

the oil which satisfactorily meets the temperature conditions will be properly distributed, it is therefore necessary to analyze thoroughly all the characteristics of the lubricating system.

The lubricant which is correct for both operating temperatures and the lubricating system must be of such character as to minimize carbon formation and at the same time seal the piston rings against the highly compressed gases on the compression and power strokes.

### ***LUBRICATION RECOMMENDATIONS***

After a detailed analysis along the lines indicated, backed by extensive test work and careful study, our engineers recommend a high quality oil of the body and character of Gargoyle Mobiloil "A" for summer.

For winter (32°F. or below), to facilitate engine starting and quick oil distribution we recommend an oil of the body and character of Gargoyle Mobiloil Arctic. At these temperatures an oil of greater fluidity is essential to insure safe and prompt distribution.

These oils are of the correct body and character to properly meet all conditions of operation when used according to the following instructions. They are adapted to be perfectly distributed in the lubricating system of this engine. They will adequately seal the pistons under all conditions of operation and will not tend to form objectionable carbon deposits. When kept in the proper condition by a replenishment of the oil supply and drainage of the crankcase at the intervals described elsewhere in this book, they should give perfect satisfaction and should eliminate the possibility of engine troubles due to incorrect lubrication.

### ***DETAILED ENGINE LUBRICATION INSTRUCTIONS***

**OIL SUPPLY:** The oil filler tube is located on the right side of the crankcase, figure 2 and figure 5.



The bayonet oil gauge, (Fig. 2), for determining the oil level is also located on the right side of the crankcase and below the oil filler tube. This gauge has two markings to indicate the high and low level of the oil. It requires about 8 quarts of oil to fill the oil reservoir to the level of the high mark on the gauge. The level should be maintained at the high or full mark by the addition of small quantities of oil daily as necessary, and not allowed

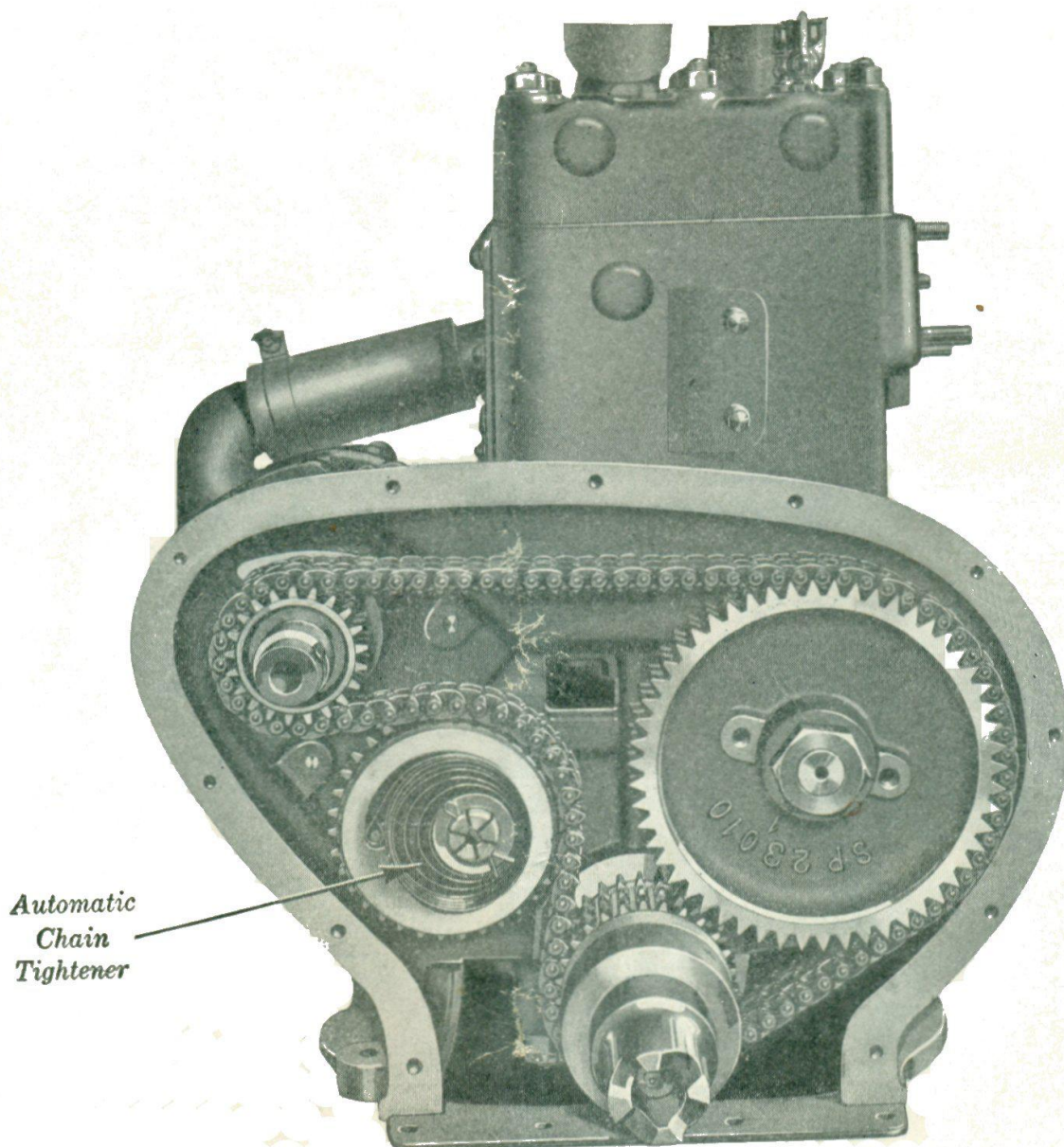


Figure 3—Two types of chain tightening devices are employed in Lycoming Engine. Figure 3 shows the automatic tightening device which needs no attention. For instructions on the manual type, see Fig. 3-A.



to drop as the drainage period approaches. This practice simply means that the road dust and other abrasives which ordinarily accumulate are distributed through a smaller body of oil in more concentrated form—and that the oil is more frequently subjected to the heat of the cylinder walls. Any saving which may be made by this practice is more than off-set by unnecessary engine wear.

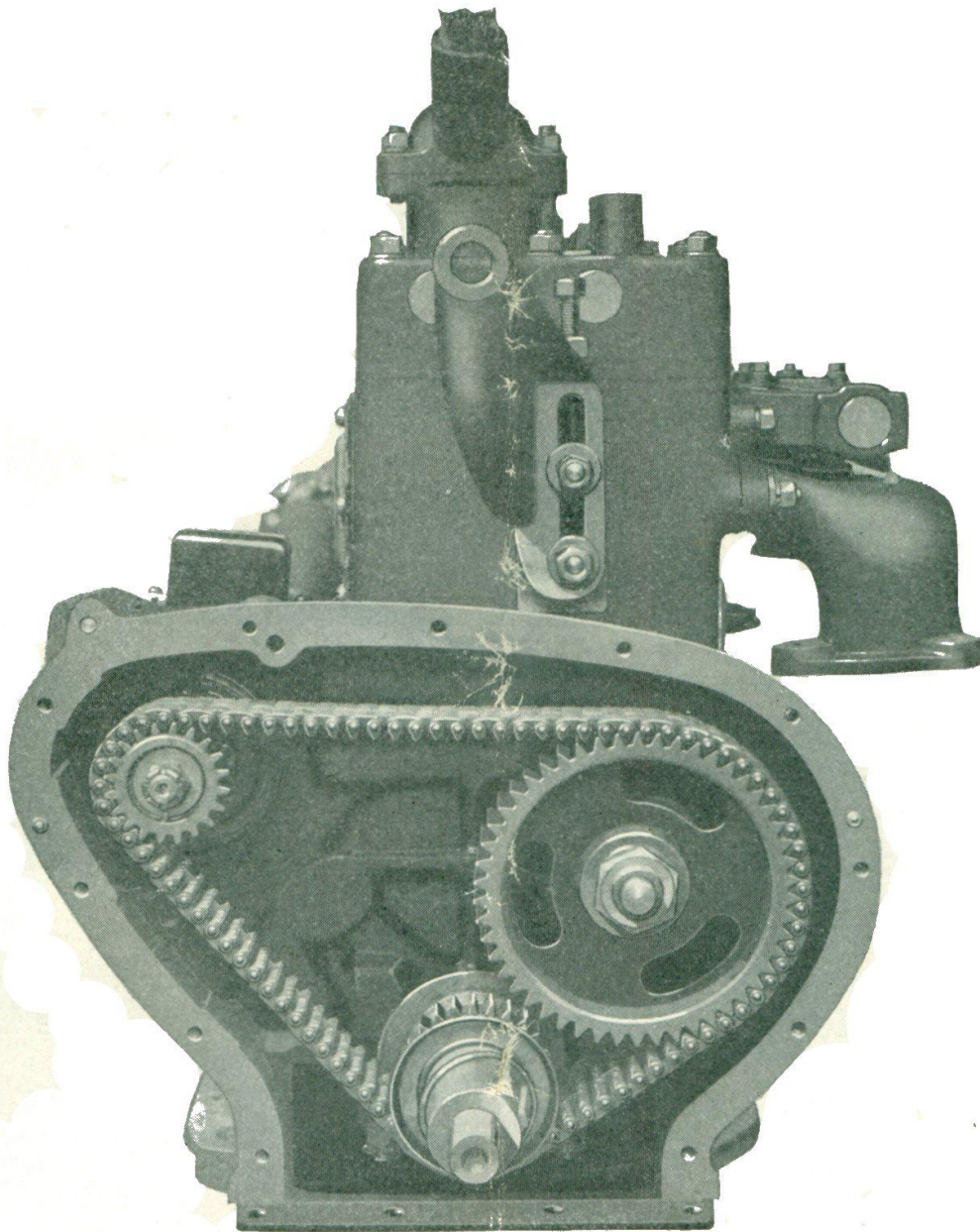


Figure 3-A—Manual type of chain adjustment.

**CAUTION:** *Be careful not to overfill.* Too much oil is not conducive to best engine performance. It causes smoking and promotes carbon formation.

*Keep filler cap on the filler tube.* This will keep out dirt and grit. If lost, replace it immediately with a new one.

### WATER PUMP GREASE CUP

Note the grease cup on the water pump shaft figure 2. Keep this cup filled with a high grade cup grease, such as Mobilubricant, and turn down about one-half turn every three hundred miles.

### OIL PRESSURE

The oil pressure is controlled by a spring actuated by-pass, or pressure regulating valve located on the valve side of the engine at the front end of the crankcase. The design and arrangement of this by-pass is shown in figure 6.

Primarily, the device is simply an oil pressure regulator. In the illustration, figure 6, at "A", can be seen the spring, the ball and the ball seat. The oil pump is designed to deliver more oil than can pass through the bearings when normal clearances are maintained, and the surplus will raise the ball from its seat when oil pressure exceeds spring pressure, and flow back into the crankcase, returning to the oil reservoir. The pressure of the spring on the ball, therefore, will determine the oil pressure in the line.

In Lycoming engines the pressure exerted by the spring is variable and is controlled by the position of the throttle.

In figure 6 at "B" is shown, above the spring, a cam attached to a shaft, which in turn is connected with the



throttle rod. The position of the throttle determines the position of the cam and hence the amount of spring pressure on the ball.

When the throttle is open the spring pressure is increased and when the throttle is closed the spring pressure is reduced. By means of this arrangement oil pressure is always in accord with engine load rather than engine speed which condition is very essential from a lubrication efficiency standpoint.

The oil pressure is set at the factory to read about 5 pounds when the motor is idling and with the oil in good condition. With hot or diluted oil the pressure may drop to 2 pounds, but it should never go below 2 pounds at 4 miles an hour.

The maximum oil pressure, with throttle wide open, will be approximately 40 pounds.

### *Timing Chain Adjustment*

The Manual type of chain adjustment is shown in figure 3-A.

To adjust the chain, loosen the three nuts on the generator flange studs and move the top of the generator away from the motor. Adjustment will ordinarily be necessary after about 1,000 miles. After that, adjustment will be required only when the chain becomes noisy. The proper tension can be determined by adjusting until a slight humming noise develops and then slacking up until the noise disappears. After securing the proper adjustment tighten the three nuts. A total deflection of  $\frac{1}{8}$ " to  $\frac{1}{4}$ " of the chain will result from this adjustment.

When the manual chain adjustment is used, the generator drive sprocket is mounted directly on the generator armature shaft. A hand hole with a cover plate is provided on the chain case directly in front of the generator sprocket making it possible to remove the generator with-



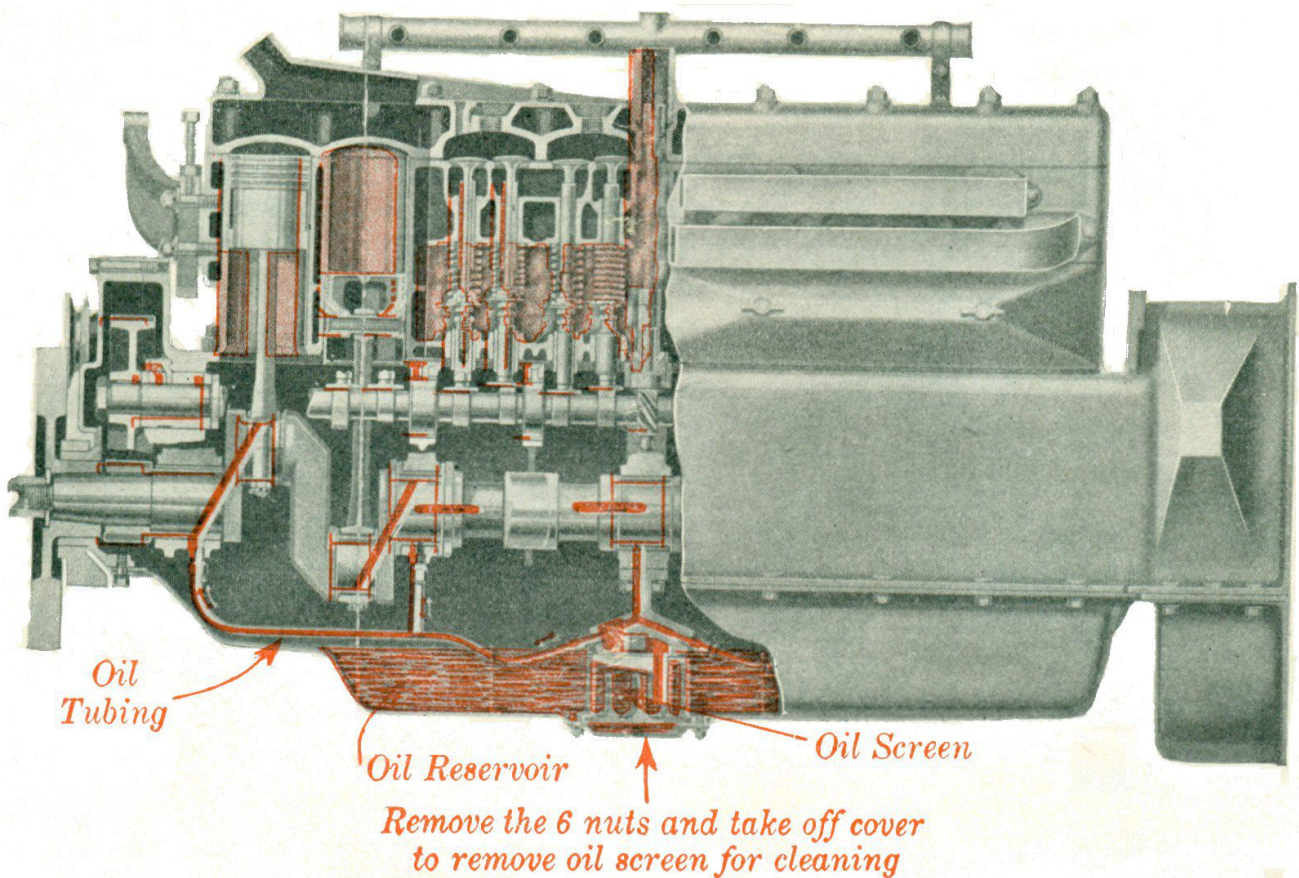


Figure 4—Longitudinal sectional view of engine showing oiling system, valve mechanism and general construction.

out removing the front chain case. Be careful that the chain is always held in mesh with the camshaft and crankshaft sprockets so that the timing is not disturbed.

### THE OIL PRESSURE GAUGE

The oil pressure gauge on the dash should always indicate some pressure when the engine is running. If it does not, an investigation should be made immediately to determine the cause. If the engine is operating without any pressure, serious damage may result.



When the engine is first started, the oil pressure will be higher than after it has warmed up. This is because the oil is heavier in body while it is cold and does not flow so freely through the various passages. When warm, however, even though the pressure may be lower, the oil will flow faster through these passages and through the bearings, so that more oil is actually supplied to the cylinder walls and other engine parts. Also, after the bearing clearances increase, the oil will flow through them more easily, thus causing a slightly lower pressure for any stated throttle position.

When this is the case it is a mistake to increase the pressure in the system by readjusting the pressure regulating valve. Since more oil is already flowing through the system than with tight bearings at higher oil pressure, any increase in pressure will lead to over-oiling.

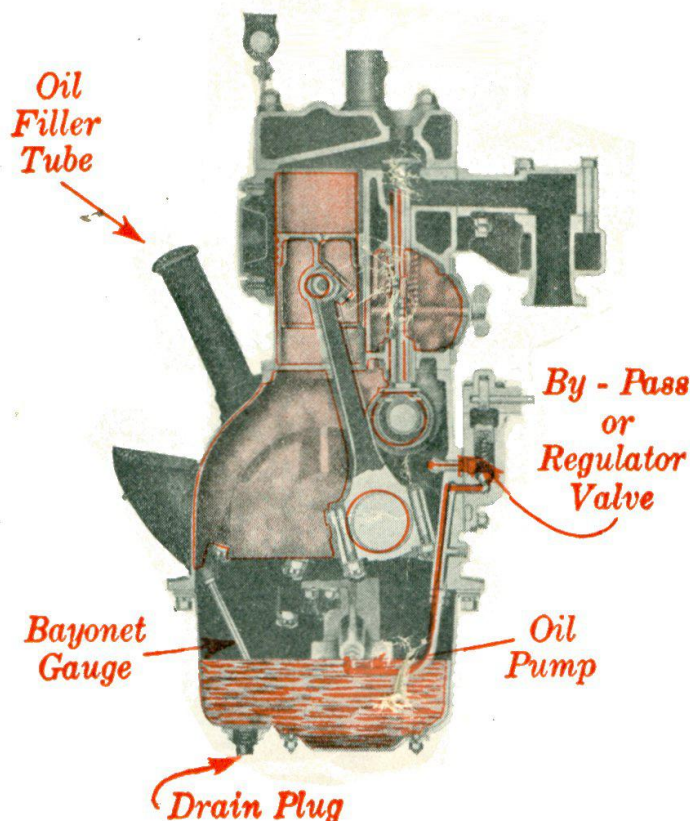


Figure 5—Cross sectional view of engine.

The adjustment of the pressure regulating valve is therefore seldom necessary, but if a change is ever needed, it should be made in the following manner and preferably by a competent service man.

### *Adjustment of Pressure*

Adjustment of pressure is secured by changing the position of the regulator camshaft with reference to the lever which connects to the throttle. To adjust the pressure loosen the lever which is clamped to the regulator camshaft, turn the camshaft, with a screw driver to the right to increase the oil pressure and to the left to reduce the oil pressure.

Re-clamp the lever on the regulator camshaft. Clamp is shown at C figure 6.

There are several conditions which may cause a reduction in the pressure registered on the gauge. They should always be carefully checked before any change is made in the adjustment of the pressure by-pass or regulator valve. Some of them are as follows:

1. Use of an oil too light in body. Follow the recommendations in this book.
2. Oil excessively thinned out by unvaporized and unburned fuel. Follow instructions for draining and refilling the crankcase.
3. Loose bearings. The looseness may be due to wear, end play or improper adjustment and should be investigated.
4. A leaky or broken oil tube or pump. Tighten connections or make necessary replacement.
5. Clogged oil screens. Follow instruction for cleaning.
6. Broken or defective oil gauge. Have new one installed.

### *DRAINING CRANKCASE OIL*

To reduce wear and maintain the efficiency of the engine, the lubricant must be kept in serviceable condition.