SECTION A

ENGINE (USHM2)

OF THE MORRIS MINOR (Series MM)

General description.

Lubrication system.

Section No. A.1 Draining the engine sump.

Section No. A.2 Removal and replacement of sump.

Section No. A.3 Removal of oil pump.

Section No. A.4 Dismantling, reassembling, and replacing oil pump.

Section No. A.5 Removal and replacement of piston and connecting rod.

Section No. A.6 Dismantling and reassembling piston and connecting rod.

Section No. A.7 Removal and replacement of piston rings.

Section No. A.8 Fitting gudgeon pins.

Section No. A.9 Piston sizes and cylinder bores.

Section No. A.10 Removal and replacement of main and big-end bearings.

Section No. A.11 Removal and replacement of engine.

Section No. A.12 Removal and replacement of power unit.

Section No. A.13 Removal of timing cover.

Section No. A.14 Replacement of timing cover.

Section No. A.15 Removal and replacement of timing chain.

Section No. A.16 Removal and replacement of carburetter.

Section No. A.17 Removal and replacement of inlet and exhaust manifold.

Section No. A.18 Removal and replacement of cylinder head.

Section No. A.19 Removal and replacement of camshaft.

Section No. A.20 Removal and replacement of tappets.

Section No. A.21 Tappet adjustment.

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Section No. A.25 Regrinding of crankshaft.

Section No. A.26 Removal and replacement of valves.

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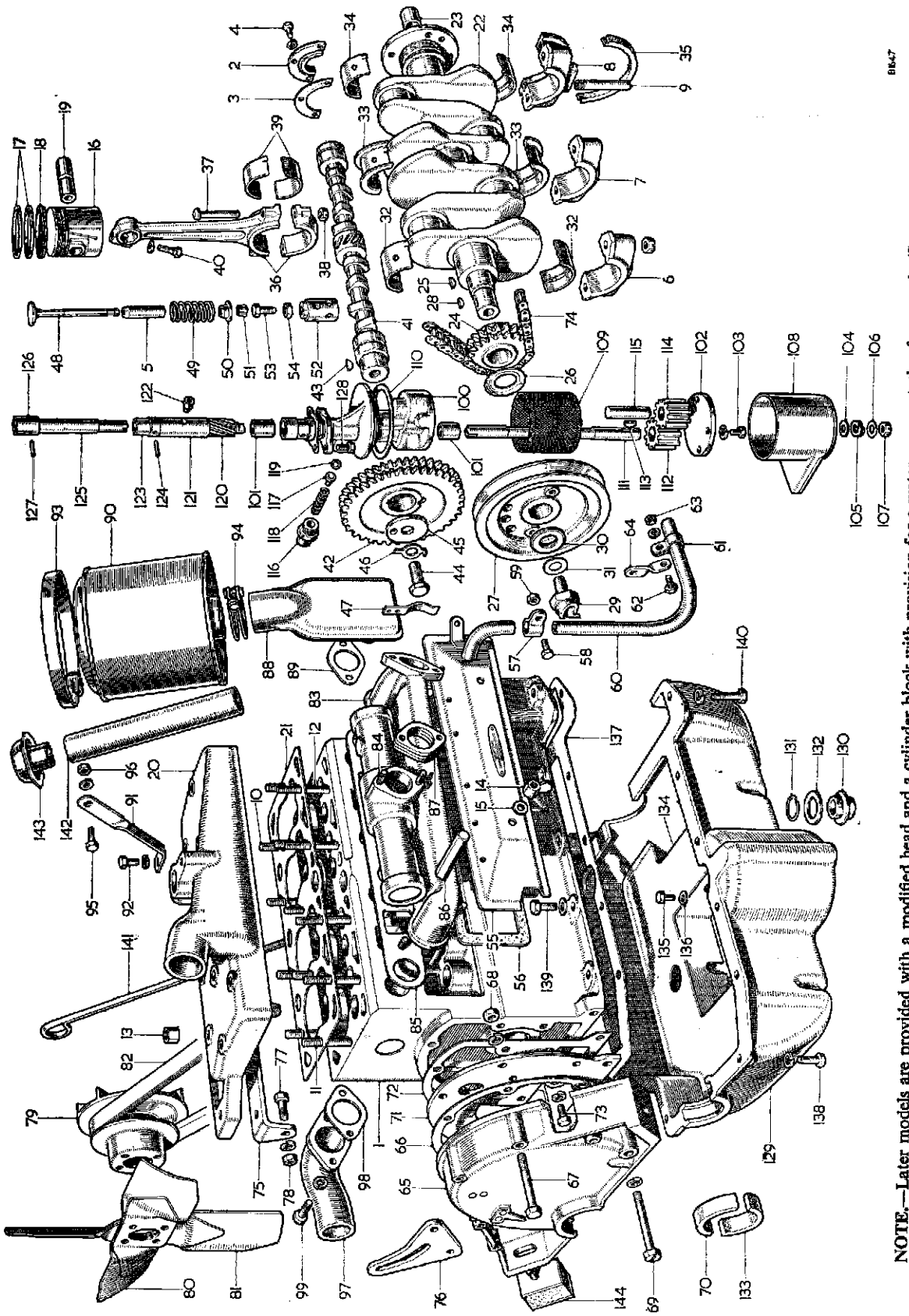
THE ENGINE COMPONENTS



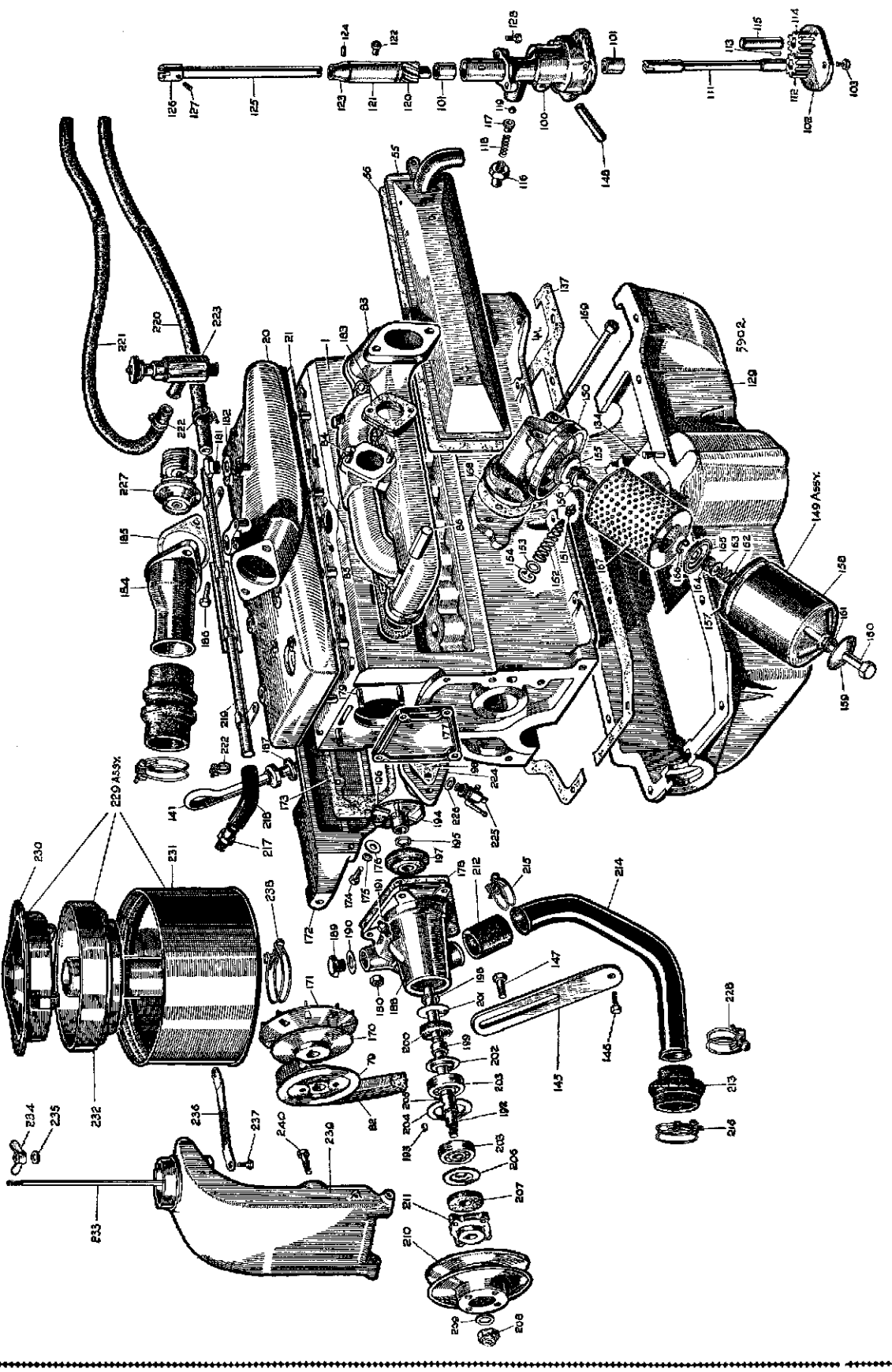
NOTE.—Later models are provided with a modified head and a cylinder block with provision for a water pump at the front end. (See pages A.4 and A.5.) Export models are fitted with an oil bath air cleaner. For remaining components and later engines see pages A.4 and A.5.

KEY TO THE ENGINE COMPONENTS

No.	Description
1.	Cylinder block assembly.
2.	Cover—crankshaft oil seal.
3.	Joint—crankshaft oil seal cover.
4.	Bolt—crankshaft oil seal cover.
5.	Valve guide.
6.	Cap—main bearing—front.
7.	Cap—main bearing—centre.
8.	Cap—main bearing—rear.
9.	Pipe—oil drain.
10.	Stud—cylinder head—short.
11.	Stud—cylinder head—medium.
12.	Stud—cylinder head—long.
13.	Nut—cylinder head stud.
14.	Wing nut—tappet cover stud.
15.	Washer—tappet cover stud.
16.	Piston.
17.	Piston ring—top.
18.	Piston ring—bottom.
19.	Gudgeon pin.
20.	Cylinder head.
21.	Cylinder head gasket.
22.	Crankshaft.
23.	Bush—drive gear spigot.
24.	Gear—timing.
25.	Key—timing gear.
26.	Oil thrower.
27.	Pulley.
28.	Key—pulley.
29.	Nut—starting-handle dog.
30.	Washer—pulley.
31.	Shim—starting-handle dog nut (·005 in.).
32.	Bearing—front main.
33.	Bearing—centre main.
34.	Bearing—rear main.
35.	Seal—rear bearing cap.
36.	Connecting rod.
37.	Bolt—connecting rod cap.
38.	Nut—cap bolt.
39.	Bearing—halves.
40.	Clamp screw—gudgeon pin.
41.	Camshaft.
42.	Gear.
43.	Key—gear.
44.	Thrust screw—camshaft.
45.	Washer—thrust screw.
46.	Lock washer—thrust screw.
47.	Thrust spring—camshaft.
48.	Valve.
49.	Spring—valve.
50.	Cap—valve spring.
51.	Retainers—valve spring cap.
52.	Tappet.
53.	Screw—tappet adjusting.
54.	Locknut—tappet adjusting screw.
55.	Cover—tappet chamber.
56.	Joint—tappet chamber cover.
57.	Clip—breather elbow.
58.	Bolt—elbow clip.
59.	Nut—elbow clip bolt.
60.	Fume pipe.
61.	Clip—fume pipe.
62.	Bolt—fume pipe clip.
63.	Nut—fume pipe clip bolt.
64.	Support—fume pipe.
65.	Case—timing gear.
66.	Joint—timing gear case.
67.	Bolt—timing case to packing plate.
68.	Nut—timing case bolt.
69.	Bolt—slotted—timing case to block.
70.	Packing—timing case to crankshaft.
71.	Plate—packing—front.
72.	Joint—front packing plate.
73.	Bolt—packing plate to block.
74.	Chain—timing.
75.	Bracket—dynamo swivel.
76.	Bracket—swivel—dynamo.
77.	Bolt—dynamo swivel.
78.	Nut—dynamo swivel bolt.
79.	Pulley—dynamo.
80.	Fan blade.
81.	Fan blade—offset.
82.	Belt—fan and dynamo.
83.	Manifold—inlet and exhaust.
84.	Stud—manifold to carburetter.
85.	Gasket—manifold to cylinder block.
86.	Nut—manifold stud.
87.	Gasket—carburetter to manifold.
88.	Pipe—carburetter to air silencer (Home).
89.	Joint.
90.	Air silencer (Home).
91.	Bracket—silencer support (Home).
92.	Bolt—support bracket (Home).
93.	Clip—silencer to support (Home).
94.	Clip—silencer to pipe (Home).
95.	Bolt—support clip (Home).
96.	Nut—support clip bolt (Home).
97.	Pipe—water inlet.
98.	Joint—water inlet pipe.
99.	Bolt—water inlet pipe to block.
100.	Body—oil pump.
101.	Bush—oil pump shaft.
102.	Cover—oil pump body.
103.	Bolt—cover to body.
104.	Washer—fibre—stud.
105.	Washer—spring—stud.
106.	Washer—plain—stud.
107.	Nut—stud.
108.	Hood—pump.
109.	Gauze—filter.
110.	Joint—hood.
111.	Shaft—pump.
112.	Gear—driver.
113.	Key—driver gear to shaft.
114.	Gear—driven.
115.	Pin—driven gear.
116.	Plug—relief valve.
117.	Pad—relief valve.
118.	Spring—relief valve.
119.	Ball—relief valve.
120.	Shaft and gear—pump drive.
121.	Bush—shaft and gear.
122.	Dowel—bush retaining.
123.	Connection—shaft and gear.
124.	Pin—connection retaining.
125.	Shaft—distributor drive.
126.	Sleeve—distributor drive shaft.
127.	Pin—distributor drive shaft sleeve.
128.	Bolt—pump body to block.
129.	Sump.
130.	Plug—drain.
131.	Circlip—drain plug.
132.	Washer—drain plug.
133.	Packing—sump to crankshaft—front end.
134.	Tray—sump.
135.	Bolt—tray to sump.
136.	Washer—tray bolt.
137.	Joint—sump to block.
138.	Bolt—sump to block—short.
139.	Bolt—sump to block (stud and nut on later models).
140.	Bolt—sump to block—long.
141.	Indicator—oil level.
142.	Oil filler—with baffle.
143.	Cap—oil filler.
144.	Mounting rubber—front.

THE ENGINE COMPONENTS

Models fitted with water pump, external oil filter, and car heater equipment



KEY TO THE ENGINE COMPONENTS

No.	Description
1.	Cylinder block assembly.
20.	Cylinder head.
21.	Cylinder head gasket.
55.	Cover—tappet chamber.
56.	Joint—tappet chamber cover.
79.	Pulley—dynamo.
82.	Belt—fan and dynamo.
83.	Manifold—inlet and exhaust.
84.	Stud—manifold to carburetter.
85.	Gasket—manifold to cylinder block.
86.	Nut—manifold stud.
98.	Joint—water inlet pipe.
100.	Body—oil pump.
101.	Bush—oil pump shaft.
102.	Cover—oil pump body.
103.	Bolt—cover to body.
111.	Shaft—pump.
112.	Gear—driver.
113.	Key—driver gear to shaft.
114.	Gear—driven.
115.	Pin—driven gear.
116.	Plug—relief valve.
117.	Pad—relief valve.
118.	Spring—relief valve.
119.	Ball—relief valve.
120.	Shaft and gear—pump drive.
121.	Bush—shaft and gear.
122.	Dowel—bush retaining.
123.	Connection—shaft and gear.
124.	Pin—connection retaining.
125.	Shaft—distributor drive.
126.	Sleeve—distributor drive shaft.
127.	Pin—distributor drive shaft sleeve.
128.	Bolt—pump body to block.
129.	Sump.
134.	Tray—sump.
137.	Joint—sump to block.
141.	Indicator—oil level.
145.	Link—adjusting.
146.	Bolt—swivel bracket and link.
147.	Screw—dynamo adjusting.
148.	Pipe—oil suction.
149.	Oil filter assembly.
150.	Head—oil filter.
151.	Valve—relief.
152.	Spring—valve.
153.	Washer—valve spring.
154.	Circlip—spring retainer.
155.	Guide—top—element.
156.	Centre tube.
157.	Gasket—sump to head.
158.	Sump filter.
159.	Reinforcement washer—sump.
160.	Centre-bolt.
161.	Seal—centre-bolt.
162.	Spring—centre-bolt.
163.	Washer—bottom seal.
164.	Seal—bottom—element guide.
165.	Guide—bottom—element.
166.	Circlip—centre-bolt.
167.	Element.
168.	Joint—to block.
169.	Bolt—to block.
170.	Pulley—rear half—dynamo.
171.	Fan—dynamo.
172.	Cover—water jacket.
173.	Joint—cover.
174.	Bolt—cover.
175.	Washer—cover bolt.
176.	Washer—inside cover.
177.	Plate—water pump blanking.
178.	Joint—pump to block or plate to block.
179.	Stud—blanking plate.
180.	Nut—stud.
181.	Plug—heater connection.
182.	Washer—plug.
183.	Distance piece—carburetter to manifold.
184.	Pipe—outlet.
185.	Joint—pipe.
186.	Bolt—pipe.
187.	Felt washer.
188.	Body—water pump.
189.	Plug—heater connection.
190.	Washer—heater plug.
191.	Grease nipple.
192.	Spindle.
193.	Key—spindle.
194.	Vane.
195.	Washer—vane.
196.	Taper pin—vane.
197.	Seal assembly.
198.	Circlip—spindle.
199.	Collar—spindle.
200.	Felt washer.
201.	Dust cover—flat.
202.	Dust cover—dished.
203.	Bearing.
204.	Circlip—bearing.
205.	Distance tube.
206.	Dust cover.
207.	Felt washer.
208.	Nut—spindle.
209.	Washer—spindle nut.
210.	Pulley.
211.	Hub—pulley.
212.	Hose—pump to connecting pipe.
213.	Hose—connecting pipe to radiator.
214.	Connecting pipe.
215.	Clip—hose—top.
216.	Clip—hose—large (to radiator).
217.	Union—pump to elbow.
218.	Elbow—rail to union.
219.	Pipe—water rail.
220.	Hose—heater to top rail.
221.	Hose—heater to control valve.
222.	Clip—hose and elbow.
223.	Valve—heater control.
224.	Cover—water drain.
225.	Tap—water drain.
226.	Washer—water drain.
227.	Thermostat—cylinder head.
228.	Clip—bottom hose.
229.	Cleaner assembly—air.
230.	Element and cover.
231.	Chamber—silencing.
232.	Container—oil.
233.	Stud—cleaner.
234.	Wing nut—stud.
235.	Washer—wing nut.
236.	Bracket—cleaner.
237.	Bolt—bracket to pipe.
238.	Clip—cleaner to pipe.
239.	Pipe—to cleaner.
240.	Bolt—pipe to carburetter.

GENERAL DESCRIPTION

The four-cylinder, side-valve engine is built in unit construction with a single-plate dry clutch and four-speed gearbox.

It has a robust four-throw crankshaft, carried in three renewable white-metal steel-backed bearings fitted without shims.

The thrust is taken by the centre bearing, which is flanged for this purpose.

The connecting rod big-end bearings are also renewable white-metal-lined steel-backed bearings fitted without shims. The little-end, embracing the gudgeon pin, is slotted and fitted with a clamp screw and spring washer, which serve to lock it solidly to the gudgeon pin.

The pistons are of tin-coated aluminium alloy, and are fitted with two compression rings and one oil control ring.

The camshaft is supported in three bearings in the cylinder block casting and is driven from the crankshaft by a duplex roller chain. The camshaft bearings are pressure-fed with oil from the main oil gallery.

The camshaft operates the valves through the medium of chill-cast tappets located in guides cast integrally with the block. Provision for adjustment of the tappets is made by the orthodox tappet head screw and locknut.

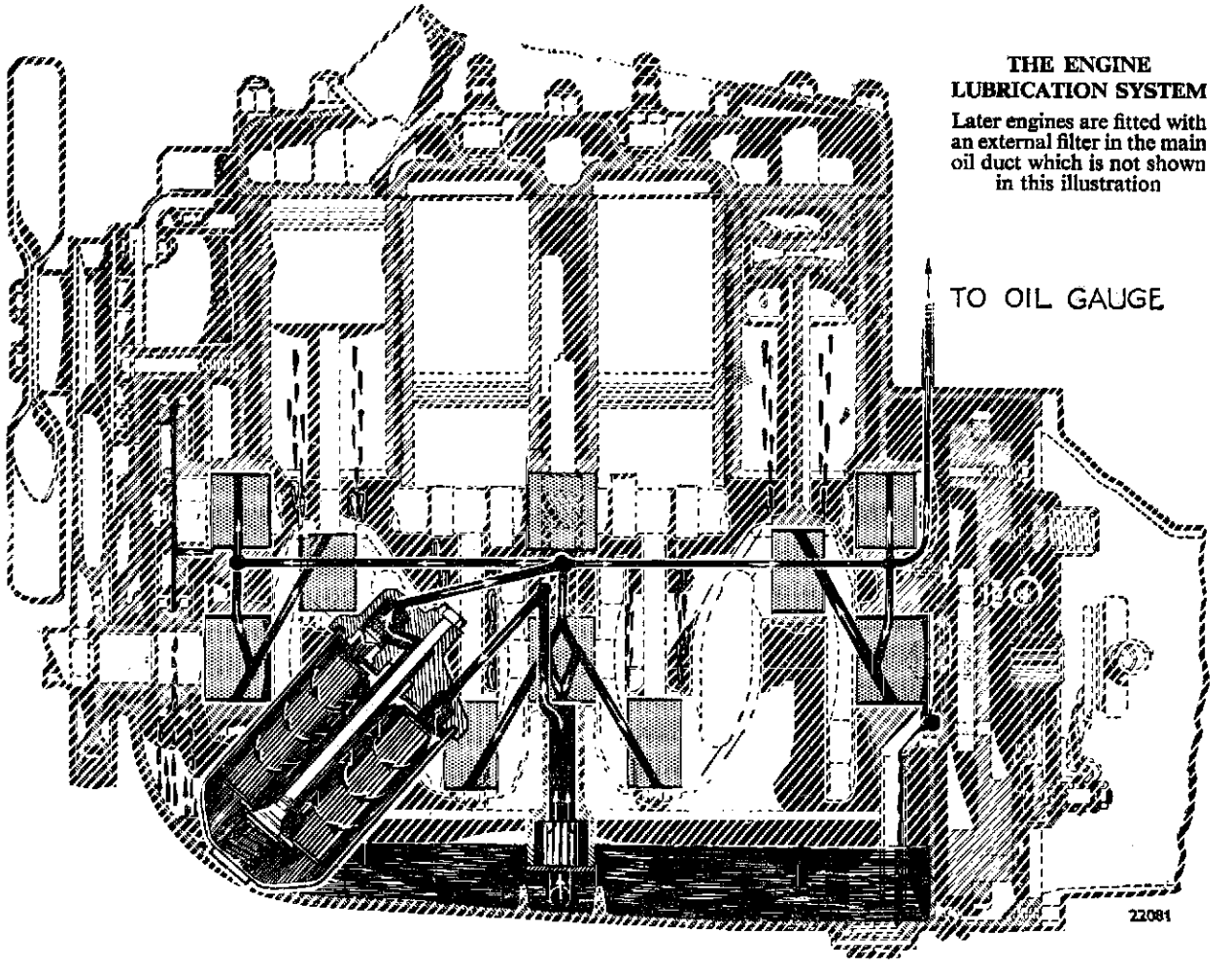
Cooling is by thermo-siphon action assisted by a fan secured to the dynamo pulley.

LUBRICATION SYSTEM

The oil supply is carried in the sump below the cylinder block. An oil filler and an oil indicator rod are fitted on the right-hand side of the engine. The oil level indicator rod has two marks on its lower end indicating the maximum and minimum levels.

The gear-type oil pump is carried in the sump of the engine, and is driven from a helical gear on the camshaft. On earlier models it draws oil from the sump through a large filter and passes clean oil to the pump shaft tunnel. On later models an external filter of the renewable element type is fitted on the left-hand side of the cylinder block.

At its upper end the pump shaft tunnel on early models



THE ENGINE LUBRICATION SYSTEM

Later engines are fitted with an external filter in the main oil duct which is not shown in this illustration

connects with a horizontal oil gallery running from front to rear of the engine, from which the oil is fed to the camshaft bearings and crankshaft main bearings through drilled passages. On models with external oil filters the pump connects with the filter intake and the filter outlet is connected to the oil gallery.

Drilled passages in the crankshaft provide lubrication for the big-end bearings, the surplus oil from which splashes onto the camshaft, tappet gear, and cylinder walls.

An oil pipe connects the rear end of the main oil gallery with the oil gauge on the instrument panel. A relief valve of the non-adjustable ball type is fitted on the delivery side of the pump to deal with cases of excessive pressure.

The timing chain is well lubricated by surplus oil from the front camshaft bearing through passages which transfer it into the concave rim of the chain wheel by centrifugal action and then through radial feed holes onto the chain itself.

Section A.1

DRAINING THE ENGINE SUMP

The sump must be drained and filled with new oil at the specified intervals. The hexagon-headed drain plug

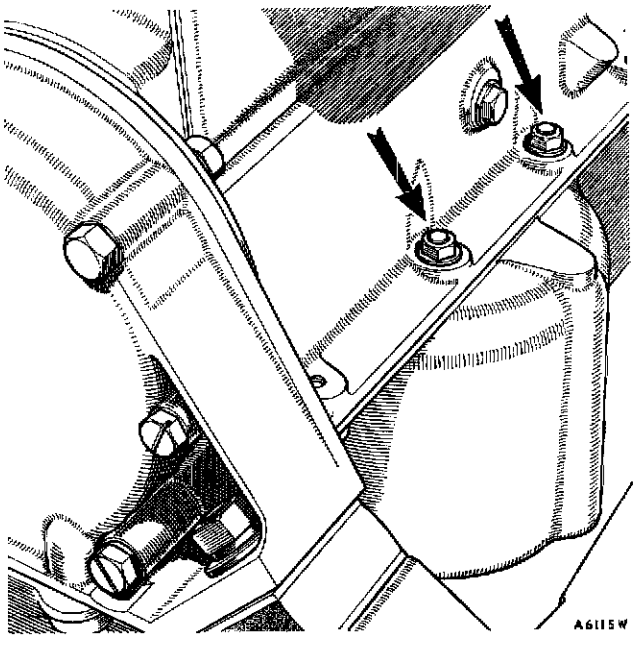
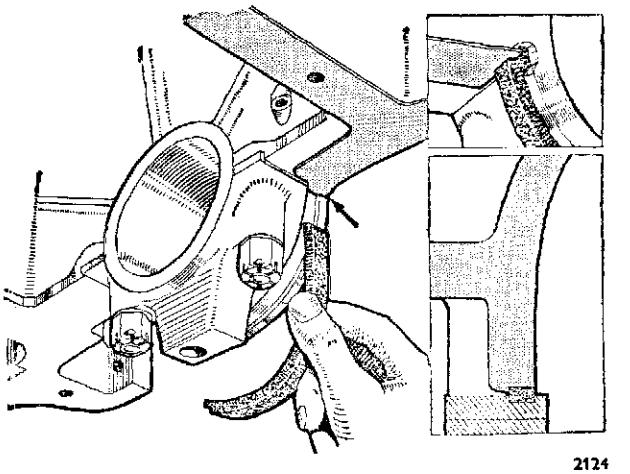


Fig. A.1

The two bolts fitted from the top of the sump flange are here shown. On later models these have been replaced by studs screwed into the sump, with nuts and spring washers for attachment



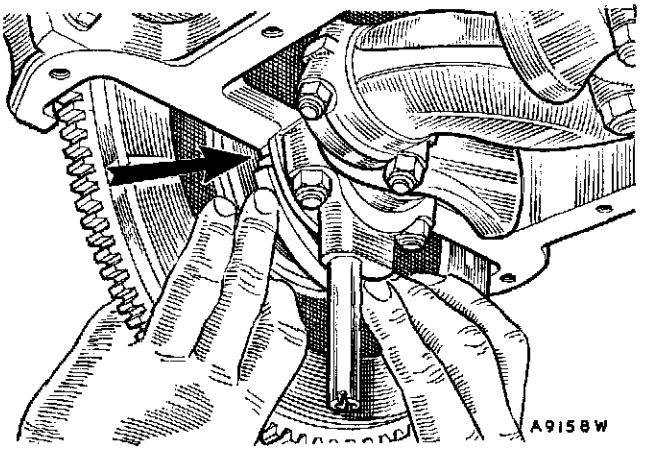


Fig. A.2

The fitting of the cork sealing strip at the rear bearing is most important to prevent oil leakage. Here is shown the correct method

is centrally situated at the rear end of the sump. The oil should preferably be drained when the engine is hot, in which condition it will flow more readily.

Unless the sump is to be removed and cleaned, it should be allowed to drain for at least 10 minutes before the drain plug is replaced. The capacity of the sump is given in **'GENERAL DATA'.**

Section A.2

REMOVAL AND REPLACEMENT OF SUMP

The sump is located by 10 $\frac{3}{16}$ in. hexagon-headed screws and spring washers inserted from the under side of the sump flange, and two screwed in from the top at

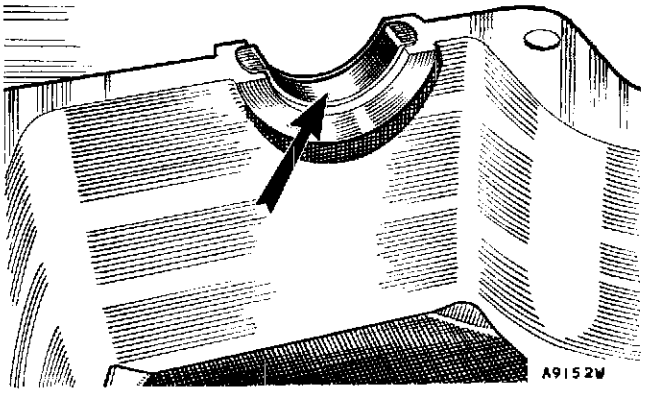


Fig. A.3

Make sure that the oil seal packing for the crankshaft at the front end of the sump is in good order and correctly positioned. The ends should be slightly proud of the gasket

either side of the oil pump housing. On later models these latter two are replaced by studs and nuts.

IMPORTANT.—Avoid displacing the hood of the oil pump when removing and replacing the sump, as any such displacement may distort or break the gasket between the hood and the pump body and so cause an air leak on the suction side, resulting in a loss of oil pressure. Should there be any doubt about the condition of the gaskets, fit new ones.

To remove the sump withdraw the 12 screws (or 10 and two stud nuts as the case may be) mentioned above and the three ¼ in. hexagon-headed bolts inserted through the flywheel housing into the sump. The sump can then be lowered from the engine if moved sufficiently to the left-hand side to clear the oil pump.

To clean the sump remove the three sump tray securing bolts, the sump tray, and the drain plug. Wash out all oil from the sump with paraffin and clean all deposit from the drain plug. Thoroughly dry the sump and refit the tray and drain plug.

When refitting the sump to the engine particular attention should be given to the three sealing gaskets. They are:

(1) The gasket on the crankcase face.
(2) The cork strip fitted into the recess in the rear main bearing cap.
(3) The packing fitted into the recess in the front of the engine sump.

If the gaskets are in good condition and have not been damaged during the removal of the sump they may be used again, but damage generally takes place and it is therefore advisable to fit new ones.

Before fitting new gaskets remove all traces of the old ones from the crankcase face, the sump face, and the recess in the rear main bearing cap. Smear the faces of the crankcase joint with a light coating of grease. Next fit the two halves of the large gasket to the crankcase face so that the holes in the gasket and crankcase register and the ends of the gasket (see arrow, Fig. A.2) fit against the side of the rear main bearing cap.

The cork strip should then be fitted tightly into the recess of the main bearing cap, taking care that the stepped ends fit the small recess (shown black in sketch) at each end of the bearing without damaging the cork.

When correctly fitted the step of the cork strip will overlap and seal the ends of the sump gaskets (see Fig. A.2). Check that all holes register correctly.

Fit the packing seal into the recess at the front end of the sump and lift the sump into position on the crankcase, taking care not to displace the cork strip while doing this.

First tighten evenly the 10 screws into the crankcase flange and the two inserted from the top into the sump flange (or nuts when studs are fitted). Then insert and tighten the three bolts that pass through the flywheel housing.

Section A.3

REMOVAL OF OIL PUMP

Drain and remove the engine sump as in Sections A.1 and A.2.

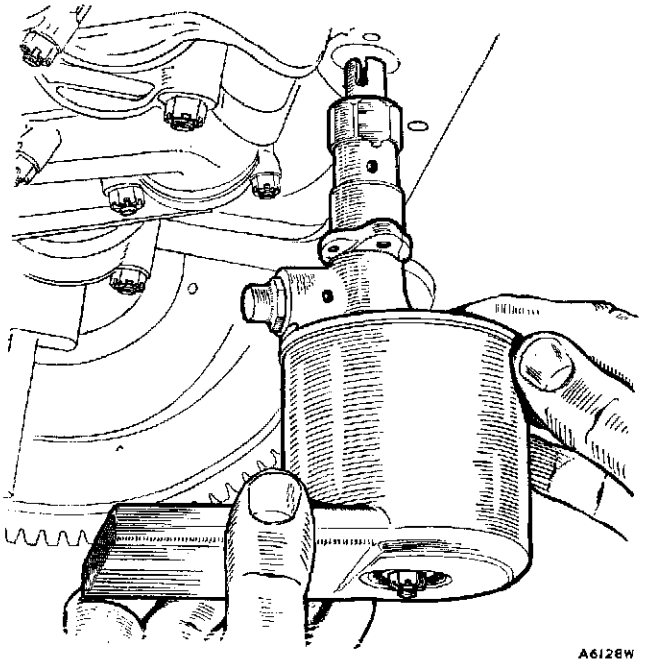


Fig. A.4

The pump may be withdrawn from the camshaft after removing the two bolts attaching it to the lower face of the crankcase. The original-type pump with body hood is illustrated

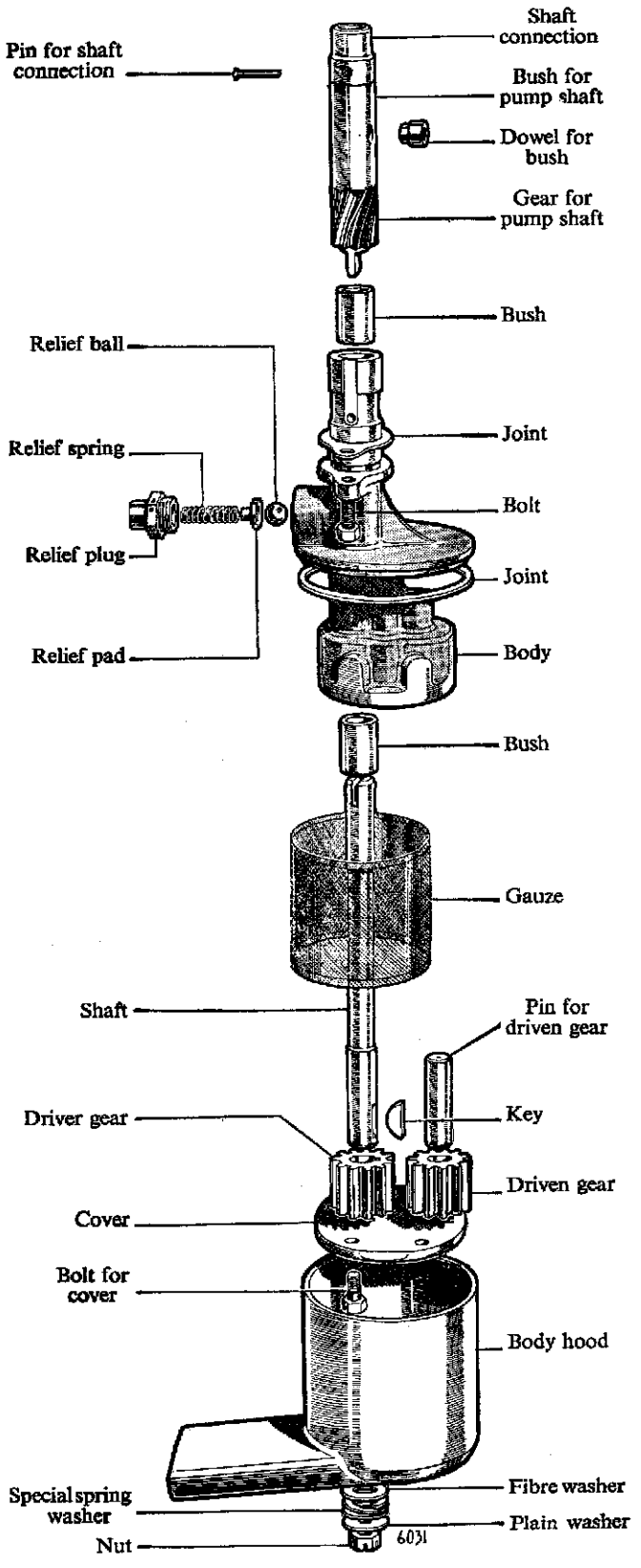


Fig. A.5

The components parts of the oil pump

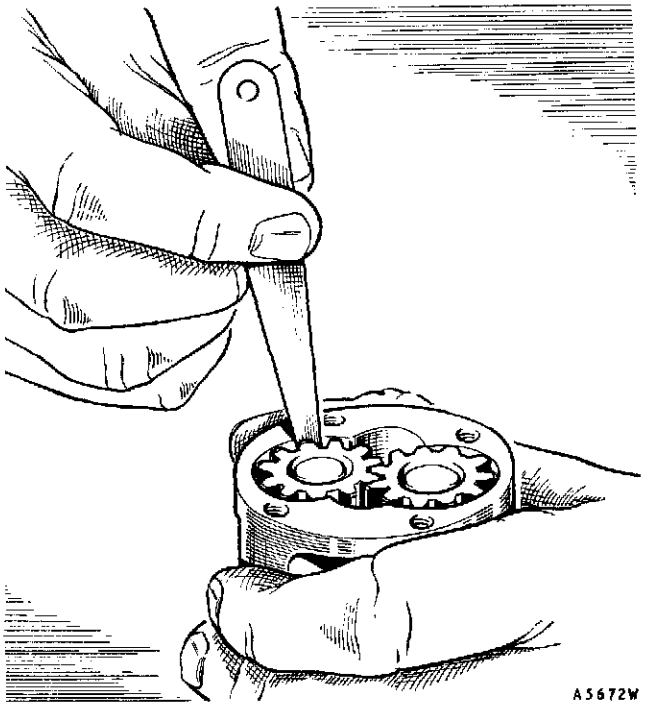


Fig. A.6

Checking the radial clearance of the pump gears with a feeler gauge

The oil pump assembly is extracted by removing the two $\frac{5}{16}$ in. hexagon-headed bolts and spring washers locating the pump to the crankcase and easing the pump

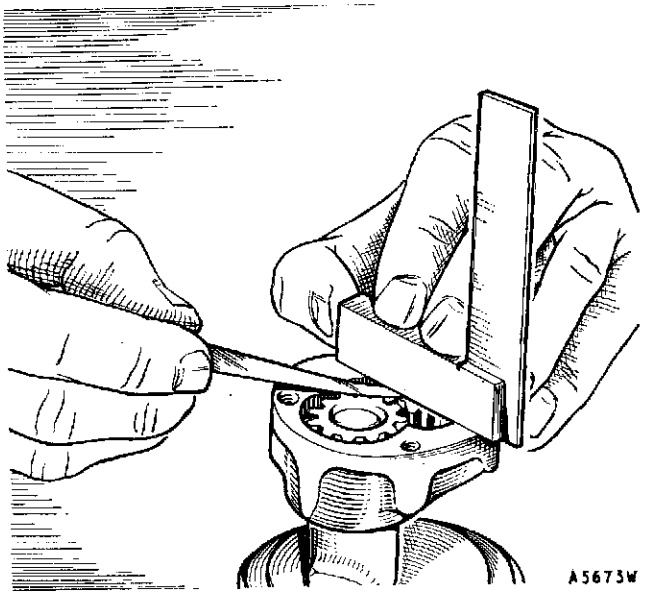


Fig. A.7

The end-float on the pump gears can be checked by means of a straight-edge and feelers

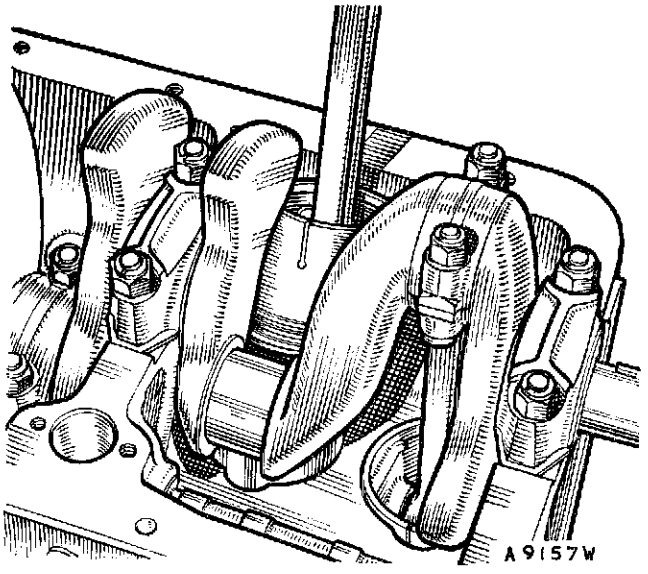


Fig. A.8

The correct method of withdrawing the piston and connecting rod assembly from the engine is here demonstrated

downwards. This is accomplished without interfering with the ignition timing.

Section A.4

DISMANTLING, REASSEMBLING, AND REPLACING OIL PUMP

The pump hood is detached by extracting the cotter pin from the fixing stud at the bottom of the pump assembly and removing the $\frac{3}{16}$ in. nut, plain steel washer, double-coil spring washer, and fibre washer. This may distort or break the gasket between the hood and the pump body and so cause an air leak on the suction side and loss of oil pressure on reassembly. Should there be any doubt about the condition of the gasket, fit a new one.

To gain access to the pump gears undo the four $\frac{3}{16}$ in. bolts with spring washers and remove the pump cover and filter gauze. The gears may now be extracted.

The oil feed from the pump is taken via the pump drive shaft into the pump body, on which is mounted the oil pressure relief valve assembly. This assembly is held in position by the relief plug (see Fig. A.5), and should be examined to ensure that the relief ball is perfectly round and that it is seating properly. Check if the relief spring has lost its tension. This can be done by measuring the length of the spring, which should not be less than 1 in. (25·4 mm.). Fit a new ball and spring if necessary.

The wire gauze oil filter which is incorporated in the oil pump should be cleaned thoroughly in petrol with a stiff brush. If damaged in any way a new gauze should be fitted. **Never use rag to clean it.**

To check the gear clearances the pump body, gears, and shaft should be cleaned carefully and reassembled before carrying out the following procedure:

(1) Measure the radial clearance between the teeth of the gears and the pump body (see Fig. A.6). This should not be more than ·006 in. (·15 mm.).

(2) Check the end-float on the gears, placing a straight-edge across the face of the pump body and measuring the clearances with feelers, as shown in the illustration (Fig. A.7). This should not be more than ·003 in. (·08 mm.).

The pump is reassembled in the reverse order to dismantling. It should be observed, however, that the pump body cover is fitted with the hood-locating slot facing to the left-hand side of the engine. The hood gasket should be placed carefully in its recess on the body flange and the hood assembled so that its intake faces the right-hand side of the engine (i.e. at right angles to the crankshaft) when the assembly is refitted to the engine.

When replacing the pump assembly in the engine care must be exercised to see that the slot in the pump drive shaft is set so as to engage with the tongue on the distributor drive gear.

Section A.5

REMOVAL AND REPLACEMENT OF PISTON AND CONNECTING ROD

Drain the engine oil and remove the sump as in Sections A.1 and A.2.

Remove the oil pump as in Section A.3.

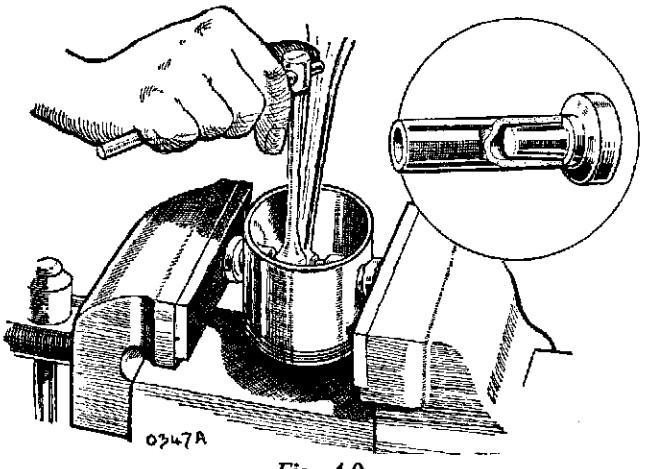


Fig. A.9

The use of special gudgeon pin plugs to hold the connecting rod and piston assembly while the gudgeon pin clamp bolt is tightened or loosened is essential

Remove the cotter pins and $\frac{1}{4}$ in. nuts from the big-end bolts (later models are fitted with self-locking nuts).

Withdraw the big-end bolts and bearing caps.

Release the connecting rod from the crankshaft.

Refit the bearing cap with the numbered side registering with the corresponding number on the connecting rod.

Rotate the crankshaft slowly and draw out the piston and connecting rod assembly down the right-hand side of the engine.

Replacement of the pistons and connecting rods is a direct reversal of the above, but the piston ring gaps should be set at 120° to each other.

An ample chamfer is given to the base of each cylinder bore to facilitate the refitting of the pistons and rings, and no difficulty should be experienced in replacement.

It is essential that the connecting rod and piston assemblies should be replaced in their own bores and fitted the same way round, i.e. with the gudgeon pin clamp screw on the opposite side to the camshaft.

NOTE.—The illustrations on pages A.2 and A.4 are intended for parts identification only.

Section A.6

DISMANTLING AND REASSEMBLING PISTON AND CONNECTING ROD

Before the piston and gudgeon pin can be dismantled from the connecting rod it is necessary to remove the clamp screw. To enable the assembly to be held in a vice for this operation without distorting the piston special holding plugs should be inserted in each end of the gudgeon pin (see Fig. A.9).

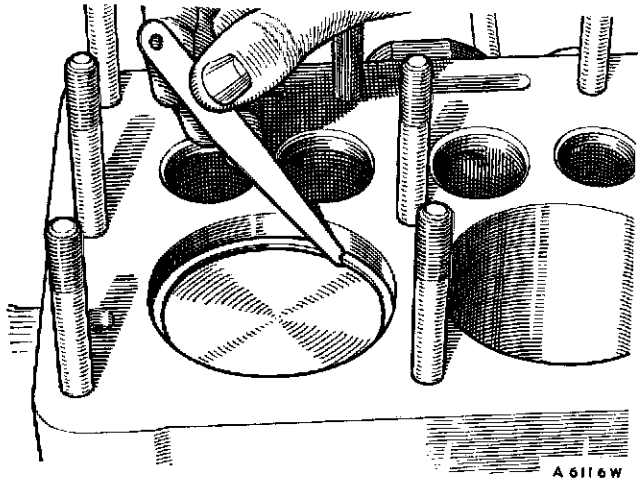


Fig. A.10

Piston ring gaps should always be measured while the ring is firmly held on top of a piston inserted in the cylinder bore

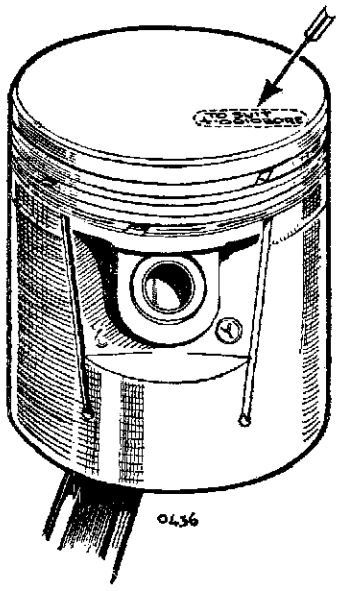


Fig. A.11

The marking on the piston crowns which indicates their size

Unscrew the gudgeon pin clamp screw (Service tool 18G 326) and remove it completely.

Push out the gudgeon pin.

Reassembly is a reversal of the above.

IMPORTANT.—Attention must be given to the following points when assembling the piston to the connecting rod:

(1) That the piston is fitted the same way round on the connecting rod.

(2) That the gudgeon pin is a correct fit in the piston. It should be a thumb-push fit for three-quarters of its travel and capable of being driven home by light tapping with a raw-hide mallet (see Section A.8).

(3) That the gudgeon pin is positioned in the connecting rod so that its groove is in line with the clamp screw hole.

(4) That the clamp screw spring washer has sufficient tension.

(5) That the clamp screw will pass readily into its hole and screw freely into the threaded portion of the little end, also that it is firmly tightened down on the spring washer.

Section A.7

REMOVAL AND REPLACEMENT OF PISTON RINGS

If no special piston ring expander is available use a piece of thin steel such as a suitably ground hacksaw blade or a disused ·020 in. (·50 mm.) feeler gauge.

Raise one end of the ring and insert the steel strip between the ring and the piston. Rotate the strip round the piston, applying slight upward pressure to the raised

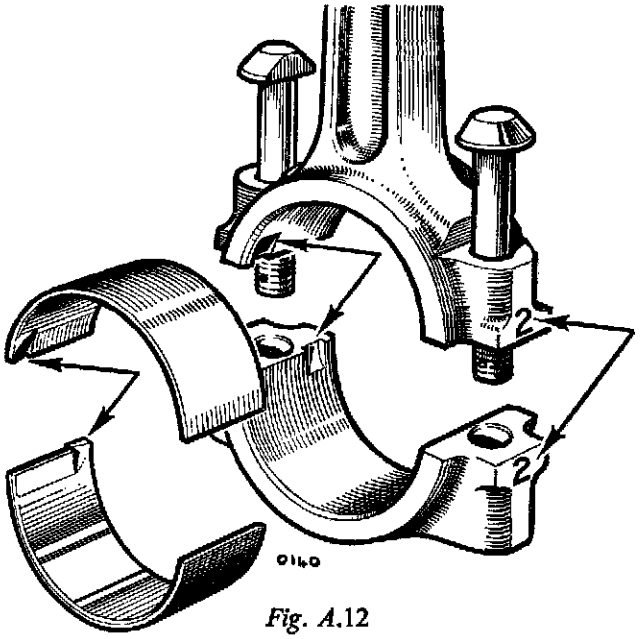


Fig. A.12

Clearly shows the location of the registering tags on the edge of each bearing shell and the identification markings on the connecting rod and cap

portion of the ring until it rests on the land above the ring groove. It can then be eased off the piston.

Do not remove the piston rings downwards over the skirt of the piston.

Before fitting new piston rings the grooves in the piston must be scraped clean of any carbon deposit, taking care not to remove any metal, since play between the ring and the groove reduces gas-tightness and produces a pumping action leading to excessive oil consumption.

IMPORTANT.—New rings should be tested in the cylinder bore to ensure that the ends do not butt together.

To do this effectively the piston should be inserted approximately 1 in. (2·54 cm.) down the cylinder bore and each ring then pushed down onto the top of the piston and held there in order to keep the ring square with the bore. The correct ring gap is from ·0025 to ·0065 in. (·06 to ·17 mm.).

When in position in the piston groove the ring must move round quite freely, but there must be no movement in a vertical direction.

Section A.8

FITTING GUDGEON PINS

When gudgeon pins are fitted to pistons a certain amount of selective assembly may be necessary, and the following points should be observed.

With the standard aluminium-alloy pistons the gudgeon pins must be a thumb-push fit for three-quarters of their travel, being finished by lightly tapping with a raw-hide mallet, this with the piston cold. Never attempt to ream out a gudgeon pin bore, as oversize gudgeon pins are not available or permissible.

Section A.9

PISTON SIZES AND CYLINDER BORES

When fitting new pistons selective assembly is necessary, and to facilitate this the pistons are stamped with identification figures on their crowns. These figures should correspond with the similar figures stamped on the bottom face of the crankcase on the oil pump side to indicate each cylinder bore size. The pistons are also graded for weight and are stamped accordingly on their crowns. It is advisable to fit pistons of the same weight grading to an engine to ensure the correct balance.

Symbols are used to indicate the actual measurements, the bores being marked:

'To suit std. bore', indicating a standard size diameter possessing the actual nominal measurement of 57 mm. (2·2441 in.);

'To suit bore +·0010', indicating an oversize of +·0010 in. (·025 mm.) on the standard size and thus having an actual measurement of 2·2451 in. (57·025 mm.), and so on through the range of sizes permitted.

The pistons are marked with the actual cylinder bore size, the requisite running clearance being allowed for in the machining.

While the cylinder head and pistons are withdrawn the cylinder bores should be measured for wear.

Indication that a rebore of the cylinders is necessary

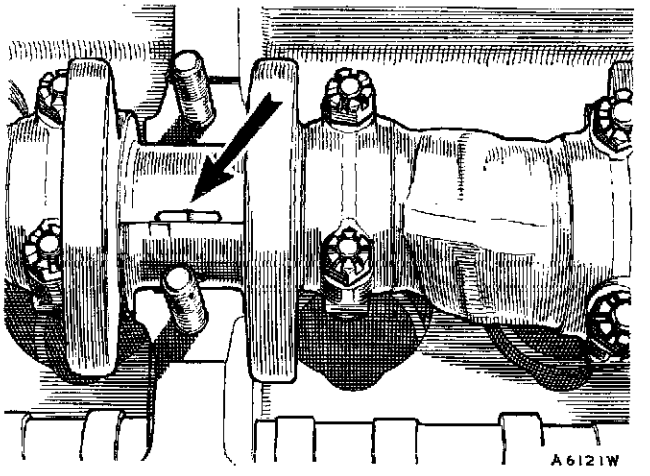


Fig. A.13

Demonstrating the use of a split pin for removal and replacement of the main bearing shells

is given by general loss of performance, oiling up, and poor compression. The pistons are supplied graded in the same way as the cylinder bores, and those marked to suit +·0010 bore should be fitted to bores marked +·0010, and so on throughout the range.

Pistons are supplied in the following sizes:

Piston marking	*Suitable for bore size*	*Equivalent metric size*
STANDARD		
To suit standard bore	2·2441 to 2·24459 in.	57·000 to 57·013 mm.
To suit +·0010 bore	2·2451 to 2·24559 in.	57·025 to 57·038 mm.
To suit +·0020 bore	2·2461 to 2·24659 in.	57·051 to 57·064 mm.
FIRST OVERSIZE		
To suit +·020 bore	2·2641 to 2·26459 in.	57·508 to 57·521 mm.
To suit +·0210 bore	2·2651 to 2·26559 in.	57·535 to 57·547 mm.
To suit +·0220 bore	2·2661 to 2·26659 in.	57·559 to 57·572 mm.
SECOND OVERSIZE		
To suit +·040 bore	2·2841 to 2·28459 in.	58·016 to 58·029 mm.
To suit +·0410 bore	2·2851 to 2·28559 in.	58·042 to 58·056 mm.
To suit +·0420 bore	2·2861 to 2·28659 in.	58·067 to 58·079 mm.

Section A.10

REMOVAL AND REPLACEMENT OF MAIN AND BIG-END BEARINGS

The replacement of both main and big-end bearings can be carried out without withdrawing the engine from the frame. Detachable bearing caps and steel-backed liners are used both for the main and the big-end bearings, which are of the shimless type and are therefore non-adjustable.

Dismantling procedure

Drain the engine oil and remove the sump as in Sections A.1 and A.2.

Remove the oil pump as in Section A.3.

As the bearings are of the shimless type it is essential that no attempt should be made to adjust worn bearings. They should be replaced with new parts. Similarly, if the crankshaft journals are found to be in a worn condition it is advisable to fit a service reground crankshaft, complete with main and big-end bearings, as supplied by the Works (see Section A.25).

Both the main and big-end bearing liners are located in position in the bearing housings by a small tag on one side of each half-liner, and it should be noted that the bearings are fitted so that the tags come on the same joint edge of the bearing housing as shown in Fig. A.12, although on opposite corners.

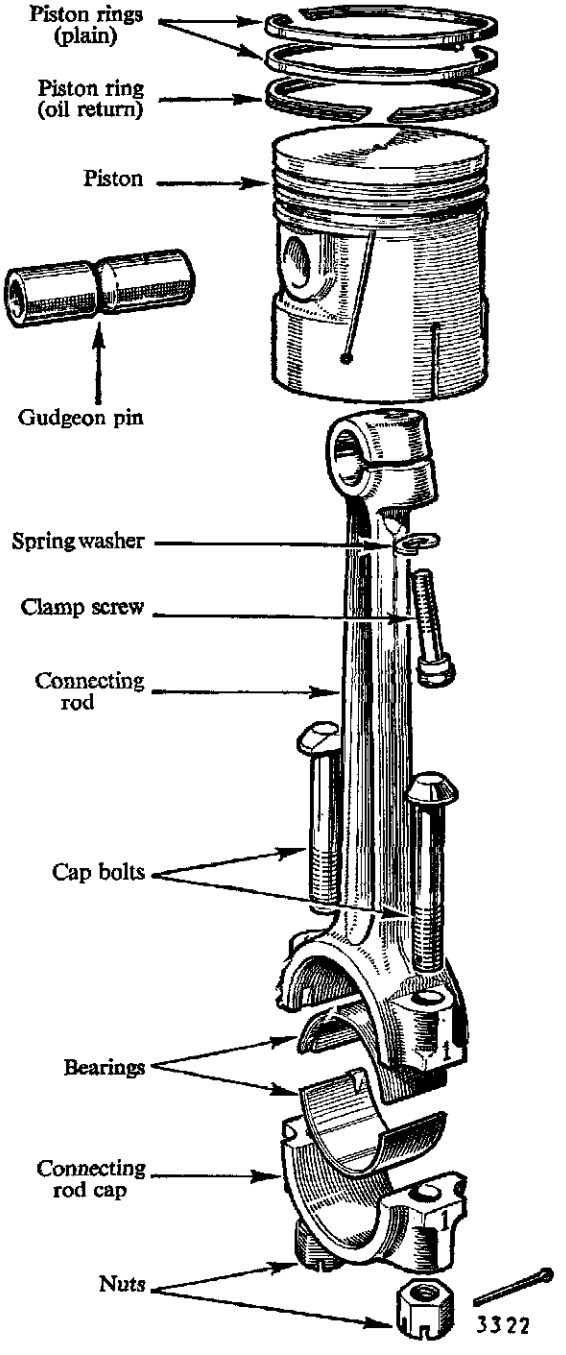


Fig. A.14

The component parts of the piston and connecting rod assembly. Later models have self-locking nuts for the cap bolts which eliminate the split pins

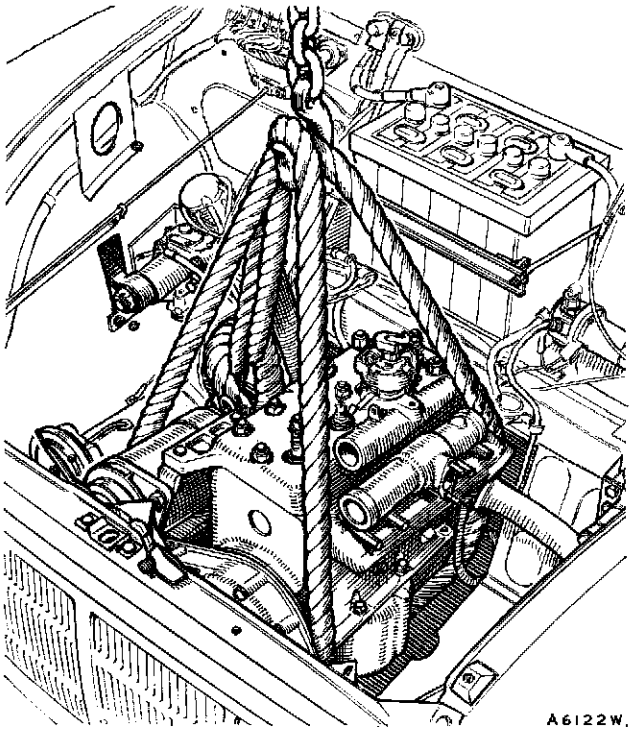


Fig. A.15
The engine supported on a suitable rope sling for removal

To detach the big-end bearings extract the split pins from the big-end bolts (later models are fitted with self-locking nuts needing no special locking precautions), and undo the ½ in. castellated nuts. Remove the connecting rod caps and extract the bearings. Care should be exercised to see that the bearing journals, etc., are thoroughly cleaned before installing new bearings. No scraping is required as the bearings are machined to give the correct diametral clearance.

The main bearings should be dealt with one at a time. Early models have split-pinned bearing cap nuts—later models are fitted with self-locking nuts. Detach the main bearing caps, together with the bottom half-bearing liner. The top halves of the bearing liners are extracted by rotating them round the crankshaft in the direction of their locating tags, using a split pin opened out and inserted in the crankshaft oil feed holes to facilitate this if necessary. The replacements are fitted in a similar manner by first inserting the plain side of each bearing liner into its housing. Here again no scraping is required as the bearings are machined to give the correct diametral clearance.

In the case of a 'run' bearing it is always essential thoroughly to clean out all the oilways in the crankshaft and block, wash out the engine base with paraffin, and remove the pump cover to ensure that no particles of white metal are left anywhere in the lubricating system.

Do not forget to split-pin the cap nuts in the case of engines employing castellated nuts.

Section A.11

REMOVAL AND REPLACEMENT OF ENGINE

There is no difficulty in removing the engine, leaving the gearbox in the frame, if the work is carried out in accordance with the following sequence. It is not necessary to remove the bonnet, but the clevis pin securing the bonnet prop to the bonnet lid must be removed and the bonnet secured carefully in the open position.

Drain the oil from the engine.

Drain the water from the radiator by means of the drain tap located in the right-hand side of the radiator bottom tank. If Bluecol or other anti-freeze mixture is in use it should be drained into a suitable clean container by fitting a rubber extension pipe to the drain tap and carefully preserved for future use.

Disconnect the battery by removing the flexible lead from the negative terminal.

Release the clips on the top and bottom water hoses and separate the hoses from their connections.

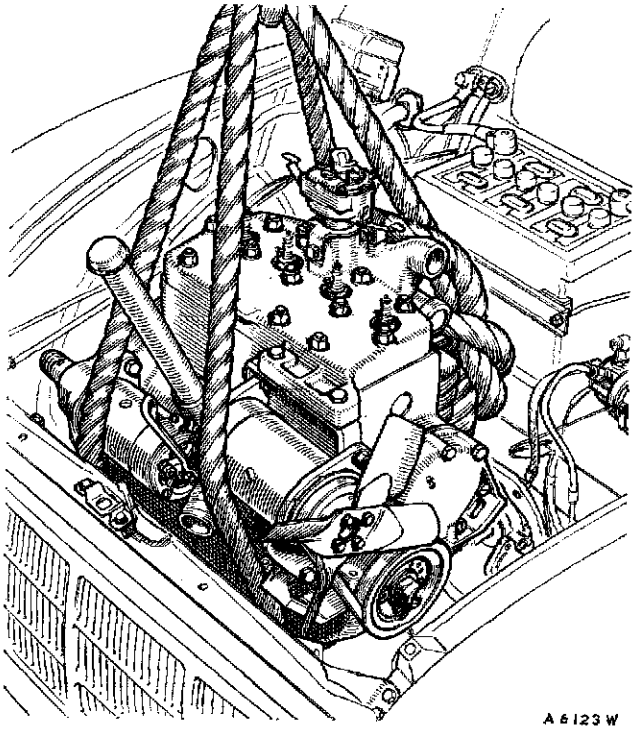


Fig. A.16
Withdrawing the engine from the car

Remove the four ¼ in. bolts and spring washers securing the radiator to the cowl and lift out the radiator.

Disconnect the throttle and mixture controls from the carburetter, and release the throttle control wire steady bracket from its attachment on the cylinder head by removing the fixing bolt.

Release the flexible petrol pipe from the $\frac{5}{16}$ in. union on the pump and detach the carburetter from the manifold.

Disconnect the high-tension cables from the sparking plugs and the low-tension cable from the distributor. Remove the two leads from the dynamo and lift off the distributor cap with wires attached. Detach the starter cable from the starter motor by undoing the terminal nut with spring washer. Disconnect the earth cable from the cylinder head.

Disconnect the oil gauge pipe from its connection on the cylinder block and release it from the clip on the tappet cover. Remove the two ¼ in. nuts, bolts, and spring washers from the exhaust manifold flange and remove the flange gasket.

Remove the two $\frac{5}{16}$ in. nuts and washers securing the front engine mountings to the timing cover and the four ¼ in. nuts and bolts securing the mounting support brackets to the frame.

Support the engine with suitable lifting tackle. If a lifting ring is employed it should form part of a plate which can be fitted under **two** of the stud nuts. Raise the front end of the engine with the lifting tackle and remove the front engine mounting rubbers and support brackets.

Remove the front floor carpet. Unscrew the gear lever knob from the gear lever after slackening the locknut and remove the rubber cowl.

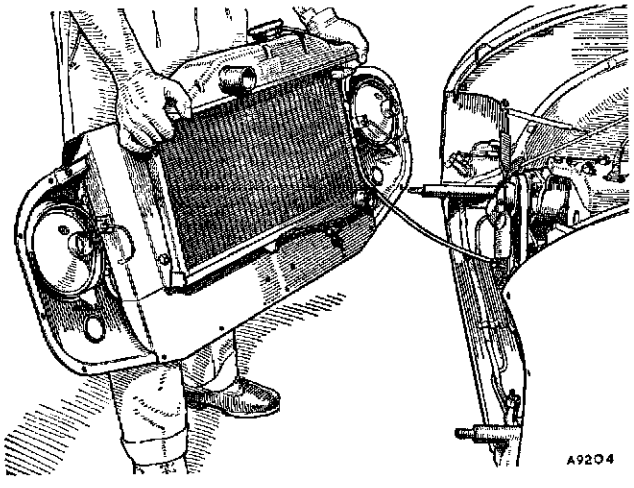


Fig. A.17

The radiator and grille assembly can be withdrawn as a unit

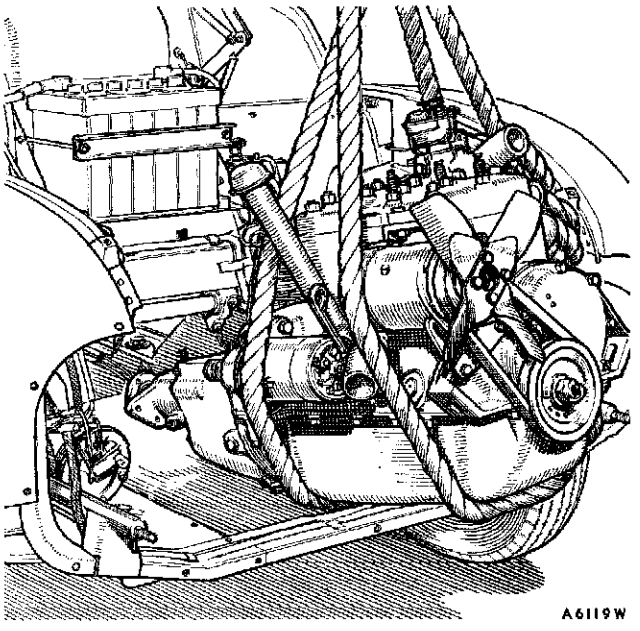


Fig. A.18

Withdrawing the power unit complete with gearbox

Remove the gearbox cover-plate. This is secured by $\frac{3}{16}$ in. brass bolts.

Note that two bolts on each side of the gearbox are longer than the remainder and secure the gearbox support member to the frame.

Lower the engine until it is possible to slacken and remove the four short ¼ in. hexagon-headed bolts locating the clutch housing to the cylinder block and the three longer ¼ in. hexagon-headed bolts locating the clutch housing to the sump housing.

To prevent the gearbox from dropping when it is released from the engine, place a suitable support beneath the gearbox housing.

Move the engine forward clear of the clutch and then lift upwards over the radiator grille, turning it at right angles to clear the battery box.

When replacing the engine in the frame it will be found helpful if a second operator raises the front end of the gearbox by exerting downward pressure on the gear lever while in gear. If the car is then moved forward steadily this will assist in aligning the gearbox drive shaft with the clutch and flywheel.

Ensure that the clutch casing is located on the two dowel pins in the flywheel housing, and then lower the front end of the power unit until the seven bolts locating the clutch casing to the flywheel housing can be replaced and tightened. Make sure that the correct length of bolt is used in each case.

Raise the engine and insert the front engine mounting rubbers and brackets.