

# WORKSHOP MANUAL

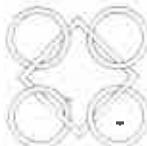
ENGINE # 6210714

*And Instruction Book for*

# PERKINS

4.270

## MARINE DIESEL ENGINES



PERKINS ENGINES LIMITED

SERVICE DIVISION

PETERBOROUGH

ENGLAND

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## PERKINS ENGINES LIMITED

### *Overseas Companies*

#### **U.S.A.**

The Perkins Engine Co. Inc.  
12345 Kercheval Avenue  
DETROIT 15  
U.S.A.

Cables : Perkoil, Detroit  
Telephone : Valley 27700

#### **FRANCE**

Societe Francaise des Moteurs Perkins  
55, Boulevard Ornano  
SAINT-DENIS (Seine)  
France

Cables : Perkoil, Paris  
Telephone : Plaine 27-40  
Telex : 23083

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DANDENONG  
Victoria, Australia

Cables : Perkoil, Dandenong  
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F. Perkins Kundendienst G.m.b.H.  
Maximilianstrasse 12  
Postfach 672  
ASCHAFFENBURG  
Germany  
Telephone : Aschaffenburg 24968  
Telex : Aschaffenburg 4188869

#### **SPAIN**

Perkins Hispania S.A.  
Carretera de Aragon 310  
MADRID  
Spain  
Cables : Perkoil, Madrid  
Telephone : Madrid 205 00 40

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SERVICE INSTRUCTION — PERPETUITY SCHEME — FILM LIBRARY  
 PERKINS DRIVERS CLUB — LUBRICATING OIL DATA —  
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## Unified Threads and Engine No. Location

All threads used on the 4.270 Marine Engine, except on proprietary equipment and the crankshaft are Unified Series, and American Pipe Series. The crankshaft and starting dog nut are threaded 1 inch American National Fine, 14 T.P.I.

These threads are not interchangeable with B.S.F. and although B.S.W. have the same number of threads per inch as the Unified Coarse Series, interchanging is not recommended, due to a difference in thread form.

The engine number is stamped on the top rear, right hand side of the cylinder block. This number should be quoted when requesting information or ordering Parts.

Where self locking nuts have been employed, and for any reason they have been removed, then they should be replaced by new self locking nuts.

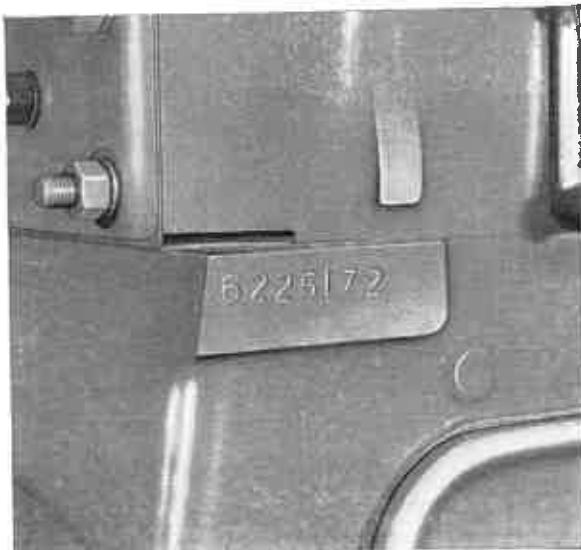


Diagram showing position of Engine No. 6200251

## FOREWORD

The Diesel Engine closely resembles its petrol counterpart inasmuch as the mechanism is essentially the same. Its cylinders are arranged above its closed crankcase, its crankshaft is one of the same general type as that of a petrol engine ; it has the same sort of valves, camshaft, pistons, connecting rods and lubrication system.

It follows, therefore, that to a great extent, it requires the same treatment as that which any intelligent and careful operator would accord to a petrol engine and the gross negligence such as running the engine short of oil, with sludged oil, or with the water boiling will have the same expensive consequences.

Where the Diesel Engine does differ from the petrol motor, however, is in the method of distributing, measuring and firing its fuel. Carburetter and ignition systems are discarded, and in their place is a single component—the Fuel Injection Pump—which performs the functions of both. This confers upon the Diesel a quite exceptional reliability, since the chances of breakdown are halved. In fact, it may be safely stated that a Diesel Engine never has an involuntary stop (other than one caused through mechanical damage due to abuse), unless there is a shortage of fuel.

The fuel injection pump, though very simple in principle, must necessarily be a piece of precision engineering. Many years of experience and many hundreds of thousands of hours of running ensure that the fuel injection pump fitted to Perkins engines will, given ordinarily decent treatment, continue to function faultlessly. It must, however, be regarded in the same light as a magneto, inasmuch as it should not be interfered with and that its repair, should it need attention, is definitely beyond the skill of any but specially trained workmen. Like the magneto, it is built as a unit, so that in the rare event of failure it can be replaced en bloc.

Unremitting care and attention at the Perkins factory have resulted in an engine capable of hundreds of hours of profitable service. WHAT

THE MANUFACTURER CANNOT HOWEVER CONTROL, IS THE TREATMENT THAT HIS PRODUCT WILL RECEIVE IN SERVICE. That part rests with you.

This manual is designed to be a guide to the Distributors of, and Dealers in craft fitted with the Perkins 4.270 Marine Diesel Engine and to others who are concerned with the sale and subsequent maintenance of such engines.

Perkins Engines Ltd., are at one with all these Distributors and Dealers in the desire to ensure that the Perkins Diesel engines in the hands of users shall give complete satisfaction.

An essential factor in the attainment of that object is efficient servicing. The Company provides a number of facilities with that end in view ; one of them is this manual. In presenting it to responsible Distributors and Dealers the Company are in effect inviting their co-operation and at the same time providing an effective aid to that co-operation.

Immediately this manual is received, hand it over to the foreman who will be responsible for carrying out the maintenance operations which are described therein. Do not, please, file it in the office.

The issue of this manual has been described above as being one of the many aids which Perkins Engines Ltd. provide in order to ensure efficient service for the engines they market. Two of the others may appropriately be mentioned here.

Service Instruction is provided at Peterborough, where the mechanics employed by Distributors, Dealers and users are given instruction on the special characteristics of the engine.

Then there is the Perkins Perpetuity Plan, which is, in fact, an engine exchange scheme of peculiar description having numerous special advantages. A booklet describing this can be obtained on request.

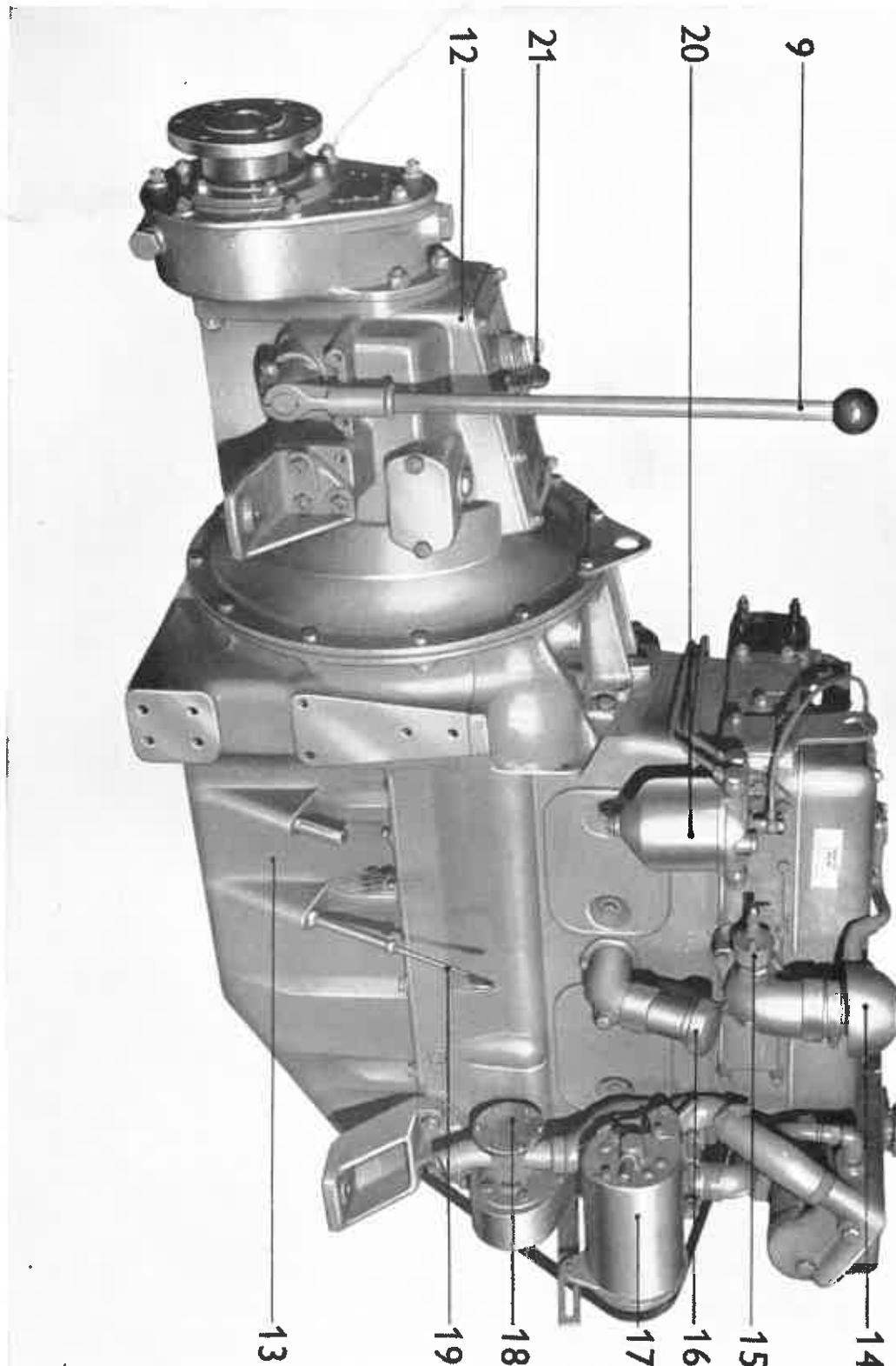
In conclusion we recommend Dealers, Distributors and users to communicate with the Service Division of Perkins Engines Ltd., Peterborough, in case of need.

DET. - DAYCO 15515

**ENGINE  
PHOTOGRAPHS**

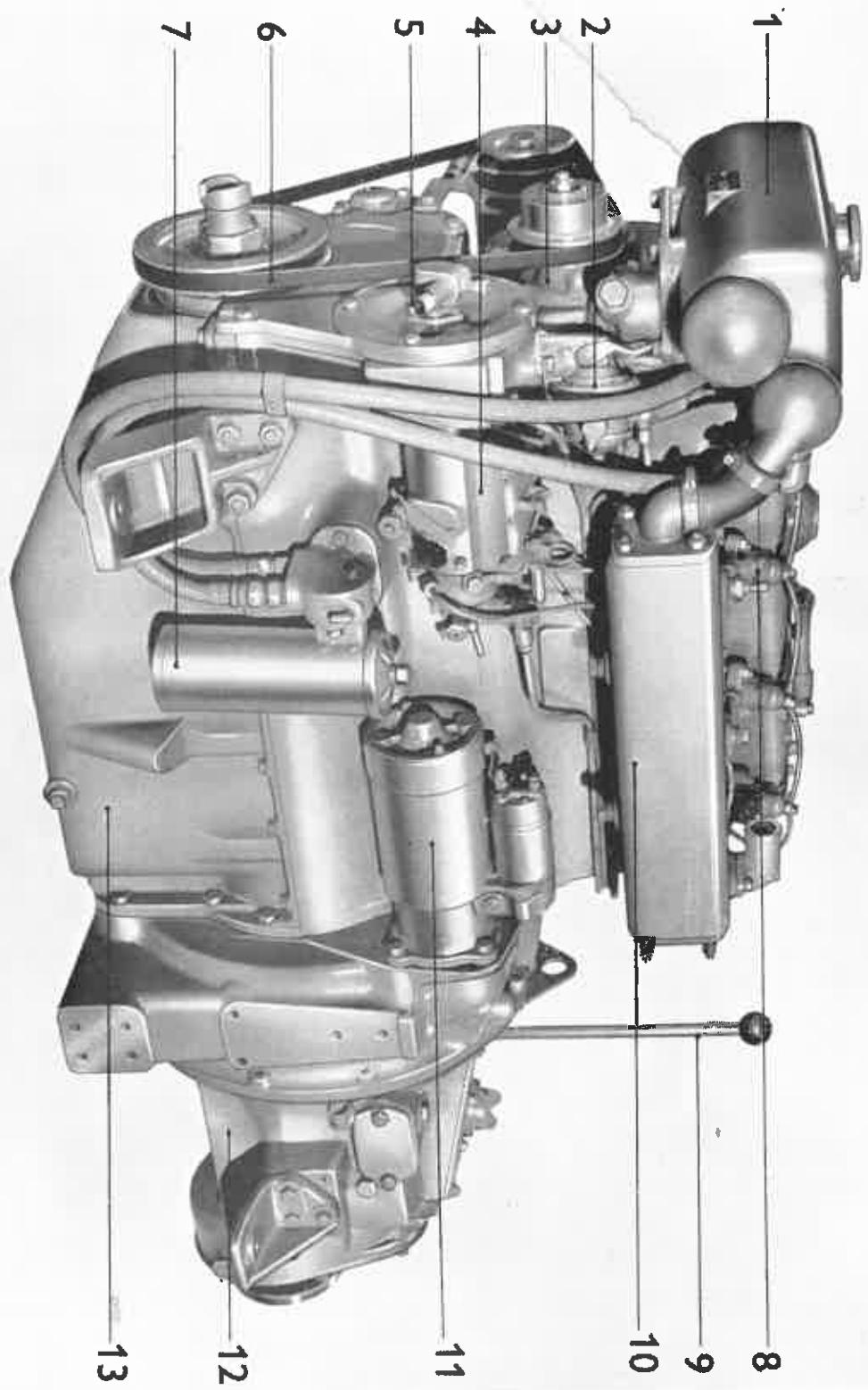
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Starboard View of 4.270 Marine Engine fitted with a Mechanical Gearbox.

Port View of 4.270 Marine Engine fitted with a Mechanical Gearbox.



## ENGINE DESCRIPTION (A)

Perkins 4.270 Marine Diesel engines are vertical four-stroke Power Units. They are entirely of British design and manufacture and embody the results of experience gained in the production of Diesel engines over a period of many years.

The materials and workmanship throughout are of the highest class. Most parts are guaranteed interchangeable, jigs being used everywhere in the course of manufacture, and all parts pass through a system of thorough inspection where they are checked to the closest limits. Each engine is subjected to stringent tests before leaving the Works.

### **General.**

The Perkins 4.270 Marine Diesel, with which this manual is concerned, is a four-cylinder unit, having a bore and stroke of  $4\frac{1}{2}$  in. and  $4\frac{3}{8}$  in. (108 mm and 120.7 mm) respectively.

### **Cylinder Block.**

The cylinder block and crankcase comprise a one-piece high duty alloy iron casting. Centrifugal cast iron wet liners are fitted, which are flanged at the top end and fitted with sealing rings at the lower end.

### **Cylinder Head.**

The cylinder head is of high duty cast iron and is secured on the cylinder block by studs and nuts; the joint being made by a copper-steel-asbestos-gasket.

The rocker assembly is mounted upon the cylinder head, and is enclosed by a cast aluminium cover.

One spring retained by a hardened steel cap, and split conical collets are provided for each valve, the spring seating on the cylinder head face.

Being a direct injection engine, the combustion chamber is formed in the piston crown. Fuel is injected into the chamber by means of a multi-hole atomiser.

### **Camshaft.**

The low level camshaft is situated in the starboard side of the cylinder block and is support-

ed by three bearings, the forward bearing being a wrapped bush type with the centre and rear bearings being machined direct into the cylinder block. The front and centre bearings are pressure-lubricated, while the rear bearing is splash-lubricated, as are the cams.

### **Crankshaft.**

The crankshaft is forged from chrome molybdenum steel, the main and big end journals being induction hardened.

The rear end of the shaft is machined to provide thrust location, oil thrower and oil return scroll.

Oil seals are provided at the front and rear ends of the crankshaft.

The front oil seal is a standard spring-loaded synthetic rubber lip type seal with an extra dust seal in the form of a leather ring at the rear of the rubber seal. This seal is fitted into the timing case cover.

The rear oil seal is of the rubber core asbestos rope type retained in a split housing.

The crankshaft is supported by three main bearings of the thin wall pre-finished steel backed, copper-lead or aluminium tin lined type.

The bearing caps are secured to the crankcase by two alloy steel cold headed setscrews locked by tabwashers, the caps are located by ring dowels.

### **Connecting Rods.**

The connecting rods are of alloy steel "H" section stampings with replaceable steel shell big end bearings, which are lead bronze or aluminium tin lined.

### **Pistons and Gudgeon Pins.**

The pistons are of high silicon aluminium alloy and have a toroidal cavity in the crown. Each piston is fitted with five piston rings, three compression and one scraper ring being fitted above the gudgeon pin and one scraper ring below. The top compression ring is chrome plated. The second and third rings are plain tapered rings.

## ENGINE DESCRIPTION—A.2

The gudgeon pins are fully floating and located axially in the pistons by circlips.

### Timing Gear and Timing Case.

The camshaft and fuel pump are driven from the front end of the crankshaft by a hardened steel crankshaft gear through a high duty cast iron idler gear to cast iron camshaft and fuel pump gear.

The teeth are straight spur, and adjustment to the fuel pump timing is provided by slots in the fuel pump gear, access to the adjustment being provided through a covered opening at the front of the timing case cover.

The timing gears are lubricated by an intermittent feed from the idler gear hub, and by splash and overflow from the main and camshaft bearings.

### Lubrication System.

Lubrication is by a gear type oil pump which is located in the cylinder block by means of a setscrew in the camshaft side of the block wall between the cylinders No. 1 and No. 2. The oil pump is driven through spiral gears from the cam-shaft. A spring-loaded ball type relief valve is located in the lubricating oil pump body to control the maximum oil pressure.

The oil is delivered by the pump, through a full flow filter and oil cooler (if fitted) to the main oil gallery drilled length-wise through the crankcase. The full flow filter affixed to the crankcase on the fuel pump side incorporates a bypass relief valve

Drilled holes through the main bearing housings carry the oil from the main gallery to the main bearings, from whence it passes via drilled holes in the crankshaft to the big end bearings.

A supply of oil is taken to the centre camshaft bearing, where it is metered to feed the rocker and valve assembly. A further supply of oil is taken to the idler gear boss through a drilled hole in No. 1 main bearing housing, for lubrication of the idler gear hub bearing. The idler gear hub meters the oil for general timing gear splash feed lubrication.

### Oil Cooler.

On heat exchanger or keel cooled engines, this is located in the header tank, but with the direct

sea water cooled version, the cooler is mounted at the forward end of the cylinder block.

Heat from the engine oil is lost as it circulates round a system of tubes through which is pumped water from the cooling system.

With the fitting of a hydraulic gearbox, a further oil cooler must be fitted in order to cool the gearbox oil. The mounting for this additional cooler is on the top of the gearbox.

The pump necessary to lift the oil is enclosed in the gearbox.

### Fuel Injection Equipment.

A distributor type fuel pump is flange mounted to a cast adaptor bolted to the timing case. A mechanical governor is incorporated in the fuel pump body, the speed control and cut-out levers being mounted on the pump body.

The diaphragm type lift pump is equipped for hand priming, and is operated by an eccentric on the fuel pump gear carrier hub and a small push rod. The pump is mounted on the timing case above the fuel pump drive gear.

A fuel transfer pump is built into the fuel pump body which circulates the fuel oil through the pump body, feeding the operating plungers.

A connection is provided in the front of the fuel pump housing to allow fuel to flow back to the filter or fuel tank. This return line also serves to permit any air in the fuel or originally contained in the pump to be displaced by the fuel.

The atomisers are located on the fuel pump side of the cylinder head in an accessible position. The atomiser is of the multi-hole type, having 4 sprays, conical in form, injecting directly into the toroidal chamber in the piston crown.

### Cooling System.

The fresh water circulating pump is mounted on the front of the cylinder block, being belt driven from the crankshaft pulley. In closed circuit systems, sea water is pumped through the heat exchanger by means of another circulating pump mounted on the timing case, and driven from the camshaft gearwheel. In direct cooling systems the fresh water pump is not fitted.

On keel cooled and heat exchanger cooled engines the water outlet is taken through a thermostat housing mounted at the front of the cylinder head.

## **ENGINE DESCRIPTION—A.3**

A tapping is provided in the water outlet housing for the fitting of a thermometer bulb.

A water drain cock is provided on the fuel pump side of the engine.

### **Gearboxes.**

The Parsons "F" type reverse gearbox can be fitted, and supplied as a direct drive, or with 2 : 1 or 3 : 1 reduction gear, the reduction gears being of the two- or three-pinion type.

The above gearboxes are mechanically operated, whereas the Self Change "MR11/2B," which can be fitted to the above specifications, are oil-operated.

### **Angle of Installation.**

The maximum operating angle of which the engine can be installed is 20°.

### **Electrical Equipment.**

A 12 volt earth return system is employed as standard equipment. A 12 or 24 volt insulating return system may be fitted as optional extra. The dynamo is located on the starboard side of the engine and is belt driven.

The starter motor is flange mounted on the port side of the engine, the starter pinion engaging with the starter ring on the flywheel at the aft end of the engine

### **Induction Manifold and Air Cleaner.**

The air inlet is an aluminium casting fitted to the camshaft side of the cylinder head.

A gauze type air filter is used, fitted directly onto the vertical air intake body.

### **Exhaust Manifold.**

A cast iron exhaust manifold with an integral water cooling jacket is fitted to the fuel pump side of the cylinder head.

An air release cock is provided at the forward end of the manifold jacket, whereby any air present in the water cooling system may be removed.

The manifold is fitted with a four bolt outlet flange.

### **Starting Aids.**

An electrically-operated cold starting aid is fitted horizontally in the induction manifold; the starter fluid is expressly fuel oil. Operation is by a three-position switch on the instrument panel.



## SETTINGS AND DATA—B.1

# SETTINGS AND DATA (B)

Bore .....	4½ in. (108 mm)
Stroke .....	4¾ in. (120.7 mm)
No. of Cylinders .....	4
Swept Volume .....	4.42 litres (269.5 cu. in.)
Compression Ratio .....	16 : 1
Firing Order .....	1, 3, 4, 2
Valve Clearance (hot) .....	.010 in. (.25 mm)
Maximum Torque .....	182 lbs./ft. (25.14 kg/m) at 1,000 r.p.m.
Maximum Rated Output .....	58 s.h.p. at 2,000 r.p.m.
Pistons .....	Light Alloy Toroidal Cavity
Static Injection Timing .....	16° B.T.D.C.
Atomisers : Body .....	BKBL97S5064
Nozzle .....	BDLL150SY6225
Injection Pressure .....	170 atmospheres
Valve Lift .....	.465 in. (11.81 mm)
Valve Seat and Face Angle .....	45°
Oil Pressure (hot) .....	.25/.35 lbs. per sq. in. (1.76/2.46 kg/sq. cm.)
Sump Capacity .....	16 pints (9.1 litres)
When checking and adjusting valve clearances the engine should be turned to bring the respective pistons to T.D.C. on compression.	

### Recommended Torque Tensions

	lbs./ft.	kg/m
Cylinder Head Nuts .....	80—85	11.1—11.7
Connecting Rod Setscrew .....	100—105	13.8—14.5
Main Bearing Setscrews .....	125—130	17.3—18
Flywheel Setscrews .....	75	10.4

With reference to the Cylinder Head Nuts, these should be rechecked with the engine hot.

Note:—It will be appreciated that after overhaul or rectification work has been carried out, there will be a settling period which will allow a slight variation on the figures quoted. This is not detrimental to the performance of the engine, and there is no necessity to interfere with the settings.

On no account should attempts be made to increase the torque already quoted by overtightening with a torque spanner, but following an overhaul a check should be made of the cylinder head nuts torque, with the engine hot, after a suitable settling-in period.

### Heaviest Weights to be Lifted During Maintenance.

Cylinder Block (with liners and studs only)  
232 lbs. (105.2 kg.)

Cylinder Head (with valves and springs only)  
80 lbs. (36.3 kg.)

Flywheel (with starter ring) 118 lbs. (53.5 kg.)

### Engine Weight.

(Dry engine, with dynamo, starter motor, air filter, flywheel and flywheel housing — 952 lbs. (431.8 kg.)

Dry engine, with dynamo, starter motor, air cleaner, flywheel, flywheel housing and direct drive reverse gear — 1,170 lbs. (530.7 kg.)

### Electrical Equipment.

Voltage of Electrical Equipment.....12 volts  
Dynamo Maximum output amperage ...13 amps.  
Power absorbed by dynamo..... 0.295 h.p.  
Starter Motor maximum current .....930 amps.

Two 6 volt batteries each of 21 plates with a capacity of 128 amps/hr (10 hour rating).

## SETTINGS AND DATA—B.2

### De-rating for Altitude.

Where engines are called upon to operate in rarefied atmospheres occasioned by altitude, such engines should be de-rated. For details regarding engine de-rating for altitude, apply to Service Division, Perkins Engines Ltd., Peterborough, or to those Overseas Companies listed on Page II.

### Examination of Bolt, Stud and Setscrew Threads.

At any time before replacing any Bolt, Stud or Setscrew the condition of the thread should be carefully examined. In particular, great care should be given to the connecting rod and main bearing setscrews, for the consequences of fitting a faulty setscrew to the connecting rod or main bearing could have a very damaging effect on the engine.

To examine any threaded hardware, check that no stretching has occurred. Stretching usually can be seen on the threaded area adjacent to the plain shank in that the threads appear wider and the diameter will have lessened; the bolt, stud or setscrew will feel narrower in the stretched area.

Examine the threads carefully to ensure no "thread flattening" has occurred, that the crest of the thread has not been worn or torn. Check that the component has not been "cross threaded" at some time during the engine life.

Inspect the component for blueing, which may be present due to overheating at some time or other, and if any blueing or high spots are detected then the Bolt, Stud or Setscrew must be discarded.

Check also for cracking which may be seen as very fine hair lines.

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**IMPORTANT NOTE.** ALL SCREW threads used on the 4.270 engine, except on proprietary equipment and the crank-shaft, are Unified Series and American Pipe Series. The crankshaft and starting dog nut are threaded 1 inch American National Fine 14 T.P.I.

# ENGINE INSTALLATION (C)

The installation of a Perkins 4.270 Marine Diesel presents no real problems, and by careful attention to details, and the correct use of modern mountings and couplings and sound-proofing techniques it is possible to provide a really smooth and quiet installation.

### Installation Angle.

The maximum angle at which engines can be installed is 20° and is quoted on the engine installation drawing. It should be remembered that this angle increases when the boat is under way by an average of 3°.

Engines installed with vee-drives can usually be mounted with the crankshaft horizontal. Mounting the engines "down by the head" should be avoided as it can lead to air-locks in the water jackets at the aft end of the cylinder head which is not vented. Where this arrangement is unavoidable it may be necessary to arrange special vents at the end of the cylinder head.

The engine oil sump is designed so that varying installation angles give approximately the same capacity of lubricating oil to the "Full" and "Danger" marks on the dipstick.

Auxiliary yacht installations may require the engine to be run while beating to windward. Under these conditions the boat may heel up to 30° without adverse effect on the lubrication system providing the boat is righted occasionally, in order to lubricate the valve assembly.

### Engine Mounting.

Generally speaking, in heavily timbered hulls, with long engine beds to distribute the load as in the cases of barges, workboats etc., the engine may be solidly mounted on the bearers, but if these are timber, pressure plates in the form of rectangular steel pads should be fitted to the tops of the bearers under the engine feet, and the holding down bolts must be taken as far down through the bearers as possible to a morticed hole for the lower nut. A second pressure plate, must, of course, be inserted above this nut. Under no circumstances should coach screws be used to fasten down the engine as vibration and torque reaction

causes these to loosen with consequent misalignment of the engine with the propeller shaft.

In some cases it may be desirable to reinforce the top of the engine bearers by bolting a length of steel plate or angle iron under the engine mounting brackets. The reinforcement should be carried along the bearers as far as possible and with the holding down bolts fitted as recommended, the plates may be additionally secured by coach screws.

When the hull is of very light construction and the primary use is for pleasure, flexible mountings are desirable. Perkins Engines Limited have carried out considerable experimental work on flexible mountings and couplings, and our recommendations should be followed in all cases where these items are fitted. Badly matched flexible mountings and couplings can give rise to more vibration than is experienced with solidly mounted engines.

The illustration (fig. C.1.) shows the adjustable flexible mountings which are specified on all types of engines. This adjustment allows the coupling to

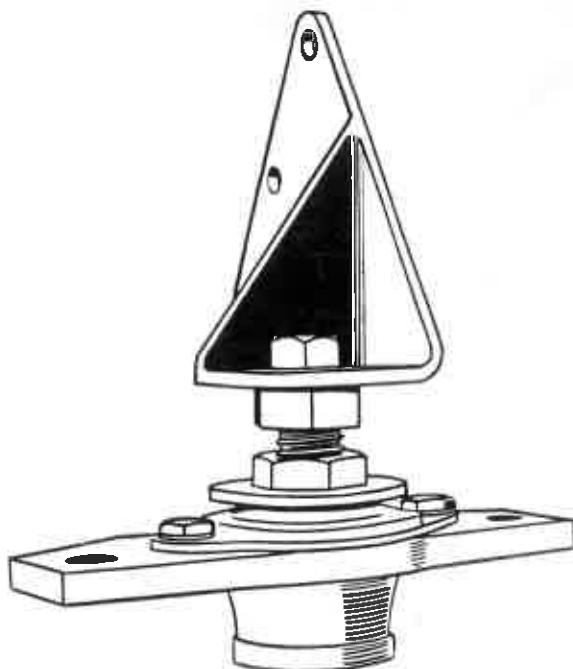
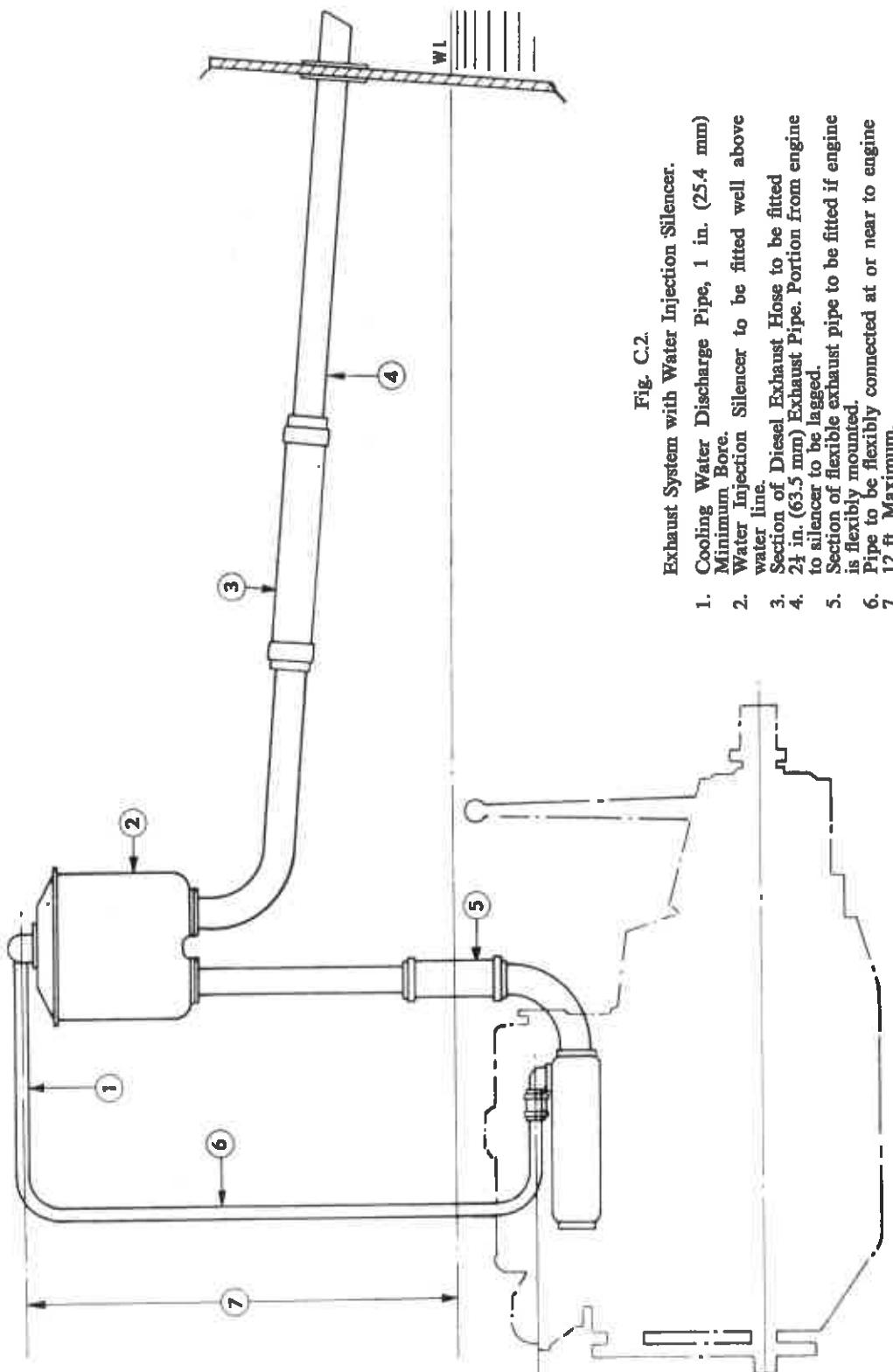


Fig. C.1.

## ENGINE INSTALLATION—C.2



## ENGINE INSTALLATION—C.3

be accurately aligned and also compensates for the small amount of settling which sometimes occurs after a period of service.

The inclusion of a flexible coupling or couplings in the tailshaft does not mean that liberties may be taken with the lining up of engine and tailshaft, and the same care must be used as when the engine is solidly mounted.

The types of flexible couplings and mountings recommended are capable of transmitting the considerable thrust exerted by the propeller on the tailshaft. The stern-gear usually allows the shaft to move axially in the bearings when this thrust is acting in both directions according to the direction of rotation of the propeller. A special heavy duty race in the aft end of the reverse gearbox (or reduction gear when this is fitted) absorbs the propeller thrust. When an engine is being fitted to a boat which was previously powered by an engine having a gearbox which was unable to withstand the propeller thrust, it will be found that a thrust block is included at the inboard end of the stern-tube. If it is desired to retain the thrust block it will be necessary with Parsons type reverse gears to change the usual thrust bearing provided to a standard journal type.

Final coupling up of sterngear to engine should never take place in wooden hulls until the vessel has been in the water for some days. As much as two or three weeks may be necessary for some hulls to take up their "wet" shape.

If there is more than say 6 ft. of unsupported tailshaft of small diameter, it may be advisable to fit a self-aligning bearing as a support. If in doubt on this point it can be left until after the initial trials when it will be soon be evident if whirling of the shaft is taking place.

### Water Connections.

Seacocks and strainers should be of the full flow type, and of a size at least equal to the inlet pipe of the seawater pump. The strainer should, where practicable, be of the type which may be withdrawn for cleaning whilst the vessel is under way. The water intake on the outside of the hull should not restrict the water flow. If an expanded metal or wire mesh type is used, the effective area should be greater than the bore of the intake pipe.

The recommended sizes of water pipes to and from the engines are given on the engine installa-

tion drawing. The engine connections are intended to be coupled to copper pipes by lengths of reinforced rubber hose and secured by hose clips. Solid connections should not be made as vibration can cause fracture. In cases where pipe lengths can be kept fairly short and out of harms way, sea water pipes can be of plastic.

Care should be taken not to use long lengths of soft rubber piping on the suction side of the water pump as, if the strainer should become partially blocked, the vacuum can cause the pipe to collapse with consequent loss of water delivery.

Where more than one engine is fitted it is important to have the water intake positions symmetrical about the keel, or if this is not possible, to ensure that the positions chosen given balanced intake flow conditions as unequal flows can cause variations in engine water temperature.

### Exhaust System.

If a water injection silencing system is fitted—and this is almost always desirable where a quiet installation is required, it is better to fit a mixing chamber of a recommended type than to take the water discharge straight into the exhaust pipe. A properly designed mixing chamber will prevent any possibility of water finding its way back to the engine when the vessel rolls heavily with the engine stopped (See fig. C.2). If, however, it is desired to fabricate the discharge fitting, the water entry should be at least 9 inches from the exhaust manifold flange. The exhaust pipe should run in a downward sweep from the manifold flange. See figure C.3.

Brass or copper is not acceptable for wet exhaust systems, as the combination of salt water and diesel exhaust gas will cause rapid deterioration. Iron fittings should be used, and with a mixing chamber fitted it is usually advisable to carry out the final run of pipe in rubber diesel exhaust hose.

With a dry exhaust system it is not wise to have long runs of pipe (which should again be iron for choice) through the after accommodation (1) because of the noise, which is much greater than that from a wet exhaust, and (2) because of the danger of fire from overheated pipes running behind panelling. A short run of pipe is much to be preferred with substantial length of water jacketing. When engines are flexible mounted it

## ENGINE INSTALLATION—C.4

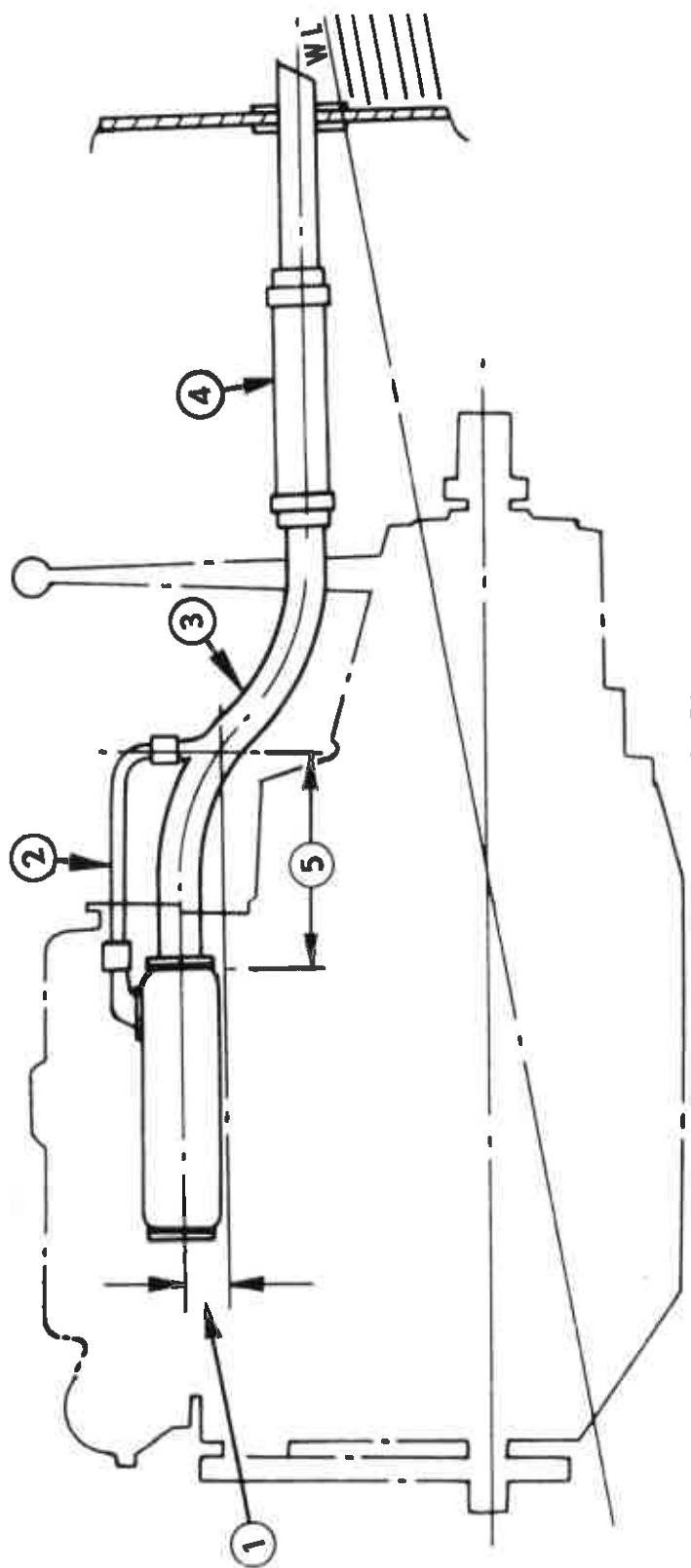


Fig. C.3  
Exhaust System with water injection bend.

1. 4 in. (100 mm) minimum.  
2. Cooling Water Discharge Pipe, 1 in. (25.4 mm) Dia.  
Minimum Bore.
3. 2½ in. (63.5 mm) O.D. Exhaust Pipe to be lagged  
from engine to at least 12 in. (300 mm) past water  
injection point.
4. Section of Diesel Exhaust Hose to be fitted in  
pipeline.
5. 9 in. (225 mm) Minimum)

## ENGINE INSTALLATION—C.5

is of course necessary to insert a section of flexible metallic pipe in dry exhausts, as the rubber exhaust used with wet systems cannot be fitted because of the heat. It is usually preferable to take the exhaust pipes through the hull just below the water line. Where this is not possible and the pipe has to rise above exhaust manifold level, provision must be made for draining water from the pipe.

On some boats it may be convenient to take the dry exhaust system up vertically from the engine to some point above the deck. When this is done a swan neck bend should be arranged at the bottom of the pipe with a drain plug so that rain water or spray can be drained off.

### Fuel System.

Fuel tanks should preferably be of plain steel or black iron; reinforced glass-fibre is also suitable. Galvanised or non-ferrous tanks are not recommended for storing diesel fuel. A sump for sludge and water must be provided with a drain tap or plug.

It is not necessary to mount the tank above the engine level as the fuel lift pump provided will raise the fuel up to 6 feet from the tank. As a rough guide to the size of tank required it can be assumed that the engine will consume about four-tenths of a pint of fuel per brake horse power per hour. If a tank is already installed above engine level it can be utilised in this position.

Great care should be taken to ensure that the fuel system is correctly installed so that airlocks are eliminated and precautions taken against dirt and water entering the fuel.

Two filters are provided with each engine. The first is a small glass bowl type which is either fitted to the engine fuel lift pump or supplied loose for attachment to or near the fuel tank. This serves as a water trap and is piped up between the fuel tank and the suction side of the fuel lift pump. The main filter is fitted between the fuel lift pump and injection pump and has a replaceable element — usually of the paper cartridge type.

As the lift pump has a capacity in excess of that required by the injection pump the overflow is piped up to the tank and should be connected as near the top of the tank as possible.

Fuel pipes are provided with some types of engine. They are usually either  $\frac{1}{2}$  in. or  $\frac{3}{4}$  in. outside diameter. Flexible connections should be used to prevent fracture and for short pipes it may sometimes be convenient to use a complete flexible pipe. Nylon piping has been successfully used in many installations.

Very long pipe runs tend to increase possibility of airlocks and should be avoided.

The introduction of extra filters can also lead to trouble especially overloading of the lift pump.

A typical fuel system is shown in fig. C.4.

### Electrical Equipment.

Starter batteries should be sited as close to the engine as possible, to avoid voltage drop through long leads. It is bad practice to use the starter batteries for other service in the boat unless these are light or very intermittent. In cases where there are substantial loads from lights, refrigerators, radio, echo sounders, etc., it is essential to have a completely separate system, and to provide charging current to this from an auxiliary generator driven from the power take off shaft at the front of the engine. Starter batteries must be of a type which permits a high rate of discharge. Two 6V 21 Plate 128 Amp-Hr. (10 Hrs) are recommended. The permissible Lamp Load is 9 Amps.

The total current requirements should be kept within the lamp load specified. On multi-engined boats one set of batteries per engine is recommended. The use of too large a battery can result in damage to the dynamo resulting from overheating during prolonged periods of charging at a high rate.

The standard dynamos supplied are not suppressed against radio interference. Engines can be supplied to special order with chokes and condensers fitted to the dynamo and regulator giving a degree of suppression. Further protection may be obtained by using screened leads and housing the regulator in a special enclosure. It is recommended that a specialist firm should be consulted in such cases.

4.270 Marine engines are wired up with an earth returned system as standard; insulated return wiring being available as an optional extra. Where the requirements of Lloyds, Bureau Veritas or the M.O.T. are to be met, an insulated return system

## ENGINE INSTALLATION—C.6

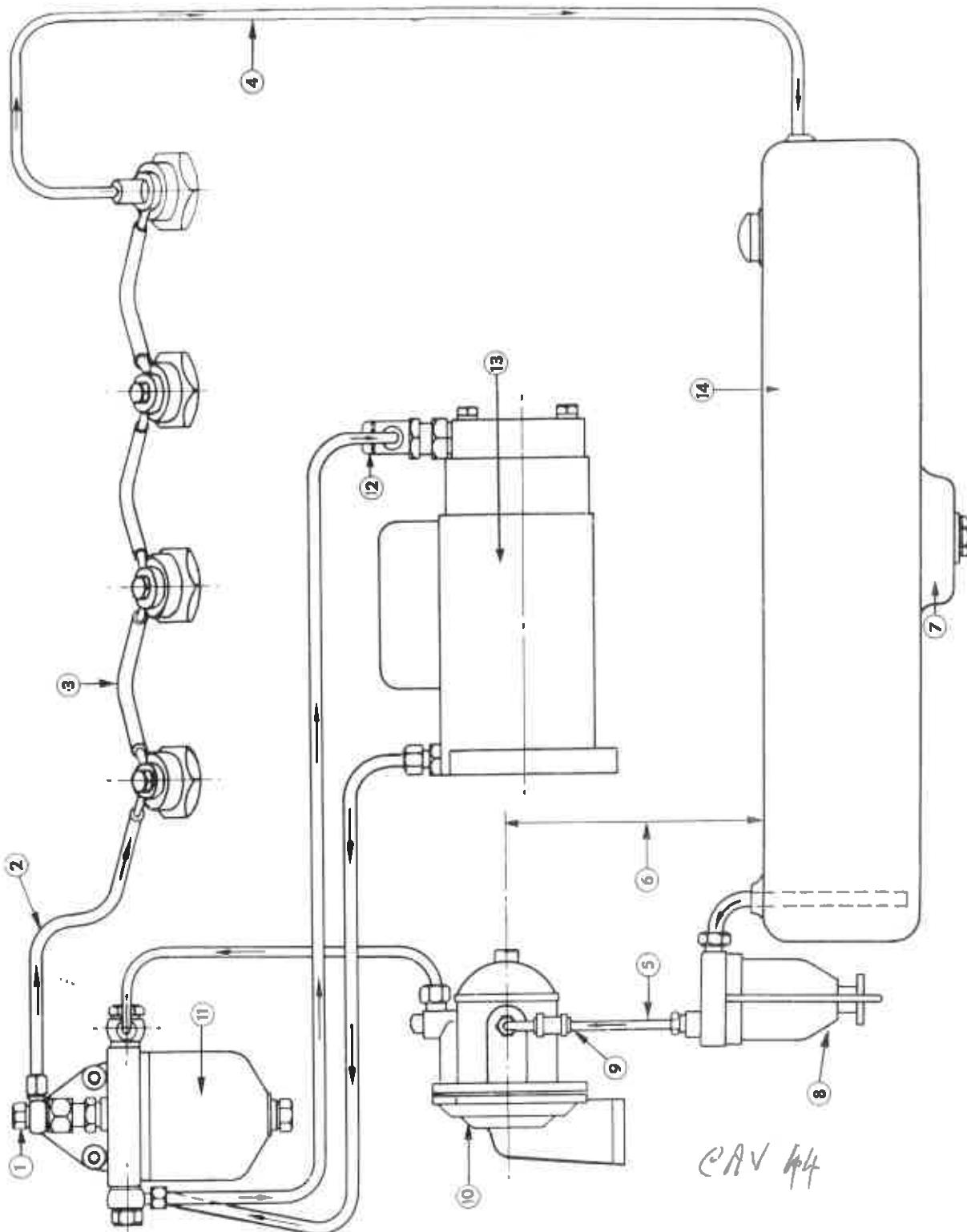


Fig. C.4. Fuel System.

1. Vent Plug.
2. Overflow from Fuel Filter.
3. Overflow from Atomisers.
4. 3/16 in. (4.7 mm) O.D. x 22 S.W.G. (.74 mm) Pipe.
5. These pipes to be supplied by boat builder. Recommended materials — Bundy tube or copper pipe. Pressure connections to engine supplied on pump and filter.
6. 6 ft. (1830 mm) Maximum below pump.
7. Sludge Trap.
8. Pipe Line Water Trap.
9. Pipe to be flexibly connected close to engine.
10. Fuel Lift Pump.
11. Fuel Filter.
12. Bleed Screw.
13. Fuel Injection Pump.
14. Fuel Tank. Recommended material—Terne Plate, plain or lead coated; Steel or reinforced glass fibre.

## ENGINE INSTALLATION—C.7

should be used. A typical wiring diagram is shown in figure C.5. SEE DIAGRAM. C8.

### Starting Aid.

To facilitate starting in cold weather a cold start device is fitted.

Fuel oil is automatically metered by a valve in the cold start device which is screwed into the air intake. The fuel oil container is mounted alongside the engine, connecting to  $\frac{1}{8}$  in. O.D. pipe which is usually provided with the engine as shown in Fig. C.6.

A Special starting switch is provided so that on starting from cold the key can be held in the "Heat Only" position for several seconds before engaging "Heat and Starter." The switch is spring loaded, returning to the disengaged position when pressure is released.

### Engine Controls.

Engines having oil operated gearboxes are equipped with a "single lever" throttle and gearbox control as an optional extra.

This system incorporates a self-contained control head which may be located on the engine or at the steering position, operating twin cables which are enclosed in flexible conduit and connected to the throttle and gearbox control levers.

For the engines fitted with manually operated gearboxes "single lever" controls are not suitable and separate controls for operation of throttle and gearchange lever must be provided. A force of from 30 to 50 lbs. (13.6 — 22.7 kg) is required at the end of the gearchange lever. If remote operating gear is to be fitted this must be extremely robust and it must be possible to select neutral accurately and "feel" the gear position.

Provision is made on all engines for a remotely operated stop control. This consists of a "push-pull" cable connected to a lever on the fuel injection pump which shuts off the fuel when it is desired to stop the engine.

### Instrument Panels.

These are usually optional items as some boat builders prefer to design their own panel to fit in with the space available or possibly to house other switches and equipment. With most engines there is a choice of cable and capillary lengths to suit

varying distances from engine to control position.

Standard Instruments include :

Tachometer.

Water temperature gauge.

Oil pressure gauge.

Ammeter.

Heater and starter switch.

Stop control.

Whether all or some of these items are supplied with the engine or not, the various pick-up points for these instruments are provided on all engines. The water thermometer is a direct reading mechanical type with the bulb screwed into the water outlet connection.

Where the instrument panel is located at too great a distance from the engine to enable the ordinary mechanical water temperature gauge and tachometer to be used, electrical types are available. These have the advantage that they may be duplicated; for example a panel may be situated in the engine room and another in the wheelhouse.

On some engines the panel may be fitted to the engine and when this is so it is recommended that the wiring loom should be purchased with the engine.

No particular problems arise in assembling the remote panel. Coils should be arranged in the pressure gauge pipe and temperature gauge capillary to prevent vibration causing "work-hardening" and subsequent fracture of the thin copper tubes. The tachometer cable should be arranged with large bends to minimise friction and the total number of bends should be minimised.

### Sound Proofing.

Sound insulation is important, and it is well worth while giving the subject special attention when completing an installation. There are various proprietary makes of sound absorbent materials produced in panel form, or double panels may be made up and packed with loose sound absorbing materials such as granulated cork, fibre-glass matting, balsa wood, etc. When the soundproofing is carried out, make sure that the panels are easily detachable to allow access to the engine for maintenance and servicing, and remember that the engine breathes a very large amount of air and

## **ENGINE INSTALLATION—C.S**

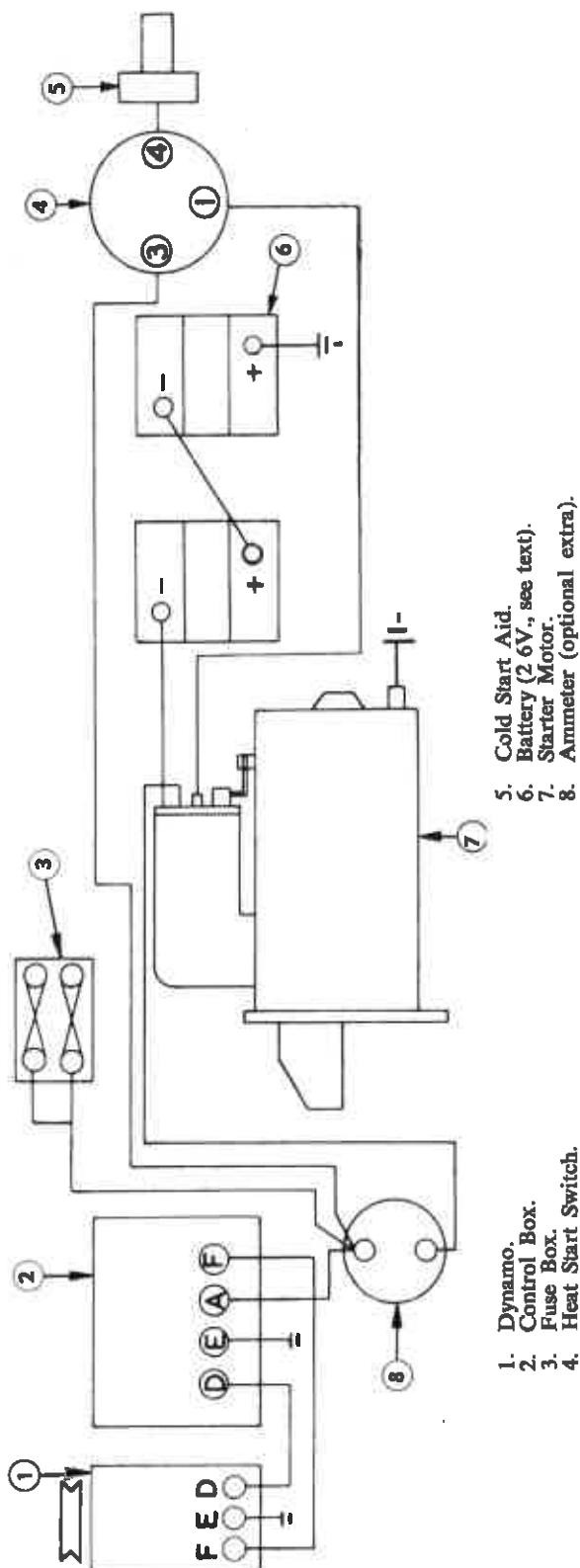


Fig C.5. Typical Wiring Diagram.

due allowance must be made for an uninterrupted flow.

## Air Cleaners.

The standard dry type air intake is suitable for all applications except canal or river work where dust may be present. In this case an oil bath air cleaner must be supplied.

## Bilge Pump.

Provision is made at the forward end of the engine for driving a bilge pump which can be supplied with the engine when required. It is necessary to make a suitable mounting bracket which can usually be bolted to the engine beds. Slotted holes should be provided for adjustment of the driving belt. On flexibly mounted engines the bracket should be attached to the engine.

## **Reverse Gear.**

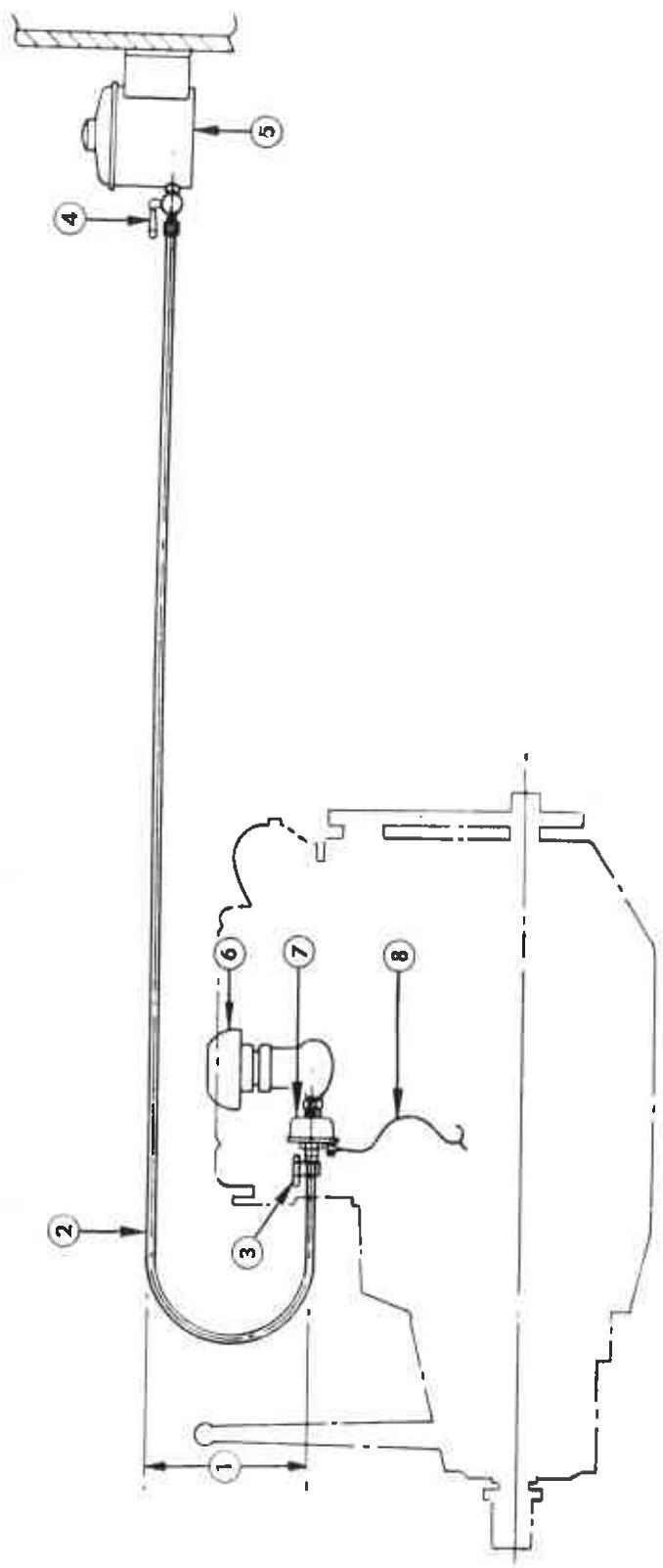
Two types of reverse gear are used and these are either manually or hydraulically operated. It should be noted that the hydraulic type lends itself much better to remote control.

When oil operated reverse gears are used on auxiliary yacht installations, it should be noted that, after trailing the propeller for 12 hours, it is necessary to run the engine for a few minutes in order to lubricate the running gear of the gearbox. In the case of Parsons type F gearboxes, the propeller can trail for any period of time, as long as the gearbox oil is maintained to the top dipstick mark.

**Vee-Drive.**

When this form of transmission is used it is advisable to use flexible couplings or universal joints between the engine end and the "V" drive unit. The latter are essential when the engine output coupling is not on the same axis as the input coupling of the Vee-drive. It should be noted that the axis of the engine and vee-drive input shaft should be parallel.

As the vee-drive will usually have a thrust bearing designed to absorb the propeller thrust, it is necessary for the bearing in the reverse gearbox to be a journal type which does not require thrust for centralisation. This only applies to Parsons gearboxes — all other types supplied have dual purpose bearings fitted.



**Fig. C.6. Cold Starting Equipment.**

1. 12 ft. (300 mm) Maximum, 4 ft. (109 mm) Minimum.
2. Fuel Pipe 3/16 in. (4.75 mm) O.D.
3. (Also 4). Fuel Cocks. These may be left on as fuel is metered by Cold Starting Aid Valve.
4. Mini-fuel Container.
5. Air Intake.
6. Cold Start Aid.
7. Cable to Heater Switch.

ENGINE INSTALLATION—C.10

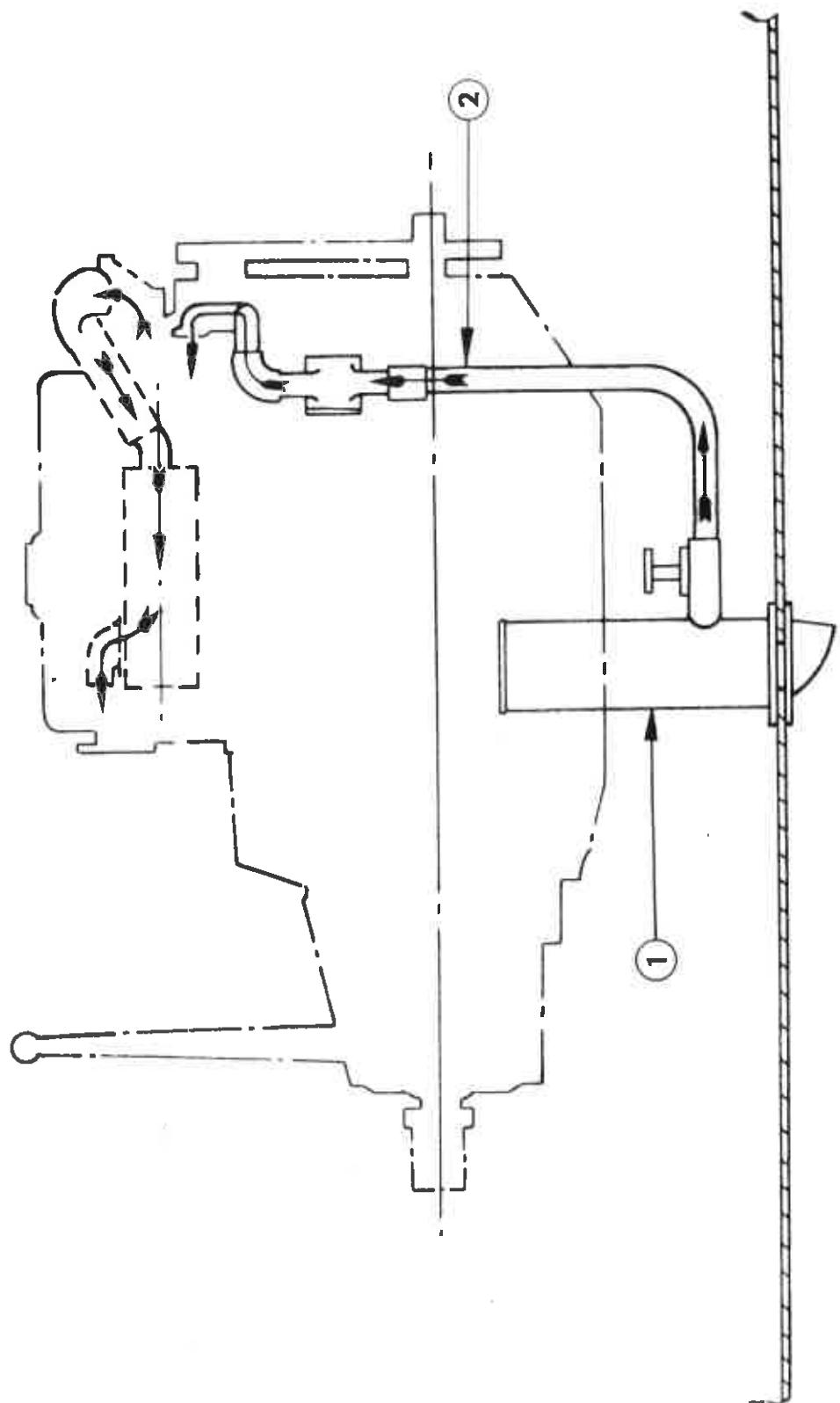


Fig. C.7. Direct Cooling System.  
1. 1 in. Seacock and Strainer incorporating a Weir  
Trap.  
2. Inlet Pipe to Water Pump, 1 in. (25.4 mm) Min-  
imum Bore. Inlet pipe to be flexibly connected at or  
near to engine

The casing of the vee-drive will usually require a supply of cooling water from the engine. This is best taken from the engine water outlet before piping into the water injection silencer. Alternatively the vee-drive can be piped up on the suction side of the sea water pump.

Where keel cooling is employed and no sea water pump is used the vee-drive may be piped up on the return pipe from the keel pipes to the engine.

All engines may be fitted with some form of power take-off at the front end of the crankshaft. This is a 2 in. (50 mm) dia. steel shaft extending forward of the timing case to which the customer may attach his own pulleys or flexible coupling. When pulleys are used, the overhang must be minimised and if in doubt on this point it should be referred to Perkins Engines Limited for approval. The use of the flexible engine mountings makes the provision of a power take off drive more difficult — it being necessary to use a flexible coupling driving the winch, etc., in tandem with the engine.

The following maximum torques can be taken from the power take off shaft :

$$\begin{aligned} \text{B.H.P.} \\ (\text{Torque in lbs. ft.}) &= \text{_____} \times 5253 \\ \text{R.P.M.} \end{aligned}$$

Cast iron crankshaft pulley—45 lbs. ft. (6.2 kg/m).  
Steel crankshaft pulley—150 lbs. ft. (20.7 kg/m.)

### Cooling Systems.

Perkins engines may be supplied with alternative cooling systems as follows :—

- (a) Direct Sea water.
- (b) Indirect fresh water (heat exchanger).
- (c) Indirect fresh water (keel pipes or skin tanks).

Direct cooling (See Fig. C.7) has little to recommend it beyond the lower initial cost, for although the system is a simple one it is not practicable to operate engine cooled by this method at anything approaching the correct working temperature of 170°F. (77°C.). Normally the temperature will remain around 90°—100°F (32°—38°C.) and even with a special thermostat and by-pass fitted, the temperature may not be raised beyond 120°F. (49°C.) due to scale which will be formed in the water passages. This in turn will bring about local overheating and atomiser troubles. Engines wear is considerably heavier with direct sea water cooling,

and oil sludging is increased. It is noticeable that engine running too cold with direct cooling are noisier than when running at the correct temperature. If an engine is to be used for less than 100 hours a season, then direct sea water cooling may be justified to save initial cost, but not otherwise.

Indirect fresh water cooling by means of a heat exchanger consists of a closed fresh water circuit around the engine, and part of the heat exchanger unit, and a salt water open circuit through the other part of the heat exchanger unit (See Fig. C.8). The salt water discharge can of course, be used for normal water injection into the silencing system. A thermostat is fitted in the fresh water circuit of this system which keeps the outlet temperature at approximately 150°—180°F. (65°—82°C.). Two water pumps are used.

Indirect fresh water cooling by means of keel pipes is a simplified version of the heat exchanger system described above (See Fig. C.9). In this case we have the same closed circuit of fresh water around the engine, oil coolers, manifold, and possibly a water jacketed silencer, a thermostat to control the water temperature and a small header tank. The heat is extracted from the fresh water by extending the circuit to include a pipe or pipes fitted outside the hull, usually in the angle between the keel and the garboard strake, and of length and diameter to suit the particular engine. One pump only is used with this system but it must be noted that there is no water discharge for wet silencing systems, and if a wet exhaust is to be used, a separate pump must be fitted to provide the water discharge. It should be remembered that it will not be possible to completely drain off the water in winter and antifreeze must therefore be used. See page G.3.

In certain circumstances it may be possible to use thin tanks built onto the inside skin of a metal hull. In this case the system is similar to keel pipes but the skin of the boat provides the necessary area for heat dissipation.

The neoprene impellers fitted in these pumps depend on water circulation for lubrication, and when engines are in transit or standing for any appreciable length of time whilst awaiting installation, or when laid up during the winter season, the pumps will dry out, and there is then a tendency for the impeller to stick to the body of the pump. This can cause failure of the impeller

## ENGINE INSTALLATION—C.12

bonding, or broken blades immediately the engine starter is operated.

To prevent this happening, it is recommended that the water pump outlet hose be disconnected and a small quantity of glycerine or melted Marfak 2HD grease poured into the pump, the engine then motored over on the starter. This will ensure

that the impeller does not stick to the body of the pump and at the same time provide adequate lubrication until the pump is again primed with water.

On new and reconditioned engines this treatment is carried out before the engine leaves our works, and is usually effective for about three months.

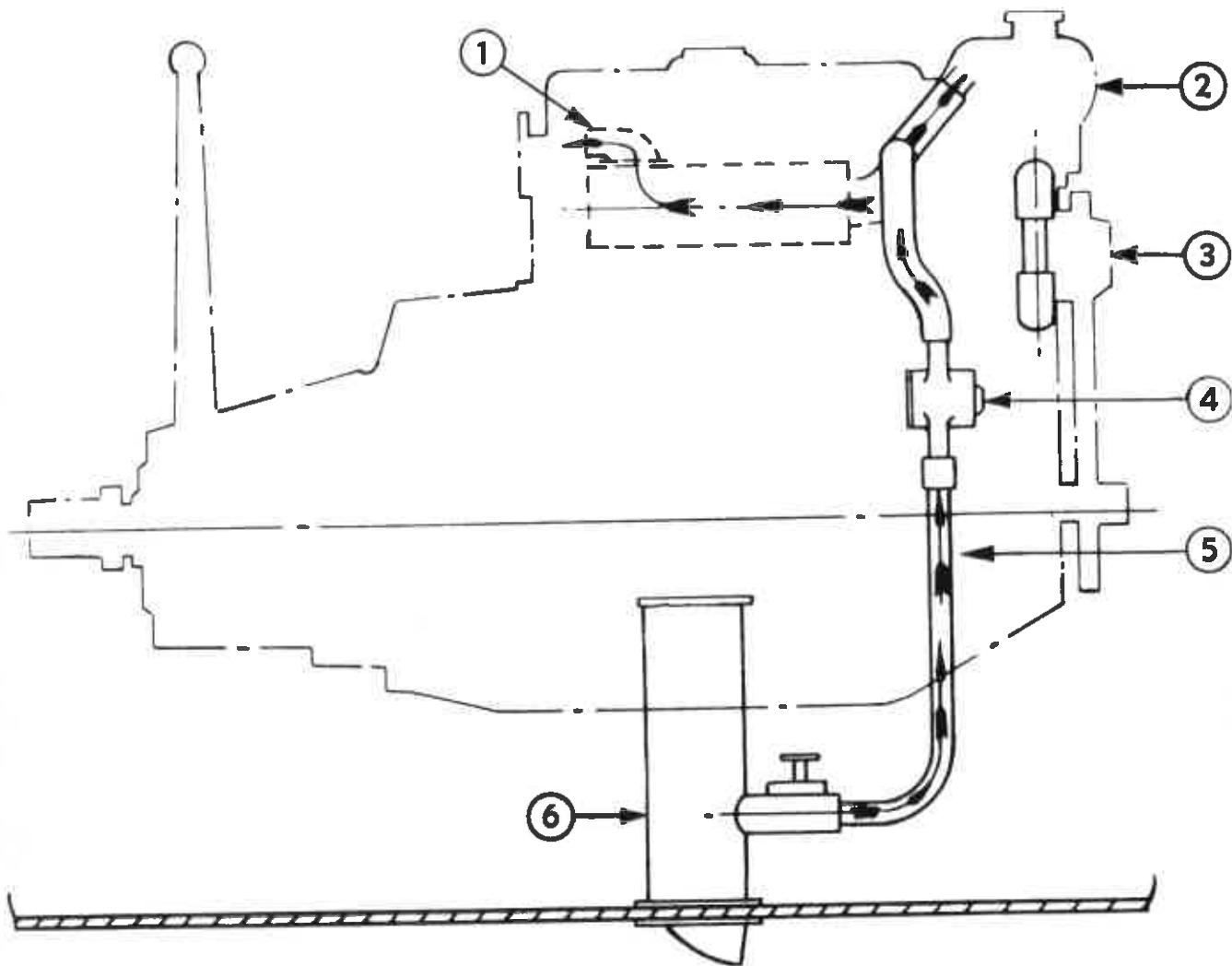


Fig. C.8. Heat Exchanger Cooled System.

1. Sea Water Discharge from Exhaust Manifold. 1 in. (25.4 mm) Minimum Bore.
2. Combined Heat Exchanger and Oil Cooler.
3. Fresh Water Pump.
4. Sea Water Pump.
5. Inlet Pipe to Water Pump. 1 in. (25.4 mm) Minimum Bore. Inlet pipe to be flexibly connected at, or near to engine.
6. 1 in. Seacock and Strainer incorporating Weed Trap.

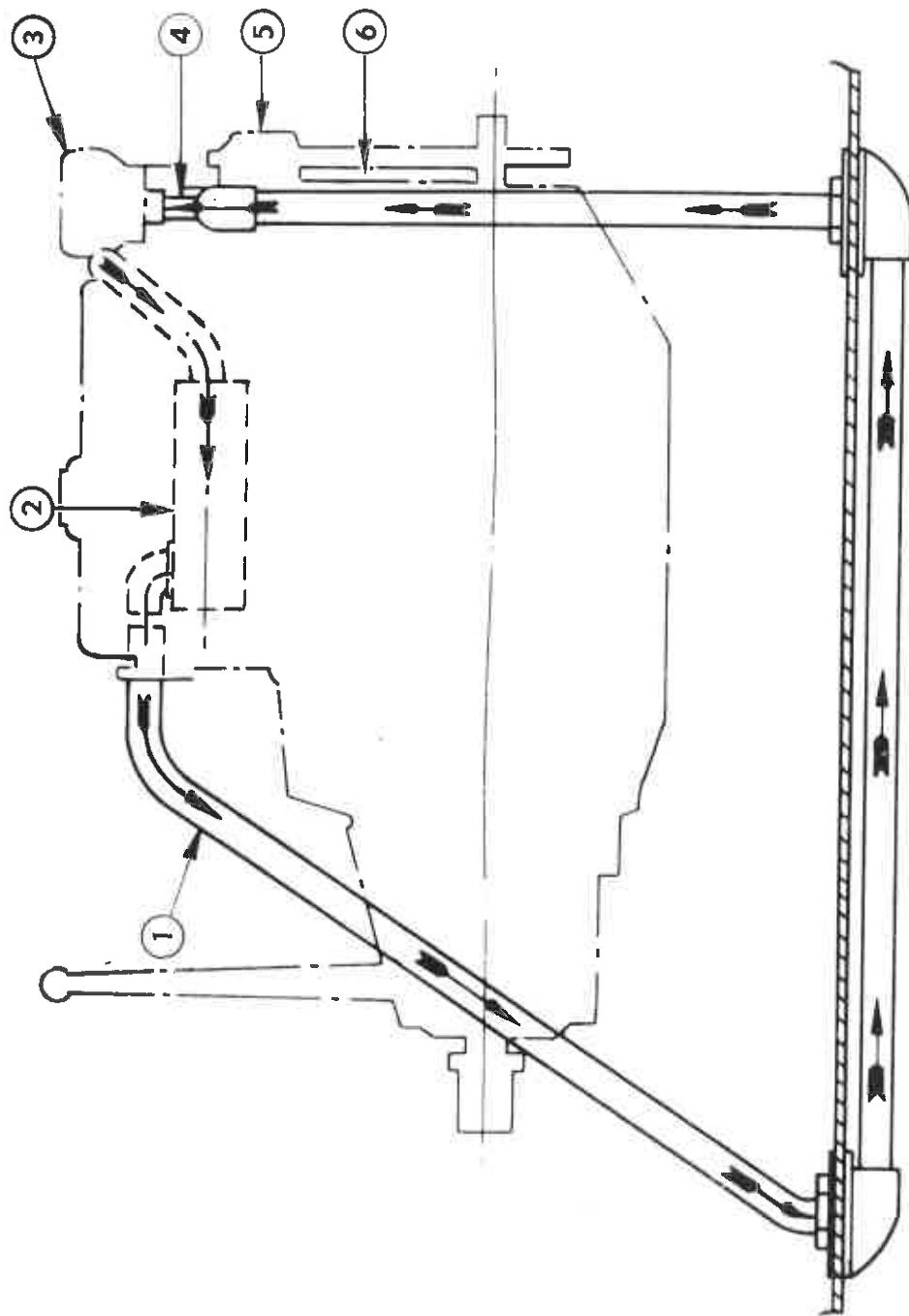
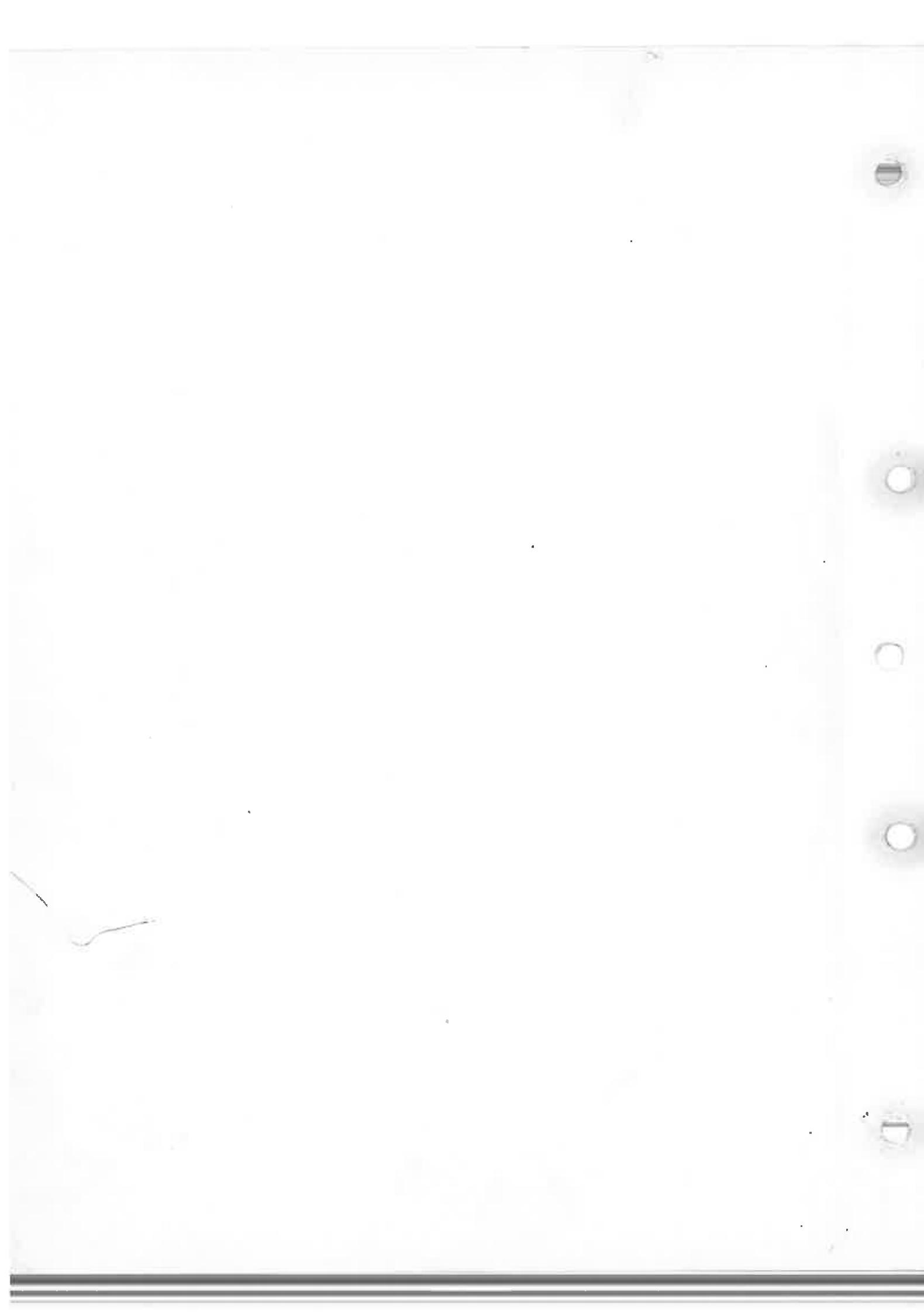


Fig. C.9. Keel Cooled System.

1. Water Pipe to Skin Fitting. 1 in. (25.4 mm) Bore  
Water pipes to be flexibly connected at, or near to  
engine.
2. Exhaust Manifold.
3. Lubricating Oil Cooler and Header Tank
4. By-pass Pipe.
5. Water Pump.
6. Return Pipe to Engine. On engines fitted with oil  
operated gearboxes, inlet pipe to be connected to  
gearbox.



# STARTING THE ENGINE (D)

## Preparation for Starting.

Check the header tank water level.

Check the engine sump oil level.

See that there is fuel oil in the tank.

Check that the starter battery is fully charged and that all electrical connections are properly made and all circuits in order.

## Priming the Fuel System.

In the case of a new engine or an engine which has been standing idle for any length of time, it is important that the fuel system be "bled."

To bleed the system, proceed as follows :—

Slacken the air vent screw (A) on the front side of the governor control cover. (Fig. D.1).

Slacken the bleed screws (B) on the side of the pump body. (Fig. D.1).

Unscrew, by two or three turns, the vent plug

(D) on the top of the filter cover (not the return pipe to the tank). (Fig. D.2).

Operate the priming lever of the feed pump, and when fuel, free from air bubbles, issues from each venting point, tighten the screws in the following order :—

1. Filter cover vent screw (D). (Fig. D.2).
2. Bleed screw (B). (Fig. D.1).
3. Governor vent screw (A). (Fig. D.1).

Slacken the pipe union nut (C) (Fig. D.1) at the pump inlet, operate the priming device and retighten when oil, free from air bubbles, issues from around the threads, or bleed screw.

Slacken the unions at the atomiser ends of two of the high pressure pipes, either Nos. 1 and 3, or Nos. 2 and 4.

Set the throttle control at the fully open position and ensure that the "stop" control is in the "run" position.

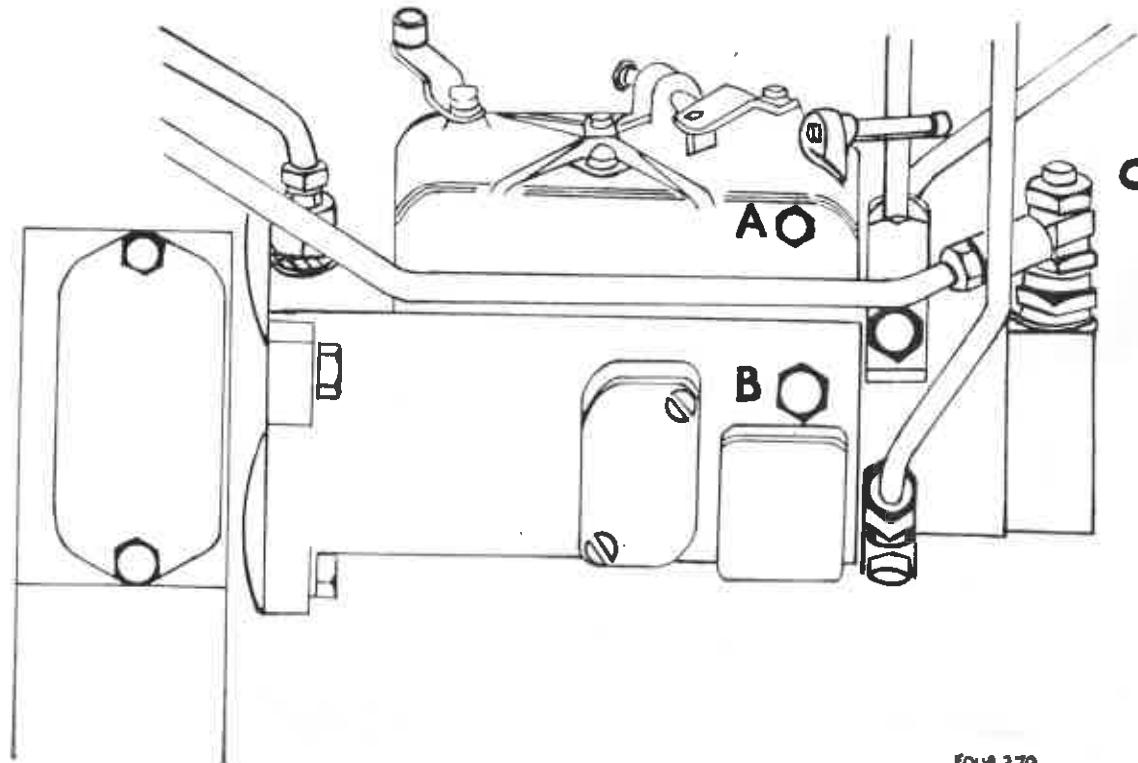


FIGURE 270

Fig. D.1. (Mechanical Governor).  
Diagram of distributor type fuel injection pump.

## STARTING THE ENGINE—D.2

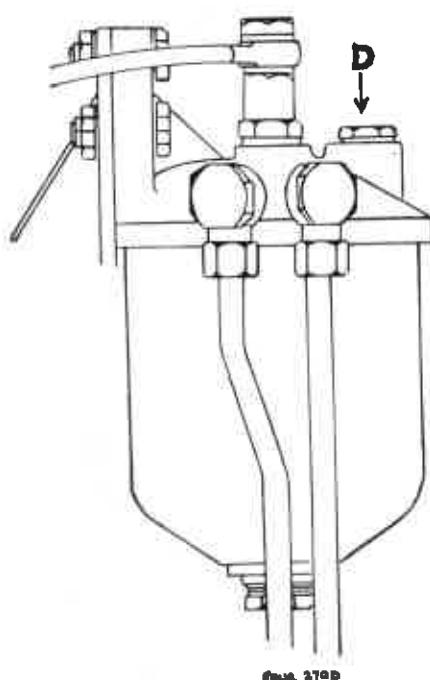


Fig. D.2. Final Fuel Filter.

Turn the engine until fuel oil, free from air bubbles, issues from both high pressure pipes.

Tighten the unions on the high pressure pipes, and the engine is ready for starting.

It should be noted that if the cam driving the fuel lift pump is on maximum lift, then it will not be possible to operate the hand primer. If such a condition arises, then the engine should be turned until the hand primer can be operated.

### Starting the Engine.

If the engine is warm and has only been stopped for a little while, place the throttle control in the fully open position and engage the starter motor by turning the starter switch in a clockwise direction. (See Fig. D.3).

If the battery is well up, enough to turn the starter motor quickly, the engine should start.

### Cold Starting Aid.

Referring to Figs. D.4 and D.5 the unit consists of a core (3), a solenoid (6) a spring loaded plunger (4) fitted with a special rubber insert (5) which abuts on a valve seat (7). The coil carrier (8) bears two heater coils (9, 10) and a circular shield surrounding the coils has large perforations (11) on one side, small perforations (13) on the other and a small flange (12) running along its outer surface.

Gravity fed fuel oil fills the adaptor (1), filter (2) hollow plunger (4) and the groove in the surface of the plunger. When the switch on the application control panel is operated, the solenoid (6) and coils (9, 10) are energised. Magnetism induced in the plunger (4) and adaptor (1) by the solenoid draws the plunger and rubber insert off the valve seat (7). Fuel oil then flows at a controlled rate along and around the coil (9) which causes the liquid to be vapourised. (Coil (10) reaches the ignition temperature of the fuel vapour.

As soon as the engine is turned over by means of the starter motor, fresh air drawn into the inlet

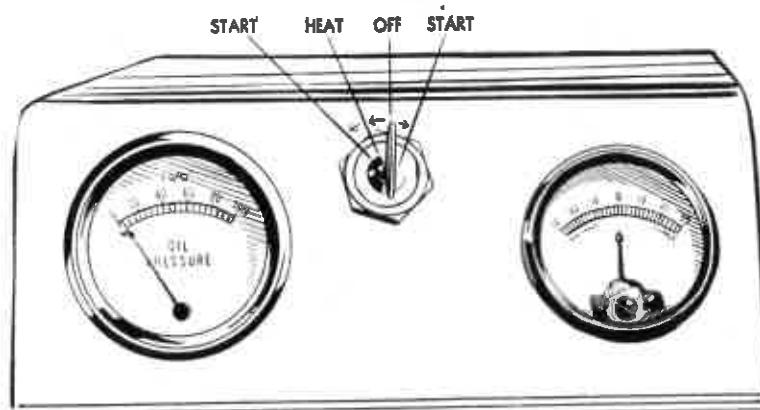


Fig. D.3.  
Heat/Start Switch.

## STARTING THE ENGINE—D.3

manifold enters the circular shield through the small perforations (13) and mixes with the vapourised fuel within. The resultant mixture is ignited by the coil (10) and so heats the air to facilitate combustion by promoting easier ignition of the fuel injected into the engine cylinders.

The flange (12) running along the outer surface of the shield provides a sheltered zone around the outlet holes (11) and protects the flame from the incoming air stream.

### Maintenance.

Very little attention is required by the unit, but no reconditioning is possible. When in service the unit should be occasionally checked to ensure that it is firmly screwed and located in the manifold, with the arrow on the casing pointing in the direction of the airflow. It should also be ensured that the electrical lead wire is tightly fixed to the terminal, that the fuel banjo is tight and that there is no leakage.

To clean the unit, remove connections and withdraw from the inlet manifold. Wash components in petrol, kerosene or spirit and brush off any carbon which may have accumulated on the circular sheath, ensuring that all holes are clear.

While no mechanical attempt should be made to remove or clean the internal filter (2), compressed air may be used to remove any foreign matter which may have been extracted from the fuel oil.

Dry the dismantled components and before reassembling, examine the plunger (4) and rubber insert (5). Should there be any apparent damage, particularly in the case of the rubber insert, the whole assembly must be rejected and replaced by a new unit.

### Using the Equipment.

To start the engine, proceed as follows :—

1. Ensure the engine stop control is in the "run" position.
2. Turn on fuel supply tap to cold starting aid in induction manifold.
3. Turn switch in anti-clockwise direction to "heat" position for ten seconds (15 seconds in winter). See Fig. D.3.
4. With the throttle control in fully open position, turn switch a further anti-clockwise movement, thereby engaging the starter motor.

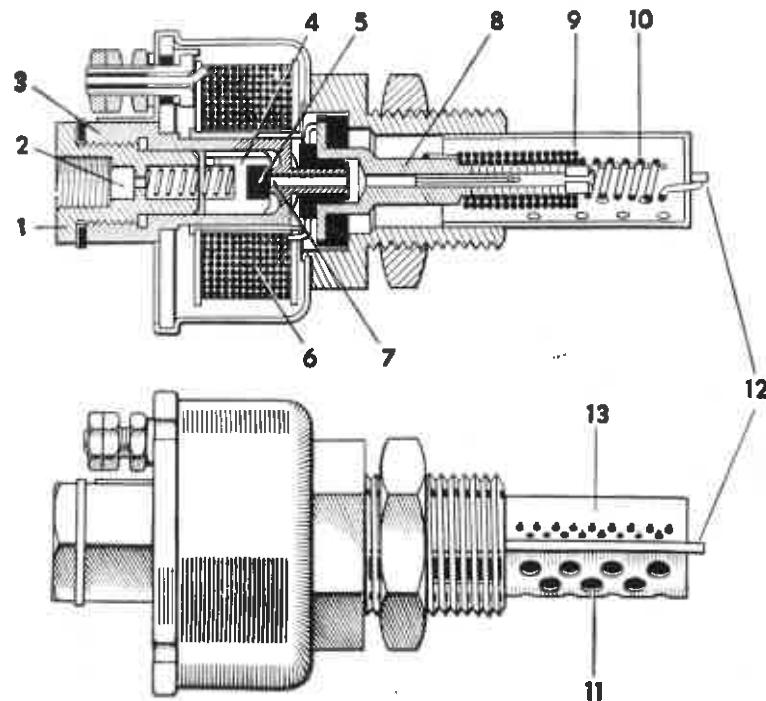


Fig. D.4 and D.5.  
Cold Start Aid.

## STARTING THE ENGINE—D.4

If the engine does not start after 15 seconds, return switch to "heat" position for five seconds and then re-engage starter motor.

As soon as the engine starts, the switch should be returned to the "off" position, and the tap on the cold starting aid turned off.

### Things to Note.

Always be sure that the starter pinion has stopped revolving before again re-engaging the starter, otherwise the ring or pinion may be damaged.

Ensure that the electrical connection to the cold starting aid is correctly made.

Always ensure that the reservoir feeding fuel to the cold starting aid is fully primed and not leaking.

In the event of difficult starting, check that fuel is reaching the cold starting aid in the induction manifold by unscrewing the inlet fuel union. If fuel is reaching it satisfactorily, then it may be that the cold starting aid itself is not working correctly. This can be checked by removing the air cleaner and watching the cold starting aid while the equipment is used. When the starting switch is turned to the heat position, the element should become red hot and on engagement of the starter motor, it should burst into flame.

The 4.270 Marine engine is fitted with efficient cold starting equipment and no responsibility can be accepted for any damage arising from the use of unauthorised starting aids.

# FAULT FINDING (E)

## DIFFICULT STARTING

### No Fuel at Atomisers :—

- (a) No fuel in tank.
- (b) Fuel lift pump not working.
- (c) Slack connections in the fuel system.
- (d) Air in the fuel system (Trace from fuel tank via the lift pump to the atomisers).

Go over the whole of the above and make sure that the atomisers are fully primed.

### Engine not being turned over quickly enough. (Particularly in cold weather).

- (a) Incorrect grade of lubricating oil. (See appendix).
- (b) Battery not fully charged. Fit fully charged battery.
- (c) Engine "gummy" due to standing in the cold.

Use the cold starting equipment (if fitted).

### Atomisers Faulty.

If, when it is certain that there is no air in the fuel system and that fuel is reaching the atomisers, and you suspect a faulty atomiser, take it out for examination.

If in doubt as to the particular atomiser which is faulty, try the method similar to that used on petrol engines to find a faulty sparking plug. Here each plug is shorted in turn until one is found which, when shorted, does not slow the engine. That is the faulty plug.

So with the atomisers.

Slacken off the union nut on the atomiser end of each fuel pipe, one at a time, with the engine running at fast idling speed.

This prevents fuel being pumped to the nozzle of that particular atomiser.

Do this with each atomiser in turn, tightening the union of one before proceeding to the next.

Keep the engine idling all the time and note the effect of cutting out an atomiser.

If cutting one particular atomiser out has no effect on the running, that is the faulty one.

Remove the suspected atomiser from the cylinder head and test as on page U.4.

**Disconnect pipes on other atomisers while making this test.**

### Sticking Valves.

Trouble with sticking valves may be due to overheating, the result of choked atomisers, or the use of unsuitable lubricating oil.

Test the atomisers as recommended in Section U and clean them if necessary.

The lubricating oil used should be of an approved type. (See appendix).

### Sticking Rocker.

If the rockers stick the cause may be : the use of unsuitable oil, shortage of oil, or sludging. Use only oil of an approved type. (See appendix). If there is a shortage of lubricant, the passages and pipes to the rockers should be checked.

### Fuel Oil.

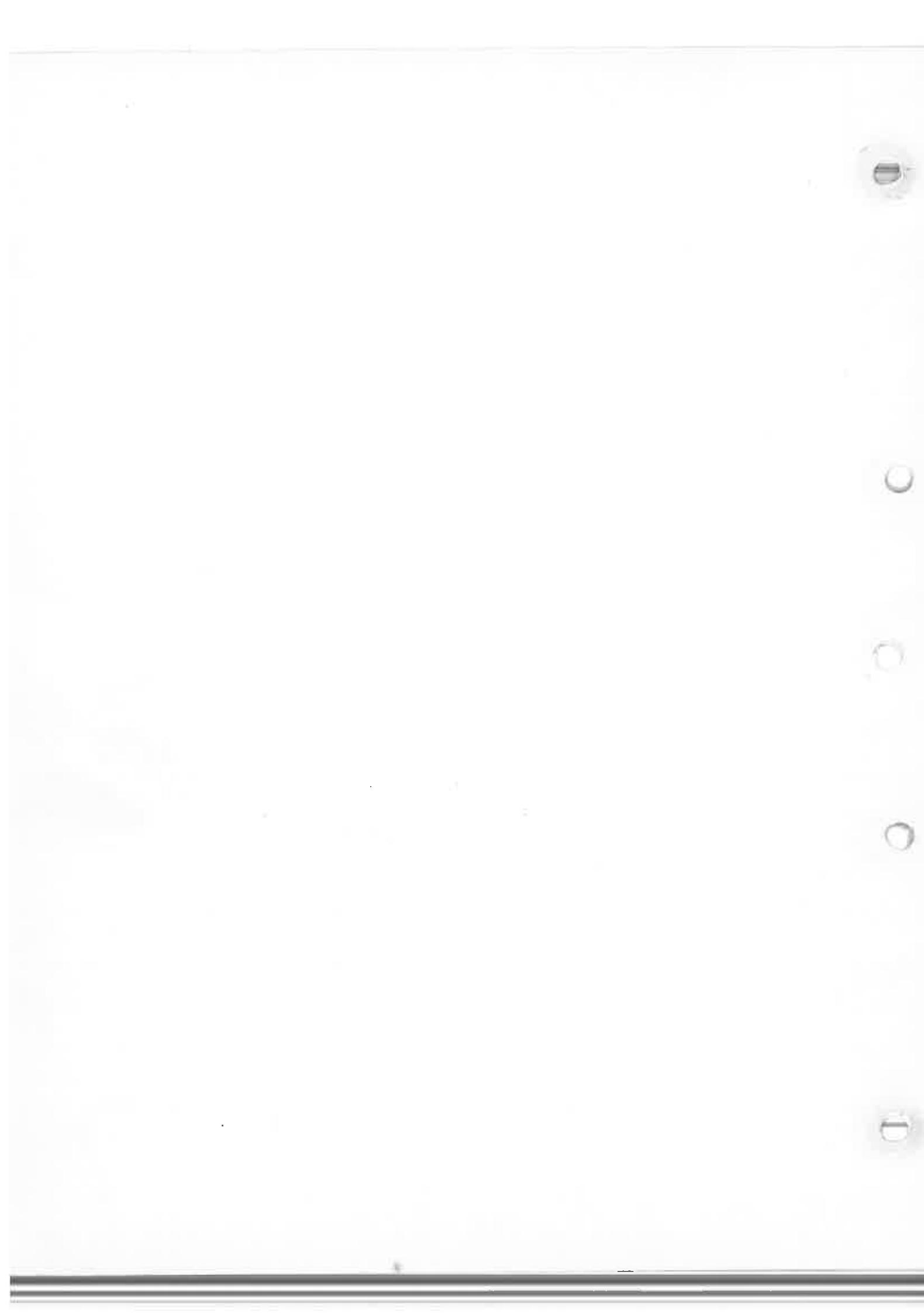
It is essential to use clean fuel oil free from water, dirt, or sand. The recommended specification for fuel oil is given on page U.1. Providing clean fuel is used, no trouble should be experienced with the fuel system but dirty oil will lead to trouble due to choked filters, damaged fuel pump and atomisers. If the engine tends to run well for a short period and then to die away or stop altogether, the fuel system should immediately be suspected. The trouble may be due to the lift pump not working properly, to a loose pipe joint allowing air to get into the fuel system, to a dirty fuel filter, or to a choked fuel pipe. The filter in the fuel lift pump should be cleaned by washing in clean fuel oil, but the final filter should not need attention more than once in 1,000 hours, when a completely new filter element should be fitted. If the conditions lead to dust or contamination of the fuel, decrease the maintenance interval.

Always, after disturbing fuel line washers, replace with new washers to ensure the joints are air tight.

### Air Cleaner.

In accordance with periodical attentions, Section G, clean the filtering element in kerosene.

Ensure the kerosene is well drained or blow off the filtering element before re-assembling.



## DO AND DO NOT (F)

### DO KEEP THE ENGINE CLEAN.

DO keep this book where it is conveniently accessible.

DO pay particular attention to lubrication.

DO use only approved grades of lubricating oil.

DO use only GENUINE PERKINS PARTS.

DO keep all bolts and nuts tight.

DO eliminate all air from the fuel system and keep all fuel oil unions AIR-TIGHT.

DO examine engine oil level in sump daily and replenish if necessary.

DO completely change engine oil in accordance with periodical attentions, Section G.

DO renew element in lubricating oil filter in accordance with periodical attentions, Section G.

DO check oil flow to rocker shaft and examine the valve springs in accordance with periodical attentions, Section G.

DO use only filtered fuel oil. Never tip into the tank a half-empty barrel of fuel oil, the bung of which may have been out for weeks.

DO keep a check on the cooling water temperature. It must not be allowed to boil. The normal running temperature is 170°F. (77°C.) for closed circuit systems, but where a pressurised filler cap is fitted, then the coolant temperature will be slightly higher. The maximum running temperature for direct cooled systems is 120°F. (49°C).

DO attend immediately to fuel and lubricating oil leaks.

DO grind in valves when necessary.

DO check tappet clearance from time to time (.010 in. or .25 mm) with warm engine.

DO tighten cylinder head nuts in correct order (See Fig. J.11) and to the correct torque (page B.1).

DO quote engine number when ordering parts.

DO keep essential parts in store.

DO drain cylinder block if engine is being left idle in frosty weather (drain tap on fuel pump side of block).

DO remove header tank filler cap when draining pressurised water systems.

DO close these drain cocks and refill with water before attempting to re-start next morning.

DO when in doubt read this Manual.

DO NOT guess. For additional information contact the suppliers of the engine.

DO NOT neglect the routine attentions specified in Section G.

DO NOT store fuel oil in a galvanised container.

DO NOT race the engine in neutral.

DO NOT run the engine unless the gauge shows OIL PRESSURE.

DO NOT unnecessarily interfere with any adjustments.

DO NOT break the fuel pump seals—remember, if broken your Guarantee may be void.

DO NOT continue to run the engine if the cooling water boils.

DO NOT forget to keep the dynamo belt adjusted.

DO NOT continue to run the engine if black smoke is coming from the exhaust.

DO NOT if the engine stops without apparent reason, fail to make sure first of all that fuel is reaching the fuel pump.

DO NOT omit to wipe the engine over occasionally with a clean rag.

DO NOT take the fuel pump to pieces.

DO NOT use cotton waste or any fluffy cloth when cleaning.

DO NOT subject the engine to continuous overloading.



# PERIODICAL ATTENTIONS (G)

## POST - DELIVERY CHECKOVER.

After a customer has taken delivery of his Perkins diesel engine, it is advisable, in his own interest, that a general checkover of the engine be carried out after the first 25 hours in service.

It is also recommended that this following procedure be adopted where an engine has been laid up for a considerable period, before it is again put into service.

This check over should comprise the following points :—

1. Drain lubricating oil sump and re-fill up to the full mark on the dipstick with new clean oil (Do not overfill).
2. Check and if necessary adjust slow running speed.
3. Check external nuts for tightness.
4. Check and adjust valve clearances (.010 in. or .25 mm hot).
5. Check fuel pipes from tank to fuel injection pump for leaks.
6. Check for lubricating oil leaks, and rectify if necessary.
7. Check cooling system for leaks and inspect header tank water level.
8. Check dynamo belt for tension.
9. Check engine mounting bolts for tightness.
10. Carry out load test to check general performance of engine.

It is advisable to check the cylinder head nuts for correct torque tightening (See page B.1).

Thereafter maintenance periods should be in accordance with the following instructions.

It is assumed that electrical equipment will have already been checked for such points as dynamo rate of charge, effectiveness of connections and circuits, etc.

## Keep Engine Clean

### DAILY

- Check oil level in sump and gearbox.
- Check cooling water circulation.
- Check lubricating oil pressure.
- Check water level in header tank of heat exchanger when fitted.

## EVERY 50 HOURS

Turn screw greaser on tachometer drive connection and replenish where necessary.

Clean gearbox oil filter (hydraulic type gearbox only).

Check, and if necessary, top up batteries with distilled water.

## EVERY 100 HOURS

Check oil level in reduction gearbox where fitted.

Lubricate and examine adjustment of single lever throttle control (if fitted).

Clean filter in lift pump.

Check oil flow to rocker shaft.

Examine valve springs and check valve clearance.

Examine and clean water inlet weed trap and strainer (when fitted).

Examine engine holding down bolts.

Drain oil from sump and fill with new lubricant.

Renew element in lubricating oil filter.

Clean water trap fuel filter.

Unscrew drain plug on final fuel filter, replace when clean fuel appears.

## EVERY 200 HOURS

Clean air filter gauze.

## EVERY 500 HOURS

Clean and check atomisers.

Clean gauze trap in lubricating filler body.

## EVERY 1,000 HOURS

When fitted, examine heat exchanger for scale formation and de-scale if necessary.

Inspect commutators and brushes of dynamo and starter motor.

Renew element in final fuel filter.

## Whenever Engine is removed from Boat.

Clean sump strainer.

Clean out fuel tank.

## PERIODICAL ATTENTIONS

### PRESERVATION OF LAID UP ENGINES

Where a craft which is powered by a Perkins engine is to be laid up for several months it is advisable that some measure of protection be afforded the engine to ensure that it suffers no ill effect during the intervening period before operations are recommended.

It is recommended, therefore, that the following procedure be adopted and applied immediately the unit is withdrawn from service.

1. Thoroughly clean all external parts of the engine.
2. Run the engine until well-warmed through. Stop the engine and drain lubricating oil sump.
3. Drain water from engine cylinder block.
4. Remove and renew lubricating oil filter element.
5. Clean out engine breathing system.
6. After replacing filters, fill sump to correct level with clean, new lubricating oil or with a suitable preservative fluid.
7. Remove atomisers and spray into cylinder bores a  $\frac{1}{2}$  pint (.14 litre) of lubricating oil divided between the cylinders.
8. Replace atomisers and turn engine slowly over compressions.
9. Remove air cleaner and any intake pipe which may be fitted between the air cleaner and air intake. Carefully seal air intake orifice with waterproofed adhesive tape or some other suitable medium.
10. Remove exhaust pipe and seal opening in manifold as in '9.'
11. Disconnect battery and store in fully charged condition. Before storing, the battery terminals should be greased to prevent corrosion.

The fuel system may either be drained and charged with a suitable preservative or alternatively, it may be left primed with normal fuel oil.

Where the latter course is taken, it should be noted that deterioration of the fuel oil may be occasioned during the months the application is idle.

If this occurs, the fuel oil may become contaminated with a wax-like substance which will quickly clog the fuel filtering arrangement once the engine is returned to service.

Therefore, before recommencing operations in respect of a unit primed with normal fuel oil which has lain idle for several months it is recommended that the fuel tank be drained and the interior of the tank thoroughly cleaned. The fuel oil drained off should be discarded as unfit for further use.

Fuel oil contained in the remainder of the fuel system should also be dispelled and the paper element in the final fuel filter renewed, following which, the system may then be re-charged with fresh, clean fuel oil.

Preparations for starting the engine should then be in accordance with the procedure detailed in Section "D."

#### NOTE :—

Where a preservative is used in the lubricating oil sump, this should be drained off and replaced by normal lubricant prior to re-starting the engine at the end of the storage period. In the case of a preservative being utilised to charge the fuel system this need not necessarily be drained off before returning the engine to service. Therefore, when a preservative is used in this respect the relevant manufacturers of the fluid should be contacted, seeking their guidance as to whether their product should be drained away prior to re-starting the engine.

Where applicable, the end plate of the sea water pump should be removed to allow drainage of any water trapped between the blades of the impeller. After the pump has been drained, the impeller should be lubricated with Marfak 2HD Grease, after which the impeller should be turned to ensure penetration of the grease. When the engine is put back into service, under no circumstances should it be run with the interior of the water pump dry.

## FROST

Precautions against damage by frost should be taken if the engine is to be left exposed to inclement weather either by adequately draining the water system or in the case of a closed circuit cooling system, an anti-freeze of reputable make and incorporating a suitable corrosion inhibitor should be used.

Should it be your policy to protect engines from frost damage by adding anti-freeze to the cooling system, it is advisable that the manufacturers of the relevant mixture be contacted to ascertain whether their products are suitable for use in Perkins engines and also to ensure that their products will have no harmful effect on the cooling system generally. It is our experience that the best results are obtained from anti-freeze which conforms to British Standard 3151.

When the engine is drained the water pump is also drained, but rotation of the pump may be prevented by :—

- (a) Locking of the impeller by ice due to the pump drain hole being blocked by sediment.

- (b) The locking of seal through the freezing of globules of moisture between the seal and the gland.

Operators are therefore advised to take these precautions when operating in temperatures below freezing point :—

1. Before starting the engine, turn the water pump by hand, this will indicate if freezing has taken place. If freezing has taken place, this should free any ice formation.
2. If it is impossible to turn the pump by hand, the engine should be filled with warm water.
3. To avoid this trouble, the operator should, when all water has been drained, run the engine for a few seconds at idling speed, thus dispersing any moisture remaining in the pump.

After an anti-freeze solution has been used, the cooling system should be thoroughly flushed in accordance with the anti-freeze manufacturer's instructions before refilling with normal coolant.

If the foregoing action is taken, no harmful effects should be experienced, but Perkins Engines Ltd., cannot be held responsible for any frost damage or corrosion which may be incurred.



## FILTERS (H)



Fig. H.1.

A prime consideration in the maintenance of Diesel engines is that of cleanliness. The air and fuel oil that enters the cylinders must be scrupulously clean and so also must the lubricating oil.

In the Perkins 4.270 Marine Diesel engine particular attention has been paid to the provision of means for ensuring cleanliness in respect of these.

Three filtration systems are provided :—Air, Fuel Oil and Lubrication, and all that the operator needs to do is to take steps to ensure that the filters are kept in such a state that they will most effectively perform their functions.

### AIR FILTERS

Air is filtered as it enters the induction manifold by means of a gauze type air filter.

The time for cleaning the air cleaner depends on operating conditions, therefore, under extreme dusty conditions, the time limit recommended in the periodical attentions for cleaning should be decreased. (See Section G).

The correct maintenance of the air cleaner will greatly assist in reducing bore wear, thereby extending the life of the engine.

### FUEL OIL FILTERS

Of all the factors on which satisfactory operation of a Diesel engine depends, cleanliness of fuel

oil is the most important. The efficient operation and length of life of the fuel pump and of the atomisers, depends, first, on the use of clean fuel oil ; second, the provision of suitable filters ; third, attention to these filters.

Protection for the Perkins 4.270 engine is provided by the following filters, reading from the tank to the pump.

1. Water Trap.
2. Paper element type filter.

#### Water Trap.

This filter varies according to application.

The gauze strainer is contained in an easily removable bowl and should be cleaned in accordance with periodical attentions, Section G.

#### Paper Element Filter.

It is not possible to clean the paper element in this filter.

It should be renewed every 1,000 hours. Every 100 hours unscrew the drain plug at the bottom



Fig. H.2.

## FILTERS—H.2



Fig. H.3.

of the filter bowl and allow fuel to flow through until clean fuel oil appears. Replace drain plug.

### To Renew Element :—

1. Unscrew the banjo connection on the top of the filter (See Fig. H.1).
2. Unscrew larger nut in the centre of the filter cover and drop the filter bowl (See Fig. H.2).
3. Remove element and discard (See Fig. H.3).

Before putting new element in position, clean the filter bowl and inspect the relief valve.

Ensure that the rubber joints are in good condition, if not, replace by new.

## FUEL LIFT PUMP.

Fitted to the timing case forward of, and above the distributor type fuel injection pump, the mechanical, push rod operated, diaphragm type lift pump draws fuel oil from the fuel tank and delivers it via the fuel filters to the injection pump.

The fuel lift pump is fitted with a gauze filter screen and the body housing forms a sediment chamber. A hand priming lever is also fitted to enable the fuel system to be primed and bled.

At least every 100 hours, the lift pump should be serviced and if very dusty and dirty conditions

are experienced then the period between cleanings should be reduced accordingly.

### To Service Lift Pump.

Unscrew single dome fixing screw.

Remove dome fixing screw, dome and filter gauze (See Fig. H.4).

Clean the sediment chamber and gauze with kerosene or fuel oil.

Assemble in reverse order ensuring that the dome sealing ring and fibre washer under dome securing screw are in a sound condition.

Do not overtighten dome securing screw.

## LUBRICATING OIL FILTERS

The importance of using clean lubricating oil in the first place, and providing means to ensure that it is always clean in use, is hardly second to the importance of cleanliness in respect of fuel oil.

It is imperative, therefore, that lubricating oil filters are not neglected. Moreover, if the periodical attentions recommended are carried out and the correct grade of clean oil used, a very long life can be obtained from the Perkins engine.

To ensure cleanliness, three filters are provided.

1. Oil Filler Strainer.
2. Sump Strainer.
3. Main (full flow) Filter.



Fig. H.4.

## FILTERS—H.3

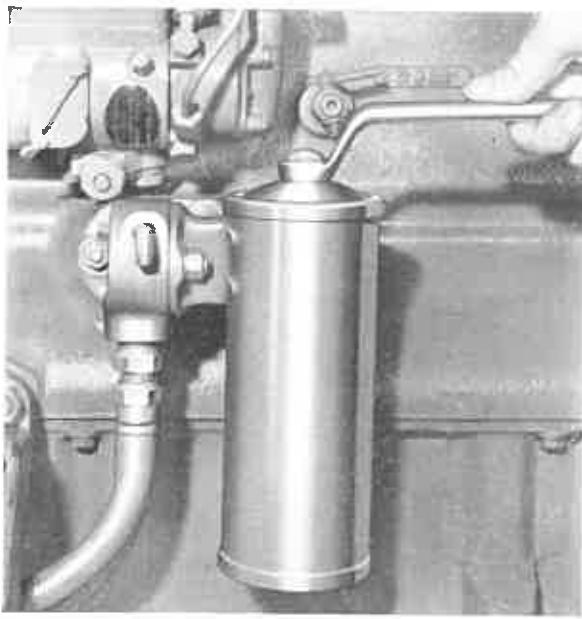


Fig. H.5.

### **Oil Filler Strainer.**

The purpose of this strainer is to prevent large objects entering the sump when the engine is being filled with lubricating oil. It should be cleaned in accordance with periodical attentions. (See Section G.)

### **To Remove and Clean Oil Filler Strainer.**

The oil filler strainer is situated at the bottom of the oil filler tube, between the oil filler and the cylinder block.

To remove for cleaning, unscrew the bolt at the base of the oil filler, remove oil filler and strainer.

Wash strainer in clean kerosene or fuel oil and replace.

### **Sump Strainer.**

The sump strainer is a wire strainer which fits over the suction pipe to the lubricating oil pump.

This strainer should be removed and cleaned every time the engine is removed from the boat.

### **Main (Full Flow) Filter.**

The main oil filter is situated on the fuel pump side of the engine in the lower area of the crank-case. No attempt should be made to clean the element of this filter, but it should be replaced

with a new element every 100 hours in accordance with the periodical attentions pages G.1.

### **To Remove and Replace Element.**

Unscrew nut on cover and remove cover (See Fig. H.5).

Remove by-pass valve assembly (See Fig. H.6).

Remove element and discard (See Fig. H.7).

Remove drain plug at base of filter casing and clean filter casing with kerosene.

To re-assemble, reverse order of procedure. Ensure that the felt sealing ring around the by-pass valve piston and the rubber sealing washer are in good condition. Fit a new element.

### **CAUTION.**

If the filter element is not replaced as recommended, the flow of oil through the filter is restricted. This does not, however, prevent oil passing to the engine, for when restriction takes place, the by-pass valve opens and permits unfiltered oil to continue to flow round the engine. The consequence of this need not be described. Do not, therefore, omit to renew the element as prescribed.



Fig. H.6.

**FILTERS—H.4**

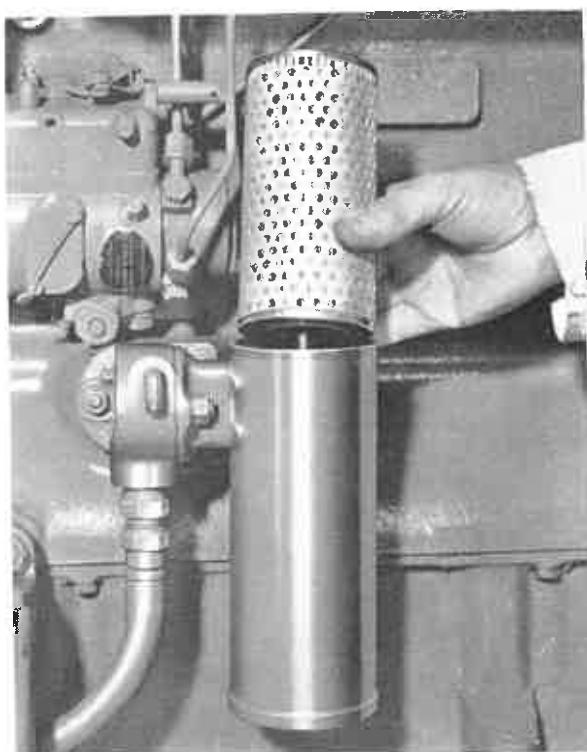


Fig. H.7.

# CYLINDER HEAD MAINTENANCE (J)

The Diesel engine rarely, if ever, needs the periodical decarbonising that is accepted as a matter of course with the petrol engine, insofar that in an engine operating on the diesel cycle, carbon, beyond a superficial coating, does not form on the pistons as in the case of the petrol engine.

Owing to its higher thermal efficiency, the valves of the Diesel engine are also much more free from trouble due to overheating; that is, of course, providing the engine is reasonably maintained.

After a period, depending upon the conditions under which the engine is operated, the valves may need attention. This will become apparent by loss of compression, in which case a top over-haul may be necessary.

## **Preparation.**

Begin by assembling all the joints and other parts required, as called for in the Perkins parts list.

Drain all water from the cooling system. The drain cock for the cylinder block is on the fuel pump side of the engine. Disconnect the exhaust pipe from the engine exhaust manifold. Uncouple external connections to the cylinder head.

## **Cylinder Head. To Remove.**

Remove the air filter.

Remove cold starting aid fuel pipe and electrical connections.

Take off the cylinder head cover when the oil pipe feeding the rocker shaft assembly will be seen. Uncouple this pipe from the cylinder head and then release and remove the nuts securing the rocker shaft assembly to the cylinder head. Below each securing nut is a retaining plate; this must be removed before lifting off the rocker shaft assembly complete with its lubricating oil pipe.

Remove all the push rods, and then prepare to remove the atomisers by removing all the leak-off pipes taking care to replace the banjo bolts into the atomisers after clearing the pipes. This is to ensure no dust or dirt can enter the body of the atomiser.

Uncouple the fuel pressure pipes from the fuel injection pump to the atomisers, and here again, to prevent the entry of dirt, carefully cover the parts of the fuel injection pump with clean rag or suitable caps. Then remove the atomisers, and wrap each one prior to inspection as in Section U.

In some applications the fuel filter body may be attached with a bracket to the cylinder head and in this case the filter body and bracket should be removed.

Finally remove the cylinder head securing nuts and lift off the cylinder head complete with exhaust and induction manifolds. Do not use any sharp tool, pushing it between the cylinder head face and cylinder block face otherwise damage may be caused to these machined faces.

**Note:** The cylinder liners are a relatively loose fit in the cylinder block and can easily move should the engine be turned over with the cylinder head removed.

To prevent such an occurrence, it is suggested that the liners be firmly located in position by placing suitable tubing over two of the cylinder head studs and securing by means of washers and nuts.

## **To Remove Valves.**

All valves are numbered consecutively from 1 to 8, commencing from the front of the engine. The cylinder head is marked with corresponding numbers opposite the valve seats, see Fig. J.1.

Compress the spring cap and springs with a valve spring compressor (See Fig. J.2) and remove the split-cone collets. Remove the spring caps and springs, thus liberating the valve which can be taken out when the cylinder head is turned upside down.

## **Grinding Valves.**

The valves and valve seats should be reconditioned in the orthodox way, using grinding compound or by means of specialised equipment as shown in Fig. J.3.

## CYLINDER HEAD MAINTENANCE—J.2

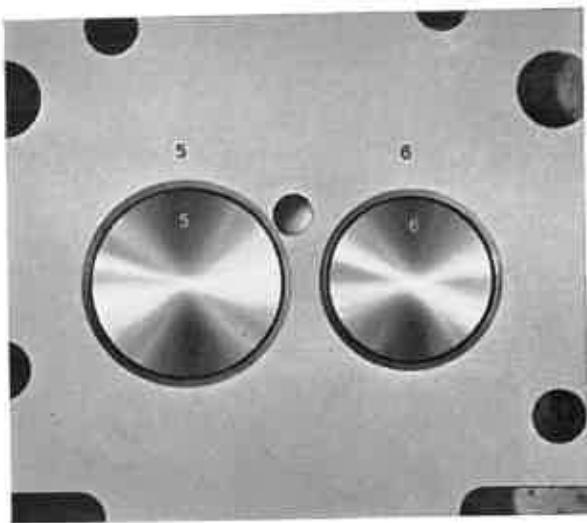


Fig. J.1. Numbering of Valves.

### EXAMINATION

Examine all parts for wear, having in mind the following points :—

#### Valve Springs.

Valve springs deteriorate because of fatigue resulting from the combined effect of heat and the normal working of the springs. After a period the spring becomes weak and is then prone to failure. This, of course, applies to all types of engines.

A new set of springs should be fitted whenever the engine undergoes a major overhaul.

#### Rocker Levers and Bushes.

Wash the rocker assembly thoroughly in kerosene. Examine the rocker lever bushes for wear. The rockers should be an easy fit on the shaft without excessive side play.

If, as a result of inadequate lubrication, any rocker bushes have seized on the rocker shaft, the rockers will have worked loose on the bushes. Should this have occurred it will be advisable to fit new rockers and/or bushes.

Should it be necessary to dismantle the rocker shaft assembly re-assemble as shown in Figs. J.4 and J.5.

#### Valves and Valve Seats.

There will be little wear of the valve stems or their guides provided that the lubrication of these

parts has always been adequate.

Examine the valves for cracks. Check wear of valve stems and their fit in guides. If the stems are worn fit new valves.

Number all new valves to correspond with the numbering of the old valves.

When fitting new valves, take care that the clearance between the valve head and the cylinder head bottom face is not less than .057 in. (1.45 mm) for inlet valves and .053 in. (1.35 mm) for exhaust valves. Maximum clearance should not exceed .140 in. (3.56 mm) for both inlet and exhaust. Check this by using a special gauge as shown in Fig. J.6 or by putting a straight edge across the bottom face of the cylinder head and measuring the distance between the straight edge and the valve.

The efficiency of a diesel engine depends largely on the maintenance of good compression; therefore, when grinding in valves, make certain that no signs of pitting are left on the seatings. Valves should be ground in until a continuous "high mark" is present the full way round the seating, both on the valve and on the valve seating in the head. At the same time care should be taken to avoid unnecessary grinding away of the seat.

The valve seat and face angle is 45°.

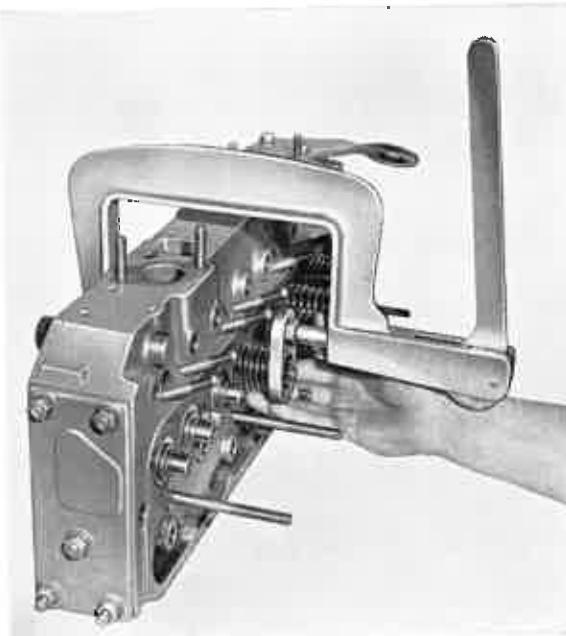


Fig. J.2. Removing Valve Collets.

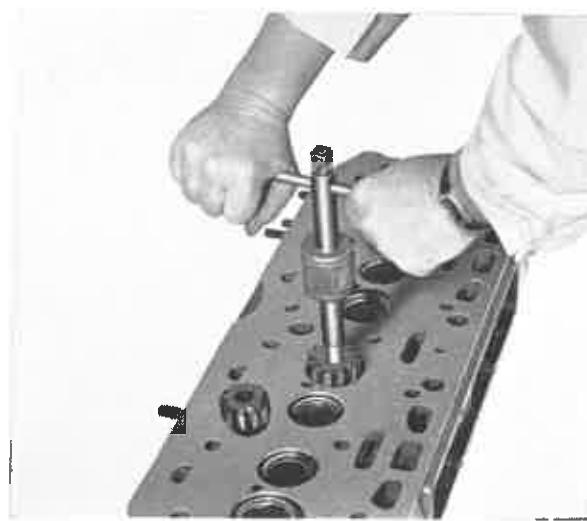


Fig. J.3. Cutting Valve Seats.

**Valve Seat Inserts.**

Valve seat inserts are not fitted to 4.270 Marine Production Engines. It is permissible however, to fit exhaust valve seat inserts to service engines where necessary i.e. if the existing seat is worn or damaged to such an extent that recutting would place the valve head depth relative to the cylinder head face beyond the service limit of .140 in. (3.56 mm).

It is important to note that the inlet valve seat is unsuitable for fitment of inserts and any attempt to fit them will result in serious damage to the cylinder head.

In order to fit the inserts, proceed as follows :

1. Press out the existing valve guide and thoroughly clean the parent bore.
2. Press in new valve guide.
3. Using the valve guide bore as a pilot, machine the recess in the cylinder head face to the dimensions quoted in Fig. J.7.
4. Remove all machining swarf and thoroughly clean the insert recess (removing any burrs which may be present) and, once more using the valve guide bore as a pilot, press the insert home with the applicable inserting tool (See Fig. J.8) using a steady pressure with either a hand or hydraulic press. The tool will ensure squareness. Under no circumstances should the insert be hammered in, neither should lubrication be used when pressing in the insert.

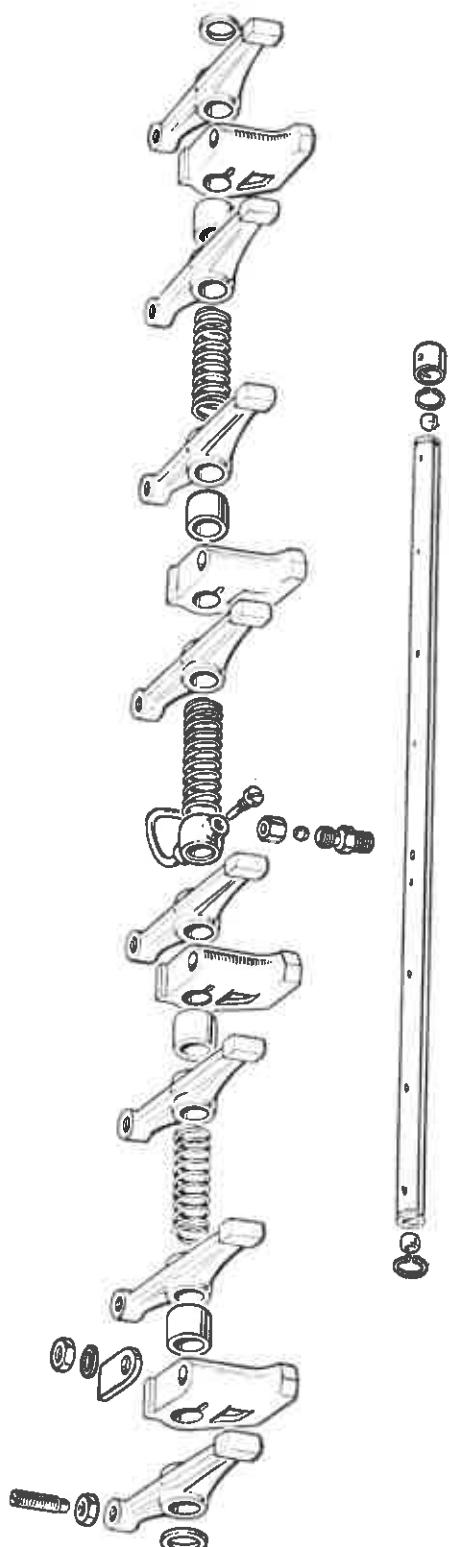


Fig. J.4.

## CYLINDER HEAD MAINTENANCE—J.4

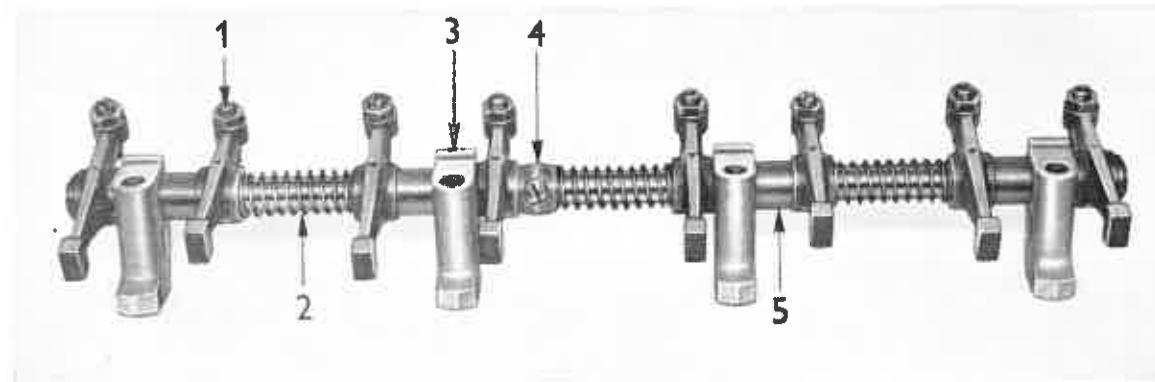


Fig. J.5. Rocker Shaft Assembly.

- |                   |                          |
|-------------------|--------------------------|
| 1. Rocker Lever.  | 3. Rocker Shaft Bracket. |
| 2. Spring.        | 4. Oil Feed Connection.  |
| 5. Spacing Washer |                          |

5. Visually inspect to ensure that the insert is pressed in squarely and that it is flush with the bottom of the recess.
6. Using the valve guide bore as a pilot, re-cut the valve seat at an included angle of  $88^\circ$  as in normal procedure so that the valve head depth below the cylinder head face is within the specified service limits of .053 in. (1.35 mm) to .140 in. (3.56 mm).

**NOTE :** The maximum limit of .140 in. (3.56 mm) is greater than that held on production but represents the maximum permissible depth on service engines. It is advantageous, therefore, to work as

closely as possible to the minimum figure in order to allow for reseating at a later date if required.

For guidance when refacing a valve, the included angle of the contact face is  $90^\circ$ .

### Re-skimming of Cylinder Heads.

It is permissible to re-skin the cylinder head bottom face without adverse effect on the valve seat inserts where fitted and, providing the cylinder head thickness is not reduced to below 3.220 in., up to a maximum of .020 in. (.51 mm) may be removed from the face.

### To Replace an Existing Insert.

In the case of damage to an existing insert this may also be replaced in conjunction with aforementioned instructions, but it should not, of course, be necessary to bore out the accommodating recess unless the cylinder head bottom face has been skimmed since fitting of the original insert. This may result in insufficient depth of the recess and this should be deepened in accordance with the dimensions given, as applicable. It is imperative when carrying out this operation that concentricity with the valve guide bore be maintained. Where machining facilities are not adequate to ensure this, it is permissible instead to surface grind the back of the insert to give a flush fitting with the cylinder head face. If this latter method is adopted, after grinding, the insert must be re-chamfered as it was prior to grinding i.e. .020 in. to .030 in. (.51—.76 mm.) at  $45^\circ$ .

### Valve Guides.

Examine the guides for wear, if necessary replace with new guides.

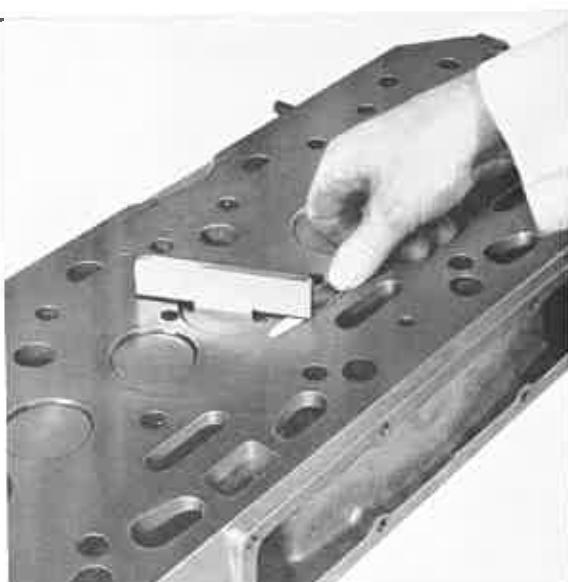


Fig. J.6.  
Checking Valve Depths.

## CYLINDER HEAD MAINTENANCE—J.5

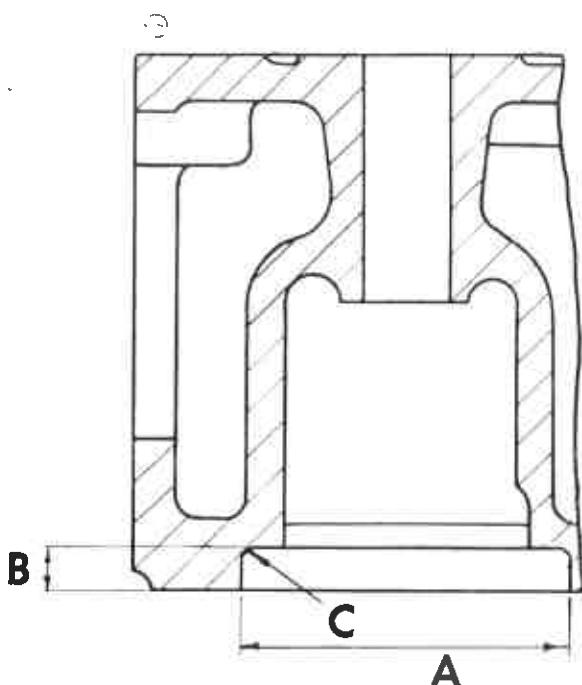


Fig. J.7. Valve Seat Cutting Dimensions.  
A. 1.874 to 1.875 in.      B. .250 to .253 in.  
C. .015 Chamber at 45° Max.

To remove old guides : press out, or use a suitable tool shown in Fig. J.9.

To fit new guides : clean and remove any burrs.

Smear the outer surface with clean oil, and using a suitable tool, press guides home hard up to the collar (See Fig. J.10). Care should be exercised as the collar approaches the cylinder head as the guides are made of cast iron and therefore comparatively brittle.

### Cylinder Head.

Remove exhaust manifold and clean off any carbon deposit formed in the cylinder head.

Examine the exhaust manifold securing flanges for cracks particularly in the area of the stud holes.

Wash out and thoroughly clean the water passages in the head, subsequently drying out and finally cleaning with compressed air.

If the water jacket of the cylinder head shows signs of excessive scale, a proprietary brand of de-scaling solution should be used.

### Re-assembly Cylinder Head.

Replace valves, valve springs, collars and collets.

Fit exhaust manifold gaskets and exhaust manifold.

### Replacing Cylinder Head.

Before replacing cylinder head it is extremely important to ensure that the cylinder block and cylinder head faces are perfectly clean, and examine all the studs to ensure no stretching has occurred, nor any damage to the threads.

When replacing the cylinder head a new gasket should be used. Cover both sides with a thin coating of good jointing compound and before placing over the cylinder head studs ensure that the gasket is correctly positioned. The gasket is marked to indicate how it should be replaced.

Having placed the gasket in position ensure that the cylinder head face is perfectly clean and that the cylinder head contains no stray nuts or bolts, place in position over the cylinder head studs.

To tighten the cylinder head nuts, a torque wrench should be used, set to the tension given in Section B, and pulled down in the order marked in Fig. J.11.

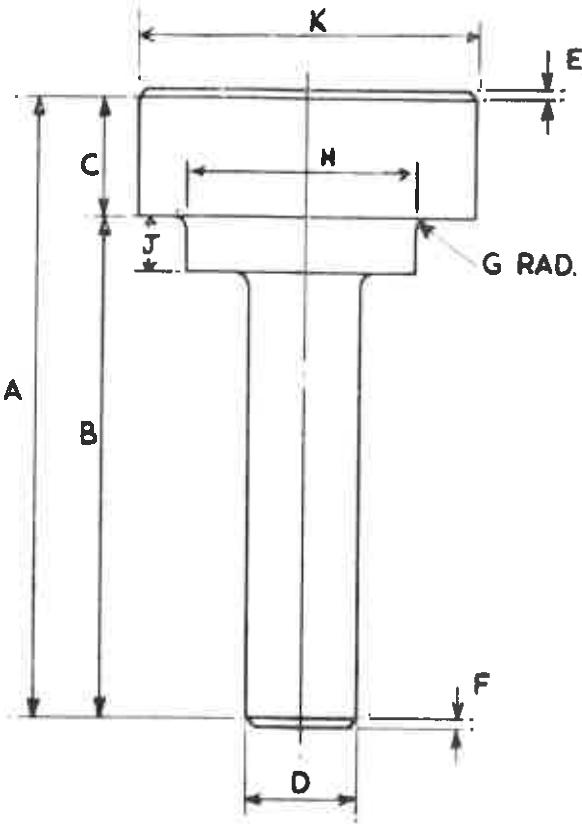


Fig. J.8.

#### Press Tool for Valve Seat Inserts.

- |                        |                       |
|------------------------|-----------------------|
| A. 3 $\frac{1}{2}$ in. | F. 1/16 in. at 45°    |
| B. 2.753 to 2.757 in.  | G. 1/32 in. Radius.   |
| C. $\frac{1}{8}$ in.   | H. 1.430 to 1.431 in. |
| D. .372 to .373 in.    | J. .243 to .247 in.   |
| E. 1/16 in. at 45°     | K. 1.842 to 1.852 in. |

## CYLINDER HEAD MAINTENANCE—J.6

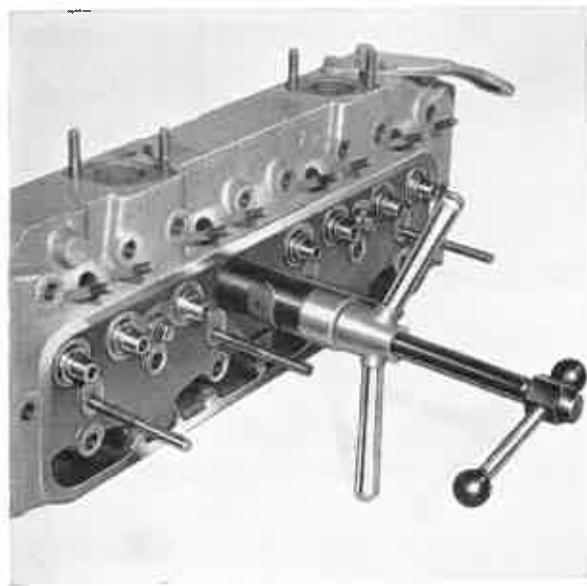


Fig. J.9.  
Removing a Valve Guide.

Before replacing the push rods, make sure they are absolutely straight, and after placing the push rods in position replace the rocker shaft assembly and tighten securing nuts. Examine the oil pipe union and ensure that it is in good condition. Connect union to cylinder head.

Replace atomisers (see Section U).

Replace leak off pipes and cold starting equipment.

For fitting of fuel pipes see Section U.

### Valve Clearance.

Valve clearances should be set to .010 in. (.25 mm).

When adjusting valve clearances the engine should be turned to bring the respective pistons to T.D.C. on compression.

To adjust : slacken the lock nut and with a .010 in. (.25 mm) feeler gauge between the top of the valve stem and the rocker lever face, turn the adjusting screw by means of a screwdriver until the correct clearance is obtained. Tighten locknut (See Fig. J.12).

The best sequence of adjusting tappets is as follows :—

Turn the engine until the rockers of No. 4 cylinder are rocking, and then adjust the tappets of No. 1 cylinder.

With No. 2 cylinder rockers rocking, adjust the tappets of No. 3 cylinder.

With No. 1 cylinder rockers rocking, adjust the tappets of No. 4 cylinder.

With No. 3 cylinder rockers rocking, adjust the tappets of No. 2 cylinder.

### STARTING THE ENGINE

Proceed as instructed in Section E.

Having started the engine, it is advisable to remove the cylinder head cover and watch for oil oozing from the rocker shaft assembly. If no oil can be seen after a minute or so then carefully and slowly unscrew the lubricating oil pipe union in the cylinder head, and as soon as oil appears tighten the union. If there is still no oil at the rocker assembly, suspect the oil pipe of being blocked, and the remedy for this fault is to strip the rocker assembly and thoroughly clean the oil pipe, its unions and the whole of the assembly.

After warming up, the engine should be shut down and the cylinder head nuts again tightened with a torque wrench, set to the tension given in Section B. The nuts should be tightened in the order shown in Fig. J.11. It will be necessary to remove the rocker assembly and possibly Nos. 2, 3, 6 and 7 atomiser studs.

Re-set valve clearance to .010 in. (.25 mm).

The cylinder head cover can now be replaced. A new joint should be fitted and care should be taken to see that it is correctly positioned.

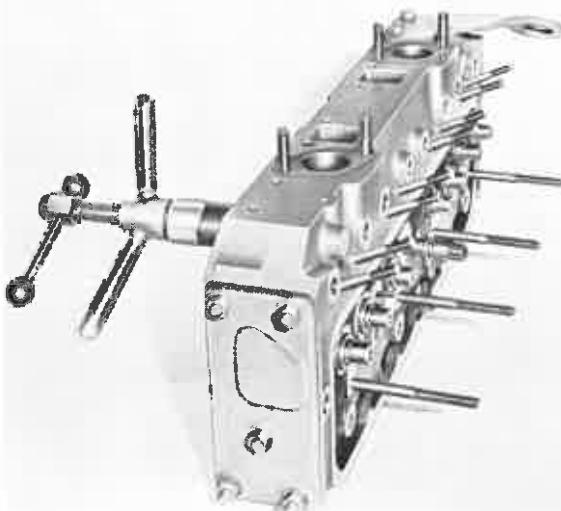


Fig. J.10.  
Fitting a Valve Guide.

CYLINDER HEAD MAINTENANCE—J.7

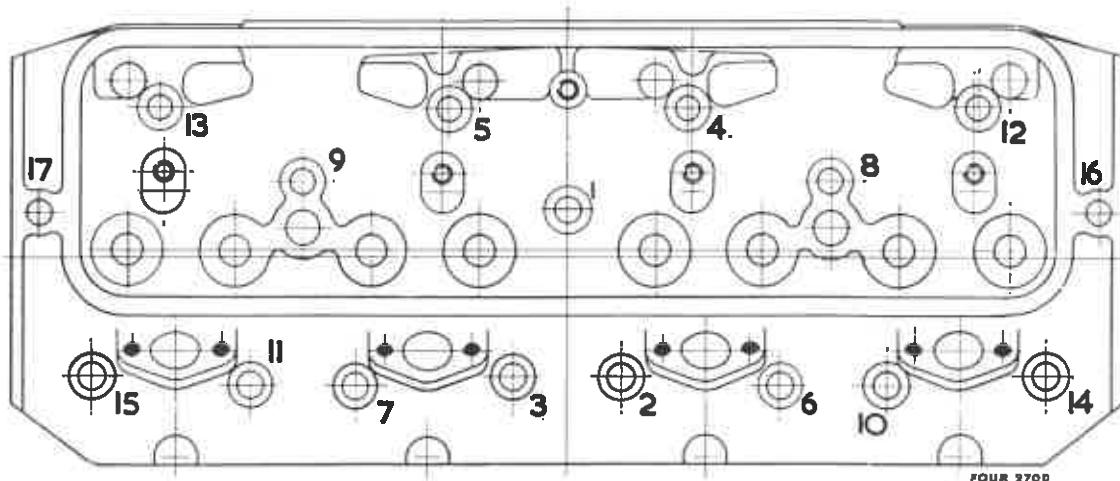


Fig. J.11.  
Diagram showing order in which cylinder head nuts  
must be tightened.



Fig. J.12. Setting Valve Clearance.



# PISTONS AND CONNECTING RODS (K)



**Fig. K.1.**  
Piston and Connecting Rod showing Toroidal Cavity in  
Piston Crown.

The pistons are of light alloy, with fully floating gudgeon pins, which work in the bush fitted to the connecting rod small end. The gudgeon pins are held in position by means of circlips.

The pistons are fitted with three compression rings, and two oil control or scraper rings.

The top compression ring is chrome plated, plain taper-faced rings are fitted in the second and third ring grooves.

Each piston has a toroidal cavity in the piston crown (See Fig. K.1) and this cavity forming the combustion chamber, is off-set from the centre of the piston. This off-setting of the cavity is to assist the correct swirling and eventually complete combustion of the fuel sprayed from the multi-hole injector.

To ensure the correct positioning of the toroidal cavity of the piston within the cylinder bore, each

piston is stamped on its crown with the letter "F" and when fitting the piston and connecting rod to the engine always ensure the letter "F" on the piston crown is on the portion of the piston which faces the front of the engine (See Fig. K.2).

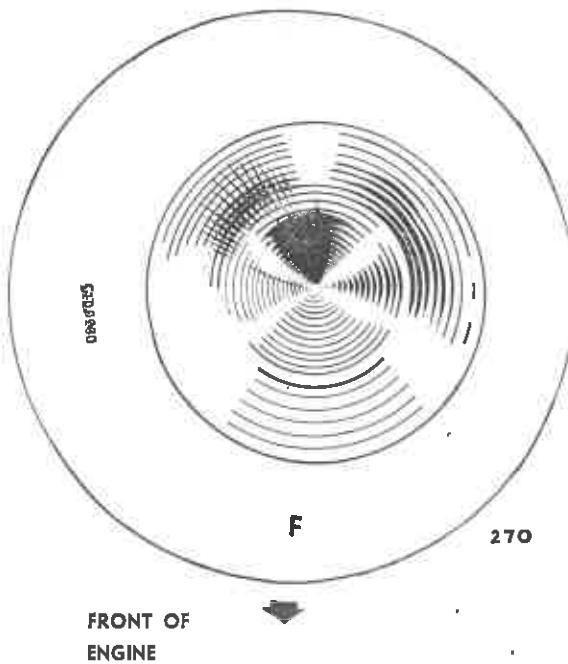
Pistons are numbered from 1 to 4 commencing with No. 1 at the front of the engine.

Each connecting rod and cap are also numbered 1 and 1, 2 and 2, etc. (See Fig. K.3).

The connecting rod and cap mating faces are serrated to ensure correct positioning and should on no account be filed.

## To Remove Pistons and Connecting Rod Assemblies.

1. Remove cylinder head assembly (see Section J).
2. Secure the cylinder liners in position to prevent them moving when the engine is turned over (see page J.1).
3. Remove sump (see Section Q).
4. Remove lubricating oil pump (see Section Q).



**Fig. K.2.**  
Marking on Piston Crown.

## PISTONS AND CONNECTING RODS—K.2

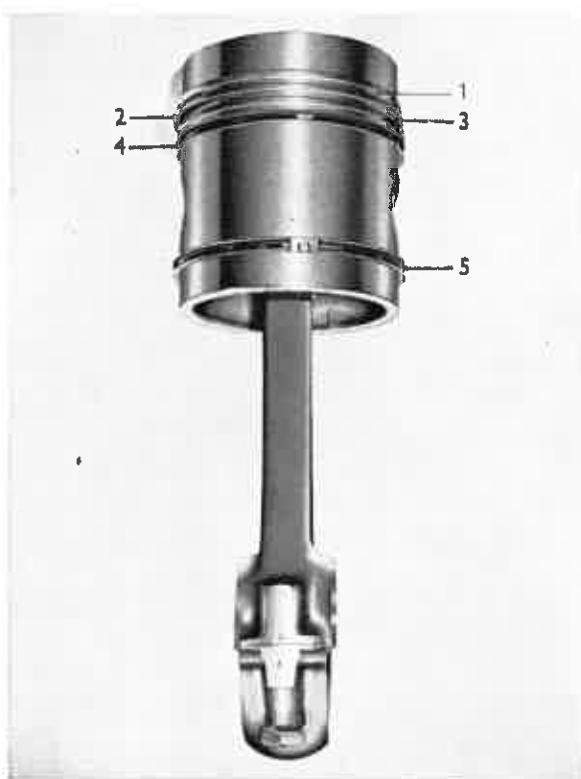


Fig. K.3.

Piston Ring Arrangement and markings on Rod and Cap.

1. Chrome plated Compression Ring.
2. Taper Faced Compression Ring.
3. Taper Faced Compression Ring.
4. Oil Control Ring.
5. Oil Control Ring.

5. Turn engine until two connecting rods are at bottom centre, then remove setscrews and locking washers.
6. Remove caps and bearing shells (See Fig. K.4).
7. Push piston and connecting rod out of the top of the cylinders (See Fig. K.5).
8. Turn engine until remaining connecting rods are at bottom centre, then repeat removal operations.

Should there be carbon ridges in the cylinder bores, remove them, using a scraper for the purpose.

Keep each piston and connecting rod assembly separate, each to each as marked.

### To Remove Gudgeon Pins.

1. Remove circlips from the piston, using long nosed pliers.

2. To remove the gudgeon pins, warm the pistons in liquid to a temperature of 100°F.—120°F. (38°—49°C). The pins can then be pushed out.

### To Fit Small End Bushes.

1. Remove piston and connecting rod from engine.
2. Remove gudgeon pins (see above).
3. The small end bushes are a press fit into the connecting rods.
4. Press out old bush with suitable tool.
5. Remove any sharp edges around small end parent bore.
6. Press in new bush, ensure that oil hole in bush coincides with hole in top of connecting rod. Ream out new bush to suit gudgeon pin (see Section V) and check for parallelism.

### To Assemble Piston and Connecting Rod.

Before inserting the gudgeon pin into the piston and the connecting rod, ensure that with the connecting rod in position, the letter "F" on the piston crown is facing towards you and that the connecting rod number (See Fig. K.3) is on your left. See



Fig. K.4.

Removing Connecting Rod Cap and Big End Bearing

under "To fit Piston and Connecting Rod to Block."

Insert gudgeon pin into position, to do this it may be necessary to heat piston in liquid to a temperature of 100°—120°F. (38°—49°C). The gudgeon pin can then be pushed easily into position.

If original pistons are being used they must be re-assembled to the same connecting rods, e.g. piston stamped 1 must go with connecting rod stamped with the figure 1. For markings of connecting rod, see Fig. K.3.

Fit circlips, check to ensure that they fit correctly into the grooves in the piston. It is advisable to fit new circlips even if the old ones do not appear to be damaged or strained.

#### Fitting New Rings.

Pistons and rings must be thoroughly washed to remove any oil or grease which may be present.

Check rings for correct gap which must be within the limits given in Section V.

In the top ring groove fit the Chrome plated ring and in the next two ring grooves fit the two taper faced compression rings. When fitting the

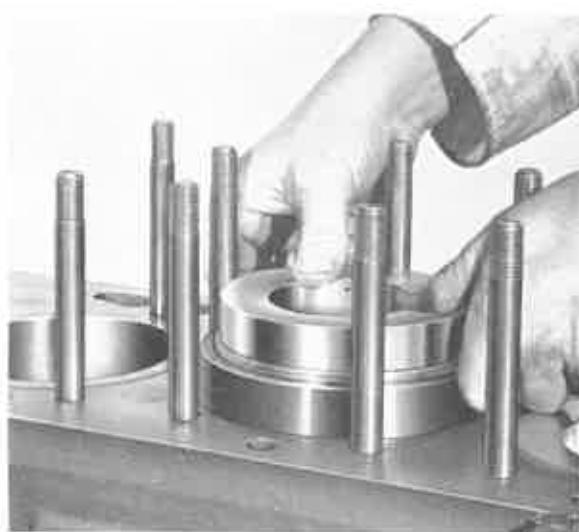


Fig. K.6.  
Fitting Piston using a Piston Ring Guide.

plain compression ring ensure they are fitted the right way up by observing the letter "T" on the top of the rings.

Fit the oil control rings one above and one below the gudgeon pin.

The gaps of the three compression rings must be arranged so that they are equally spaced around the piston and not in line with one another.

When fitting new rings to original pistons, clean out piston ring grooves using the old ring from the appropriate groove for this.

Examine the piston skirt and if there is any scoring, the piston must not be used again.

The piston should be examined carefully for bruising of the ring grooves and to ensure that the rings move freely in their grooves.

**NOTE :** When fitting new rings to worn cylinder liners, the ring gaps should be checked at a bore diameter of 4.250 in.

#### To Fit Piston and Connecting Rod to Cylinder Block.

All connecting rods and caps are plainly marked with a number corresponding to their position in the engine. For method of marking see Fig. K.3. These numbers are stamped on that side of the connecting rods and caps which are machined to take the locating lips of the bearings.

When fitting pistons and connecting rods to cylinder block and crankshaft, ensure that the side



Fig. K.5.  
Removing Piston and Connecting Rod.

## PISTONS AND CONNECTING RODS—K.4



Fig. K.7.  
Showing Connecting Rod Code Number.

of the connecting rod which is stamped with the number goes to the camshaft side of the engine.

**Before assembling the connecting rod setscrews to the connecting rods, make sure each setscrew receives a very careful inspection as on page B.2.**

Insert the pistons and connecting rods into the cylinder bores from the top, ensuring that piston and rod stamped No. 1 are fitted into No. 1 cylinder bore and No. 2 into No. 2 cylinder bore and so on counting from the front of the engine. When fitting assemblies, deal with them in the order 1 and 4 then 2 and 3. Turn the crankshaft until the appropriate crankpins are at B.D.C.

To minimise the possibility of breaking piston rings, it is advisable to use a piston ring guide (see Fig. K.6). Take care not to damage the rings. Should the piston accidentally drop partly into the bore and is held suspended by a piston ring, it must be taken out again and the ring examined to see if it is cracked or broken.

Pull the connecting rod to the crankpin and insert the half bearing.

Fit cap and cap half bearing.

**NOTE.** When replacing connecting rod setscrews, new locking washers must always be used.

**Never use any metal other than the correct locking washers as supplied by Perkins Engines Ltd.**

The top and bottom half shells are not interchangeable with each other, due to the locating lips of the two half bearings being offset in relation to each other.

Tighten connecting rod setscrews, using a torque wrench set to the tension given in Section B.

### Fitting New Pistons.

When fitting new pistons it is essential to see that the piston and connecting rod are correctly assembled before fitting them to the engine, see "To assemble Piston and Connecting Rod."

Before pulling the connecting rod to the crank-shaft, check to see the letter "F" stamped on the piston crown is towards the front of the engine. (See Fig. K.2).

Ensure that Perkins Parts are used so that the new piston will, when assembled to the engine, comply with the tolerances as listed on page V.3.

The piston if correctly assembled will not protrude above the cylinder block face by more than .011 in. (.28 mm) nor will it be more than .003 in. (.08 mm) below the cylinder block face.

### Connecting Rod Weights.

The finished weight of connecting rods in engine sets should balance within two ounces.

In order to effect this, rods are batched as follows:—

Code No.	Minimum weight (kg)	Maximum weight (kg)
10	4 lbs. 6 ozs. (1.98 kg)	4 lbs. 8 ozs. (2.04 kg)
11	4 lbs. 8 ozs. (2.04 kg)	4 lbs. 10 ozs. (2.09 kg)
12	4 lbs. 10 ozs. (2.09 kg)	4 lbs. 12 ozs. (2.15 kg)
13	4 lbs. 12 ozs. (2.15 kg)	4 lbs. 14 ozs. (2.21 kg)
14	4 lbs. 14 ozs. (2.21 kg)	5 lbs. (2.27 kg)
15	5 lbs. (2.21 kg)	5 lbs. 2 ozs. (2.33 kg)
16	5 lbs. 2 ozs. (2.33 kg)	5 lbs. 4 ozs. (2.38 kg)
17	5 lbs. 4 ozs. (2.38 kg)	5 lbs. 6 ozs. (2.44 kg)

It is necessary, therefore, when ordering spares for an individual engine that the appropriate code number of the connecting rod set be quoted.

**PISTONS AND CONNECTING RODS—K.5**

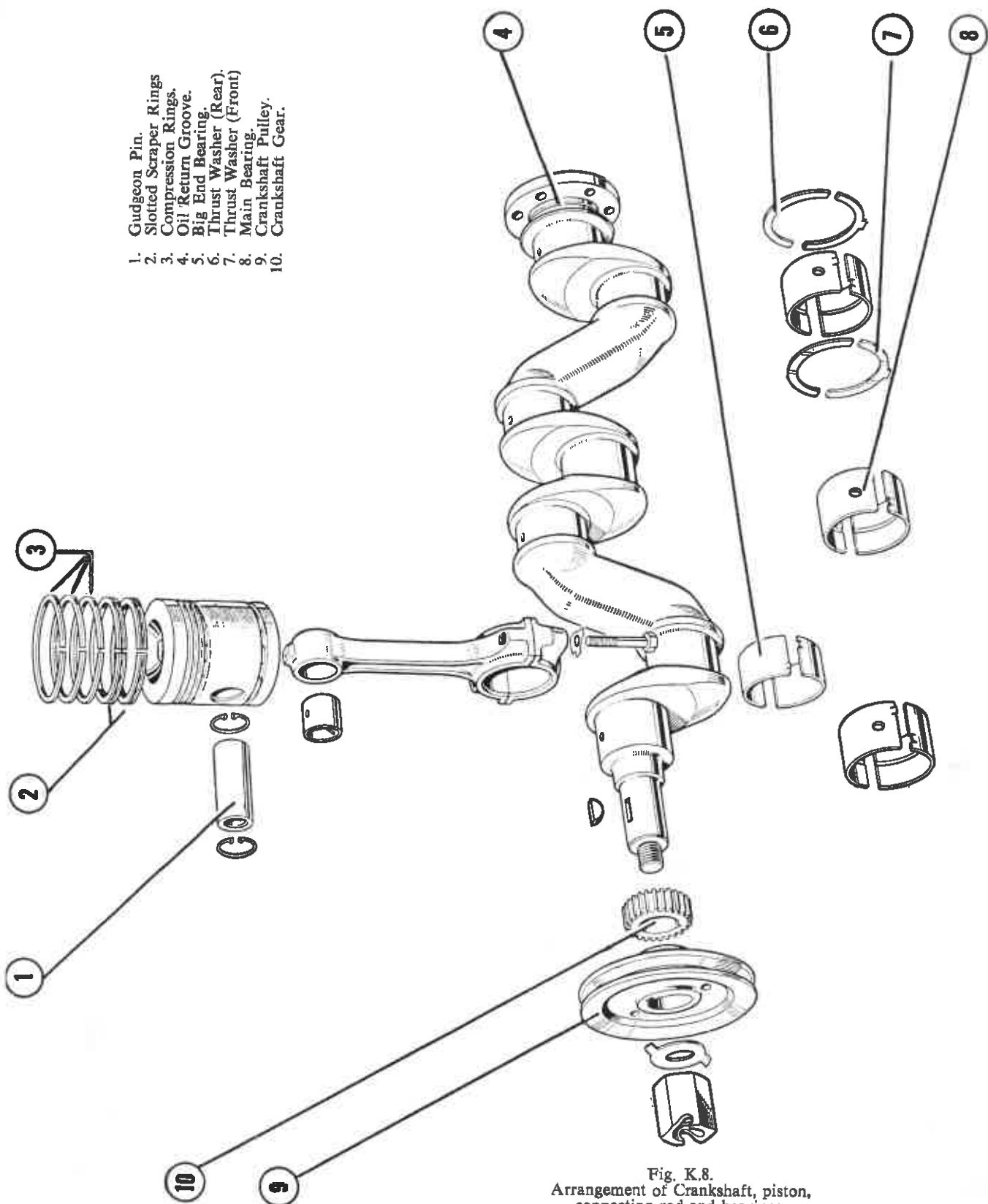


Fig. K.8  
Arrangement of Crankshaft, piston,  
connecting rod and bearings.

## **PISTONS AND CONNECTING RODS—K.6**

This code number can be found etched either on Nos. 1 or 4 connecting rod on the machined shoulder which is on the fuel pump side of the engine (See Fig. K.7).

On spare rods, however, the code number is present on each rod.

Arrangement of piston and connecting rod to the crankshaft is seen in Fig. K.8.

## CYLINDER LINERS (L)



Fig. L.1. Cylinder Liner.

The liners fitted to Perkins 4.270 Marine engines are centrifugal cast iron wet liners. They are flanged at the top and rubber type sealing rings are fitted at the bottom. See Fig. L.1.

Under normal circumstances the liner would only need to be renewed during a major overhaul, but should it be necessary to remove the liner for any other reason this can be carried out without removal of the crankshaft.

Should, at any time, the liner be removed and later replaced for further service, it is essential the liner be marked to show which parent bore it belongs and also to show its original position in that parent bore, so that it may be replaced in its original position in its original bore.

### To Remove Liners.

1. Remove cylinder head (See Section J).
2. Remove sump (See Section Q).
3. Remove oil pump. (See Section Q).
4. Disconnect connecting rods and remove pistons. (See Section K).
5. Mark liner and block.
6. Remove liner, using a liner removing tool (See Fig. L.2).

7. Number the liner according to parent bore.
8. When the rubber sealing rings have cleared the bottom landing, the liner can be removed by hand.

### To Fit New Liners.

When fitting new liners, it is essential that new pistons and rings are also fitted. On no account should old pistons be fitted to new liners. For fitting of new pistons see Section K.

Over a period of service, corrosion may have taken place at the inner ends of the bottom landings. This corrosion and any burrs which may be present should be removed with a scraper or emery cloth.

Fit the rubber sealing rings in the grooves provided in the lower diameter of the liner. (See Fig. L.1). Care should be taken not to stretch these rings as they are not elastic and if stretched will not return to their former size.

In order to facilitate the fitting of the liners when the two rings have been placed in position



Fig. L.2. Removing a Cylinder Liner.

## CYLINDER LINERS—L.2



Fig. L.3. Fitting a Cylinder Liner.

on the liner, smear them with soft soap or soapy water.

On the fuel pump side of the cylinder block will be seen four 3/32 in. (2.4 mm) holes each one in a lateral alignment with the fuel pump and vertically aligned to the centre of each cylinder (See Fig. L.3). With the cylinder liners correctly fitted, each hole breaks through to the area between the sealing rings on the lower portion of the cylinder liners.

The object of the holes is to release to atmosphere any coolant which may have leaked past

the first sealing ring, thus relieving the bottom sealing ring of any pressures above it, thereby assisting in its complete sealing properties.

When fitting new liners or replacing the old ones, certain precautions must be taken to ensure no damage is caused to the lower liner sealing ring by the holes referred to above. A suitable tool may be constructed with a length of 3/32 in. (2.4 mm) diameter round steel bar secured in a file handle or the like, so that approximately 1½ in. (38 mm) of steel bar protrudes from the handle. The exposed end of the tool bar should be treated so as to remove any sharp edges.

Place the liner in position and press down ensuring that the rubber sealing rings remain in their respective grooves, until the lower sealing ring touches the lower landing of the cylinder block when a resistance will be felt. Insert the above mentioned tool through the 3/32 in. (2.4 mm) hole in the cylinder block until it is arrested by the cylinder liner wall. Hold the tool exactly in this position and press the liner home, taking care not to push the tool inwards at all, the bottom sealing ring should then ride over the end of the tool within the hole. It cannot be overemphasized the importance of ensuring there are no burrs or sharp edges on the tool.

The liners are a push fit and no force is required but should a liner require more pressure than can be applied by the fingers, place a suitable piece of wood across the top flange and press home.

After fitting the liners, the cylinder block should be water tested to a pressure of 20—25 lb. per sq. inch. (1.4 — 1.8 kg/sq. cm).

Re-assemble engine as required and to instructions given for the various components.

# CRANKSHAFT AND MAIN BEARINGS (M)

The crankshaft runs in three pre-finished replaceable shell bearings, which are copper-lead or aluminium tin lined.

## To Remove Crankshaft.

1. Remove cylinder head (See Section J).
2. Remove sump (See Section Q).
3. Remove lubricating oil pump (See Section Q).
4. Remove pistons and connecting rods (See Section K).
5. Take off timing case front cover and remove idler gear.
6. Remove timing case bottom cover.
7. Remove starter motor.
8. Remove flywheel and assembly.
9. Remove main bearing caps and half bearings (See Fig. M.1).
10. Lift out crankshaft.

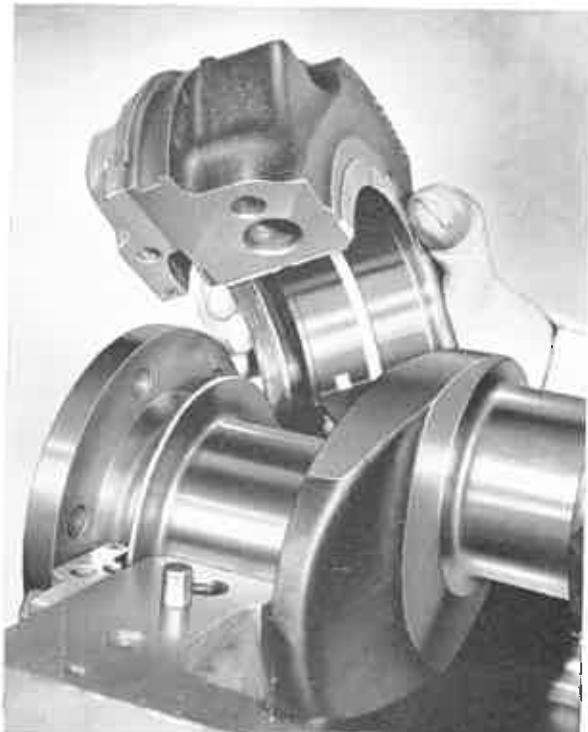


Fig. M.1. Removing Rear Main Bearing Cap.

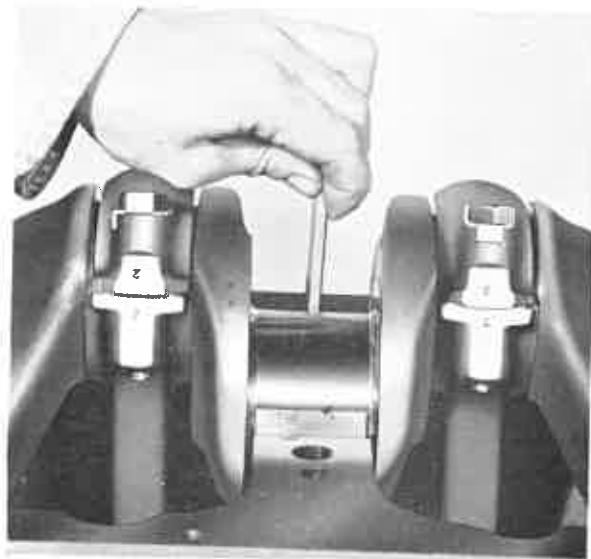


Fig. M.2.  
Removing Main Bearing with Crankshaft in Position.

## Crankshaft Regrinding.

### Cold Rolling.

Before attempting to regrind the 4.270 Crankshaft ; facilities must be available for cold rolling the crankshaft after regrinding.

The fillet radii of the crankshaft has been cold rolled by the manufacturer to add strength and regrinding of the crankshaft will practically remove the beneficial effects of the cold rolling, therefore to retain the crankshaft strength after regrinding it is essential that cold rolling of the crankshaft be carried out.

If no cold rolling equipment is available then a service crankshaft obtainable under the Perkins Perpetuity Plan should be fitted.

A booklet explaining the Perpetuity Plan may be obtained from the Service Division of Perkins Engines Ltd., Peterborough.

## Examination for Wear.

Before proceeding to regrind the Crankshaft, the following points should be checked to ensure it is suitable for further grinding.

The Crankshaft should be crack-detected and then demagnetised in order to remove any polar-

## CRANKSHAFT AND MAIN BEARINGS—M.2

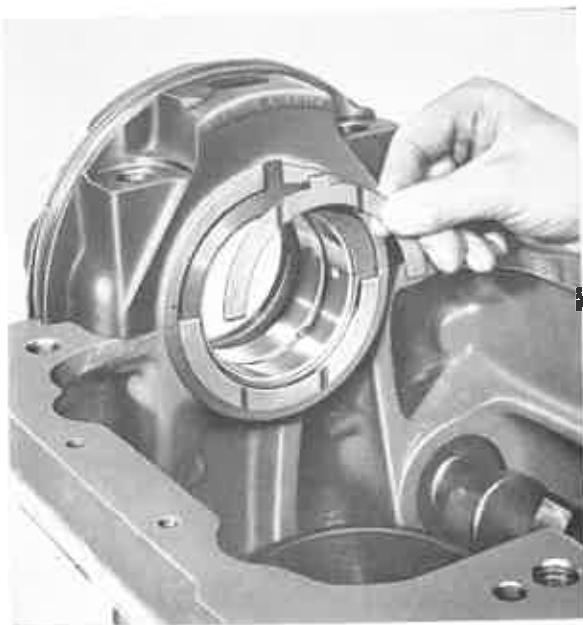


Fig. M.3.

Thrust Washers which control Crankshaft End Float.

isation which may be present.

The main journal and crankpin diameters should be checked for ovality and measured to ascertain the next appropriate size to which the Crankshaft can be reground i.e. —.010 in., —.020 in., —.030 in. (—.25 mm, —.51 mm or —.76 mm) from Standard. If the Crankshaft requires regrounding below —.030 in. (—.76 mm), it is recommended that a new Crankshaft be fitted.

It should be noted, however, that in the home market, an exchange scheme is in operation whereby replacement Crankshafts are available at a certain cost, providing the Crankshaft being exchanged is not damaged and is suitable for regrinding to a limit of —.030 in.

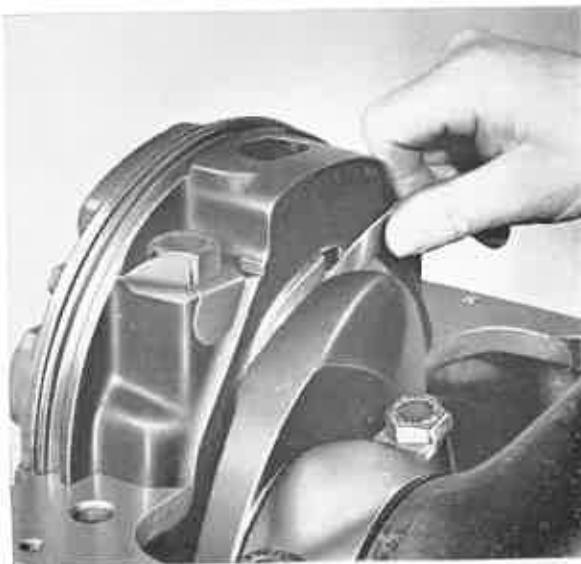


Fig. M.4.  
Checking Crankshaft End Float.

### Regrinding.

All the necessary information required for regrinding to a limit of —.030 in. (—.76 mm). shaft Data." All limits listed thereunder must be adhered to and the main journals and Crankpins must be free from grinding marks.

After regrinding, the sharp corners on the oil ways should be removed and the Crankshaft crack-detected again and demagnetised.

NOTE :—It is important that the RADII on the main journals and Crankpins are maintained. If these are neglected, a fatigue fracture is liable to occur.

### CRANKSHAFT REGRIND DATA

Main Journal Dia. .010 in. (.25 mm) undersize ... 2.988/2.9885 in. (75.89/75.91 mm)

Main Journal Dia. .020 in. (.51 mm) undersize ... 2.978/2.9785 in. (75.64/75.65 mm)

Main Journal Dia. .030 in. (.76 mm) undersize ... 2.968/2.9685 in. (75.39/75.40 mm)

Maximum Permissible Width of Rear Main

Journal after Regrinding ..... 2.0785 in. (52.79 mm)

Main Journal Radii (must be maintained) ..... 0.125/0.140 in. (3.18/3.55 mm)

Crankpin Dia. .010 in. (.25 mm) undersize ..... 2.73825/2.739 in. (70.55/70.57 mm)

Crankpin Dia. .020 in. (.51 mm) undersize ..... 2.72825/2.729 in. (70.30/70.32 mm)

Crankpin Dia. .030 in. (.76 mm) undersize ..... 2.71825/2.719 in. (70.04/70.06 mm)

Maximum Permissible Width of Crankpins after Regrinding ... 1.800 in. (45.72 mm)

Crankpin Radii (must be maintained) ..... 0.187/0.202 in. (4.76/5.13 mm)

Surface Finish — All Dias. (not to exceed) ..... 16 micro in. (.4 microns)

## CRANKSHAFT AND MAIN BEARINGS—M.3

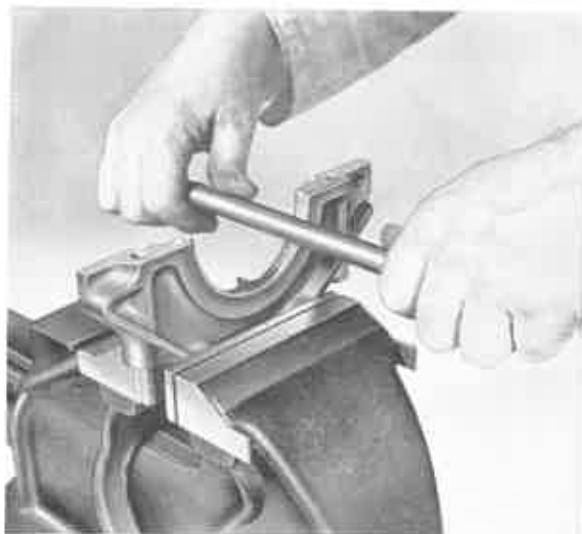


Fig. M.5.

Fitting Rope Seal to Rear Main Oil Seal Housing.

### To Fit New Main Bearings and Thrust Washers.

The main bearings being of the pre-finished strip type, the fitting of these should present no difficulty.

To prevent errors occurring in fitting top and bottom half bearings, the locating lips, and the recesses in the caps and bearing housings, are offset in relation to one another.

The bearing caps and crankcase are numbered 1—3, No. 1 being at the front of the engine.

To avoid the caps being inadvertently assembled to the crankcase the wrong way round the locating dowels and dowel holes are also offset.

Under normal circumstances by the time the main bearings require to be renewed, the crankshaft will need to be removed for regrinding. However, if for any reason one or more of the bearings should have to be renewed or removed for inspection, this can be carried out on Nos. 1 and 2 bearings without the necessity of removing the crankshaft from the engine.

Proceed as follows : —

1. Remove sump (See Section Q).
2. Take off the cap of the bearing in question.
3. Slacken remaining bearing cap setscrews one or two turns.
4. Remove the lower half of the bearing from the bearing cap.
5. With a suitable piece of wood push out the top half of the bearing by rotating it on the crankshaft, applying the tool to the side opposite the locating lip (See Fig. M.2). The

locating lips are on the camshaft side of the engine.

6. Inspect the bearing shells and if they require renewing insert a new half bearing in the top, inserting plain end first. Fit new half bearing to cap. Do not remove more than one bearing at a time.
7. Replace cap and tighten setscrews lightly before proceeding to next bearing.
8. Having replaced the bearings and caps pull down the setscrews with a torque wrench set to the tension given in Section B.

The thrust washers fit in the recesses provided on either side of the rear main bearing housing and should be assembled with the flat steel side to the bearing housing (See Fig. M.3). The end float of the crankshaft is measured between the crank cheek and the thrust washers (See Fig. M.4). This measurement should be between .0045 and .0155 in. (.11 to .39 mm). If greater or smaller than this amount fit new thrust washers or oversize thrust washers if necessary.

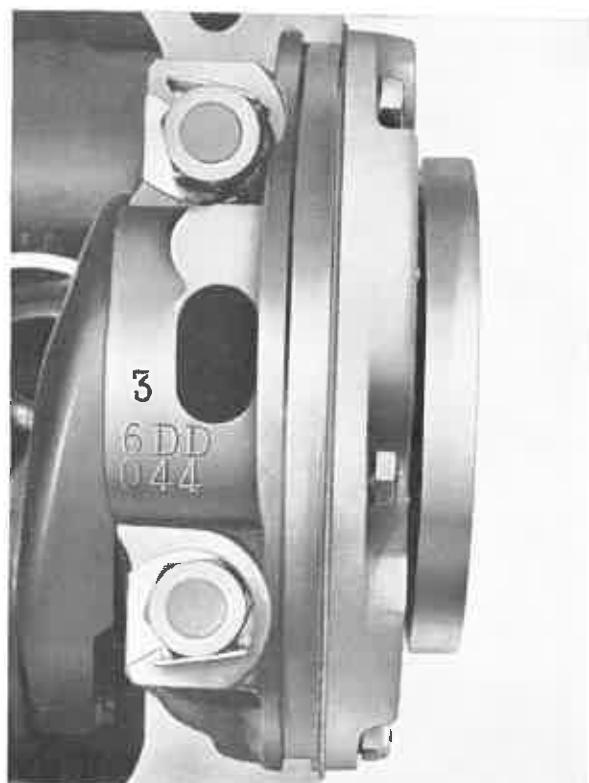


Fig. M.6.  
Showing Markings on Main Bearing Caps.

## CRANKSHAFT AND MAIN BEARINGS—M.4

### CRANKSHAFT OIL SEAL

#### Rear Oil Seal.

The part of the crankshaft around which the oil seal fits has a shallow spiral groove machined to a depth of .004/.008 in. (.10/.20 mm). The part of the crankshaft that is machined is that upon which the oil seal itself bears.

The oil seal consists of two half-housings suitably machined to accommodate a rubber cored asbestos strip. This strip is in two sections, one for each half housing, and forms a positive seal with the crankshaft.

Each half of the oil seal housing contains two pins designed to grip the rope type seal when it is positioned around the crankshaft.

Where it should be necessary in service to replace the rope type rear main oil seal, the following procedure should be employed to ensure an efficient seal between the rubber cored asbestos strips and the rear crankshaft journal.

The strips themselves should be pressed by hand into their respective grooves and are required to project .010 in./.020 in. (.25/.51 mm) beyond the joint face at each end of the groove in the seal half housing. This projection serves to ensure intimate contact between the end faces of the strips when the housing halves are united on the crankshaft. It should be realised that any gap at this joint when the strips are fitted will defeat the purpose of this particular sealing medium.

A projection exceeding that quoted above should be avoided, because the excess may not settle in the housing groove, but will splay over the joint face as the half housings are pulled together. Thus the half housings may be held slightly apart and so result in a weep of lubricant.

Due to the interference between the strips and the relevant grooves in the seal housings an operator may fail to consolidate the strips in their grooves, thus producing the appearance that the strips are too long. This is a false indication and the strips must never be trimmed after being fitted to the housing or at any other time.

The method of seal fitment is as follows :—

1. Set up in turn, one half housing in a vice with the seal recess uppermost.
2. Settle approximately 1 in. (25 mm) of the strip, at each end, into the ends of the groove, ensuring that each end of the strip

projects .010/.020 in. (.25/.51 mm) beyond the half housing joint place. Allow the middle of the seal to bulge out of the groove during this operation.

3. With thumb or finger press the remainder of the strip into the groove working from the centre. Then use any convenient round bar to further bed in the strip by rolling and pressing its inner diameter (See Fig. M.5). This procedure takes advantage of the friction between the strip and the groove at the ends, to compact the rope, whilst ensuring that the projections of the end faces of the rope remain as set.
4. Fit seal to other half housing in a similar manner.
5. Lightly paint the joint faces of the housings with a suitable jointing compound.
6. Spread a film of graphited grease over the exposed diameter surface of the strips.
7. Assemble the half housings around the crankshaft and fasten together by the two setscrews.
8. Swivel the complete seal housing on the shaft to bed in the strips, and to establish that the assembly turns easily on the shaft.
9. Bolt the seal housing in position on the block and main bearing cap and finally tighten.

It should be noted that the six setscrew holes in the half housings are positioned such that only one end of each housing has a positive fixture in close proximity to the dividing or split line of the housing. In the case of that half housing attached to the cylinder block, the nearest retaining setscrew on the camshaft side is approximately 4 in. from the housing split line and it may be possible, when fitting, for this end of the half housing not to be in intimate contact with the block face since the nipped setscrews uniting the two housings resist the desired setting.

Therefore, to avoid inadequate contact between the relevant half housing and the block face with consequent oil leaks, it is necessary to ease off the two setscrews securing the half housings together and then to tap the half housing lightly at the unclamped end of the split line until satisfied that good contact has been established. Finally retighten the two setscrews which join the half housings.

## CRANKSHAFT AND MAIN BEARINGS—M.S

### Replacing Crankshaft.

1. Ensure that all oilways are clear.
2. Check main bearing setscrews for stretch or damage to threads (See page B.2). Affected setscrews must be scrapped.
3. In no case should setscrews, other than those supplied by the engine manufacturer be used, as they are of special heat treated high-grade steel.
4. Clean bearing housings and place top half bearings in position.
5. Place crankshaft in position.
6. Fit lower halves of bearings to bearing caps and place in position. Each main bearing cap is stamped 1, 2 or 3 to indicate the position in which it should be replaced (See Fig. M.6). The bearing caps are also marked with a serial number which can again be

found on the bottom face of the cylinder block. Ensure that the thrust washers on No 3 bearing are fitted correctly.

7. Place tab washers in position and tighten setscrews. Use none other than those supplied by the engine manufacturers.
8. For final tightening of the setscrews a torque wrench should be used, set to the tension given in Section B.
9. Lock setscrews in position by means of the tab washers.
10. Fit crankshaft rear end oil seal as previously described.
11. Re-assemble engine as required and to the instructions given for the various operations.

It is important that new locking washers of the correct type are fitted when setscrews have been removed.



## CAMSHAFT AND FUEL PUMP DRIVE (N)

The camshaft and fuel pump gears are driven by the crankshaft gear through an idler gear. All the gears are suitably marked during production to facilitate retiming, the marks being in line when No. 1 piston is at T.D.C. on its compression stroke (see Fig. P.2). It will be appreciated that these timing marks will not align at every rotation of the crankshaft where No. 1 piston is at T.D.C. compression.

### To Remove Camshaft.

An exploded view of the camshaft drive is shown in Fig. N.1.

1. Remove cylinder head cover, rocker shaft assembly and push rods.
2. Remove timing case front cover.
3. Remove sump (see Section Q).
4. Remove lubricating oil pump (see Section Q).
5. Remove timing case "Power Take Off" facing cover, or sea water pump adaptor where applicable.
6. Note timing marks.
7. Remove idler gear.
8. If engine is in a swivel stand, turn engine completely over, if not lay engine over at an angle. This will prevent the tappets dropping out when the camshaft is removed.
9. Remove camshaft.

### To Remove Camshaft Gear.

To remove camshaft gear from camshaft, remove the three setscrews in the centre of the gear. The gear can now be removed from the camshaft.

### To Replace Camshaft Gear.

The three clearance holes drilled at equal angles are the holes for attaching the gear to the cam-shaft.

When fitting a replacement gear to the cam-shaft, turn the camshaft until No. 1 cam is upright. It will be observed that a tapped hole on the camshaft hub is also at the top, in line with No. 1 cam marked with a letter "D." Look at the

gear, and it will be noted that one of the holes in the gear has the letter "D" adjacent to it.

Place the gear on the hub with these two holes marked "D" in line (See Fig. N.2).

Replace setscrews and shakeproof washers.

### To Replace Camshaft.

1. See that tappets are in position (See Fig. N.3).
2. Replace camshaft.
3. Replace idler gear but do not lock idler gear retaining setscrew.
4. Reset timing (see Section P).
5. Lock idler gear retaining setscrew.
6. Re-assemble engine as required and to the instructions given for the various operations.

### To Remove the Idler Gear and Spigot.

1. Remove the timing case cover as previously detailed.
2. Bend back the locking washer on the idler gear retaining setscrew and remove the setscrew, locking washer and idler gear retaining plate.
3. Remove the idler gear from its spigot.
4. The idler gear spigot may now be removed from its machined location in the timing case (See Fig. N.4).

### To Replace the Idler Gear and Spigot.

Replace the idler gear spigot ensuring the small locating peg is entered into its recess in the cylinder block (See Fig. M.4).

Fit the idler gear to the spigot with the boss of the gear towards the cylinder block. Whilst entering the idler gear into position make sure that all the timing marks of the camshaft gear, the fuel pump gear and the crankshaft gear are aligned with the timing marks of the idler gear (see fig. P.2).

Replace the idler gear retaining plate, locking washer and retaining setscrew. Fully tighten the setscrew and bend up the locking washer. Check that there is end float of the idler gear on its

## CAMSHAFT AND FUEL PUMP DRIVE—N.2

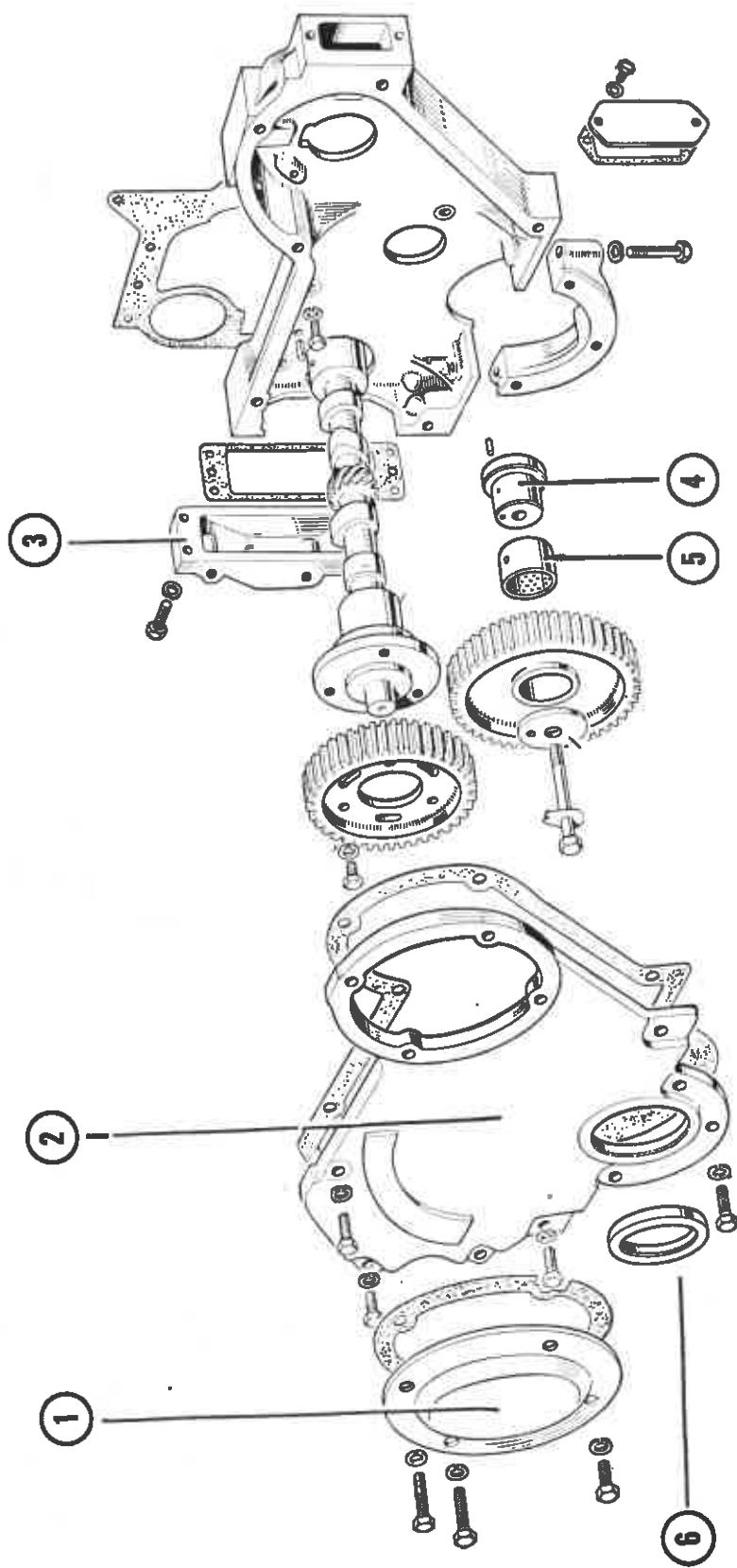


Fig. N.1.  
Arrangement of Timing Case, Cover, Camshaft and  
Idler Gear  
1. Inspection Cover for Fuel Pump Drive. 4. Idler Gear Hub.  
2. Timing Case Cover. 5. Idler Gear Bush.  
3. Power Take-off Facing Cover. 6. Timing Case Front Cover Oil Seal.

## CAMSHAFT AND FUEL PUMP DRIVE—N.3

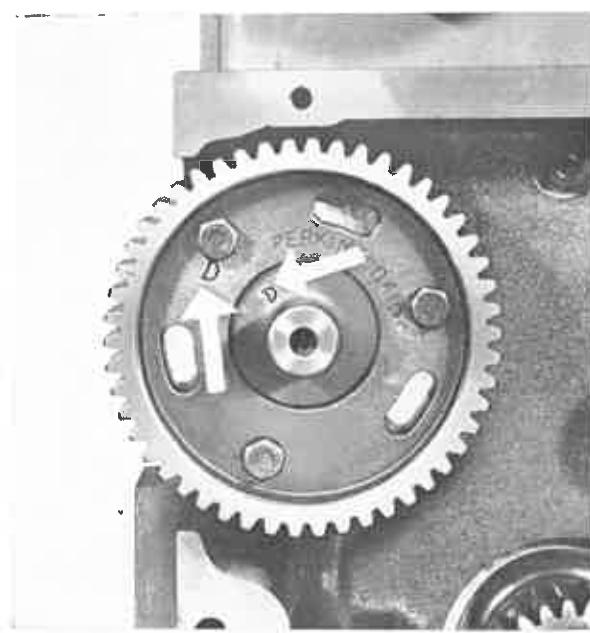


Fig. N.2.  
Markings on Camshaft Gear and Hub.

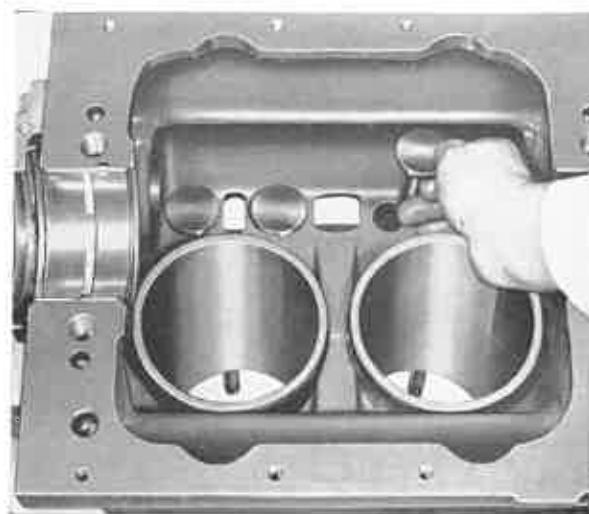


Fig. N.3. Replacing a Tappet.

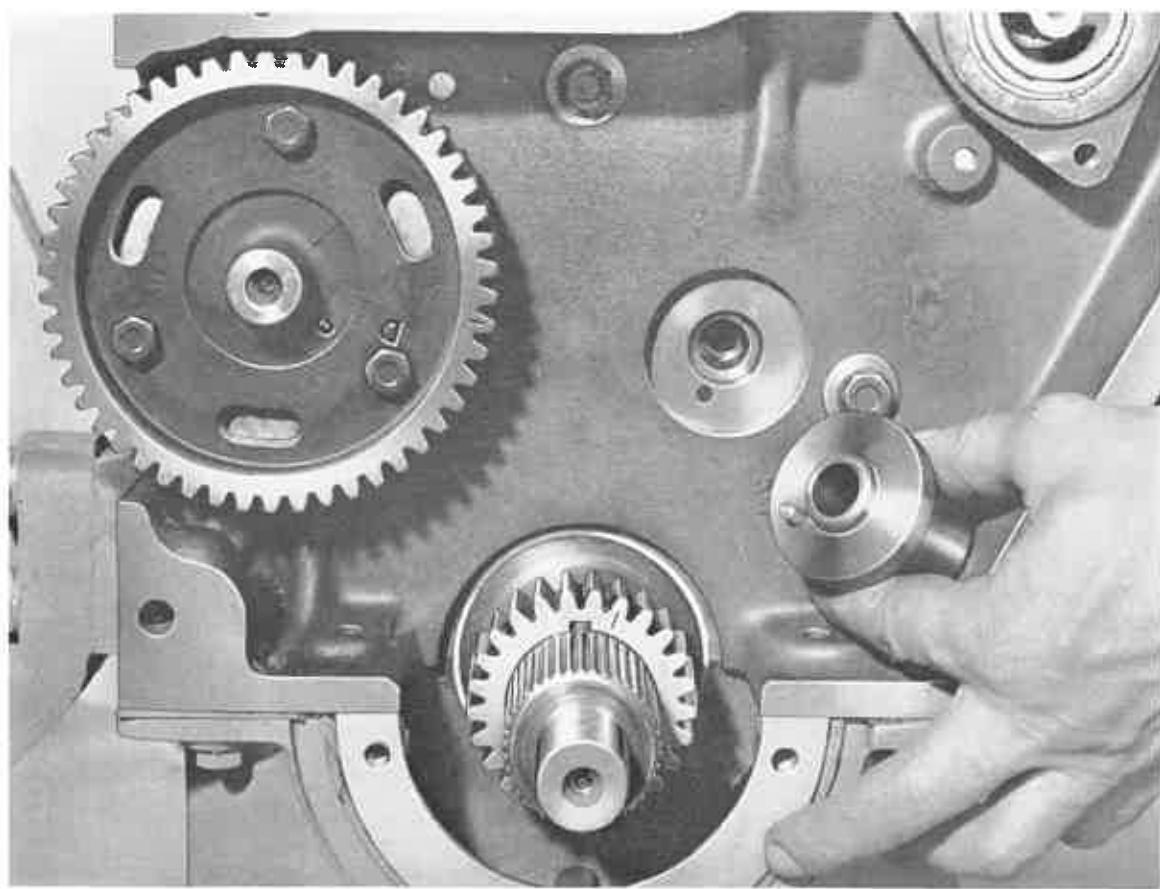


Fig. N.4. Removing Idler Gear Spigot.

## CAMSHAFT AND FUEL PUMP DRIVE—N.4

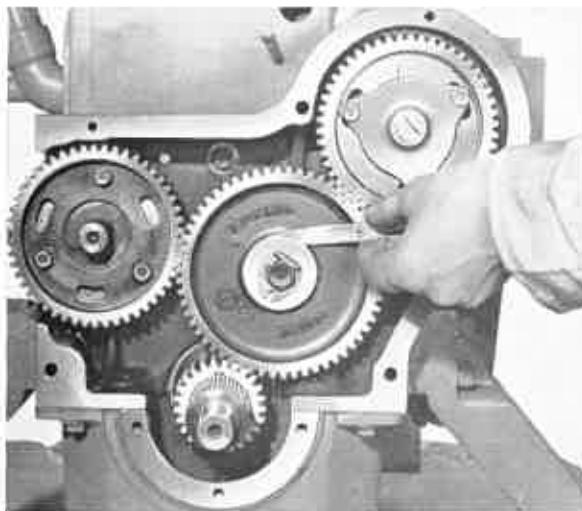


Fig. N.5. Checking Idler Gear End Float.

spigot. This should be within the limits of 0.005 in. (0.127 mm) to 0.015 in. (0.381 mm) (see fig. N.5).

### To Remove the Fuel Pump Gear, Hub and Carrier.

An exploded view of the fuel injection pump and drive can be seen in Fig. N.6.

1. Remove the idler gear as previously de-

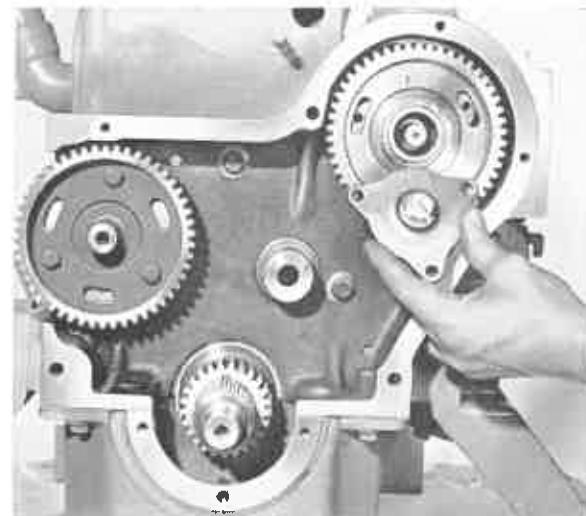


Fig. N.7. Removing Fuel Pump Gear Adaptor.

- cribed and remove the rocker assembly.
2. Remove the three securing setscrews and spring washers on the fuel pump gear assembly.
  3. Remove the fuel pump gear adaptor (See Fig. N.7).
  4. Remove the fuel pump quillshaft (See Fig. N.8).

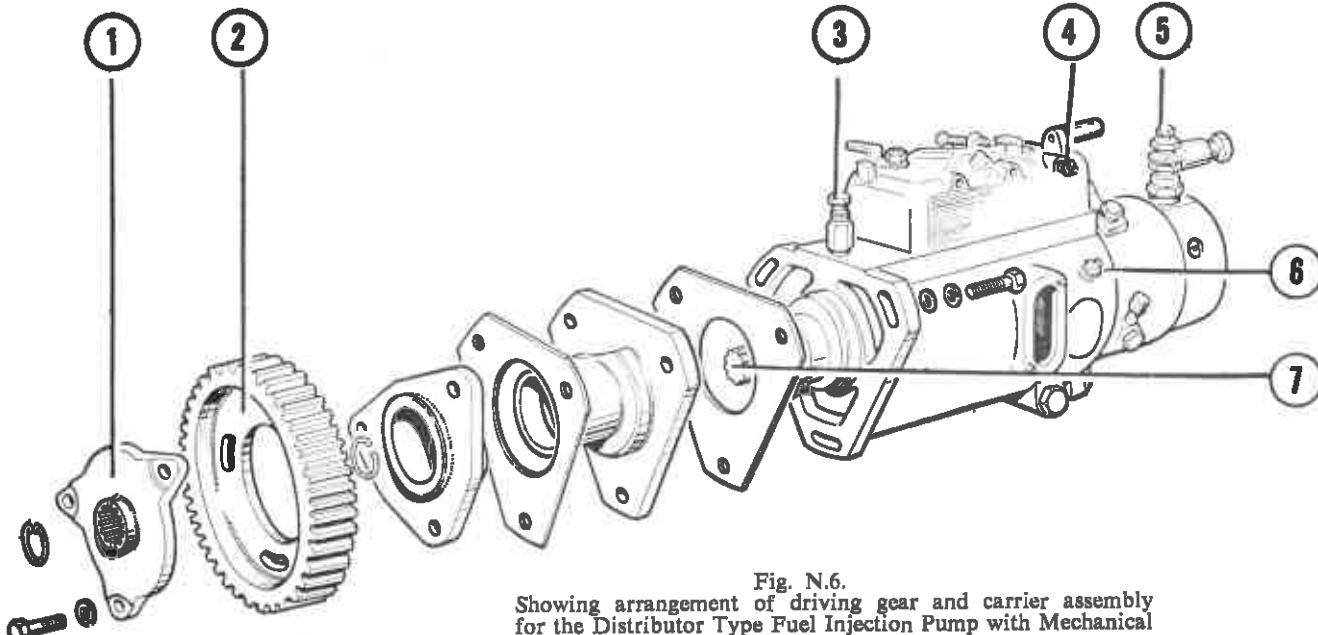


Fig. N.6.  
Showing arrangement of driving gear and carrier assembly  
for the Distributor Type Fuel Injection Pump with Mechanical  
Governor.

1. Driving Plate.
2. Driving Gear.
3. Fuel Return Outlet.
4. Governor Control Air Vent Screw.
5. Fuel Inlet Adaptor Vent Screw.
6. Hydraulic Head Locking Screw Vent
7. Quill Driving Shaft.

## CAMSHAFT AND FUEL PUMP DRIVE—N.5

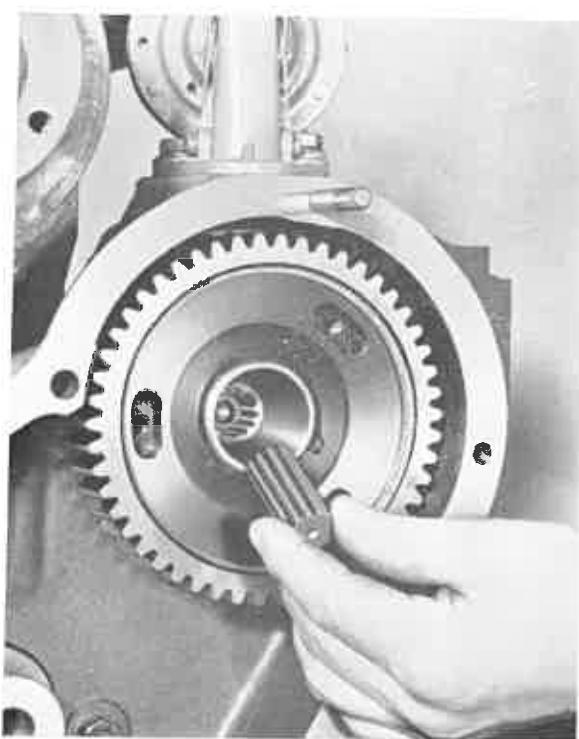


Fig. N.8. Removing Quill Shaft.

5. Remove the fuel pump driving gear from its hub (See Fig. N.9).
6. Remove the circlip retaining the hub to the carrier and remove the hub (See Fig. N.10).

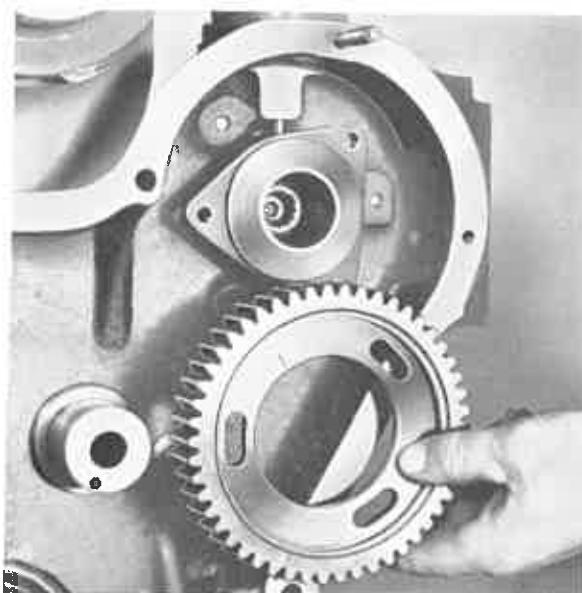


Fig. N.9. Removing Fuel Pump Drive Gear.

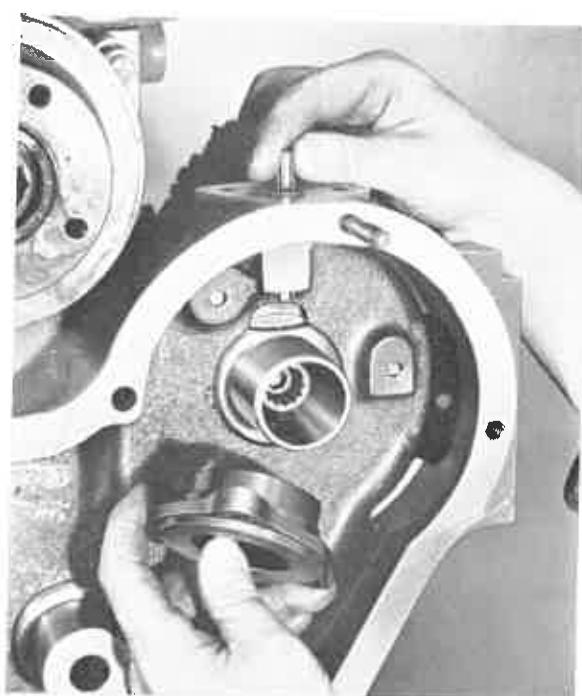


Fig. N.10. Removing Fuel Pump Drive Gear Hub.

7. Remove the fuel lift pump and its push rod.
8. Remove the fuel pump as detailed in Section P.
9. The fuel pump gear hub carrier may now be withdrawn from the rear of the timing case (See Fig. N.11).

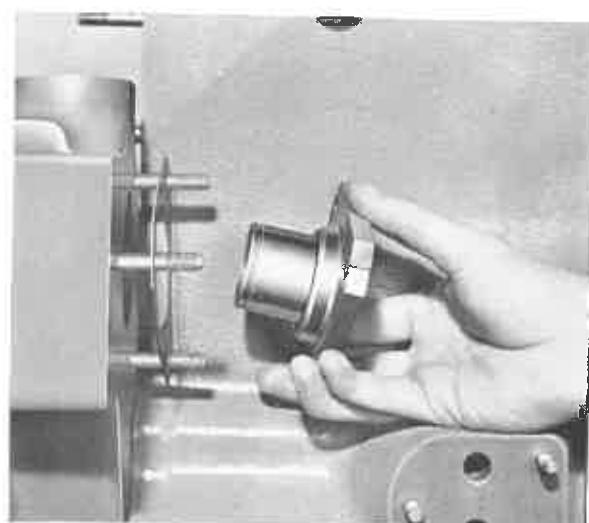


Fig. N.11. Removing Fuel Pump Gear Hub Carrier.

## CAMSHAFT AND FUEL PUMP DRIVE—N.6

### To Replace the Fuel Pump Gear, Hub and Carrier.

1. Insert the hub carrier through the rear of the timing case.
2. Fit the fuel pump gear hub to the carrier and secure with the large outer circlip, ensuring the circlip is correctly located in its groove around the carrier.
3. Fit the fuel pump as detailed in Section P.
4. Fit the fuel pump driving gear to its hub. It will be seen that there is only one position for the slotted holes in the gear to align with the setscrew holes of the hub, with the setscrew holes of the hub in the centre of the slotted holes of the gear.
5. Fit the quillshaft into the nose of the fuel pump, noting the master spline location.

6. Offer the fuel pump driving gear adapter to the gear assembly, and here again it will be noted that it will only fit in one position with the securing holes of the adaptor in line with the slotted holes of the gear and setscrew holes of the hub. Affix the driving gear adaptor noting the master spline engagement with the quillshaft. Fit the securing setscrews but do not tighten.
7. A scribed timing mark will be seen on the inside front face of the driving gear and another timing mark on the front face of the adaptor. Adjust the position of the fuel pump driving gear to the adaptor until these two timing marks align, and then tighten the three setscrews (see fig. P.2).

**NOTE :** In production the timing mark of the adaptor and the timing mark on the inner front face of the timing gear are not premarked, so should it be necessary to renew either the fuel pump gear or the adaptor, the fuel pump timing procedure as laid down in Section N. should be followed. Mark the timing gear and adaptor after resetting the timing.

### To Check Timing Gear Backlash.

Remove the timing case as previously detailed. Check the backlash between the timing gears using a set of feeler gauges (See Fig. N.12). The backlash should be between 0.003 in. (0.076 mm) and 0.006 in. (0.152 mm).

If the backlash of the timing gears is within these limits replace the timing case cover, if not, renew the gears concerned. Replacement gears are premarked.

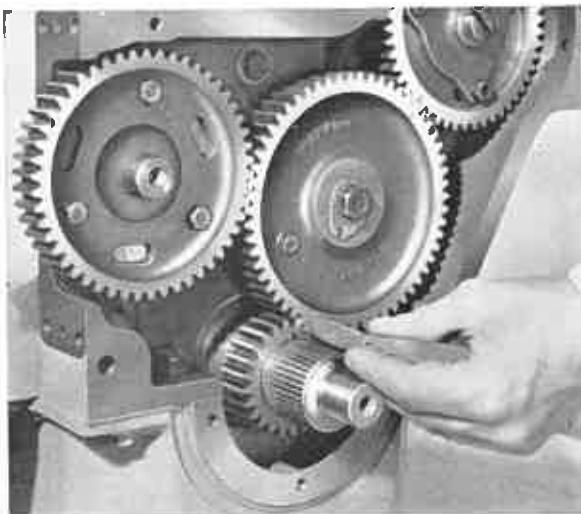


Fig. N.12. Checking Drive Gears for Backlash.

## TIMING (P)

**NOTE:**—When checking and adjusting valve clearances the engine should be turned to bring the respective pistons to T.D.C. on compression. (See page J.6).

The timing or resetting of the timing on the Perkins 4.270 Marine engine can be simply and expediently carried out if the following instructions are followed.

It is well to remember that if the cylinder head has been removed it does not, in any way, affect the timing of the engine.

### MARKINGS.

On the 4.270 Engine the scribed line marked "E" on the fuel pump rotor should be in line with the scribed line on the circlip at commencement of injection. This point should be at 16° B.T.D.C. of the engine (See Fig. N.1).

On the fuel pump carrier flange situated between the fuel pump on the front timing case will be a scribed line, and this scribed line should coincide with the scribed line on the fuel pump body flange.



Fig. P.1. Markings on Fuel Pump Rotor.



Fig. P.2. Timing Marks on Drive Gears.

With the timing case cover removed a further scribed line will be seen on the fuel pump driving gear and this line should coincide with the scribed line on the triangular driving plate, secured to the driving gear hub by three bolts through the elongated holes in the driving gear (See Fig. P.2).

### To Re-set Engine to its Original Timing.

If for any reason the front timing gear arrangement has been dismantled, the following procedure should be adopted when re-assembling these gears.

1. Remove atomisers.
2. Release rocker assembly and remove.
3. Set crankshaft to T.D.C. Nos. 1 and 4 pistons as indicated by the T.D.C. mark on the flywheel and the keyway of the crank-shaft pulley which should be at the top of its periphery.
4. On the hub of the camshaft will be seen the letter "D" adjacent a fixing hole, and on the camshaft gear another letter "D" will be seen stamped adjacent a fixing hole. Ensure these letters "D" coincide when offering the camshaft gear to the camshaft hub (See Fig. N.2).

## TIMING—P.2

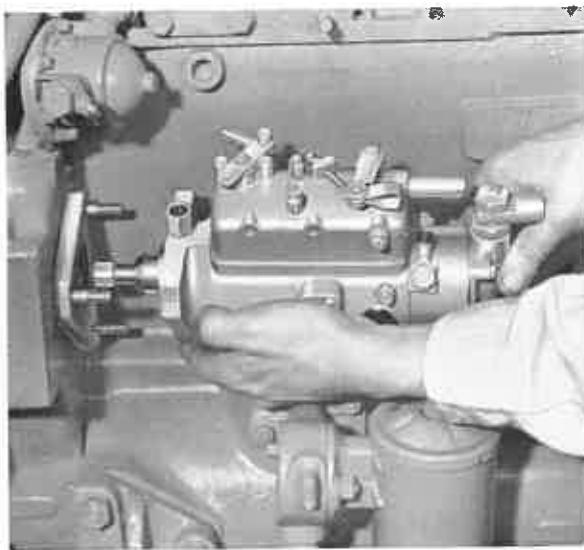


Fig. P.3. Removing Fuel Injection Pump.

5. If the fuel pump driving gear hub and circlip has for any reason been removed it is advisable to remove the fuel lift pump and its push rod. Having replaced the fuel pump driving gear hub and circlip, replace the push rod so that it rides on the eccentric of the driving gear hub. Replace fuel lift pump.
6. Offer up the fuel injection pump driving gear to the hub, but first ensure it will locate in the one position to the hub where the fixing bolts will be in a central position within the elongated slots.
7. Offer up the triangular adaptor or driving plate and fixing bolts to the fuel pump gear and hub, taking care to engage the master spline of the quill shaft within the master spline female of the adaptor or driving plate. Secure the fixing bolts but do not tighten.
8. Replace the circlip inside the driving plate.
9. With a suitable tool turn the driving plate in relation to the fuel pump driving gear until the scribe lines on the gear and driving plate coincide. Tighten the securing bolts (See Fig. P.2).
10. With the camshaft and fuel pump gears fitted, replace the idler gear ensuring all the timing marks coincide (See Fig. P.2).

### Checking Fuel Pump Timing.

The fuel pump timing can be checked by dropping a valve onto No. 1 Piston to enable the piston

displacement from T.D.C. to be measured with No. 1 piston on compression stroke. Great care is necessary with this operation as the consequences of a valve dropping right down into the cylinder bore need not be described.

With the aid of a clock gauge on the valve now sitting on the No. 1 piston it will be necessary to position the crankshaft so that the piston will be .116 in. B.T.D.C., this being an equivalent of 16° B.T.D.C. on the flywheel.

At this point the position of the scribe line marked "E" on the fuel pump rotor should coincide with the circlip scribe line (See Fig. P.1). If not, an adjustment of the fuel pump position in relation to the engine must be made.

### Fuel Pump Timing Adjustment.

To adjust the fuel pump timing should the scribe line "E" on the fuel pump rotor not coincide with the circlip scribe line at 16 degrees B.T.D.C., adjustment may be made through the front inspection cover, by releasing the three bolts securing the fuel pump drive gear and moving the drive plate in relation to the gear. Re-mark the fuel pump drive gear and adaptor plate.

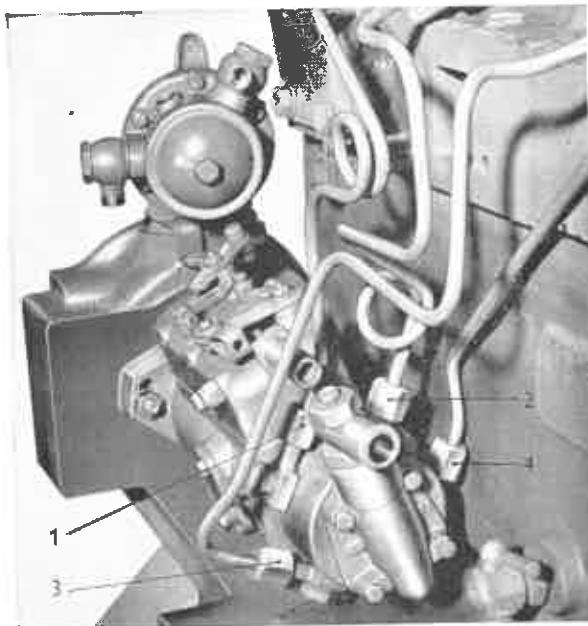


Fig. P.4.

1. Fuel Pipe Connection to No. 1 Atomiser.
2. Fuel Pipe Connection to No. 2 Atomiser.
3. Fuel Pipe Connection to No. 3 Atomiser.
4. Fuel Pipe Connection to No. 4 Atomiser.

Final adjustments of the fuel pump timing may be made during the testing of the engine under normal load.

### TO CHECK VALVE TIMING

To check valve timing proceed as follows:

1. Remove valve cover.
2. Set valve clearance of No. 1 cylinder inlet valve to .020 in. (.51 mm) with No. 1 piston at T.D.C. on compression.
3. Remove atomisers.
4. Turn engine in the normal direction of rotation until the inlet push rod of No. 1 cylinder just begins to tighten. This is the point at which the inlet valve begins to open.
5. Check through the inspection hole in the flywheel housing that the flywheel T.D.C. mark is central within the inspection hole. If the T.D.C. mark on the flywheel is within plus or minus 3° of T.D.C. position, then the valve timing is correct.
6. Having checked the valve timing, the valve clearances should be re-set to .010 in. with engine warm. When checking and adjusting valve clearances the engine should be turned to bring the respective pistons to T.D.C. on compression (see page J.6).

### Changing a Fuel Pump.

If at any time during the engines life it is found necessary to change the fuel injection pump, the following procedure should be adopted.

1. Remove injection pipes and all fuel pipes.
2. Remove all controls.
3. Check the position of the timing marks on the fuel pump flange and fuel pump carrier, these should align.
4. Remove the three securing nuts.
5. Withdraw fuel pump and its quill shaft. (See Fig. P.3).
6. Offer up replacement fuel pump ensuring the master spline on its quill shaft is in a relative position to the female within the driving plate.
7. Position the fuel pump and secure.
8. Replace all fuel pipes and controls.

Note that No. 1 cylinder high pressure pipe from the atomiser to the fuel pump should be connected to the outlet connection marked "X" on the fuel injection pump.

Fig. P.4 shows how the fuel injection pipes should be connected.

The fuel injection timing may be checked as described under "Checking Fuel Pump Timing."



# LUBRICATING SYSTEM (Q)

**NOTE :** Lubricating oil Data in appendix.

The importance of correct and clean lubrication cannot be stressed too highly and all references to engine oil should be taken to mean lubricating oil which falls within the specifications given in the appendix. Care should be taken that the oil chosen is that specified for the climatic conditions under which the engine is operated.

The sump should be filled with suitable lubricant to the correct level, but do not attempt to overfill above the full mark. Before filling, or checking the dipstick, ensure that the engine is level.

## Oil Circulation.

The system of lubrication is pressure feed to main and big end bearings, to camshaft bearings and to valve rocker assembly.

The pump draws oil through the strainer from the sump and delivers it by an external pipe inside the crankcase through a drilling in the side of the cylinder block; thence through the lubricating oil filter bracket to the lubricating oil filter.

From the filter it is delivered through external pipes to the oil cooler and then to the pressure rail which is an internal passage within the crankcase; holes are drilled which lead from the pressure rail to the crankshaft main bearings and holes drilled in the crankshaft carry oil to the big end bearings. Surplus oil returns to the sump.

Seals prevent oil leaking from the rear and front end of the crankshaft.

The small end bushes are lubricated by splash and lubricating oil mist.

A passage from the centre main bearing conveys oil to the centre camshaft bearing which is also in open communication with the top face of the cylinder block by means of a vertical drilling.

In conjunction with the centre camshaft journal, this latter drilling serves to provide oil at a reduced pressure to the top face of the cylinder block and thence to the rocker assembly.

The camshaft journal contains two drilled passages and when these drillings are in line with the feed from the centre main bearing, oil flows to the

top face of the cylinder block. Since these drillings coincide but momentarily for every revolution of the camshaft, only a reduced quantity of oil is delivered to the drilling leading to the top face of the cylinder block.

This drilling matches up with a vertical passage machined through to the top face of the cylinder head from whence the oil is taken by an external pipe to the hollow rocker shaft. Drillings in this shaft allow the oil to pass to the rockers, the overflow being returned to the sump by way of the push rod chamber.

Oil also flows from the front main bearing bracket via a hole drilled in the front of the cylinder block to the idler gear spigot from which it escapes through a drilling in the boss of the idler gear to lubricate the timing gears.

A further drilling from No. 1 Main Bearing Housing conveys oil to the front camshaft bearing, surplus oil returning to the sump.

## Oil Pressure.

See that oil pressure is registered on the gauge. The actual pressure may vary with individual engines and under different operating conditions but should be 25/35 lbs. per sq. in. (1.76/2.46 kg/sq. cm) at working temperature and normal running speed.

If the oil pressure, as registered on the gauge, is below normal, check the following in the order given below.

1. Dipstick. Ensure that there is sufficient oil in the sump.
2. Oil pressure gauge. Check for accuracy with master gauge.
3. Lubricating oil filter. May be choked, renew element (see periodical attentions Section G).
4. Sump strainer. This may be choked, remove, clean and replace (for removal instructions see page Q.3).
5. Lubricating oil pump. Ensure that suction and delivery pipe unions are tight.
6. Oil pressure relief valve. Foreign matter may be preventing the valve from closing. For cleaning instructions see page Q.4).

## LUBRICATING SYSTEM—Q.2

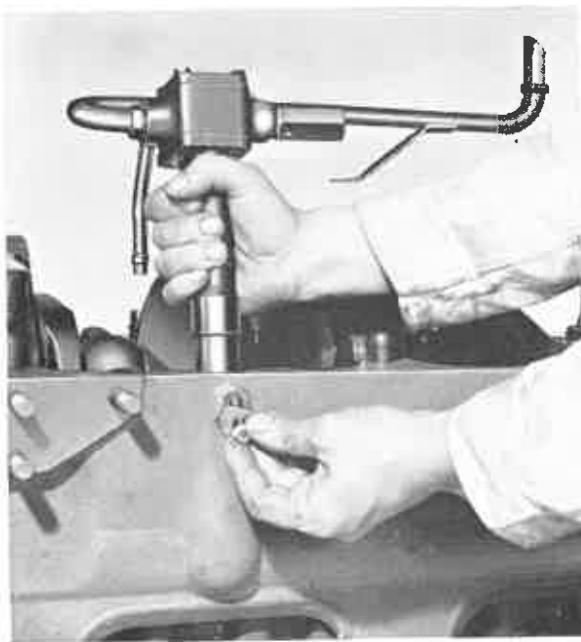


Fig. Q.2. Removing Lubricating Oil Pump.

### The Oil Pressure Relief Valve.

The oil pressure relief valve which is incorporated in the pump prevents the pressure becoming excessive as might happen when the engine is cold.

When the predetermined pressure is exceeded the valve opens against the spring and some of the oil is by-passed back into the sump. That continues until the oil warms up and flows at the desired pressure. The valve then closes.

Lubricating oil pumps incorporate a detachable pressure relief valve which is screwed into the outlet side of the pump body (See Fig. Q.2). The action of this valve is described above, and cleaning instructions are given on page Q.4.

### When to Renew the Oil.

The oil in the sump must be drained in accordance with periodical attentions Section G and replaced by new oil of a specification suitable for the climate in which the engine is operated. (See appendix).

### Sump Oil Drain Pump (Hand Operated).

On the majority of marine installations it is impossible to gain access to the sump drain plug which is situated on the bottom of the sump. Therefore, in order to facilitate the draining of

the engine oil, a hand pump may be provided. This pump when used must be fitted remote from the engine. Drainage of the sump is effected by operation of the pump after attaching a length of suitable piping to the inlet side of the pump and placing the free end of the pipe into the sump via the dipstick orifice.

### General.

Particular care must be taken to wipe off any water which may have splashed onto the engine at any time, since water, which may find its way into the sump from the exterior, will tend to form sludge.

Failure to change the oil at the recommended intervals is false economy even if the oil seems good at the time of recommended change.

Dirty lubricating oil filters aggravate the formation of sludge, which in turn will further choke the filters. Regular filter inspection and cleaning at the specified periods is essential, see Section G.

### Lubrication of Dynamo Rear Bush.

The dynamo rear bush is lubricated by means of a felt wick. This wick should be removed (See Fig. Q.4) and reimpregnated with lubricating oil in accordance with periodical attentions (See Section G).

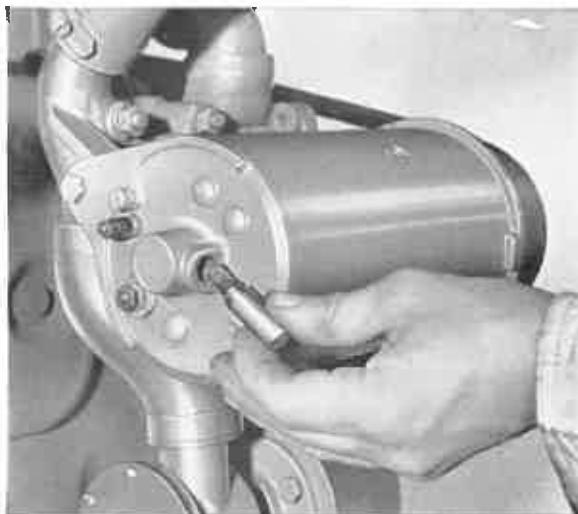


Fig. Q.3. Lubricating Dynamo Rear Bush.

## LUBRICATING SYSTEM—Q.3

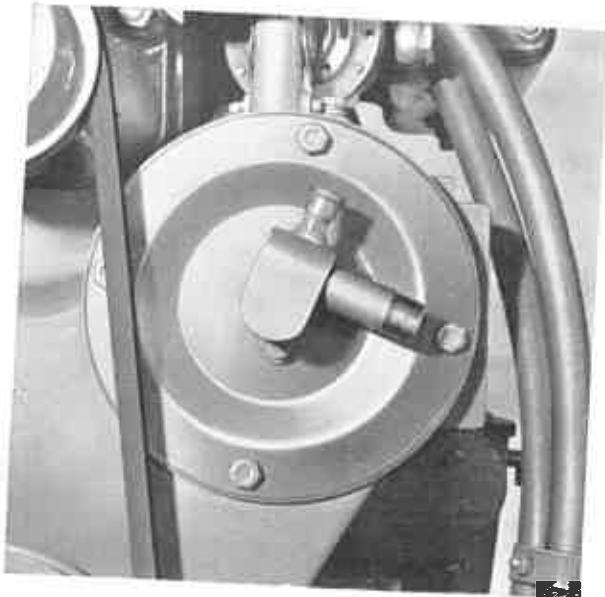


Fig. Q.4. Tachometer Drive Connection and Greaser.

The ball bearing in the front of the dynamo is pre-packed with a special grease and requires no special attention.

### Tachometer Drive Connection.

Provision is made for the connection of a tachometer drive at the front of the timing case (See Fig. Q.4). The greaser on this connection should be turned every 50 hours and the greaser replenished where necessary.

### To Remove Sump.

1. Remove drain plug and drain off oil.
2. Remove dipstick, sump strainer (as above) and all setscrews securing sump to crankcase and lower sump.
3. Remove all traces of old joints, and strip sump cork from timing case bottom cover and rear main bearing cap.

### To Replace Sump.

Assemble new joints and cork strips.

Lightly smear crankcase faces with a thin coating of jointing compound and place joints in position ensuring all holes line up.

When placing joints in position it is important that the mitred ends go right up into the recesses of the timing case bottom cover and rear main bearing cap, and careful inspection of the front

and rear joints will show that one face is marked with two coloured stripes. The strip of material should be fitted to the timing case bottom cover at the front, and to the rear main bearing cap at the rear, so that the face marked with two coloured stripes will be next to the sump, lightly coat one face and the two sides with jointing compound and place in position.

To facilitate assembly of the sump, screw two guide studs into the crankcase, one on each side.

The studs will position the sump accurately and prevent displacement of the joints.

Place the sump in position and insert the screws. Remove guide studs.

When all the setscrews have been inserted tighten evenly all round. Do not overtighten setscrews.

Replace sump strainer and cover plate as previously described.

### To Remove and Refit Oil Pump.

1. Remove sump and sump strainer (see previous headings).
2. Disconnect oil pump delivery pipe from the crankcase union.
3. Remove setscrew from centre main bearing cap thus releasing the oil suction pipe.
4. Unscrew the lubricating oil pump locating setscrew. This screw is situated outside the cylinder block (See Fig. Q.2).



Fig. Q.5.  
Checking End Clearance of Lubricating Oil Pump Gears.

## LUBRICATING SYSTEM—Q.4

5. The oil pump may now be removed.
6. To refit, reverse the above order of operations.

### To Remove and Clean Oil Pressure Relief Valve.

The breaking pressure of the relief valve is set and adjusted at the factory and unless special test equipment is available no attempt should be made to dismantle the oil pressure relief valve.

The lubricating oil pump relief valve may be removed and cleaned without dismantling the pump from the engine.

After the sump has been removed, break locking wire, and unscrew the relief valve assembly from the side of the oil pump body. Wash the valve in clean fuel oil and blow dry with compressed air.

### To Dismantle the Oil Pump.

1. Remove pump from engine (see above).
2. Remove locking wire from suction and delivery banjo bolts and remove pipes. It will be necessary to remove the relief valve assembly in order to release the delivery or outlet pipe.
3. Remove the setscrews securing the bottom cover and gear housing.
4. The idler gear can now be removed.
5. Press off spiral driving gear.
6. The drive shaft and gear can now be removed. To remove gear from shaft use suitable press.
7. To remove the idler gear shaft, withdraw the split pin first; the shaft can then be pressed out. Unless a replacement shaft is to be fitted it is not necessary to remove this shaft and pin.

The cleaning of the pressure relief valve has been dealt with under a previous heading.

### Inspection.

All the parts of the pump should be cleaned and inspected for wear. The fit of the shaft in

the pump body should be carefully checked. The shaft should work easily without lateral movement in the bushes fitted in the body. If the bushes are worn they should be replaced.

If the oil pump gears show signs of wear they should be renewed.

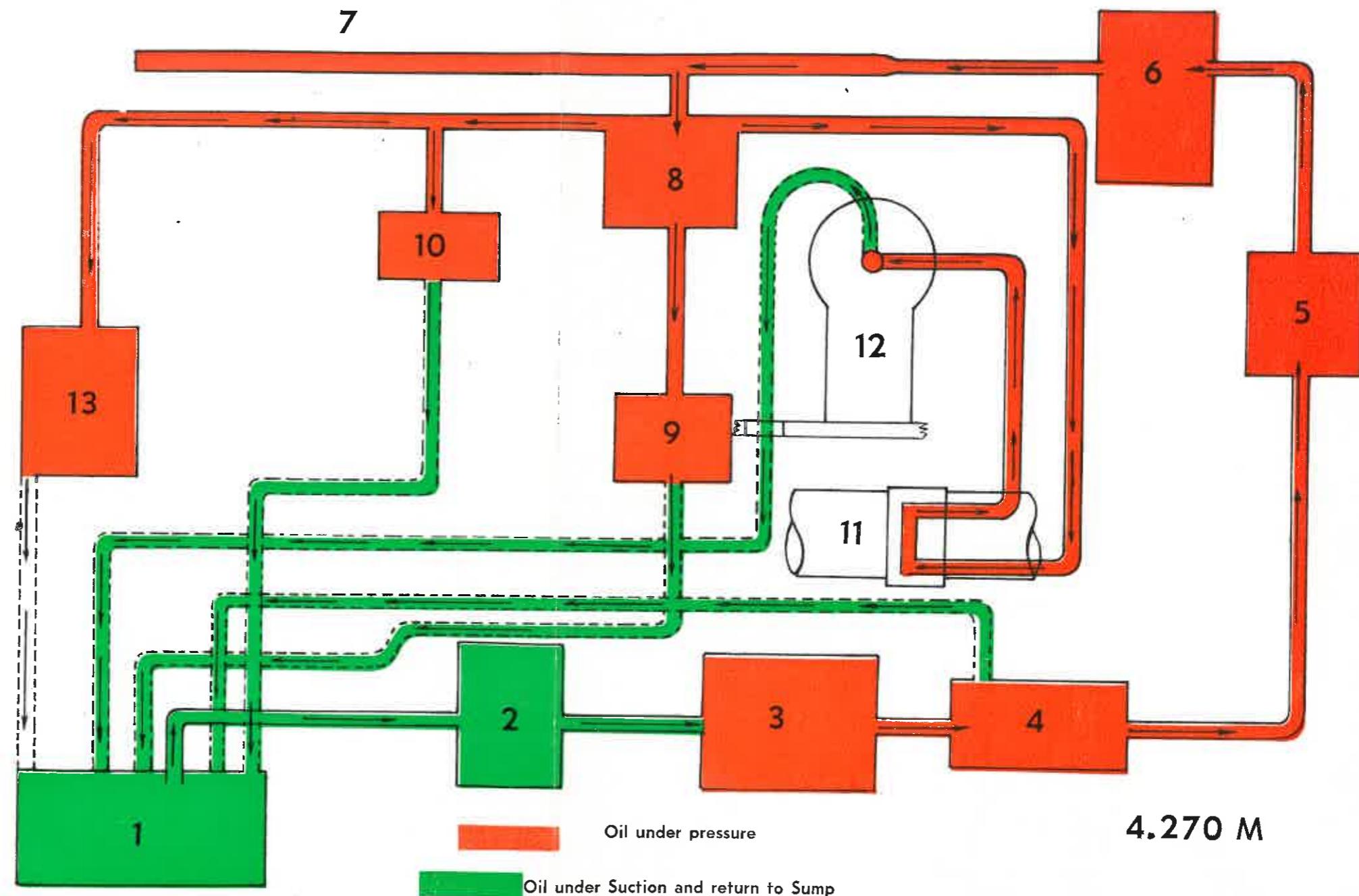
### To Re-assemble the Oil Pump.

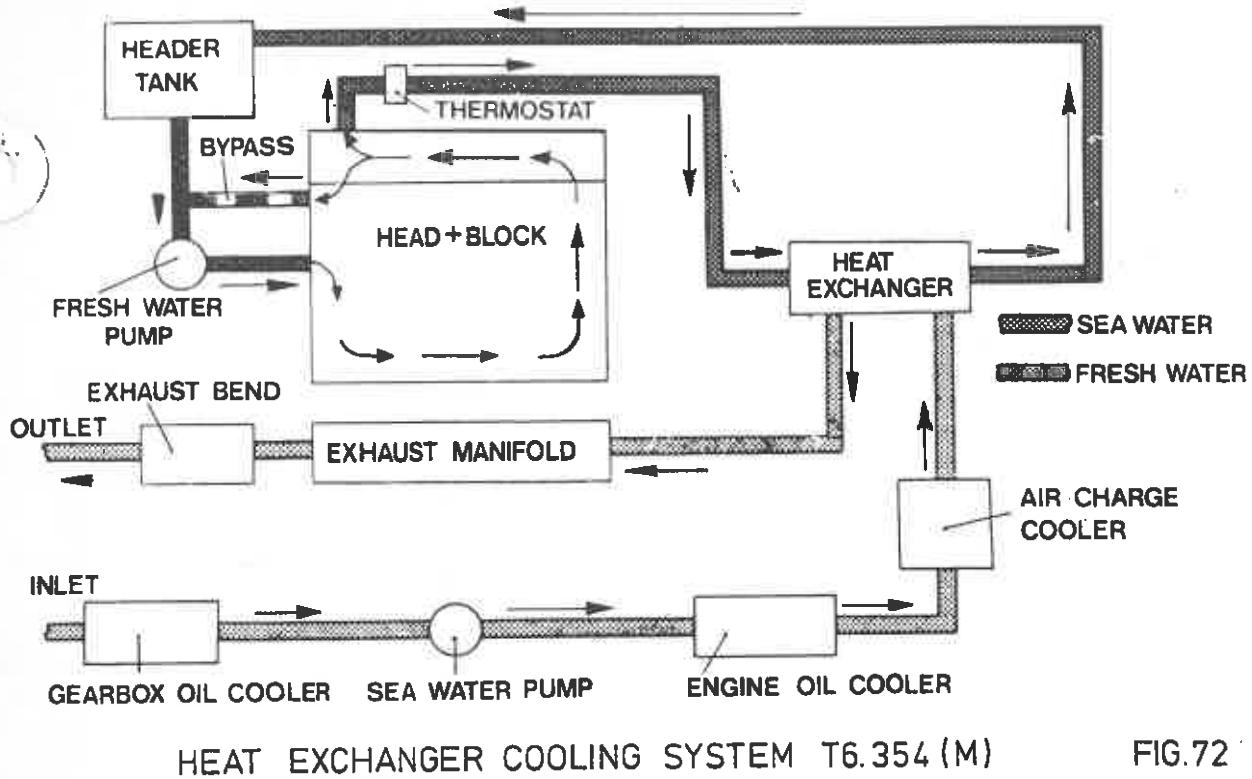
1. Press drive shaft gear on to shaft. The end of the shaft should be flush with the bottom face of the gear.
2. Assemble gear and shaft to pump body.
3. Assemble idler gear, pump housing and joint to body; secure by using setscrews with suitable distance pieces.
4. Check that there is clearance between housing and gears.
5. Place bottom cover joint on bottom face of housing and with a straight edge and feeler gauge, check the clearance between the straight edge and face of gears (See Fig. Q.5). This clearance should be .002 in. to .006 in. (.05/.15 mm). It is important that this clearance does not exceed .006 in. (.15 mm) otherwise the pump output will be insufficient and the lubricating system adversely affected. New joints should be used when carrying out this test.
6. Remove setscrews, pump housing and idler gear.
7. Using a suitable press, press the spiral driving gear on to the shaft. The shaft end should be just level with the top face of the spiral gear.
8. Assemble housing, joints, idler gear and bottom cover to pump body, using new shakeproof washers for the securing setscrews.
9. Replace suction and delivery pipes and lock banjo bolts with locking wire.
10. Re-assemble pump to engine.

FIG. Q.1. LUBRICATING OIL DIAGRAM

Key to Fig. Q.1.

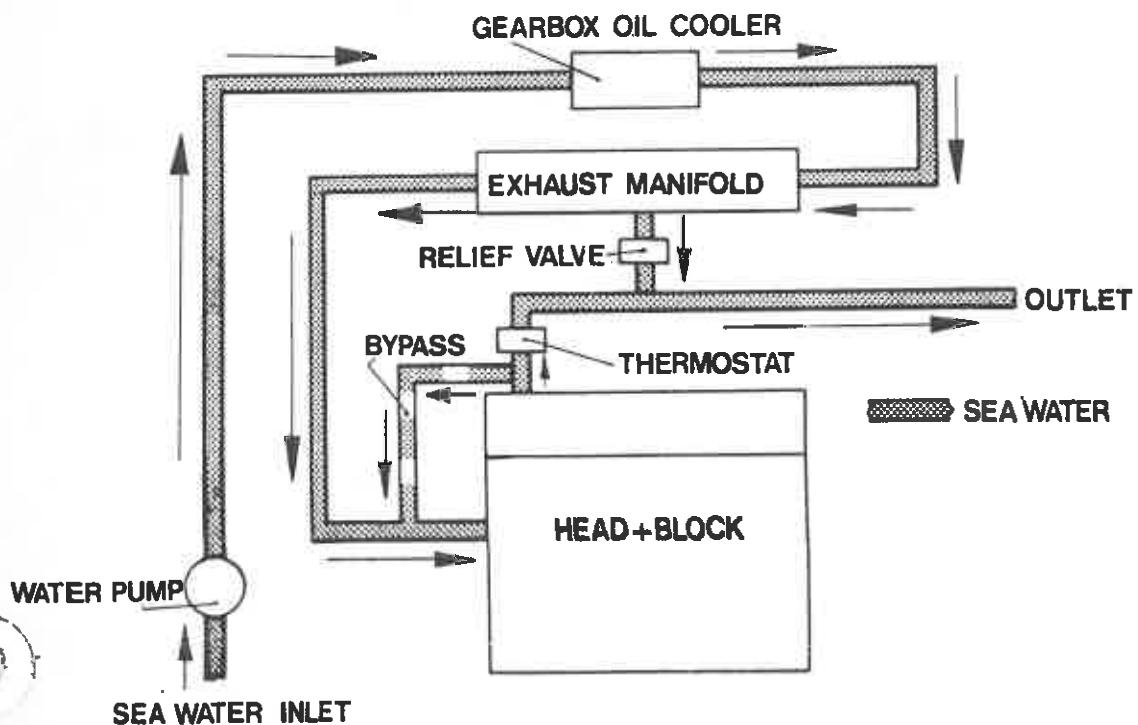
1. Sump.
2. Sump Strainer.
3. Lubricating oil Pump.
4. Oil Pressure Relief Valve.
5. Filter.
6. Oil Cooler.
7. Main Oil Gallery.
8. Main Bearings.
9. Big End Bearings.
10. No. 1 Camshaft Bearing.
11. Centre Camshaft Bearing.
12. Rocker Shaft.
13. Timing Gears.





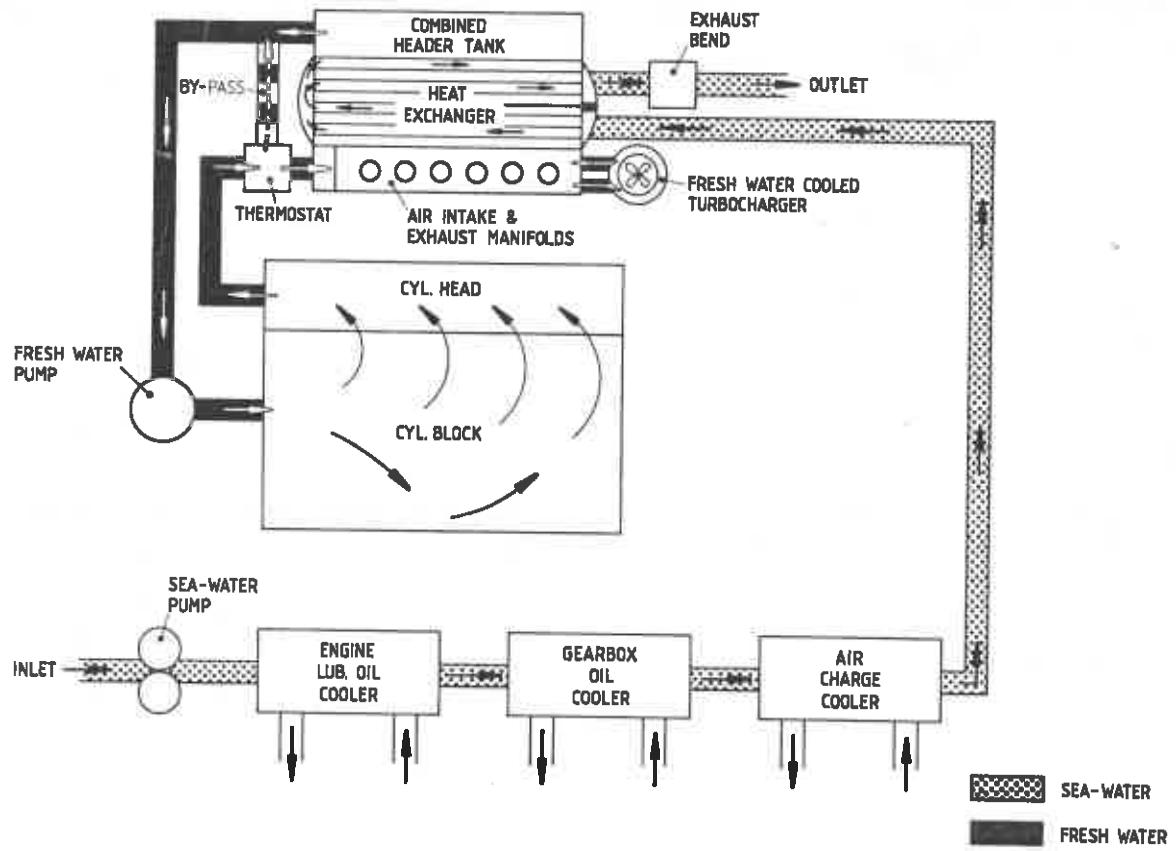
HEAT EXCHANGER COOLING SYSTEM T6.354 (M)

FIG.72



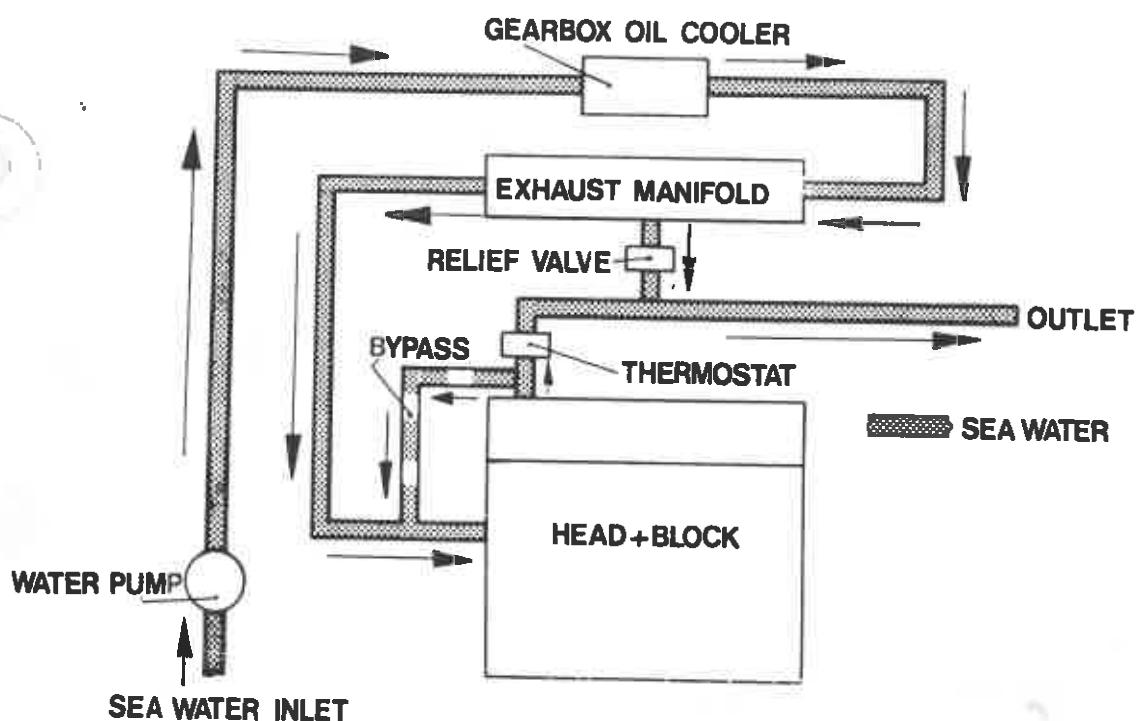
DIRECT COOLING SYSTEM 4.108(M) LOWLINE

FIG.73



HEAT EXCHANGER COOLING SYSTEM T6.3544(M)

Fig. 72



DIRECT COOLING SYSTEM 4.108(M)

78

Fig.73

## COOLING SYSTEM (R)

The 4.270 Marine Engine may be so arranged as to accommodate any one of the following three types of cooling system.

### Direct Cooling System.

With this system, water from a source outside the boat is utilised, i.e. sea or river water. The coolant is fed by means of a rubber impeller type water pump into the forward end of the cylinder block. Here it circulates around the cylinder liners and cylinder head by means of thermo-syphon action. The cooling water leaves the engine at the forward end of the cylinder head and is then delivered to the cooling jacket surrounding the exhaust manifold. An outlet connection fitted to the rear end of the exhaust manifold enables the water to be finally led overboard.

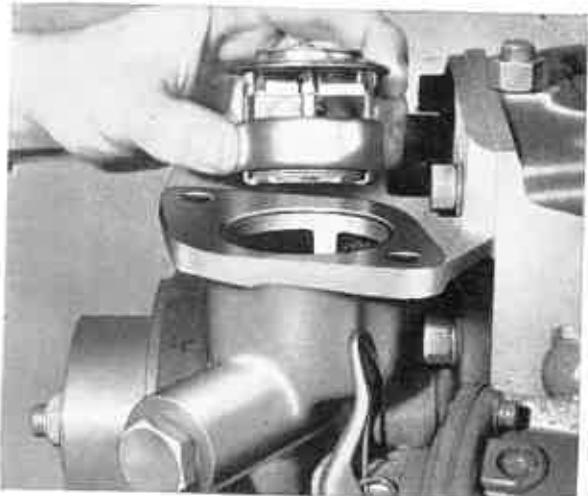


Fig. R.1. Removing the Thermostat.

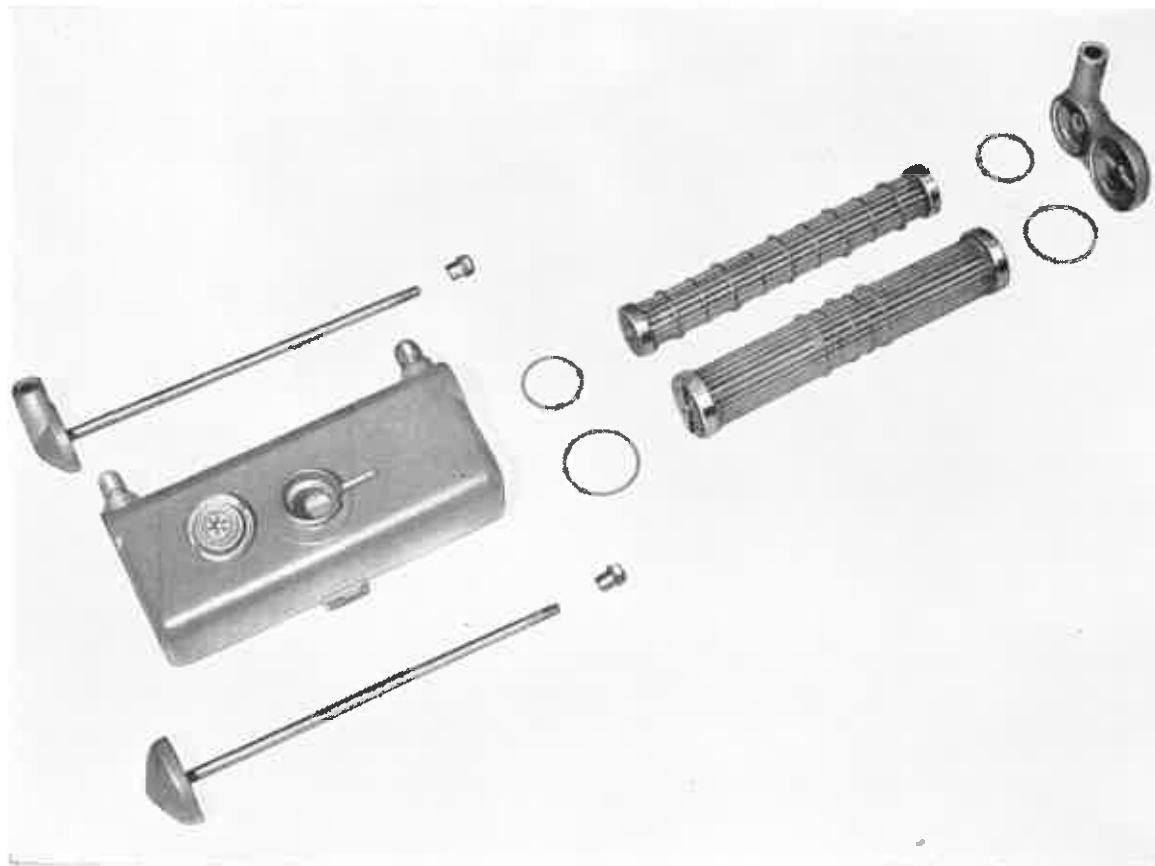


Fig. R.2. Exploded view of Heat Exchanger.

## **COOLING SYSTEM—R.2**

With a direct cooling system, the water temperature should not be allowed to exceed 120°F. (49°C.) otherwise salt deposits are liable to form in the water jackets of the cylinder block and head which could of course cause a restriction.

A lubricating oil cooler for engines utilising this system of cooling is obtainable as an optional extra and when incorporated in the cooling system is fitted to the front end of the engine sump on the suction side of the water pump.

### **Indirect Cooling System (Heat Exchanger).**

This type of cooling system utilised in conjunction with a heat exchanger, incorporates two separate water pumps, viz. the rubber impeller and centrifugal types.

The rubber impeller type pump is used to circulate sea water through the heat exchanger which is affixed to the front of the cylinder head. Overboard discharge is taken through the exhaust manifold cooling jacket.

Circulation of the closed fresh water system is effected by means of the centrifugal pump which is belt driven from the crankshaft pulley. Water is drawn from the heat exchanger and enters the cylinder block at the rear of the water pump. After circulation through the engine, the water is expelled from the front of the cylinder head back into the heat exchanger.

The top part of the heat exchanger forms a header tank for the fresh water and a pressure type filler cap with overflow pipes is provided. The valve in the cap operates between  $3\frac{1}{2}$  and  $4\frac{1}{2}$  lb./sq. in. (.24/.31 kg/sq. cm). A thermostat is supplied as standard for this type of cooling system, the coolant temperature being controlled at approximately 150°F.—180°F. (65°C.—82°C).

The thermostat is fitted in the heat exchanger inlet connection (See Fig. R.1).

### **Keel Cooling System.**

Fresh water cooling by means of keel pipes is a simplified version of the heat exchanger system described above.

The water pump which is of the centrifugal type, draws up cooling water from pipes running along the keel of the craft. Prior to reaching the water pump, the coolant passes through the lubri-

cating oil cooler which is fitted as standard equipment to engines employing this type of cooling system. The coolant then enters the engine at the forward end of the cylinder block and is expelled at the forward end of the cylinder head. From the cylinder head the water is discharged back into the keel pipes via the exhaust manifold cooling jacket. It will be observed that this is a closed circuit type of cooling system, the water in the keel pipes being cooled by the water through which the craft passes.

With this type of cooling system, a thermostat is fitted as an optional extra.

Information regarding dimensions of Keel Pipes may be obtained on request from Service Department, Perkins Engines Ltd., Peterborough.

### **Heat Exchanger.**

- (a) The general purpose of the heat exchanger is to provide :—  
A reservoir of fresh water in the header tank to allow for expansion and contraction, evaporation, and unavoidable leakage.
- (b) A method of cooling the fresh water by means of sea water. This is accomplished by passing the sea water through a series of small bore tubes and guiding the fresh water over the tubes with the aid of a number of circular shaped baffles.
- (c) A method of cooling the engine lubricating oil by means of sea water. This is accomplished by passing the sea water through a series of small bore tubes and guiding the oil over the tubes with the aid of a number of circular shaped baffles.

The Unit therefore basically comprises :—

- (a) An aluminium casing providing the header tank and a machined bore into which the heat exchanger tube stack is located.
- (b) A smaller aluminium cylinder into which the oil cooler stack tube is located.
- (c) Two tube stacks each comprising a multiplicity of small bore tubes running between two tube plates.
- (d) Two sea water end covers.
- (e) A tie rod which passes between the end covers and secures the assembly together.

## COOLING SYSTEM—R.3



Fig. R.3.  
Removing Fresh Water Pump Pulley.

An exploded view of the heat exchanger is shown in Fig. R.2.

### Dismantling the Heat Exchanger.

When dismantling it is best to proceed in the order given below.

1. Remove the two sea water pipes from their respective end covers.
2. Disconnect the two oil pipes.
3. Remove the brass cap nut.
4. This end cover can now be removed.
5. The other end cover complete with tie rod can now be withdrawn. Care should be taken to support the oil cooler and the spacing ring after the tie rod has been removed, as this will not be attached in any way to the main casing.
6. The 'O' seals can now be removed from the end of the tube stacks allowing the latter to be withdrawn from their respective castings.
7. The main aluminium casing can now be removed from the engine if necessary ; this will entail disconnection of the fresh water flanges.

### Cleaning the Heat Exchanger.

If the tube stack appears to be badly choked the best method of cleaning is to place the assem-

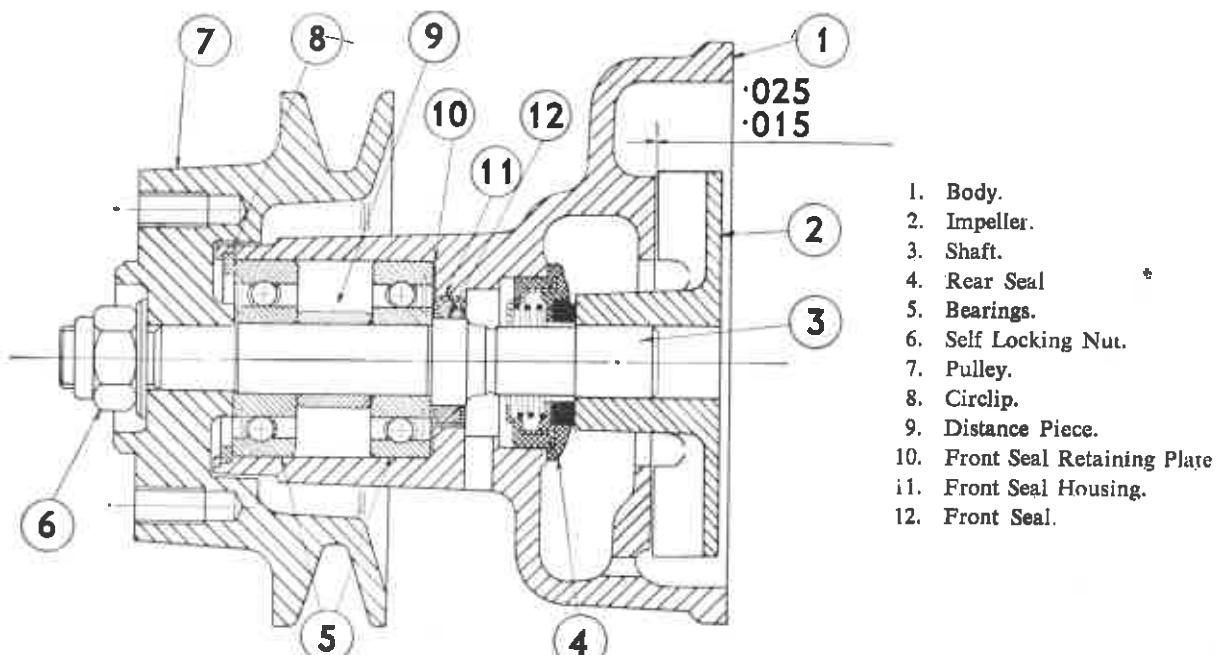
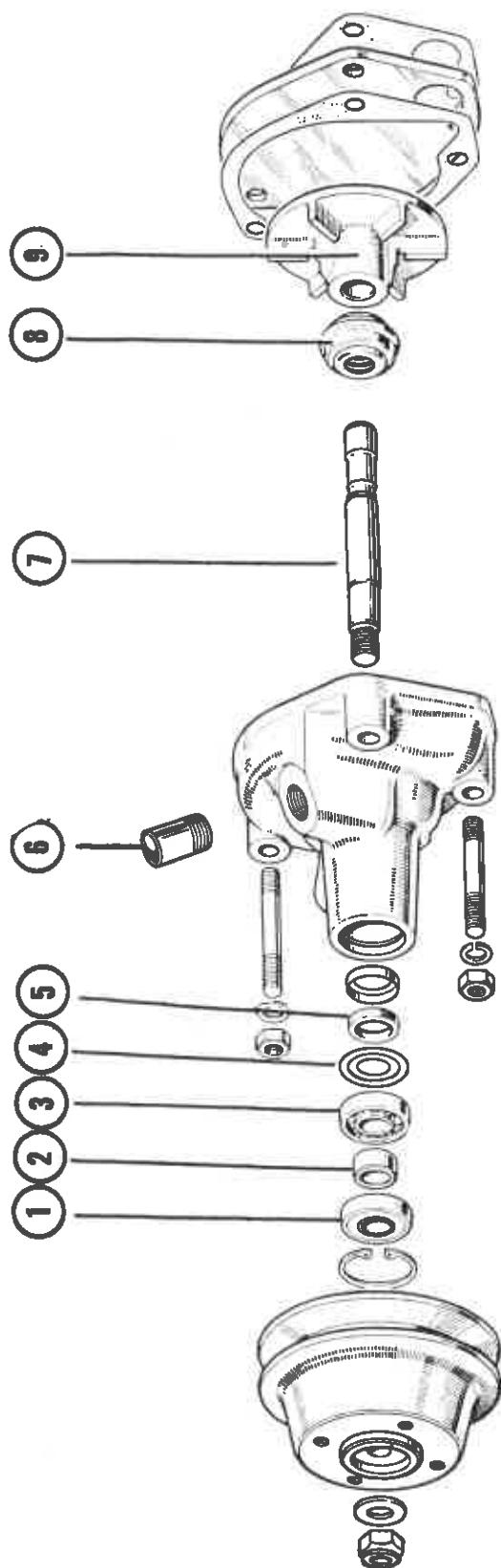


Fig. R.4.  
Sectional Arrangement of Fresh Water Pump.

## COOLING SYSTEM—R.4



bly in a hot, preferably boiling, caustic soda solution. This will loosen all foreign matter adhering to the unit. Generally speaking however, the fresh water side and the oil side, i.e. the outside of the tubes, should be relatively clean as these are on closed circuit. The inside of the tubes which have salt water passing through them, are more likely to require cleaning. If these are not choked enough to require the Caustic Soda treatment details above, they can be cleaned by pushing a length of  $\frac{1}{2}$  in. (3.18 mm) dia. steel rod down the tube so as to dislodge all foreign matter. It is **IMPORTANT** when doing this, to push the rod through the tubes in the opposite direction to that in which the sea water flows. The other components of the heat exchanger should be cleaned before assembly, and as these contain no hidden surface no special instructions are required.

### Re-Assembly of the Heat Exchanger.

If the main aluminium casing has been removed from the engine it is best to refit this to the engine first before re-assembling the Heat Exchanger itself, although if conditions are too cramped it is quite possible to reassemble the Heat Exchanger first, and then re-attach it to the engine.

1. Place the two tube stacks in their respective casings and fit the 'O' seals over each end. It is advisable to renew these seals if they appear badly worn or deformed.
2. The complete Oil Cooler should now be slid along the tierod, taking care that the tube stack is located in the end cover.
3. The spacing ring should be replaced in position and the tie rod complete with oil cooler assembly fitted to the main casing.
4. The other end cover can be replaced and the cap nut complete with its copper and asbestos washer refitted.

**Fig. R.5.**  
Exploded arrangement of the Fresh Water Pump Assembly

- |                               |                        |
|-------------------------------|------------------------|
| 1. and 3. Shaft Bearings.     | 6. By-pass Connection. |
| 2. Bearing Distance-piece.    | 7. Shaft.              |
| 4. Front Seal Retaining Plate | 8. Rear Seal.          |
| 5. Front Felt Seal.           | 9. Impeller.           |

## COOLING SYSTEM—R.5

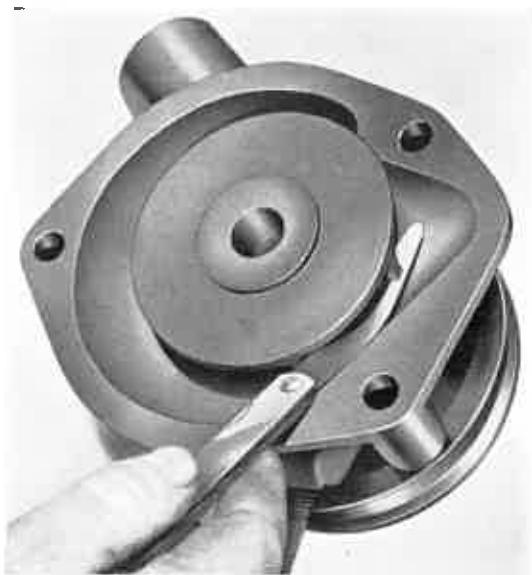


Fig. R.6.  
Checking Impeller Clearance.

### Exhaust Manifold.

The exhaust manifold is water cooled and constructed of cast iron. An air release cock is provided at the forward end of the manifold, whereby any air present in the water cooling system may be removed.

### Fresh Water Pump.

The water pump for indirect or keel cooling is mounted on the front of the cylinder block and is belt driven from the engine crankshaft.

The pump does not require greasing as the bearings are packed with a special quality grease during assembly.

### To Remove and Refit Fresh Water Pump.

1. Slacken Dynamo securing screws and remove belt.
2. Unscrew nuts securing water pump to cylinder block and remove water pump.
3. To refit pump to cylinder block is a reversal of the above procedure.
4. When re-assembling to cylinder block a new joint should be used to ensure that a watertight joint is made.

### To Dismantle Water Pump.

1. Remove self-locking nut securing water pump pulley, and remove with the washer.
2. Using a suitable drawer, remove water pump pulley from the front of the shaft (See Fig. R.3).
3. Remove front bearing retaining circlip using suitable pliers for the purpose.
4. Using a suitable press, press the shaft out of the body from the impeller end.
5. Remove rear seal.
6. Remove the front seal and flanges. The two bearings and distance piece will still be on the water pump shaft. These can be removed by means of a suitable press.

### Inspection.

If the water pump drive shaft shows signs of wear in the region of the bearings, the shaft must be renewed, as a worn shaft in this region will allow the inner race of the bearings to rotate on the shaft.

Clean impeller and check for cracks and broken blades.

Examine casing for cracks.

Wash bearings in thin lubricating oil and examine for pitting, corrosion or wear. If necessary renew bearings.

Arrangements of the fresh water pump will be seen in Figs. R.4 and R.5.

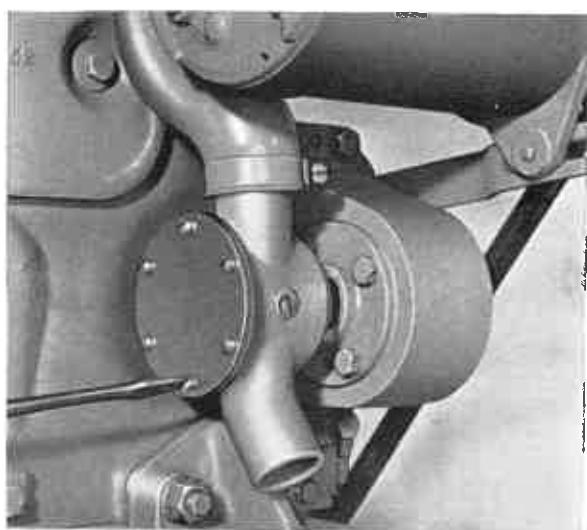


Fig. R.7. Removing Sea Water End Plate.

## COOLING SYSTEM—R.6

### To Re-assemble the Fresh Water Pump.

1. Press rear bearing on to shaft, fit bearing distance piece and then press on front bearing. Ensure that each bearing end cover faces outwards towards the ends of the shaft.
2. The front seal retaining plate should then be placed in position against the back face of the rear bearing. This retaining plate is 'dished' and when positioned, the centre of the plate must not be in contact with the rear bearing.
3. Fit the felt seal and seal housing, so that these bear on the retaining plate.
4. The whole of the foregoing assembly should then be pressed into the water pump body from the front end, and the circlip securely positioned in the recess forward of the front bearing. Before pressing the assembly into the pump body, however, the bearings and the space between the two bearings should be half filled with a high melting point grease.
5. Fit the rear seal into the pump body ensuring that the carbon face is positioned towards the rear of the pump body. When fitted, the seal must rest squarely on its seat and not be canted in anyway.
6. At this stage the shaft should be turned by hand to ensure that there is no undue resistance to rotation.
7. Press on the pulley making certain that no rearward axial movement of the shaft is incurred.
8. The impeller should now be pressed on to the shaft. With the impeller fitted, care should be taken to ensure that a clearance of .015—.025 in. (.38—.63 mm) is maintained between the inner edge of the impeller vanes and the water pump body (See Fig. R.6). As a guide to obtaining a correct clearance in this respect, the impeller should be so positioned as to allow a straight edge to simultaneously touch the back face of the pump body and the two raised extractor hole faces in the rear of the impeller.
9. Refit plain washer and self-locking nut, tightening to a torque of 55—60 lbs./ft. (7.6—8.3 kg/m).

### Sea Water Pump.

The water pump used for direct cooling or in conjunction with a heat exchanger is gear driven from the engine camshaft gear, the pump being located on the starboard side of the engine directly below the dynamo.

### Removal and Dismantling of Sea Water Pump.

First disconnect water inlet and outlet hose connections. The pump may then be detached by removing the setscrews that secure it to the engine timing case.

To dismantle the pump, proceed as follows :-

1. Remove rear end cover.
2. Remove impeller.
3. Remove wearplate.
4. With the front bearing cover removed, a suitable press may be used to press out the impeller shaft together with the front bearing leaving the driving gear wheel loose in its housing.
5. The cam in the impeller housing may then be detached by removing the single securing setscrew.
6. Remove rubber seal in impeller housing.
7. Remove rubber 'O' ring.
8. Remove distance-pieces.
9. The driving gear wheel housing and impeller shaft rear bearing may then be removed from the pump body.
10. Finally remove front rubber seal.

To reassemble the water pump, the reverse order of the above procedure should be adopted, care being taken when replacing the rubber impeller that the blades all lie in the same direction to the rotation of the pump, i.e. blades trailing

When reassembling, ensure that the rubber impeller is coated with a layer of water resisting grease. It should also be noted that, if necessary the impeller may be dismantled without removing the water pump.

When replacing the cam fitted in the impeller housing, be certain to treat the entire top surface, rear face and securing setscrews hole with a suitable jointing compound. NOTE : This cam will go into place one way only.

## COOLING SYSTEM—R.7

With the assembled pump fitted to the engine, backlash between the pump and camshaft gears should be .003 in. to .009 in. (.08 to .23 mm). To achieve this in production, two joints may have been fitted between the pump gear wheel housing and the engine timing case. Should this be so, ensure that both joints (or two new joints) are replaced when refitting the pump.

If the engine is to be withdrawn from service for any length of time it will be necessary to effect lubrication of the rubber impeller at the commencement of the storage period. This may be achieved by removing the end cover (Figs. R.7 and R.8) and placing Marfak 2HD grease between the vanes of the impeller.



Fig. R.8. Sea Water Pump with End Plate Removed.



## DYNAMO BELT ADJUSTMENT (S)



Fig. S.1. Checking Dynamo Belt Tension.

Incorrect adjustment of the dynamo belt can result in the fraying of the belt and eventual failure. To ensure the belt is correctly adjusted it should be checked every 50 hours. Tight adjustment will tend to overload the bearings in the dynamo and water pump which consequently may result in damage to these components. If the adjustment is too slack belt slip will occur. This

could result in overheating of the engine due to the reduced efficiency of the water pump. The output of the dynamo would also be reduced.

### Method of Checking Correct Adjustment.

Press the belt with the thumb at the centre point between the water pump and the crankshaft pulley in a sideways direction. Check the amount of movement of the belt which should be  $\frac{3}{4}$  in. (19 mm) if correctly adjusted (See Fig. S.1).

### Method of Adjustment.

Unscrew the dynamo adjusting lever setscrew, the setscrew securing adjusting lever to timing case and dynamo support bracket bolts. The dynamo can then be moved inwards towards the engine to slacken the belt and in an outwards direction to tighten it. When the belt is tensioned correctly tighten dynamo adjusting lever setscrew, the setscrew securing adjusting lever to timing case, and support bracket bolts.

In the event of a new belt being fitted it is advisable to check the adjustment again after a few hours running to ensure no initial stretching has occurred. Should this have developed re-adjust as already described.

### Dynamo Bracket Locating Screw.

This locating screw is adjustable when in position, in the rear arm of the dynamo support bracket, and should always be tight against the rear dynamo lug before the support bracket nuts and bolts are tightened.



## FLYWHEEL AND FLYWHEEL HOUSING—T.1

# FLYWHEEL AND FLYWHEEL HOUSING (T)

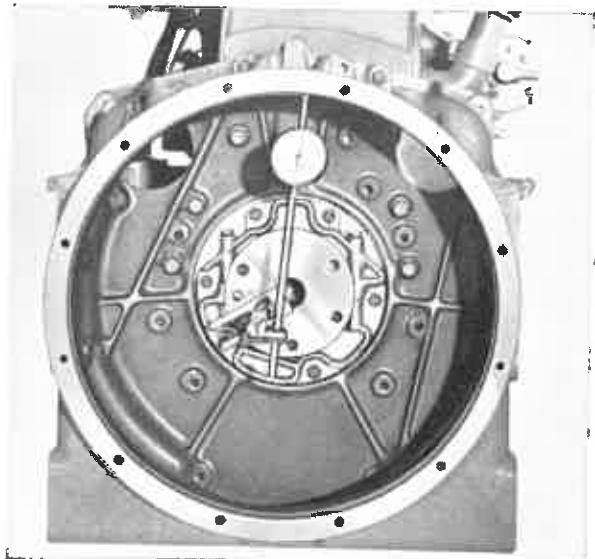


Fig. T.1.  
Checking Alignment of Flywheel Housing Bore.

It is most important that the flywheel housing be correctly aligned with the crankshaft, therefore if a housing has been removed the greatest care must be taken on replacement to ensure accuracy of alignment.

For convenience in turning the engine it is advisable to release (but not remove) the nuts holding the atomisers in place when carrying out alignment of flywheel and flywheel housing.

### To Remove Flywheel.

1. Release tab washers from the setscrews which secure the flywheel to the crankshaft flange.
2. Turn the engine to bring one setscrew to the top.
3. Remove this setscrew and screw in a stud in its place as a temporary measure, to prevent the flywheel from dropping.
4. Remove remainder of setscrews.
5. Remove flywheel.

### To Remove Flywheel Housing.

Remove flywheel.

Removal of nuts and spring washers from the

studs securing the flywheel housing to the cylinder block, or back plate (if fitted) will enable the flywheel housing to be removed.

### To Refit Flywheel Housing.

Before fitting or refitting flywheel housing ensure that the mating faces of the cylinder block, or back plate (when fitted) and housing are perfectly clean and free from burrs.

Put the housing on to the studs, replace spring washers and nuts. Tighten nuts evenly, do not overtighten so as to allow adjustment.

### Alignment of Flywheel Housing Bore.

Secure the base of an indicator stand to the flange of the crankshaft.

Set the needle of the gauge to the interior of the bored hole in the flywheel housing (See Fig. T.1).

Turn the crankshaft and check that this hole is central. The housing is adjusted until the bored hole is central with the crankshaft within the following limits (total indicator reading).

Flywheel Housing Dia.	Deviation
30—23 in. (762—584 mm)	.010 in. (.25 mm)
22 $\frac{1}{2}$ —16 $\frac{1}{2}$ in. (581—413 mm)	.008 in. (.20 mm)
16 $\frac{1}{2}$ —12 $\frac{1}{2}$ in. (409—314 mm)	.006 in. (.15 mm)

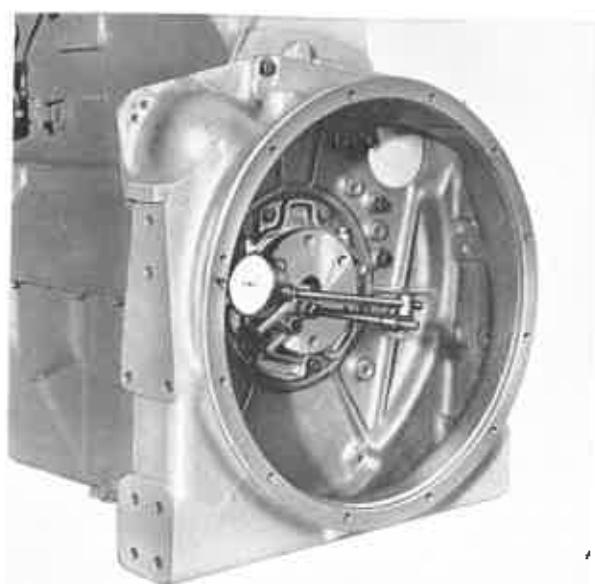


Fig. T.2.  
Checking Alignment of Flywheel Housing Face.

## FLYWHEEL AND FLYWHEEL HOUSING—T.2

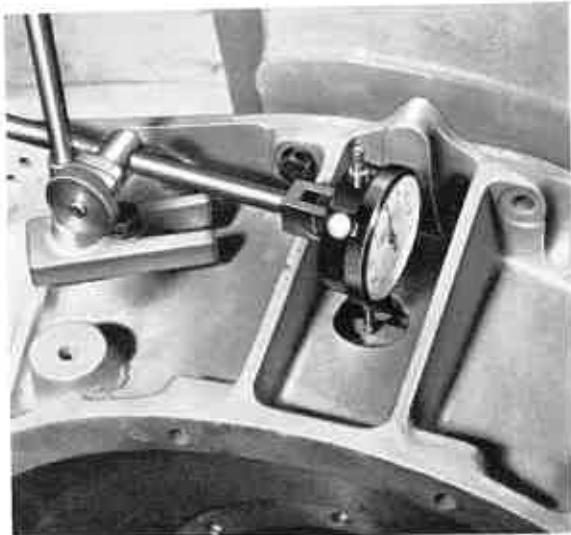


Fig. T.3.  
Checking Alignment of Flywheel Periphery.

### Alignment of Flywheel Housing Face.

With the base of the indicator stand still secured to the crankshaft flange, adjust to set the needle of the indicator against the vertical machined face on the flywheel housing (See Fig. T.2).

Turn crankshaft and check that this face is at right angles to the crankshaft axis. This facing must be within the following limits (total indicator reading) of being at true right angles to the crank-shaft.

Flywheel Housing Dia.	Deviation
30—23 in. (762—584 mm)	.010 in. (.25 mm)
22 $\frac{1}{2}$ —16 $\frac{1}{2}$ in. (581—413 mm)	.008 in. (.20 mm)
16 $\frac{1}{2}$ —12 $\frac{1}{2}$ in. (409—314 mm)	.006 in. (.15 mm)

All adjustments to bring the flywheel housing within the limits specified must be on the flywheel housing and under NO CONDITIONS must the rear of the cylinder block or adaptor plate be interfered with.

When the housing is aligned to the above limits tighten the securing nuts evenly.

Ream the two dowel holes and fit the correct length and size of dowels.

### To Refit Flywheel.

The flywheel should be replaced in the reverse order to when removing but the following must also be carried out :

See that the flywheel face and crankshaft flange are perfectly clean and free from burrs before fitting the flywheel.

When replacing the setscrews, tighten evenly and for final tightening, a torque wrench should be used, set to the tension recommended in Section B.

### Checking Alignment of Flywheel.

When the flywheel has been removed, it is necessary to check the alignment on replacement

Replace flywheel as mentioned above.

Secure the base of a dial indicator stand to the flywheel housing.

With the flywheel at top centre set the needle of the indicator on the flywheel periphery at T.D.C (See Fig. T.3).

Turn the crankshaft and check the clock. The flywheel should run true within .012 in (.30 mm) (total indicator reading).

With the base of the indicator stand still bolted to the flywheel housing, adjust to bring the indicator needle against the vertical machined face of the flywheel (See Fig. T.4).

Again turn the crankshaft and check the clock. The flywheel should be within .0005 in. per inch

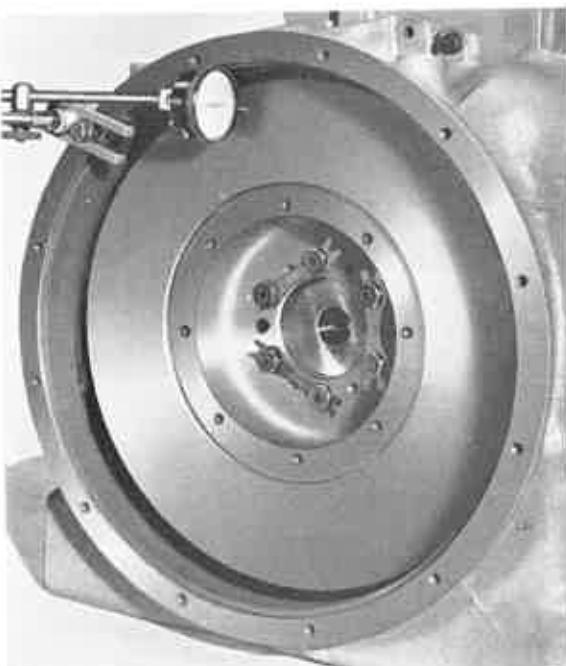


Fig. T.4.  
Checking Alignment of Flywheel Face

## FLYWHEEL AND FLYWHEEL HOUSING—T.3

(.01 mm per 25 mm) of diameter (total indicator reading) at right angles to the crankshaft axis.

When the flywheel has been checked for the correct limits, lock the setscrews by means of tab washers.

### Replacing Input Shaft and Gearbox.

Using the eight setscrews complete with washers, fit the input shaft to the engine flywheel and tighten evenly.

Secure the base of a clock gauge securely to the flywheel housing and adjust the clock so as to set the needle on the outside diameter of the input

shaft and by turning the engine check that the shaft is central (See Fig. S.5). The limit in respect of input shaft concentricity is set at .005 in. (.127 mm) total indicator reading.

With satisfactory alignment attained, the securing setscrews should be wired together.

The gearbox may then be eased into position on the input shaft. With the mechanical box, care should be taken to ensure that the key on the input shaft is in line with the keyway in the gearbox bearing. Secure the gearbox to the flywheel housing by means of the twelve setscrews and washers and refit propeller shaft.

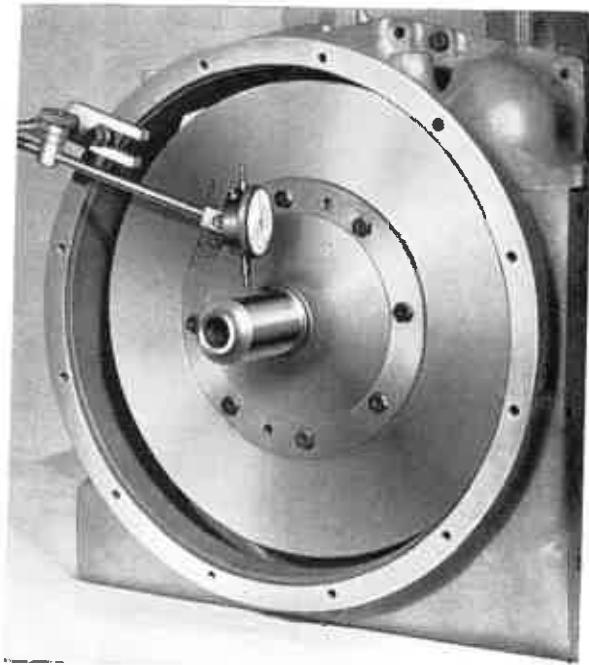


Fig. T.5.  
Checking Alignment of Gearbox Input Shaft.



## FUEL INJECTION SYSTEM (U)

The principal components of the equipment for the delivery of fuel oil to the engine are as follows :—

- Filters.
- Fuel Lift Pump.
- Fuel Injection Pump.
- Atomisers.

So accurate is the manufacture of the fuel injection equipment that the importance of cleanliness when handling fuel cannot be overstressed.

Adequate filters are provided in the system but much can be done by the operator to ensure that equipment is maintained in first class condition.

All fuel used must conform to BRITISH STANDARD No. BS 2869 (1957) CLASS A, and must be clean, free from water suspended dirt and other foreign matter. Filtering of fuel before it enters

the tank will help and regular filter changing will ensure that only perfectly clean fuel reaches the fuel injection pump.

Given these conditions, ninety per cent, at least of potential engine troubles would be eliminated. Attention is on that account earnestly directed towards the section of this manual which refers to the care and upkeep of the filtering apparatus.

In a pressure fed system the lift pump lifts the fuel from the tank via the pre-filter and then passes it through the final filter to the fuel injection pump which delivers it in measured quantities and at appropriate intervals to the atomisers.

### The Fuel Lift Pump.

The fuel lift pump is of the diaphragm type. It is mounted on the timing case and is driven by an



Fig. U.1.  
Exploded View of Fuel Lift Pump.

## FUEL INJECTION SYSTEM—U.2

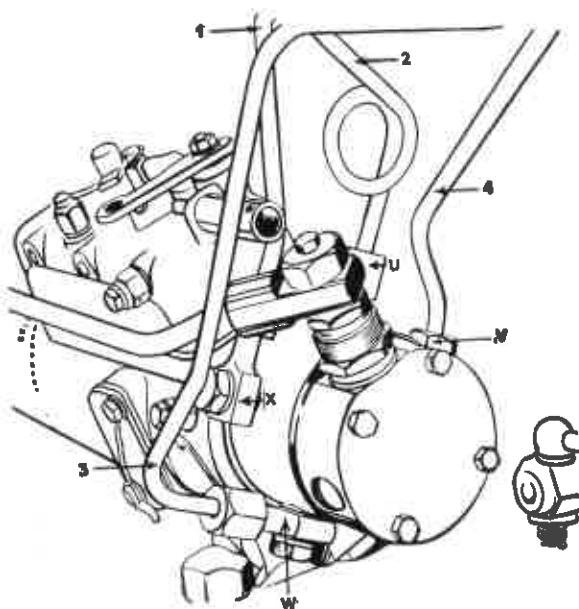


Fig. U.2. Fuel Pipes Correctly Fitted.  
1. To No. 1 Atomiser. 3. To No. 3 Atomiser.  
2. To No. 2 Atomiser. 4. To No. 4 Atomiser

eccentric on the fuel pump gear hub and a push rod.

A hand primer is fitted for use if the supply of fuel from the tank has at any time failed.

To use this primer, pump by hand until pipes, lift pump, filters and fuel pump are full of fuel oil. To ensure that this is so, proceed as instructed on page D.1. An exploded view of the fuel lift pump is shown in Fig. U.1.

### Fuel Pump.

The fuel pump is an instrument of precision. Its working parts are made to extremely fine limits and mishandling in any shape or form or the entry of the smallest particle of dirt into its working parts may damage it and diminish its accuracy of operation. Hence the importance of ensuring that the fuel is thoroughly filtered before the pump is reached.

When requesting information regarding the fuel pump, the type and number should be quoted. This can be obtained from a plate fitted to the side of the pump. Where service is required, the fuel pump manufacturer's agents should be contacted.

For removal and replacement of fuel pump see Section P.

### Atomisers.

Each atomiser body consists of a steel body held to the cylinder head by means of a flange and two studs at an angle of 25° from the perpendicular.

The joint between the atomiser and cylinder head is made by a copper washer between the lower face of the nozzle cap and the metal of the cylinder.

Atomisers fitted to the 4.270 Marine can be identified by the letter "X" stamped on the tab washer fitted under the atomiser cap nut.

Atomisers supplied under the perpetuity scheme have green painted caps.

When preparing to fit the atomiser into place in the cylinder head, care should be taken that only the correct copper washer is used to make this joint. The metal of the cylinder head, the faces of the copper joint ring, and the corresponding face on the nozzle holder cap nut should be perfectly clean if a leak-proof joint is to result.

It is advisable to fit a new joint washer when the atomiser is replaced after having been removed for any reason.

Ensure that the old washer has been removed from atomiser or cylinder head.

This joint washer should be an easy, but not loose fit for the atomiser nozzle, and it is because this is such an important feature that the washers especially made for the purpose should be used and none other. On no account should ordinary sparking plug type washers be used.

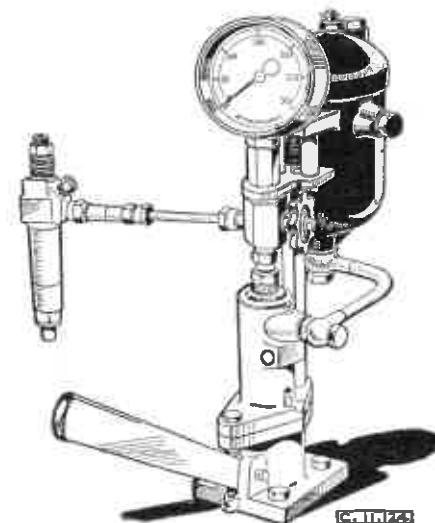


Fig. U.3. Typical Atomiser Testing Pump.

## FUEL INJECTION SYSTEM—U.3

The atomiser can now be fitted in place, care being taken to see that it is an easy fit in the cylinder head and on the holding-down studs, so that it can be placed down on the copper joint without force of any kind. The nuts on the flange should then be tightened down evenly in order to prevent the atomiser nozzle being canted and so "nipped" in the cylinder head.

When fitting the leak-off pipes make sure new washers are used, and before tightening the banjo bolt make sure the washers are a good fit and are placed centrally, and remain central when tightening the bolt.

### Fuel Pipes.

No two of the pressure pipes, from fuel pump to atomisers, are alike. Keep this in mind when replacing.

Examine the nipples which will be found on each end of these pipes.

If the union nuts have at any time been overtightened there is a risk that the nipples will have cracked or been unduly compressed. If so, leakage will result and a new pipe should be fitted.

In this connection bear in mind that the working pressure which these joints must sustain is several thousand pounds per sq. in. Only a perfect joint is satisfactory.

Offer up the pipe to the fuel pump and atomiser unions to check that the pipe fits square at both ends. Do not fit one and then bend the pipe to square it with the other union.

To simplify the fitting of fuel injection pipes, the fuel pipe nuts are marked as follows:—

#### No. 1 Cylinder.

Nut fuel pump end stamped with letter "X."

Nut atomiser end stamped with fig. 1.

#### No. 2 Cylinder.

Nut fuel pump end stamped with letter "U."

Nut atomiser end stamped with fig. 2.

#### No. 3 Cylinder.

Nut fuel pump end stamped with letter "W."

Nut atomiser end stamped with fig. 3.

#### No. 4 Cylinder.

Nut fuel pump end stamped with letter "V."

Nut atomiser end stamped with fig. 4.

As the fuel pump outlet connections are also

marked X, U, W, V, no difficulty should be experienced when replacing fuel injection pipes. Fig. U.2, shows the fuel pipes correctly fitted.

When fitting the pipe tighten the unions alternately a little at a time, first one end and then the other.

If the nipples are in good condition and the pipe is square to the unions at each end as described previously, no force will be needed to make a good joint. No force should be used.

Use only a standard open-ended  $\frac{1}{4}$  in. A.F. spanner.

If the union is tightened excessively the nipple may collapse and split. The same danger exists if the pipe is not square to and central with the union.

When changing an atomiser always remove the pipe entirely. Never undo only one end, leaving the other tight. Never bend the pipe.

## MAINTENANCE

Atomisers should be taken out for examination at regular intervals. How long this interval should be is difficult to advise, because of the widely different conditions under which engines operate. When combustion conditions in the engine are good and the fuel tank and filtering system are maintained in first-class order, it is often sufficient if the atomisers are tested twice yearly.

For detailed times refer to periodical maintenance, Section G. It is no use taking atomisers out for attention unless the equipment described on page U.4 is available, or spare atomisers are at hand for substitution.

The nearer the ideal conditions of good fitting with adequate cooling and absolutely clean fuel are realised, the less attention the atomisers will need, and so the longer their efficient life. In this connection, since there is no other item of the equipment upon which the performance of an engine depends so much, it pays the user handsomely to see that the engine never runs with any of its atomisers out of order.

### Troubles in Service.

The first symptoms of atomiser troubles usually fall in one or more of the following headings:

1. Misfiring.
2. Knocking in one (or more) cylinders.

## FUEL INJECTION SYSTEM—U.4

3. Engine overheating.
4. Loss of power.
5. Smoky exhaust (black).
6. Increased fuel consumption.

Often the particular atomiser or atomisers causing trouble may be determined by releasing the pipe union nut on each atomiser in turn, with the engine running at a fast "tick-over." This will prevent fuel being pumped through the nozzle to the engine cylinder, thereby altering the engine revolutions. If after slackening a pipe union nut the engine revolutions remain constant, this denotes a faulty atomiser.

The nuts from the flange of the doubtful atomiser should be removed and the complete unit withdrawn from the cylinder head and turned round, atomiser nozzle outwards and the unions re-tightened. After slackening the unions of the other atomiser pipes (to avoid the possibility of the engine starting), the engine should be turned until the nozzle sprays into the air, when it will be seen at once if the spray is in order. If the spray is unduly "wet" or "streaky" or obviously to one side, or the atomiser nozzle "dribbles," the spray holes should be probed with the special tool ET.120. (See Fig. U.4). If after probing the spray holes, the condition of the atomiser is still faulty, replace the complete unit, the faulty atomiser being securely wrapped in clean grease-proof paper or rag for attention on the maintenance bench.

Great care should be taken to prevent the hand from getting into contact with the spray, as the working pressure will cause oil to penetrate the skin with ease.

### Examination and Testing.

A bench suitable for working with atomisers is preferably linoleum-covered with glass on top. It should be entirely reserved for this work and kept absolutely free from dirt. The use of cotton waste or fluffy rags must be absolutely forbidden.

The bench should have a dust proof drawer for holding the atomiser cleaning tools and equipment described in detail below.

An atomiser testing pump (Fig. U.3) should be available. This outfit has been specially designed to provide a reliable means of testing and setting the atomisers.

The doubtful atomiser should be removed from

its wrappings and fitted nozzle downwards, and still unwiped, to the testing pump.

No observations should be made until at least ten full strokes of the hand pump have been given to expel all air from the system.

#### Atomiser Pressures.

The pressure at which the spray breaks should then be recorded and checked against the recommended pressure which is 170 atmospheres.

The spray should now be observed for uniformity at a rate of pumping of not less than 20 strokes per minute.

Each should be a misty spray spreading to about 3 inches diameter at about one foot away from the atomiser nozzle, then breaking into a very fine mist. There should be four sprays from each atomiser nozzle.

An atomiser is good for service if, when operating the atomiser testing pump at the above speed, it gives four effective sprays as above described.

An atomiser is dirty and requires reconditioning if (a), when proceeding as above it throws out solid wet jets and not broken up spray or (b), if either of the holes are choked or partially choked so that spray issues from one hole in the atomiser only or appreciably more spray issues from one hole than the others.

In this connection, as the Perkins engine idles at about 500 r.p.m. the atomiser is never called upon to work in the engine more slowly than 250 injections per minute. Thus by taking the atomiser spray at 20 strokes per minute, ample margin is allowed.

When removing an atomiser from the testing pump close valve by rotating the hand-wheel and screw off the union nut a little at a time so that the pressure falls gradually.

Atomisers are set to operate at the pressures described previously before leaving the works. If a new atomiser nozzle is fitted to an atomiser body it is necessary to reset the pressure. After the atomiser has been in service for some time, the opening pressure tends to fall, but provided that the atomiser nozzle holes do not choke up, there is no need to adjust the pressure.

**NO ATTEMPT SHOULD BE MADE TO ADJUST THE INJECTION PRESSURE WITHOUT A PROPER TESTING PUMP AND PRESSURE GAUGE AS DESCRIBED**

## FUEL INJECTION SYSTEM—U.S

AND ILLUSTRATED, IT IS QUITE IMPOSSIBLE TO ADJUST THE SETTING OF ATOMISERS WITH ANY DEGREE OF ACCURACY WITHOUT PROPER EQUIPMENT.

If the atomisers are interfered with, on the assumption that so many turns of the adjusting screw represents so many pounds, they may vary as much as 200 pounds as between one and another. With such differences between atomisers the engine cannot possibly give of its best.

If the spray is still unsatisfactory, even after brushing the carbon away from around the atomiser nozzle with the fine wire brush specially designed for the purpose and illustrated in Fig. U.4, the atomiser should be placed on the atomiser holding plate.

Before attempting to dismantle the atomiser, the tension on the spring should be released by unscrewing the compression screw. The nozzle holder cap nut should be slackened with a  $\frac{1}{2}$  in. A.F. spanner. To hold the nozzle holder cap nut in the vice or to use ill-fitting "packed" or adjustable spanners or wrenches is to invite disaster.

Examine the pressure face of the nozzle holder cap nut to see it is not damaged so as to have "nipped" the atomiser nozzle in any way.

The nozzle holder cap nut should now be removed and the atomiser nozzle completely lifted from the atomiser body for examination. The surfaces on the top of the atomiser nozzle should be clean and bright, free from damage, likewise the under-surface of the flange, the face of the atomiser body and the interior retaining shoulder of the nozzle holder cap nut. All of these must register together absolutely cleanly and squarely to form the high pressure joint between the atomiser body and nozzle.

The atomiser body should now be removed from the plate, and together with the cap nut immersed in clean kerosene or fuel oil, and left to soak in a suitable container. The nozzle valve should be grasped by the stalk between finger and thumb and withdrawn, carefully, for examination. The stem of the nozzle valve should be clean and bright, and free from high spots, bad scratches or dull patches, and the grooves free from dirt, metal particles or other foreign matter.

The stem and the valve seat of the nozzle valve should now be examined, and if dirty, or "coked" cleaned until bright metal is shown.

### Cleaning.

Assuming that the nozzle valve has been soak-

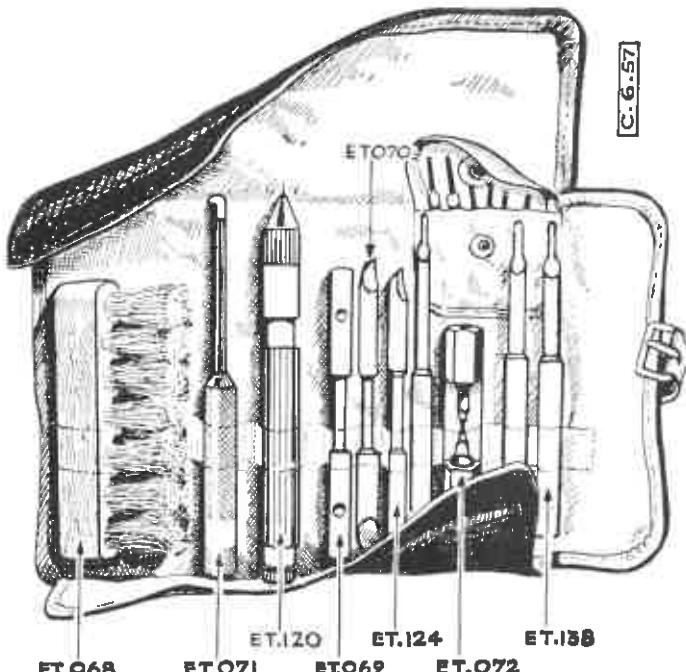


Fig. U.4.  
Complete Kit of Tools for use when cleaning

## FUEL INJECTION SYSTEM—U.6

ing and the two surfaces on the top of the atomiser nozzle flange already mentioned, are clean and free from damage, the inside of the atomiser nozzle should be examined. The kit of tools shown in Fig. U.4 is recommended. The small drilled passages should be explored to see that they are clear and clean, followed by an examination of the valve stem bore in which the nozzle valve slides. This surface should be clean and bright and free from high spots or scratches or dull patches. The valve seating should now come under observation under a strong light to ascertain whether or not it is free from dirt or carbon. If this is not so, and indeed, in any case, it is advisable to use the soft brass seat scraper No. ET070 (See Fig. U.4) to remove any carbon or particles that may be imprisoned on the seat. The gallery should now be cleaned with the aid of the special soft brass scraper No. ET071 (see fig. U.4) to ensure that it is also clean and free from dirt or carbon.

The spray holes in the atomiser nozzle end should be probed with the special tool ET120 (see Fig. U.4).

In cases where the holes cannot be cleaned by this process, the complete atomiser should be returned securely wrapped and packed as described above. Assuming that the spray holes have been cleaned satisfactorily, the atomiser nozzle can then be placed in the container to soak in kerosene or fuel oil or preferably assembled in the atomiser flushing tool No. ET137 (Fig. U.5) and thoroughly flushed through to ensure that all carbon particles are removed from the inside of the atomiser nozzle.

The nozzle valve should now be polished by rubbing with an absolutely clean cloth—a piece of used boiled cotton is best—upon which there is no suggestion of fluff. Particular attention should be given to the valve seat. This and the smaller cylindrical portion above it, called the "stem" and "cone" can be cleaned with the fine brass wire brush. To ensure that the stem and cone are free from any particles, the soft brass stem cleaner No. ET072 should be applied with a rotary action, pressing the nozzle valve into the cleaning tool with the fingers.

After ensuring that the exterior of the atomiser nozzle is clean and free from carbon, the valve and atomiser nozzle may be assembled together. This should be after the two parts have been thoroughly washed in clean kerosene or fuel oil and placed together, preferably with the fingers whilst submerged in the clean oil.

The atomiser body should now receive attention: it should be washed in clean kerosene or fuel oil, care being taken to ensure that the highly ground face is clean and free from scratches. This face must register with the atomiser nozzle flange cleanly and squarely to form a high-pressure joint and must, therefore, be handled in such a way as to avoid damage to the surface. The exterior of the atomiser body, of course, should be cleaned thoroughly from dirt and grease in the usual manner. Periodically, it is advisable to dismantle the interior of the atomiser body to examine the springs, spring plate, and nozzle spindle. When dismantling, special spanners, should be applied for the removal of the nozzle holder spring cap, which is revealed after the removal of the cover.

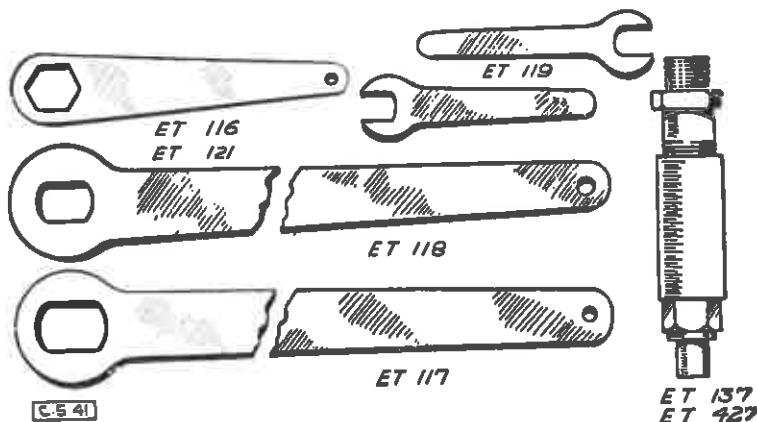


Fig. U.5.  
Spanners and cleaning tools for use with atomisers.

## FUEL INJECTION SYSTEM—U.7

ing protection cap. The interior of the atomiser body and the parts removed should be washed carefully to remove any dirt or moisture. If the spring and the parts are in good condition, they should be re-assembled carefully, and preferably after having been slightly coated with lubricating oil.

The serviceable life of the atomiser valve spring can be considerably enhanced by careful treatment, and great care should be taken to avoid the damage likely to be caused by moisture, corrosion arising in storage, handling, or by reason of condensation owing to temperature changes in service. It is recommended that these valve springs should be inspected, cleaned and greased whenever the atomisers are removed for cleaning, whilst care should be taken in storing spares to preclude all possibility of the access of moisture.

### Re-Assembly of Atomisers.

The atomiser body and atomiser nozzle may now be assembled carefully, after having immersed the pressure faces of each in clean fuel oil, to ensure that they are free from dirt. The nozzle

holder cap nut should be screwed onto the body by use of the special spanner. Excessive tightening of the nozzle holder cap nut may result in constriction or distortion of the atomiser nozzle and its consequent failure; care should be exercised to ensure that the leverage applied is not excessive.

After cleaning, the atomiser should be tested always on the atomiser testing pump as previously described. If the pressure at which the spray breaks is not that quoted above it can be adjusted by the spring adjusting screw and locknut, using spanner ET119 (Fig. U.5).

A perfect atomiser, when tested by pumping fuel through it in the open air gives a short "pinging" sound as the fuel emerges from the holes. After the atomiser has been in service for some time, the "pinging" changes to a crackling sound. It is not until the atomiser sounds "dead" that its condition is likely to affect the running of the engine.

When replacing the atomiser in the cylinder head follow carefully the instructions for fitting given on page U.3.

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## SCHEDULE OF CLEARANCES AND TOLERANCES (V)

All threads used on the 4.270 Marine Engine except on proprietary equipment and the crankshaft are Unified Series, and American Pipe Series. The crankshaft and starting dog nut are threaded 1 inch American National Fine of 14 T.P.I.

The new threads are not interchangeable with B.S.F. and although B.S.W. have the same number of threads per inch as the Unified Coarse Series, interchanging is not recommended, due to a difference in thread form.

1. The data regarding clearances and tolerances are given as a guide for personnel engaged upon major overhauls.
2. The figures in the column "Permissible Dimensions" are the drawing sizes to which the parts are made. These dimensions are given in limit form and represent the minimum and maximum sizes to which parts may be accepted when new, as, for example, .4985 quoted for a shaft diameter.  
—  
499
3. The difference between the minimum and maximum dimensions quoted in para. 2 is known as the manufacturing tolerance. This tolerance is necessary as an aid to manufacture and its numerical value is an expression of the accuracy of the design ; it may also be considered as a numerical expression of the desired quality of workmanship. For the example referred to in para. 2 the tolerance is 0.0005.
4. If when carrying out a major overhaul it is found that a bush and corresponding shaft have worn and that the majority of wear has taken place in the bush it may be necessary to renew the bush only. Similarly if the majority of wear has taken place on the shaft it might only be necessary to renew the shaft.
5. During the overhaul of worn components personal initiative must be exercised at all times. It is obviously uneconomical to return worn parts to service with an expectation of life which may involve labour costs again at an early date.
6. Further information can be obtained on request from the Service Division, Perkins Engines Limited, Peterborough, England.

To ensure you obtain the best results from your engine  
and to safeguard your own guarantee, fit only genuine  
Perkins Parts. These are readily obtainable throughout  
the world.

**SCHEDULE OF BUILDING CLEARANCES AND TOLERANCES TO BE ADHERED TO WHEN  
OVERHAULING ENGINES TO FACTORY STANDARDS (ENGINE TYPE 4.270)**

Part No.	DESCRIPTION	PERMISSIBLE DIMENSION		PERMISSIBLE CLEARANCE		REMARKS
		inches	mm.	inches	mm.	
<b>OIL PUMP</b>						
0440452	Gear Housing (Dia. of pocket)	1.339	34,011			
		1.341	34,061	0.006	0.152	
0410120	Gears (Internal, Idler and Driver) (Dia. over teeth) ....	1.331	33,807	0.010	0.254	
	Ditto (Length of gears)	1.333	33,858			
		1.495	37,973			
		1.497	38,024	0.001	0.025	
0440452 0490247	Housing (Depth of Gear Pocket) c/w Joints ....	1.498	38,049	0.006	0.152	
		1.501	38,125			
0050131	Bush, Oil Pump Gear (Bore Dia.)	0.502	12,751			
		0.503	12,776	0.0005	0.0127	
0750265	Shaft, Oil Pump Gear (Dia.)	0.501	12,725	0.002	0.051	
		0.5015	12,738			
0750402	Shaft (Internal, Idler) (Dia.)	0.4985	12,662			
		0.499	12,675	0.00075	0.019	
0410120	Gear (Internal, Idler) (Hole Dia.)	0.49975	12,693	0.00175	0.044	
		0.50025	12,706			
<b>CAMSHAFT</b>						
0140036	Camshaft. No. 1 Journal Dia.	2.0565	52,235			
		2.0575	52,261	0.002	0.051	Journal tapered 0.00125 in. (0,0324mm)
0050215	Bush, No. 1 Camshaft Bearing Bore Dia. ....	2.0595	52,311	0.005	0.127	
	No. 2 Journal Dia.	2.0615	52,362			
		2.0465	51,981			
		2.0475	52,007	0.004	0.102	
	No. 2 Hole for Shaft in Cylinder Block	2.0515	52,108	0.007	0.178	
		2.0535	52,159			
	No. 3 Journal Dia.	2.0365	51,727			
		2.0375	51,753	0.004	0.102	
	No. 3 Hole for Shaft in Cylinder Block	2.0415	51,854	0.007	0.178	
		2.0435	51,905			
0995195	Spigot, Idler Gear (Dia.)	1.497	38,024			
		1.498	38,049	0.001	0.025	
0050127	Bush, Idler Gear (Bore)	1.499	38,075	0.003	0.076	
		1.500	38,100			

**SCHEDULE OF BUILDING CLEARANCES AND TOLERANCES TO BE ADHERED TO WHEN  
OVERHAULING ENGINES TO FACTORY STANDARDS (ENGINE TYPE 4.270)**

Part No.	DESCRIPTION	PERMISSIBLE DIMENSION		PERMISSIBLE CLEARANCE		REMARKS
		inches	mm.	inches	mm.	
	<b>CAMSHAFT (cont.)</b> Cam Lift	0.304 — 0.312	7,721 — 7,925			
	<b>CYLINDER BLOCK</b>					
0280103	Cylinder Block (for Camshaft bores see Camshaft Assembly) ....	13.773 — 13.776	349,834 — 349,910			
0530015	Bore of Cylinder Liner ....	4.250 — 4.251	107,950 — 107,975			
0630073	Piston (Height of Crown above face of Cylinder Block) ....	+0.011 — -0.003	+0.279 — -0.076			Measured with crank and piston at T.D.C.
0640130 0640129	Comp. Ring Grooves (Width) ....	0.127 — 0.128 0.124 — 0.125	3,226 — 3,251 3,150 — 3,175	0.002 — 0.004	0.051 — 0.102	
0640130	Chrome Plated Compression Ring Gap ....			0.012 — 0.019	0.305 — 0.482	Gap dimensions are given for a bore diameter of 4.250 in.
640129	Plain Compression Ring Gap ....			0.012 — 0.019	0.305 — 0.482	
0630073	Comp. Ring Groove (Width) ....	0.127 — 0.128	3,226 — 3,251			
0630041	Piston (Scraper Ring Groove) (Width) ....	0.2525 — 0.2535	6,414 — 6,439	0.0025	0.064	
0640026	Ring, Scraper (Width) ....	0.249 — 0.250	6,325 — 6,350	0.0045	0.114	
	Gap ....			0.012 — 0.017	0.305 — 0.432	
	<b>CRANKSHAFT AND CONNECTING ROD</b>					
	Weight Connecting Rods (Sets) ....	See	Remarks			
0210009	Rod, Connecting Big End (Bore)	2.916 — 2.917	74,066 — 74,092			Weights of Rods in engine sets must balance within two ounces.

**SCHEDULE OF BUILDING CLEARANCES AND TOLERANCES TO BE ADHERED TO WHEN  
OVERHAULING ENGINES TO FACTORY STANDARDS (ENGINE TYPE 4.270)**

Part No.	DESCRIPTION	PERMISSIBLE DIMENSION		PERMISSIBLE CLEARANCE		REMARKS
		inches	mm.	inches	mm.	
0050348	CRANKSHAFT AND CONNECTING RODS (cont.)	2.7515	69,888			Measured in position
	Bearing, Connecting Rod Big End (Bore) ....	2.753	69,926	0.0025	0,063	
0260097	Crankshaft Crankpins (Dia.)	2.74825	69,806	0.00475	0,120	NOTE : Bushes reamed to suit individual pins Bushes provided with reaming allowance.
		2.749	69,825			
0050128	Bush, Connecting Rod, Small End (Bore) ....	1.4382	36,530			Bushes provided with reaming allowance.
		1.43925	36,557	0.0004	0,010	
0610621	Pin, Gudgeon (Dia.)	1.4375	36,513	0.00175	0,044	Alignment measured between mandrels through large and small end bores See Fig. V.1.
	Rod, Connecting, alignment between small and large end bearing bores. (Parallelism) Ditto. (Twist)	1.4378	36,520			
0280073	Housings, Main Bearings (Bore)	3.16625	80,423			Measured in position
		3.167	80,442			
0050347 0050346	Bearings, Main (Bore)	3.001	76,225			Standard Crankshafts only.
		3.00225	76,256	0.0025	0,063	
0260097	Crankshaft, Main Journals (Dia.)	2.998	76,49	0.00425	0,109	
		2.9985	76,162			
	Crankshaft, Main Journal No. 1 (Length)	1.9225	48,832			
		1.9525	49,594			
	Crankshaft, Main Journal No. 2 (Length)	2.0313	51,595			
		2.0363	51,722			
	Crankshaft, Main Journal No. 3 (Length)	2.0625	52,388			
		2.0635	52,413			
	Crankshaft End Float	0.0045	0,114			
		0.0155	0,394			
0921318 0921319	Thrust Washers, Standard (Width)	0.091	2,311			
		0.093	2,362			
0921318A 0921319A	Thrust Washers, Oversize (Width)	0.098	2,489			
		0.100	2,540			

The 4.270 crankshaft MUST be cold rolled after re-grinding—See Section M.

	CYLINDER HEAD AND VALVE GEAR					
0050132	Bush, Rocker Lever (Bore Dia.) ....	0.6245	15,863			
		0.62575	15,894	0.00075	0,019	
0750166	Shaft, Rocker (Dia.)	0.62225	15,805	0.0035	0,089	
		0.62375	15,843			

**SCHEDULE OF BUILDING CLEARANCES AND TOLERANCES TO BE ADHERED TO WHEN  
OVERHAULING ENGINES TO FACTORY STANDARDS (ENGINE TYPE 4.270)**

Part No.	DESCRIPTION	PERMISSIBLE DIMENSION		PERMISSIBLE CLEARANCE		REMARKS
		inches	mm.	inches	mm.	
	<b>CYLINDER HEAD AND VALVE GEAR (contd.)</b>					
	Valve Seat and Face Angle (Inlet and Exhaust) ....	45°				
0420013	Guide, Valve (Bore Dia.) ....	0-376 0-3775	9,550 9,589	0-0015	0,038	Clearance of Valve Head (new) below Cyl Head Face :— Inlet, 0-057 in. to 0-070 in. or 1,448 mm. to 1,778 mm. Exhaust, 0-053 in. to 0-065 in. or 1,346 mm. to 1,651 mm. Seat should not be recut unless essential when clearance should not exceed 0-140 in. or 3,556 mm.
0910030 0910029	Valves, Inlet and Exhaust (Stem Dia.) ....	0-3735 0-3745	9,487 9,512	0-004	0,102	
0860009	Tappet, Valve (Shank Dia.)	0-7475 0-7485	18,987 19,012	0-001	0,025	
	Hole in Cylinder Block for Tappet (Dia.) ....	0-7495 0-75075	19,037 19,069	0-00325	0,082	

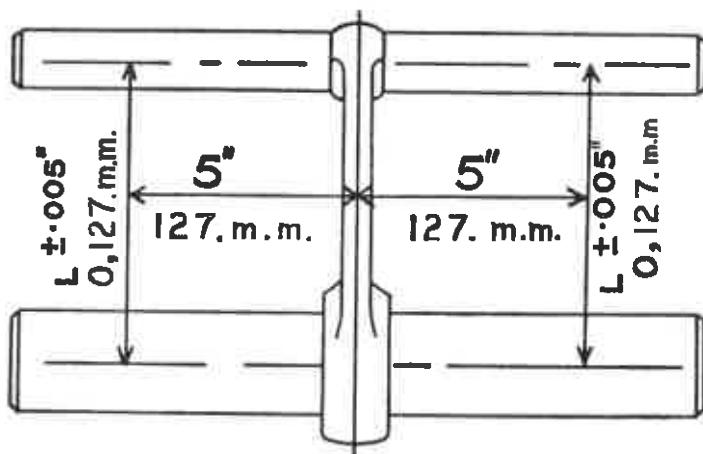


FIG. V.1.

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# APPROVED SERVICE TOOLS

Available from V. L. Churchill & Co. Ltd., Great South West Road, Belfont, Feltham, Middx., England

## PD 1C Valve Guide Remover and Replacer.

Engine Type : All.

With this tool all valve guides can be removed and replaced provided puller bars are available.

## PD 1C-1 Puller Bars.

Engine Type : All.

Two bars are supplied for use with PD 1C to suit nominal  $\frac{5}{16}$ " and  $\frac{3}{8}$ " i/d Bore Guide.

## PD 1C-2 Valve Guide Replacing Stop.

Engine Type : 4.99 4.107.

Remarks. See PD 1C-4.

## PD 1C-3 Valve Guide Replacing Stop.

Engine Type 6.354.

Remarks. See PD 1C-4.

## PD 1C-4. Valve Guide Replacing Stop.

Engine Type :

P3	P3/152	P3/144	3.144
B3.152	3.152	6.288	4.192
B4.192	4.203	P4	
B.6305	6.305	P6	

When the valve guide is replaced using one of the above end stops it will ensure that the guide protrudes the correct amount above the top face of the cylinder head.

## PD 2 Auxiliary Drive Assembly Gauge.

Engine Type : S6.

The gauge is used to align the drive shaft of the assembly with the cylinder block.

## PD 17 Valve Head Depth Gauge.

Engine Type :

P3	3.152	P6
B3.152	4.203	L4
B4.192	6.305	3.144
B6.305	F340	4.192
R6	P3/144	6.288

This tool enables the mechanic to quickly check whether the inlet or exhaust valves have exceeded the maximum depth.

## PD 27 Piston Assembly Ring (Std.)

Engine Type : S6

This ring has an internal taper enabling the piston to be refitted with ease and prevents damage to piston rings.

## PD 28 Piston Assembly Ring +0.030".

Engine Type : S6.

Remarks : See PD 27.

## PD 55 Piston Assembly Ring.

Engine Type : L4 4.270.

Remarks : See PD 27.

## PD 85 Piston Assembly Ring (Std.)

Engine Type : R6 F340

Remarks : See PD 27.

## PD 88 Piston Assembly +0.030"

Engine Type : R6 F340

Remarks : See PD 27.

## PD 94 Piston Assembly Ring.

Engine Type : 4.99

Remarks : See PD 27.

## PD 133 Assembly Ring.

Engine Type : 4.107

Remarks : See PD 27.

## PD 107 Piston Assembly Ring.

Engine Type :

P3/152	B3.152	3.152
B6.305	6.305	4.203

Remarks : See PD 27.

## D16153 Piston Assembly Ring (Std.)

Engine Type :

P3	4.192
P4	B4.192
6.288	3.144
P3/144	P6

Remarks : See PD 27.

## D26153 Piston Assembly Ring +0.030"

Engine Type : as for D16153.

Remarks : See PD 27.

## PD 131 Piston Assembly Ring (Std.).

Engine Type : 6.354

Remarks : See PD 27.

## PD 132 Piston Assembly Ring +0.030"

Engine Type : 6.354.

Remarks : See PD 27.

**PD 37 Flywheel Runout-Gauge.**

Engine Type : All.

With this tool a check can speedily be made on the alignment of the flywheel, flywheel housing or back plate.

**PD 38B Crankshaft Gear, Sprocket, Water Pump and Water Pump Pulley Remover.**

Engine Type : This is controlled by adaptors available. Details below.

Sprockets or crankshaft gears cannot be removed with this tool when the shaft is in situ.

**PD 38B-1 Crankshaft Sprocket Remover Adaptor.**

Engine Type :

P3	P3/152	P4
P6	6.288	6B.305
6.305	R6	F340

This Adaptor is used with PD 38B.

**PD 38B-2 Crankshaft Gear Remover Adaptor.**

Engine Type 4.99 4.107

Remarks : See PD 38B-1.

**PD 38B-3 Crankshaft Gear Remover Adaptor.**

Engine Type :

P3/144	3.144	B3.152
3.152	L4	4.270

Remarks : See PD 38B-1.

**PD 38B-4 Crankshaft Gear Remover Adaptor.**

Engine Type 6.354.

Remarks : See PD 38B-1.

**PD 38B-5 Water Pump Impeller Remover Adaptor.**

Engine Type : All.

The Impeller can be removed with ease and safety.

**PD 38B-6 Water Pump Pulley Remover Adaptor.**

Engine Type : 3.152.

Remarks : See PD 38B-1.

**6200B Small End Reaming Fixture.**

Engine Type : All.

The correct small end bush reamers must be available to complete the job. Details as follows :

**PD 39A Set of Small End Bush Reamers.**

Engine Type :

P3	B6.305	3.152	P4
B4.192	6.305	4.203	P6
4.192	P3/152	P3/144	3.144
6.288			

Two reamers are supplied in a set. The first reamer to be used is marked low. The second

reamer is marked high which will give required dia.

**PD 6200-1 Set of Small End Bush Reamers.**

Engine Type :

L4 4.270 R6 F340

Remarks : See PD 39.

**PD 6200-2 Small End Bush Reamer.**

Engine Type 4.99

This is an adjustable reamer.

**PD 6200-3 Set of Small End Bush Reamers.**

Engine Type : 6.354

Remarks : See PD 39.

**PD 40 Exhauster Alignment Gauge.**

Engine Type : P6 R6 F340

Used for checking the exhauster alignment when the cylinder head is removed. See PD 87.

**PD 87 Exhauster Alignment Gauge (Sleeve Type).**

Engine Type :

P6	6.288	B6.305
R6	F340	6.305

Used for checking the exhauster alignment.  
(Couplings must be removed).

**PD 41B Piston Height Gauge.**

Engine Type : All.

Used for checking piston height.

**PD 46B Turning Handle Dog Box Spanner.**

Engine Type :

P3	3.152	P6
B3.152	4.203	L4
B4.192	6.305	3.144
B6.305	6.354	4.192
R6	P3/144	6.288
P3/152	P4	4.270

This is a heavy duty box double ended spanner complete with turning bar 1" Whit.  $\times$  2" A.F.

**PD 47 Cylinder Head Nut Wrench.**

Engine Type : L4 4.270

This is a  $\frac{3}{4}$ " AF long socket to remove and replace cylinder head nuts, fitted at the base of the atomiser securing studs, (L4 engine only)

**PD 83 Cylinder Head Nut Wrench.**

Engine Type :

P3/144	3.144	B3.152
3.152	R6	F340

This is  $\frac{11}{16}$ " A.F.

Remarks : See PD 47.

**D6050 Cylinder Head Nut Wrench.**

Engine Type :

P3	P4	P6
6.288	B6.305	6.305

This is  $\frac{5}{8}$ " Whit.

Remarks : See PD 47.

**PD 49 Fuel pump Adaptor Remover.**

Engine Type : P3/144 P3/152 L4

To remove drive adaptor from fuel pump cam-shaft.

**PD50-C Cylinder Liner Remover and Replacer.**

Engine Type :

L4	4.270	4.99
P3/152	B3.152	3.152
4.203	B6.305	6.305

One of the following adaptor sets must be ordered to complete the operation.

Note : L4, 4.270 and 4.99 are wet lined engines and do not require a replacing tool.

**PD 50C-1 Cylinder Liner Remover Adaptor.**

Engine Type : L4, 4.270.

Completes PD 50-C for removing liners.

**PD 50C-- Cylinder Liner Remover Adaptor.**

Engine Type : 4.99.

Completes PD 50C for removing liners.

**PD 50C-3 Cylinder Liner Remover Adaptor.**

Engine Type :

P3/152	B3.152	3.152
4.203	B6.305	6.305

Completes PD 50C to remove and replace liners.

**PD 91 Cylinder Bore Dial Gauge.**

Engine Type : All.

This guage has been developed to cover cylinder and bearing bores from 1" to  $4\frac{3}{8}$ ".**PD 155A Small Adjustable Puller.**

Engine Type : All.

With suitable adaptors can be used to remove water pump pulley, oil pump drive gears and camshaft gear see adaptor details.

**PD 155A-1 Small Adjustable Puller Adaptors.**

Engine Type :

R6	P3/144	3.144	B3.152
3.152	4.192	B4.192	4.203

Water Pump Pulley.

6.305	L4	4.270	4.99	4.107
-------	----	-------	------	-------

Removes water pump pulleys only on above engines.

6.354

Removes water pump pulley and camshaft gear. Two screw legs  $\frac{5}{16}$ " dia. U.N.F.**PD 155A-2 Small Adjustable Puller Adaptors.**

Engine Type : P3 P4 P6

Remove low position water pump pulley. Two screw legs. ( $\frac{5}{16}$ " dia. Whit.)**PD 155A-4 Small Adjustable Puller Adaptor.**

Engine Type :

P3/144	4.203	4.192
3.152	3.144	B3.152
B4.192		

Removal of oil pump gear. Two screw legs.  $\frac{1}{2}$ " Dia. U.N.F.)**No. 3. Tension Wrench.**

Engine Type : All.

 $\frac{1}{2}$ " square drive 25—170 lbs. ft.**316 X Valve Seat Cutter Handle.**

Engine Type : All except 6.354.

This tool is required for operation of all cutters and pilots.

**316-10 Valve Seat Cutter Pilot.**

Engine Type :

P3	P3/152	P3/144	3.144
B3.152	3.152	P6	4.192
B4.192	4.203	P4	4.99
6.288	B6.305	6.305	4.107

This pilot is suitable for all guides that have a nominal  $\frac{5}{16}$ " i/d.**316-12 Valve Seat Cutter Pilot.**

Engine Type :

L4	4.270	R6	F340
S6			

This pilot is suitable for all guides that have a nominal  $\frac{3}{8}$ " i/d.**PD317-23 Valve Seat Cutter Exhaust.****PD317-26 Valve Seat Cutter Inlet.****317-G22 Glaze Breakers.****317-G25 Glaze Breakers.**

Engine Type :

P3	3.152	P4
B3.152	4.203	3.144
B4.192	6.305	4.192
B6.305	P3/144	6.288
P3/152	P6	

The above cutters have been designed to cut seats to the correct angle and at the same time reduce seat width. It is strongly recommended that the glaze breakers be used first as this will greatly reduce chattering of the cutters.

**PD317-25 Valve Seat Cutter Exhaust.**

**PD317-29 Valve Seat Cutter Inlet.**

**317-G30 Glaze Breaker.**

Engine Type : L4 4.270 R6 F340  
Remarks : See PD 317-23.

**PD317-27 Valve Seat Cutter Exhaust**

**PD317-34 Valve Seat Cutter Inlet**

**317-G27 Glaze Breaker.**

Engine Type : S6.  
Remarks : See PD 317-23.

**PD317-18 Valve Seat Cutter Exhaust.**

**PD317-22 Valve Seat Cutter Inlet.**

**317-G19 Glaze Breaker.**

Engine Type : 4.99 4.107.  
Remarks : See PD317-23.

**FC 9900 Atomiser Tester.**

Engine Type : All.  
This is a portable tester fitted with a paper filter element.

**7065 Circlip Pliers.**

Engine Type : All.  
Two types of points are available  $\frac{1}{2}$ " shaft size.  
 $\frac{1}{2}$ "—1" "B" Shaft size 1"—3".

**355 Connecting Rod Alignment Jig.**

Engine Type : All.  
Enables a quick check to be made on the alignment required. See below.  
ment of connecting rods—various adaptors are

**336 Multi-Purpose Con. Rod Arbor.**

Engine Type : All.  
Required with the above tool.

**PD 336-1 Adaptor.**

Engine Type :  

P3	P3/152	P6
B3.152	4.203	3.144
B4.192	6.305	4.192
B6.305	P3/144	6.288
3.152	P4	

  
This adaptor is fitted into the big-end bore when checking the alignment (Thin wall bearings only).

**PD 336-2 Adaptor.**

Engine Type : P3 P4 P6  
Remarks : See PD 336-1.  
(Thick wall bearings only).

**PD 336-3 Adaptor.**

Engine Type : L4 4.270  
Remarks : See PD 336-1.

**PD 336-4 Adaptor.**

Engine Type : R6 F340  
Remarks : See PD 336-1.

**PD 336-5 Adaptor.**

Engine Type : 4.99 4.107  
Remarks : See PD 336-1.

**PD 336-6 Adaptor.**

Engine Type : 6.354  
Remarks : See PD 336-1.

**6118 Valve Spring Compressor.**

Engine Type : All.  
This valve spring compressor has been designed to remove valve springs without removing the cylinder head, provided the adaptors are available.

**PD6118-1 Valve Spring Compressor Adaptor.**

Engine Type : 4.99.  
The adaptor is fitted to one of the rocker shaft securing studs.

**PD6118-2 Valve Spring Compressor Adaptor.**

Engine Type :  

P3	P3/152	P4	P6
6.288	B6.305	6.305	S6

  
Remarks : See PD 6118-1.

**PD6118-3 Valve Spring Compressor Adaptor.**

Engine Type :  

P3/144	B4.192	F340
4.192	R6	3.152
4.270	B3.152	L4
3.144	4.203	

  
Remarks : See PD 6118-1.

**PD6118-4 Valve Spring Compressor Adaptor.**

Engine Type : 6.354  
Remarks : See PD 6118-1.

**PD 130 Fuel Pump Allen Screw Wrench.**

Engine Type : 4.192 4.203 4.99 4.107  
Use to remove the Allen screw securing D.P.A. fuel pump.

**PD 42B Small End Bush Remover Main Tool.**

Engine Type : All.  
Enables a new small end bush to be drawn into the small end of con. rod and at the same time will displace the old bush : adaptors are required. See below.

**PD 42B-1 Small End Bush Remover Adaptor.**

Engine Type :

P3	P3/152	P3/144	3.144
B3.152	3.152	P4	B4.192
4.192	4.203	P6	6.288
B6.305	6.305		

An adaptor to suit the small end bore.

**PD 42B-2 Small End Bush Remover Adaptor.**

Engine Type :

L4 4.270 R6 F340

Remarks : See PD 42B-1.

**PD 42B-3 Small End Bush Remover Adaptor.**

Engine Type : 4.99

Remarks : See PD 42B-1.

**PD 42B-4 Small End Bush Remover Adaptor.**

Engine Type 6.354

Remarks : See PD 42B-1.

**PD 134 Auxiliary Drive Shaft Bush Remover and Replacer.**

Engine Type : 6.354

To remove old bushes and draw in new bush.

**6000C Compression Tester.**

Engine Type : See adaptor details

**6000C-3 Compression Tester Adaptor**

Engine Type :

P3	P3/152	P3/144	3.144
B3.152	3.152	P4	4.192
B4.192	4.203	P6	6.288
B6.305	6.305	L4	R6
F340			

This adaptor replaces the atomiser for compression testing.

**6000C-4 Compression Tester Adaptor.**

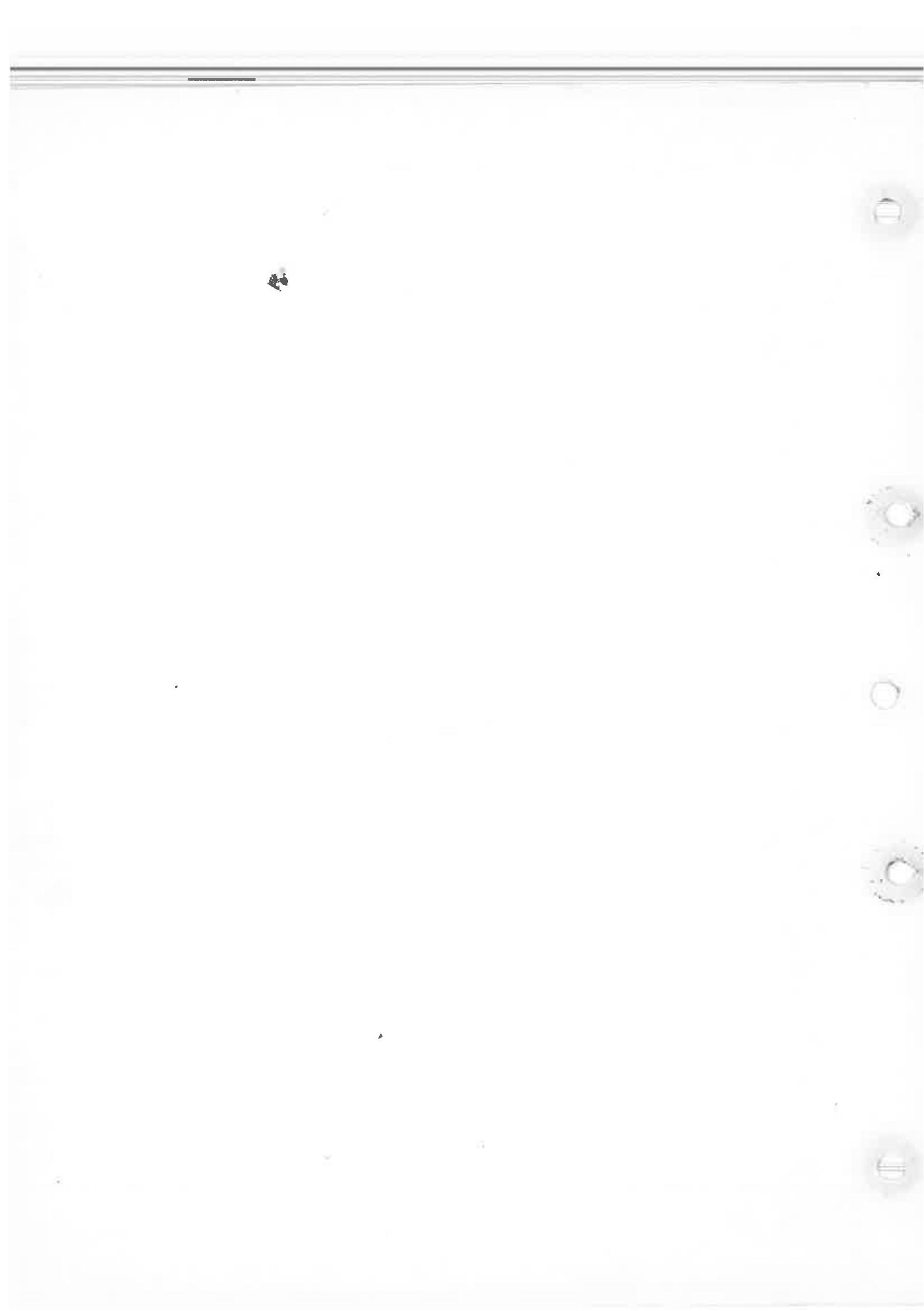
Engine Type : 6.354 4.270

Remarks : See 6000C-3.

**6000C-5 Compression Tester Adaptor.**

Engine Type : 4.99

Remarks : See 6000C-3. This addaptor is for the older type of cylinder head with screw in lock nuts.



## APPROVED LUBRICATING OILS

### 4.270 SERIES

Normal Working Temperature S.A.E. Designation	0°F.—30°F. 10W	30°F.—80°F. 20/20W	Over 80°F. 30
<b>Gulf Oil Group of Companies</b> <b>British American Oil Company</b>	Gulfflube Motor Oil XHD 10W Gulfflube Motor Oil HD 10W Peerless Heavy Duty 10W	Gulfflube Motor Oil XHD 20/20W Gulfflube Motor Oil HD 20/20W Peerless Heavy Duty 20/20W	Gulfflube Motor Oil XHD 30 Gulfflube Motor Oil HD 30 Peerless Heavy Duty 30
<b>Esso Petroleum Co. Ltd.</b> <b>Imperial Oil Ltd.</b>	Estor HD 10W Essolube HD 10 Essofleet HD 10	Estor HD 20 Essolube HD 20 Essofleet HD 20	Estor HD 30 Essolube HD 30 Essofleet HD 30
<b>Germ Lubricants Ltd.</b>	Germil 100 Series	Germil 200 Series	Germil 300 Series
<b>Shell Mex and B.P. Ltd.</b>	Shell Rotella Oil 10W BP Energol Diesel D-SAE 10W	Shell Rotella Oil 20/20W BP Energol Diesel D-SAE 20W	Shell Rotella Oil 30 BP Energol Diesel D-SAE 30
<b>Regent Oil Co. Ltd.</b> <b>Texaco/Caltex</b>	RPM Delo S.A.E. 10W Ursa Oil HD 10W	RPM Delo S.A.E. 20W Ursa Oil HD 20W	RPM Delo S.A.E. 30 Ursa Oil HD 30
<b>Mobil Oil Co. Ltd.</b>	Mobiland Diesel 10 Delvac Oil 910	Mobiland Diesel 20 Delvac Oil 920	Mobiland Diesel 30 Delvac Oil 930
<b>Alex. Duckham &amp; Co. Ltd.</b>	Duckhams HD 10/Mil	Duckhams HD 20/Mil	Duckhams HD 30/Mil
<b>Vigzol Oil Co. Ltd.</b>	A 10W Diesel Engine Oil	A 20W/20 Diesel Engine Oil	A 30 Diesel Engine Oil
<b>Castrol Ltd.</b>	Agricastrol HD 10 Castrol CR 10	Agricastrol HD 20 Castrol CR 20	Agricastrol HD 30 Castrol CR 30

And other reputable detergent oils to approved specification including : Any lubricating oils which have passed Approval Tests for the U.S. Ordnance Specification MIL-L-2104A and British Ministry Test DEF 2101B (which are equivalent) in their S.A.E. 10 and 30 grades, with a viscosity index of 80 minimum shall be deemed equally acceptable.

**Special Note :** All grades listed above are detergent Heavy Duty oils.

Where conditions of service warrant (e.g. continuous heavy load operations) the grades shown in the right hand column may be used in lieu of those shown in the centre columns, and where high temperatures are the rule, heavier (SAE40) equivalents of the grades shown in the right hand hand column should be used.

The above Specifications are subject to alteration without notice.

02-8321111 Mitchenberry

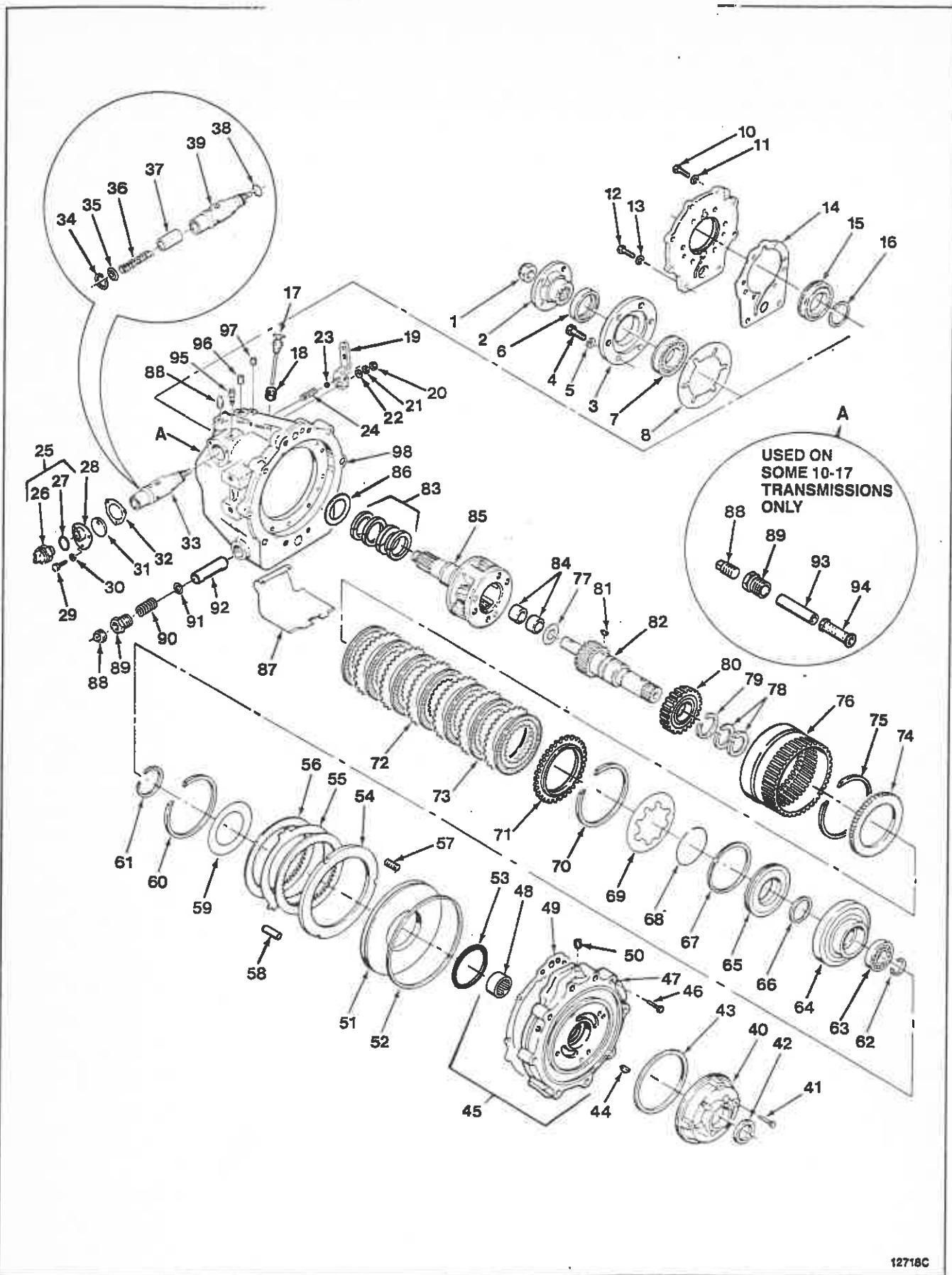


Figure 8. 71C and 72C Transmission Assembly - Current Production



INDEX NO.	PART NUMBER	DESCRIPTION	QTY
Fig. 8	10-17-000-*	TRANSMISSION ASSEMBLY (MODEL 71C)	
	10-18-000-*	TRANSMISSION ASSEMBLY (MODEL 72C)	
1	4775L	• OUTPUT SHAFT NUT	1
2	4547BA	• COUPLING (10-17 ONLY)	1
2A	4547AY	• COUPLING (10-18 ONLY)	1
3	71-7	• BEARING RETAINER (10-17 ONLY)	1
3A	72-7	• BEARING RETAINER (10-18 ONLY)	1
4	0000179859	• HEX HEAD BOLT (7/16-14 x 1-1/4) (10-17 ONLY)	6
4A	10-00-183-043	• HEX HEAD BOLT (7/16-14 x 1-1/4) (10-18 ONLY)	6
5	0000103322	• LOCKWASHER (7/16) (10-17 ONLY)	6
6	71C-110	• OIL SEAL	1
7	B111AG	• BEARING	1
7A	B308AGS	• BEARING	1
7B	B309AGS	• BEARING	1
8	71-147	• BEARING RETAINER GASKET (10-17 ONLY)	1
8A	72-147	• BEARING RETAINER GASKET (10-18 ONLY)	1
9	**	• ADAPTER	1
9A	**	• ADAPTER	1
9B	**	• ADAPTER	1
10	**	• LOCK BOLT (7/16-14 x 7/8)	6
11	**	• LOCKWASHER (7/16) (10-18 ONLY)	6
11A	**	• LOCKWASHER (7/16) (10-17 ONLY)	6
12	**	• HEX HEAD BOLT (7/16-14 x 1-3/4)	2
13	**	• LOCKWASHER (7/16)	2
14	**	• ADAPTER GASKET	1
15	**	• BEARING	1
16	**	• RETAINING RING	1
17	10-17-559-001	• DIPSTICK (ALL DIRECT DRIVES EXCEPT -015 AND -016)	1
17A	10-13-559-001	• DIPSTICK (FOR -015 AND -016)	1
18	10-04-034-002	• DIPSTICK TUBE	1
19	71-79B	• SHIFT LEVER	1
20	9418892	• HEX NUT (5/16-24)	1
21	0000108579	• LOCKWASHER (5/16)	1
22	0000103340	• FLATWASHER (5/16)	1
23	0000453632	• STEEL BALL (5/16)	1
24	71-42	• POPPET SPRING	1
25	10-00-640-004	• NEUTRAL SWITCH ASSEMBLY	1
26	NO NUMBER	• • NEUTRAL SWITCH (NSS)	1
27	10-00-141-046	• • O-RING	1
28	10-16-039-001	• • VALVE COVER	1
29	0000179796	• HEX HEAD BOLT (1/4-20 x 1/2)	3
30	0000103319	• LOCKWASHER (1/4)	3
31	10-16-039-001	• SWITCH CAM	1
32	71-14	• VALVE COVER GASKET	1
33	71-A244A	• CONTROL VALVE ASSEMBLY	1
34	4821	• • SNAP RING	1
35	71-246	• • SPRING RETAINER	1
36	71-242	• • VALVE SPRING	1
37	71-243	• • REGULATOR VALVE	1
38	4804H	• • O-RING	1

\* REFER TO ASSEMBLY NUMBER ON ID TAG (See Figure 1)

\* REFER TO REDUCTION SECTION IN BACK OF MANUAL.

NSS - NOT SERVICED SEPARATELY, BUY NEXT HIGHER ASSEMBLY

1

C

C

INDEX NO.	PART NUMBER	DESCRIPTION	QTY
39	71-244A	• • CONTROL VALVE	1
40	71C-A60	• PUMP ASSEMBLY	1
41	10-00-183-021	• HEX HEAD BOLT (5/16-18 x 1-3/8)	4
42	10-00-044-014	• • OIL SEAL	1
43	3-61	• PUMP GASKET	1
44	4873	• WOODRUFF KEY	1
45	71C-A8	• FORWARD AND REVERSE ADAPTER ASSEMBLY	1
46	4911	• CAPSCREW (3/8-16 x 1-1/4)	4
47	NO NUMBER	• • FORWARD AND REVERSE ADAPTER (NSS)	1
48	4840D	• • NEEDLE BEARING	1
49	71-144B	• GASKET	1
50	0000444858	• PIPE PLUG (1/4)	1
51	71-35	• REVERSE CLUTCH PISTON	1
52	4805A	• CLUTCH SEALING RING	1
53	4804G	• O-RING	1
54	71-71	• REVERSE CLUTCH PRESSURE PLATE	1
55	72-176	• STEEL CLUTCH PLATE	0-2
56	72-A66B	• FRICTION CLUTCH PLATE	1-3
57	71-97	• PRESSURE PLATE SPRING	11
58	71-87A	• DOWEL PIN (.312 DIA x .438 LONG)	3
58A	R6-177	• DOWEL PIN (.312 DIA x .621 LONG)	3
58B	4622E	• DOWEL PIN (.312 DIA x .875 LONG)	3
59	71-15B	• THRUSTWASHER	1
59A	10-16-193-001	• THRUSTWASHER	1
60	4822	• SNAP RING	1
61	R6A-7 1/2	• SNAP RING (10-17 ONLY)	1
61A	4766B	• SNAP RING (10-18 ONLY)	1
62	4734	• SNAP RING (10-17 ONLY)	1
62A	4559A	• SNAP RING (10-18 ONLY)	1
63	B107A	• BEARING (10-17 ONLY)	1
63A	B108A	• BEARING (10-18 ONLY)	1
64	71-70	• FORWARD CLUTCH CYLINDER (10-17 ONLY)	1
64A	72-70	• FORWARD CLUTCH CYLINDER (10-18 ONLY)	1
65	10-16-124-001	• FORWARD CLUTCH PISTON	1
65A	71-45	• FORWARD CLUTCH PISTON	1
66	5M-122	• O-RING	1
67	5L-36	• PISTON SEALING RING	1
68	5C-33	• CLUTCH SPRING BEARING RING	1
69	3-37	• CLUTCH BELLEVILLE SPRING	1
70	4755	• SNAP RING	1
71	5C-175A	• CLUTCH PRESSURE PLATE	1
72	3-176	• STEEL CLUTCH PLATE (10-17 ONLY)	4
72A	3-176	• STEEL CLUTCH PLATE (10-18 ONLY)	6
73	5C-A66A	• FRICTION CLUTCH PLATE (10-17 ONLY)	5
73A	5C-A66A	• FRICTION CLUTCH PLATE (10-18 ONLY)	7
74	5L-67	• CLUTCH PRESSURE PLATE	1
75	10-00-139-048	• SNAP RING (.033-.037 THICK) (10-17 ONLY)	1
75A	10-00-139-049	• SNAP RING (.050-.054 THICK) (10-17 ONLY)	1
75B	4768	• SNAP RING (.050-.054 THICK) (10-18 ONLY)	1-2
75C	4768A	• SNAP RING (.074-.078 THICK) (10-18 ONLY)	1
75D	4768B	• SNAP RING (.096-.100 THICK) (10-18 ONLY)	1
75E	10-00-139-018	• SNAP RING (.062-.066 THICK) (10-18 ONLY)	1

NSS - NOT SERVICED SEPARATELY, BUY NEXT HIGHER ASSEMBLY.



INDEX NO.	PART NUMBER	DESCRIPTION	QTY
76	.71-6	• RING GEAR (10-17 ONLY)	1
76A	72-6	• RING GEAR (10-18 ONLY)	1
77	71-17	• THRUSTWASHER	1
78	4806J	• SEALING RING	2
79	4495	• SNAP RING	1
80	71-40	• FORWARD CLUTCH HUB (10-17 ONLY)	1
80A	10-16-179-001	• FORWARD CLUTCH HUB (10-18 ONLY)	1
81	0000218211	• WOODRUFF KEY (10-17 ONLY)	1
81A	0000124553	• WOODRUFF KEY (10-18 ONLY)	1
82	71C-3A16	• DRIVE GEAR ASSEMBLY (10-17 ONLY)	1
82A	72C-2A16	• DRIVE GEAR ASSEMBLY (10-18 ONLY)	1
83	4806B	• SEALING RING	4
84	A4877D (KIT)	• BUSHING	2
85	10-17-659-***	• PINION CARRIER ASSEMBLY (10-17 ONLY)	1
85A	10-18-659-***	• PINION CARRIER ASSEMBLY (10-18 ONLY)	1
86	71-159	• THRUSTWASHER	1
86A	10-17-193-001	• THRUSTWASHER	1
87	71-140	• OIL BAFFLE	1
87A	71B-140	• OIL BAFFLE	1
88	10-00-191-002	• PLUG (3/8-18)	2
89	4885B	• DRYSEAL BUSHING (3/4-14)	1
90	5L-222	• SPRING	1
91	35-143	• FLAT WASHER	1
92	72C-98	• OIL INLET SHIELD	1
93	71C-84	• OIL RETURN TUBE	1
94	71C-A98	• OIL STRAINER ASSEMBLY	1
95	A4740G	• BREATHER	1
96	0000444866	• PIPE PLUG (3/8-18)	1
97	0000444687	• PIPE PLUG (1/8-27)	1
98	10-17-565-***	• CASE (10-17 ONLY)	1
98A	10-18-565-***	• CASE (10-18 ONLY)	1

\*\*\* CHECK MODEL CHART TO DETERMINE CORRECT PART NUMBER

**NOTE:** The following kits are available for the Model 71C and 72C transmissions. Index numbers shown match the index numbers on the exploded-view, Figure 8.

INDEX NO.	PART NUMBER	DESCRIPTION	QTY
71	A4867AB	FORWARD CLUTCH PACK KIT (10-18 ONLY)	
72A	5C-175A	• CLUTCH PRESSURE PLATE	1
73A	3-176	• STEEL CLUTCH PLATE	6
74	5C-A66A	• FRICTION CLUTCH PLATE	7
	5L-67	• CLUTCH PRESSURE PLATE	1



# MAINTENANCE

## A. GENERAL.

Maintenance to the transmission will normally consist of the following items.

- Checking oil level or changing oil. Regular scheduled oil changes are an important part of transmission maintenance.



**WARNING: SHIFT LINKAGE MUST BE ADJUSTED FOR PROPER OPERATION OF TRANSMISSION.**

**NOTE:** For details on each of these adjustments refer to the OEM manual.

- Checking pressure in each circuit (if a problem is detected).



**CAUTION:** Transmission mounting bolts should be checked and tightened to torque specified in OEM manual. Do not overtighten! Damage to the transmission can result.

## B. LUBRICATION.

Due to the various installation angles and oil cooler set-ups, it may be necessary to adjust your oil level.



**WARNING: DO NOT REMOVE DIPSTICK WITH ENGINE RUNNING. HOT OIL CAN CAUSE BURNS.**



**CAUTION:** Clean around the area of the dipstick, before removing. Small particles of dirt can cause damage to internal components and cause valves to stick.

### Check Oil Level.

The transmission should be at operating temperature (190° max.) to get an accurate oil level reading. Oil will expand when it is heated. Oil will drain back from the cooler. Expansion and drain-back can significantly affect oil level.

### Warm Oil Level Check.

When the transmission is at operating temperature, place selector lever in neutral. Shut off engine. Carefully remove transmission dipstick. Immediately insert clean dipstick and read oil level.

**NOTE:** Oil level must be checked immediately after engine shut-down to prevent an incorrect reading. Oil drains back into transmission from the cooler and cooler lines.

Add or remove oil if necessary. Repeat the above checking procedure as required until oil is at the dipstick mark.

### Cold Oil Level Check.

For ease of checking the oil prior to engine start-up, a cold oil level mark can be made. To find the cold oil level mark, the oil level must first be set according to the warm oil level checking procedure. Then, let the boat sit overnight. Insert clean dipstick and read oil level.

Put a mark on the dipstick at the cold oil level reading.

You can use the new mark to check the oil level when cold. If oil level adjustment is needed, add oil to the new mark.

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### Type of Oil.

Dexron, Type F, or any hydraulic fluid which meets the C-3 oil specification is acceptable. Do not mix different brands. If engine doesn't exceed 3,000 R.P.M., a premium grade 30 weight engine oil is acceptable. SAE #40 and multi-viscosity oils are not recommended.

If the transmission oil temperature has exceeded 190° F or the alarm sounds, the oil must be changed in the transmission and cooler system.

### Changing Oil.

Oil in transmission, cooler, and cooler lines should be changed after every 1,000 hours of operation or annually. Severe service conditions or high operating temperatures may require more frequent changes.

- Place selector lever in neutral. Run engine for five minutes at 1500 RPM. Shut down engine.



**CAUTION:** Clean around the area of drain plug, before removing. Small particles of dirt can cause damage to internal components and cause valves to stick.

- Drain oil from transmission, cooler, and cooler lines into a suitable container.

- Check oil for signs of metal or rubber particles.



**CAUTION:** A few small metal particles are normal. However, if large metal chips or a large number of particles are found, this could be an early sign of transmission failure. The transmission should be disassembled and inspected for internal damage.

**NOTE:** Particles of rubber can indicate cooler line wear. Each line should be inspected for cracks or fraying and should be replaced if damaged.

- Fill transmission with new oil.

**NOTE:** The amount of oil required will vary based on length of cooler lines. Use an amount equal to about three-fourths the quantity removed.

- Install dipstick. Run engine for two minutes to fill cooler and cooler lines with oil. Set oil level according to procedure at start of section B, Lubrication.

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## INTRODUCTION

### TO ALL USERS OF THIS PUBLICATION

This Parts Book has been published for the special benefit of the operator in order to simplify the servicing of parts for the Perkins 4.270 Marine Diesel Engine, commencing Engine No. 6200251.

The book comprises of two parts as follows :—

Part 1 covers the Basic Engine (with provision for keel, direct or indirect cooling).

Part 2 covers the Standard Accessories, Back-end Arrangements and Gearboxes.

As much detail as possible has been incorporated in this book, and if the procedure outlined below is followed, supplies will be obtained with the minimum of delay.

### SOURCE OF SUPPLY

Home operators are recommended to obtain parts through one of the Perkins Marine Depots listed overleaf, and overseas operators should contact the Perkins Distributor in their territory. To ensure you obtain the best results from your engine and to safeguard your own guarantee, **FIT ONLY GENUINE PERKINS PARTS**. These are readily obtainable throughout the world.

### INFORMATION REQUIRED

Wherever parts are ordered it is essential that full information is given to the Supplier to enable him to identify your requirements. Complete descriptions and part numbers, should always be stated and in case of parts required for an individual engine, the engine serial number must be included.

Take as an example :—

For 4.270 Marine Engine No. 6200251.

35532 Filter, Fuel Oil—1 off.

Such an order gives all the information needed to enable your requirements to be identified correctly, and consequently it will receive prompt attention.

### SPECIAL PARTS

This book covers Basic 4.270 Marine Engines, with alternative Water Cooling arrangements, Standard accessories, Back-ends and Gearboxes, but does not incorporate conversion parts suitable for special applications. Supplements to Part 1 of this book covering parts for special applications are published but if a supplement is not available you should, as in all instances, quote full details outlined above to ensure that you receive the correct parts.

### SCREW THREADS

All screw threads used on this engine except on certain items of proprietary equipment and the crankshaft are Unified Series and American Pipe Series.

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#### IMPORTANT

Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

## INTRODUCTION Continued

### ENGINE IDENTIFICATION

The engine number is stamped on the L.H. side of the engine at the rear end of the cylinder block.

### ENGINE CLASSIFICATION

Three types of Basic Engines are incorporated in Part 1 as follows :—

- List No. 181. Engines with Keel cooling arrangement.
  - List No. 180. Engines with Direct cooling arrangement.
  - List No. 182. Engines with Indirect cooling arrangement.
- 

The items illustrated and described in this Parts Book are correct at the time of publication, but as developments are made we reserve the right to alter or withdraw items without notice.

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#### IMPORTANT

Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

## Perkins (U.K.) Marine Distributors

Distributor	Area
Agra Motor Engineers Ltd., Quayside, BANFF.	Aberdeenshire, less Aberdeen, Banffshire, Morayshire, Nairnshire, Inverness-shire, Ross and Cromarty, Sutherland and Caithness.
William Heath, The Garage, Gordon-by-Montrose, ANGUS.	The City of Aberdeen, Kincardineshire and Angus.
Messrs. Moodie & Co. Ltd., 27/29, Colston Road, Bishopbriggs, GLASGOW.	Peebleshire, Kirkcudbrightshire, Ayrshire, Midlothian, Dunbartonshire, Perthshire, Kinrossshire, West Lothian, Buteshire, Renfrewshire, Dumfriesshire, Wigtonshire, Lanarkshire, Stirlingshire, Argyllshire, Clackmannan- shire, Fifeshire, Selkirkshire, Island of Arran.
Messrs. G. C. Monk & Co. Ltd., Waterville Road, North Shields, NORTHUMBERLAND.	Yorks, Durham, Northumberland, Roxburghshire, Ber- wickshire, East Lothian.
Messrs. C. W. Green & Sons, Brayford North, LINCOLN	Lincs., Notts., Leics., Rutland, Northampton, (excluding Soke of Peterborough).
Messrs. J. F. Duffield & Son, 304, Constitution Hill, NORWICH. NOR. 440.	Norfolk plus Lowestoft and Beccles.
Messrs. J. & A. Higginbottom Ltd., The Quay, Conway, NORTH WALES.	Anglesey, Flintshire, Denbighshire, Caernarvonshire.
Messrs. Milford Haven Marine Services Ltd., P.O. Box 12, The Dockyard, PEMBROKE DOCK.	Pembrokeshire, Carmarthenshire, Glamorganshire, Brecknockshire, Radnorshire, Cardiganshire, Mont- gomeryshire, Merionethshire.
Messrs. Maratime Motors Limited, Fordwater Trading Estate, Chertsey, SURREY.	Postal district of LONDON, Surrey, Middx., Berks., Oxon, Bucks.
Messrs. P. G. Tyer (Turbines) Ltd., 22, Tidal Basin Road, Royal Victoria Dock, LONDON, E.16.	Cambs., Beds., Suffolk, Less Beccles, and Lowestoft, Essex and Herts.
Messrs. Walkers Marine Limited, Royal Harbour, Ramsgate, KENT.	County of Kent.
The Golden Arrow Speedboats, Estate Road, Newhaven, SUSSEX.	County of Sussex Plus Hayling Island.
The Kemps Shipyard Limited, Quayside Road, Bitterne Manor, Southampton, HANTS.	Hampshire, with exception of Christchurch, Bourne- mouth and Hayling Island.
E. Gillam, Royal Motor Yacht Club Yard, Sandbanks, BOURNEMOUTH.	Counties of Dorset, Wiltshire, plus Bournemouth and Christchurch.
Reeds Marine Division, The Barbican, Plymouth, DEVON.	Cornwall, Devon and Scilly Isles.
Messrs. Wilson & Leeper Limited, Bridge End, BELFAST.	Northern Ireland.

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**IMPORTANT**  
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## NOTES

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# PART I

## BASIC ENGINES

### INDEX

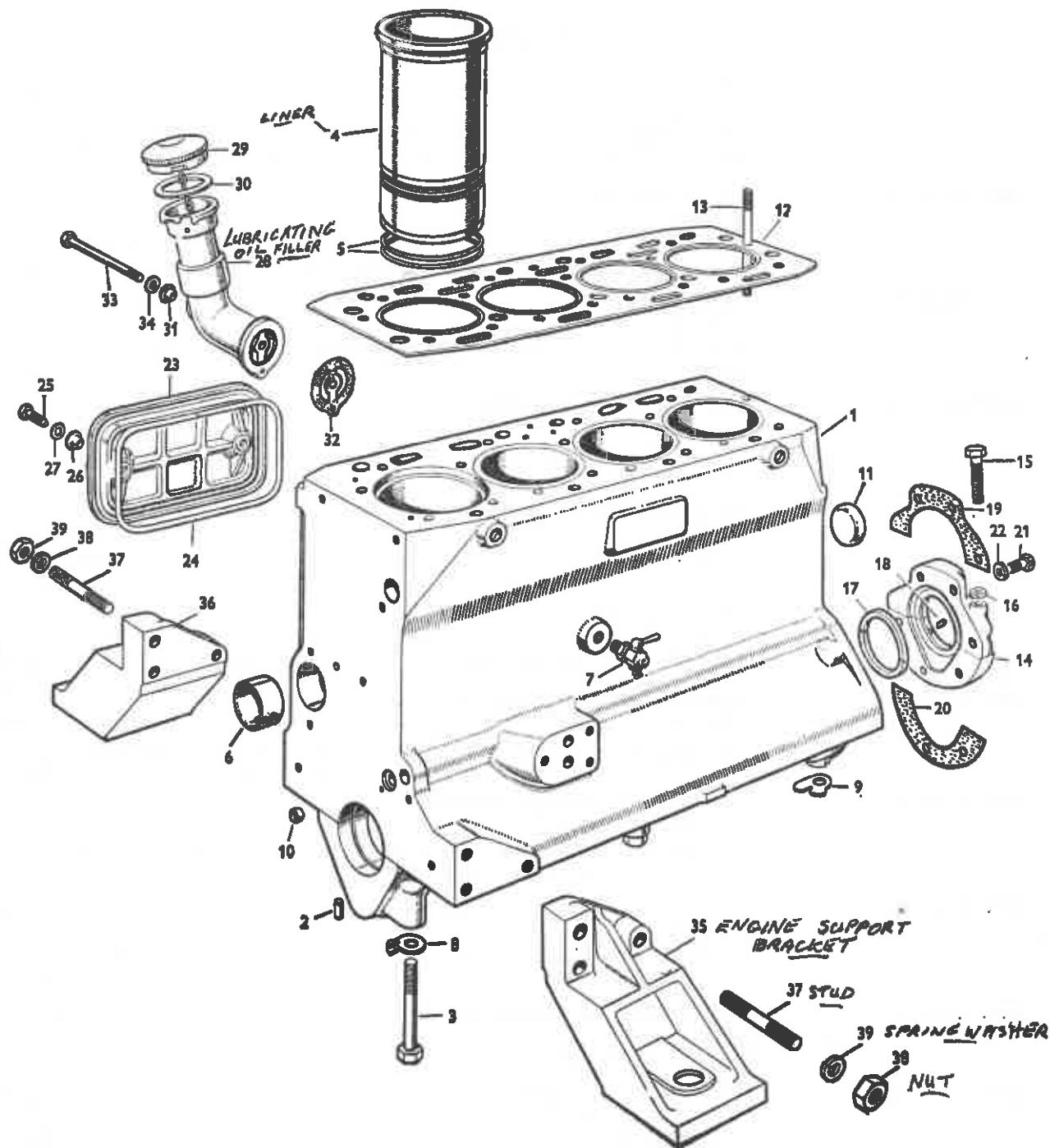
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**IMPORTANT**

Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "A"**



## SECTION "A"

**Cylinder Block**

Plate Ref.	Part No.	Description	Qty.	Remarks
1	59839	CYLINDER BLOCK (ASSEMBLY)	1	
		Including :		
		Cap, crankshaft main bearing—Front and middle .. .. ..		
		Cap, crankshaft main bearing—Rear .. .. ..		}
2	0350016	Dowel, crankshaft main bearing cap to cylinder block .. .. ..	6	
3	0745050	Setscrew, crankshaft main bearing cap to cylinder block .. .. ..	6	
4	31358506	Liner, cylinder block .. .. ..	4	
5	0640023	Ring, cylinder block liner sealing .. .. ..	8	
6	0050215	Bush, cylinder block No. 1 camshaft bearing .. .. ..	1	
7	31422	Cock, cylinder block drain .. .. ..	1	
8	31733119	Tabwasher, crankshaft main bearing cap setscrew (Replace 0920796) .. .. ..	4	Front and middle cap
9	0920795	Tabwasher, crankshaft main bearing cap setscrew .. .. ..	2	Rear cap
	0760001	Washer, crankshaft main bearing cap setscrew—Shim .. .. ..	6	
10	0650566	Plug, cylinder block lub. oil pressure rail front and rear .. .. ..	2	
11	0650572	Plug, cylinder block camshaft end .. .. ..	1	
12	0490735	Gasket, cylinder head .. .. ..	1	Replaces 36812308
13	0826801	Stud, cylinder block to cylinder head .. .. ..	17	
	56236	COVERS, CRANKSHAFT REAR END OIL SEAL (ASSEMBLY)	1	Prior to Eng. No. 6212604. Obsolete—Use 58898/ 0746208/0746255/36441106
14	58898	COVERS, CRANKSHAFT REAR END OIL SEAL (ASSEMBLY)	1	Eng. No. 6212604 onwards
		Comprising :—		
	0746235	Setscrew, crankshaft rear end oil seal cover clamping .. .. ..	2	Used only with 56236
	0920299	Washer, crankshaft rear end oil seal cover clamping setscrew .. .. ..	2	
15	0096239	Setscrew, crankshaft rear end oil seal cover clamping .. .. ..	2	Used only with 58898
16	0920053	Washer, crankshaft rear end oil seal cover clamping setscrew .. .. ..	2	
17	0730071	Seal, crankshaft rear end oil .. .. ..	2	
18	2115201	Pin, crankshaft rear end oil seal retaining .. .. ..	4	Used only with 0490478/ 0490747
19	0490478	Joint, crankshaft rear end oil seal cover to cylinder block—Top .. .. ..	1	Obsolete—Use 36817133
20	0490747	Joint, crankshaft rear end oil seal cover to main bearing cap—Bottom .. .. ..	1	
	36817133	Joint, crankshaft rear end oil seal cover to cylinder block and rear main bearing cap .. .. ..	1	
	0746254	Setscrew, crankshaft rear end oil seal cover to cylinder block and rear main bearing cap .. .. ..	6	Used only with 56236
21	0746208	Setscrew, crankshaft rear end oil seal cover to cylinder block and rear main bearing cap .. .. ..	4	
	0746255	Setscrew, crankshaft rear end oil seal cover to cylinder block and rear main bearing cap—Also secure clamping washers fitted in holes nearest butt face of cover .. .. ..	2	
	36441106	Washer, crankshaft rear end oil seal covers clamping .. .. ..	2	
22	0920053	Washer, crankshaft rear end oil seal cover setscrew .. .. ..	4	"6" fitted prior to Eng. No. 6212604
23	0240752	COVER, TAPPET INSPECTION .. .. ..	2	
24	0490720	Joint, tappet inspection cover to cylinder block .. .. ..	2	
25	0746454	Setscrew, tappet inspection cover to cylinder block .. .. ..	4	Replace 0745055
26	0920933	Washer, tappet inspection cover setscrew—Leather .. .. ..	4	
27	0920488	Washer, tappet inspection cover setscrew—Plain .. .. ..	4	
28	0993181	Body, lub. oil filler .. .. ..	1	
29	2487845	Cap, lub. oil filler body .. .. ..	1	
30	24870002	Joint, lub. oil filler body cap (Replaces 0490209) .. .. ..	1	Included in 2487845

**IMPORTANT**  
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**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "A" Continued****Cylinder Block**

Plate Ref.	Part No.	Description	Qty.	Remarks
31	0920986	Washer, lub. oil filler body sealing .. .. ..	1	
32	0490466	Joint, lub. oil filler body to cylinder block .. .. ..	1	
33	0746601	Setscrew, lub. oil filler body to cylinder block .. .. ..	1	
34	0920006	Washer, lub. oil filler body setscrew .. .. ..	1	
35	0101109	BRACKET, ENGINE FRONT SUPPORT—PORT SIDE .. .. ..	1	
36	0101110	BRACKET, ENGINE FRONT SUPPORT—STARBOARD SIDE .. .. ..	1	
37	0826804	Stud, engine front support brackets to cylinder block .. .. ..	6	
38	0576005	Nut, engine front support brackets retaining .. .. ..	6	
39	0920056	Washer, engine front support brackets retaining nut .. .. ..	6	
0200907		Connection, cylinder block water inlet .. .. ..	1	
0490419		Joint, cylinder block water inlet connection to block .. .. ..	1	
0826425		Stud, cylinder block water inlet connection to block .. .. ..	1	Obsolete—Use 0746453
0746453		Setscrew, cylinder block water inlet connection to block .. .. ..	1	
0826434		Stud, cylinder block water inlet connection to block—Long .. .. ..	1	Obsolete—Use 0096436
0096436		Setscrew, cylinder block water inlet connection to block—Long .. .. ..	1	
0576051		Nut, cylinder block water inlet connection retaining .. .. ..	2	Used only with 0826425/0826434
0920053		Washer, cylinder block water inlet connection retaining nut/setscrew .. .. ..	2	

**IMPORTANT**

Always quote Engine Number when ordering Parts

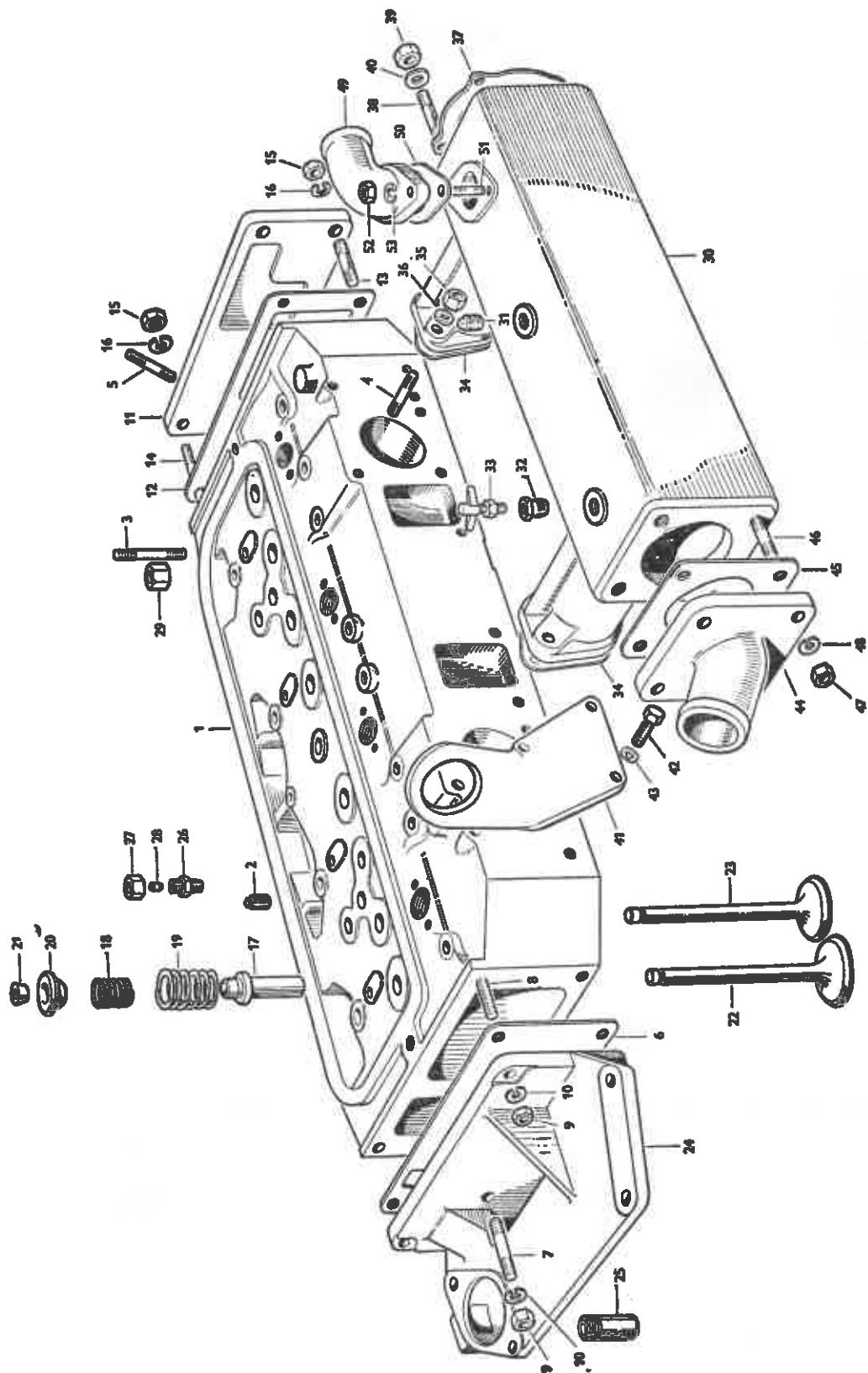
**FIT ONLY GENUINE PERKINS PARTS**

## **NOTES**

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**IMPORTANT**  
Always quote Engine Number when ordering Parts  
**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "B"**



**SECTION "B"****Cylinder Head**

Plate Part Ref. No.	Description	Qty.	Remarks
1 82614	CYLINDER HEAD (ASSEMBLY) Including :—	1	
2 0650540	Plug, cylinder head .. .. ..	2	
0420013	Guide, inlet and exhaust valve .. .. ..	8	
3 0827405	Stud, cylinder head to rocker shaft bracket .. .. ..	4	Also secure cylinder head cover
4 0826484	Stud, cylinder head to exhaust manifold .. .. ..	4	
5 0826226	Stud, cylinder head to fuel oil atomiser .. .. ..	8	
6 36846112	Joint, cylinder head to lub. oil cooler and header tank support bracket .. .. ..	1	
7 0826409	Stud, cylinder head to lub. oil cooler and header tank support bracket .. .. ..	1	
8 0826466	Stud, cylinder head to lub. oil cooler and header tank support bracket .. .. ..	1	Also detailed on Section "H"
9 0576051	Nut, lub. oil cooler and header tank support bracket retaining .. .. ..	5	
10 0920054	Washer, lub. oil cooler and header tank support bracket retaining nut .. .. ..	5	
11 0240223	COVER, CYLINDER HEAD—REAR .. .. ..	1	
12 0490253	Joint, cylinder head rear cover to head .. .. ..	1	
0826403	Stud, cylinder head rear cover to head—Also secures fuel pipe support clip ..	1	Prior to Eng. No 6219928
13 0826409	Stud, cylinder head rear cover to head .. .. ..	3	{ 2 fitted prior to Eng. No. 6219928
14 0826404	Stud, cylinder head rear cover to head—Long—Also secures fuel oil filter support bracket .. .. ..	2	
15 0576051	Nut, cylinder head rear cover retaining .. .. ..	5	
16 0920054	Washer, cylinder head rear cover retaining nut .. .. ..	5	
17 —	Guide, inlet and exhaust valve .. .. ..		See cylinder head assembly
18 —	Spring, inlet and exhaust valve—Inner .. .. ..		No longer fitted
19 0780141	Spring, inlet and exhaust valve—Outer .. .. ..	8	
20 33423122	Cap, inlet and exhaust valve spring retaining .. .. ..	8	Replace 0150119
21 0230002	Cotter, inlet and exhaust valve spring retaining clip .. .. ..	8 pr.	
22 0910030	Valve, inlet .. .. ..	4	
23 0910029	Valve, exhaust .. .. ..	4	
24 37766351	BRACKET, LUB. OIL COOLER AND HEADER TANK SUPPORT .. .. ..	1	Also detailed on Section "H"
25 0470743	Adaptor, water outlet by-pass to water pump—In lub. oil cooler and header tank support bracket .. .. ..	1	

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "B" Continued****Cylinder Head**

Plate	Part	Description	Qty.	Remarks
Ref.	No.			
37532821		COVER, CYLINDER HEAD—FRONT	..	1
0490253		Joint, cylinder head front cover to head	..	1
0826409		Stud, cylinder head front cover to head	..	5
0576051		Nut, cylinder head front cover retaining	..	5
0920054		Washer, cylinder head front cover retaining nut	..	5
37761342		BODY, CYLINDER HEAD WATER OUTLET	..	1
0650203		Plug, cylinder head water outlet body	..	1
2411107		Wafer, cylinder head water outlet body plug	..	1
0490255		Joint, cylinder head water outlet body to front cover	..	1
0826240		Stud, cylinder head water outlet body to front cover	..	1
0096233		Setscrew, cylinder head water outlet body to front cover	..	2
0576002		Nut, cylinder head water outlet body retaining	..	2 } Used only with 0826240
0920053		Washer, cylinder head water outlet body retaining nut	..	2 } Used only with 0096233
2411102		Washer, cylinder head water outlet body setscrew	..	2
0940614		PLATE, CYLINDER HEAD WATER OUTLET BODY BY-PASS CONNECTION BLANKING	..	1
0490391		Joint, cylinder head water outlet body by-pass connection blanking plate to body	..	1
0746253		Setscrew, cylinder head water outlet body by-pass connection blanking plate to body	..	2
2411102		Washer, cylinder head water outlet body by-pass connection blanking plate setscrew	..	2
		BRACKET, HEAT EXCHANGER AND LUB. OIL COOLER—		See Section "H"
		LIST NO. 182 ONLY		
26	0206002	Union, rocker shaft oil feed pipe	..	1
27	0576111	Nut, rocker shaft oil feed pipe	..	1 } Also detailed on Section "D"
28	0566002	Olive, rocker shaft oil feed pipe	..	1 }
		Gasket, cylinder head	..	See Section "A"
29	0576050	Stud, cylinder head to cylinder block	..	..
		Nut, cylinder head retaining	..	17
	0200962	CONNECTION, CYLINDER HEAD WATER OUTLET BY-PASS	..	1
	0490184	Joint, cylinder head water outlet by-pass connection to outlet body	..	1
	0826419	Stud, cylinder head water outlet by-pass connection to outlet body	..	2 } List No. 180 only
	0576051	Nut, cylinder head water outlet by-pass connection retaining	..	2 }
	0920054	Washer, cylinder head water outlet by-pass connection retaining nut	..	2
30	0540085	MANIFOLD, EXHAUST	..	1
31	0650540	Plug, exhaust manifold—In water jacket	..	3
32	0470535	Insert, exhaust manifold	..	1
33	31419	Cock, exhaust manifold air release	..	1
34	0490771	Joint, exhaust manifold to cylinder head	..	2
35	0576065	Nut, exhaust manifold retaining	..	4
36	0920004	Washer, exhaust manifold retaining nut	..	4
		FLANGE, EXHAUST MANIFOLD OUTLET	..	Quote Eng. No.
37	0490197	Joint, exhaust manifold outlet flange to manifold	..	1
38	0826449	Stud, exhaust manifold outlet flange to manifold	..	4
39	0576065	Nut, exhaust manifold outlet flange retaining	..	4
40	0920004	Washer, exhaust manifold outlet flange retaining nut	..	4
41	38361122	PLATE, ENGINE LIFTING—FRONT	..	1
42	0746452	Setscrew, engine front lifting plate to head	..	3
43	0920054	Washer, engine front lifting plate setscrew	..	3

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "B" Continued****Cylinder Head**

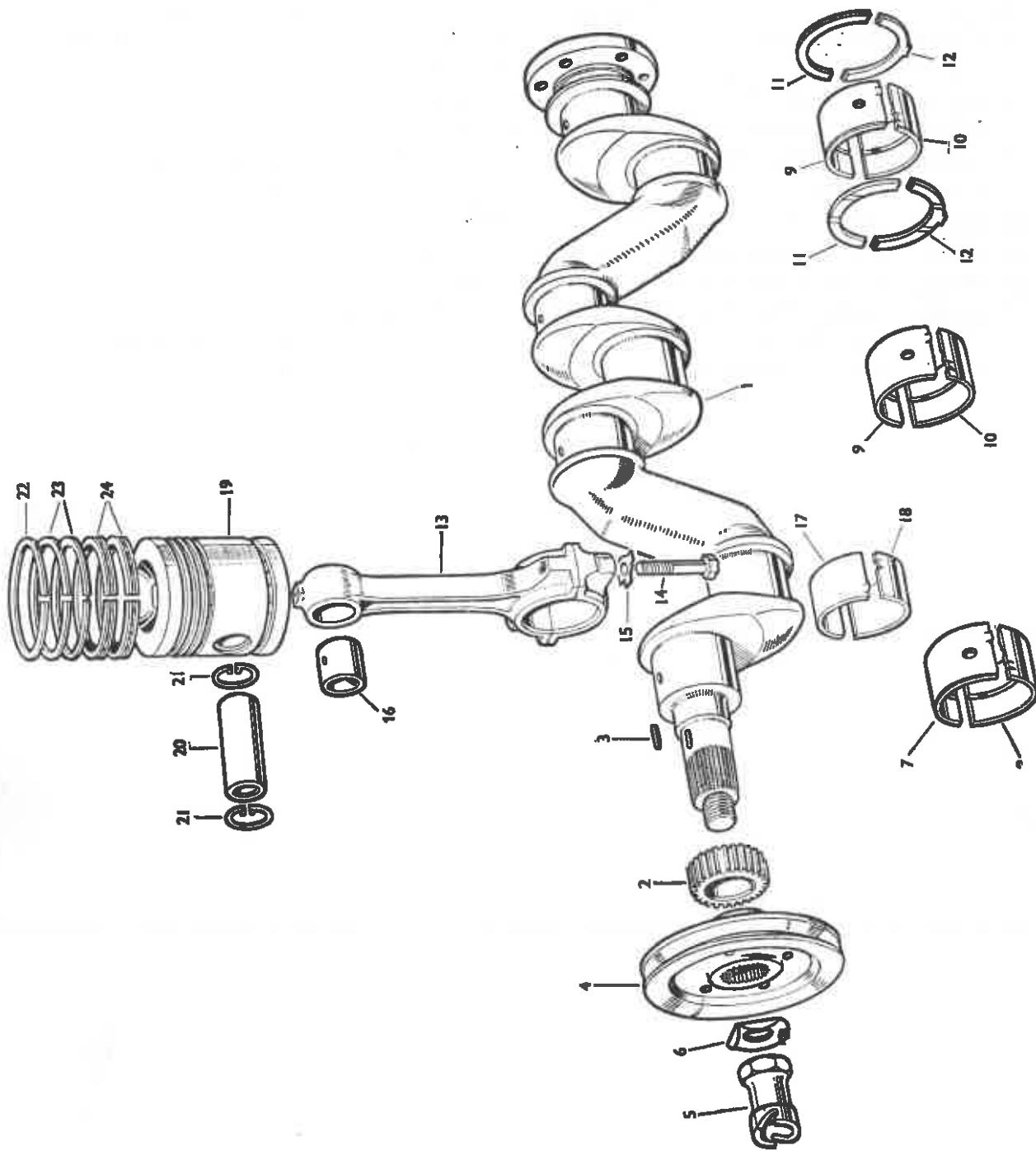
Plate Ref.	Part No.	Description	Qty.	Remarks
44	37747551	CONNECTION, EXHAUST MANIFOLD WATER INLET ..	..	1 List Nos. 181 and 180 only
	37737501	CONNECTION, EXHAUST MANIFOLD WATER INLET ..	..	1 List No. 182 only
45	0490418	Joint, exhaust manifold water inlet connection to manifold ..	..	1
46	0826409	Stud, exhaust manifold water inlet connection to manifold ..	..	4
47	0570651	Nut, exhaust manifold water inlet connection retaining ..	..	4
48	0920054	Washer, exhaust manifold water inlet connection retaining nut ..	..	4
	34824121	Hose, exhaust manifold water inlet connection to heat exchanger outlet ..	1	List No. 182 only
	0180067	Clip, water pipe hose .. .. .. ..	2	
49	0200709	CONNECTION, EXHAUST MANIFOLD WATER OUTLET ..	..	1
50	0490217	Joint, exhaust manifold water outlet connection to manifold ..	..	1
51	0826008	Stud, exhaust manifold water outlet connection to manifold ..	..	2
52	0576001	Nut, exhaust manifold water outlet connection retaining ..	..	2
53	0920052	Washer, exhaust manifold water outlet connection retaining nut ..	..	2
	34824405	CONNECTION, WATER OUTLET CONNECTION TO EXHAUST MANIFOLD .. .. .. ..	1	List No. 180 only
	0180067	Clip, water pipe connection .. .. .. ..	2	

**IMPORTANT**

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**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "C"**



## SECTION "C"

## Crankshaft

Plate Ref.	Part No.	Description	Qty.	Remarks
	0260097	CRANKSHAFT	.. .. .. .. ..	1 { Prior to Eng. No. 6230201. Obsolete—Use 31315428/ 80039
1	31315428	CRANKSHAFT	.. .. .. .. ..	1 Eng. No. 6230201 onwards
2	0410058	Gear, crankshaft	.. .. .. .. ..	1
3	0500167	Key, crankshaft gear	.. .. .. .. ..	1
4	0670104	Pulley, crankshaft gear	.. .. .. .. ..	1 { Prior to Eng. No. 6250199. Obsolete—Use 0670105/ 0571233/33125113
	0670105	Pulley, crankshaft gear	.. .. .. .. ..	1 Eng. No. 6250199 onwards
5	31777011	Dog, starting (Replaces 0340013)	.. .. .. .. ..	1 } Used only with 0670104
6	0920804	Tabwasher, starting dog locking	.. .. .. .. ..	1 }
	0571233	Nut, crankshaft pulley retaining	.. .. .. .. ..	1 }
	33125113	Washer, crankshaft pulley retaining nut	.. .. .. .. ..	1 } Used only with 0670105
+59125		BEARINGS, CRANKSHAFT MAIN COMPLETE SET STD. SIZE (PRE-FINISHED)	.. .. .. .. ..	1 } Prior to Eng. No. 6230201
	+31127191	Comprising :— Bearing, crankshaft main top std. size (Pre-finished) (Replace 0050347)	.. .. .. .. ..	3
	+31127201	Bearing, crankshaft main bottom std. size (Pre-finished) (Replace 0050346)	.. .. .. .. ..	3
+80039		BEARINGS, CRANKSHAFT MAIN COMPLETE SET STD. SIZE (PRE-FINISHED)	.. .. .. .. ..	1 } Eng. No. 6230201 onwards
	7	+31127261	Comprising :— Bearing, crankshaft main front top std. size (Pre-finished)	.. 1
	8	+31127241	Bearing, crankshaft main front bottom std. size (Pre-finished)	.. 1
	9	+31127251	Bearing, crankshaft main middle and rear top std. size (Pre-finished)	.. 2
10	+31127231	Bearing, crankshaft main middle and rear bottom std. size (Pre-finished)	.. .. .. .. ..	2
		For Engine Sets of Crankshaft Main Bearings .010" u/s, .020" u/s or .030" u/s add suffix "A," "B" or "C" to Part No. 59125/80039.		
		For individual Crankshaft Main Bearings .010" u/s, .020" u/s or .030" u/s quote the next three consecutive Part Numbers.		
		Example : 31127261 Std. Size 31127262 .010" u/s 31127263 .020" u/s 31127264 .030" u/s		
11	0921318	Washer, crankshaft main bearing thrust—Top	.. .. .. .. ..	2
12	0921319	Washer, crankshaft main bearing thrust—Bottom	.. .. .. .. ..	2
		For Thrust Washer .007" o/s approx.—Add suffix "A" to Part Number.		

IMPORTANT  
Always quote Engine Number when ordering Parts

FIT ONLY GENUINE PERKINS PARTS

**PERKINS 4.270 MARINE DIESEL ENGINE**

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**SECTION "C" Continued**

**Crankshaft**

Plate Ref.	Part No.	Description	Qty.	Remarks
	55739	CONNECTING ROD (ASSEMBLY)—MAJOR .. .. ..	4	Prior to Eng. No. 6219938. Obsolete—Use 59665 See Note *
	59181	CONNECTING ROD (ASSEMBLY)—MAJOR .. .. ..	4	Eng. No. 6219938 to 6230200. Obsolete—Use 59665
	59665	CONNECTING ROD (ASSEMBLY)—MAJOR .. .. ..	4	Eng. No. 6230201 onwards Comprising :—
	50430	CONNECTING ROD (ASSEMBLY)—MINOR .. .. ..	4	Prior to Eng. No. 6219938. Obsolete—Use 59182 See Note *
13	59182	CONNECTING ROD (ASSEMBLY)—MINOR .. .. ..	4	Eng. No. 6219938 onwards
14	0745065	Setscrew, connecting rod cap to rod .. .. ..	8	
15	0920794	Washer, connecting rod cap setscrew .. .. ..	8	Included in 54030/
	33115408	Washer, connecting rod cap setscrew shim 59182 .. .. ..	8	
16	0050128	Bush, connecting rod small end .. .. ..	4	
+57218		BEARINGS, CONNECTING ROD BIG END STD. SIZE (PRE-FINISHED) .. .. ..	4	Prior to Eng. No. 6230201. Obsolete—Use 59664
+0050348		Bearing, connecting rod big end std. size (Pre-finished)—Top .. .. ..	4	Comprise 57218
+31132151		Bearing, connecting rod big end std. size (Pre-finished)—Bottom .. .. ..	4	Obsolete—See Note §
+59664		BEARINGS, CONNECTING ROD BIG END STD. SIZE (PRE-FINISHED) .. .. ..	4	Eng. No. 6230201 onwards
17	+31132161	Bearing, connecting rod big end std. size (Pre-finished)—Top .. .. ..	4	
18	+31132171	Bearing, connecting rod big end std. size (Pre-finished)—Bottom .. .. ..	4	
For Engine Sets of Big End Bearing .010" u/s, .020" u/s or .030" u/s add suffix "A," "B" or "C" to Part Number 59664.				
For individual Big End Bearings .010" u/s, .020" u/s or .030" u/s quote the following Part Numbers :—				
		Example :—		
		31132161 Std. Size		
		31132162 .010" u/s		
		31132163 .020" u/s		
		31132164 .030" u/s		
55738		PISTON (ASSEMBLY)—MAJOR .. .. ..	4	
		Comprising :—		
19	55737	PISTON (ASSEMBLY)—MINOR .. .. ..	4	
20	0610621	Pin, gudgeon .. .. ..	4	
21	0170037	Circlip, gudgeon pin .. .. ..	8	Included in 57737
22	0640130	Ring, piston compression (Chrome Plated) .. .. ..	4	Top Groove
23	0640129	Ring, piston compression (Taper Faced) .. .. ..	8	2nd and 3rd Grooves
24	0640026	Ring, piston scraper (Slotted) .. .. ..	8	4th and Bottom Grooves

**NOTES :—**

\*Pre-finished Bearings are to size stated and require no final fitting by hand.

\*Connecting Rods 59665/59182 replace 55739/50430 for engines prior to Engine No. 6219938 in engine sets only. For quantities less than engine sets use 55739/50430.

§Connecting Rod Big End Bearings 31132161/31132171 replace 0050348/31132151 in pairs only for engines prior to Engine No. 6230201.

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

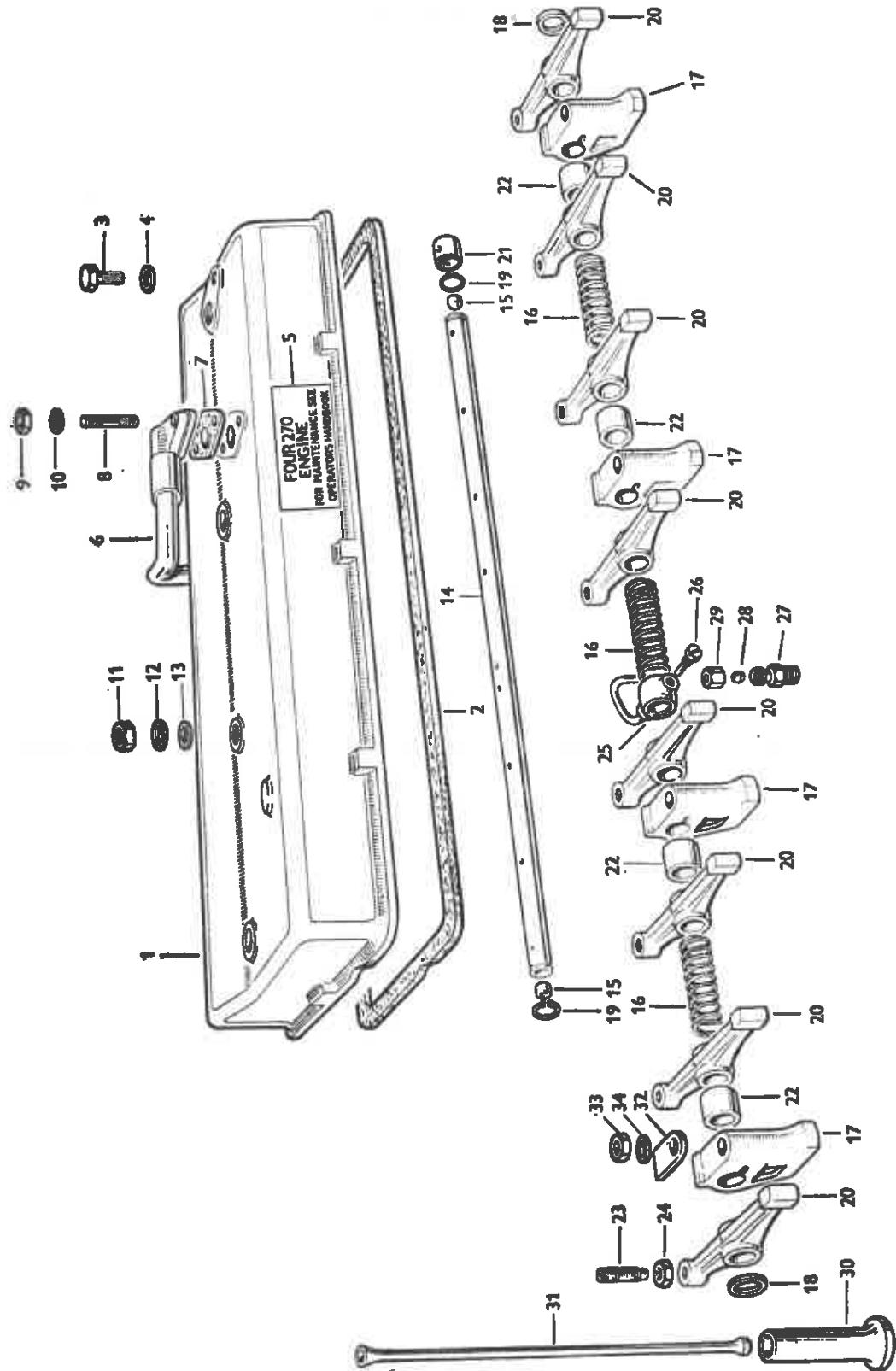
## **NOTES**

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**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "D"**



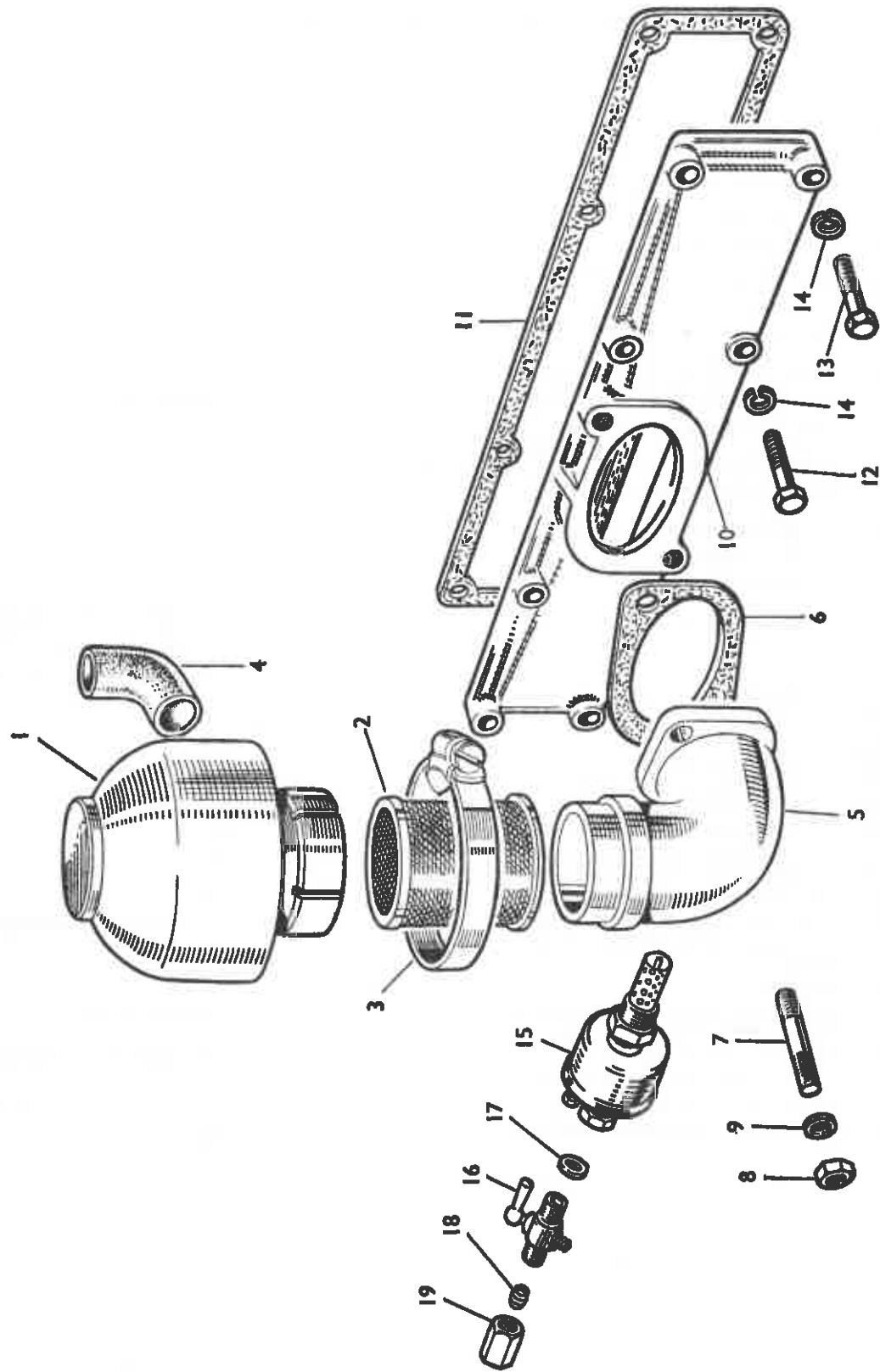
**SECTION "D"****Cylinder Head Cover**

Plate No.	Part Ref.	Description	Qty.	Remarks
1	0240741	COVER, CYLINDER HEAD	.. .. .. .. ..	1
2	0490722	Joint, cylinder head cover	.. .. .. .. ..	1
3	0746051	Plug, cylinder head cover	.. .. .. .. ..	1
4	0920052	Washer, cylinder head cover plug	.. .. .. .. ..	1
	0941163	Plate, instruction	.. .. .. .. ..	1 Obsolete—Use 31815517
5	31815517	Label, engine name	.. .. .. .. ..	1
	0690051	Rivet, instruction plate to cylinder head cover	.. .. .. .. ..	2 Used only with 0941163
6	35718524	PIPE, BREATHER	.. .. .. .. ..	1
7	0490342	Joint, breather pipe to cylinder head cover	.. .. .. .. ..	1
8	0826001	Stud, breather pipe to cylinder head cover	.. .. .. .. ..	2
9	0576001	Nut, breather pipe retaining	.. .. .. .. ..	2
10	0920052	Washer, breather pipe retaining nut	.. .. .. .. ..	2
		Stud, cylinder head cover to cylinder head	.. .. .. .. ..	See Section "B"
11	0576104	Nut, cylinder head cover retaining	.. .. .. .. ..	4
12	0920004	Washer, cylinder head cover retaining nut—Plain	.. .. .. .. ..	4
13	0920306	Washer, cylinder head cover retaining nut—Leather	.. .. .. .. ..	4
	52955	SHAFT, ROCKER (ASSEMBLY)	.. .. .. .. ..	1
		Comprising :—		
14	52706	SHAFT, ROCKER C/W PLUGS	.. .. .. .. ..	1
15	0650507	Plug, rocker shaft	.. .. .. .. ..	2
16	0780095	Spring, rocker shaft	.. .. .. .. ..	3
17	0101129	Bracket, rocker shaft	.. .. .. .. ..	4 { Prior to Eng. No. 6246578. Obsolete—Use 37521291/ 0576104/0920004
	37521291	Bracket, rocker shaft	.. .. .. .. ..	4 Eng. No. 6246578 onwards
18	0330624	Distance-piece, rocker shaft end	.. .. .. .. ..	2
19	0170033	Circlip, rocker shaft locating	.. .. .. .. ..	2
20	50311	Lever, rocker c/w bush	.. .. .. .. ..	8
21	0050132	Bush, rocker lever	.. .. .. .. ..	8
22	0330623	Distance-piece, rocker lever	.. .. .. .. ..	4
23	0720579	Screw, tappet adjusting	.. .. .. .. ..	8
24	0576052	Nut, tappet adjusting screw locking	.. .. .. .. ..	8
25	0990871	Connection, rocker shaft oil feed	.. .. .. .. ..	1
26	0720580	Screw, rocker shaft oil feed connection locating	.. .. .. .. ..	1
27	0206002	Union, rocker shaft oil feed pipe	.. .. .. .. ..	1 }
28	0566002	Olive, rocker shaft oil feed pipe union	.. .. .. .. ..	1 } Also detailed on Section "B"
29	0576111	Nut, rocker shaft oil feed pipe union	.. .. .. .. ..	1 }
30	0860009	Tappet	.. .. .. .. ..	8
31	0700044	Push Rod	.. .. .. .. ..	8
		Stud, rocker shaft bracket to cylinder head	.. .. .. .. ..	See Section "B"
32	0940714	Plate, rocker shaft bracket retaining	.. .. .. .. ..	4 }
33	0576052	Nut, rocker shaft bracket retaining	.. .. .. .. ..	4 }
34	0920054	Washer, rocker shaft bracket retaining nut	.. .. .. .. ..	4 }
	0576104	Nut, rocker shaft bracket retaining	.. .. .. .. ..	4 } Used only with 0101129
	0920004	Washer, rocker shaft bracket retaining nut	.. .. .. .. ..	4 } Used only with 37521291

IMPORTANT  
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FIT ONLY GENUINE PERKINS PARTS

**PLATE "E"**



**SECTION "E"****Air Induction System**

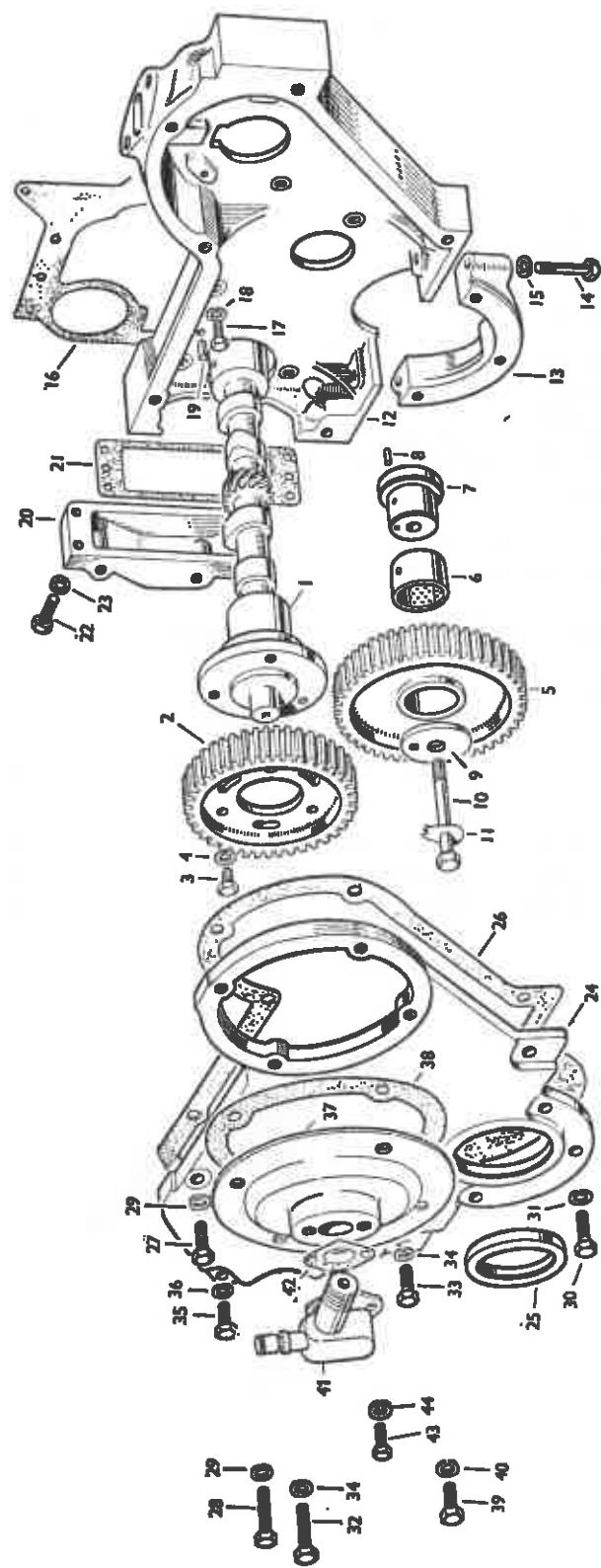
Plate Ref.	Part No.	Description	Qty.	Remarks
1	0240568	COVER, AIR FILTER .. .. .. .. ..	..	1
2	0997018	FILTER, AIR .. .. .. .. ..	..	1
3	0180070	Clip, air filter cover securing .. .. .. .. ..	..	1
4	34824118	Hose, air filter to cylinder head cover breather pipe .. .. .. .. ..	..	1
5	37757281	BODY, AIR INTAKE .. .. .. .. ..	..	1 Prior to Eng. No. 6242435
	37757282	BODY, AIR INTAKE .. .. .. .. ..	..	1 Eng. No. 6242435 onwards
6	0490257	Joint, air intake body to induction manifold .. .. .. .. ..	..	1
7	0826405	Stud, air intake body to induction manifold .. .. .. .. ..	..	2
8	0576051	Nut, air intake body retaining .. .. .. .. ..	..	2
9	0920054	Washer, air intake body retaining nut .. .. .. .. ..	..	2
10	0540184	MANIFOLD, INDUCTION .. .. .. .. ..	..	1
11	0490737	Joint, induction manifold to cylinder head .. .. .. .. ..	..	1
12	0746259	Setscrew, induction manifold to cylinder head .. .. .. .. ..	..	6
13	0746261	Setscrew, induction manifold to cylinder head—Long .. .. .. .. ..	..	2 { Also secure fuel oil filter support bracket
14	0920053	Washer, induction manifold setscrew .. .. .. .. ..	..	8
15	33385	HEATER, COLD STARTING FUEL OIL .. .. .. .. ..	..	1 { Prior to Eng. No. 6242435. Obsolete—Use 2666805
	2666805	HEATER, COLD STARTING FUEL OIL (CONVERSION SET) .. .. .. .. ..	1 { To Service Engines prior to Eng. No. 6242435	
Comprising :—				
	2666105	Heater, cold starting fuel oil .. .. .. .. ..	..	1
	2666803	Adaptor, cold starting fuel oil heater .. .. .. .. ..	..	1
	2666804	Washer, cold starting fuel oil heater adaptor .. .. .. .. ..	..	1
	2666102	HEATER, COLD STARTING FUEL OIL .. .. .. .. ..	..	1 Eng. No. 6242435 onwards
16	31441	Cock, cold starting fuel oil heater .. .. .. .. ..	..	1 } Used only with 33385/
17	0920148	Washer, cold starting fuel oil heater cock .. .. .. .. ..	..	1 } 2666805
18	0566002	Olive, cold starting fuel oil heater cock/pipe .. .. .. .. ..	..	1
19	0576111	Nut, cold starting fuel oil heater cock/pipe .. .. .. .. ..	..	1

**IMPORTANT**

Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "F"**



**SECTION "F"****Timing Gear**

Plate Ref.	Part No.	Description	Qty.	Remarks
1	31415232	CAMSHAFT ..	..	1
2	0410283	Gear, camshaft ..	..	1
3	0746255	Setscrew, camshaft gear to camshaft ..	..	3
4	0920053	Washer, camshaft gear setscrew ..	..	3
5	0993741	GEAR, IDLER (ASSEMBLY) ..	..	1
		Including :—		
6	0050127	Bush, idler gear ..	..	1
7	0995195	Hub, idler gear ..	..	1
8	0350005	Dowel, idler gear hub to cylinder block ..	..	1
9	0940303	Plate, idler gear retaining ..	..	1
10	0096842	Setscrew, idler gear retaining ..	..	1
11	0920883	Washer, idler gear retaining setscrew ..	..	1
	55916	HOUSING, TIMING GEAR (ASSEMBLY)	..	1 { Prior to Eng. No. 6216059. Obsolete—Use 59074
	59074	HOUSING, TIMING GEAR (ASSEMBLY)	..	1 { Eng. No. 6216059 onwards
		Comprising :—		
	0440643	Housing, timing gear ..	..	1 { Used only with 55916. Obsolete—Use 37161134
12	37161134	Housing, timing gear ..	..	1
13	0240220	Cover, timing gear housing—Bottom ..	..	1
14	0096438	Setscrew, timing gear housing bottom cover to housing ..	..	2
15	0920054	Washer, timing gear housing bottom cover setscrew ..	..	2
	0940301	Plate, fuel pump gear inspection ..	..	1 }
	0490686	Joint, fuel pump gear inspection plate to housing ..	..	1 { Used only with 55916/ 0440643
	0746051	Setscrew, fuel pump gear inspection plate to housing ..	..	2 }
	0920052	Washer, fuel pump gear inspection plate setscrew ..	..	2 }
16	0490240	Joint, timing gear housing to cylinder block ..	..	1
17	0746553	Setscrew, timing gear housing to cylinder block ..	..	4
18	0920054	Washer, timing gear housing setscrew ..	..	4
19	0350016	Dowel, timing gear housing to cylinder block ..	..	1
20	0240572	COVER, TIMING GEAR HOUSING POWER TAKE-OFF FACING	..	1 }
21	0490242	Joint, power take-off cover to timing gear housing ..	..	1 { List No. 181 only
22	0746456	Setscrew, power take-off cover to timing gear housing ..	..	4 }
23	0920054	Washer, power take-off cover setscrew ..	..	4 }
24	0240841	COVER, TIMING GEAR HOUSING FRONT	..	1 { Replaces 0240633
25	34186	Seal, timing gear housing front cover—Oil ..	..	1
26	36813125	Joint, timing gear housing front cover to housing ..	..	1
27	0746258	Setscrew, timing gear housing front cover to housing—Also secures dynamo adjusting lever. Also detailed on Section "J" ..	..	1 { List No. 182—Prior to Eng. No. 6250503 List No. 180
	0746257	Setscrew, timing gear housing front cover to housing ..	..	1 { List No. 181—Eng. No. 6250503 onwards List No. 180
28	0746257	Setscrew, timing gear housing front cover to housing ..	..	2 { Also secures tachometer drive cover
29	0920053	Washer, timing gear housing front cover setscrew ..	..	3
	0746257	Setscrew, timing gear housing front cover to housing ..	..	1 { List No. 182 only
	0920053	Washer, timing gear housing front cover setscrew ..	..	1 }
30	0746255	Setscrew, timing gear housing front cover to bottom cover ..	..	3
31	0920053	Washer, timing gear housing front cover setscrew ..	..	3
32	0095252	Setscrew, timing gear housing front cover and housing to cylinder block ..	..	1 { Also secures tachometer drive cover

IMPORTANT  
Always quote Engine Number when ordering Parts

FIT ONLY GENUINE PERKINS PARTS

**SECTION "F" Continued****Timing Gear**

Plate Ref.	Part No.	Description	Qty.	Remarks
33	0096442	Setscrew, timing gear housing front cover to cylinder block	.. ..	2
34	0920054	Washer, timing gear housing front cover setscrew	.. ..	3
0746255		Setscrew, timing gear housing front cover to power take-off facing cover	.. ..	1
35	0746258	Setscrew, timing gear housing front cover to power take-off facing cover—Top Hole—Also secures dynamo adjusting lever. Also detailed on Section "J"	.. ..	List No. 181 only      1 Prior to Eng. No. 6250503
0746259		Setscrew, timing gear housing front cover to power take-off facing cover—Top hole—Also secures dynamo adjusting lever. Also detailed on Section "J"	.. ..	Eng. No. 6250503 onwards
0920497		Washer, timing gear housing front cover setscrew	.. ..	
36	0920053	Washer, timing gear housing front cover setscrew	.. ..	
0746255		Setscrew, timing gear housing front cover to water pump drive housing	.. ..	"2 off" prior to Eng. No. 6250503
0746259		Setscrew, timing gear housing front cover to water pump drive housing—Also secures dynamo adjusting lever—Also detailed on Section "J"	.. ..	List No. 180 only      Eng. No. 6250503 onwards
0920497		Washer, timing gear housing front cover setscrew	.. ..	
0920053		Washer, timing gear housing front cover setscrew	.. ..	
0746255		Setscrew, timing gear housing front cover to water pump drive housing	.. ..	
0920053		Washer, timing gear housing front cover setscrew	.. ..	List No. 182 only
37	37425205	COVER, TACHOMETER DRIVE	.. ..	1
38	0490548	Joint tachometer drive cover to front cover	.. ..	1
39	0746253	Setscrew, tachometer drive cover to front cover	.. ..	1
40	0920053	Washer, tachometer drive cover setscrew	.. ..	1
41	33874	DRIVE, TACHOMETER	.. ..	1
42	0490528	Joint, tachometer drive to tachometer drive cover	.. ..	1
43	0748352	Setscrew, tachometer drive to tachometer drive cover	.. ..	2
44	0920052	Washer, tachometer drive setscrew	.. ..	2

**IMPORTANT**  
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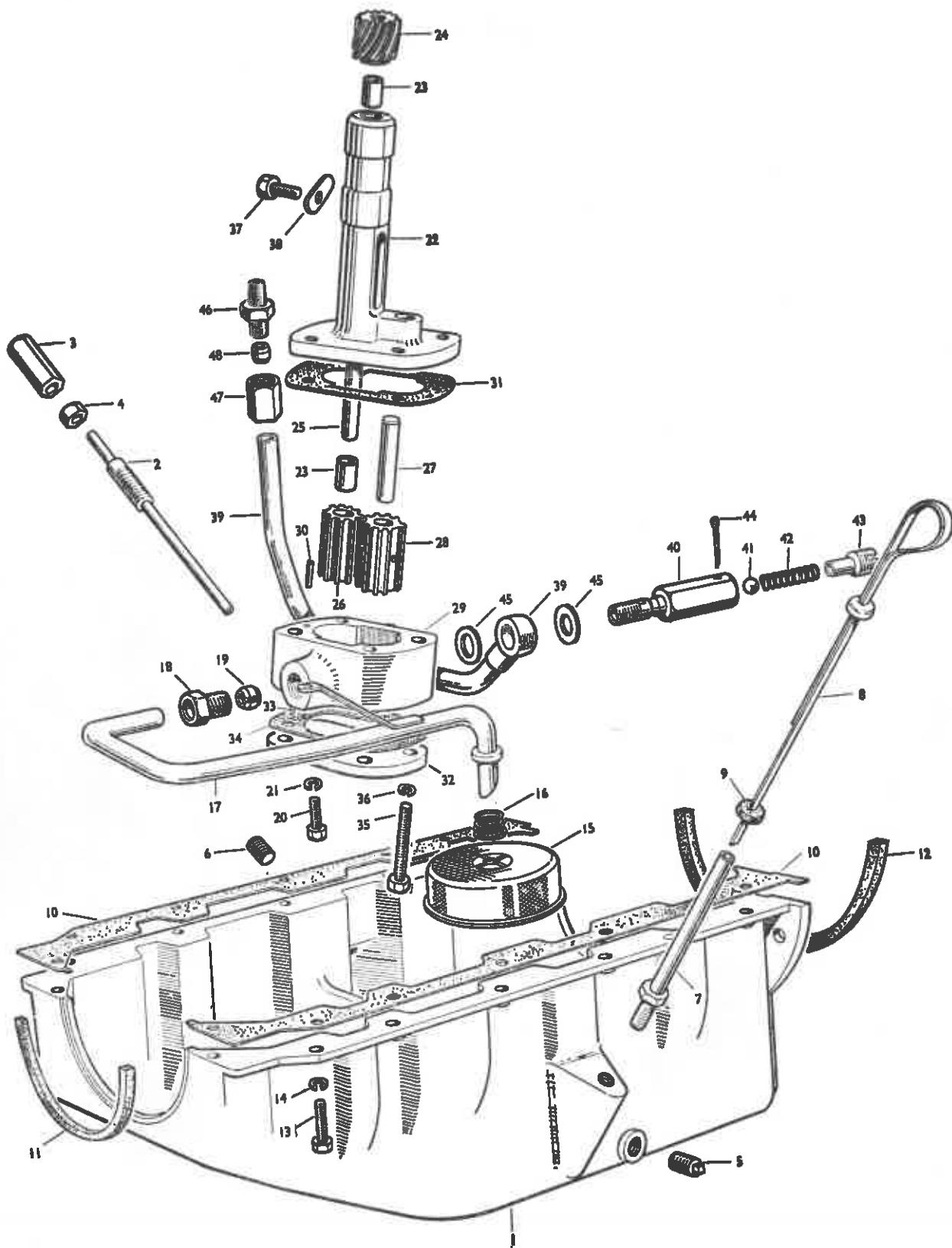
**FIT ONLY GENUINE PERKINS PARTS**

## NOTES

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**IMPORTANT**  
Always quote Engine Number when ordering Parts  
**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "G1"**



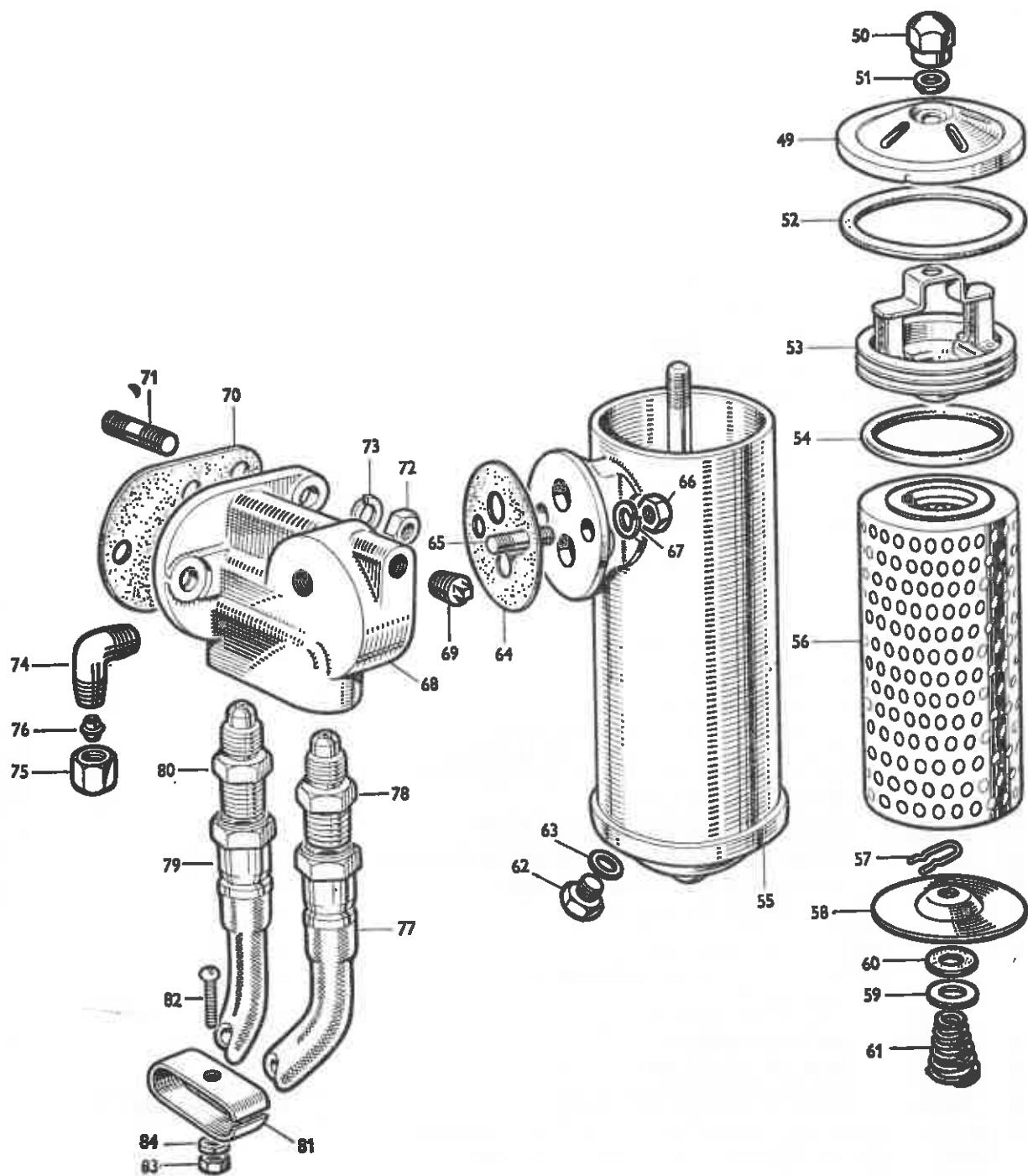
**SECTION "G"****Lubricating Oil System**

Plate	Part Ref.	No.	Description	Qty.	Remarks
1	37171381		SUMP, LUB. OIL	.. .. .. .. .. ..	1
—	2	35131108	Tube, lub. oil sump drain	.. .. .. .. .. ..	1
3	32726509		Cap-nut, lub. oil sump drain tube	.. .. .. .. .. ..	1
4	0576059		Locknut, lub. oil sump drain tube	.. .. .. .. .. ..	1
5	0650540		Plug, lub. oil sump drain	.. .. .. .. .. ..	1
6	0650738		Plug, lub. oil sump—Alternative dipstick position	.. .. .. .. .. ..	1
7	0993356		Tube, lub. oil sump dipstick	.. .. .. .. .. ..	1
8	31785415		DIPSTICK, LUB. OIL	.. .. .. .. .. ..	1
9	0920329		Washer, lub. oil dipstick sealing	.. .. .. .. .. ..	1
10	0490314		Joints, lub. oil sump—Sides	.. .. .. .. .. ..	1 pr.
11	0490249		Joint, lub. oil sump—Front	.. .. .. .. .. ..	1
12	0490250		Joint, lub. oil sump—Rear	.. .. .. .. .. ..	1
13	0746256		Setscrew, lub. oil sump to cylinder block and timing gear housing	.. .. .. .. .. ..	14
14	0920053		Washer, lub. oil sump setscrew	.. .. .. .. .. ..	14
15	0800094		STRAINER, LUB. OIL SUMP	.. .. .. .. .. ..	1
16	0780310		Spring, lub. oil sump strainer positioning	.. .. .. .. .. ..	1
17	35737132		PIPE, LUB. OIL SUCTION	.. .. .. .. .. ..	1
18	33532121		Nut, lub. oil pipe } To lub. oil pump	.. .. .. .. .. ..	1 Replaces 0571293
19	0560244		Olive, lub. oil pipe }	.. .. .. .. .. ..	1
20	0746252		Setscrew, lub. oil suction pipe clip to middle main bearing cap	.. .. .. .. .. ..	1
21	0920053		Washer, lub. oil suction pipe clip setscrew	.. .. .. .. .. ..	1
	57118		PUMP, LUB. OIL (ASSEMBLY)	.. .. .. .. .. ..	1
			Comprising :—		
22	56703		BODY, LUB. OIL PUMP C/W BUSHES	.. .. .. .. .. ..	1
23	0050131		Bush, lub. oil pump body	.. .. .. .. .. ..	2
24	31171415		Gear, lub. oil pump driving	.. .. .. .. .. ..	1
25	0750265		Shaft, lub. oil pump driven	.. .. .. .. .. ..	1
26	0410120		Gear, lub. oil pump driven	.. .. .. .. .. ..	1
27	0750402		Shaft, lub. oil pump idler	.. .. .. .. .. ..	1
28	0410120		Gear, lub. oil pump idler	.. .. .. .. .. ..	1
29	0440452		Housing, lub. oil pump driven and idler gears	.. .. .. .. .. ..	1
30	0350005		Dowel, lub. oil pump driven and idler gear housing to body	.. .. .. .. .. ..	2
31	0490247		Joint, lub. oil pump driven and idler gear housing to body	.. .. .. .. .. ..	As reqd.
32	0240591		Cover, lub. oil pump—Bottom	.. .. .. .. .. ..	1
33	0350006		Dowel, lub. oil pump bottom cover to housing	.. .. .. .. .. ..	1
34	0490247		Joint, lub. oil pump bottom cover to housing	.. .. .. .. .. ..	1 min.
35	0096039		Setscrew, lub. oil pump bottom cover to housing and body	.. .. .. .. .. ..	4
36	0920298		Washer, lub. oil pump bottom cover setscrew	.. .. .. .. .. ..	4
37	0746258		Setscrew, cylinder block to lub. oil pump	.. .. .. .. .. ..	1
38	0920833		Washer, cylinder block setscrew	.. .. .. .. .. ..	1
39	0993916		PIPE, LUB. OIL DELIVERY	.. .. .. .. .. ..	1
	52750		VALVE, LUB. OIL RELIEF (ASSEMBLY)	.. .. .. .. .. ..	1
			Comprising :—		
40	0080196		Body, lub. oil relief valve	.. .. .. .. .. ..	1
41	0020011		Ball, lub. oil relief valve	.. .. .. .. .. ..	1
42	0780210		Spring, lub. oil relief valve	.. .. .. .. .. ..	1
43	0650671		Plug, lub. oil relief valve spring	.. .. .. .. .. ..	1
44	2117047		Pin, lub. oil relief valve plug locating	.. .. .. .. .. ..	1 Replaces 0610003
45	0920128		Washer, lub. oil delivery pipe banjo and relief valve to pump	.. .. .. .. .. ..	2
	0930004		Lockwire, lub. oil relief valve to delivery pipe banjo	.. .. .. .. .. ..	1
46	0206008		Union, lub. oil delivery pipe }	.. .. .. .. .. ..	1
47	0576116		Nut, lub. oil delivery pipe }	To Cylinder Block	.. .. .. .. .. ..
48	0566007		Olive, lub. oil delivery pipe	.. .. .. .. .. ..	1

**IMPORTANT**  
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**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "G2"**



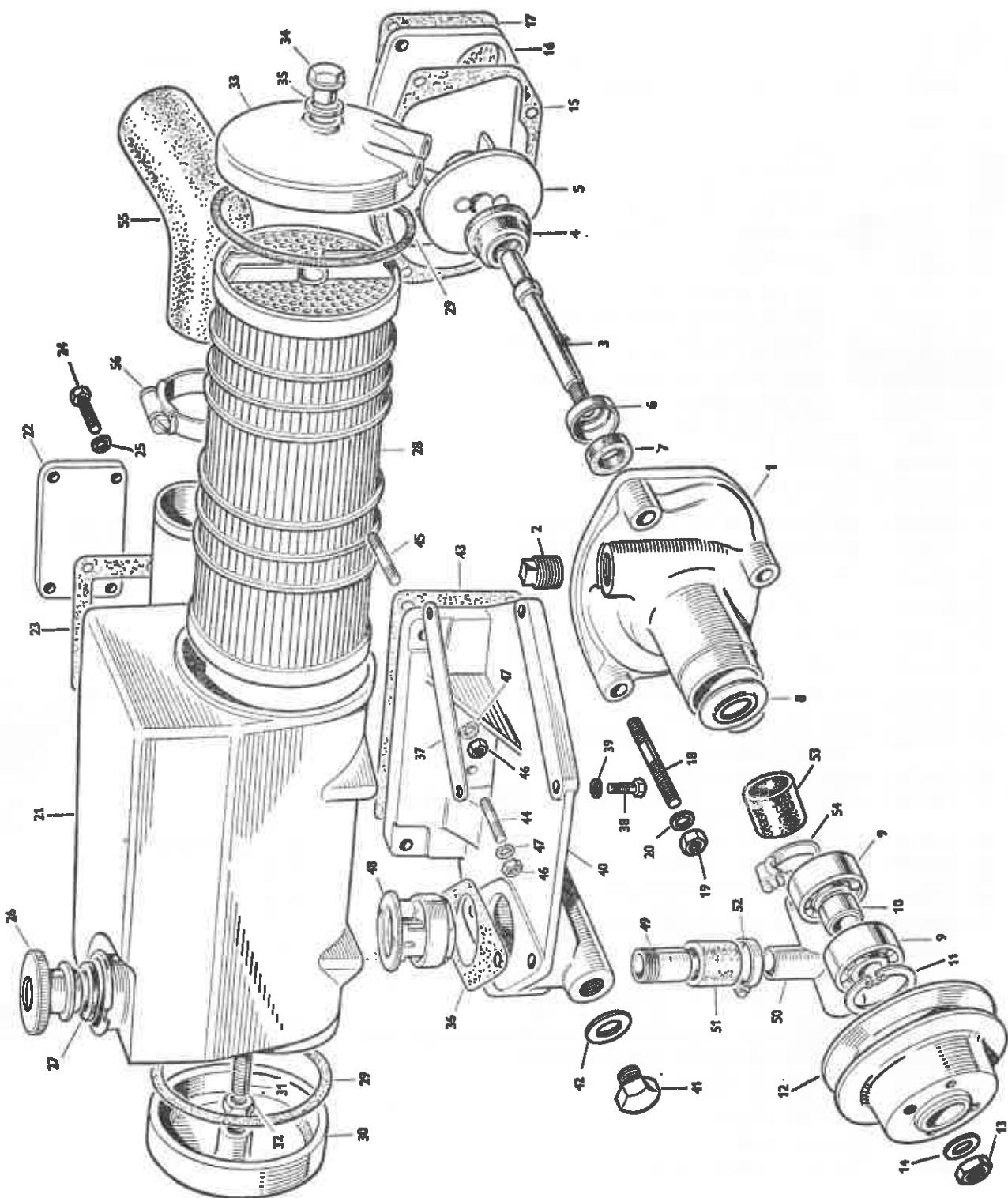
**SECTION "G" Continued****Lubricating Oil System**

Plate Ref.	Part No.	Description	Qty.	Remarks
30266	FILTER, LUB. (OIL ASSEMBLY)	.. .. .. .. 1		
	Comprising :—			
49	0240246	Cover, lub. oil filter .. .. .. .. 1		
50	0571141	Nut, lub. oil filter cover retaining .. .. .. .. 1		
51	0730040	Seal, lub. oil filter cover retaining nut .. .. .. .. 1		
52	0490598	Joint, lub. oil filter cover to container .. .. .. .. 1		
53	30222	Valve, lub. oil filter balance .. .. .. .. 1		
54	0920753	Washer, lub. oil filter balance valve .. .. .. .. 1	Included in 30222	
55	30223	Container, lub. oil filter element .. .. .. .. 1		
56	30267	Element, lub. oil filter .. .. .. .. 1		
57	0180594	Clip, lub. oil filter element pressure plate .. .. .. .. 1		
58	0941119	Plate, lub. oil filter element pressure plate .. .. .. .. 1		
59	0920749	Washer, lub. oil filter element pressure plate—Steel .. .. .. .. 1		
60	0920750	Washer, lub. oil filter element pressure plate—Felt .. .. .. .. 1		
61	0780101	Spring, lub. oil filter element pressure plate .. .. .. .. 1		
62	0650591	Plug, lub. oil filter drain .. .. .. .. 1		
63	0920751	Washer, lub. oil filter drain plug .. .. .. .. 1		
64	0490252	Joint, lub. oil filter to support bracket .. .. .. .. 1		
65	0826402	Stud, lub. oil filter to support bracket .. .. .. .. 2		
66	0576051	Nut, lub. oil filter retaining .. .. .. .. 2		
67	0920054	Washer, lub. oil filter retaining nut .. .. .. .. 2		
68	37763681	BRACKET, LUB. OIL FILTER SUPPORT .. .. .. .. 1	List Nos. 181 and 182 only	
	37763682	BRACKET, LUB. OIL FILTER SUPPORT .. .. .. .. 1	List No. 180 only	
69	0650594	Plug, lub. oil filter support bracket .. .. .. .. 1		
70	0490246	Joint, lub. oil filter support bracket to cylinder block .. .. .. .. 1		
71	0826201	Stud, lub. oil filter support bracket to cylinder block .. .. .. .. 3		
72	0576002	Nut, lub. oil filter support bracket retaining .. .. .. .. 3		
73	0920053	Washer, lub. oil filter support bracket retaining nut .. .. .. .. 3		
74	0201047	Connection, lub. oil pressure gauge pipe .. .. .. .. 1		
75	0576111	Nut, lub. oil pressure gauge pipe .. .. .. .. 1		
76	0566002	Olive, lub. oil pressure gauge pipe .. .. .. .. 1		
77	35831428	PIPE, LUB. OIL—FILTER SUPPORT BRACKET TO COOLER .. .. .. .. 1		
	(Replaces 35831426) .. .. .. .. 1			
78	33554502	Connection, lub. oil pipe .. .. .. .. 2		
79	35831428	PIPE, LUB. OIL—COOLER TO FILTER SUPPORT BRACKET .. .. .. .. 1		
	(Replaces 35831426) .. .. .. .. 1			
80	33554502	Connection, lub. oil pipe .. .. .. .. 2	List No. 181 only	
81	36653106	Clip, lub. oil pipes clamping .. .. .. .. 2		
82	0726261	Screw, lub. oil pipes clamping clip .. .. .. .. 2		
83	0576053	Nut, lub. oil pipes clamping clip .. .. .. .. 2		
84	0920051	Washer, lub. oil pipes clamping clip .. .. .. .. 2		
35831428	PIPE, LUB. OIL—FILTER SUPPORT BRACKET TO COOLER .. .. .. .. 1			
	(Replaces 35831426) .. .. .. .. 1			
33554502	Connection, lub. oil pipe—Filter bracket end .. .. .. .. 1			
37732854	Connection, lub. oil pipe—Cooler end .. .. .. .. 1			
35831427	PIPE, LUB. OIL—COOLER TO FILTER SUPPORT BRACKET .. .. .. .. 1			
33554502	Connection, lub. oil pipe—Filter bracket end .. .. .. .. 1		List No. 182 only	
37732854	Connection, lub. oil pipe—Cooler end .. .. .. .. 1			
36653106	Clip, lub. oil pipes clamping .. .. .. .. 1			
0726261	Screw, lub. oil pipes clamping clip .. .. .. .. 1			
0576053	Nut, lub. oil pipes clamping clip .. .. .. .. 1			
0920051	Washer, lub. oil pipes clamping clip .. .. .. .. 1			

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "H1"**



**SECTION "H"****Water Cooling Equipment****(Keel Cooling Arrangement — List No. 181 Only)**

Plate Ref.	Part No.	Description	Qty.	Remarks
41312057	WATER PUMP (ASSEMBLY)	.. .. .. ..	.. 1	
	Comprising :—			
1	0080257	Body, water pump .. .. .. ..	.. 1	
2	0650540	Plug, water pump body .. .. .. ..	.. 1	Obsolete—Use 2431127
	2431127	Plug, water pump body .. .. .. ..	.. 1	
3	*32753411	Shaft, water pump drive .. .. .. ..	.. 1	
4	*2415207	Seal, water pump—Rear (Alternative 2415208) .. .. .. ..	.. 1	Replaces 32274
5	*0460009	Impeller, water pump .. .. .. ..	.. 1	
6	*0380098	Housing, water pump seal—Front .. .. .. ..	.. 1	
7	*0730046	Seal, water pump—Front .. .. .. ..	.. 1	
8	*0380164	Plate, water pump front seal retaining .. .. .. ..	.. 1	
9	*0040057	Bearing, water pump .. .. .. ..	.. 2	
10	*0330875	Distance-piece, water pump bearing .. .. .. ..	.. 1	
11	*0170046	Circlip, water pump bearing locating .. .. .. ..	.. 1	
12	31145601	Pulley, water pump .. .. .. ..	.. 1	
13	0576103	Nut, water pump pulley retaining .. .. .. ..	.. 1	
14	0920007	Washer, water pump pulley retaining nut .. .. .. ..	.. 1	
15	0490260	Joint, water pump body to backplate .. .. .. ..	.. 1	
16	0940305	BACKPLATE, WATER PUMP .. .. .. ..	.. 1	
17	0490259	Joint, water pump body backplate to cylinder block .. .. .. ..	.. 1	
18	0826401	Stud, water pump body and backplate to cylinder block .. .. .. ..	.. 3	
19	0576051	Nut, water pump body and backplate retaining .. .. .. ..	.. 3	
20	0920054	Washer, water pump body and backplate retaining nut .. .. .. ..	.. 3	
	35630	HEADER TANK AND LUB. OIL COOLER (ASSEMBLY) .. .. .. ..	.. 1	
	Comprising :—			
21	24860001	Body, header tank and lub. oil cooler .. .. .. ..	.. 1	{ Obsolete—Use 24860120/ 24870003
	24860120	Body, header tank and lub. oil cooler .. .. .. ..	.. 1	
22	24860015	Plate, header tank and lub. oil cooler body blanking .. .. .. ..	.. 1	
23	24860016	Joint, header tank and lub. oil cooler body blanking plate to body .. .. .. ..	1	
24	0748521	Setscrew, header tank and lub. oil cooler body blanking plate to body .. .. .. ..	4	
25	0920054	Washer, header tank and lub. oil cooler body blanking plate setscrew .. .. .. ..	4	
26	0150142	Cap, header tank and lub. oil cooler body water filler .. .. .. ..	.. 1	{ Used only with 24860001
27	0730134	Seal, header tank and lub. oil cooler body water filler cap .. .. .. ..	.. 1	
	24870003	Cap, header tank and lub. oil cooler body water filler .. .. .. ..	.. 1	Used only with 24860120
28	24860004	Tube-stack, lub. oil cooler .. .. .. ..	.. 1	
29	2415744	Seal, lub. oil cooler tube stack .. .. .. ..	.. 2	
30	24860003	Cover, header tank and lub. oil cooler body .. .. .. ..	.. 1	
31	24860007	Tie-rod, header tank and lub. oil cooler .. .. .. ..	.. 1	
32	24860008	Locknut, header tank and lub. oil cooler tie-rod .. .. .. ..	.. 1	
33	24860002	Cover, header tank and lub. oil cooler body c/w oil ports .. .. .. ..	.. 1	
34	0571365	Cap-nut, header tank and lub. oil cooler body tie-rod .. .. .. ..	.. 1	
35	0920153	Washer, header tank and lub. oil cooler body tie-rod cap nut .. .. .. ..	.. 1	
36	36837106	Joint, header tank and lub. oil cooler to support bracket .. .. .. ..	.. 1	
37	36857104	Distance-piece, header tank and lub. oil cooler to support bracket .. .. .. ..	.. 1	
38	0748523	Setscrew, header tank and lub. oil cooler to support bracket .. .. .. ..	.. 4	
39	0920054	Washer, header tank and lub. oil cooler setscrew .. .. .. ..	.. 4	

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

## **SECTION "H" Continued**

# **Water Cooling Equipment**

**(Keel Cooling Arrangement — List No. 181 Only)**

Plate	Part Ref.	No.	Description	Qty.	Remarks
40	37766351		BRACKET, HEADER TANK AND LUB. OIL COOLER SUPPORT	1	Also detailed on Section "B"
41	0650203		Plug, header tank and lub. oil cooler support bracket ..	1	
42	2411107		Washer, header tank and lub. oil cooler support bracket plug ..	1	
43	36846112		Joint, header tank and lub. oil cooler support bracket to cylinder head ..	1	
44	0826409		Stud, header tank and lub. oil cooler support bracket to cylinder head ..	1	
45	0826466		Stud, header tank and lub. oil cooler support bracket to cylinder head ..	4	Also detailed on Section "B"
46	0576051		Nut, header tank and lub. oil cooler support bracket retaining ..	5	
47	0920054		Washer, header tank and lub. oil cooler support bracket retaining nut ..	5	
48	32550		THERMOSTAT ..	1	
49	0470743		Adaptor, water outlet by-pass to water pump—In header tank support bracket ..	1	
50	35184107		Tee-piece, water outlet by-pass ..	1	
51	33851405		Hose, water outlet by-pass to tee-piece ..	1	
52	0180065		Clip, water hose ..	2	
53	0200055		Hose, tee-piece to water pump inlet ..	1	
54	0180069		Clip, water hose ..	2	Replace 0180068
55	34821418		Connection, oil cooler to exhaust manifold water inlet hose ..	1	
56	0180067		Clip, water hose ..	2	Replace 0180068
			BELT, WATER PUMP AND DYNAMO DRIVE ..	..	See Section "J"
59093			WATER PUMP REPAIR KIT—Comprises items marked *	1	

**IMPORTANT**

**Always quote Engine Number when ordering Parts**

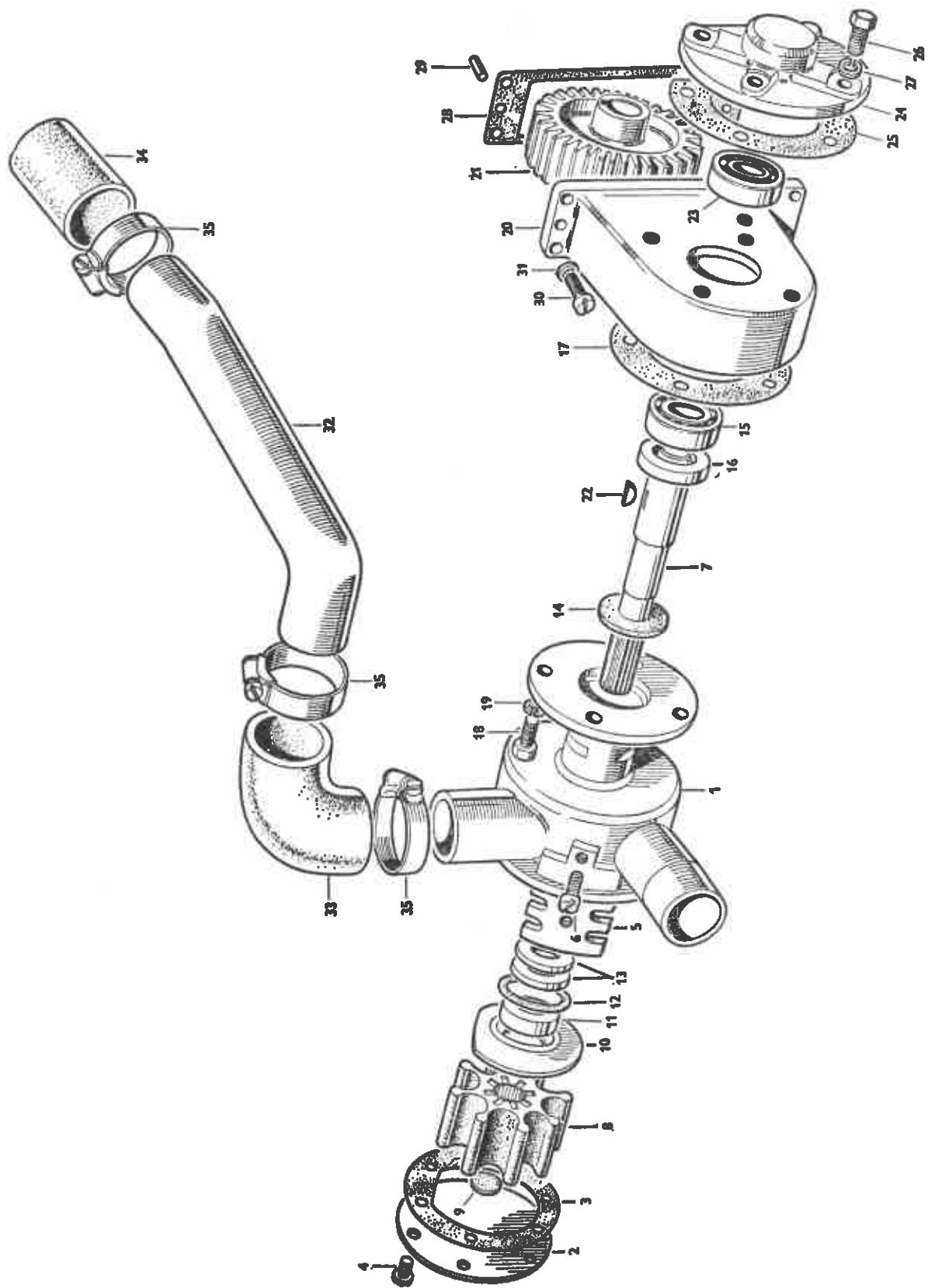
## NOTES

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**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "H2"**



**PERKINS 4.270 MARINE DIESEL ENGINE**

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**SECTION "H" Continued**

**Water Cooling Equipment**  
**(Direct Cooling Arrangement — List No. 180 Only)**

Plate Ref.	Part No.	Description	Qty.	Remarks
	0994701	WATER PUMP (ASSEMBLY) ..	..	1
		Comprising :—		
1	0080190	Body, water pump ..	..	1
2	0240494	Cover, water pump body—End	..	1
3	0490503	Joint, water pump body end cover	..	1
4	0720732	Screw, water pump body end cover securing	..	6
5	0130015	Cam, water pump impeller restrictor	..	1
6	0720688	Screw, water pump body to cam	..	1
7	0750285	Shaft, water pump driving	..	1
8	0460024	Impeller, water pump	..	1
9	0730110	Seal, water pump shaft spline end	..	2
10	0940758	Plate, water pump impeller wearing	..	1
11	0730086	Seal, water pump drive shaft	..	1
12	0640069	Ring, water pump drive shaft seal	..	1
13	0330815	Distance-piece, water pump drive shaft seal	..	2
14	0995454	Thrower, water pump drive shaft	..	1
15	0040552	Bearing, water pump drive shaft	..	1
16	0730085	Seal, water pump drive shaft bearing	..	1
17	0490413	Joint, water pump body to drive housing	..	1
18	0746255	Setscrew, water pump body to drive housing	..	4
19	0920053	Washer, water pump body setscrew	..	4
20	0440306	HOUSING, WATER PUMP DRIVE ..	..	1
21	0410097	Gear, water pump driving	..	1
22	0500009	Key, water pump driving gear	..	1
23	0040019	Bearing, water pump drive shaft	..	1 In water pump drive housing
24	0240411	COVER, WATER PUMP DRIVE HOUSING END	..	1
25	0490413	Joint, water pump drive housing end cover	..	1
26	0746255	Setscrew, water pump drive housing end cover to housing	..	4
27	0920053	Washer, water pump drive housing end cover setscrew	..	4

**IMPORTANT**  
Always quote Engine Number when ordering Parts  
**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "H" Continued**

## **Water Cooling Equipment**

**(Direct Cooling Arrangement — List No. 180 Only)**

Plate Ref.	Part No.	Description	Qty.	Remarks
41311007	WATER PUMP (ASSEMBLY) .. ..	.. ..	..	1 Eng. No. 6243554 onwards
	Comprising :-			
24880067	Body, water pump .. ..	.. ..	..	1
24880023	Dowel, end cover to water pump body .. ..	.. ..	..	1
24880068	Cover, water pump body—End .. ..	.. ..	..	1
24880010	Joint, water pump body end cover .. ..	.. ..	..	1
0720804	Screw, water pump body end cover securing .. ..	.. ..	..	6
0130018	Cam, water pump impeller restriction .. ..	.. ..	..	1
0720688	Screw, water pump body to cam .. ..	.. ..	..	1
24880069	Shaft, water pump driving .. ..	.. ..	..	1
0460024	Impeller, water pump .. ..	.. ..	..	1
0730110	Seal, water pump shaft spline end .. ..	.. ..	..	2
0941114	Plate, water pump impeller wearing .. ..	.. ..	..	1
24880035	Seat, water pump drive shaft seal (Lead) .. ..	.. ..	..	1
24880036	Seat, water pump drive shaft seal (Rubber) .. ..	.. ..	..	1
24880034	Ring, water pump drive shaft seal .. ..	.. ..	..	1
0995454	Thrower, water pump drive shaft .. ..	.. ..	..	1
0040552	Bearing, water pump drive shaft .. ..	.. ..	..	1
0730085	Seal, water pump drive shaft bearing .. ..	.. ..	..	1
0490413	Joint, water pump body to drive shaft bearing .. ..	.. ..	..	1
0746255	Setscrew, water pump body to drive housing .. ..	.. ..	..	4
0920053	Washer, water pump body setscrew .. ..	.. ..	..	4
0440306	HOUSING, WATER PUMP DRIVE .. ..	.. ..	..	1
0410097	Gear, water pump driving .. ..	.. ..	..	1
0500009	Key, water pump driving gear .. ..	.. ..	..	1
0040019	Bearing, water pump drive shaft .. ..	.. ..	..	1 In water pump drive housing
0240411	COVER, WATER PUMP DRIVE HOUSING END .. ..	.. ..	..	1
0490413	Joint, water pump drive housing end cover .. ..	.. ..	..	1
0746255	Setscrew, water pump drive housing end cover to housing .. ..	.. ..	..	4
0920053	Washer, water pump drive housing end cover setscrew .. ..	.. ..	..	4
28	0490242	Joint, water pump drive housing to timing gear housing .. ..	.. ..	1 min.
29	0350014	Dowel, water pump drive housing to timing gear housing .. ..	.. ..	2
30	0746424	Setscrew, water pump drive housing to timing gear housing .. ..	.. ..	4
31	0920054	Washer, water pump drive housing setscrew .. ..	.. ..	4
32	0622034	PIPE, WATER PUMP TO CYLINDER BLOCK WATER INLET CONNECTION .. ..	.. ..	1 } Used only with 0994701
	34752107	PIPE, WATER PUMP TO CYLINDER BLOCK WATER INLET CONNECTION .. ..	.. ..	1 } Used only with 41311007
33	0200964	Hose, water pump to cylinder block water inlet connection .. ..	.. ..	1 To water pump body
34	0200009	Hose, water pump to cylinder block water inlet pipe .. ..	.. ..	1
35	0180067	Clip, water pipe hose .. ..	.. ..	4

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

## NOTES

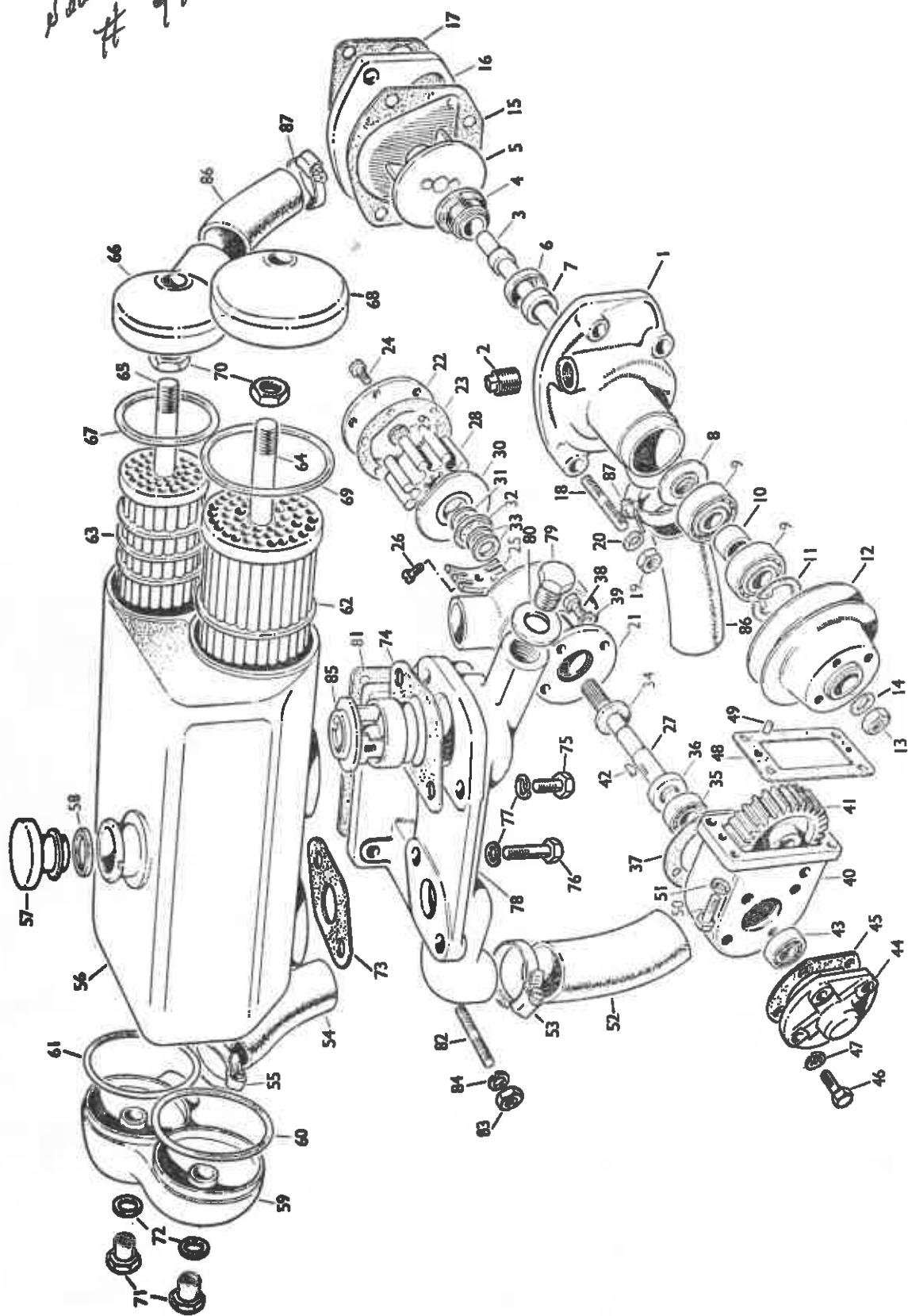
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### IMPORTANT

Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "H3"**



**SECTION "H" Continued**

# **Water Cooling Equipment**

**(Indirect Cooling Arrangement — List No. 182 Only)**

Plate Ref.	Part No.	Description	Qty.	Remarks
	41312057	WATER PUMP (ASSEMBLY)—FRESH WATER ..	.. 1	
		Comprising :—		
1	0080257	Body, water pump .. .. .. .. ..	.. 1	
2	0650540	Plug, water pump body .. .. .. .. ..	.. 1	Obsolete—Use 2431127
	2431127	Plug, water pump body .. .. .. .. ..	.. 1	
3	*32753411	Shaft, water pump drive .. .. .. .. ..	.. 1	
4	*2415207	Seal, water pump—Rear (Alternative 2415208) .. .. .. .. ..	.. 1	Replaces 32274
5	*0460009	Impeller, water pump .. .. .. .. ..	.. 1	
6	*0380098	Housing, water pump seal—Front .. .. .. .. ..	.. 1	
7	*0730046	Seal, water pump—Front .. .. .. .. ..	.. 1	
8	*0380164	Plate, water pump front seal retaining .. .. .. .. ..	.. 1	
9	*0040057	Bearing, water pump .. .. .. .. ..	.. 2	
10	*0330875	Distance-piece, water pump bearing .. .. .. .. ..	.. 1	
11	*0170046	Circlip, water pump bearing locating .. .. .. .. ..	.. 1	
12	31145601	Pulley, water pump .. .. .. .. ..	.. 1	
13	0576103	Nut, water pump pulley retaining .. .. .. .. ..	.. 1	
14	0920007	Washer, water pump pulley retaining nut .. .. .. .. ..	.. 1	
15	0490260	Joint, water pump body to backplate .. .. .. .. ..	.. 1	
16	0940305	BACKPLATE, WATER PUMP .. .. .. .. ..	.. 1	
17	0490259	Joint, water pump body backplate to cylinder block .. .. .. .. ..	.. 1	
18	0826401	Stud, water pump body and backplate to cylinder block .. .. .. .. ..	.. 3	
19	0576051	Nut, water pump body and backplate retaining .. .. .. .. ..	.. 3	
20	0920054	Washer, water pump body and backplate retaining nut .. .. .. .. ..	.. 3	
	0994701	WATER PUMP (ASSEMBLY)—SEA WATER .. .. .. .. ..	.. 1	{ Prior to Eng. No. 6243554 Obsolete—Use 41311007
		Comprising :—		
21	0080190	Body, water pump .. .. .. .. ..	.. 1	
22	0240494	Cover, water pump body—End .. .. .. .. ..	.. 1	
— 23	0490503	Joint, water pump body end cover .. .. .. .. ..	.. 1	
24	0720732	Screw, water pump body end cover securing .. .. .. .. ..	.. 6	
25	0130015	Cam, water pump impeller restrictor .. .. .. .. ..	.. 1	
26	0720688	Screw, water pump body to cam .. .. .. .. ..	.. 1	
27	0750285	Shaft, water pump driving .. .. .. .. ..	.. 1	
— 28	0460024	Impeller, water pump .. .. .. .. ..	.. 1	
29	0730110	Seal, water pump shaft spline end .. .. .. .. ..	.. 2	
30	0940758	Plate, water pump impeller wearing .. .. .. .. ..	.. 1	
— 31	0730086	Seal, water pump drive shaft .. .. .. .. ..	.. 1	
32	0640069	Ring, water pump drive shaft seal .. .. .. .. ..	.. 1	
33	0330815	Distance-piece, water pump drive shaft seal .. .. .. .. ..	.. 2	
34	0995454	Thrower, water pump drive shaft .. .. .. .. ..	.. 1	
35	0040552	Bearing, water pump drive shaft .. .. .. .. ..	.. 1	
— 36	0730085	Seal, water pump drive shaft bearing .. .. .. .. ..	.. 1	
— 37	0490413	Joint, water pump body to drive housing .. .. .. .. ..	.. 1	
38	0746255	Setscrew, water pump body to drive housing .. .. .. .. ..	.. 4	
39	0920053	Washer, water pump body setscrew .. .. .. .. ..	.. 4	
40	0440306	HOUSING, WATER PUMP DRIVE .. .. .. .. ..	.. 1	
41	0410097	Gear, water pump driving .. .. .. .. ..	.. 1	
42	0500009	Key, water pump driving gear .. .. .. .. ..	.. 1	
43	0040019	Bearing, water pump drive shaft .. .. .. .. ..	.. 1	In water pump drive housing
44	0240411	COVER, WATER PUMP DRIVE HOUSING END .. .. .. .. ..	.. 1	
45	0490413	Joint, water pump drive housing end cover .. .. .. .. ..	.. 1	
46	0746255	Setscrew, water pump drive housing end cover to housing .. .. .. .. ..	.. 4	
47	0920053	Washer, water pump drive housing end cover setscrew .. .. .. .. ..	.. 4	

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "H" Continued**

## **Water Cooling Equipment**

**(Indirect Cooling Arrangement — List No. 182 Only)**

Plate	Part Ref.	Part No.	Description	Qty.	Remarks
	41311007		WATER PUMP (ASSEMBLY)—SEA WATER	.. ..	1 Eng. No. 6243554 onwards
			Comprising :—		
	24880067		Body, water pump .. .. ..	.. .. ..	1
	24880023		Dowel, end cover to water pump body .. .. ..	.. .. ..	1
	24880068		Cover, water pump body—End .. .. ..	.. .. ..	1
	24880010		Joint, water pump body end cover .. .. ..	.. .. ..	1
	0720804		Screw, water pump body end cover securing .. .. ..	.. .. ..	6
	0130018		Cam, water pump impeller restriction .. .. ..	.. .. ..	1
	0720688		Screw, water pump body to cam .. .. ..	.. .. ..	1
	24880069		Shaft, water pump driving .. .. ..	.. .. ..	1
	0460024		Impeller, water pump .. .. ..	.. .. ..	1
	0730110		Seal, water pump shaft spline end .. .. ..	.. .. ..	2
	0941114		Plate, water pump impeller wearing .. .. ..	.. .. ..	1
	24880035		Seat, water pump drive shaft seal (Lead) .. .. ..	.. .. ..	1
	24880036		Seat, water pump drive shaft seal (Rubber) .. .. ..	.. .. ..	1
	24880034		Ring, water pump drive shaft seal .. .. ..	.. .. ..	1
	0995454		Thrower, water pump drive shaft .. .. ..	.. .. ..	1
	0040552		Bearing, water pump drive shaft .. .. ..	.. .. ..	1
	0730085		Seal, water pump drive shaft bearing .. .. ..	.. .. ..	1
	0490413		Joint, water pump body to drive shaft bearing .. .. ..	.. .. ..	1
	0746255		Setscrew, water pump body to drive housing .. .. ..	.. .. ..	4
	0920053		Washer, water pump body setscrew .. .. ..	.. .. ..	4
	0440306		HOUSING, WATER PUMP DRIVE .. .. ..	.. .. ..	1
	0410097		Gear, water pump driving .. .. ..	.. .. ..	1
	0500009		Key, water pump driving gear .. .. ..	.. .. ..	1
	0040019		Bearing, water pump drive shaft .. .. ..	.. .. ..	1 In water pump drive housing
	0240411		COVER, WATER PUMP DRIVE HOUSING END .. .. ..	.. .. ..	1
	0490413		Joint, water pump drive housing end cover .. .. ..	.. .. ..	1
	0746255		Setscrew, water pump drive housing end cover to housing .. .. ..	.. .. ..	4
	0920053		Washer, water pump drive housing end cover setscrew .. .. ..	.. .. ..	4
48	0490242		Joint, water pump drive housing to timing gear housing .. .. ..	.. .. ..	1 min.
49	0350014		Dowel, water pump drive housing to timing gear housing .. .. ..	.. .. ..	2
50	0746424		Setscrew, water pump drive housing to timing gear housing .. .. ..	.. .. ..	4
51	0920054		Washer, water pump drive housing setscrew .. .. ..	.. .. ..	4
52	0200972		Hose, sea water pump outlet to heat exchanger .. .. ..	.. .. ..	1 Pump end
53	0180067		Clip, water pipe hose .. .. ..	.. .. ..	2
54	34824119		Hose, sea water pump outlet to heat exchanger .. .. ..	.. .. ..	1 Heat exchanger end
55	0180067		Clip, water pipe hose .. .. ..	.. .. ..	2

**IMPORTANT**

Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "H" Continued**

# **Water Cooling Equipment**

**(Indirect Cooling Arrangement — List No. 182 Only)**

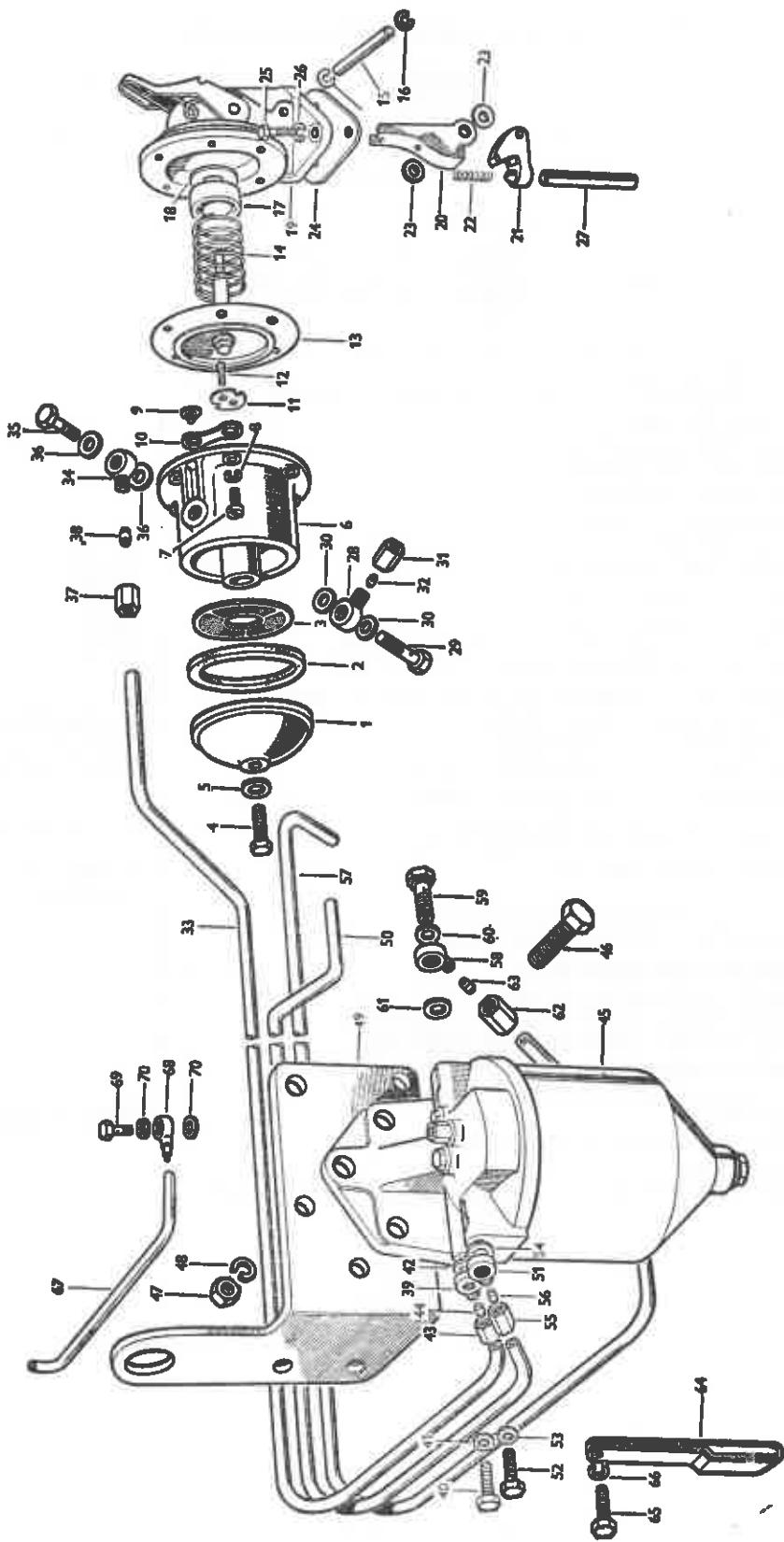
Plate Ref.	Part No.	Description	Qty.	Remarks
	2486111	HEAT EXCHANGER AND LUB. OIL COOLER (ASSEMBLY) Comprising :—	1	
56	24860022	Body, heat exchanger and lub. oil cooler .. .. ..	1	
57	0150142	Cap, heat exchanger and lub. oil cooler body water filler .. .. ..	1	
58	0730134	Seal, heat exchanger and lub. oil cooler body water filler cap .. .. ..	1	
59	24860023	End Cover, heat exchanger and lub. oil cooler body c/w sea water inlet port .. .. ..	1	
60	24860027	Seal, heat exchanger and lub. oil cooler end cover to body (Heat Exchanger) .. .. ..	1	
61	24860029	Seal, heat exchanger and lub. oil cooler end cover to body (Lub. Oil Cooler) .. .. ..	1	
62	24860026	Tube-Stack, heat exchanger .. .. ..	1	
63	24860028	Tube-Stack, lub. oil cooler .. .. ..	1	
64	24860030	Tie-Rod, heat exchanger .. .. ..	1	
65	24860031	Tie-Rod, lub. oil cooler .. .. ..	1	
66	24860025	End Cover, lub. oil cooler c/w sea water outlet port .. .. ..	1	
67	24860029	Seal, lub. oil cooler end cover .. .. ..	1	
68	24860024	End Cover, heat exchanger .. .. ..	1	
69	24860027	Seal, heat exchanger end cover .. .. ..	1	
70	24860008	Locknut, heat exchanger and lub. oil cooler tie rods .. .. ..	2	
71	24860032	Cap Nut, heat exchanger and lub. oil cooler tie rods .. .. ..	2	
72	0920153	Washer, heat exchanger and lub. oil cooler tie rods cap nut .. .. ..	2	
73	36837107	Joint, heat exchanger to support bracket .. .. ..	1	Sea water inlet side
74	36837106	Joint, heat exchanger to support bracket .. .. ..	1	Thermostat side
75	0746453	Setscrew, support bracket to heat exchanger—Short .. .. ..	3	Obsolete—Use 0826502
	0826502	Stud, support bracket to heat exchanger—Short .. .. ..	3	
76	0746458	Setscrew, support bracket to heat exchanger—Long .. .. ..	1	Obsolete—Use 0826501
	0826501	Stud, support bracket to heat exchanger—Long .. .. ..	1	
	0576051	Nut, support bracket retaining .. .. ..	4	{ Used only with 0827602/ 0827601
77	0920054	Washer, support bracket setscrew/retaining nut .. .. ..	4	
78	37766341	BRACKET, HEAT EXCHANGER SUPPORT .. .. ..	1	
79	0650203	Plug, heat exchanger support bracket .. .. ..	1	
80	2411107	Washer, heat exchanger support bracket plug .. .. ..	1	
81	0490253	Joint, heat exchanger support bracket to cylinder head .. .. ..	1	
82	0826409	Stud, heat exchanger support bracket to cylinder head .. .. ..	5	
83	0576051	Nut, heat exchanger support bracket retaining .. .. ..	5	
84	0920054	Washer, heat exchanger support bracket retaining nut .. .. ..	5	
85	32550	THERMOSTAT .. .. ..	1	Alternative 33841
86	0200055	Hose, heater exchanger to fresh water pump .. .. ..	2	
87	0180067	Clip, water pipe hose .. .. ..	4	
	59093	WATER PUMP REPAIR KIT—COMPRIMES ITEMS MARKED *	1	

**IMPORTANT**

Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "II"**



## SECTION "I"

## Fuel Oil Injection Equipment

Plate Ref.	Part No.	Description	Qty.	Remarks
32514	LIFT PUMP, FUEL OIL (ASSEMBLY)	.. .. .. ..	1	
	Comprising :—			
1	0240549	Cover, fuel oil lift pump strainer .. .. ..	1	
2	0490558	Joint, fuel oil lift pump strainer cover .. .. ..	1	
3	0800068	Strainer, fuel oil lift pump .. .. ..	1	
4	0720707	Screw, fuel oil lift pump strainer cover to housing .. .. ..	1	
5	0490557	Joint-washer, fuel oil lift pump strainer cover to housing .. .. ..	1	
6	0080215	Housing, fuel oil lift pump inlet and outlet valve .. .. ..	1	
7	0720709	Screw, fuel oil lift pump inlet and outlet valve housing to body .. .. ..	6	
8	0921018	Washer, fuel oil lift pump inlet and outlet valve housing screw .. .. ..	6	
9	32517	Valve, fuel oil lift pump inlet and outlet .. .. ..	2	
10	0490559	Joint, fuel oil lift pump inlet and outlet valve to housing .. .. ..	1	
11	0910058	Plate, fuel oil lift pump inlet and outlet valve retaining .. .. ..	1	
12	0720708	Screw, fuel oil lift pump inlet and outlet valve retaining plate to housing .. .. ..	2	
13	2641491	Diaphragm, fuel oil lift pump .. .. ..	1	Replaces 32518
14	26410001	Spring, fuel oil lift pump diaphragm return .. .. ..	1	
15	0610809	Pin, fuel oil lift pump rocker arm and diaphragm operating lever .. .. ..	1	
16	0180902	Clip, fuel oil lift pump rocker arm pin .. .. ..	2	
17	26410003	Retainer, fuel oil lift pump diaphragm spring .. .. ..	1	
18	26410002	Washer, fuel oil lift pump diaphragm spring retainer .. .. ..	2	
19	32519	Body, fuel oil lift pump c/w priming lever .. .. ..	1	
20	0520368	Lever, fuel oil lift pump diaphragm operating .. .. ..	1	
21	0520367	Rocker arm, fuel oil lift pump actuating .. .. ..	1	
22	0780225	Spring, fuel oil lift pump rocker arm return .. .. ..	1	
23	0921019	Washer, fuel oil lift pump rocker arm and diaphragm operating lever pin .. .. ..	2	
24	36862126	Joint, fuel oil lift pump to timing gear housing .. .. ..	1	
25	0746256	Setscrew, fuel oil lift pump to timing gear housing .. .. ..	2	
26	0920053	Washer, fuel oil lift pump setscrew .. .. ..	2	
27	0700251	Push rod, fuel oil lift pump operating .. .. ..	1	
28	0201501	Banjo, fuel oil pipe .. .. ..	1	
29	32184414	Bolt, fuel oil pipe banjo .. .. ..	1	
30	0920120	Washer, fuel oil pipe banjo bolt } In lift pump inlet port .. .. ..	2	Prior to Eng. No. 6226932
31	0576113	Nut, fuel oil pipe .. .. ..	1	
32	0566004	Olive, fuel oil pipe .. .. ..	1	
	33533112	Nut, fuel oil pipe .. .. ..	1	Eng. No. 6226932 onwards
	0566003	Olive, fuel oil pipe .. .. ..	1	
33	34524113	PIPE, FUEL OIL—LIFT PUMP TO FILTER .. .. ..	1	Prior to Eng No. 6226932
34	0201501	Banjo, fuel oil pipe .. .. ..	1	
35	32184414	Bolt, fuel oil pipe banjo .. .. ..	1	
36	0920120	Washer, fuel oil pipe banjo bolt } To lift pump .. .. ..	2	
37	0576113	Nut, fuel oil pipe .. .. ..	1	
38	0566004	Olive, fuel oil pipe .. .. ..	1	
39	0201500	Banjo, fuel oil pipe .. .. ..	1	
40	0095031	Bolt, fuel oil pipe banjo .. .. ..	1	
41	2411156	Washer, fuel oil pipe banjo bolt } To filter .. .. ..	1	
42	0920498	Nut, fuel oil pipe .. .. ..	1	
43	0576113	Olive, fuel oil pipe .. .. ..	1	
44	0566004	.. .. ..	1	Used only with 34524113

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

## SECTION "I" Continued

## Fuel Oil Injection Equipment

Plate	Part	Description	Qty.	Remarks
Ref.	No.			
	35356532	PIPE, FUEL OIL—LIFT PUMP TO FILTER	.. ..	1 Eng. No. 6226932 onwards
	0201332	Banjo, fuel oil pipe ..	.. ..	1 Eng. No. 6226932 to Eng. No. 6248697. Obsolete—Use 0201091/0095332/0920154
	32184414	Bolt, fuel oil pipe banjo ..	.. ..	1 Used only with 0201332
	0920120	Washer, fuel oil pipe banjo bolt ..	.. ..	2
	0201091	Banjo, fuel oil pipe ..	.. ..	1 Eng. No. 6248698 onwards
	0095332	Bolt, fuel oil pipe banjo ..	.. ..	1 Used only with 0201091
	0920154	Washer, fuel oil pipe banjo bolt ..	.. ..	1
	0576112	Nut, fuel oil pipe ..	.. ..	1
	0566003	Olive, fuel oil pipe ..	.. ..	1 Included in 35356532
	33533112	Nut, fuel oil pipe ..	.. ..	1
	0566003	Olive, fuel oil pipe ..	.. ..	1
45	*35532	FILTER, FUEL OIL (TYPE F4B/2)	.. ..	1 Prior to Eng. No. 6226932
	2656653	FILTER, FUEL OIL (ASSEMBLY)	.. ..	1 Eng. No. 6226932 onwards
		Comprising :—		
	26560006	COVER, FUEL OIL FILTER (ASSEMBLY)	.. ..	1
	26560007	Cover, fuel oil filter—Bare ..	.. ..	1
	0490520	Joint, fuel oil filter cover to container ..	.. ..	1
	26560003	Seal, fuel oil filter element seating ..	.. ..	1
	0650702	Plug, fuel oil filter cover ..	.. ..	1 Comprise 26560006
	0921079	Washer, fuel oil filter cover plug ..	.. ..	1
	0095292	Bolt, fuel oil filter cover to container ..	.. ..	1
	0921079	Washer, fuel oil filter cover bolt ..	.. ..	1
	32543	Element, fuel oil filter ..	.. ..	1
	26560008	CONTAINER, FUEL OIL FILTER ELEMENT (ASSEMBLY)	1	
	26560010	Joint, fuel oil filter element spring ..	.. ..	1
	26560009	Washer, fuel oil filter element spring ..	.. ..	1 Included in 26560008
	26560004	Spring, fuel oil filter element pressure ..	.. ..	1
	33423	Non-return, valve fuel oil filter ..	.. ..	1 Used only with 2656653
	0920146	Washer, fuel oil filter non-return valve ..	.. ..	1
46	0746455	Bolt, fuel oil filter to support bracket ..	.. ..	2 3 off each prior to Eng. No.
47	0576051	Nut, fuel oil filter retaining ..	.. ..	2 6226932
48	0920054	Washer, fuel oil filter retaining nut ..	.. ..	2
49	36456503	BRACKET, FUEL OIL FILTER SUPPORT	.. ..	1 To cylinder head rear cover studs and induction manifold setscrews
50	34522314	PIPE, FUEL OIL—FILTER TO FUEL PUMP	.. ..	1 Prior to Eng. No. 6226932
51	0201500	Banjo, fuel oil pipe ..	.. ..	1
52	0095031	Bolt, fuel oil pipe banjo ..	.. ..	1
53	2411156	Washer, fuel oil pipe banjo bolt ..	.. ..	1
54	0920498	Washer, fuel oil pipe banjo bolt ..	.. ..	1 Used only with 34522314
55	0576113	Nut, fuel oil pipe ..	.. ..	1
56	0566004	Olive, fuel oil pipe ..	.. ..	1
	35356531	PIPE, FUEL OIL—FILTER TO FUEL PUMP	.. ..	1 Eng. No. 6226932 onwards
	33533112	Nut, fuel oil pipe ..	.. ..	2 Included in 35356531
	0566003	Olive, fuel oil pipe ..	.. ..	2
57	34523314	PIPE, FUEL OIL—FUEL OIL PUMP RETURN TO FILTER	.. ..	1 Prior to Eng. No. 6226932
58	0201500	Banjo, fuel oil pipe ..	.. ..	1
59	0095031	Bolt, fuel oil pipe banjo ..	.. ..	1
60	2411156	Washer, fuel oil pipe banjo bolt ..	.. ..	1 Used only with 34523314
61	0920498	Washer, fuel oil pipe banjo bolt ..	.. ..	1
62	0576113	Nut, fuel oil pipe ..	.. ..	1
63	0566004	Olive, fuel oil pipe ..	.. ..	1

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

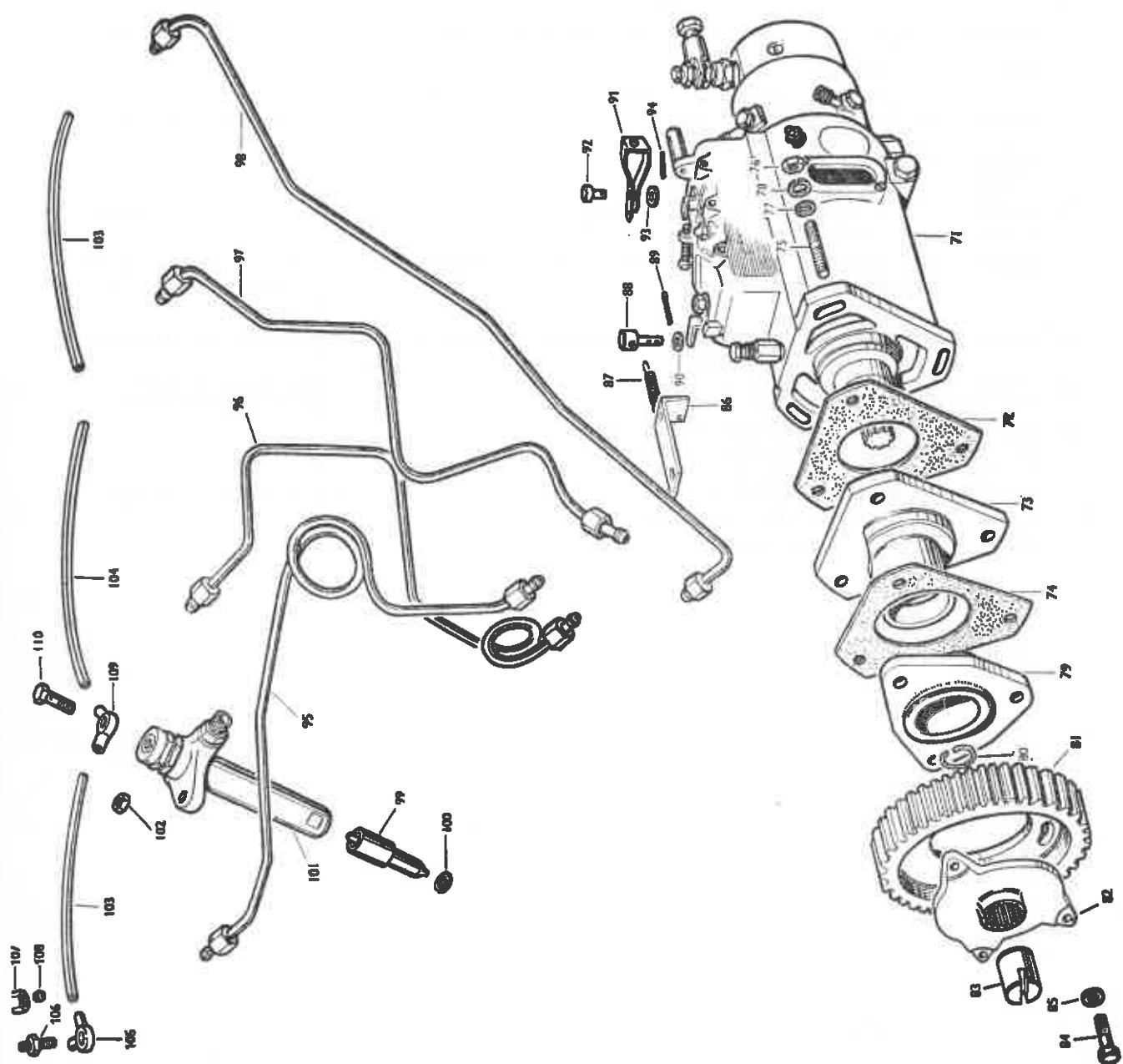
**SECTION "I" Continued****Fuel Oil Injection Equipment**

Plate Ref.	Part No.	Description	Qty.	Remarks
	35356533	PIPE, FUEL OIL—FUEL OIL PUMP RETURN TO FILTER	.. 1	Eng. No. 6226932 onwards
	33533112	Nut, fuel oil pipe	.. 2	
	0566003	Olive, fuel oil pipe	.. 2	
	36651116	Clip, fuel oil pipes support—To cylinder head rear end cover stud—Centre	1	
	0746051	Bolt, fuel oil pipes clip clamping	.. 1	Prior to Eng. No. 6219928
	0576001	Nut, fuel oil pipes clip clamping bolt	.. 1	
	0920052	Washer, fuel oil pipes clip clamping bolt	.. 1	
64	36651117	Clip, fuel oil pipes support	.. 1	
65	0746451	Setscrew, fuel oil pipes support clip to cylinder head	.. 1	Prior to Eng. No. 6226932
66	0920054	Washer, fuel oil pipes support clip setscrew	.. 1	
	0623877	PIPE, FUEL OIL—FILTER LEAK-OFF TO NO. 4 ATOMISER LEAK-OFF CONNECTION	.. 1	Prior to Eng. No. 6219928. Obsolete—Use 0623941/ 0826409
67	0623941	PIPE, FUEL OIL—FILTER LEAK-OFF TO NO. 4 ATOMISER LEAK-OFF CONNECTION	.. 1	Eng. No. 6219928 onwards
68	0999253	Connection, fuel oil filter leak-off pipe	.. 1	Prior to Eng. No. 6226932
	31721211	Connection, fuel oil filter leak-off pipe	.. 1	Eng. No. 6226932 onwards
69	0095344	Bolt, fuel oil filter leak-off pipe connection	.. 1	
70	0920146	Washer, fuel oil filter leak-off pipe connection	.. 1	
	36651116	Clip, fuel oil pipe support	.. 1	
	0746051	Bolt, fuel oil pipe support clip clamping	.. 1	Used only with 0623877
	0576001	Nut, fuel oil pipe support clip clamping	.. 1	
	0920052	Washer, fuel oil pipe support clip clamping	.. 1	

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "12"**



## SECTION "I" Continued

## Fuel Oil Injection Equipment

Plate Ref.	Part No.	Description	Qty.	Remarks
71	*33496	PUMP, FUEL INJECTION C/W THROTTLE & STOP LEVERS (TYPE No. 3242325) .. .	.. 1	Prior to Eng. No. 6226932. Obsolete—Use 36367
	*36367	PUMP, FUEL INJECTION C/W THROTTLE & STOP LEVERS (TYPE No. 3242750) .. .	.. 1	Eng. No. 6226932 onwards
72	0490685	Joint, fuel injection pump to driving gear hub carrier ..	.. 1	
73	0450043	CARRIER, FUEL INJECTION PUMP DRIVING GEAR HUB ..	.. 1	
74	0490773	Joint, driving gear hub carrier to timing gear housing ..	.. 1	
75	0826227	Stud, fuel injection pump and carrier to timing gear housing ..	.. 3	
76	0576002	Nut, fuel injection pump and carrier retaining ..	.. 3	
77	0920003	Washer, fuel injection pump and carrier retaining nut—Plain ..	.. 3	
78	0920053	Washer, fuel injection pump and carrier retaining nut—Spring ..	.. 3	
79	0450044	HUB, FUEL INJECTION PUMP DRIVING GEAR ..	.. 1	
80	0170044	Circlip, fuel injection pump driving gear retaining ..	.. 1	
81	0410284	Gear, fuel injection pump driving ..	.. 1	
82	37427444	Plate, fuel injection pump gear driving ..	.. 1	Replaces 37427442
83	32414408	SHAFT, TACHOMETER DRIVE EXTENSION ..	.. 1	
84	0746256	Setscrew, fuel injection pump driving plate and gear to housing ..	.. 3	
85	0920053	Washer, fuel injection pump driving plate and gear setscrew ..	.. 3	
86	36445111	BRACKET, STOP CONTROL SPRING ANCHOR ..	.. 1	{ To lift pump setscrew Replaces 0101540
87	31751107	Spring, stop control return ..	.. 1	
88	0610895	Pin, stop control lever ..	.. 1	
89	0610042	Split pin, stop control lever pin ..	.. 2	
90	0920446	Washer, stop control lever pin ..	.. 2	
91	36671405	FORK-END, THROTTLE CONTROL LEVER ..	.. 1	
92	32713313	Clevis pin, throttle control lever fork-end ..	.. 1	
93	0920002	Washer, throttle control lever fork-end clevis pin ..	.. 1	
94	0610042	Split pin, throttle control lever fork-end clevis pin retaining ..	.. 1	
	55923	PIPS, FUEL INJECTION (ASSEMBLY) ..	.. 1	Prior to Eng. No. 6226932
		Comprising :—		
95	0994953	Pipe, fuel injection c/w nuts and nipples, No. 1 cylinder ..	.. 1	
96	0994954	Pipe, fuel injection c/w nuts and nipples, No. 2 cylinder ..	.. 1	
97	0994955	Pipe, fuel injection c/w nuts and nipples, No. 3 cylinder ..	.. 1	
98	0994956	Pipe, fuel injection c/w nuts and nipples, No. 4 cylinder ..	.. 1	
	59212	PIPS, FUEL INJECTION (ASSEMBLY) ..	.. 1	Eng. No. 6226932 onwards
		Comprising :—		
	35355221	Pipe, fuel injection c/w nuts and nipples, No. 1 cylinder ..	.. 1	
	35355222	Pipe, fuel injection c/w nuts and nipples, No. 2 cylinder ..	.. 1	
	35355223	Pipe, fuel injection c/w nuts and nipples, No. 3 cylinder ..	.. 1	
	35355224	Pipe, fuel injection c/w nuts and nipples, No. 4 cylinder ..	.. 1	
	33811408	Damper, fuel injection pipe vibration ..	.. 4	
	37551113	Retainer, fuel injection pipe vibration damper ..	.. 1	
	2182008	Bolt, fuel injection pipe vibration damper to bracket ..	.. 2	Used only with 36548109
	0571350	Nut, fuel injection pipe vibration damper retaining ..	.. 2	
	36651121	Clip, fuel oil pipes support—To injection pipes retainer bracket rear setscrew ..	.. 1	
	36548109	Bracket, fuel injection pipe damper retainer ..	Used only with	1 Obsolete—Use 36548219
	36548219	Bracket, fuel injection pipe damper retainer ..	59212..	1
	0746451	Setscrew, fuel injection pipe damper retainer bracket to cylinder head ..	.. 1	
	0746452	Setscrew, fuel injection pipe damper retainer bracket to cylinder head—Rear Hole ..	.. 1	
	0920054	Washer, fuel injection pipe damper bracket setscrew ..	.. 2	

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "I" Continued****Fuel Oil Injection Equipment**

Plate Ref.	Part No.	Description	Qty.	Remarks
2646193		ATOMISER, FUEL INJECTION (ASSEMBLY) (DESPATCH No. 5253501)	4	Replace 33482
		Comprising :—		
99	*33470	NOZZLE, FUEL INJECTION ATOMISER	4	
100	0921173	Washer, fuel injection atomiser seating	4	Replace 0921169
101	*2646472	HOLDER, FUEL INJECTION ATOMISER	4	Replace 33480
102	0576002	Stud, fuel injection atomiser to cylinder head	8	See Section "B"
103	0623771	PIPE, FUEL INJECTION ATOMISER LEAK-OFF—FRONT & REAR	2	
104	0623772	PIPE, FUEL INJECTION ATOMISER LEAK-OFF—MIDDLE	1	
105	0201521	Connection, fuel injection atomiser leak-off pipe	1	
106	0201526	Connection, leak-off pipe connection to atomiser	1	
0920107		Washer, leak-off pipe connection	2	To No. 1 atomiser
107	0576111	Nut, leak-off pipe connection to atomiser	1	
108	0566002	Olive, leak-off pipe connection to atomiser	1	
109	0201520	Connection, fuel injection atomiser leak-off pipe	3	
110	0095315	Bolt, leak-off pipe connection to atomiser	3	
0920107		Washer, fuel injection atomiser leak-off pipe	6	

NOTE :—

\*Component parts supplied by Messrs. C.A.V. Ltd.

**IMPORTANT**

Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**NOTES**

Hydraulic Gearbox Qd. D.E. 30. H.D.

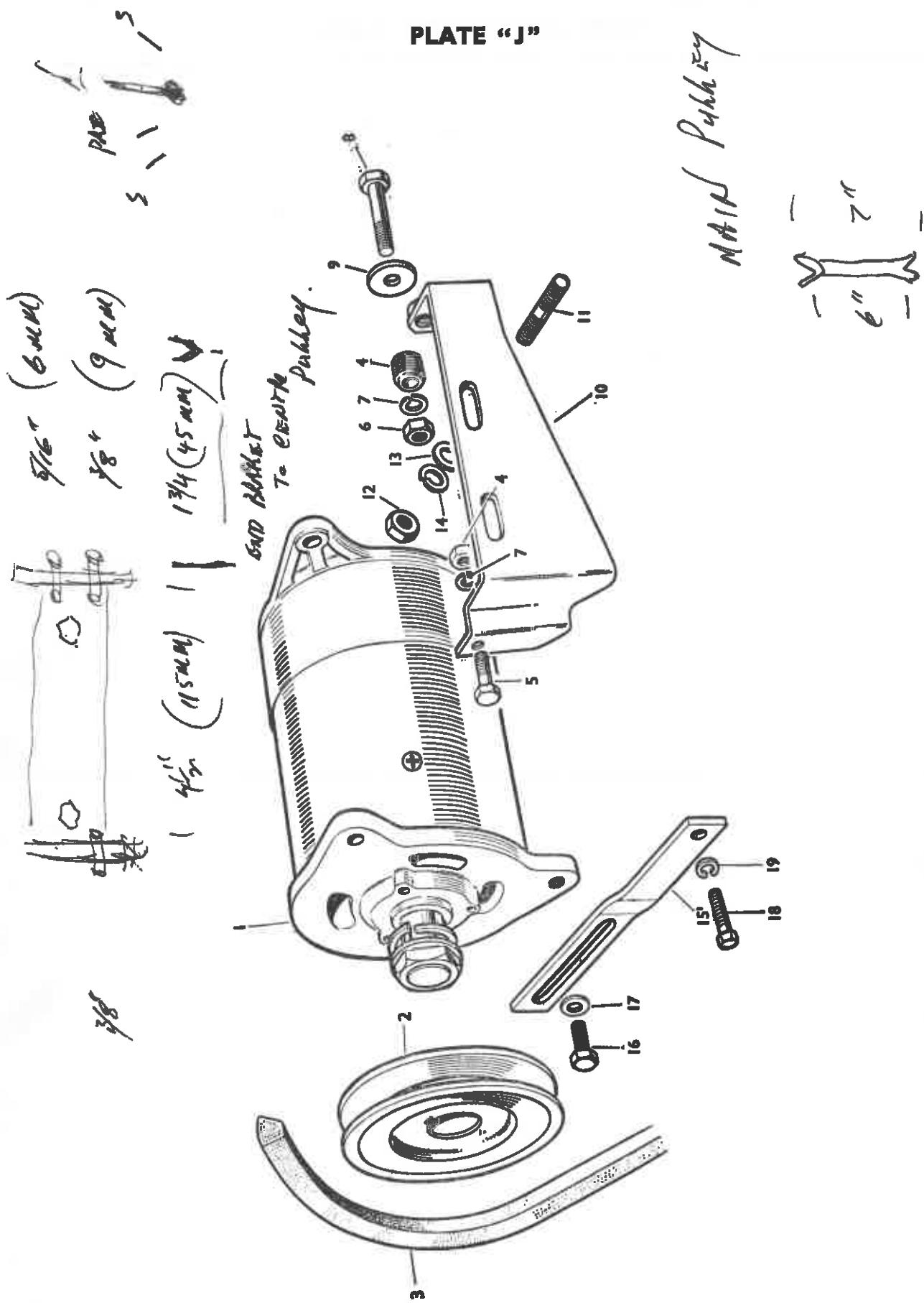
ENGINE IDLE SPEED 500 R.P.M.  
MAX. TORQUE 1000 R.P.M.  
MAX. SPEED 2000 R.P.M.

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**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "J"**



**SECTION "J"**

## Electrical Equipment (List No. 181 Only)

Plate Ref.	Part No.	Description	Qty.	Remarks
<b>(PRIOR TO ENGINE NUMBER 6250503)</b>				
1	DYNAMO, W/NUT AND KEY (TYPE C.45 P6 DESPATCH No. 22526)			{ Serviced directly by Messrs. J. Lucas Ltd.
2	0670071 Pulley, dynamo .. .. .. .. .. 1			
3	0070047 Belt, dynamo and water pump driving .. .. .. .. .. 1	Replaces 0070052/0070090		
4	0720622 Screw, dynamo support bracket locating .. .. .. .. .. 1			
5	0746256 Bolt, dynamo to support bracket—Front .. .. .. .. .. 1	Obsolete—Use 0096231/ 0920497—2 off		
	0096231 Bolt, dynamo to support bracket—Front .. .. .. .. .. 1			
6	0576002 Nut, dynamo retaining .. .. .. .. .. 2			
	0920497 Washer, dynamo retaining nut—Plain .. .. .. .. .. 2	Used only with 0096231		
7	0920053 Washer, dynamo retaining nut—Spring .. .. .. .. .. 2			
8	0096233 Bolt, dynamo to support bracket—Rear .. .. .. .. .. 1			
9	0920443 Washer, dynamo to support bracket bolt .. .. .. .. .. 1			
10	38161518 BRACKET, DYNAMO SUPPORT .. .. .. .. .. 1			
11	0826409 Stud, dynamo support bracket to cylinder block .. .. .. .. .. 2			
12	0576051 Nut, dynamo support bracket retaining .. .. .. .. .. 2			
13	0920004 Washer, dynamo support bracket retaining nut—Plain .. .. .. .. .. 2			
14	0920054 Washer, dynamo support bracket retaining nut—Spring .. .. .. .. .. 2			
15	0520180 LEVER, DYNAMO ADJUSTING .. .. .. .. .. 1			
16	0748413 Setscrew, dynamo adjusting lever to dynamo .. .. .. .. .. 1			
17	0920497 Washer, dynamo adjusting lever setscrew .. .. .. .. .. 1			
18	0746258 Setscrew, dynamo adjusting lever and timing gear housing front cover to power take-off facing cover .. .. .. .. .. 1			
19	0920053 Washer, dynamo adjusting lever and timing gear housing front cover setscrew .. .. .. .. .. 1 } Also detailed on Section "F"			

### (ENGINE NUMBER 6250503 ONWARDS)

*2871170	DYNAMO, W/NUT AND KEY (TYPE C.40A DESPATCH No. 22703)	1	
31141419	Pulley, dynamo .. .. .. .. .. 1		
0070159	Belt, dynamo and water pump driving .. .. .. .. .. 1		
0096231	Bolt, dynamo, to support bracket—Front .. .. .. .. .. 1		
0576002	Nut, dynamo retaining .. .. .. .. .. 2		
0920497	Washer, dynamo retaining nut—Plain .. .. .. .. .. 2		
0920053	Washer, dynamo retaining nut—Spring .. .. .. .. .. 2		
0096201	Bolt, dynamo to support bracket—Rear .. .. .. .. .. 1		
0920497	Washer, dynamo to support bracket bolt .. .. .. .. .. 1		
36671131	BRACKET, DYNAMO SUPPORT .. .. .. .. .. 1		
0826409	Stud, dynamo support bracket to cylinder block .. .. .. .. .. 2		
0576051	Nut, dynamo support bracket retaining .. .. .. .. .. 2		
0920004	Washer, dynamo support bracket retaining nut—Plain .. .. .. .. .. 2		
0920054	Washer, dynamo support bracket retaining nut—Spring .. .. .. .. .. 2		
36541116	LEVER, DYNAMO ADJUSTING .. .. .. .. .. 1		
0748413	Setscrew, dynamo adjusting lever to dynamo .. .. .. .. .. 1		
0920053	Washer, dynamo adjusting lever setscrew .. .. .. .. .. 1 } Also detailed on Section "F"		
0746259	Setscrew, dynamo adjusting lever and timing gear housing front cover to power take-off facing cover .. .. .. .. .. 1		
0920053	Washer, dynamo adjusting lever and timing gear housing front cover setscrew .. .. .. .. .. 1 } Also detailed on Section "F"		
0920497	Washer, dynamo adjusting lever and timing gear housing front cover setscrew .. .. .. .. .. 1		

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "J" Continued**

## **Electrical Equipment**

**(List No. 180 Only)**

Plate Ref.	Part No.	Description	Qty.	Remarks
<b>(PRIOR TO ENGINE NUMBER 6250503)</b>				
	DYNAMO, W/NUT AND KEY (TYPE C.45 P6 DESPATCH No. 22526)			{ Serviced directly by Messrs. J. Lucas Ltd.
0670071	Pulley, dynamo .. .. .. .. ..	1		
0070089	Belt, dynamo driving .. .. .. .. ..	1		
0720622	Screw, dynamo support bracket locating .. .. .. .. ..	1		
0746256	Bolt, dynamo to support bracket—Front .. .. .. .. ..	1		{ Obsolete—Use 0096201/0920497—2 off
0096201	Bolt, dynamo to support bracket—Front .. .. .. .. ..	1		
0576002	Nut, dynamo retaining .. .. .. .. ..	2		
0920497	Washer, dynamo retaining nut—Plain .. .. .. .. ..	2		Used only with 0096201
0920053	Washer, dynamo retaining nut—Spring .. .. .. .. ..	2		
0096233	Bolt, dynamo to support bracket—Rear .. .. .. .. ..	1		
0920443	Washer, dynamo to support bracket bolt .. .. .. .. ..	1		
0102129	BRACKET, DYNAMO SUPPORT .. .. .. .. ..	1		
0330779	Distance-piece, dynamo support bracket to cylinder block .. .. .. .. ..	1		
0826421	Stud, dynamo support bracket to cylinder block .. .. .. .. ..	1		
0576051	Nut, dynamo support bracket retaining .. .. .. .. ..	1		
0920054	Washer, dynamo support bracket retaining nut—Spring .. .. .. .. ..	1		
0746453	Setscrew, dynamo support bracket to cylinder block .. .. .. .. ..	2		
0920004	Washer, dynamo support bracket setscrew—Plain .. .. .. .. ..	2		
0920054	Washer, dynamo support bracket setscrew—Spring .. .. .. .. ..	2		
0520180	LEVER, DYNAMO ADJUSTING .. .. .. .. ..	1		
0748413	Setscrew, dynamo adjusting lever to dynamo .. .. .. .. ..	1		
0920497	Washer, dynamo adjusting lever setscrew .. .. .. .. ..	1		
0746258	Setscrew, dynamo adjusting lever and timing gear housing front cover to housing .. .. .. .. ..	1		{ Also detailed on Section "F"
0920053	Washer, dynamo adjusting lever and timing gear housing front cover setscrew .. .. .. .. ..	1		
<b>(ENGINE NUMBER 6250503 ONWARDS)</b>				
*2871170	DYNAMO, W/NUT AND KEY (TYPE C.40A DESPATCH No. 22703)	1		
31141419	Pulley, dynamo .. .. .. .. ..	1		
0070089	Belt, dynamo driving .. .. .. .. ..	1		
0096231	Bolt, dynamo to support bracket—Front .. .. .. .. ..	1		
0576002	Nut, dynamo retaining .. .. .. .. ..	2		
0920497	Washer, dynamo retaining nut—Plain .. .. .. .. ..	2		
0920053	Washer, dynamo retaining nut—Spring .. .. .. .. ..	2		
0096201	Bolt, dynamo to support bracket—Rear .. .. .. .. ..	1		
0920497	Washer, dynamo to support bracket bolt .. .. .. .. ..	1		
36671131	BRACKET, DYNAMO SUPPORT .. .. .. .. ..	1		
0826409	Stud, dynamo support bracket to cylinder block .. .. .. .. ..	2		
0576051	Nut, dynamo support bracket retaining .. .. .. .. ..	2		
0920004	Washer, dynamo support bracket retaining nut—Plain .. .. .. .. ..	2		
0920054	Washer, dynamo support bracket retaining nut—Spring .. .. .. .. ..	2		
36541116	LEVER, DYNAMO ADJUSTING .. .. .. .. ..	1		
0748413	Setscrew, dynamo adjusting lever to setscrew .. .. .. .. ..	1		
0920053	Washer, dynamo adjusting lever setscrew .. .. .. .. ..	1		
0920460	Distance-piece, dynamo adjusting lever to timing gear housing front cover .. .. .. .. ..	1		
0746259	Setscrew, dynamo adjusting lever and water pump drive housing to timing gear housing front cover .. .. .. .. ..	1		{ Also detailed on Section "F"
0920497	Washer, dynamo adjusting lever and water pump drive housing setscrew .. .. .. .. ..	1		

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**PERKINS 4.270 MARINE DIESEL ENGINE**

**SECTION "J" Continued**

**Electrical Equipment**  
**(List No. 182 Only)**

Plate Part Ref. No.	Description	Qty.	Remarks
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**(PRIOR TO ENGINE NUMBER 6250503)**

	DYNAMO, W/NUT AND KEY (TYPE C.45 P6 DESPATCH No. 22526)		Serviced directly by Messrs. J. Lucas Ltd.
0670071	Pulley, dynamo	1	
0070047	Belt, dynamo and water pump driving	1	
0096235	Bolt, dynamo to support bracket	2	Obsolete—Use 0096236/0920497—2 off
0096236	Bolt, dynamo to support bracket	2	
0576002	Nut, dynamo retaining	2	
0920497	Washer, dynamo retaining nut—Plain	2	Used only with 0096236
0920053	Washer, dynamo retaining nut—Spring	2	
37763811	BRACKET, DYNAMO SUPPORT	1	
0826434	Stud, dynamo support bracket to cylinder block	2	
0576051	Nut, dynamo support bracket retaining	2	
0920054	Washer, dynamo support bracket retaining nut	2	
0520180	LEVER, DYNAMO ADJUSTING	1	
0920460	Distance-piece, adjusting lever to dynamo	1	
0748413	Setscrew, dynamo adjusting lever to dynamo	1	
0920497	Washer, dynamo adjusting lever setscrew	1	
0746258	Setscrew, dynamo adjusting lever and timing gear housing front cover to housing	1	
0920053	Washer, dynamo adjusting lever and timing gear housing setscrew	1	Also detailed on Section "F"

**(ENGINE NUMBER 6250503 ONWARDS)**

*2871170	DYNAMO, W/NUT AND KEY (TYPE C.40A DESPATCH No. 22703)	1	
31141419	Pulley, dynamo	1	
0070159	Belt, dynamo and water pump driving	1	
0096236	Bolt, dynamo to support bracket—Front	1	
0576002	Nut, dynamo retaining	2	
0920497	Washer, dynamo retaining nut—Plain	3	"1 off" fitted between front dynamo lug and bracket
0920053	Washer, dynamo retaining nut—Spring	2	
0096232	Bolt, dynamo to support bracket—Rear	1	
37763861	BRACKET, DYNAMO SUPPORT	1	
0826434	Stud, dynamo support bracket to cylinder block	2	
0576051	Nut, dynamo support bracket retaining	2	
0920054	Washer, dynamo support bracket retaining nut	2	
36541113	LEVER, DYNAMO ADJUSTING	1	
0920460	Distance-piece, adjusting lever to dynamo	1	
0748413	Setscrew, dynamo adjusting lever to dynamo	1	
0920497	Washer, dynamo adjusting lever setscrew	2	
0746258	Setscrew, dynamo adjusting lever and timing gear housing front cover to housing	1	
0920053	Washer, dynamo adjusting lever and timing gear housing front cover setscrew	1	Also detailed on Section "F"

**NOTE :—**

\*Component parts supplied by Messrs. J. Lucas Ltd.

**IMPORTANT**  
Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "K"****Joints and Gaskets**

Plate Ref.	Part No.	Description	Qty.	Remarks
---------------	-------------	-------------	------	---------

**(List No. 181 Only)**

59659	JOINTS AND GASKETS .. .. ..	COMPLETE ENGINE SET	1 set	
	JOINT, HEADER TANK AND LUB. OIL COOLER ..			
	SUPPORT BRACKET TO CYLINDER HEAD ..		1 See Section "H"	
59656	JOINTS AND GASKETS—REMOVAL OF HEAD ..		1 set	

**(List No. 180 Only)**

59654	JOINTS AND GASKETS—COMPLETE ENGINE.. ..	..	..	1 set
59653	JOINTS AND GASKETS—REMOVAL OF HEAD ..	..	..	1 set

**(List No. 182 Only)**

59659	JOINTS AND GASKETS—COMPLETE ENGINE.. ..	..	..	1 set
59658	JOINTS AND GASKETS—REMOVAL OF HEAD ..	..	..	1 set

181/180/182/R.M.E./F.J.E./10604

**IMPORTANT**

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**FIT ONLY GENUINE PERKINS PARTS**

## NOTES

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**IMPORTANT**  
Always quote Engine Number when ordering Parts  
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**PART 2**

**STANDARD ACCESSORIES**

**BACKEND ARRANGEMENTS**

**& GEARBOXES**

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## PART 2

# STANDARD ACCESSORIES BACKEND ARRANGEMENTS & GEARBOXES

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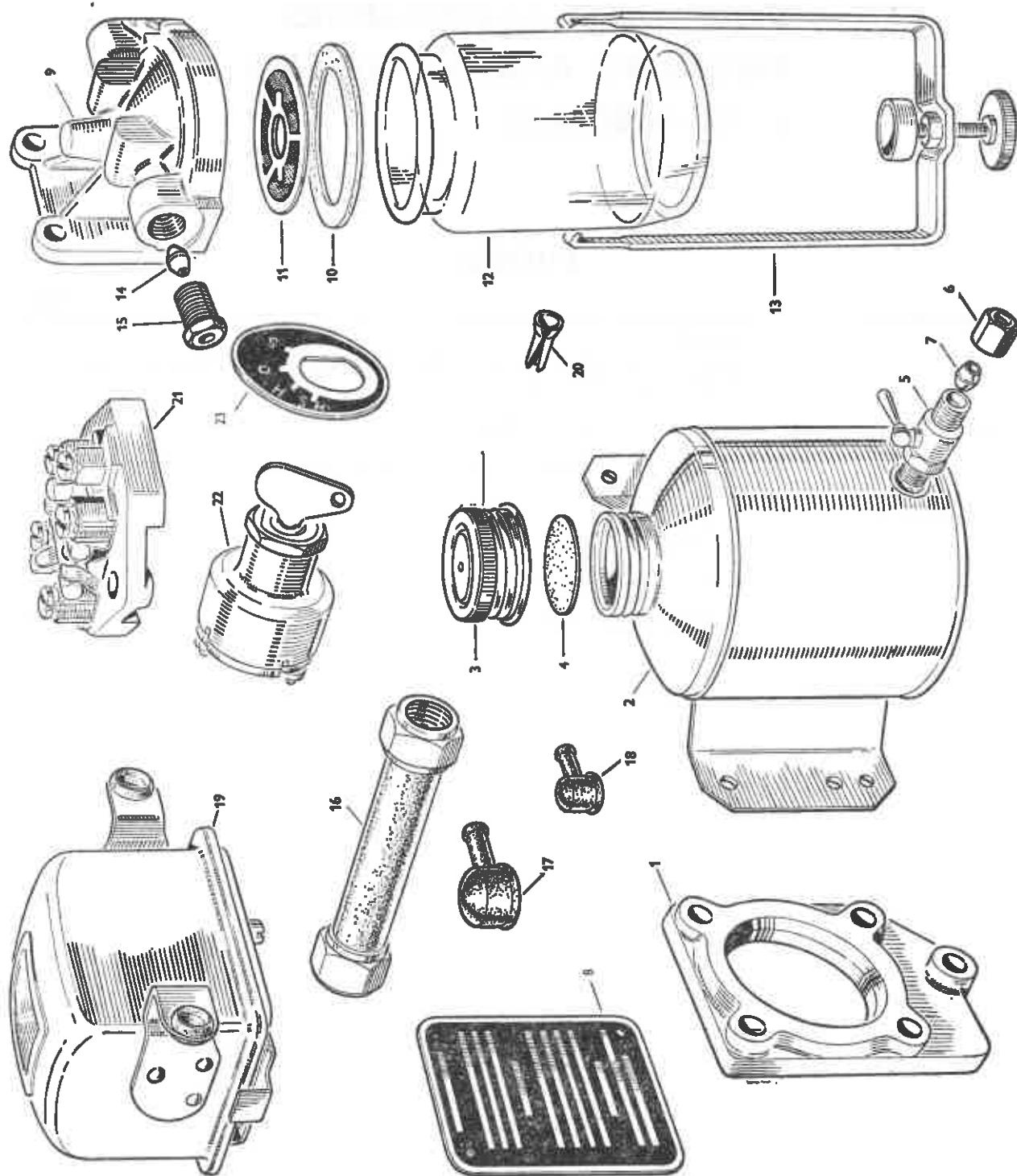
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**IMPORTANT**  
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**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "2A"**



**SECTION "A"****Standard Accessories**

Plate No.	Part Ref.	Description	Qty.	Remarks
1 0380203		Flange, exhaust manifold outlet .. .. ..	.. 1	
70422		<b>CONTAINER, COLD STARTING FUEL OIL (ASSEMBLY)</b> .. ..	.. 1	
		Comprising :—		
2 32313		Container, cold starting fuel oil .. .. ..	.. 1	
3 0150065		Cap, cold starting fuel oil container .. .. ..	.. 1	Included
4 0920700		Washer, cold starting fuel oil container cap .. .. ..	.. 1	in 32313
5 34149		Cock, cold starting fuel oil container .. .. ..	.. 1	
6 0576111		Nut, cold starting fuel oil pipe .. .. ..	.. 1	
7 0566002		Olive, cold starting fuel oil pipe .. .. ..	.. 1	
0622899		Pipe, cold starting fuel oil .. .. ..	.. 1	Replaces 0620036
8 31812127		Plate, cold starting instruction .. .. ..	.. 1	Replaces 0941206
32513		<b>PRE-FILTER, FUEL OIL (ASSEMBLY)</b> .. .. ..	.. 1	Obsolete—Use 2656007/ 33533112/0566003/0200570
2656007		<b>PRE-FILTER, FUEL OIL (ASSEMBLY)</b> .. .. ..	.. 1	
		Comprising :—		
9 0290025		Headcasting, fuel oil pre-filter .. .. ..	.. 1	Used only with 32513
26560059		Headcasting, fuel oil pre-filter .. .. ..	.. 1	Used only with 2656007
10 0490506		Joint, fuel oil pre-filter headcasting to bowl .. .. ..	.. 1	
11 0800059		Gauze, fuel oil pre-filter .. .. ..	.. 1	
12 0995458		Glass bowl, fuel oil pre-filter container .. .. ..	.. 1	
13 0993394		Stirrup, fuel oil pre-filter headcasting to bowl clamping c/w screw .. .. ..	.. 1	
0201070		Union, fuel oil pre-filter .. .. ..	.. 2	Used only with 2656007
0920127		Washer, fuel oil pre-filter union .. .. ..	.. 2	
14 0571346		Nut, fuel oil pre-filter .. .. ..	.. 2	
15 0566004		Olive, fuel oil pre-filter .. .. ..	.. 2	Used only with 32513
16 0200618		Connection—Flexible, fuel oil pipe .. .. ..	.. 1	
33533112		Nut, fuel oil pre-filter .. .. ..	.. 2	
0566003		Olive, fuel oil pre-filter .. .. ..	.. 2	Used only with 2656007
0200570		Connection—Flexible, fuel oil pipe .. .. ..	.. 1	
17 31129		Cover, dynamo charge terminal .. .. ..	.. 1	
18 31130		Cover, dynamo field terminal .. .. ..	.. 1	
19 *2872622		<b>CUT-OUT &amp; REGULATOR, DYNAMO (TYPE RB.108 DESPATCH No. 37230)—REPLACES 34215</b> .. .. ..	.. 1	Prior to Eng. No. 6250503
20 0370110		Ferrules, cable .. .. ..	.. 4	
21 *31135		<b>FUSE BASE (TYPE SF.6, DESPATCH No. 37132D)</b> .. .. ..	.. 1	
22 *2846113		<b>SWITCH, HEATER/STARTER (3 WAY) (TYPE 70 S.A. DESPATCH No. 34501A)—REPLACES 34231/2846112</b> .. .. ..	.. 1	
35684		Sleeve, dynamo charge terminal .. .. ..	.. 1	
35683		Sleeve, dynamo field terminal .. .. ..	.. 1	
*2872637		<b>CUT-OUT &amp; REGULATOR, DYNAMO (TYPE RB.108 DESPATCH No. 37398)—REPLACES 2872634</b> .. .. ..	.. 1	Eng. No. 6250503 onwards
*2841203		<b>FUSE BASE (TYPE 4 FJ DESPATCH No. 54038032)</b> .. .. ..	.. 1	
*2846115		<b>SWITCH, HEATER/STARTER (3 WAY) (TYPE 70SA DESPATCH No. 34626A)</b> .. .. ..	.. 1	
23 0941188		Plate, heater/starter switch index .. .. ..	.. 1	

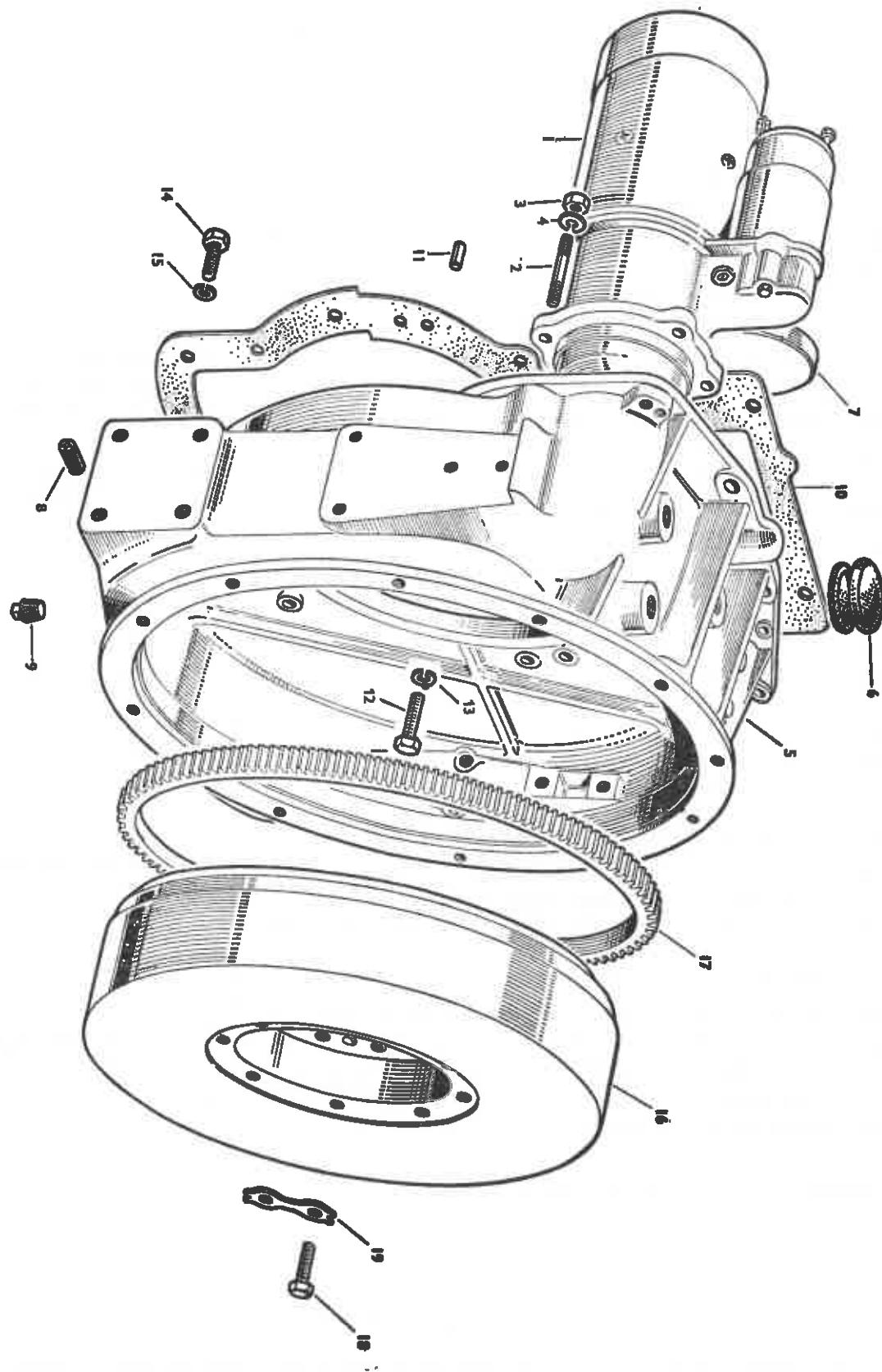
NOTE :—

\*Component parts supplied by Messrs. J. Lucas Ltd.

**IMPORTANT**  
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**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "2B"**



**SECTION "B"****Backend Arrangements****Arrangements to suit "F" or MRFII/2B Type Gearboxes**

Plate No.	Part Ref.	Description	Qty.	Remarks
1	*2873123	STARTER MOTOR W/10T. PINION (TYPE M45G (S.I.D.) DESPATCH No. 26151L)—REPLACES 31196 .. ..	.. 1	Prior to Eng. No. 6250503
	*2873124	STARTER MOTOR W/10T. PINION (TYPE M45G (S.I.D.) DESPATCH No. 26198) .. ..	.. 1	Eng. No. 6250503 onwards
2	0826403	Stud, starter motor to flywheel housing .. ..	.. ..	3 Replace 0826459
3	0576051	Nut, starter motor retaining .. ..	.. ..	3
4	0920054	Washer, starter motor retaining nut .. ..	.. ..	3
5	37135174	HOUSING, FLYWHEEL .. ..	.. ..	1 Replaces 0440398
6	0650542	Plug, flywheel housing—Timing inspection hole .. ..	.. ..	1
7	0650663	Plug, flywheel housing .. ..	.. ..	1
8	0650738	Plug, flywheel housing—Bearer facings .. ..	.. ..	16
9	0650593	Plug, flywheel housing .. ..	.. ..	1
10	36867112	Joint, flywheel housing to cylinder block and sump .. ..	.. ..	1
11	0350037	Dowel, flywheel housing to cylinder block .. ..	.. ..	2
12	0746455	Setscrew, flywheel housing to cylinder block .. ..	.. ..	8
13	0920054	Washer, flywheel housing setscrew .. ..	.. ..	8
14	0746652	Setscrew, lub. oil sump to flywheel housing .. ..	.. ..	6
15	0920055	Washer, lub. oil sump setscrew .. ..	.. ..	6
16	0999663	FLYWHEEL & STARTER RING (ASSEMBLY) .. ..	.. ..	1
		Including :—		
17	0410264	Starter ring .. ..	.. ..	1
18	32162203	Setscrew, flywheel to crankshaft .. ..	.. ..	6
19	0921062	Tabwasher, flywheel to crankshaft setscrew .. ..	.. ..	3

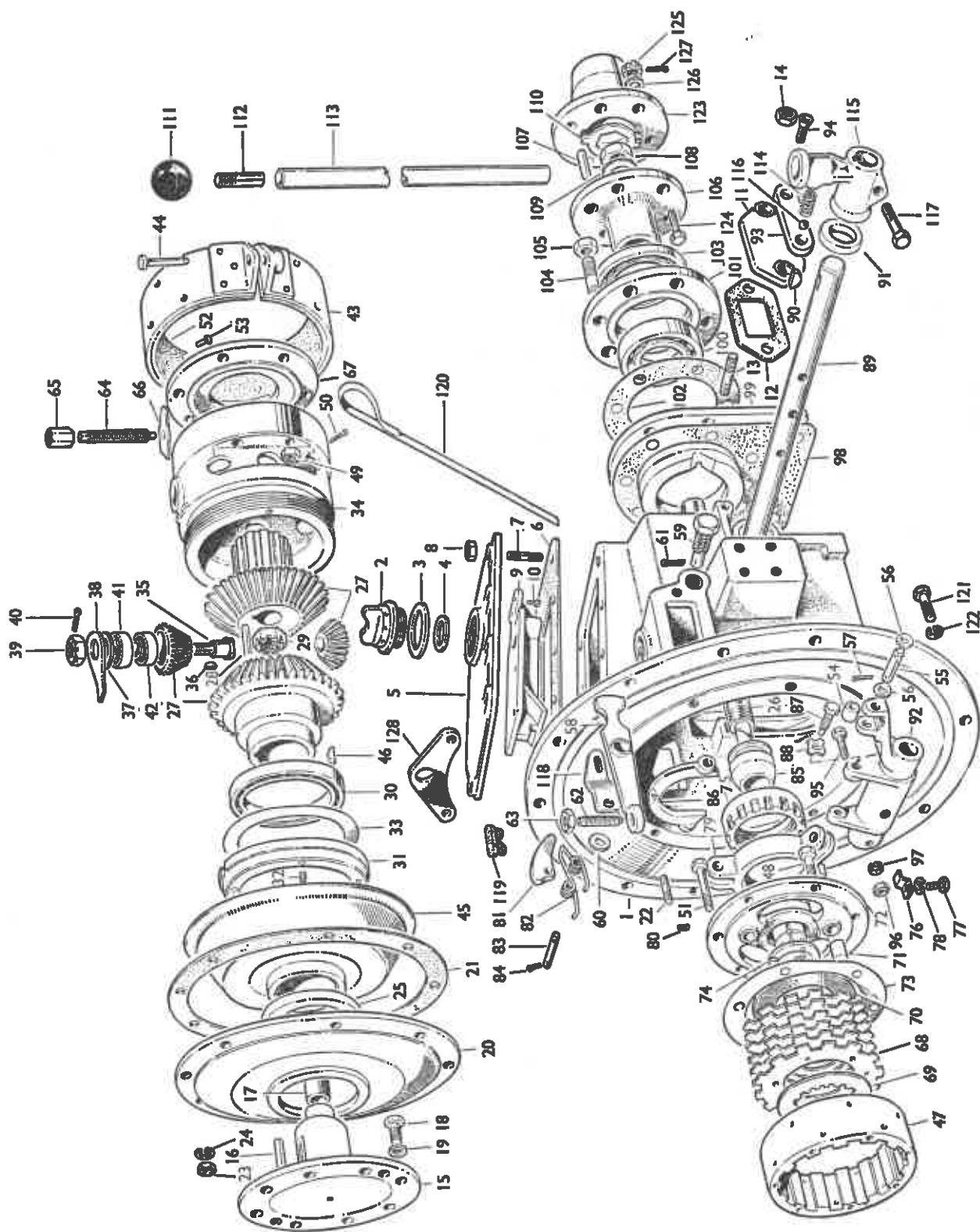
NOTE :—

\*Component parts supplied by Messrs. J. Lucas Ltd.

**IMPORTANT**  
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**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "2CIA"**



**SECTION "C"**  
**Category 1**

## Gearboxes

### ("F" Type Reverse Gearboxes)

Plate Ref.	Part No.	Description	Qty.	Remarks
	32160	REVERSE GEARBOX (ASSEMBLY) "F" TYPE— DIRECT DRIVE .. . . .	1	
	32161	REVERSE GEARBOX (ASSEMBLY) "F" TYPE C/W 2 PINION REDUCTION GEAR (2.1 RATIO) .. . . .	1	
	32162	REVERSE GEARBOX (ASSEMBLY) "F" TYPE C/W 2 PINION REDUCTION GEAR (3.1 RATIO) .. . . .	1	
1	0440354	HOUSING, REVERSE GEARBOX .. . . .	1	
2	0150097	Cap, reverse gearbox oil filler .. . . .	1	
3	0490444	Joint, reverse gearbox oil filler cap .. . . .	1	
4	0995423	Baffle, reverse gearbox oil filler cap .. . . .	1	
5	0240432	Cover, reverse gearbox inspection—Top .. . . .	1	
6	0490442	Joint, reverse gearbox inspection cover to housing .. . . .	1	
7	0825128	Stud, reverse gearbox inspection cover to housing .. . . .	8	
8	0570003	Nut, reverse gearbox inspection cover retaining .. . . .	8	
9	0995422	Collector, reverse gearbox oil .. . . .	1	
10	0690514	Rivet, reverse gearbox oil collector .. . . .	4	
11	0240433	Cover, reverse gearbox inspection—Sides .. . . .	2	
12	0490443	Joint, reverse gearbox inspection cover to housing .. . . .	2	
13	0825129	Stud, reverse gearbox inspection cover to housing .. . . .	4	
14	0570004	Nut, reverse gearbox inspection cover retaining .. . . .	4	
15	0980611	COUPLING, REVERSE GEARBOX INPUT .. . . .	1	
16	0500517	Key, reverse gearbox input coupling .. . . .	1	
17	0050199	Bush, reverse gearbox input coupling .. . . .	1	
18	0746430	Setscrew, reverse gearbox input coupling to flywheel .. . . .	8	
19	0920004	Washer, reverse gearbox input coupling setscrew .. . . .	8	
	0930012	Lockwire, reverse gearbox input coupling setscrew .. . . .	1	
20	0240435	Cover, reverse gearbox housing—Front .. . . .	1	
21	0490447	Joint, reverse gearbox housing front cover to housing .. . . .	1	
22	0825130	Stud, reverse gearbox housing front cover to housing .. . . .	8	
23	0570002	Nut, reverse gearbox housing front cover retaining .. . . .	8	
24	0920907	Washer, reverse gearbox housing front cover retaining nut .. . . .	8	
25	0730072	Seal, reverse gearbox housing front cover .. . . .	1	
26	0750259	Main Shaft, reverse gearbox drive .. . . .	1	
27	0992869	PINION, REVERSE GEARBOX C/W FORWARD AND AFT BEVELS .. . . .	1	
28	0500511	Key, reverse gearbox aft bevel .. . . .	1	
29	0571220	Nut, reverse gearbox aft bevel .. . . .	1	
30	0040541	Bearing, reverse gearbox bevel housing .. . . .	1	
31	0640065	Ring, reverse gearbox bevel locating .. . . .	1	
32	0720799	Screw, reverse gearbox bevel locating ring locking .. . . .	2	
33	0760076	Shim, reverse gearbox bevel housing .. . . .	1	
34	0440352	Housing, reverse gearbox bevel .. . . .	1	
35	0610727	Pin, reverse gearbox bevel pinion .. . . .	2	
36	0500514	Key, reverse gearbox bevel pinion pin .. . . .	2	
37	0920909	Washer, reverse gearbox bevel pinion .. . . .	2	
38	0940663	Plate, reverse gearbox bevel pinion pin locking .. . . .	2	
39	0570158	Nut, reverse gearbox bevel pinion pin locking .. . . .	2	
40	0610011	Split Pin, reverse gearbox bevel pinion pin locking nut .. . . .	2	
41	0040013	Bearing, reverse gearbox bevel pinion—Journal .. . . .	2	
42	0040543	Bearing, reverse gearbox bevel pinion—Cup and Cone .. . . .	2	

**IMPORTANT**  
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**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "C" Continued**  
**Category 1 Continued**

## **Gearboxes**

**(“F” Type Reverse Gearboxes)**

Plate Ref.	Part No.	Description	Qty.	Remarks
43	0992870	Brake Band, reverse gearbox c/w lugs	..	1
44	0610731	Pin, reverse gearbox brake band	..	1
45	0995429	Oil Thrower, reverse gearbox c/w boss	..	1
46	0500515	Key, reverse gearbox oil thrower	..	1
47	0995426	Brake Drum, reverse gearbox	..	1
48	0095187	Bolt, reverse gearbox brake drum	..	4
49	0570154	Nut, reverse gearbox brake drum retaining	..	4
50	0610010	Split Pin, reverse gearbox brake drum retaining nut	..	4
	0930073	Lockwire, reverse gearbox brake drum retaining nut	..	2
51	0095189	Setscrew, reverse gearbox brake drum	..	2
52	0995419	Lining, reverse gearbox brake band	..	1
53	0690515	Rivet, reverse gearbox brake band lining	..	14
54	0995428	Roller, reverse gearbox brake	..	1
55	0610733	Pin, reverse gearbox brake roller	..	2
56	0920912	Washer, reverse gearbox brake roller pin	..	1
57	0610010	Split-pin, reverse gearbox clutch operating lever	..	2
58	0520268	Lever, reverse gearbox brake operating	..	1
59	0610732	Pin, reverse gearbox brake operating lever	..	1
60	0920909	Washer, reverse gearbox brake operating lever pin	..	1
61	0610016	Split-pin, reverse gearbox brake operating lever pin	..	1
62	0720658	Screw, reverse gearbox brake adjusting	..	1
63	0570106	Nut, reverse gearbox brake adjusting screw locking	..	1
64	0720659	Screw, reverse gearbox brake balance	..	1
65	0571226	Nut, reverse gearbox brake balance screw	..	1
66	0920908	Washer, reverse gearbox brake balance screw	..	1
67	0940662	Plate, reverse gearbox clutch—Back	..	1
68	0940666	Plate, reverse gearbox clutch—Inner	..	6
69	0940667	Plate, reverse gearbox clutch—Outer	..	6
70	0940668	Plate, reverse gearbox clutch—Pressure	..	1
71	0610729	Pin, reverse gearbox clutch pressure plate	..	3
72	0240436	Cover, reverse gearbox clutch—End	..	1
73	0760077	Shim, reverse gearbox clutch end cover	..	10
74	0030200	Bush, reverse gearbox clutch end cover	..	1
75	0571218	Nut, reverse gearbox clutch adjusting	..	1
76	0940665	Plate, reverse gearbox clutch adjusting nut locking	..	1
77	0720661	Setscrew, reverse gearbox clutch adjusting nut locking	..	1
78	0920052	Washer, reverse gearbox clutch adjusting nut locking setscrew	..	1
79	0995425	Spider, reverse gearbox clutch toggle	..	1
80	0720660	Screw, reverse gearbox clutch toggle spider locating	..	1
81	0995424	Toggle, reverse gearbox clutch	..	3
82	0780165	Spring, reverse gearbox clutch toggle	..	3
83	0610728	Pin, reverse gearbox clutch toggle	..	3
84	0610734	Split pin, reverse gearbox clutch toggle pin	..	6
85	0995418	Cone, reverse gearbox clutch operating	..	1
86	0995417	Stirrup, reverse gearbox clutch operating cone	..	1
87	0610730	Pin, reverse gearbox clutch operating cone stirrup	..	2
88	0920906	Washer, reverse gearbox clutch operating cone stirrup pin	..	2
89	0750260	Shaft, reverse gearbox clutch operating	..	1
90	0500513	Key, reverse gearbox clutch operating shaft	..	1
91	0730074	Seal, reverse gearbox clutch operating shaft	..	2
92	0520267	Lever, reverse gearbox clutch operating	..	1
93	0500516	Quadrant, reverse gearbox reverse gear	..	1
94	0745098	Setscrew, reverse gearbox reverse gear	..	2

**IMPORTANT**

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**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "C" Continued**  
**Category 1 Continued**

## Gearboxes

### ("F" Type Reverse Gearboxes)

Plate Ref.	Part No.	Description	Qty.	Remarks
95	0095186	Bolt, reverse gearbox clutch operating lever clamping	.. ..	3
96	0570002	Nut, reverse gearbox clutch operating lever clamping bolt	.. ..	3
97	0920052	Washer, reverse gearbox clutch operating lever clamping bolt	.. ..	3
98	0490445	Joint, reverse gearbox to thrust bearing housing	.. ..	1
99	0440353	Housing, reverse gearbox thrust bearing	.. ..	1
100	0040542	Bearing, reverse gearbox thrust	.. ..	1
101	0240434	Cover, reverse gearbox thrust bearing housing	.. ..	1
102	0490446	Joint, reverse gearbox thrust bearing housing	.. ..	1
103	0730073	Seal, reverse gearbox oil—Aft	.. ..	1
104	0825131	Stud, reverse gearbox thrust bearing housing and cover to gearbox housing	.. ..	8
105	0570005	Nut, reverse gearbox thrust bearing housing and cover retaining	.. ..	8
106	0980622	Coupling, reverse gearbox output	.. ..	1
107	0500512	Key, reverse gearbox output coupling or reduction gear pinion	.. ..	1
108	0571219	Nut, reverse gearbox output coupling retaining	.. ..	1
109	0920911	Washer, reverse gearbox output coupling retaining nut	.. ..	1
110	0940664	Plate, reverse gearbox output coupling retaining nut locking	.. ..	1
111	0510018	Knob, reverse gearbox control lever	.. ..	1
112	0470552	Adaptor, reverse gearbox control lever knob	.. ..	1
113	0900115	Tube, reverse gearbox control lever	.. ..	1
114	0780164	Spring, reverse gearbox control lever	.. ..	1
115	0996500	Fork, reverse gearbox control lever	.. ..	1
116	0020008	Ball, reverse gearbox control lever	.. ..	1
117	0095188	Bolt, reverse gearbox control lever	.. ..	1
118	0995427	Bracket, reverse gearbox ahead and astern stop	.. ..	1
119	0650545	Plug, reverse gearbox oil drain holes	.. ..	3
120	0700173	Dipstick, reverse gearbox oil level	.. ..	1
	0940679	Plate, reverse gearbox instruction	.. ..	2
	0940680	Plate, reverse gearbox oil level	.. ..	1
	0940681	Plate, reverse gearbox serial number	.. ..	1
	0690513	Rivet, reverse gearbox plates	.. ..	12
121	0746431	Setscrew, reverse gearbox to flywheel housing	.. ..	12
122	0920054	Washer, reverse gearbox setscrew	.. ..	12
123	0980612	Coupling, reverse gearbox prop. shaft half	.. ..	1
124	0096809	Bolt, reverse gearbox prop. shaft half coupling to gearbox output coupling	.. ..	6
125	0576074	Nut, reverse gearbox prop. shaft half coupling retaining	.. ..	6
126	0920007	Washer, reverse gearbox prop. shaft half coupling retaining nut	.. ..	6
127	0610008	Split Pin, reverse gearbox prop. shaft half coupling retaining nut	.. ..	6
128	0940551	Plate, engine rear lifting	.. ..	1 To gearbox securing setscrews

Important details for converting gearboxes.

When converting a Direct Drive Gearbox to take a Reduction Gear, the following parts must be removed from the Gearbox and discarded :—

0040542	Bearing, reverse gearbox thrust	.. ..	.. ..	.. ..	1
0240434	Cover, reverse gearbox thrust bearing housing	.. ..	.. ..	.. ..	1
0490446	Joint, reverse gearbox thrust bearing housing cover	.. ..	.. ..	.. ..	1
0730073	Seal, reverse gearbox oil—Aft	.. ..	.. ..	.. ..	1

**IMPORTANT**  
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**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "C" Continued**  
**Category 1 Continued**

**Gearboxes**  
**("F" Type Reverse Gearboxes)**

Plate Ref.	Part No.	Description	Qty.	Remarks
0825131		Stud, reverse gearbox thrust bearing housing and cover to gearbox housing	.. 8	
0570005		Nut, reverse gearbox thrust bearing housing and cover retaining	.. 5	only
0920622		Coupling, reverse gearbox output	.. ..	1
0571219		Nut, reverse gearbox output coupling retaining	.. ..	1
0920911		Washer, reverse gearbox output coupling retaining nut	.. ..	1
0920664		Plate, reverse gearbox output coupling retaining nut locking	.. 1	
The following parts which are supplied with Reduction Gear Assemblies, must be fitted with relevant Reduction Gear to replace those discarded.				
0040548		Bearing, reverse gearbox thrust	.. .. .. .. .. .. .. ..	1
0490445		Joint, reverse gearbox thrust bearing housing to reduction gear housing	1	Additional to one already fitted
0730076		Seal, reduction gear oil—Top	.. .. .. .. .. .. .. ..	1
*0825134		Stud, reduction gear housing to gearbox housing	.. .. .. .. .. .. .. ..	7 2 : 1 ratio only
*0825137		Stud, reduction gear housing to gearbox housing	.. .. .. .. .. .. .. ..	3 }
*0825204		Stud, reduction gear housing to gearbox housing	.. .. .. .. .. .. .. ..	3 } 3 : 1 ratio only
*0825203		Stud, reduction gear housing to gearbox housing	.. .. .. .. .. .. .. ..	2 }
*0570155		Nut, reduction gear housing retaining	.. .. .. .. .. .. .. ..	4 (2 : 1 ratio only) (3 : 1 ratio only) 5
0571223		Nut, reduction gear pinion retaining	.. .. .. .. .. .. .. ..	1
0940669		Plate, reduction gear pinion retaining nut locking	.. .. .. .. .. .. .. ..	1
0745099		Setscrew, reduction gear pinion locking plate retaining	.. .. .. .. .. .. .. ..	2

When converting a Gearbox fitted with a Reduction Gear to a Direct Drive, the discarding and replacing of parts is reversed.

When converting a Gearbox fitted with a 2 : 1 Ratio Reduction Gear to take a 3 : 1 Reduction Gear or vice versa, only the Stud and Nut arrangement securing the relevant Reduction Gear is affected. These parts are marked thus\*.

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**FIT ONLY GENUINE PERKINS PARTS**

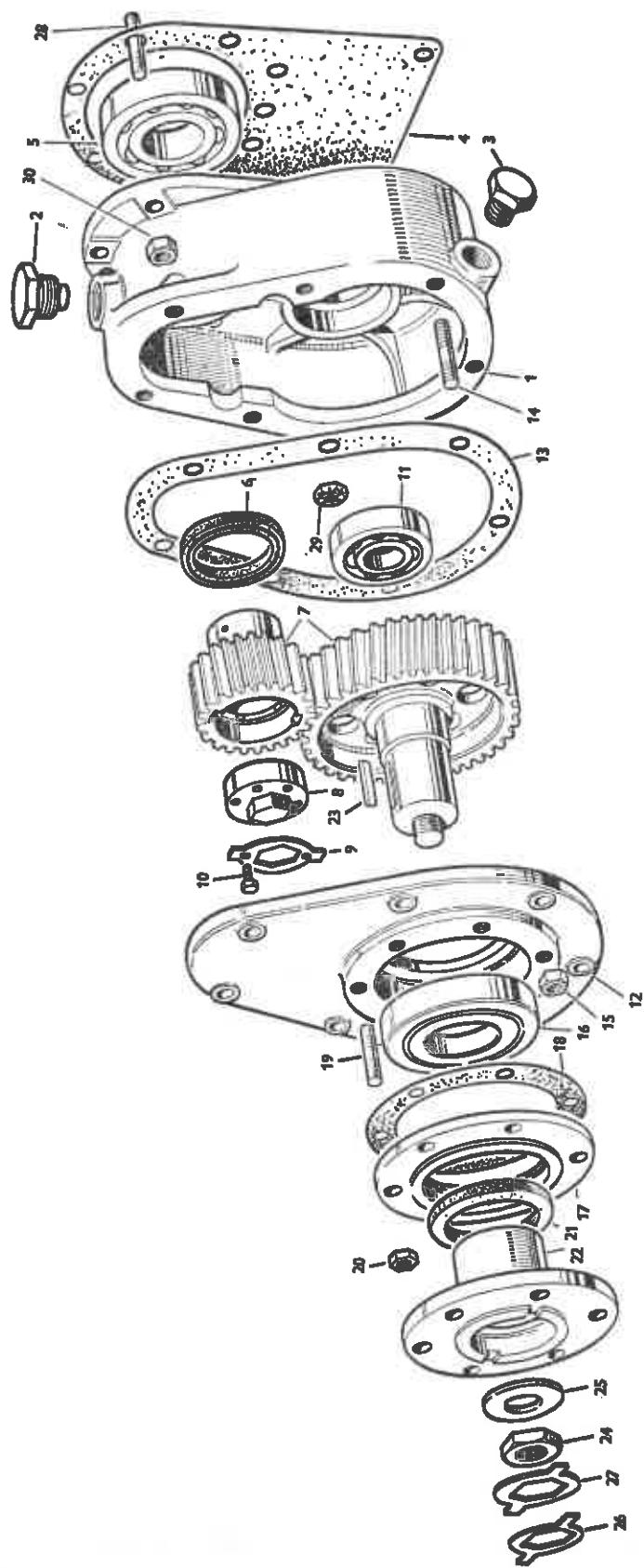
## NOTES

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**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "2C2A"**



**SECTION "C" Continued**  
**Category 1 Continued**

**Gearboxes**  
**("F" Type Reverse Gearboxes)**

Plate Ref.	Part No.	Description	Qty.	Remarks
32399		REDUCTION GEAR (ASSEMBLY) 2 PINION (2 : 1 RATIO) C/W		
		PINION AND GEARWHEEL .. .. .. .. 1		
1	0440355	Housing, reduction gear .. .. .. .. 1		
2	0650646	Plug, reduction gear housing oil filler hole .. .. .. .. 1		
3	0650647	Plug, reduction gear housing oil drain .. .. .. .. 2		
4	0490445	Joint, reduction gear top thrust bearing housing to reduction gear housing .. .. .. .. 1		
5	0040548	Bearing, reduction gear thrust—Top .. .. .. .. 1		
6	0730076	Seal, reduction gear oil—Top .. .. .. .. 1		
7	0992871	PINION & GEARWHEEL, REDUCTION GEAR .. .. .. .. 1		
8	0571223	Nut, reduction gear pinion retaining .. .. .. .. 1		
9	0940669	Plate, reduction gear pinion retaining nut locking .. .. .. .. 1		
10	0745099	Setscrew, reduction gear pinion locking plate retaining .. .. .. .. 2		
11	0040545	Bearing, reduction gear gearwheel .. .. .. .. 1		
12	0240437	Cover, reduction gear housing .. .. .. .. 1		
13	0490449	Joint, reduction gear housing cover to housing .. .. .. .. 1		
14	0825132	Stud, reduction gear housing cover to housing .. .. .. .. 7		
15	0570004	Nut, reduction gear housing cover retaining .. .. .. .. 7		
16	0040544	Bearing, reduction gear thrust—Bottom .. .. .. .. 1		
17	0240438	Cover, reduction gear bottom thrust bearing .. .. .. .. 1		
18	0490448	Joint, reduction gear bottom thrust bearing cover to housing cover .. .. .. .. 1		
19	0825133	Stud, reduction gear bottom thrust bearing cover to housing cover .. .. .. .. 6		
20	0570004	Nut, reduction gear bottom thrust bearing cover retaining .. .. .. .. 6		
21	0730075	Seal, reduction gear oil—Bottom .. .. .. .. 1		
22	0980623	Coupling, reduction gear output .. .. .. .. 1		
23	0500512	Key, reduction gear output coupling locking .. .. .. .. 1		
24	0571222	Nut, reduction gear output coupling retaining .. .. .. .. 1		
25	0920913	Washer, reduction gear output coupling retaining nut .. .. .. .. 1		
26	0940670	Plate, reduction gear output coupling retaining nut locking .. .. .. .. 1		
27	0940673	Plate, reduction gear output coupling retaining nut locking .. .. .. .. 1		
	0940671	Plate, reduction gear instruction .. .. .. .. 1		
	0940672	Plate, reduction gear serial numbers .. .. .. .. 1		
	0690521	Rivet, reduction gear instruction and serial number plates .. .. .. .. 6		
	0995431	Arrow, reduction gear direction .. .. .. .. 1		
	0690520	Rivet, reduction gear direction arrow .. .. .. .. 2		
28	0825134	Stud, reduction gear housing to gearbox housing .. .. .. .. 7		
29	0570155	Nut, reduction gear housing retaining .. .. .. .. 4		
30	0570005	Nut, reduction gear housing retaining .. .. .. .. 3		

**IMPORTANT**  
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**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "C" Continued**  
**Category 1 Continued**

## Gearboxes

**("F" Type Reverse Gearboxes)**

Plate Ref.	Part No.	Description	Qty.	Remarks
32400		<b>REDUCTION GEAR (ASSEMBLY) 2 PINION (3 : 1 RATIO) C/W</b>		
		<b>PINION AND GEARWHEEL</b>	1	
0440356		Housing, reduction gear	1	
0650648		Plug, reduction gear housing oil filler hole	1	
0650649		Plug, reduction gear housing oil level and oil drain	3	
0490445		Joint, reduction gear top thrust bearing housing to reduction gear housing	1	
0650651		Plug, reduction gear housing oil	1	
0040548		Bearing, reduction gear thrust—Top	1	
0730076		Seal, reduction gear oil—Top	1	
0992872		<b>PINION &amp; GEARWHEEL, REDUCTION</b>	1	
0571223		Nut, reduction gear pinion retaining	1	
0940669		Plate, reduction gear pinion retaining nut locking	1	
0745099		Setscrew, reduction gear pinion locking plate retaining	2	
0040546		Bearing, reduction gear gearwheel	1	
0240439		Cover, reduction gear housing	1	
0490451		Joint, reduction gear housing cover to housing	1	
0825132		Stud, reduction gear housing cover to housing	9	
0570004		Nut, reduction gear housing cover retaining	9	
0040547		Bearing, reduction gear thrust—Bottom	1	
0440357		Cover, reduction gear bottom thrust bearing	1	
0490448		Joint, reduction gear bottom thrust bearing cover to housing cover	1	
0825133		Stud, reduction gear bottom thrust bearing cover to housing cover	6	
0570004		Nut, reduction gear bottom thrust bearing cover retaining	6	
0730078		Seal, reduction gear oil—Bottom	1	
0980624		Coupling, reduction gear output	1	
0500519		Key, reduction gear output coupling locking	1	
0571224		Nut, reduction gear output coupling retaining	1	
0920914		Washer, reduction gear output coupling retaining nut	1	
0940673		Plate, reduction gear output coupling retaining nut locking	1	
0940671		Plate, reduction gear instruction	1	
0940672		Plate, reduction gear serial number	1	
0690521		Rivet, reduction gear instruction and serial number plates	6	
0995431		Arrow, reduction gear direction	1	
0690520		Rivet, reduction gear direction arrow	2	
0825137		Stud, reduction gear housing to gearbox housing	3	
0825204		Stud, reduction gear housing to gearbox housing	3	
0825203		Stud, reduction gear housing to gearbox housing	2	
0570155		Nut, reduction gear housing retaining	5	
0570005		Nut, reduction gear housing retaining	3	

**IMPORTANT**

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**FIT ONLY GENUINE PERKINS PARTS**

## NOTES

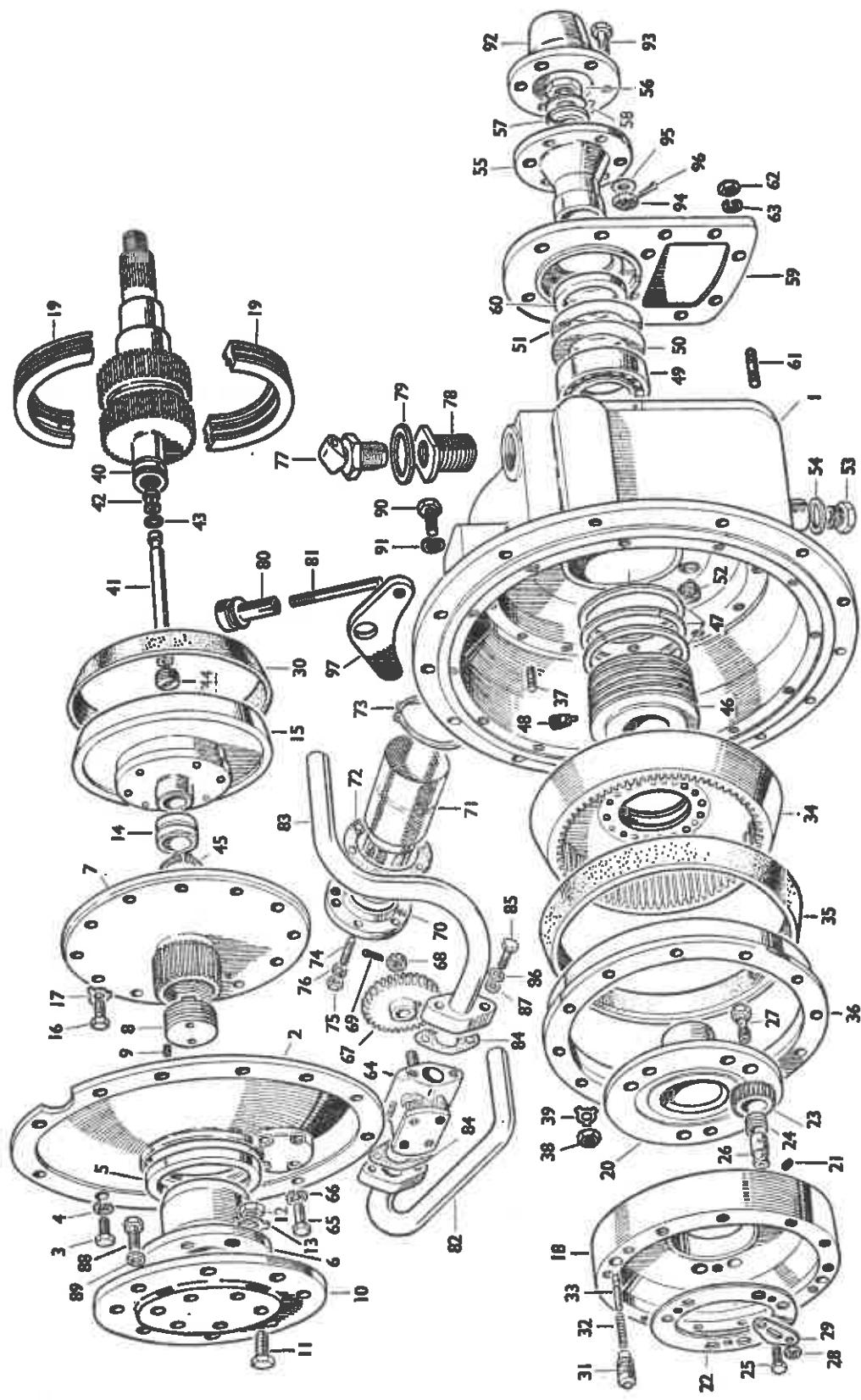
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**IMPORTANT**

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**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "2C1B"**



**PERKINS 4.270 MARINE DIESEL ENGINE**

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**SECTION "C" Continued**  
**Category 2**

**Gearboxes**  
**(MRFII/2B Type Gearboxes)**

Plate Ref.	Part No.	Description	Qty.	Remarks
31355		REVERSE GEARBOX (ASSEMBLY) "MR11/2B" TYPE— DIRECT DRIVE .....	.. 1	
31394		REVERSE GEARBOX (ASSEMBLY) "MRF11/2B" TYPE C/W 2 PINION REDUCTION GEAR (2 : 1 RATIO) ..	.. 1	
31395		REVERSE GEARBOX (ASSEMBLY) "MRF11/2B" TYPE C/W 2 PINION REDUCTION GEAR (3 : 1 RATIO) ..	.. 1	
31396		REVERSE GEARBOX (ASSEMBLY) "MRF11/2B" TYPE C/W 3 PINION REDUCTION GEAR (2 : 1 RATIO) ..	.. 1	
31397		REVERSE GEARBOX (ASSEMBLY) "MRF11/2B" TYPE C/W 3 PINION REDUCTION GEAR (3 : 1 RATIO) ..	.. 1	
1 0440482		HOUSING, REVERSE GEARBOX ..	.. 1	
2 0330657		Plate, reverse gearbox ..	.. 1	
3 0095126		Setscrew, reverse gearbox plate to housing ..	.. 11	
4 0920053		Washer, reverse gearbox plate setscrew ..	.. 11	
5 0730051		Oil-Seal, reverse gearbox plate to input coupling ..	.. 1	
6 31312		Coupling, reverse gearbox ..	.. 1	
7 0995252		Member, reverse gearbox input ..	.. 1	
8 0650607		Plug, reverse gearbox input member ..	.. 1	
9 0720607		Grubsscrew, reverse gearbox input member plug ..	.. 1	
10 0470624		Adaptor, reverse gearbox input member ..	.. 1	
11 0095285		Bolt, reverse gearbox input member adaptor ..	.. 6	
12 0570006		Nut, reverse gearbox input member ..	.. 6	
13 0921066		Washer, reverse gearbox input member ..	.. 6	
14 0040534		Bush, reverse gearbox inner member ..	.. 1	
15 31338		FORWARD CONE AND INNER MEMBER ..	.. 1	
16 0095126		Setscrew, input member to planet carrier ..	.. 12	
17 0920786		Washer, input member setscrew ..	.. 12	
18 0995250		PLANET CARRIER, REVERSE GEARBOX ..	.. 1	
19 0040532		Bush, reverse gearbox planet carrier ..	.. 1 pr.	
20 0995249		Member, reverse gearbox planet carrier locating ..	.. 1	
21 0720607		Grubsscrew, reverse gearbox planet carrier ..	.. 1	
22 0940386		Backplate, reverse gearbox planet carrier ..	.. 1	
23 0410072		Pinion, reverse gearbox planet ..	.. 6	
24 0040535		Bush, reverse gearbox planet pinion ..	.. 6	
25 0095127		Setscrew, reverse gearbox planet pinion bush ..	.. 3	
26 0770034		Sleeve, reverse gearbox planet ..	.. 6	
27 0610659		Pin, reverse gearbox planet sleeve ..	.. 6	
28 0570002		Nut, reverse gearbox planet sleeve pin ..	.. 6	
29 0940387		Locking plate, reverse gearbox planet sleeve ..	.. 3	
30 0995253		Clutch lining, reverse gearbox forward drive ..	.. 1	
31 0910034		Valve, reverse gearbox relay—Forward clutch ..	.. 1	
32 0780116		Spring, reverse gearbox relay valve ..	.. 1	
33 0610658		Pin, reverse gearbox relay valve spring guide ..	.. 1	
34 32722		Astern cone and diaphragm, reverse gearbox ..	.. 1 Replaces 31337	
35 0995159		Clutch lining, reverse gearbox astern clutch ..	.. 1	
36 0640098		Ring, reverse gearbox astern clutch lining retaining ..	.. 1	
37 0825021		Stud, reverse gearbox astern clutch lining retaining ring to gearbox casing ..	12	
38 0570003		Nut, reverse gearbox astern clutch lining retaining ring retaining ..	.. 12	
39 0920786		Washer, reverse gearbox astern clutch lining retaining nut ..	.. 12	

**IMPORTANT**  
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**FIT ONLY GENUINE PERKINS PARTS**

**PERKINS 4.270 MARINE DIESEL ENGINE**

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**SECTION "C" Continued**  
**Category 2 Continued**

**Gearboxes**  
**(MRFII/2B Type Gearboxes)**

Plate Ref.	Part No.	Description	Qty.	Remarks
	0995251	Annulus, reverse gearbox	.. .. ..	.. 1 { Used only with 31337. Obsolete—Use 32722
	0095118	Bolt, reverse gearbox annulus to astern cone	.. .. ..	.. 16 }
	0570152	Nut, reverse gearbox annulus retaining	.. .. ..	.. 16 }
	0610031	Split pin, reverse gearbox annulus retaining nut	.. .. ..	.. 16 }
	31339	OUTPUT SHAFT, REVERSE GEARBOX Comprising :—	.. .. ..	.. 1
40	0750192	Shaft, reverse gearbox output	.. .. ..	.. 1
41	0470521	Insert, reverse gearbox output shaft—Long	.. .. ..	.. 1
42	0470520	Insert, reverse gearbox output shaft—Short	.. .. ..	.. 1
43	0640041	Sealing ring, reverse gearbox output shaft	.. .. ..	.. 1
44	0650606	Plug, reverse gearbox output shaft	.. .. ..	.. 1
45	0170110	Circlip, reverse gearbox output shaft	.. .. ..	.. 1
46	0993544	Oil-muff, reverse gearbox output shaft	.. .. ..	.. 1
47	0640039	Ring, reverse gearbox output shaft oil-muff	.. .. ..	.. 3
48	0610817	Pin, reverse gearbox output shaft oil-muff	.. .. ..	.. 1
49	0040568	Bearing, reverse gearbox output shaft	.. .. ..	.. 1
50	0760099	Shim, reverse gearbox output shaft bearing .003"	.. .. ..	.. 2
51	0760100	Shim, reverse gearbox output shaft bearing .002"	.. .. ..	.. 2
52	31335	RELEASE VALVE, REVERSE GEARBOX BEARING HOUSING	.. .. ..	.. 1
53	0650605	Plug, reverse gearbox drain	.. .. ..	.. 1
54	0920785	Washer, reverse gearbox drain plug	.. .. ..	.. 1
55	0980641	Coupling, reverse gearbox output shaft	.. .. ..	.. 1
56	0571160	Nut, reverse gearbox output shaft retaining	.. .. ..	.. 1
57	0920784	Washer, reverse gearbox output shaft retaining nut—Taper	.. .. ..	.. 1
58	0920777	Tab-washer, reverse gearbox output shaft retaining nut	.. .. ..	.. 1
59	0240584	END COVER, REVERSE GEARBOX BEARING HOUSING	.. .. ..	.. 1
60	0730047	Oil seal, reverse gearbox bearing housing end cover	.. .. ..	.. 1
61	0825200	Stud, reverse gearbox bearing housing end cover to housing	.. .. ..	.. 12
62	0570004	Nut, reverse gearbox bearing housing end cover retaining	.. .. ..	.. 12
63	0920054	Washer, reverse gearbox bearing housing end cover retaining nut	.. .. ..	.. 12
64	31340	PUMP, REVERSE GEARBOX OIL	.. .. ..	.. 1
65	0745205	Setscrew, reverse gearbox oil pump securing	.. .. ..	.. 4
66	0920788	Washer, reverse gearbox oil pump securing setscrew	.. .. ..	.. 4
67	0410071	Gear, reverse gearbox oil pump	.. .. ..	.. 1
68	0571167	Nut, reverse gearbox oil pump gear retaining	.. .. ..	.. 1
69	0610007	Split pin, reverse gearbox oil pump gear retaining nut	.. .. ..	.. 1
70	0080201	BODY, REVERSE GEARBOX OIL PUMP FILTER	.. .. ..	.. 1
71	0800061	Strainer, reverse gearbox oil pump filter body	.. .. ..	.. 1
72	0490596	Joint, reverse gearbox oil pump filter body strainer	.. .. ..	.. 1
73	0170123	Circlip, reverse gearbox oil pump filter	.. .. ..	.. 1
74	0825157	Stud, reverse gearbox oil pump filter body	.. .. ..	.. 5
75	0570002	Nut, reverse gearbox oil pump filter body retaining	.. .. ..	.. 5
76	0920052	Washer, reverse gearbox oil pump filter body retaining nut	.. .. ..	.. 5
77	0080122	Body, reverse gearbox breather	.. .. ..	.. 1
78	0770033	Sleeve, reverse gearbox breather body	.. .. ..	.. 1
	0350522	Dowel, reverse gearbox breather body	.. .. ..	.. 1
79	0920783	Washer, reverse gearbox breather body to casing	.. .. ..	.. 1
	0940139	Nameplate reverse gearbox	.. .. ..	.. 1
	0720538	Screw, reverse gearbox nameplate securing	.. .. ..	.. 4

**IMPORTANT**  
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**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "C" Continued**  
**Category 2 Continued**

**Gearboxes**  
**(MRFII/2B Type Gearboxes)**

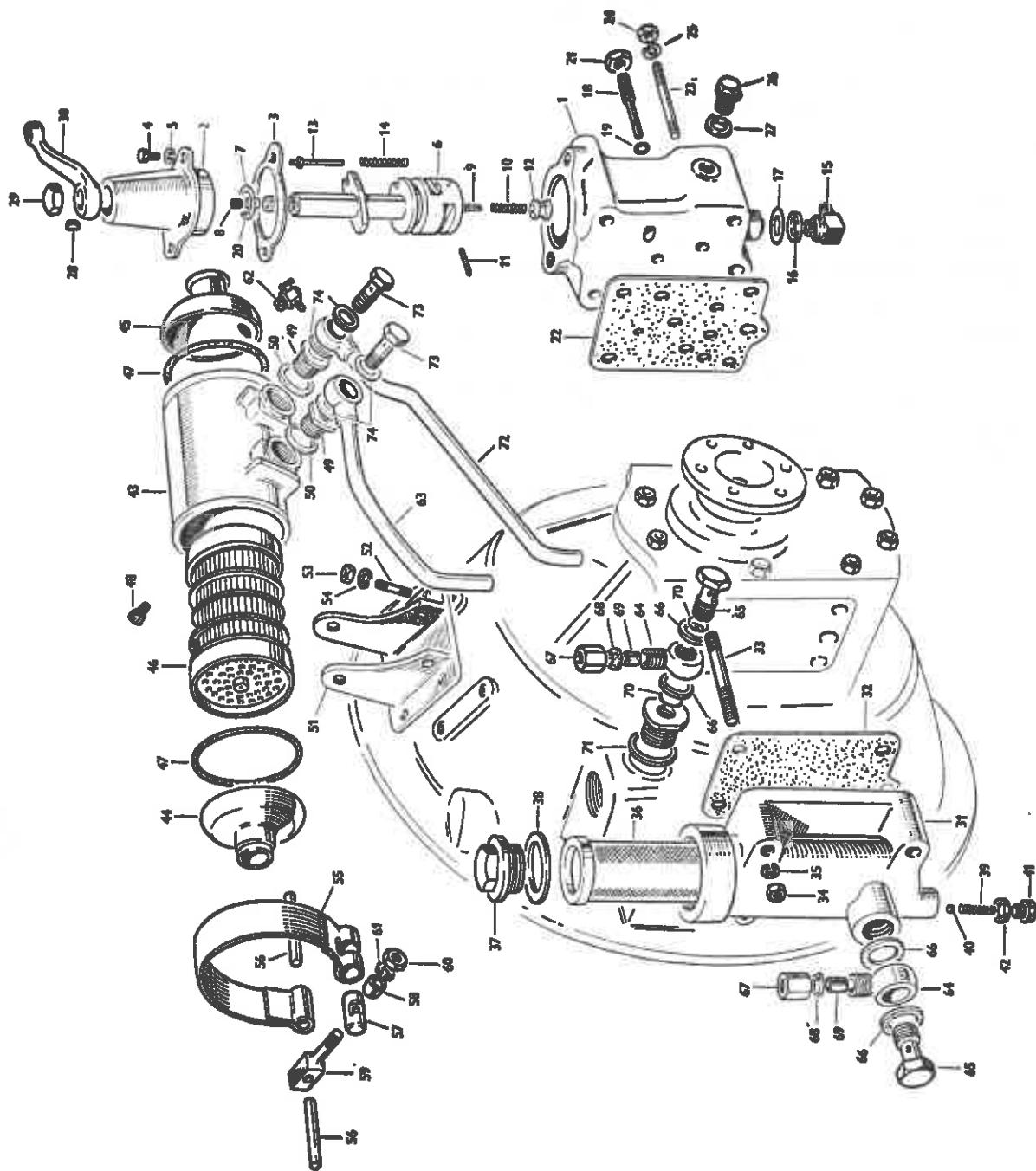
Plate Ref.	Part No.	Description	Qty.	Remarks
80	0510011	Handle, reverse gearbox dipstick	.. .. ..	1
81	0320038	Dipstick, reverse gearbox	.. .. ..	1
82	32703	PIPE, REVERSE GEARBOX SUCTION—STRAINER TO PUMP	.. 1	
83	32702	PIPE, REVERSE GEARBOX DELIVERY—PUMP TO FILTER	.. 1	
84	0490361	Joint, reverse gearbox suction and delivery pipe flange	.. ..	1
85	0095222	Bolt, reverse gearbox suction and delivery pipe flange	.. ..	4
86	0920966	Washer, reverse gearbox suction and delivery pipe flange bolt—Plain	.. ..	4
87	0920788	Washer, reverse gearbox suction and delivery pipe flange bolt—Copper	.. ..	4
88	0746430	Setscrew, reverse gearbox input coupling to flywheel	.. ..	8
89	0920004	Washer, reverse gearbox input coupling setscrew	.. ..	8
	0930012	Lockwire, reverse gearbox input coupling setscrew	.. ..	1
90	0746431	Setscrew, reverse gearbox to flywheel housing	.. .. ..	12
91	0920054	Washer, reverse gearbox setscrew	.. .. ..	12
92	0980612	COUPLING, REVERSE GEARBOX PROP. SHAFT HALF	.. 1	
93	0096809	Bolt, reverse gearbox prop shaft half coupling to gearbox output coupling	6	
94	0576074	Nut, reverse gearbox prop. shaft half coupling retaining	.. ..	6
95	0920007	Washer, reverse gearbox prop. shaft half coupling retaining nut	.. ..	6
96	0610008	Split-pin, reverse gearbox prop. shaft half coupling retaining nut	.. ..	6
97	0940551	Plate, engine rear lifting	.. .. ..	1 To gearbox securing setscrews

**IMPORTANT**

Always quote Engine Number when ordering Parts

**FIT ONLY GENUINE PERKINS PARTS**

**PLATE "2C2B"**



**SECTION "C" Continued**  
**Category 2 Continued**

**Gearboxes**  
**(MRFII/2B Type Gearboxes)**

Plate Ref.	Part No.	Description	Qty.	Remarks
32717		SELECTOR VALVE, REVERSE GEARBOX (ASSEMBLY)	.. 1	
		Comprising :—		
1	0440175	Casing, reverse gearbox selector valve ..	.. 1	
2	0995041	Pillar, reverse gearbox selector valve ..	.. 1	
3	0490138	Joint, reverse gearbox selector valve pillar to casing ..	.. 1	
4	0745023	Screw, reverse gearbox selector valve pillar to casing ..	.. 2	
5	0920052	Washer, reverse gearbox selector valve pillar screw ..	.. 2	
6	0995164	Rotor, reverse gearbox selector valve ..	.. 1	
7	0680014	"O" Ring, reverse gearbox selector valve rotor ..	.. 1	
8	0650536	Plug, reverse gearbox selector valve rotor ..	.. 1	
9	0780058	Spring, reverse gearbox selector valve rotor—Long ..	.. 1	
10	0630019	Plunger, reverse gearbox selector valve rotor ..	.. 1	
11	0610573	Pin, reverse gearbox selector valve rotor plunger ..	.. 1	
12	0770014	Sleeve, reverse gearbox selector valve rotor—Bottom ..	.. 1	
13	0630018	Plunger, reverse gearbox selector valve ..	.. 1	
14	0780092	Spring, reverse gearbox selector valve plunger—Short ..	.. 1	
15	0200598	Union, reverse gearbox selector valve ..	.. 1	
16	0920621	Washer, reverse gearbox selector valve union ..	.. 1	
17	0760024	Shim, reverse gearbox selector valve union .010"	.. 4	
18	0720573	Screw, reverse gearbox selector valve adjusting ..	.. 1	
19	0730036	Seal, reverse gearbox selector valve adjusting screw ..	.. 1	
20	0470515	Insert, reverse gearbox selector valve ..	.. 1	
21	0571166	Locknut, reverse gearbox selector valve adjusting screw ..	.. 1	
22	0490359	Joint, reverse gearbox selector valve to gearbox casing ..	.. 1	
23	0825022	Stud, reverse gearbox selector valve to gearbox casing ..	.. 4	
24	0570002	Nut, reverse gearbox selector valve retaining ..	.. 4	
25	0920052	Washer, reverse gearbox selector valve retaining nut ..	.. 4	
26	0650535	Plug, reverse gearbox selector valve casing ..	.. 1	
27	0920616	Washer, reverse gearbox selector valve casing plug ..	.. 1	
28	0500507	Key, reverse gearbox selector valve operating lever ..	.. 1	
29	0571062	Cap nut, reverse gearbox selector valve operating lever ..	.. 1	
30	0520080	Lever, reverse gearbox reverse gear operating ..	.. 1	
31	0440099	CASING, REVERSE GEARBOX OIL FILTER ..	.. 1	
32	0490357	Joint, reverse gearbox oil filter to gearbox casing ..	.. 1	
33	0825022	Stud, reverse gearbox oil filter to gearbox casing ..	.. 4	
34	0570002	Nut, reverse gearbox oil filter retaining ..	.. 4	
35	0920052	Washer, reverse gearbox oil filter retaining nut ..	.. 4	
36	31360	GAUZE, REVERSE GEARBOX OIL FILTER ..	.. 1	
37	0150052	Cap, reverse gearbox oil filter ..	.. 1	
38	0920593	Washer, reverse gearbox oil filter cap ..	.. 1	
39	0780092	Spring, reverse gearbox oil filter relief valve ..	.. 1	
40	0020102	Ball, reverse gearbox oil filter relief valve ..	.. 1	
41	0650533	Plug, reverse gearbox oil filter relief valve ..	.. 1	
42	0920782	Washer, reverse gearbox oil filter relief valve plug ..	.. 1	
0570301		Nut, lub. oil pressure gauge pipe ..	.. 1	To Gearbox
0560002		Nipple, lub. oil pressure gauge pipe ..	.. 1	

**IMPORTANT**  
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**FIT ONLY GENUINE PERKINS PARTS**

**SECTION "C" Continued**  
**Category 2 Continued**

## Gearboxes

**(MRFII/2B Type Gearboxes)**

Plate Ref.	Part No.	Description	Qty.	Remarks
32165		COOLER, LUB. OIL (ASSEMBLY) Comprising :—	1	
43	0440468	Housing, lub. oil cooler tube stack	1	
44	32386	Cover, lub. oil cooler c/w water inlet port	1	
45	32387	Cover, lub. oil cooler c/w water outlet port	1	
46	32388	Tube Stack, lub. oil cooler	1	
47	0730101	Seal, lub. oil cooler covers	2	
48	0720714	Screw, lub. oil cooler tube stack retaining	2	
	0940910	Identification Plate, lub. oil cooler	1	
	0690051	Rivet, lub. oil cooler identification plate retaining	2	
49	0470522	Insert, reverse gearbox lub. oil cooler	2	In Lub. Oil Cooler Inlet and Outlet Ports
50	2411108	Washer, reverse gearbox lub. oil cooler insert	2	
51	0101181	BRACKET, REVERSE GEARBOX LUB. OIL COOLER	1	
52	0821623	Stud, reverse gearbox lub. oil cooler bracket to gearbox	4	
53	0570003	Nut, reverse gearbox lub. oil cooler bracket retaining	4	
54	0920053	Washer, reverse gearbox lub. oil cooler bracket retaining nut	4	
55	0810149	Strap, reverse gearbox lub. oil cooler retaining	1	
56	0610680	Pin, reverse gearbox lub. oil cooler retaining strap anchor	2	
57	0610679	Swivel pin, reverse gearbox lub. oil cooler retaining strap	1	
58	0330673	Distance-Piece, reverse gearbox lub. oil cooler retaining strap swivel pin	1	
59	0095152	Bolt, reverse gearbox hub. oil cooler retaining strap swivel	1	
60	0576002	Nut, reverse gearbox hub. oil cooler retaining strap clamping	1	
61	0920053	Washer, reverse gearbox hub. oil cooler retaining strap clamping nut	1	
62	31422	Cock, reverse gearbox hub. oil cooler water drain	1	
63	0992947	PIPE, LUB. OIL—REVERSE GEARBOX TO LUB. OIL COOLER	1	Obsolete—Use 35557105
	35557105	PIPE, LUB. OIL—REVERSE GEARBOX TO LUB. OIL COOLER	1	
64	0993545	Banjo, lub. oil pipe	2	
65		Banjo, lub. oil pipe		No longer fitted
66		Bolt, lub. oil pipe banjo		
67		Washer, lub. oil pipe banjo bolt		
68		Nut, lub. oil pipe banjo		
69		Collar, lub. oil pipe banjo		
	0095064	Ferrule, lub. oil pipe banjo		
	2411110	Bolt, lub. oil pipe banjo	2	To gearbox
70	0730049	Washer, lub. oil pipe banjo	2	
71	0920780	"O" Ring, lub. oil pipe banjo	2	
72	0992948	PIPE, LUB. OIL—COOLER TO REVERSE GEARBOX FILTER	1	Obsolete—Use 35557106
	35557106	PIPE, LUB. OIL—COOLER TO REVERSE GEARBOX FILTER	1	
73	0095182	Bolt, lub. oil cooler pipe banjo	2	To cooler
74	2411110	Washer, lub. oil cooler pipe banjo bolt	4	

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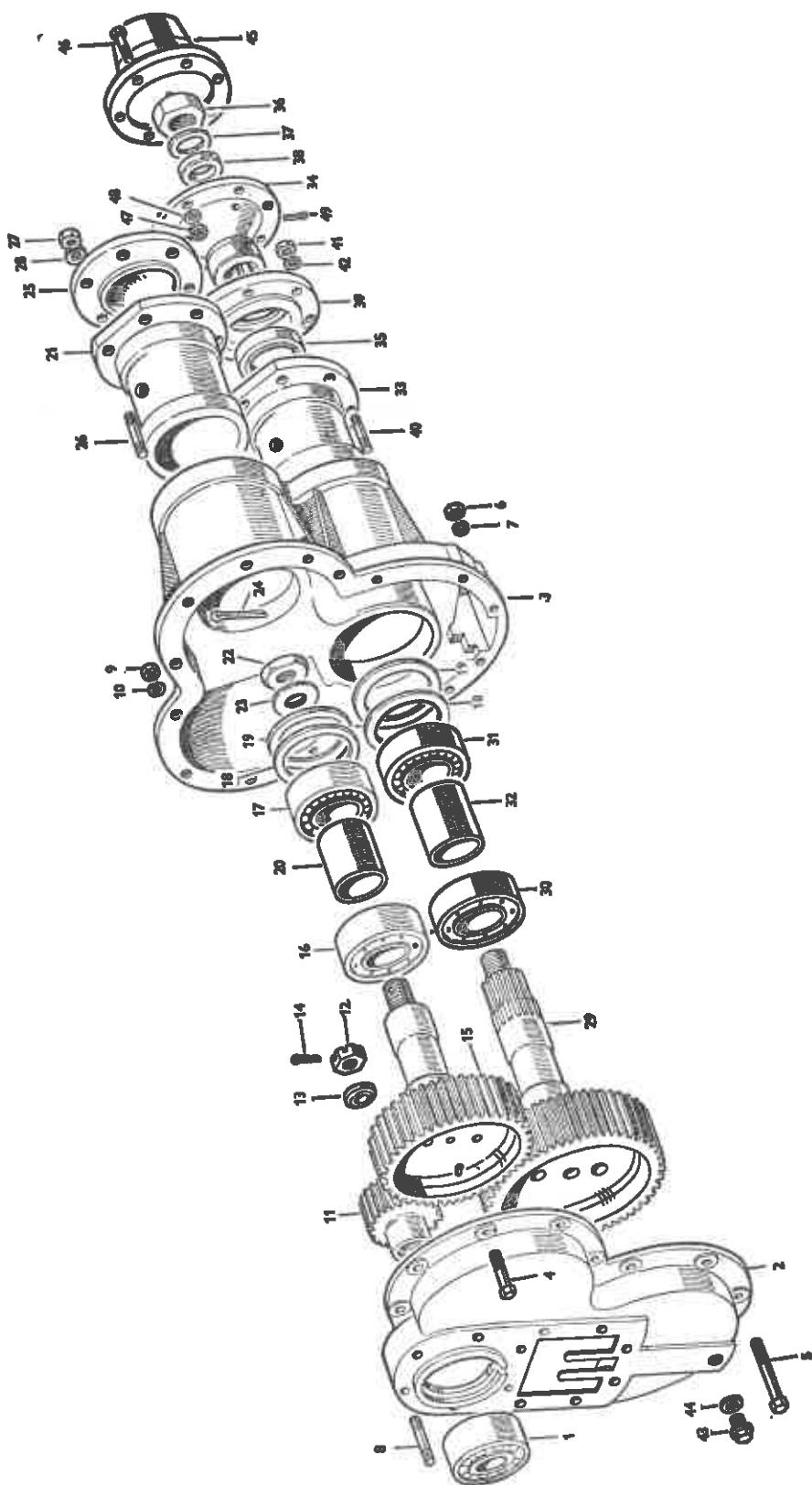
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## **NOTES**

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**IMPORTANT**  
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**PLATE "2C3B"**



**SECTION C Continued**  
**Category 2 Continued**
**Gearboxes**  
**(MRFII/2B Type Gearboxes)**

Plate Ref.	Part No.	Description	Qty.	Remarks
	32707	REDUCTION GEAR (ASSEMBLY) 3 PINION (2 : 1 RATIO)	.. 1	
	32709	REDUCTION GEAR (ASSEMBLY) 3 PINION (3 : 1 RATIO)	.. 1	
1	0040530	Bearing, reduction gear main shaft .. .. ..	.. 1	
2	0240543	COVER, REDUCTION GEAR—INTERMEDIATE .. .. ..	.. 1	Used only with 32707
	0240583	COVER, REDUCTION GEAR—INTERMEDIATE .. .. ..	.. 1	Used only with 32709
3	0440235	HOUSING, REDUCTION GEAR BEARING .. .. ..	.. 1	Used only with 32707
	0440236	HOUSING, REDUCTION GEAR BEARING .. .. ..	.. 1	Used only with 32709
4	0095119	Bolt, reduction gear bearing housing to intermediate cover—Short .. .. ..	.. 8	
5	0095124	Bolt, reduction gear bearing housing to intermediate cover—Long .. .. ..	.. 4	
6	0570003	Nut, reduction gear bearing housing retaining .. .. ..	.. 12	
7	0920053	Washer, reduction gear bearing housing retaining nut .. .. ..	.. 12	
8	0825202	Stud, reduction gear bearing housing to intermediate cover .. .. ..	.. 3	
9	0570004	Nut, reduction gear bearing housing retaining .. .. ..	.. 3	
10	0920054	Washer, reduction gear bearing housing retaining nut .. .. ..	.. 3	
11	0410147	PINION, REDUCTION GEAR DRIVING .. .. ..	.. 1	Used only with 32707
	0410173	PINION, REDUCTION GEAR DRIVING .. .. ..	.. 1	Used only with 32709
12	0571162	Nut, reduction gear driving pinion .. .. ..	.. 1	
13	0921068	Washer, reduction gear driving pinion nut .. .. ..	.. 1	
14	0610014	Split pin, reduction gear driving pinion nut—Locking .. .. ..	.. 1	
15	0410153	Gear, reduction gear idling .. .. ..	.. 1	
16	0040536	Bearing, reduction gear idler gear—Roller .. .. ..	.. 1	
17	0040529	Bearing, reduction gear idler gear—Ball .. .. ..	.. 1	
18	0760099	Shim, reduction gear main shaft bearing .003" .. .. ..	..	As reqd.
19	0760100	Shim, reduction gear main shaft bearing .002" .. .. ..	..	As reqd.
20	0330656	Distance-piece, reduction gear idler bearing .. .. ..	.. 1	
21	0770036	Sleeve, reduction gear idler bearing .. .. ..	.. 1	
22	0571163	Nut, reduction gear idler gear securing .. .. ..	.. 1	
23	0920776	Washer, reduction gear idler gear securing nut .. .. ..	.. 1	
24	0610660	Split pin, reduction gear idler gear securing nut .. .. ..	.. 1	
25	0240291	Cover, reduction gear idler gear .. .. ..	.. 1	
26	0825069	Stud, reduction gear idler gear cover to bearing housing .. .. ..	.. 6	
27	0570003	Nut, reduction gear idler gear cover retaining .. .. ..	.. 6	
28	0920053	Washer, reduction gear idler gear cover retaining nut .. .. ..	.. 6	
29	31399	OUTPUT SHAFT AND GEAR .. .. ..	.. 1	Used only with 32707
	32705	OUTPUT SHAFT AND GEAR .. .. ..	.. 1	Used only with 32709
30	0040536	Bearing, reduction gear output shaft—Roller .. .. ..	.. 1	
31	0040568	Bearing, reduction gear output shaft—Ball .. .. ..	.. 1	
32	0330656	Distance-piece, reduction gear output shaft bearing .. .. ..	.. 1	
33	0770036	Sleeve, reduction gear output shaft bearing .. .. ..	.. 1	
34	0980642	Coupling, reduction gear output shaft .. .. ..	.. 1	
35	0730047	Seal, reduction gear output shaft coupling .. .. ..	.. 1	
36	0571160	Nut, reduction gear output shaft coupling securing .. .. ..	.. 1	
37	0920777	Tab-washer, reduction gear output shaft coupling securing nut .. .. ..	.. 1	
38	0920748	Washer, reduction gear output shaft coupling securing nut—Taper .. .. ..	.. 1	
39	0240292	Cover, reduction gear output shaft .. .. ..	.. 1	
40	0825069	Stud, reduction gear output shaft cover to bearing housing .. .. ..	.. 6	
41	0570003	Nut, reduction gear output shaft cover retaining .. .. ..	.. 6	
42	0920053	Washer, reduction gear output shaft cover retaining nut .. .. ..	.. 6	
43	0650533	Plug, reduction gear drain .. .. ..	.. 1	
44	0920967	Washer, reduction gear drain plug .. .. ..	.. 1	
45	0980612	COUPLING, REVERSE GEARBOX PROP. SHAFT HALF .. .. ..	.. 1	

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**SECTION "C" Continued**  
**Category 2 Continued**

## **Gearboxes**

### **(MRFII/2B Type Gearboxes)**

Plate Ref.	Part No.	Description	Qty.	Remarks
46	0096809	Bolt, reverse gearbox prop. shaft half coupling to gearbox output coupling	6	
47	0576074	Nut, reverse gearbox prop. shaft half coupling retaining	..	6
48	0920007	Washer, reverse gearbox prop. shaft half coupling retaining nut	..	6
49	0610008	Split pin, reverse gearbox prop. shaft half coupling retaining nut	..	6
32706		REDUCTION GEAR (ASSEMBLY) 2 PINION (2 : 1 RATIO)	..	1
32708		REDUCTION GEAR (ASSEMBLY) 2 PINION (3 : 1 RATIO)	..	1
0440481		HOUSING, REDUCTION GEAR MAIN	..	1
0440233		HOUSING, REDUCTION GEAR BEARING	..	1
0825158		Stud, reduction gear bearing housing to gearbox	..	4
0570004		Nut, reduction gear bearing housing retaining	..	4
0920054		Washer, reduction gear bearing housing retaining nut	..	4
0095119		Bolt, reduction gear housing to main housing	..	6
0095124		Bolt, reduction gear bearing housing to main housing	..	4
0570003		Nut, reduction gear bearing housing retaining	..	10
0920053		Washer, reduction gear bearing housing retaining nut	..	10
0040530		Bearing, reduction gear input shaft	..	1
0170124		Circlip reduction gear input shaft bearing	..	1
0650533		Plug, reduction gear bearing housing	..	2
0921070		Washer, reduction gear bearing housing plug	..	2
0410148		PINION, REDUCTION GEAR DRIVING	..	1 Used only with 32706
0410174		PINION, REDUCTION GEAR DRIVING	..	1 Used only with 32708
0571160		Nut, reduction gear driving pinion	..	1
0921068		Washer, reduction gear driving pinion nut	..	1
0610014		Split pin, reduction gear driving pinion nut—Locking	..	1
31400		OUTPUT SHAFT AND GEAR, REDUCTION GEAR	..	1 Used only with 32706
32704		OUTPUT SHAFT AND GEAR, REDUCTION GEAR	..	1 Used only with 32708
0040536		Bearing, reduction gear output shaft—Roller	..	1
0040568		Bearing, reduction gear output shaft—Ball	..	1
0330656		Distance-piece, reduction gear output shaft bearing	..	1
0770035		Sleeve, reduction gear output shaft bearing	..	1
0980642		Coupling, reduction gear output shaft	..	1
0730047		Seal, reduction gear output shaft coupling	..	1
0571160		Nut, reduction gear output shaft coupling securing	..	1
0920784		Washer, reduction gear output shaft coupling securing nut—Taper	..	1
0920777		Tab-washer, reduction gear output shaft coupling securing nut	..	1
0240274		Cover, reduction gear output shaft	..	1
0760059		Shim, reduction gear output shaft cover to bearing housing .003"	..	As Reqd.
0760060		Shim, reduction gear output shaft cover to bearing housing .005"	..	As Reqd.
0825069		Stud, reduction gear output shaft cover to bearing housing	..	6
0570003		Nut, reduction gear output shaft cover retaining	..	6
0920053		Washer, reduction gear output shaft cover retaining nut	..	6
0940390		Baffle-plate, reduction gear bearing housing	..	1 Used only with 32706
0095121		Bolt, reduction gear bearing housing baffle-plate securing	..	2
0570002		Nut, reduction gear bearing housing baffle-plate securing bolt	..	2
0920052		Washer, reduction gear bearing housing baffle-plate securing bolt—Spring	2	
0920788		Washer, reduction gear bearing housing baffle-plate securing bolt—Plain	2	
0650533		Plug, reduction gear bearing housing drain	..	2
0920967		Washer, reduction gear bearing housing drain plug	..	2

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