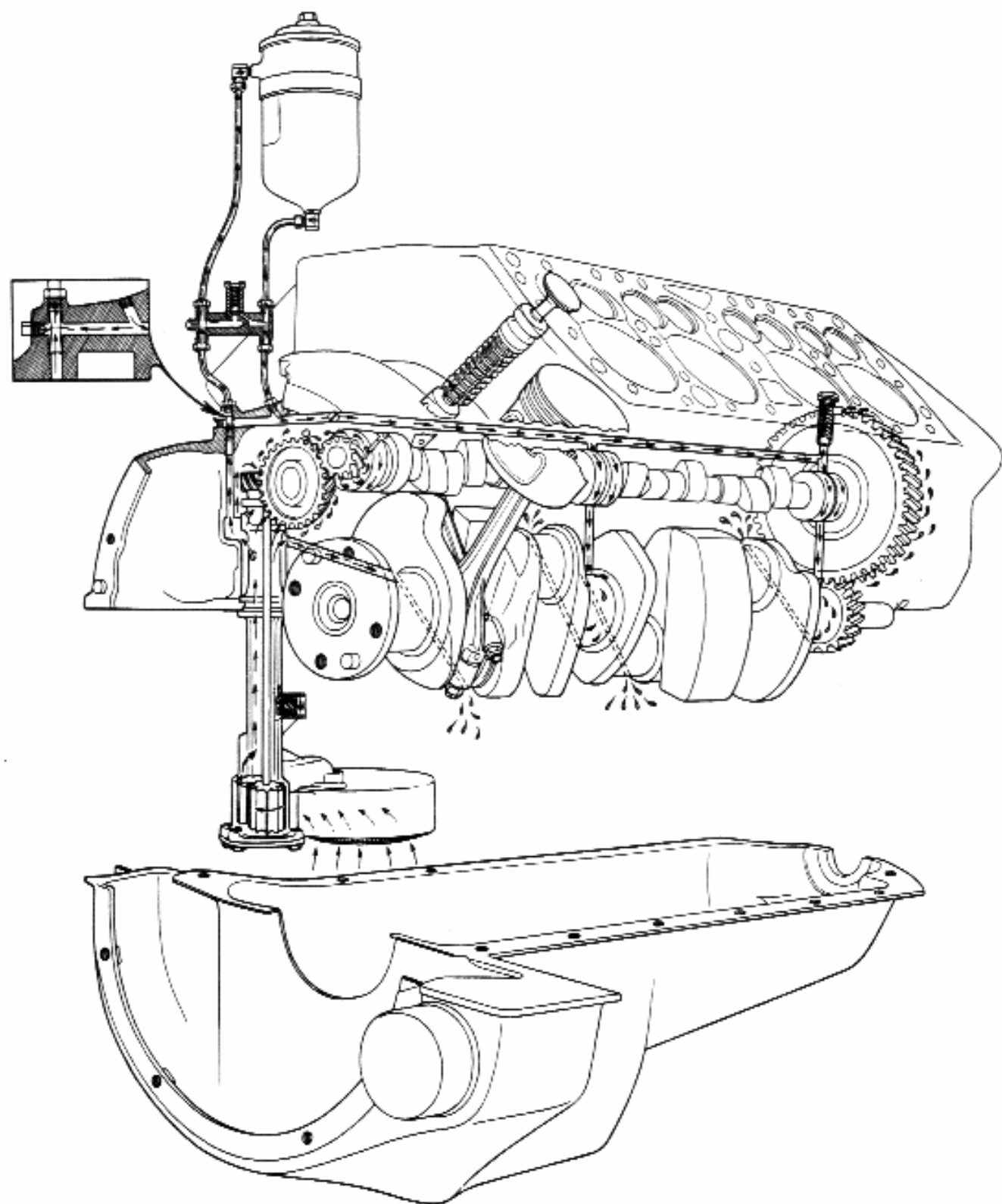




Engine Lubricating System

Fig. 1

ENGINE LUBRICATION

A gear type oil pump shown in Fig. 1 draws oil through a strainer located in the lowest portion of the engine oil pan.

The oil is then forced around the outside of the oil pump gears, up through the inside of the pump housing to a large vertical well machined in the rear left corner of the engine. The oil flow then divides and flows to the rear main crankshaft bearing through a diagonally drilled passage and into a vertical passage which is connected to the oil filter by pipe. It returns to the engine after passing through the oil filter and enters a horizontal passage which connects with the previous mentioned vertical passage, but which is separated from it by a bushing which is pressed into the hole as shown in the enlarged section indicated by the arrow in Fig. 1.

The horizontal passage carries the oil over the top of the camshaft and joins a pipe directly over the camshaft and parallel to it.

Oil is forced from the pipe through holes drilled to the camshaft bearings. It then passes around an undercut between the two bearing surfaces of the front and centre camshaft bearings and continues down through the webbing of the engine block to the front and centre crankshaft main bearings.

Crankshaft connecting rod throw No. 4 is lubricated from a passage drilled diagonally through the crankshaft from the rear main crankshaft bearing. Nos. 2 and 3 crankshaft connecting rod throws are lubricated similarly from the centre main crankshaft bearing.

No. 1 crankshaft connecting-rod throw is lubricated from a similar passage from the front main crankshaft bearing.

The pistons, cylinder walls, piston pins and

valve assemblies are lubricated from the "throw-off" of oil from the crankshaft.

Pressure in the engine lubricating system is limited to 40 lbs. by a pressure relief valve in the front of the valve chamber.

The oil pressure relief valve plunger has one side of the radius on the valve flattened. This passes sufficient oil to lubricate the timing gears when the valve is closed.

The upper oil pump drive gears, camshaft gear, rear camshaft bearing and fuel pump push rod eccentric are lubricated from oil forced past the pump housing lands into the pump gear housing. Excess oil is returned to the oil pan by a hole drilled through the pump gear housing inner wall.

Before considering the details in connection with lubrication of a vehicle, it is essential to understand some of the conditions which are encountered. Most moving parts are manufactured to a high degree of precision and are fitted to very close limits. Lubricants for such parts must be capable of penetrating quickly between the closely-fitted surfaces and must retain their lubricating qualities under high or below zero temperatures. Different characteristics are required in lubricants for different parts of the vehicle due to the varying degree of pressure, heat, friction and in some locations, the presence of water.

The importance of adhering closely to the specified lubricants cannot be over-emphasized. To appreciate fully the importance of using the correct lubricant, a motor vehicle must be considered as a group of entirely different mechanical units, many of which perform a different function and for this reason they should be lubricated with a lubricant specially designed to combat heat, friction or pressure encountered in that particular unit.

Specifications of Service Lubricants, as supplied by the Department of Munitions and Supply (Canada), are given in the table on page C-20.

Engine Lubrication

It is essential to keep the quantity of oil in the system within the "safe driving range" marked on the oil level depth gauge, Fig. 2. It is not necessary to add oil until the level drops to "danger" point.

Access to depth gauge is provided through the inspection plate on the left side of the engine enclosure inside the cab. Readings should be taken frequently and oil of the correct viscosity added as necessary.

To take a reading, the engine should be stopped long enough to permit all oil to drain back into oil pan. Remove oil level indicator, wipe oil from it with a clean cloth, then reinsert to its full depth, withdraw and take reading.



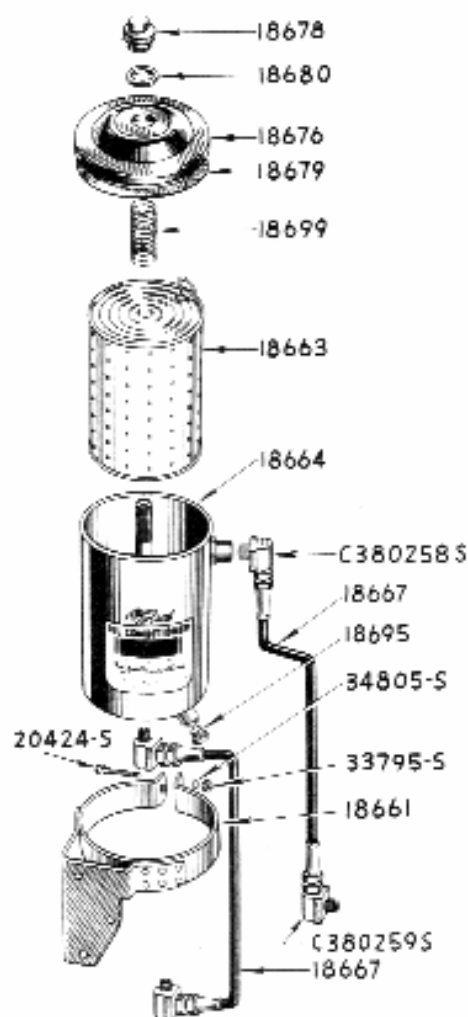
Oil Level Indicator

Fig. 2

Oil Filter

The engine oil is forced through a filtering device to remove impurities. In this manner the oil is cleaned before reaching bearings, etc., within the engine, Fig. 3.

The filter is attached to the left side of the engine and contains a removable filtering cartridge which must be changed periodically.



Oil Filter

Fig. 3

The period of useful service performed by the filter is controlled by the following, and good judgment must be used to determine when the filter cartridge should be changed.

- (a) Climatic conditions.
- (b) Load.
- (c) Engine temperature.
- (d) Mechanical condition of engine.
- (e) Percentage of dust in air.
- (f) Frequency of operating periods.

(g) Viscosity of oil; type of oil.

The body assembly is drained by removing a plug in the bottom. This operation should be performed frequently, otherwise the moisture accumulation may freeze when temperatures are low.

The filter ceases to be of service once the filtering cartridge becomes impregnated with impurities; however, the periods at which the cartridge requires changing may be prolonged by frequently draining the body assembly.

If the engine oil becomes contaminated, it should be changed immediately regardless of the mileage or length of time it has been in service.

To drain the oil, place a container of not less than five-quart capacity beneath the engine oil pan drain plug. If oil is cold start engine and operate until warm. Remove oil pan drain plug. If sludge is observed in the oil or around the engine oil pan drain plug opening the entire engine oiling system should be flushed with a suitable flushing oil.

In certain cases it may be necessary to remove the engine oil pan and valve chamber cover in order to clean the sludge accumulation from the engine.

The formation of sludge should be taken as a danger sign. If the condition is not serious it is sometimes possible to clean the lubricating system without dismantling the engine. This is accomplished by frequently changing the filtering cartridges. Naturally the cartridges will become dirty very quickly during the cleaning period, and it will be necessary to change them frequently. Engine oil pressure should be closely observed and if erratic operation is observed, stop the engine immediately and determine the cause. Abnormal operation of the oil pressure is usually caused by large pieces of sludge which have become

dislodged and caused stoppage in the oil channels while circulating through the lubricating system.

The engine oil filter is serviced as follows:

1. Remove drain plug, hold container under filter body to catch oil.
2. Remove the $\frac{5}{8}$ " oil filter cover retainer nut (18678) and small gasket (18680).
3. NOTE—Cover is under spring tension. Hold it down while removing cover retainer nut.
4. Remove cover carefully.
5. Remove oil filter cartridge support spring (18699).
6. Lift oil filter cartridge from body assembly, Fig. 4. Place in container.
7. Clean inside of body assembly (18644). Replace drain plug.
8. Examine stand tube for openings in pipe seam. Clean outlet holes in pipe.
9. Examine all fittings and pipes for loose connections.
10. Renew filter cartridge (18663) (18679) and install new gaskets. Tighten cover retainer nut.
11. Start engine. Observe oil pressure and examine filtering assembly for leaks.

Relief Valve

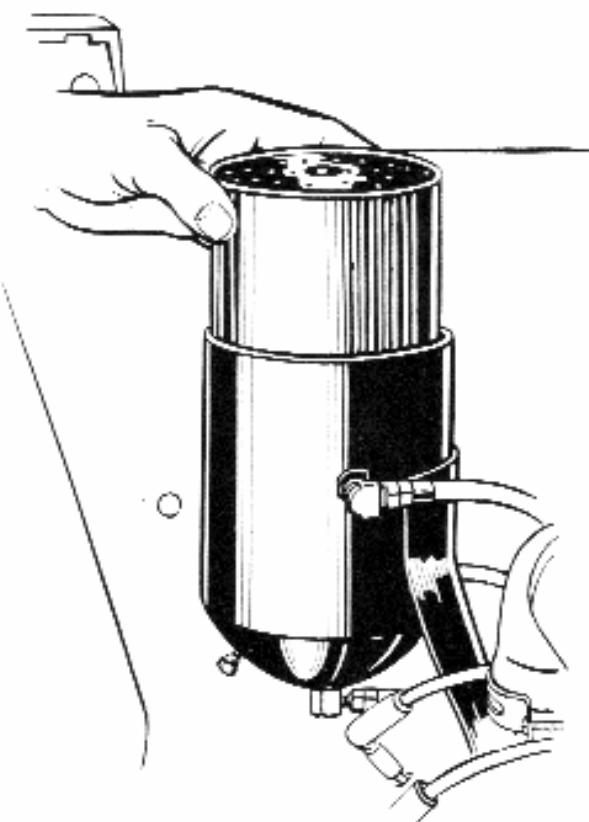
The oil pressure relief valve is attached to the rear of the engine as shown in Fig. 1. Its purpose is to provide a path for oil within the valve should oil lines or filter become clogged. Normally oil passes through the valve to the filtering element and returns to the engine where it supplies bearings, etc. However, if the lines or filter become plugged the oil pressure will build up on the

pump side of the external line and will diminish on the other side of the stoppage. When difference in pressures exceed 10 lbs. the ball check is forced from its seat and allows oil to pass across between passages in the valve to supply the engine. If it were not for this valve any stoppage in the oil passages to or from the filtering element would prevent all oil reaching the engine.

The valve should not be disassembled in any way as it will be necessary to reset the spring adjustment.

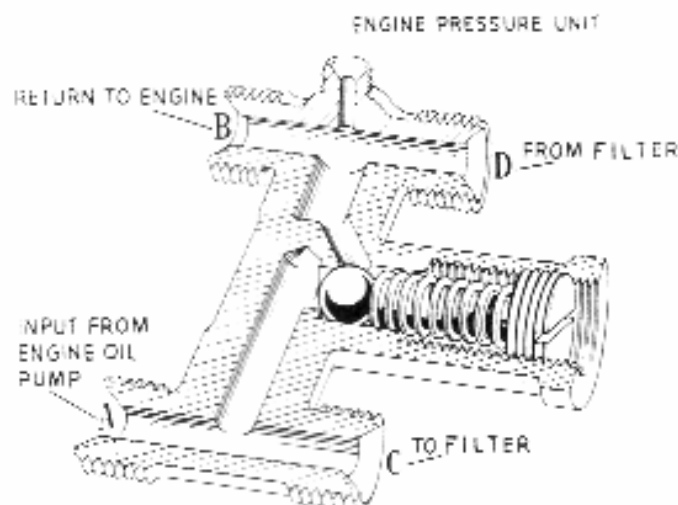
However, should this ever become necessary the adjustment may be made as follows:

1. Remove valve from the engine.
2. Remove the adjustment cap and adjustment screw.



Removing Filtering Cartridge

Fig. 4



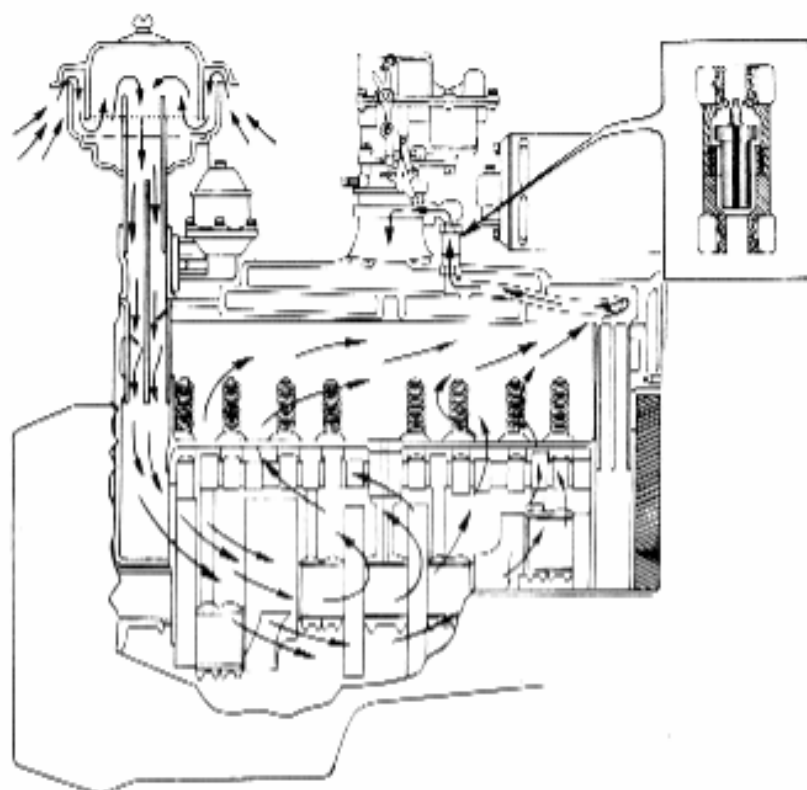
Oil Pressure Relief Valve

Fig. 5

3. Remove spring and ball check.
4. Clean all passages thoroughly.
5. Reassemble and install a pressure gauge at C, Fig. 5.
6. Attach air pressure line at A. Adjust air pressure by means of a pressure reducing valve to 10 lbs.
7. Adjust regulating screw until the valve just starts to open, then stake the adjusting screw to prevent movement.
8. Install cap and replace unit on engine.

Crankcase Ventilation

The crankcase breather pipe at the rear of the intake manifold is provided with an oil bath type of cap to keep out dust and dirt. Clean air is drawn into the breather tube and enters the crankcase at the rear. It is then directed forward and upward through the openings in the valve chamber from where it is drawn through a pipe and a metering valve into the intake manifold by the engine vacuum. The volume of air circulated through



Crankcase Ventilation

Fig. 6

the crankcase is pre-determined by the installation of a metering valve (Hydro-Vent) in the line between the intake manifold and the valve chamber, Fig. 6. At low engine speeds the high vacuum in the intake manifold lifts the weight in the valve, thus restricting the outlet orifice and the amount of air circulated. At higher speeds the vacuum decreases allowing the weight to drop, uncovering the orifice to allow more air to circulate.

Heavy-Duty Oil

Engine oils now being used are of the heavy-duty type. This change from straight mineral oil was effected on January 18, 1943, with vehicle serial number 110601.

For the benefit of the user all vehicles equipped with this oil carry a red tag on the oil filler cap and a red sticker on the windshield. Only heavy-duty engine oil should be used for topping up when required.

If vehicle has been operated with straight mineral oil and a heavy-duty oil is to be used, it is essential that an approved method of changeover procedure be used.

Heavy-duty oils loosen sludge deposits from the engine and these will be carried by the oil stream throughout the oil passages and may block these passages with resulting damage to the engine.

The following procedure will prevent the possibility of above occurring:

If vehicle has had considerable service and is believed to be heavily sludged, it is desirable to remove the oil pan and valve chamber cover and thoroughly clean the interior of the engine. Oil filter cartridge should be replaced and future oil changes based on the condition of the oil.

Where it is found that it is not necessary to remove the oil pan the following procedure may be applied:

1. Drain crankcase when engine and oil are thoroughly heated. The best time is immediately after vehicle has been in operation, otherwise the engine should be operated at a fast idle for 15 to 30 minutes until the engine and oil are thoroughly heated, blanketing the radiator if necessary in cold weather.

2. The filter should be thoroughly cleaned and cartridge changed. In no case should an oil filter which has become dirty from previous use with other oils be left uncleaned or unchanged at the time heavy-duty oils are placed in engine.

3. Fill crankcase to normal level with heavy-duty engine oil and run engine at fast idle for 30 minutes. Watch oil pressure gauge carefully for abnormal fluctuations.

4. Drain and refill crankcase with heavy-duty engine oil and repeat fast idle for 30 minutes.

5. Drain crankcase and refill with heavy-duty engine oil. Examine oil and, if conditions warrant, change filter cartridge.

6. Upon completion of two 30-minute run-in periods attach tag to oil filler cap indicating vehicle has been changed over to heavy-duty type oil.

7. Place vehicle in normal service for 250 miles. Watch oil pressure indicator for abnormal fluctuation.

8. At the end of 250 miles, drain oil and fill with heavy-duty type engine oil.

9. Place vehicle in normal service and base further oil changes on the condition of the oil.

NOTE Oil filter cartridge should be changed at the time oil is being changed if the condition of the oil indicates heavy sludging and a dirty oil filter cartridge.

Heavy-duty oil darkens quickly with very little service, therefore it is not a true indication of the condition of the oil. Check condition of the oil by placing a drop from the oil level indicator on a white blotter. The amount of foreign material will clearly indicate whether or not a filter change is necessary.

Dust

Driving over dusty roads, through dust storms, or cross country introduces abrasive material into the engine. Air cleaners decrease the amount of dust that may enter the crankcase. However, if the oil becomes contaminated it should be drained promptly to prevent harmful engine wear. The frequency of draining depends upon the severity of the dust conditions and no definite period can be recommended. The engine consumes approximately 1,400 cubic feet of air for each gallon of gasoline. It is obvious, particularly when an engine is operated under very dusty conditions, that the job of filtering the air entering the engine is a very important one, and servicing of the air cleaning devices must be performed at frequent intervals to prevent harmful wear to the engine.

Temperature Range

During the colder months of the year, an oil that will permit easy starting, at the lowest temperature which is likely to be encountered, should be used.