

Fig. 2. Fuel system

The fuel oil which flows through the amplifier valve is led to the inside of the servo piston, and acts to assist the servo piston spring in opposing the 'opening pressure' and brings the servo piston to a state of balance, depending on the difference between the 'opening pressure' and 'closing pressure.'

The 'closing pressure' is controlled by the low pressure relief valve which returns excess fuel oil to the inlet side of the gear pump.

In communication with the 'closing pressure' system is the idling valve. This valve can allow fuel oil to

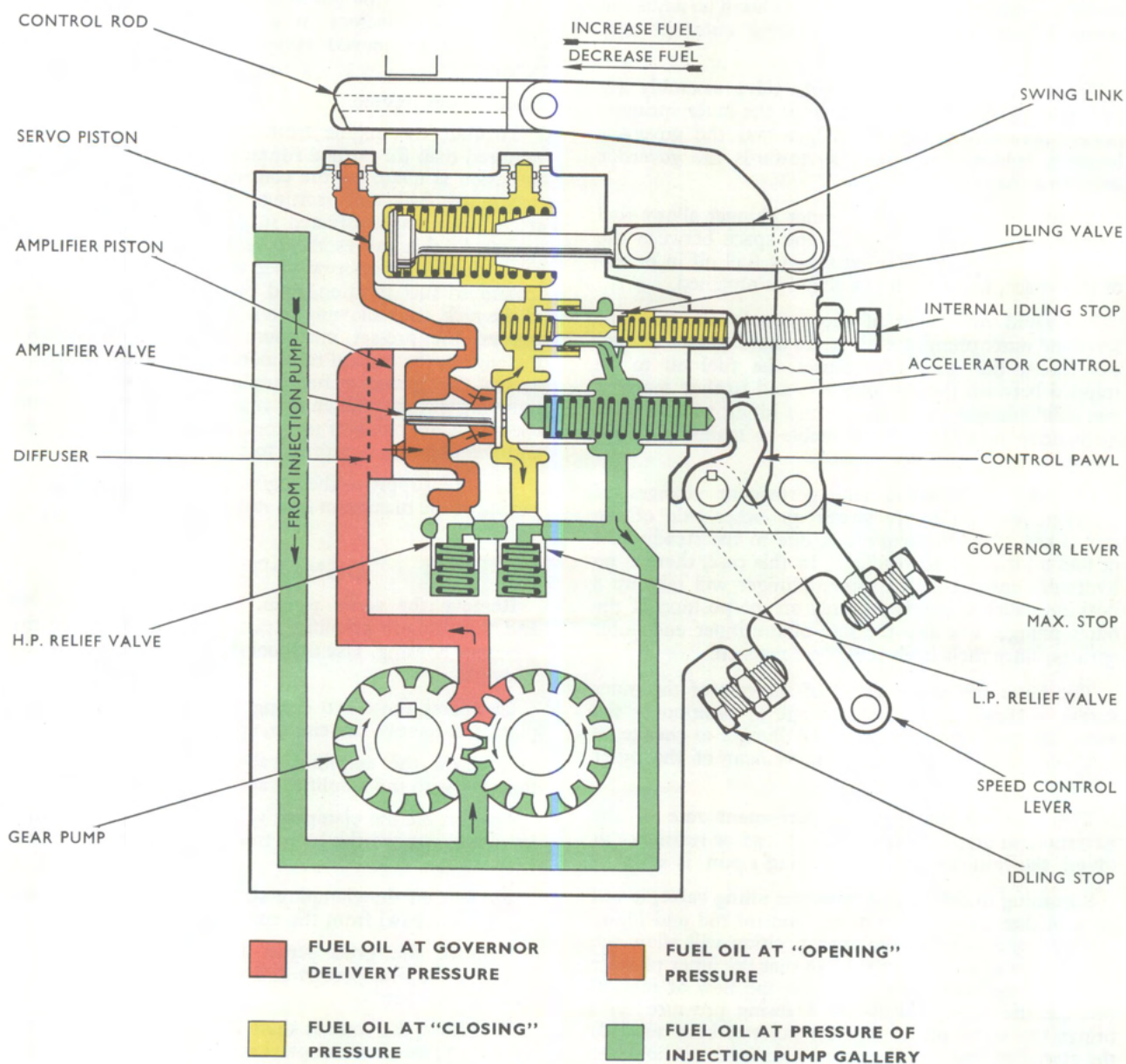
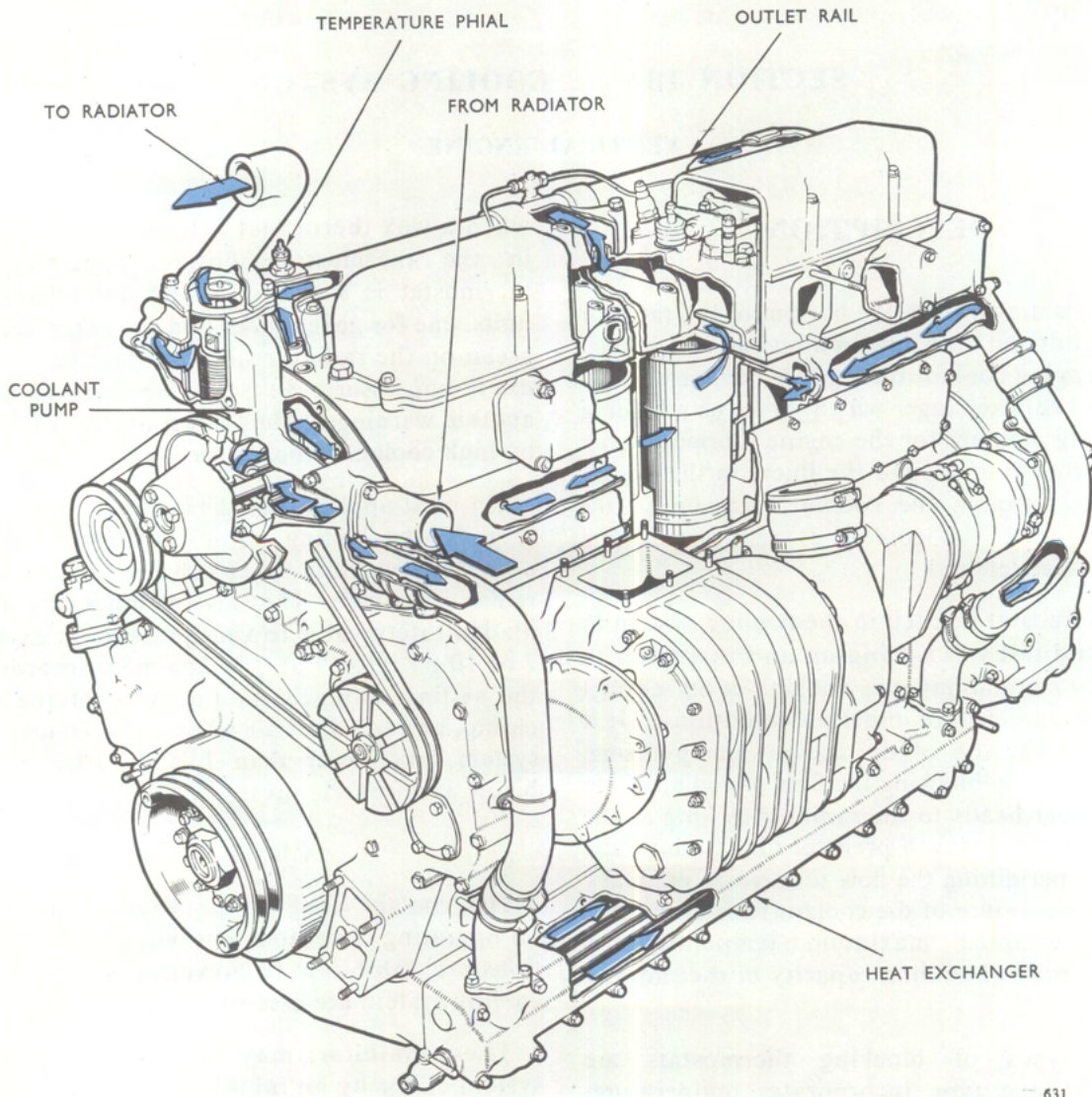
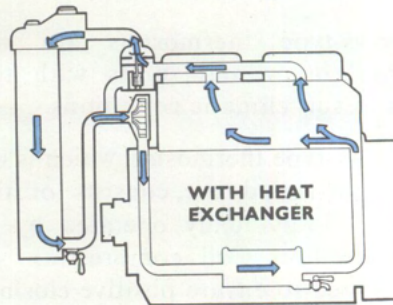
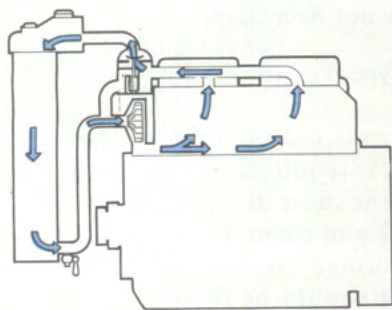


Fig. 33 Schematic diagram of hydraulic governor

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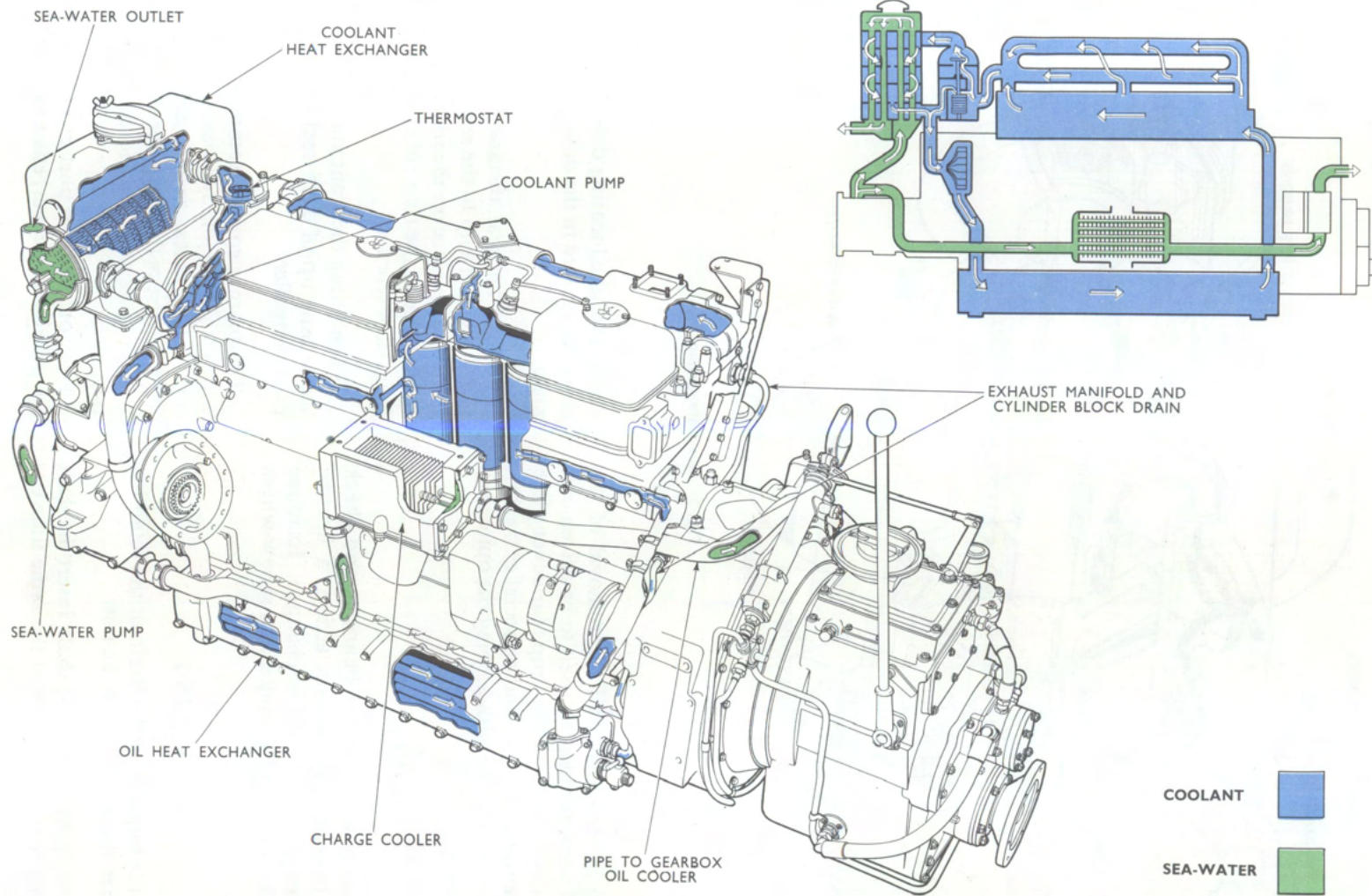


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Fig. 1 Cooling system



ROLLS-ROYCE OIL ENGINES

Fig. 2 Cooling system

The oil which is delivered under pressure to the crankshaft from the main oil feed gallery lubricates the main and big-end bearings, and is conveyed along drillings in the connecting rods to lubricate the gudgeon pin bearings and the cylinder walls.

On 6-cylinder engines the camshaft bearings are fed through the hollow camshaft by a direct supply from the main oil feed gallery to the camshaft centre journal, and a restricted low pressure feed is taken from this supply to lubricate the valve rocker shafts. On 4- and 8-cylinder engines, in which a solid camshaft is employed, each camshaft bearing is fed from the adjacent main bearing journal via drillings in the crankcase, the end

bearing feeds providing the low pressure supply to the valve rocker shafts. A drilling in one of the holding-down studs of each cylinder head is used in all engines to convey the rocker shaft oil from the crankcase to the cylinder head. Spill oil from the rocker shaft bearings lubricates the ends of the valve stems, the push rod ball ends, and the tappets. Additional bleeds from the camshaft tapping lubricate the air compressor, supercharger and supercharger driving gears, when fitted.

When an engine-oil lubricated fuel injection pump is fitted to an engine, the feed tapping is taken through a restrictor from the main idler gear supply at the front of the crankcase.

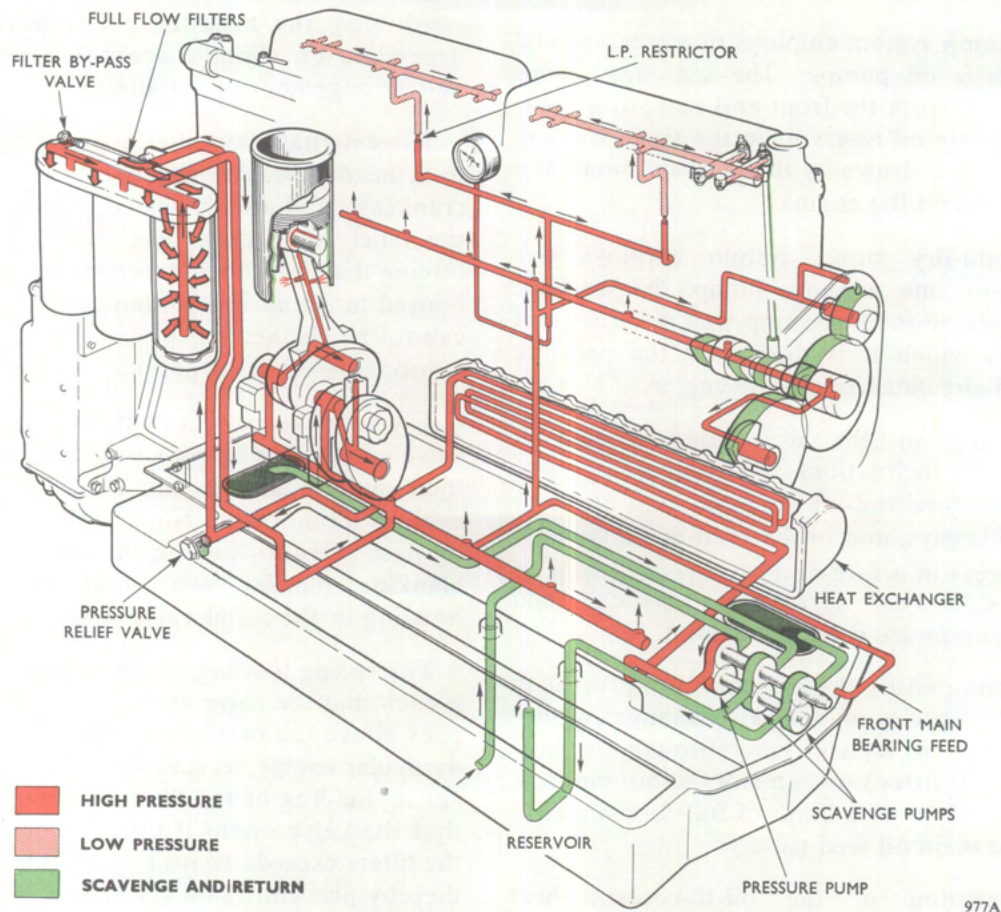


Fig. 1 Lubrication system — dry sump engine

CHANGING THE OIL

Drain the oil system immediately after stopping the engine while the oil is still warm.

Remove the drain plug or plugs from the bottom of the sump and after all oil has drained from the engine refit the drain plugs.

Use the oil recommended, see 'Engine Data'; fill through the stand pipe, until the oil level in the sump is up to the 'MAX' mark on the dipstick.

Remove the oil filters, pour out the oil, and fit new elements, see 'Filters'.

Fill the filter canisters with lubricating oil and refit them to the header bracket.

Run the engine for 1 minute to circulate the oil, and re-check the level.

FILTERS

To renew the filter elements, unscrew the cap-nut securing each filter to the header bracket and remove the filters.

Withdraw the filter elements, clean out the canisters, and fit new elements and sealing rings, and ensure that the bottom sealing ring, spring, and washer are correctly fitted. The elements removed cannot be cleaned and should be discarded with the old sealing rings.

Fill the filter canisters with clean lubricating oil immediately before refitting them to the header bracket. Always fit a new sealing ring in each header bracket recess, and ensure that a new sealing ring is in position on the top of each filter element.

Note: Two types of oil filter assemblies are in service: the earlier long-bowl

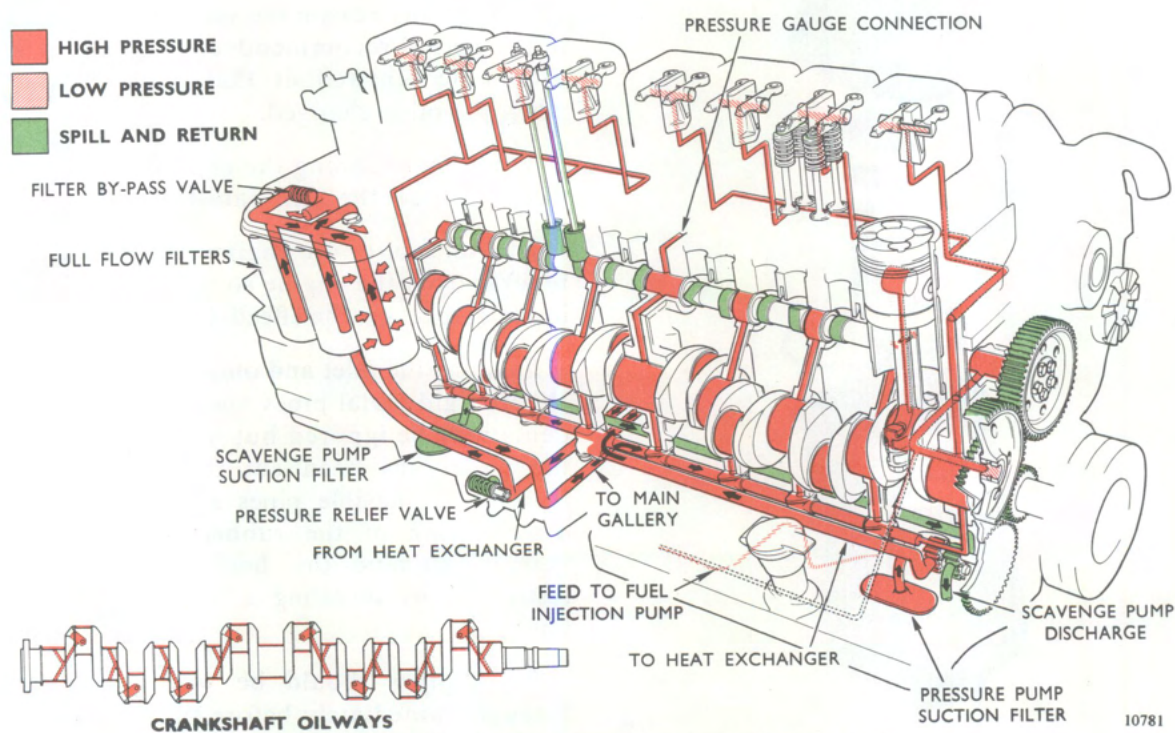


Fig. 2 Lubrication system — semi-dry sump, 4-valve head engine.

assembly with corrugated paper elements fitted to engines manufactured before August, 1958, and the short-bowl assembly with multiple-disc paper elements fitted to all engines manufactured after August, 1958, and to engines manufactured before August, 1958, which have been modified to incorporate the improved type filter assembly. *On no account should components from one type of filter assembly be used with the other, as unfiltered oil will be circulated through the system if short-bowl elements are fitted in long-bowl filters.*

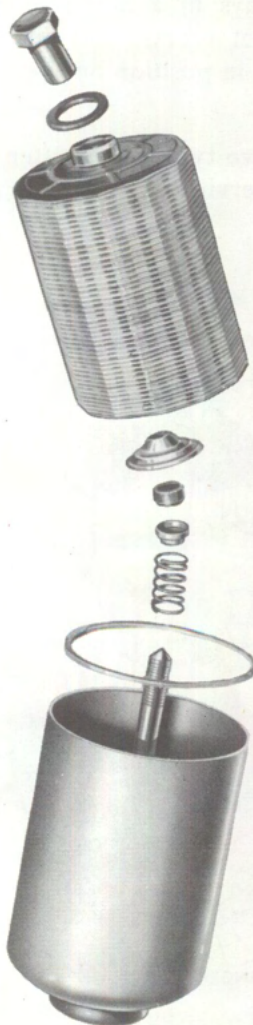


Fig. 3 Oil filter details (short bowl)

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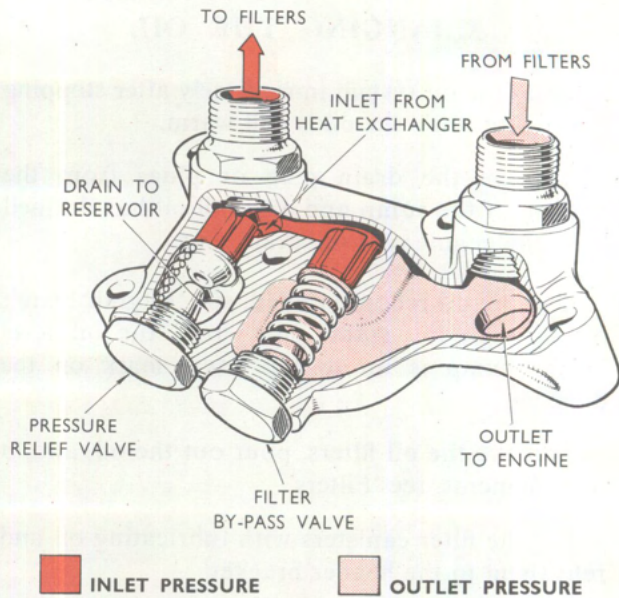


Fig. 4 Oil flow through relief valves — dry sump engine

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The change period for the oil filter elements has been arranged to coincide with that for the oil. If for any reason the oil cannot be changed at the period recommended, the filter elements should be renewed at that period and again when the oil is changed.

When first running the engine after filter servicing, inspect the filter canister joints for leaks.

At overhaul of the engine remove the header bracket from the engine so that the oil passages in the bracket can be effectively cleaned out.

Examine the inlet and outlet pipes for damage. Where rigid metal pipes are fitted small smooth dents may be ignored but where the surface of the metal has been cut the pipe should be replaced. If flexible pipes are fitted, check for deterioration of the rubber outer cover and visually examine the bore of the pipes for restriction by directing a light down the pipe bore.

Rigid pipes should be washed and blown through immediately before they are refitted to the engine.

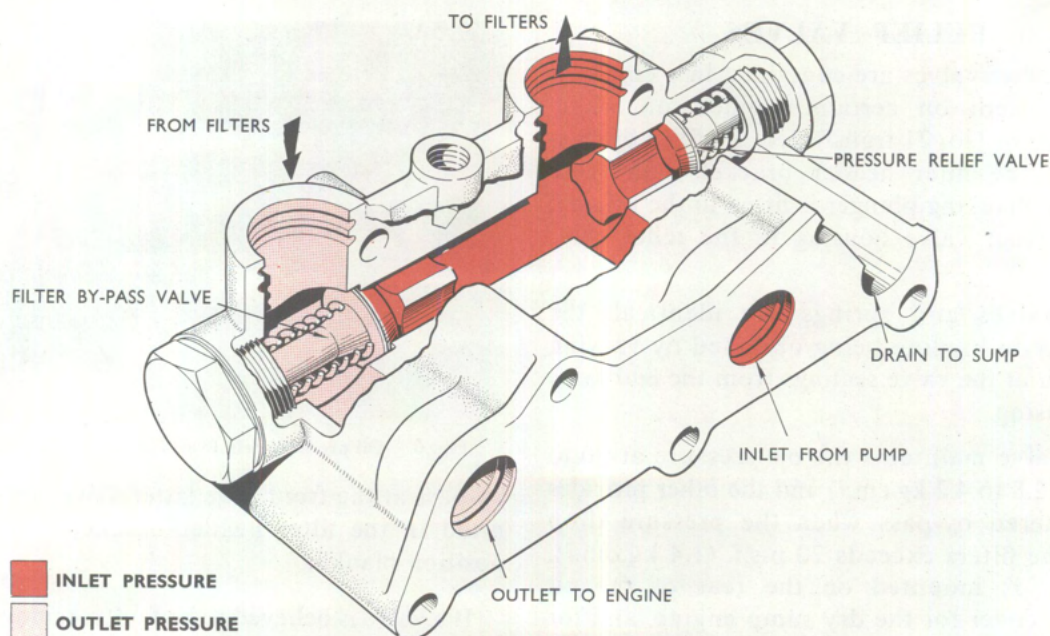


Fig. 7 Oil flow through relief valves — semi-dry sump engine

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Before re-assembling the unit thoroughly clean all parts. Fit new sealing washers under the valve retaining caps. After assembly, check the opening pressure of the valves in the following manner:

Seal off the inlet and outlet ports of the unit and by means of a 3-way connection and a hand pressure pump, apply an oil pressure through the filter delivery and return unions of the unit. The pressure relief valve should lift at 60 lb. per sq. in. (4.2 kg. per sq. cm.) and allow oil to flow from the by-pass port.

Uncover the outlet port and seal off the inlet and by-pass ports. Remove the 3-way connection and apply an oil pressure through the filter delivery connection. The by-pass valve should lift at 15 lb. per sq. in. (1.054 kg. per sq. cm.) and allow oil to flow through the outlet port.

If a valve leaks before the lift pressure is reached, examine the valve and seating, and if these are unsatisfactory, fit a new spring.

When refitting the unit to the engine, use a new jointing washer for the semi-dry sump engine, and ensure that new rubber sealing rings are fitted to the inlet and outlet pipes at their connections to the relief valve unit.

SUMP

REMOVAL AND REFITTING

Drain the engine cooling system.

Remove the drain plugs from the sump and drain the oil from the engine. Refit the drain plugs.

If the installation does not allow access to the sump, remove the engine and fit it to a turnover stand.

For the dry-sump engine release the coolant inlet and outlet pipes to the heat exchanger at the hose connections on the coolant adapters. Release the oil inlet and outlet pipes to the relief valves at the unions on the valve assembly. Release the front and rear air balance pipes at the unions on the oil reservoir.

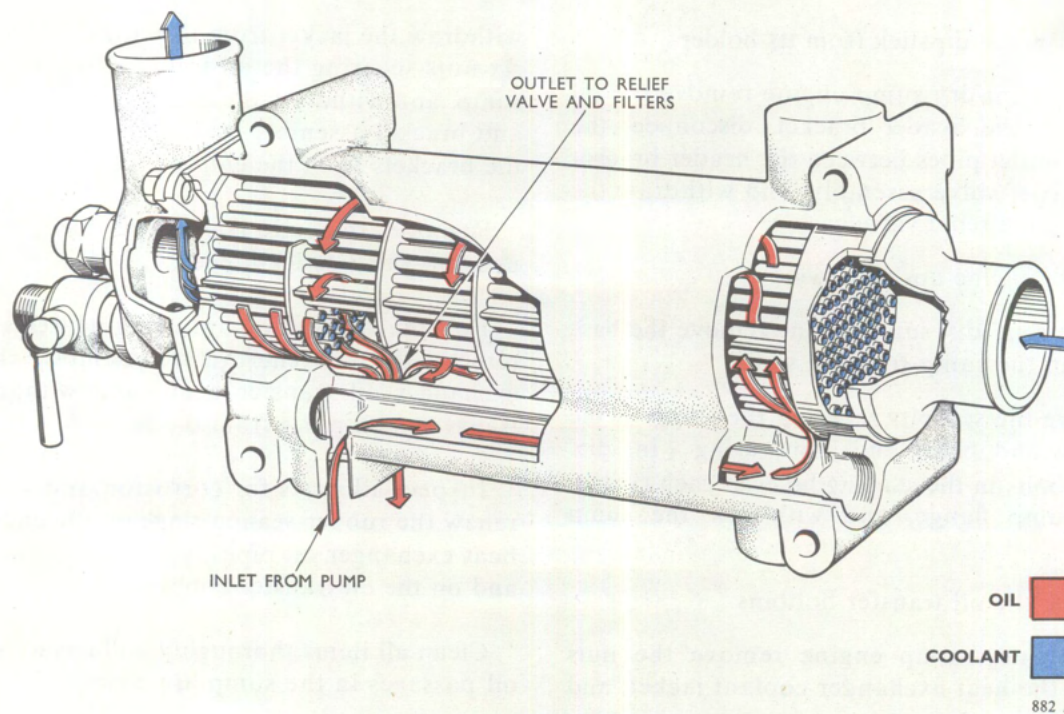


Fig. 9 Cut-away view of heat exchanger—semi-dry sump engine

Assembling is the reversal of dismantling. Use new joint washers on all the mating surfaces.

When refitting the sump, position the transfer bobbins in the holes in the main gallery pipe bracket, and for the semi-dry sump ensure that the transfer bobbins are positioned in the heat exchanger oil transfer bracket.

Fit a new joint washer and offer the sump up to the crankcase, locating it with the four sump guide bars GA.257 before pressing into position.

Remove the four guide bars and secure the sump with the setbolts.

For the semi-dry sump fit and secure the base plate to the sump front oil well.

Refit all parts removed for access.

OIL PUMP AND FITTINGS

The oil pump, gallery and suction pipe assembly are bolted to the cap halves of the main

bearings. The pipes are sealed at their connections by rubber sealing rings located in grooves in the pump and bracket bores.

On dry sump engines, Modification No. 128 introduced an improved oil pump located to the main bearing cap by two dowels. The modification also includes a redesigned oil gallery bracket and main oil feed pipe, together with double sealing rings at the oil pipe connections.

REMOVAL

Drain the oil and remove the sump.

Remove the bolts securing the pump assembly and the pump inlet and outlet pipes to the engine main bearing caps.

For the dry sump engine release the front main bearing feed pipe at the union on the pipe between the rear oil intake and the pump.

The complete assembly can then be lifted off the engine.

FILTERS

The servicing of the full-flow oil filters is the same as described for the vertical engines in Section 19A.

RELIEF VALVES

The housing for the relief valves is secured to crankcase adapter plate and connected by a drilling and internal pipe to the delivery side of the oil pressure pump.

Detail parts of each valve assembly are identical and differ only in the loading which is obtained by varying the depth of the valve seating from the machined locating faces for the retaining caps.

The relief valve stems are drilled and tapped 2 BA. to facilitate the removal of the valves.

When the valves are removed for servicing, inspect the faces of the valves and seats for indentations. Light scoring and indentation of the valve seatings may be faced out by lapping; valves that are deeply grooved must be renewed.

Indented valve seatings may be restored by lightly cutting the seating with a suitable flat faced cutter to restore the knife edge seating, which should be smoothed off by inserting a $\frac{1}{8}$ in (22.225 mm.) dia. steel ball bearing and tapping it with a light hammer.

The dimensions from the valve seat faces to the machined locating faces of the valve retaining caps are:—

High pressure valve 1.462 in. (37.089 mm.).

Filter by-pass valve 2.132 in. (53.42 mm.).

When refacing a relief valve seating, only the minimum amount of metal should be removed, and

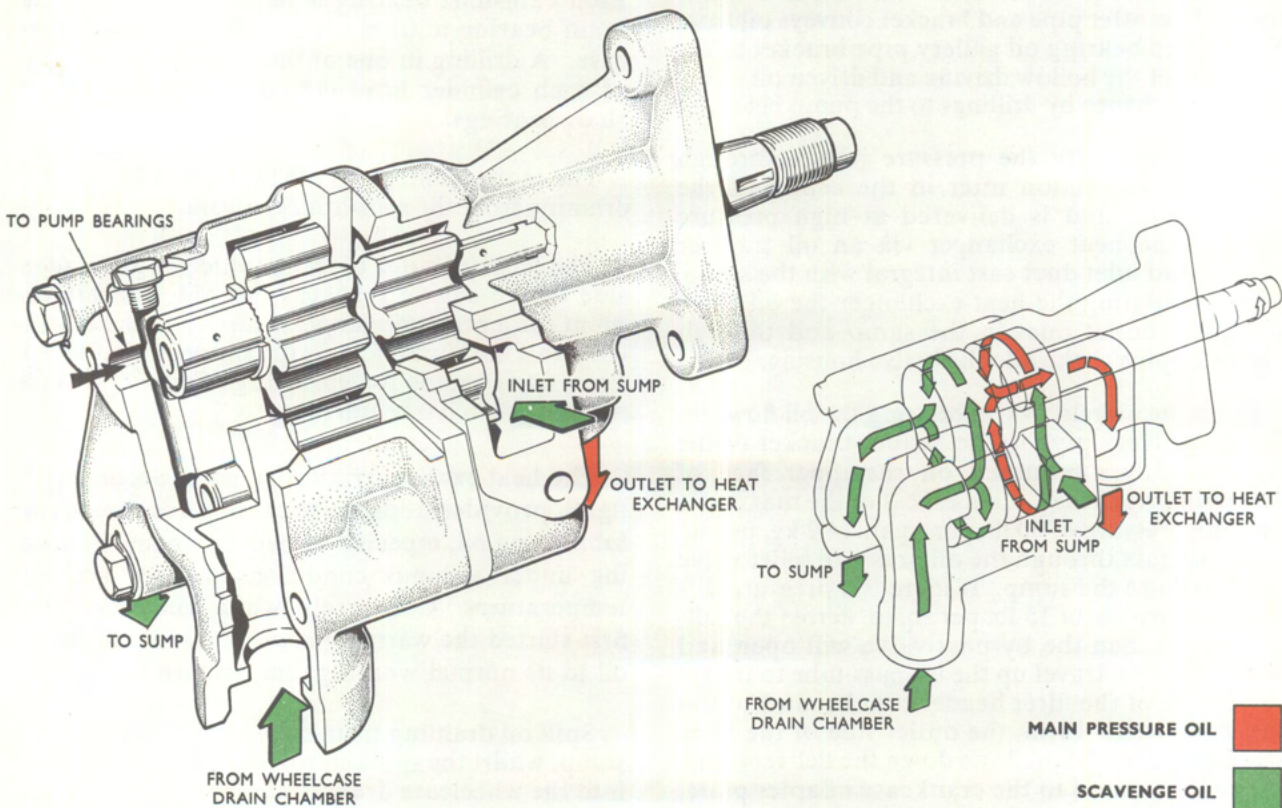


Fig. 1 Oil flow through lubrication oil pump

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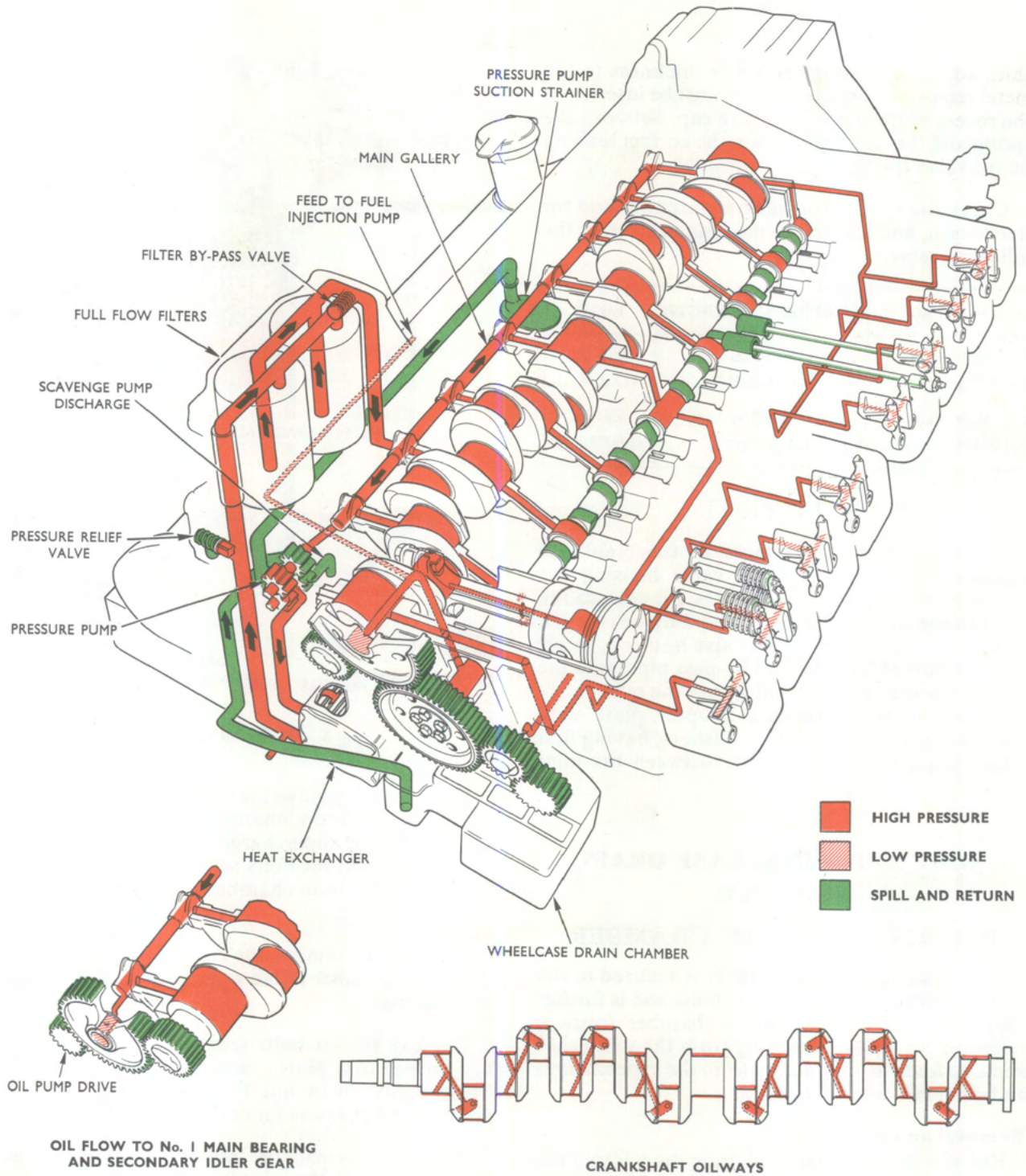


Fig. 2 Lubrication system — 8-cylinder 4-valve head engine

10782

shim adjusting washers equal in thickness to the metal removed from the seating must be inserted in the recess of the valve retaining cap, between the spring and the cap, to maintain the correct loading on the valve spring.

Check the springs for wear, squareness, and for free length, and loading to the figures given in the following table.

SETTING	COMPRESSED LENGTH	LOAD
60 lb./sq. in. (4.2 kg./sq. cm.)	1.650 in. (41.91 mm.)	26.5 lb. (12.02 kg.)
15 lb./sq. in. (1.0546 kg./sq. cm.)	2.320 in. (58.928 mm.)	6.63 lb. (3.0078 kg.)

REFITTING

Ensure that the joint faces of the crankcase adapter plate and the relief valve housing are perfectly clean and free from burrs. Fit new sealing rings to the ends of the oil inlet and by-pass pipes, and fit the pipes to the relief valve housing. Insert the free ends of the inlet and by-pass pipes into the oil filter header bracket and secure the relief valve assembly to the crankcase adapter plate with the four set-bolts and spring washers, having first interposed a new joint washer between the joint faces.

SUMP AND WHEELCASE DRAIN CHAMBER

WHEELCASE DRAIN CHAMBER

The wheelcase drain chamber is secured to the bottom of the wheelcase by set-bolts and is further supported by a bracket. The chamber forms a reservoir for spill oil draining from the wheelcase and also for spill oil draining from the supercharger and compressor when fitted.

Removal and refitting

Remove the drain plug and drain the oil from the drain chamber, preferably when the engine is hot, then refit the plug.

Release and remove the scavenge oil pipe from between the drain chamber and the engine sump.

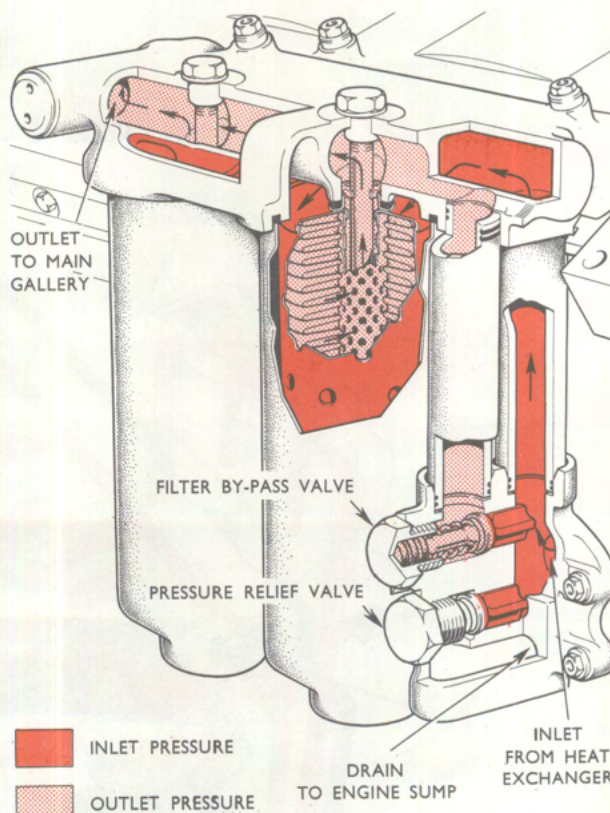


Fig. 3 Oil flow through filters

1470

Release and remove the nuts and spring washers securing the drain chamber to the supporting bracket. If the supercharger is fitted release and remove the two set-bolts securing the oil transfer adapter to the drain chamber and ease the adapter off its joint face.

Release and remove the eight set-bolts securing the drain chamber to the wheelcase, and withdraw the chamber.

Remove the set-bolts securing the drain chamber inspection plates and remove the plates. Thoroughly clean out the drain chamber with paraffin and examine for cracks or other damage.

Refit the inspection plates interposing new gaskets between the joint faces.

Refitting of the wheelcase drain chamber is the reversal of removal. Always ensure that new sealing rings and joint washers are fitted.

ENGINE SUMP

The sump has internal ductings for conveying oil to the scavenge pump and from the pressure pump to the heat exchanger, and has a machined face for the fitting of the pack-type heat exchanger at the front end, the whole forming a single casting secured to the crankcase by set-bolts. The capacity of the 6-cylinder sump is approximately 7.5 Imperial gallons (32.095 litres) and 12.5 Imperial gallons (56.825 litres) for the 8-cylinder engine sump.

Removal and refitting

Drain the oil from the sump by removing the three drain plugs.

Disconnect the scavenge oil pipe between the sump and the wheelcase drain chamber and remove the pipe.

Release the coolant hose clips on the coolant connection between the coolant pump outlet elbow and the heat-exchanger and break the joint. Release and remove the setbolts securing the coolant outlet elbow, and remove the elbow and connection. Release the rear coolant connection hose clips and rubber connections and remove the pipe between the coolant delivery rail and the cylinder block.

Remove the set-bolts securing the sump to the crankcase adapter plate and break the joint using $\frac{3}{8}$ in. UNF. set-bolts in the starting holes at each corner of the sump. Withdraw the sump evenly until the transfer bobbins connecting the oil pump to the sump oil ducts are free.

Release and remove the heat exchanger coolant outlet hose connection.

Remove the six set-bolts securing the heat exchanger to the sump and detach the heat exchanger.

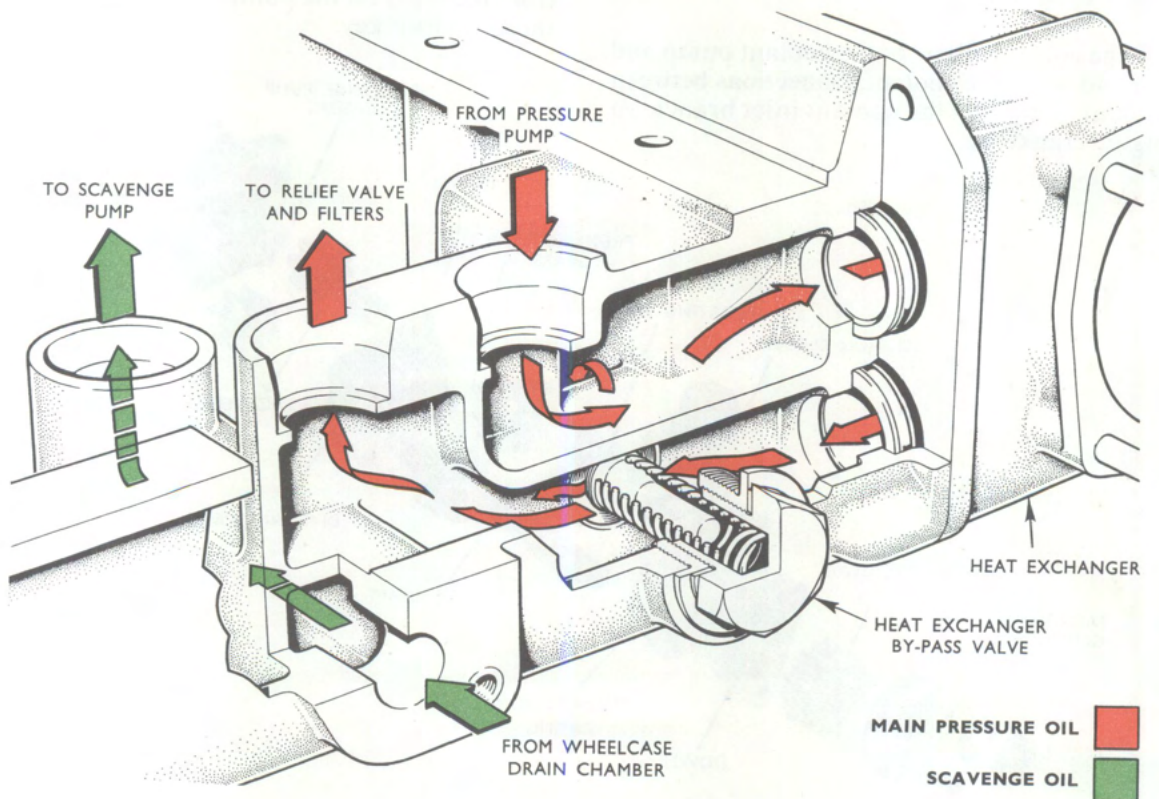


Fig. 4 Oil flow through sump

1355

SECTION 24 . . . COLD STARTING CARBURETTER—START PILOT

The Start Pilot Carburetter is in effect a pilot injection system where the burning of the atomized fluid provides initial heat to assist combustion of the normal fuel oil.

The unit consists of a hand operated double acting air pump, a reservoir and capsule chamber, and an injector which is fitted in the engine inlet manifold.

By operating the hand pump, air pressure is created and delivered via a drilling to the bottom of the upper diffuser plug, here the flow divides; part of the air being directed to the head of the diffuser jet and part to the capsule chamber. The pressure of air on the surface of the fluid in the capsule chamber forces the fluid through a nylon filter in the chamber base plug to the diffuser lower plug via a drilling in the casting. From the diffuser housing

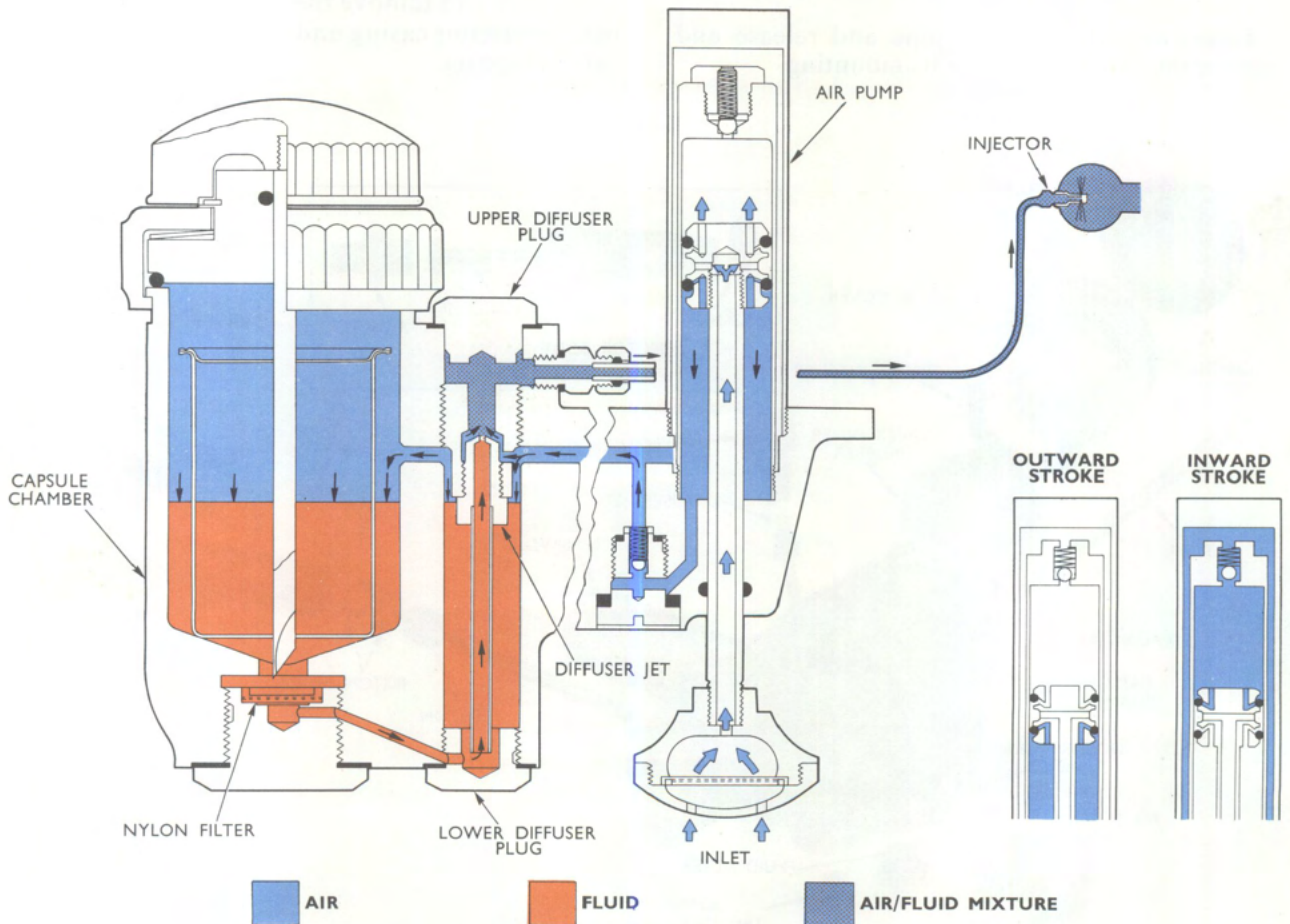


Fig. 1 Schematic arrangement of starting carburetter

1373

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