CHAPTER IV

Engine Lubrication System

Filling the System—Oil Pump—Crankshaft—Connecting Rods—Relief Valves—Valve Rockers, Push Rods and Tappets—Camshaft—By-pass Oil Filter—Oil Sump—Oil Level Indicator—Oil Pressure.

The engine lubrication system is diagrammatically illustrated in Fig. 6.

Recommended oils will be found on page 27.

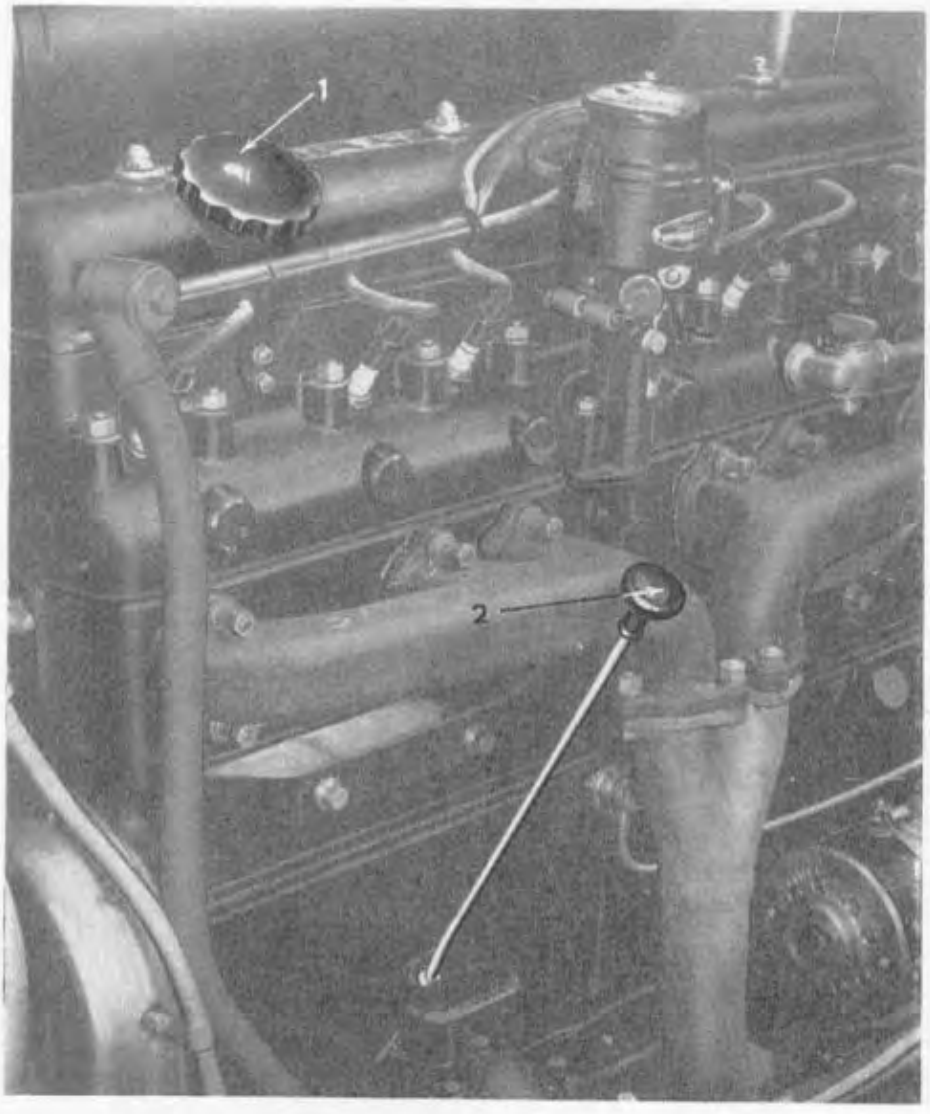

Fig. 7.—FILLER CAP AND DIPSTICK.
1. Engine oil filler cap. 2. Dipstick.

cardiagn.com

Filling the System.

The system is filled, or topped up, by removing the oil filler cap (**1**, Fig. **7**), located on the inlet rocker cover, and pouring in the required amount of recommended oil.

It should be appreciated that it takes a little time for the oil to drain through to the sump, especially if the oil is cold.

The level of the oil should be frequently checked with the dipstick **when the engine is not running** (**2**, Fig. **7**), and the system regularly topped up as required (see page 29), so as to keep the level of the oil up to the "Max" mark.

Oil Pump.

A gear type pump is mounted in the lower half of the crankcase, and is driven by means of a vertically-mounted shaft and skew gears from the centre of the camshaft, a coupled extension of which drives the ignition distributor.

The oil intake from the sump is of the floating gauze filter type, ensuring the collection of clean oil, free from sludge, water or grit.

Oil is drawn by the pump through the floating intake and is delivered direct to the oil gallery, which is incorporated in the crankcase casting.

Crankshaft.

From the internal oil gallery, oil is fed through oil ways drilled in the crankcase webs to each of the seven main crankshaft bearings, which are of the copper-lead-indium lined, steel shell type.

The crankshaft journals and crankpins are bored for lightness and to act as oil conduits, the ends of the holes being plugged with caps.

All the main bearings have circumferential oil grooves, and radial holes are drilled in the crank journals to register with these grooves.

Oil from the main bearings passes to the bore of each journal through the radial transfer holes, and thence to the crankpins through diagonal ducts drilled in the crankshaft webs. Oil from each crankpin bore issues through radial holes in the crankpins to lubricate the big end bearings.

Connecting Rods.

The big end bearings are of similar type and material to that of the main bearings.

Each connecting rod is drilled to convey oil to the gudgeon pin bearing, the drilling passing through the big end bearing shell.

Two radial holes in the crankpin ensures communication, twice per revolution, with the oil way up the connecting rod. Thus, all the crankshaft bearings, and all the connecting rod bearings, are supplied with oil under pressure.

cardiagn.com

Relief Valves.

A drilling through the casting conveys oil to a double relief valve located in an accessible position on the right-hand side of the crankcase. (See Fig. **8**.)

The two valves are in series, and their combined effect is to regulate the pressure of the main high-pressure supply to the crankshaft and connecting rod bearings to approximately 25 lbs. per square inch.

Oil passing the high-pressure valve (**3**, Fig. **8**) enters the low-pressure chamber, and from there via pipe (**4**) to the inlet valve rocker shaft.

In order to ensure a supply of oil to the low-pressure system under all conditions of running, small slots are cut in the seating of the high-pressure valve (**3**).

If it should be suspected that the relief valves are not working properly, they can be inspected by removing the plugs (**3**), above the high-pressure valve, and (**2**), above the low-pressure valve (Fig. **8**).

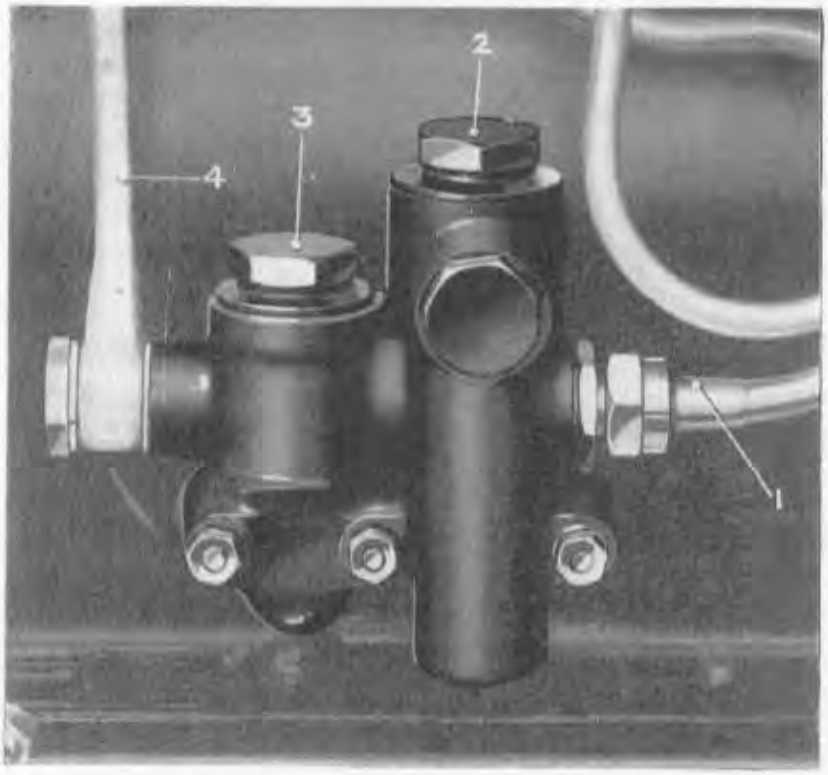

Fig. 8.—OIL RELIEF VALVES.

1. Return from by-pass filter.
2. Low-pressure valve.
3. High-pressure valve.
4. Outlet to rockers.

In each case the valve spring will be found retained on the plug. The valves can then be lifted out and the valves and seats cleaned and inspected.

No attempt must be made to alter the spring settings by interfering with the springs themselves, or by varying the washers under the plugs.

Care must be taken to replace all parts in a perfectly clean state.

Valve Rockers, Push Rods and Tappets.

The centre pedestal of the inlet valve rocker shaft is drilled and communicates through an oil hole in the head with a union on the right-hand side, to which pipe (**4**, Fig. **8**) is connected.

The rocker shaft is drilled radially where each rocker works to lubricate the bearings of the latter. The rocker arms are also drilled, the holes running through the bearing bushes. By this means oil is fed on to the push-rod ball ends and the ends of the valve stems.

Each valve guide is provided with a packing gland, held in position by the valve spring, which prevents excess oil from percolating down the valve guides. Oil is returned from the rocker casing to the crankcase through the push-rod tunnels.

Camshaft.

The camshaft is driven by single helical gears and carried in four plain bearings, the latter being lubricated with high-pressure oil through drillings in the crankcase webs.

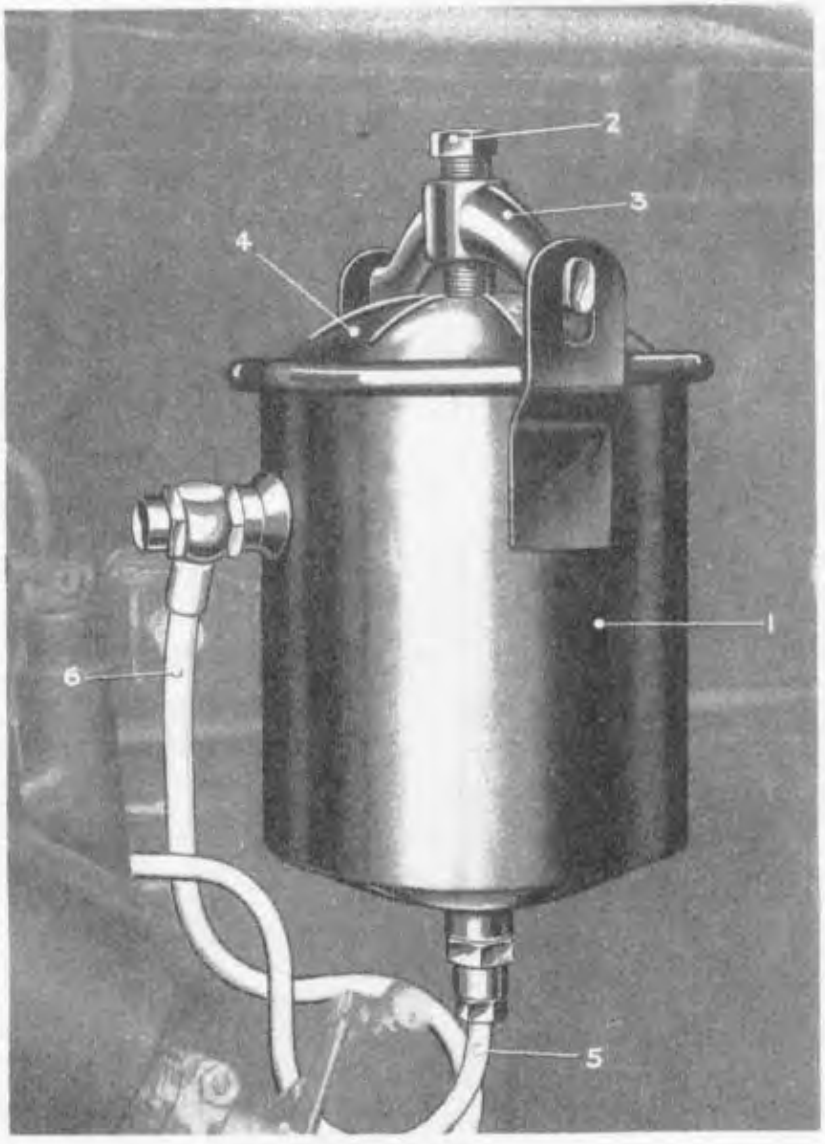

Fig. 9.—BY-PASS FILTER.

1. Filter.
2. Cover screw.
3. Yoke.
4. Cover.
5. Supply to filter.
6. Return from filter.

By-Pass Filter.

A special filter is provided on the right-hand side of the crankcase, as shown at (1, Fig. 9), which is fed with oil under maximum pressure from a bleed hole in the high-pressure oil gallery, via pipe (5). The filter element restricts the flow of the by-passed oil, and so ensures that the by-passing effect of the filter shall not appreciably rob the main pressure system.

A proportion of high-pressure oil being thus continuously forced through the filter, it follows that the whole of the crankcase oil passes through the filter in a short time.

Oil from the filter is conveyed back to the crankcase via pipe (**6**), which is connected to the low-pressure chamber of the relief valve.

Every 10,000 miles, as directed on page 31, the filter element should be discarded and replaced with a new one. It is not practicable to clean the filter element, and no attempt must be made to do so.

To remove the element, the screw (**2**) should be released, and the yoke (**3**) removed. The cover (**4**) can then be taken off and the element removed.

When fitting the new element, care must be taken to ensure that the cork washer, under the cover (**4**), is in position, and that the screw (**2**) is well tightened. On next running the engine, it should be inspected for oil leaks around the filter cover.

Oil Sump.

Under normal circumstances, and with proper attention, the by-pass filter will maintain the oil in a clean condition.

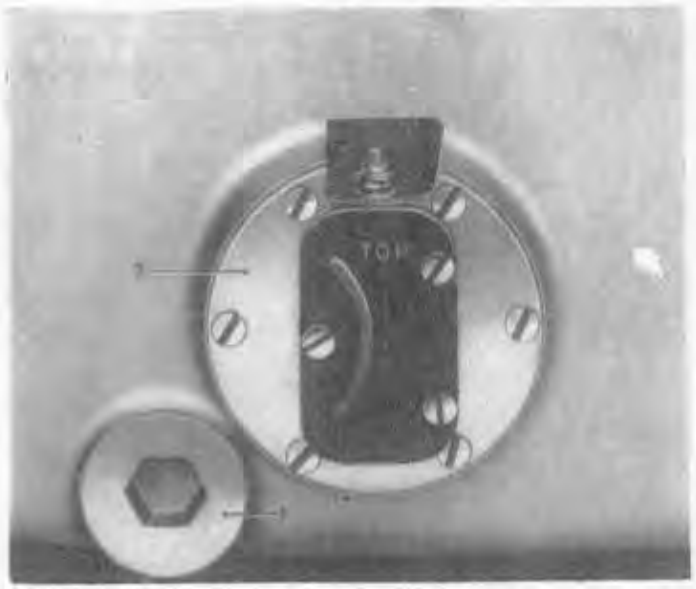

Fig. 10.—CRANKCASE DRAIN PLUG.
1. Drain plug. 2. Oil level indicator float unit.

Owing to the risk of dilution of the oil, however, it is advisable to drain the sump and renew the oil every 10,000 miles, as directed on page 31.

To drain the oil, a plug (**1**, Fig. **10**) is provided, which should be unscrewed and the oil allowed to drain out. On replacing the plug, care must be taken that the joint washer is also refitted in position.

Oil Level Indicator.

In order that a quick check may be obtained, the petrol gauge on the instrument panel has been so arranged that by depressing the switch (see Fig. **1**), it will register the approximate quantity of oil in the engine sump.

The gauge is electrically connected to a float unit fitted into the right-hand side of the crankcase sump (**2**, Fig. **10**.)

The reading should be taken when the car is standing as nearly level as possible.

The amount of oil should be maintained at **"Full"**, this corresponding with the **"Max"** mark on the dipstick, and showing that there is approximately 16 pints of oil present. A red line on the gauge indicates "minimum", and the engine should never be run with the oil level below this mark.

Oil Pressure.

Under normal conditions of engine temperature and speed, the instrument board pressure gauge should read approximately 25 lbs.

On starting the engine from cold, however, a higher oil pressure will be indicated, but this need not cause alarm, as the pressure will fall when the engine becomes warmed up.

When the engine is idling and hot, the pressure may fall to 4 lbs., but provided that it increases as the engine speed increases, this is in order.

The car must on no account be run if the gauge reads as low as this *continuously*.

Such a persistently low pressure, which may be accompanied by fluctuations of the gauge needle, may be due to one or more causes.

In the first place, it should be ascertained that there is sufficient oil in the sump by referring to the oil level indicator.

If this is found to be in order, the trouble may be due to a particle of foreign matter having lodged on one of the relief valve seatings and preventing the valve from closing. If the latter is suspected, the relief valve should be inspected and cleaned as directed on page 39.