocking the crankshaft will usually enable the mechanic to determine which bearing is in need of adjustment.

GRINDING THE VALVES: It is necessary that valves be reground into their seat whenever they become pitted or scored sufficient to cause loss of compression. To remove the valves proceed thus: (1) Drain the water and remove the cylinder head as described in the paragraph under cylinder head and gaskets.

(2) Remove the valve tappet cover plates from the side of the engine. (3) With a suitable valve lifter raise the valve springs and take out the horseshoe valve spring seat supports. Be careful that the horseshoe supports do not drop through the oil holes in the cylinder into the crankcase. (4) Lift out the valves.

When grinding the valves, it is advisable to place under the head a spring of sufficient tension to hold the valve away from its seat when not under pressure from the valve tool.

Valve grinding compound may be purchased at any accessory store and is usually sold in combination tins containing coarse and fine grades. A little of the coarse grade should be placed on the valve and with an oscillating movement of the valve it should be worked into the seat, always bearing lightly on valve and being careful not to make more than 1/8 to 1/2 a revolution of the valve before reversing its direction of motion, or otherwise grooves in the valve face will result. When all pits and black spots have disappeared and the valve presents a dull, silvery appearance, finish the grinding with a fine compound. The valve face should have a uniform surface, free from grooves and pits, but should not necessarily have a polish. The valve acquires a glassy polish while in use. Each valve should be ground and returned to the seat from which it was removed.

An excellent test to determine whether a perfect seat has been ground is as follows: With a soft lead pencil, mark lines across the face of the valve head, spacing them approximately 1/8 inch apart around the entire face of the valve. Then replace the valve and make a quarter rotation backward and forward. All lead pencil lines should be broken. If not, continue grinding until such time as all pencil marks are broken, which indicates that the valve is seating all around. Remember, all of the pencil mark is not to be rubbed out, but the pencil mark should be broken at one point on the seat, wherever the valve comes in contact with the seat in the cylinder block.

After regrinding valves and seats, make certain that every trace of the grinding compound is removed, especially around valve stems, as well as cloth or other material used to prevent the grinding compound from reaching the cylinder bores.

PISTON PIN: After having removed the connecting rod and piston as directed above, test the pin for looseness in the piston bosses. The pin is held in the connecting rod by means of a screw which passes through the sawed end and engages in a notch in the piston pin clamping the pin tightly and preventing it from turning in the rod. This screw is locked by a flat plate under the head bent against the head of the screw after tightening. A loose pin will cause a knock in which case replacement of the pin is necessary.

It is very important in reaming the bronze bushings in the piston bosses to see that the holes are reamed smooth and in alignment so that the pin will have a perfect fit.

PISTON RING: When the piston rings become worn to any extent as indicated by lack of compression or excessive oil consumption immediate replacement should be made.

In fitting new piston rings to the pistons they should have about from .0015″ to .003″ side clearance between the ring and piston groove. The gaps between the ends of the piston rings should be .006″ to .012″.

MAIN BEARINGS: The main crankshaft bearings are of die cast special bearing alloy. No shims are used and adjustment is secured by filing off the faces of the caps the same as described under Connecting Rod Bearings.

When adjustment of connecting rod or crankshaft bearings is necessary, it is our suggestion that the work be done in a properly equipped service station. This class of work is for an experienced mechanic only. In case this procedure is not possible or desirable the following points should be noted:

The proper clearance between the crankshaft and the main bearings is .002″ to .0025″. The bearing clearance can readily be checked by inserting a feeler gauge of the proper thickness between the shaft and the bearing and drawing the cap nuts up tight. The bearings should be adjusted after wear of .004″ or more has taken place. Never fit them so tight that the shaft cannot be turned by hand with a .002″ feeler 1/2 inch wide, assembled between the bearing and shaft. This insures the proper clearance for oil film. The bearings are extra large and well lubricated. Adjustment is required only at comparatively long intervals.

However, overheating or overloading of a new engine, due to operation withoer sufficient quantity of oil, or with an inferior oil, is sure to cause loosening of the bearings by the melting of a small portion of the facing.

A loose bearing always causes in the engine a knock of a magnitude depending upon the degree of looseness. It is readily discernable by any person in the immediate vicinity, and ignorance of its existence is inexcusable. Proper attention must be given immediately or the wrecking of the entire engine may result. A loose or burned-out bearing will pound the crankshaft out of round, necessitating replacement. Pounding will crystalize the connecting rod and the connecting rod cap bolts, resulting in their failure and generally the mashing of both halves of the crankcase, camshaft and piston.

We cannot too strongly impress on the inexperinced owner the necessity of having an expert mechanic do all the work on adjustment and replacement of main or crankshaft bearings. In the great majority of cases there is no necessity for having to replace main bearings, as they will last the lifetime of the car if proper attention is given to lubrication and necessary adjustment for looseness.

CAMSHAFT: The camshaft has six large bearings which under normal conditions will not have to be replaced during the life of the engine. All end play is taken up by a spring actuated plunger in the front end of the shaft which forces the chain sprocket flange against the bearing face. The clearance between the shaft and bearings when refitting should be .0025″ to .0035″.

VALVE ADJUSTMENT: It is important that sufficient clearance be had between the end of the valve and the head of the adjusting screw on the valve tappet, to insure the proper fitting of the valve in its seat. With the engine hot the clearance should be not less than .006″ and not more than .008″.

The clearance is readily adjusted by removing the valve tappet cover plates and adjusting the screw on the top of the tappet with suitable wrenches.

VALVES AND TIMING: The intake valves are larger than the exhaust to provide a full charge at high speed. The firing order is 1, 6, 2, 5, 8, 3, 7, 4. The valve timing is as follows:

Intake open upper dead center. Intake close 45 degrees past lower dead center. Exhaust open 50 degrees before lower dead center. Exhaust close 10 degrees after upper dead center.

When checking the valve timing the clearance between the valve stem and the tappet must be exactly .010". This clearance should then be reset to .006" to .008" for quietness with the engine hot. A change in the valve timing is possible only by removing the front end chain.

In resetting the camshaft, the sprockets on the camshaft and on the crankshaft should be lined up so that there are twelve chain links on the lower side of the chain between the prick punch marks on the two sprockets. With the sprockets in this position the top dead center mark for No. 1 and No. 8 cylinders will be in line with dead center mark on the crankcase.

OIL CIRCULATION: The oil is drawn from the reservoir through the strainer, and is pumped to the main bearings. The main bearings are all supplied by copper tubing manifolds which are connected to the bottom of the bearing caps. Oil is forced to the connecting rod lower bearings through drilled passages leading through the shaft from the main bearings. The front end chain is supplied through a special lead from the front camshaft bearing to which oil pressure is supplied.

The surplus oil from the front end drains back into the oil reservoir. The cylinder walls, piston pin bearings, valve operating mechanism and valve stems are oiled by spray thrown from the connecting rod bearings.

OIL SUPPLY: Oil is poured through the filler tube on the side of the crankcase. Keep filled between the two marks on the bayonet type gauge located near the filler. Seven quarts are required to fill to the high level. Do not carry oil above the high mark. The oil should be drained from the reservoir and replaced with a fresh supply every 500 miles unless a test shows the oil has lost its viscosity before this time, in which case it should be drained more frequently. The oil is drained by removing a plug in the bottom of the reservoir. To clean the oil strainer, drain the oil and remove the oil pan, when the screen may be detached.

OIL PUMP: The gear type pump is held in place by a set screw from the outside of the case and is located in the oil reservoir about even in height with the normal oil level. It is operated by a shaft driven by a spiral gear on the camshaft. The pump may be removed for cleaning or inspection by taking off the lower half of the crankcase and disconnecting the oil manifolds.

OIL PRESSURE REGULATOR: The oil pressure is controlled by a regulator located on the valve side of the engine towards the front end of the crankcase. The pressure is controlled by a spring with tension on a piston valve. Any excess pressure causes the valve to rise. The excess oil goes through the regulator body into the crankcase and is returned to the oil reservoir. The pressure of the spring on the valve which regulates the oil pressure is controlled by a screw which may be adjusted to give the oil pressure desired.

To adjust the pressure, loosen the lock nut and turn the regulating screw with a screw driver to the right to increase the oil pressure, and to the left to reduce the oil pressure. The oil pressure will vary somewhat depending on the viscosity of the oil.

With the motor idling and with oil in good condition, the oil pressure should be at least five pounds. When the motor is cold, the pressure will be high until the oil thins down. The maximum oil pressure should be 40 to 60 pounds at car speed of 40 miles per hour. During extremely cold weather, the oil may show excessive pressure due to congeaning or oil in the oil pipes which prevents free circulation. Running the motor slowly for a few minutes, will give the oil a chance to warm up and become thinner.

Failure of the gauge to show pressure is an indication that something is wrong, lack of oil or a clogged strainer. The motor should be stopped immediately and cause determined.

COMPRESSION: Compression in all cylinders should be equal. Weakness or loss of compression is probably due to badly worn piston rings or imperfectly seated valves, which latter may be caused by insufficient clearance between the valve stems and tappets or by sticky valve stems or tappets.

The use of a poor or improper grade of lubricating oil, or running with too rich a mixture, may cause carbon deposits to collect on the valve seats preventing valves from seating properly. If the compression varies greatly between the various cylinders, it will result in a loss of power and the cause should be determined and remedied.

FRONT END CHAIN: The camshaft is driven from the crankshaft by a Link-Belt silent chain 1-1/4" wide with fixed centers between sprockets.

To remove chain take out camshaft sprocket screws and pull off sprocket.

TO REPLACE THE CHAIN PROCEED AS FOLLOWS: First line up the timing marks on the crankshaft and camshaft sprockets, as described under Valves and Timing, wrap the chain over the sprockets, then fasten the camshaft sprocket in place with the dowel properly lined up.

CARBON: If the motor knocks easily under load and does not seem to develop its normal amount of power, it is generally an indication that there is carbon in the cylinders. The carbon can readily be cleaned by raising the cylinder head. Before replacing the cylinder head, be sure that the cylinder and surface of the cylinder head gasket are clean.

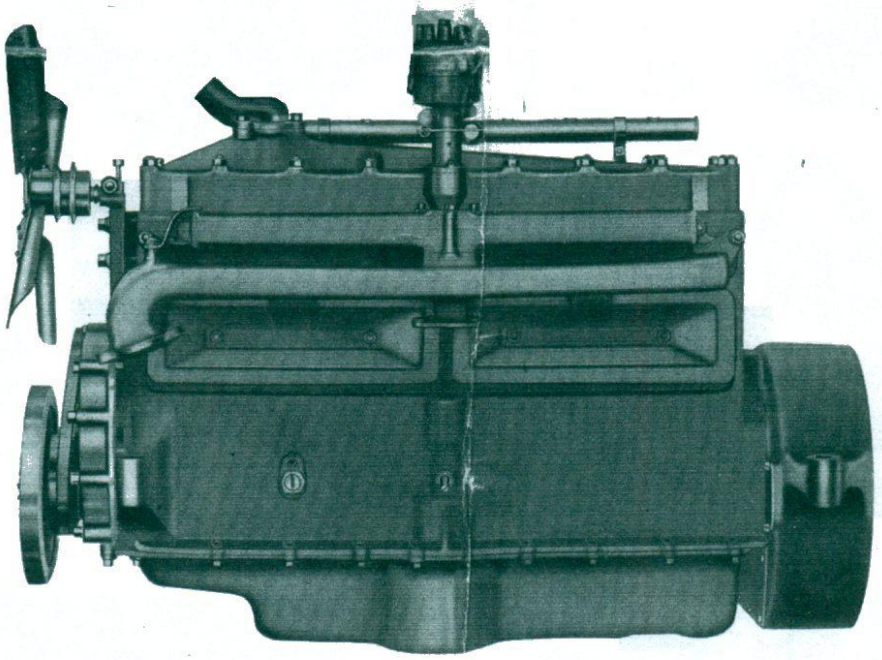
CYLINDER HEAD AND GASKET: To remove the cylinder head proceed as follows:

(1) Drain water. (2) Disconnect the upper hose. (3) Disconnect the spark plug wires. (4) Disconnect the cable tube brackets from the cylinder head. (5) Loosen the distributor set screw. (6) Lift the distributor together with the cable tube and cable tube brackets off the cylinder head out of the way. (7) Remove the cylinder head and then the gasket, being very careful of the gasket.

The method of replacement of the gasket and head is as important as the method of removing them. Put the gasket in position on the studs and press it down on the cylinder face.

The cylinder head nuts should be tightened gradually and in such a manner as to insure their pressure being equally distributed throughout the entire head. After partially tightening down the nuts, those in the center of the cylinder head should be finally drawn up, working both ways towards the ends.

This is important and will insure freedom from strains in the cylinder head casting.



General Specifications

TYPE—Eight cylinders integral with crankcase, four cycle, detachable "L" head.

Model	Bore	Stroke	Piston Displacement	N. A. C. C. H. P. Rating	H. P. Developed
"GT"	2-3/4"	4-3/4"	225.7 Cu. In.	24.2	62 @ 3200
"GS"	2-7/8"	4-3/4"	246.7 Cu. In.	26.45	69-1/2 @ 3000

FIRING ORDER—1, 6, 2, 5, 8, 3, 7, 4.

BELL HOUSING FLANGE—SAE No. 5.

COOLING—Centrifugal water pump.

IGNITION—Battery—Mounting adapted for any standard make of ignition distributor.

GENERATOR MOUNTING—Hinged bracket, belt driven.

STARTING MOTOR MOUNTING—SAE standard No. 1 flange outboard type with reduction gear in starter.

FLYWHEEL—Furnished to suit any standard make of clutch.

INTAKE—For 1-1/4" Vertical carburetor.

SUSPENSION—Four point.

Detail and Dimensional Specifications

CAMSHAFT—Six bearing, .15-.25 carbon steel, cams integral.

CAMSHAFT DIAMETER—1-1/8".

CAMSHAFT BEARINGS—

	Diameter	Length
Front	2.037"	1-7/32"
1st Inter.	2.007"	3/4"
2nd Inter.	1.991"	3/4"
3rd Inter.	1.975"	3/4"
4th Inter.	1.959"	3/4"
Rear	1.944"	1-1/16"

CONNECTING ROD—"I"—Beam section .30-.40 Carbon Steel. Length (center to center) 9-1/2".

CONNECTING ROD BEARINGS—Diameter and length 2-1/8 x 1-1/4".

CONNECTING ROD BOLTS—Nickel steel 7/16" —two per rod.

CRANKSHAFT—Five bearing type, .40-.50 Carbon Steel.

	Diameter	Length
Front bearing	2-3/8"	1-7/8"
1st Inter. bearing	2-3/8"	1-5/8"
Center bearing	2-3/8"	1-5/8"
2nd Inter. bearing	2-3/8"	1-5/8"
Rear bearing	2-3/8"	1-7/8"

PISTON RINGS—Four per piston.

PISTON PIN—Diameter 7/8".

VALVES—Effective working diam. (port diameter) Intake 1-3/8"; Exhaust 1-1/4".

VALVE LIFT—11/32".