SECTION AA

THE ENGINE
(1½ LITRE)

GENERAL DESCRIPTION

The four-cylinder, overhead valve engine is built in unit construction with a four-speed synchromesh gearbox.

It has a robust four-throw crankshaft carried in three main bearings, the front one being of the sleeve type and located in the front face of the crankcase.

The centre and rear main bearings are white-metal lined and located in split housings which are fitted and assembled to the crankshaft prior to insertion into the crankcase. This is known as the threaded type of crankshaft. The rear bearing takes the end thrust by flanges provided on both sides.

The connecting rod big-ends are white metalled direct and the gudgeon pin is retained by spring rings and is a floating fit in the little-end.

The pistons are of aluminium alloy and have three compression rings and one oil control ring.

The two three-bearing camshafts are carried at each end in phosphor-bronze bushes, the centre bearing running directly in the cylinder block. All three bearings are line-reamed in position. The camshaft drive is by means of an endless duplex roller chain.

The valves are operated via tappets and short, stiff push-rods. Tappet adjustment takes place at the rocker end. Cooling is by fan and thermo-siphon action, pump assisted.

THE LUBRICATION SYSTEM

The engine oil is carried in the ribbed aluminium sump below the crankcase and an oil level dipstick is provided on the left-hand side of the block. The oil filler is situated on the forward end of the exhaust rocker cover and the crankcase breather is on the left-hand side of the crankcase adjacent to the dipstick.

The submerged, self-priming, gear-type oil pump is bolted to the under face of the cylinder block and is driven by means of a skew gear on the inlet camshaft.

From the pump, oil is delivered by an external pipe to the full-flow filter.

From the filter another external pipe leads to the crankcase side and thence via internal oilways to the main bearings.

The big-end bearings receive oil by means of oilways drilled in the crankshaft. Camshafts, timing chain and rocker-shafts are supplied by means of internal oilways drilled in the crankcase.

The oil pressure relief valve is situated just to the rear of the oil filter.

Section AA.1

DRAINING THE ENGINE SUMP

The sump on new and reconditioned engines must be drained and refilled with new oil after the first 500 miles (800 km.) and then at intervals of every 3,000 miles (5000 km.). The hexagon-headed drain plug is situated on the right-hand side of the sump. The oil should preferably be drained when the engine is hot, in which condition the oil flows more readily.

Unless the sump is to be removed and cleaned, it should be allowed to drain for at least ten minutes before the drain plug is replaced. When the sump has been drained, approximately 10 pints (5·7 litres) of oil are required to refill it (see page P.2 for recommended oils).

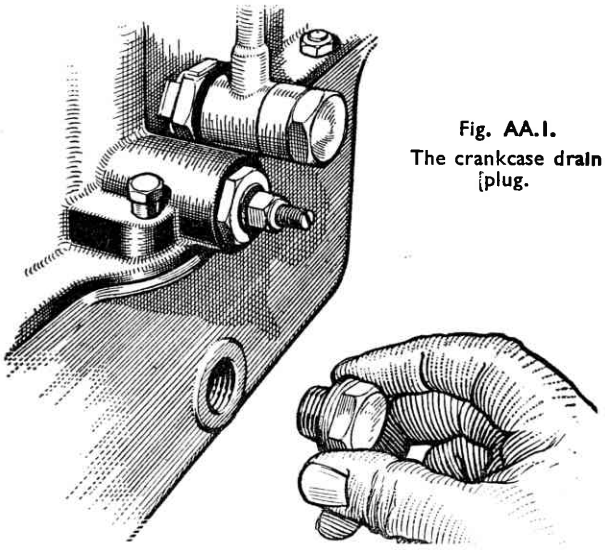


Fig. AA.1.
The crankcase drain plug.

Section AA.2

REMOVAL AND REPLACEMENT OF THE SUMP

The sump is located by nine hexagon-headed set screws and nine hexagon nuts on studs, all with spring washers, inserted from the underside of the flange.

To clean the sump, take out the sump baffle plate and wash with paraffin and a clean brush. Take out the drain plug and clean away any sediment. Make sure that all traces of old jointing compound are removed before the sump is refitted.

When the sump is dry, refit the baffle and drain plug.

No gasket is fitted on early models, but a jointing compound may have been used. All trace of compound must be removed from the joint faces before replacing the sump. Later models are fitted with a gasket and a new one should be used when refitting the sump on all models.

Section AA.3

REMOVAL AND REPLACEMENT OF THE OIL PUMP

Drain the sump as in Section AA.1.

Remove the sump as in Section AA.2.

Then undo the three nuts holding the oil pump to the crankcase.

The pump, complete with its driving shaft and gear, may then be pulled away.

Section AA.4

DISMANTLING AND REASSEMBLING THE OIL PUMP

Remove the oil pump as detailed in Section AA.3 and take off the coarse mesh screen surrounding the pump body.

Next, take off the bottom cover and tap the shaft out of the gear wheel and remove the Woodruff key.

The skew gear at the top of the driving shaft is pinned and keyed in position.

The driven gear is bushed and runs on a spindle which is pressed into the pump body.

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

1. Measure the diametrical clearance between the teeth of the gears and the pump body (see Section A.4). 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 clearance with feelers, as shown in the illustration Fig. A.3. This should not be more than ·003 in. (·08 mm.).

Ensure that the cover-plate and pump body faces are perfectly clean before reassembling. They form a metal-to-metal joint and no gasket or sealing compound must be used.

When refitting the cover-plate take special note of the two dowel pins.

Section AA.5

THE OIL PRESSURE RELIEF VALVE

This is provided to prevent the building up of excessive pressure when the oil is cold. It is located low down on the right-hand side of the crankcase, and to adjust the release pressure the Simmonds nut must be unscrewed and the adjusting screw turned either in or out to increase or reduce the pressure respectively.

To dismantle the assembly the Simmonds nut and adjusting screw must be taken out, and then the oil relief valve bush, followed by the washer, spring and relief valve. The actual valve seating is pressed into the block, but is renewable. Normal oil pressure is 30 lb./sq. in. at 40 m.p.h. (2·12 kg./cm.^{2} at 65 k.p.h.).

The relief valve seating is removable by tapping the hole in the seating $\frac{5}{16}$ in. B.S.F. and then using a bolt and nut for withdrawal purposes.

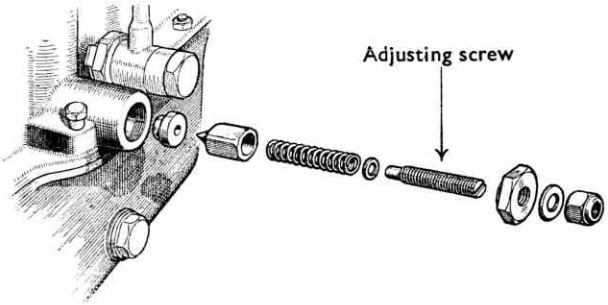


Fig. AA.3.
The oil pressure relief valve components.

Section AA.6

REMOVAL AND REPLACEMENT OF MAIN BEARINGS AND CRANKSHAFT

There are three main bearings of the thick white-metal type and they cannot be changed with the crankshaft in place.

The front bearing is of the sleeve type and dowelled in position. The centre and rear bearings are carried in large-diameter split housings. New bearings are supplied with an allowance for line-reaming.

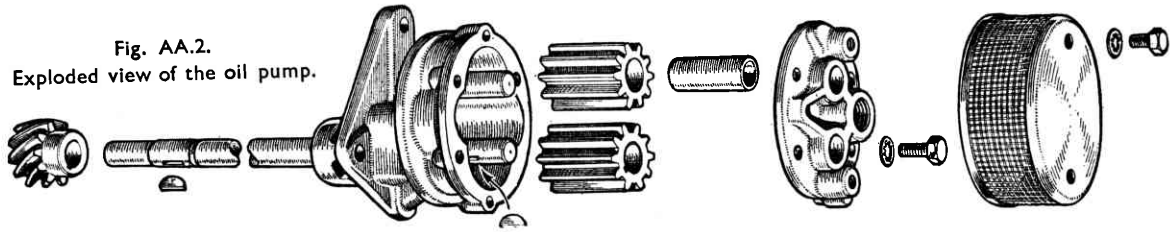
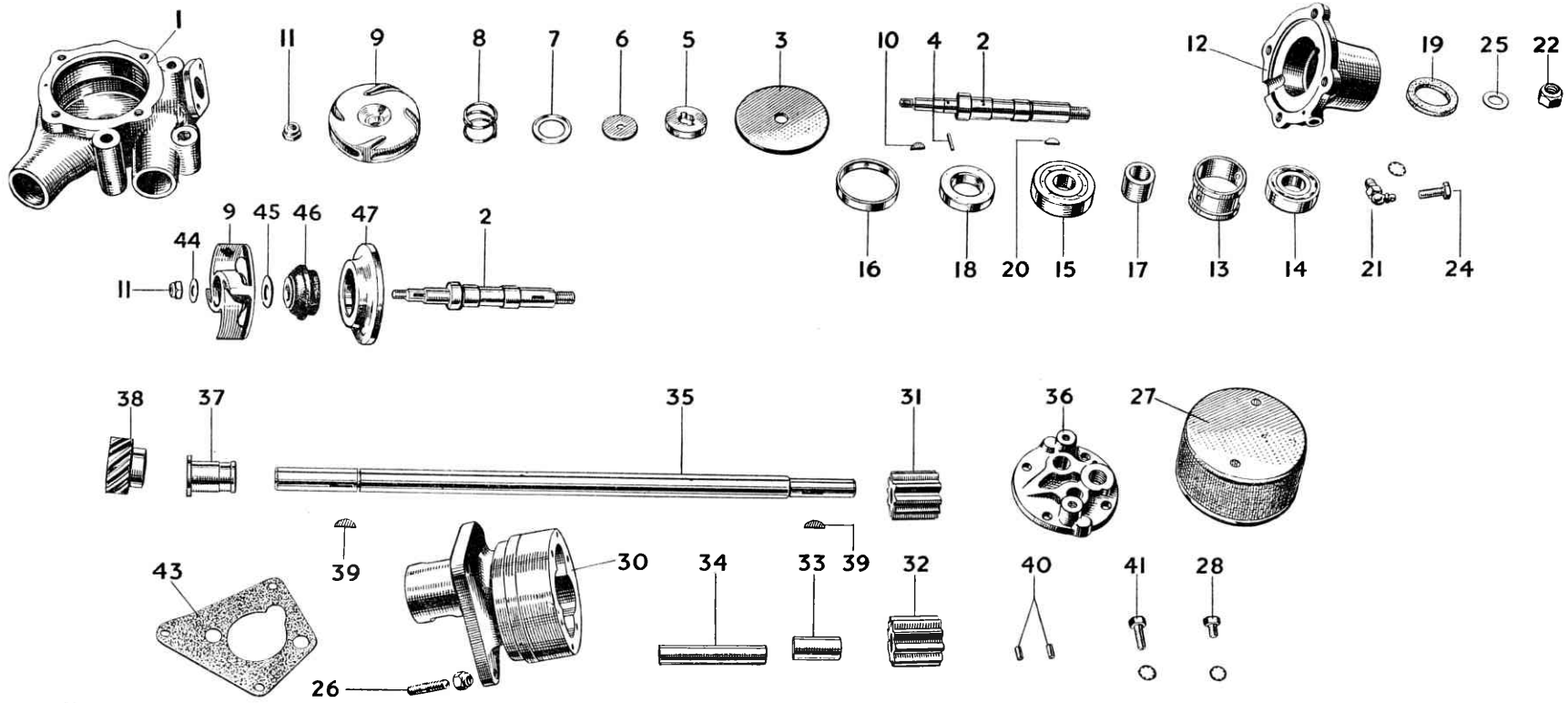


Fig. AA.2.
Exploded view of the oil pump.

THE WATER PUMP COMPONENTS (1½ LITRE)



No.	Description
1.	Water pump body.
2.	Water pump shaft.
3.	Water pump sealing plate.
4.	Carbon ring driving peg.
5.	Carbon ring.
6.	Water pump gland.
7.	Water pump gland spring retainer.
8.	Water pump gland spring.
9.	Water pump impeller.
10.	Water pump impeller key.
11.	$\frac{5}{16}$ in. B.S.F. nut (thin).
12.	Fan bearing housing.
13.	Fan bearing distance-piece (outer).
14.	Fan bearing—small.
15.	Fan bearing—large.

No.	Description
16.	Oil seal spacing ring.
17.	Fan bearing distance-piece.
18.	Oil seal.
19.	Water pump shaft oil retaining washer.
20.	Fan pulley key.
21.	$\frac{1}{8}$ in. grease nipple.
22.	Water pump shaft nut.
24.	Set screw for bearing housing.
25.	Water pump shaft plain washer.
26.	Crankcase oil pump stud.
27.	Carbon trap.
28.	Carbon trap set screw.
30.	Oil pump body.
31.	Oil pump gear—driver.
32.	Oil pump gear—driven.

No.	Description
33.	Oil pump gear bush.
34.	Oil pump gear pin.
35.	Oil pump shaft.
36.	Oil pump lid.
37.	Oil pump shaft bush.
38.	Oil pump shaft gear (driving).
39.	Key for gears.
40.	Oil pump lid dowel.
41.	Oil pump lid set screw.
43.	Oil pump body gasket.
44.	Water pump impeller nut washer.
45.	Water pump impeller facing.
46.	Water pump seal.
47.	Water pump impeller housing.

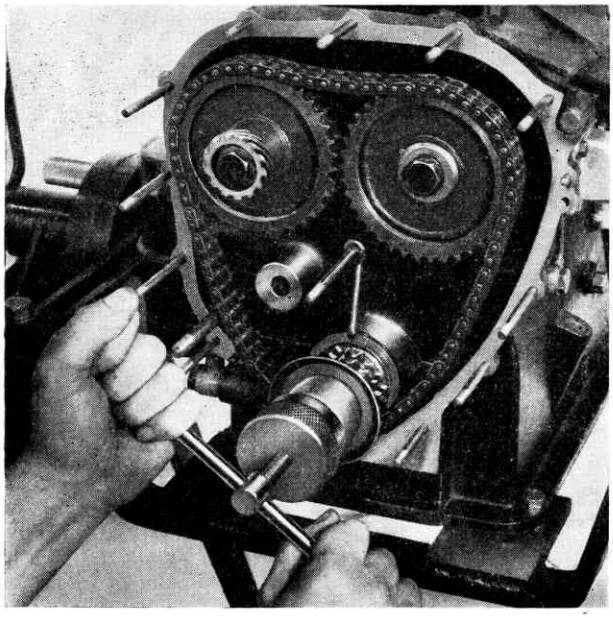


Fig. AA.4.
Removing the crankshaft oil thrower.

To remove the main bearings it is also necessary to take out the crankshaft, the procedure being as follows :—

Take off the cylinder head as explained in Section AA.7.

Remove the sump as in Section AA.2.

Take off the clutch (see Section AA.30) and the flywheel (see Section AA.31).

Remove the timing chain cover and crankshaft sprocket. This is explained in Sections AA.18 and AA.19.

Extract the connecting rods and pistons as in Section AA.8.

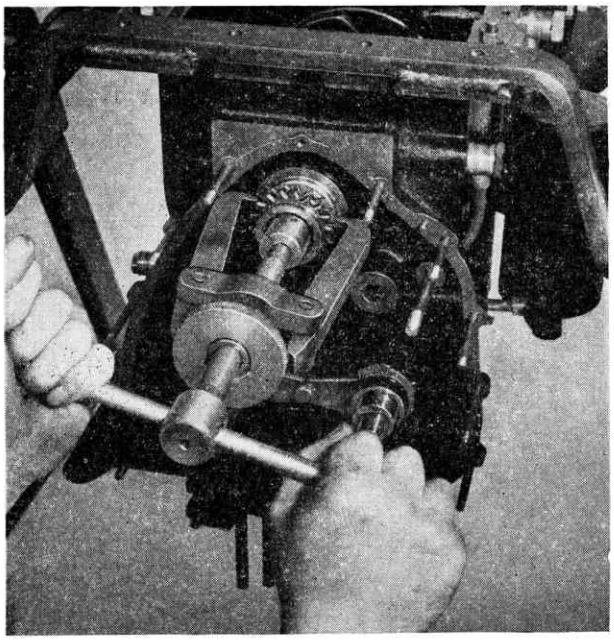


Fig. AA.5.
Removing the crankshaft sprocket.

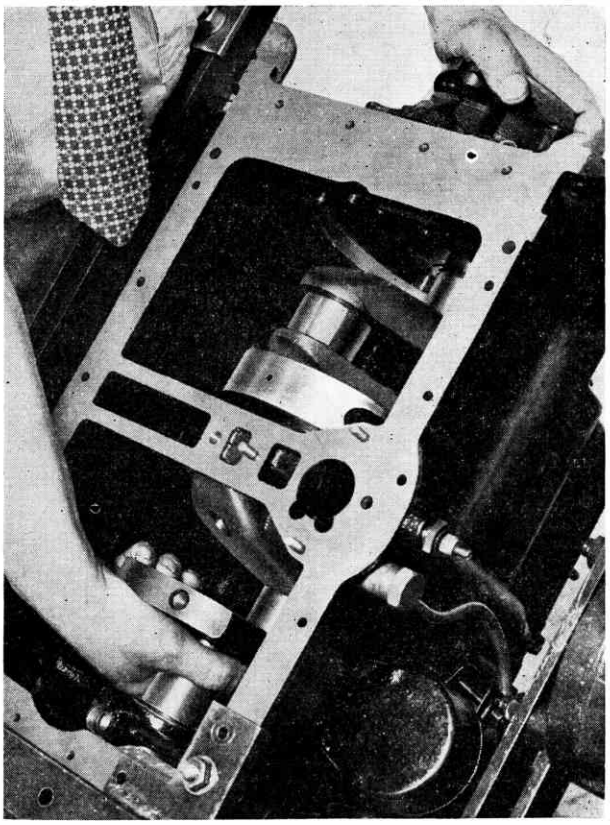


Fig. AA.6.
The crankshaft is removed complete with rear and centre bearings by withdrawing from the cylinder block rearwards.

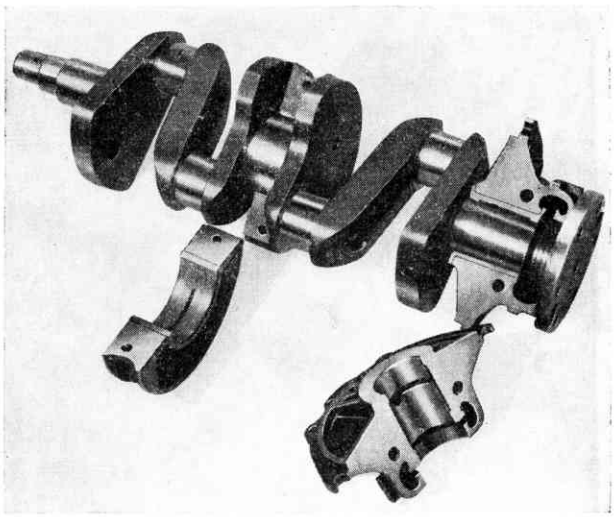
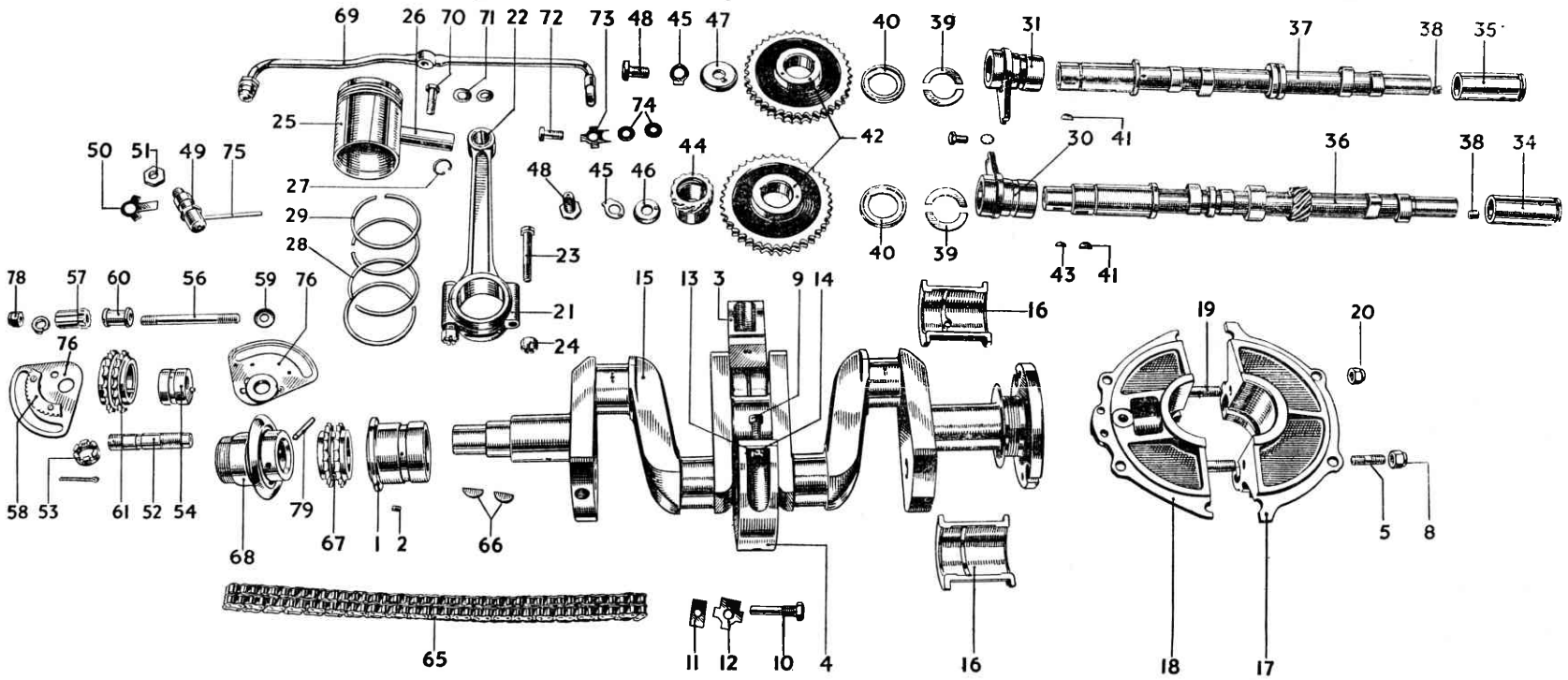


Fig. AA.7.
The crankshaft and bearing assembly, showing the large-diameter centre and rear main bearings which permit the webs to pass through the crank chamber walls.

THE CRANKSHAFT, CAMSHAFT AND PISTON COMPONENTS (1½ LITRE)



No.	Description
1.	Crankshaft front bearing.
2.	Crankshaft front bearing dowel.
3. } 4.	Crankshaft bearing.
5.	Rear main bearing stud.
8.	Rear main bearing stud nut.
9.	Crankshaft centre bearing bolt.
10.	Crankshaft centre bearing set screw.
11.	Crankshaft centre bearing key.
12.	Crankshaft centre bearing tab washer.
13.	Crankshaft centre bearing bolt nut.
15.	Crankshaft.
16.	Crankshaft rear bearing.
17. } 18.	Crankshaft rear bearing cap.
19.	Crankshaft rear bearing bolt.

No.	Description
20.	Nut for bearing cap.
21.	Connecting rod assembly.
22.	Connecting rod bush.
23.	Connecting rod bolt.
24.	Connecting rod bolt nut.
25.	Piston case.
26.	Gudgeon pin.
27.	Gudgeon pin circlip.
28.	Piston compression ring.
29.	Piston oil control ring.
30.	Inlet camshaft front bearing.
31.	Exhaust camshaft front bearing.
34.	Inlet camshaft rear bearing.
35.	Exhaust camshaft rear bearing.
36.	Inlet camshaft.
37.	Exhaust camshaft.
38.	Camshaft plug.
39.	Camshaft spacing collar split ring.
40.	Camshaft wheel spacing collar.

No.	Description
41.	Key—camshaft chain wheel.
42.	Timing wheel—camshaft.
43.	Camshaft distributor gear key.
44.	Camshaft distributor gear.
45.	Camshaft tab washer.
46.	Camshaft lock washer (inlet).
47.	Camshaft lock washer (exhaust).
48.	Camshaft set screw.
49.	Timing chain oil pin.
50.	Timing chain oil pipe tab washer.
51.	Timing chain oil pin nut.
52.	Timing chain sprocket spindle.
53.	Timing chain sprocket spindle locknut.
54.	Timing chain tensioner sprocket centre.
56.	Timing chain tensioner stud.
57.	Timing chain tensioner pinion.
58.	Timing chain tensioner segment.

No.	Description
59.	Tensioner segment distance washer.
60.	Chain tensioner distance-piece.
61.	Timing wheel tensioner.
65.	Timing chain.
66.	Key—crankshaft chain wheel.
67.	Timing wheel—crankshaft.
68.	Crankshaft oil thrower.
69.	Main bearing oil feed pipe assembly.
70.	Banjo bolt (centre).
71.	Banjo bolt washer.
72.	Banjo bolt (rear).
73.	Banjo bolt tab washer.
74.	Banjo bolt washer.
75.	Chain oil pipe.
76.	Timing chain adjuster and washer.
78.	Chain tensioner nut.
79.	Crankshaft oil thrower taper pin.

Remove the main oil feed pipe and take off the Simmonds nuts holding the rear bearing housing to the crankcase.

Unscrew the set pin on the side of the crankcase. This pin locates the centre bearing housing and fits into a block which in turn is a sliding fit in a slot on the bearing housing.

The crankshaft is now ready for removal and it should be knocked out by alternately hitting the front end with a hide hammer and tapping the centre bearing housing with a suitable drift and hammer.

The rear and centre bearings may now be removed from the crankshaft by undoing the retaining bolts.

Take care that no damage occurs to the oil retainer in the rear housing. The front bearing may be drifted or pressed out of the crankcase after removal of the dowel. Alternatively Special Tool No. ST.59 may be used. (See Section Q.)

Section AA.7

REMOVAL AND REPLACEMENT OF THE CYLINDER HEAD

Drain the water from the cooling system by means of the two taps, one at the base of the radiator and the other just forward of the fuel pump.

Take off the bonnet tops, as detailed under Section D.2, and the radiator steady rods. This will give plenty of working clearance.

Remove the throttle control rod from carburetter and disconnect the mixture control at the carburetter.

Detach the fuel line at the float-chamber and take off the carburetter air filter.

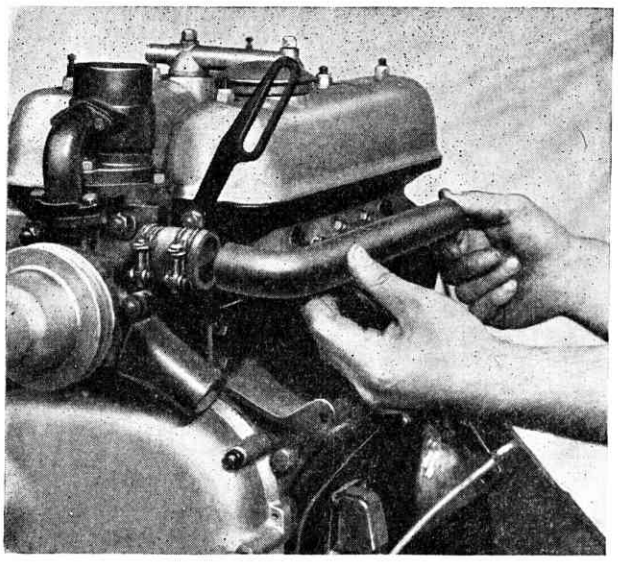


Fig. AA.8.
Removing cross-flow pipe.

Disconnect the slow-running control.

Take off the carburetter.

Remove the induction manifold and hot-spot tubes as explained in Section AA.12.

Detach the distributor head and the ignition harness.

Disconnect the water hose connections, one at the thermostat and the other on the underside of the water pump.

Remove the fan so that this does not become damaged when the head is lifted off.

Disconnect the water temperature capillary head.

Release the dynamo attachment bolts.

Remove the dynamo drive belt and swing the dynamo away clear of the exhaust manifold.

Disconnect the exhaust pipe at the manifold and remove the cross-flow water pipe. Take off the exhaust manifold and remove both rocker covers. Take out the sparking plugs. Remove the cylinder head holding-down nuts, taking care to see that each nut is undone a small amount at a time in the sequence indicated in Fig. A.7, Section A.7.

Lift off the cylinder head, which will come away complete with the push-rods, and remove the gasket.

The cylinder head is now ready for valve grinding and decarbonisation as detailed in Section AA.26.

Replacement of the head is a reversal of this process and the holding-down nuts should be tightened in the sequence shown in Fig. A.7, Section A.7. The torque spanner figure for these nuts is 540 in./lb. (6·21 m./kg.).

Note.—*When reassembling the head, the push-rods should be fitted in the following manner : The rocker should be moved to one side against the rocker spring pressure and the push-rod inserted.*

If a downward pressure is then applied to the valve, the rocker can be moved into its correct position. Take great care during this operation that the push-rods are not bent.

Section AA.8

REMOVAL AND REPLACEMENT OF PISTON AND CONNECTING ROD

The big-end will not pass up the cylinder bore, neither will the piston pass the crankshaft. The removal procedure is therefore as follows :—

Remove the cylinder head. (See Section AA.7.)

Drain the sump. (See Section AA.1.)

Remove the sump. (See Section AA.2.)

Take out the split pins and remove the castellated nuts from the big-end bearing bolts.

Take off the bearing cap which is marked to line up with its corresponding connecting rod.

Remove the big-end bolts and push the rod and piston far enough up the cylinder to expose the gudgeon pin.

Remove a circlip and tap the pin out of the little-end with a suitable drift. Support the piston at the same time, otherwise the connecting rod may be bent.

The piston may now be lifted out through the top of the block and the connecting rod extracted from the bottom.

When refitting the pistons to the bores, use some form of piston ring compressor in order to prevent ring damage.

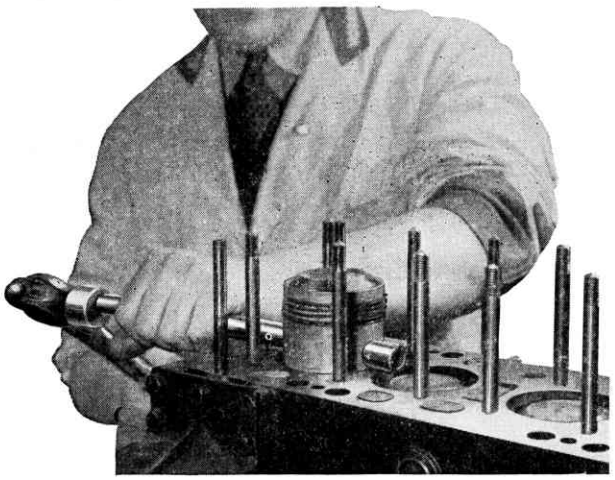


Fig. AA.9.
The method of removing the gudgeon pin with a suitable drift is shown in the above photograph.

Section AA.9

FITTING GUDGEON PIN

The gudgeon pin is a push fit in the little-end and a light drive fit in the piston at room temperature. Gudgeon pins ·002 in. oversize (Part No. 166515) are available, and may be fitted to take up slack in the small end bushes or pistons, which must, of course, be reamed out to suit.

The gudgeon pin circlips should be fitted with a special pair of peg-nosed pliers, and it is essential to make sure that they are in proper engagement with their retaining grooves.

Section AA.10

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 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 rings downwards over the skirt of the piston.

Before fitting new 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. There must be no play between the rings and their grooves but they must nevertheless be free to move without restriction.

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. (2·5 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 ·008 *in.* (·2 *mm.*).

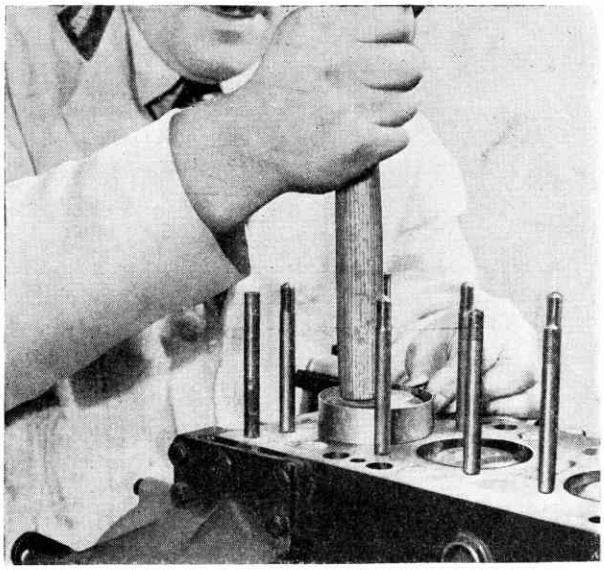


Fig. AA.10.
The use of a piston ring compressor is advisable when fitting the pistons.

Section AA.11

REMOVAL AND REPLACEMENT OF THE CARBURETTER

Take off the air cleaner and silencer.

Disconnect the throttle control.

Disconnect the slow-running control cable.

Disconnect the rich mixture control cable.

Uncouple the fuel line at the float-chamber.

Undo the two retaining nuts and withdraw the carburetter complete with the intake elbow.

Section AA.12

REMOVAL OF THE INLET MANIFOLD

Take off the carburetter as explained in Section AA.11.

Disconnect the manifold hot-spot elbow.

Undo the manifold retaining nuts and pull the manifold casting away from the cylinder block.

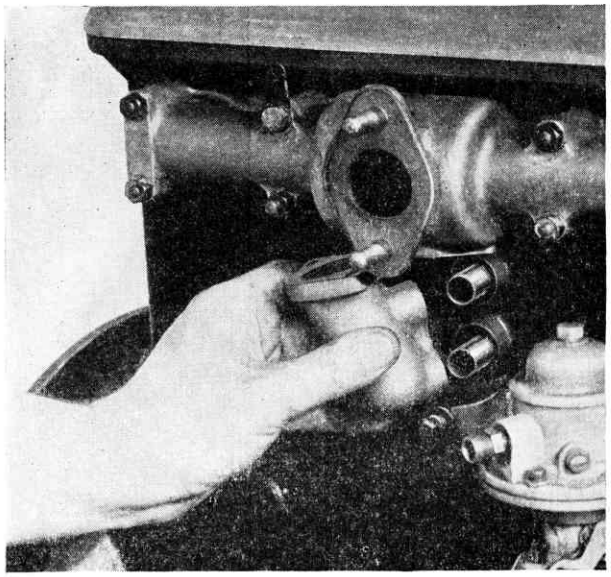


Fig. AA.11.
Removing the hot-spot elbow.

Section AA.13

REMOVAL OF THE EXHAUST MANIFOLD

Drain the cooling system as in Section AA.7.

Slacken the nut on the dynamo pivot and remove the upper attachment bolt.

Remove the driving belt and swing the dynamo to one side.

Remove the cooling water inlet pipe.

Undo the hot-spot casting elbow at the inlet side.

Disconnect the exhaust pipe at the manifold.

Undo the manifold retaining nuts and pull the casting away complete with the hot-spot tubes. Difficulty may be experienced here due to the sticking of the hot-spot tubes. If necessary use Special Tool ST.56.

Section AA.14

REMOVAL AND DISMANTLING OF THE WATER PUMP

To detach the pump the dynamo must be slackened and the water pump and fan belt removed.

Take off the fan pulley and fan (one Simmonds nut).

It is not necessary to remove the impeller housing from the cylinder head because the bearing housing complete with pulley and impeller may be taken out by removing four set screws and washers.

Note that one screw breaks into the waterway, and when refitting, a copper washer is essential at this point.

Before taking off the pump the thermostat by-pass elbow must be removed, and in this case make quite sure that the two joints are in good order when refitting.

The dismantling and reassembly of the pump unit are as in Section A.14.

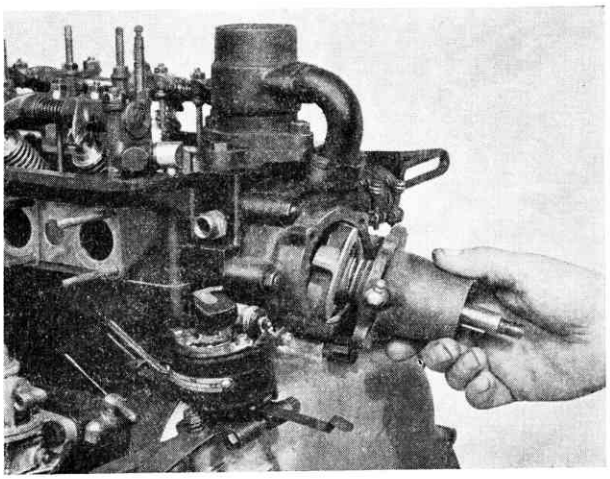


Fig. AA.12.
Removing the water pump.

Section AA.15

SETTING THE TAPPETS

Remove the ignition harness and the small inter-connecting breather pipe for the rocker covers. Take off the rocker covers and this will expose the rockers and their adjusters.

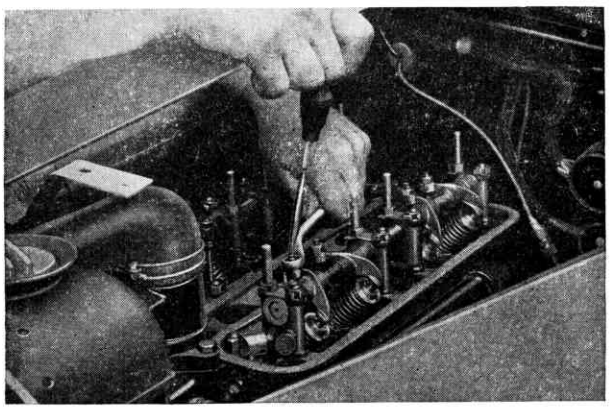
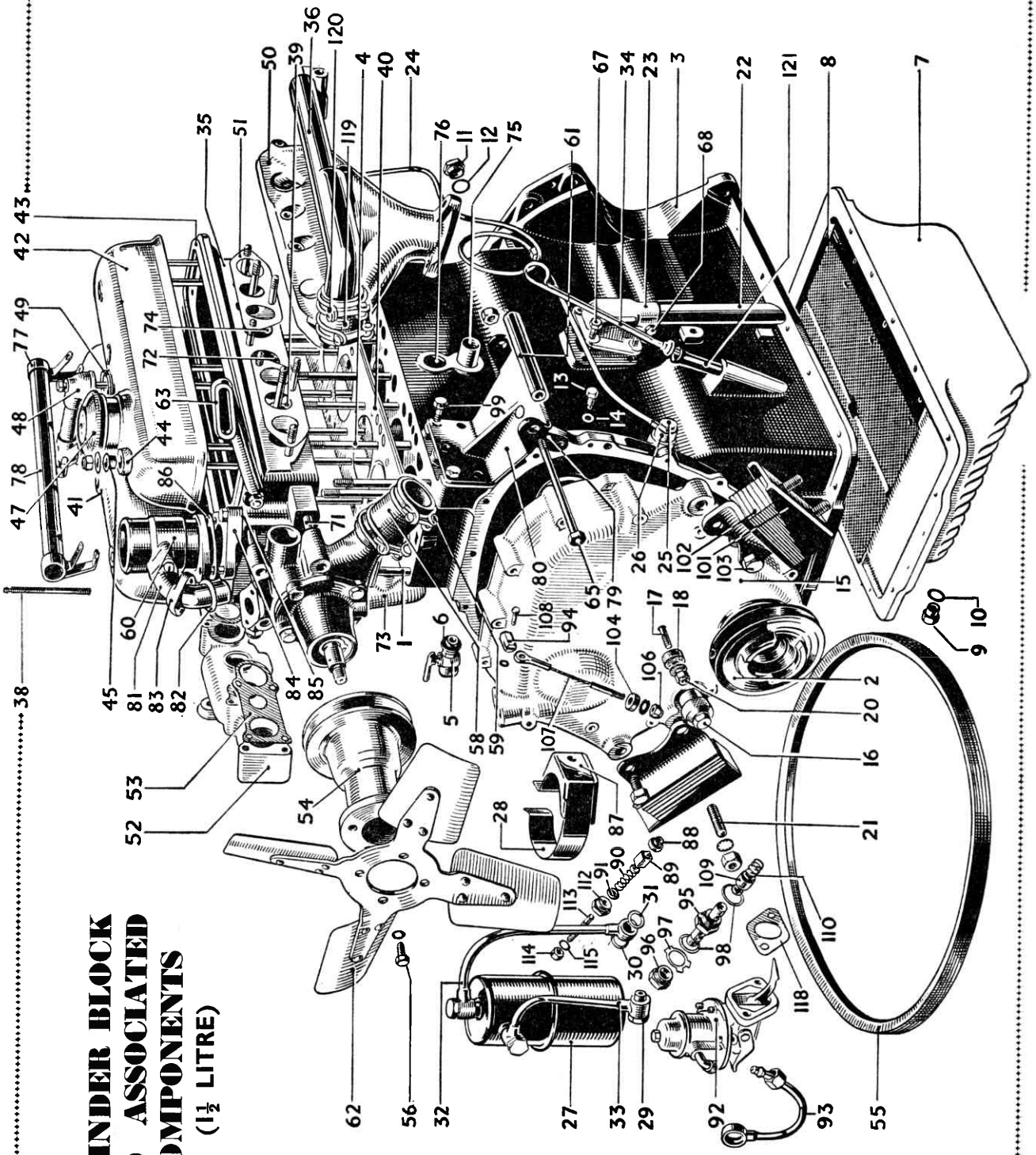


Fig. AA.13.
The valve clearance is set by the orthodox tappet screw and locknut.

CYLINDER BLOCK AND ASSOCIATED COMPONENTS
(1½ LITRE)



KEY TO CYLINDER BLOCK AND ASSOCIATED COMPONENTS (1½ LITRE)

No.	Description
1.	Rocker lubrication stud.
2.	Crankshaft fan pulley.
3.	Cylinder block.
4.	Cylinder head stud.
5.	Cylinder drain tap.
6.	Cylinder drain tap washer.
7.	Sump.
8.	Sump baffle plate.
9.	Sump drain plug.
10.	Sump drain plug washer.
11.	Rear bearing plug.
12.	Copper washer.
13.	Bearing screw.
14.	Bearing screw copper washer.
15.	Timing cover.
16.	Chain tensioner screwed plug.
17.	Timing cover damping stud.
18.	Damping stud cork washer.
19.	Damping stud washer.
20.	Damping stud nut.
21.	Stud (support block to timing case).
22.	Breather tube.
23.	Breather crankcase.
24.	Oil pipe (engine to adaptor).
25.	Banjo bolt.
26.	Banjo bolt washer.
27.	Oil filter.
28.	Oil filter strap.
29.	Oil filter union bolt.
30.	Oil filter union washer—large.
31.	Oil filter union washer.
32.	Oil filter pipe assembly—long.
33.	Oil filter pipe assembly—short.
34.	Crankcase oil dipstick.
35.	Cylinder head case.
36.	Water inlet manifold.
38.	H.T. wire clip stud.
39.	Water inlet fibre washer.
40.	Cylinder head gasket.
41.	Inlet rocker cover.
42.	Exhaust rocker cover.
43.	Rocker cover gasket.
44.	Rocker cover insert.
45.	Rocker cover insert ferrule.
46.	Rocker cover insert washer.
47.	Rocker cover filler cap.
48.	Rocker cover breather.
49.	Rocker cover breather gasket.
50.	Exhaust manifold.
51.	Exhaust manifold gasket.
52.	Induction pipe.
53.	Induction pipe gasket.
54.	Fan pulley.
55.	Fan and dynamo belt.
56.	Fan centre and pulley set screw.
58.	Water pump hose.
59.	Water pump hose clip.
60.	Thermostat complete.
61.	Dynamo mounting—distance tube.
62.	Fan centre and blades assembly.
63.	Dynamo adjusting link.
65.	Bolt (dynamo to bracket).
66.	Nut (dynamo to bracket).
67.	Breather set pin.
68.	Breather tube bolt.
71.	Water pump body stud.
72.	Hot-spot conduit tube (head).
73.	Hot-spot outlet.
74.	Hot-spot tube (through head).
75.	Hot-spot return tube (in block).
76.	Hot-spot conduit tube (block).
77.	H.T. wire clip.
78.	H.T. wire tube.
79.	Dynamo bracket lug.
80.	Dynamo bracket.
81.	Thermostat by-pass elbow.
82.	By-pass joint ring.
83.	By-pass fixing flange.
84.	Assembly thermostat flange and baffle plate.
85.	Thermostat adaptor flange washer.
86.	Thermostat washer to flange.
87.	Oil filter bracket.
88.	Oil relief valve seat.
89.	Oil relief valve.
90.	Oil relief valve spring.
91.	Oil relief valve washer.
92.	Petrol pump assembly.
93.	Petrol pipe (pump to carburetter).
94.	Nut.
95.	Oil filter oil delivery adaptor.
96.	Oil filter oil delivery blind nut.
97.	Oil filter oil delivery tab washer.
98.	Oil filter oil delivery washer.
99.	Dynamo bracket set screw (to block).
100.	Engine steady cable plain washer.
101.	Engine support block case.
102.	Engine support block—front.
103.	Bolt (support block to timing case).
104.	Engine steady cable rubber washer.
105.	Engine steady cable plain washer.
106.	Engine steady cable nut.
107.	Engine steady cable.
108.	Engine steady cable nut pin.
109.	Delivery adaptor relief valve.
110.	Delivery adaptor relief valve spring.
112.	Oil relief valve bush.
113.	Oil relief valve adjusting screw.
114.	Oil relief valve adjusting screw nut.
115.	Oil relief valve adjusting screw washer.
116.	Engine mounting shakeproof washer.
117.	Stud and bolt nut.
118.	Petrol pump gasket.
119.	Water pump hose.
120.	Water pump hose clip.

The tappets are set by slackening back the locknut and screwing the ball-ended adjuster in or out as required. Set the clearance on engines prior to No. A.10311 to ·003 in. (·08 mm.) inlet and ·004 in. (·10 mm.) exhaust with the engine hot. On engines subsequent to No. A.10310 the correct tappet clearance is ·015 in. (·38 mm.) with the engine hot.

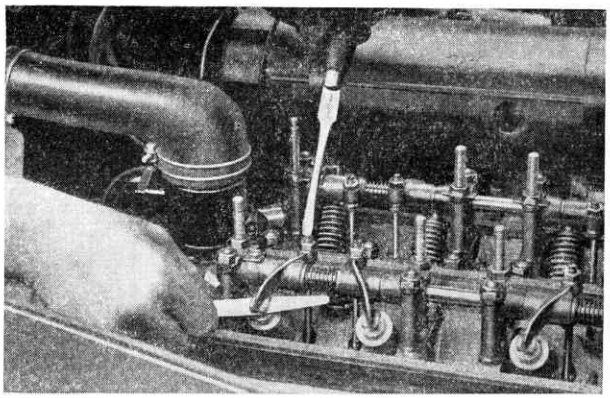


Fig. AA.14.
The valve clearance should be checked with a feeler.

Section AA.16

REMOVAL OF THE CRANKSHAFT PULLEY

The crankshaft pulley is screwed onto the crankshaft with a left-hand thread. There is no locking device.

Section AA.17

CHANGE OF DYNAMO BELT

Slacken the dynamo retaining and adjusting nuts and move the instrument inwards towards the engine.

Disconnect the front engine steady cable and feed off the old belt. Fitting the new belt is a reversal of this process.

Section AA.18

REMOVAL OF THE TIMING CHAIN COVER

Take off the distributor. (See Section C.7.)

Unscrew the crankshaft pulley. (See Section AA.16.)

Remove all the fixing nuts, including the Simmonds nut and cork washer in the centre of the cover.

Pull off the cover.

No gasket is fitted, and when refitting use a liquid jointing compound after making sure that both mating surfaces are clean.

Section AA.19

REMOVAL OF THE CRANKSHAFT CHAIN WHEEL

Remove the crankshaft pulley. (See Section AA.16.)

Take off the timing cover. (See Section AA.18.)

Pull off the crankshaft oil thrower sleeve after knocking out the pin in front of the thrower plate and the taper pin behind. Use Special Tool No. ST.53.

Section AA.20

REMOVAL AND REPLACEMENT OF THE TIMING CHAIN

Remove the crankshaft pulley. (See Section AA.16.)

Take off the timing cover. (See Section AA.18.)

Set the engine so that the timing marks are correctly positioned, that is, on engines prior to No. A.10311, with the crankshaft keyway vertical and the camshaft chain wheel marks in line (Fig. AA.15).

Polish three links of the chain to coincide with a scribed mark added to each of the three chain wheels.

On engines from No. A.10311 onwards, the crankshaft key must be vertical, and the "T"s on the chain wheels must coincide with the bright links on the chain.

Remove the chain tensioner. (See Section AA.21.)

Lift off the chain.

Note.—*With an old chain it is sometimes possible to lift it off the timing wheels without removing one of them. With a new chain this is not possible and one timing wheel must be removed.* (See Section AA.21.)

If a new chain is to be fitted, lay it alongside the old and mark the corresponding links on the new chain from those on the old.

Replacement is a reversal of this process.

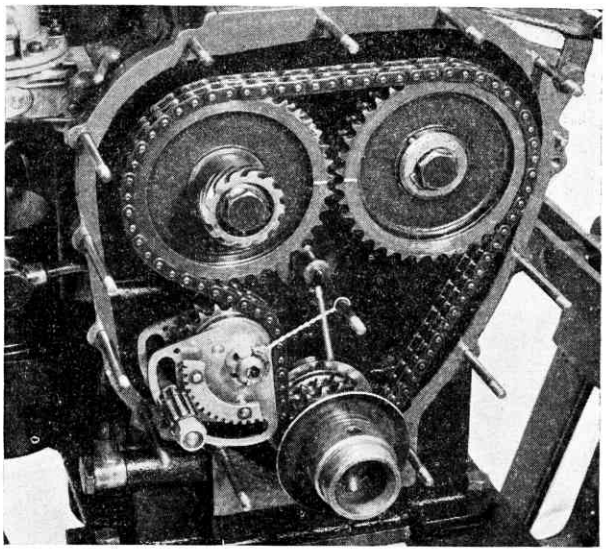


Fig. AA.15.
The camshaft timing wheel markings on earlier engines.

Section AA.21

REMOVAL OF THE CHAIN TENSIONER

Remove the locking wire and nut from the chain tensioner.

Note.—*The split pin locks the round nut and the locking wire prevents the stud and nut from rotating.*

Remove the nut.

Undo the Simmonds nut and pull off the splined adjusting sleeve.

Take off the outer plate of the adjuster and then pick off the distance-piece.

Unscrew the spindle with an Allen key and lift the tensioner sprocket away.

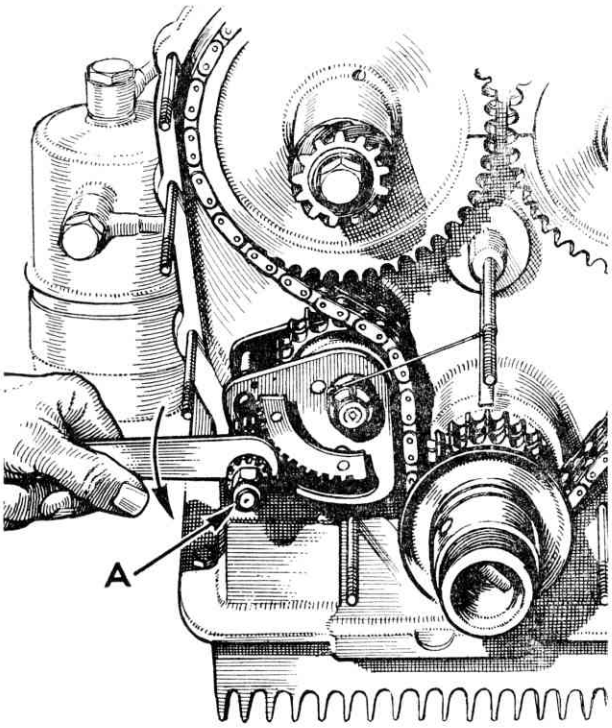


Fig. AA.16.
The chain tensioner, illustrating the use of the special spanner.

Section AA.22

REMOVAL OF THE CAMSHAFTS

Remove the crankshaft pulley, timing case, camshaft sprocket, and timing chain as explained in Sections AA.16, AA.18, AA.20 and AA.21.

Take off the exhaust camshaft chain wheel by bending back the lock washer and undoing the bolt.

Do the same with the inlet wheel after first removing the distributor drive gear. (See Section C.7.)

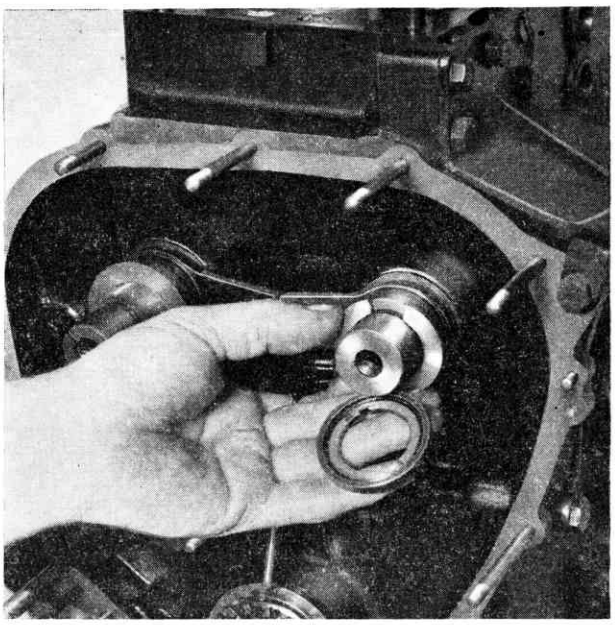


Fig. AA.17.
The camshafts are located by split rings retained by recessed thrust washers.

Both these chain wheels and the distributor gear are mounted on parallel shafts with Woodruff keys.

Take off the end thrust washers and split rings.

Remove the rocker gear. (See Section AA.23.)

Turn the engine upside down so that the tappets fall away from the camshafts.

In the case of earlier engines the camshaft will then pull away complete with the front bearing, after the set screw holding the two lugs on the camshaft bearings, and the two screws entering from either side of the crankcase, have been removed.

On later engines each bearing is held by two set screws from the front with none from the side of the crankcase.

Section AA.23

REMOVAL OF THE ROCKER GEAR

Take off the ignition harness.

Remove the breather pipe and rocker covers.

Depress each valve in turn and move the rocker aside so that all loads are taken off the rocker-shaft assembly.

Undo all the rocker securing nuts and lift off the rocker-shafts and pedestals.

The rockers are bushed and are right- and left-handed.

The two front rocker pedestals are handed and oil flows through suitable drillings in them to feed the rocker-shafts.

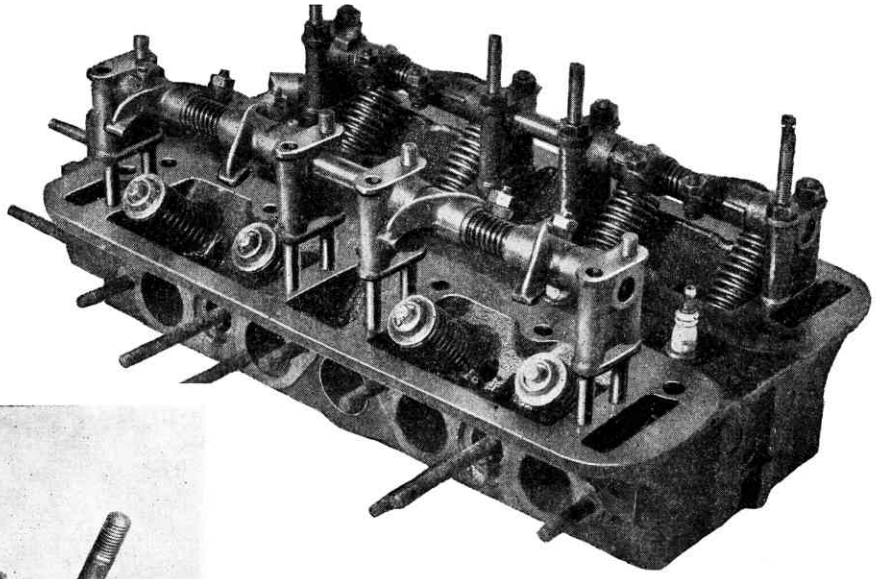
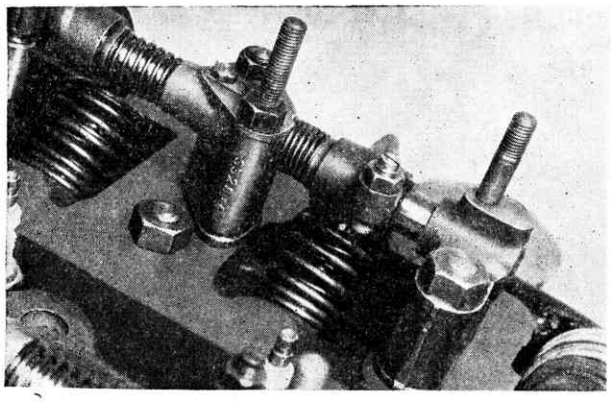


Fig. AA.18.
Right is shown the method of removing the rocker assembly as a complete unit.

Fig. AA.19.
Below is a close-up view of one of the forward rocker pedestals.



Section AA.24

REMOVAL OF THE VALVES

The valve springs are held in place by cups and split collets. Support the head of the valve inside the combustion space, apply a suitable compressor to the spring cap and lift off the collets.

In order to prevent valve crash on cars fitted with the 8/41 ratio rear axle, a stronger outer valve spring (Part No. 166553) may be fitted instead of the earlier type (Part No. R.647). The new valve spring is fitted as standard equipment on engines from No. RMA.11280 onwards.

Section AA.25

REMOVING AND FITTING THE VALVE GUIDES

The valve guides may be drawn or tapped out. When fitting new guides make sure they are positioned according to Fig. AA.20. Alternatively a special blind drift may be made up so that the guide is automatically fitted to the correct dimension.

All guides must be reamed to size in position.

Section AA.26

DECARBONISING

Remove the cylinder head as in Section AA.7.

Take out the valves as in Section AA.24.

Lift off the cylinder head gasket and plug up all water holes and tappet guides with pieces of clean rag.

Scrape all carbon off the inlet and exhaust ports and the cylinder head and piston crowns, taking care that the pistons are not scratched. Polish the combustion chambers and ports with emery cloth. Never use emery cloth on the piston tops because small abrasive particles will undoubtedly find their way into the cylinder bores.

A ring of carbon should be left on the periphery of the piston crowns and the carbon round the top of the cylinder bores should also be retained. This is best achieved by placing an old piston ring on top of the piston.

Remove all traces of dust by means of compressed air and then clean well with paraffin. Always use a new cylinder head gasket after decarbonising.

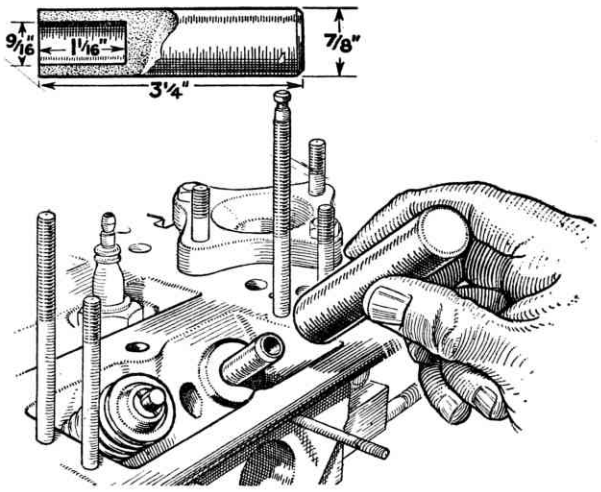
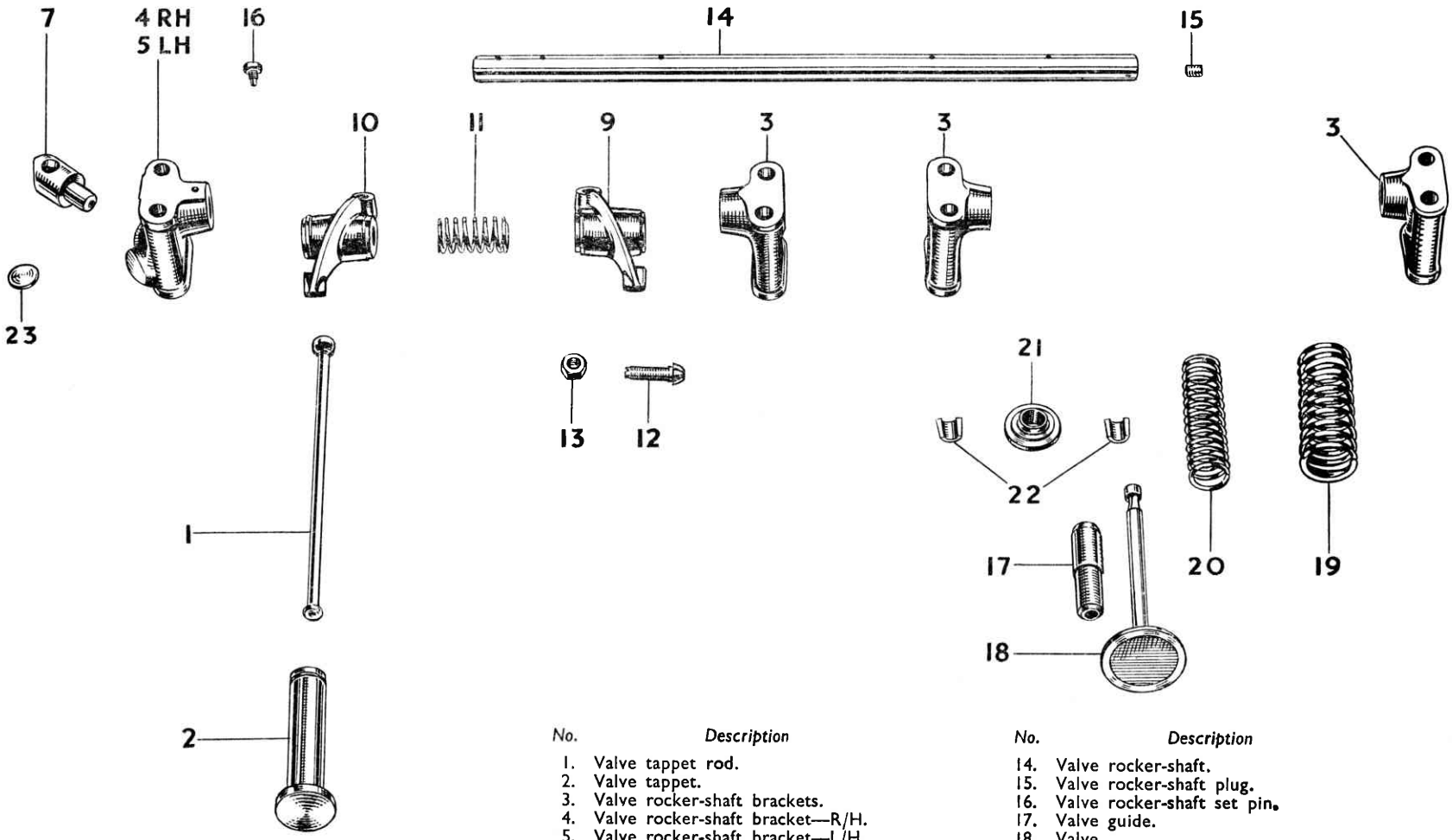


Fig. AA.20.
The valve guide positioning tool to ensure correct fitting.

THE VALVE GEAR COMPONENTS (1½ LITRE)



No.	Description
1.	Valve tappet rod.
2.	Valve tappet.
3.	Valve rocker-shaft brackets.
4.	Valve rocker-shaft bracket—R/H.
5.	Valve rocker-shaft bracket—L/H.
7.	Valve rocker lubricating stud socket.
9.	Valve rocker—R/H.
10.	Valve rocker—L/H.
11.	Valve rocker distance spring.
12.	Valve rocker ball pin.
13.	Valve rocker ball pin adjusting nut.

No.	Description
14.	Valve rocker-shaft.
15.	Valve rocker-shaft plug.
16.	Valve rocker-shaft set pin.
17.	Valve guide.
18.	Valve.
19.	Valve spring (outer).
20.	Valve spring (inner).
21.	Valve spring cup.
22.	Valve spring collar.
23.	Cylinder head plug.

Section AA.27

GRINDING AND TESTING THE VALVES AND THEIR SEATINGS

Remove the valves and springs as detailed in Section AA.24.

Clean each valve carefully and examine the seating for signs of pitting. If pitting is apparent then the valve must be refaced. The same applies to the valve seats and great care must be taken not to remove too much metal.

Each valve must be replaced in the same port from which it was removed and when grinding in the faces a fine or medium grade carborundum paste should be used.

Place a light coil spring under the head of the valve and use a suction-type grinding tool to impart a reciprocating motion to the valve.

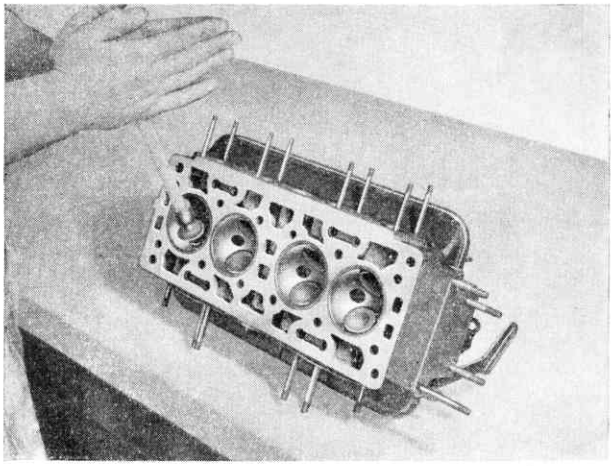


Fig. AA.21.
Grinding the valves with a suction tool.

An even matt finish is desirable and if the seat is too wide it should be reduced to approximately 2 mm. (·080 in.) by means of a 45° cutter.

After having ground in each valve, the port, seating and valve itself should be carefully cleaned with paraffin and then dried, taking care that no trace of grinding paste finds its way into the valve guide.

Section AA.28

ADJUSTING THE FAN BELT

The fan belt tension is altered by slackening the nuts of the dynamo swivel bolts and then undoing the Simmonds nut on the top adjuster link bolt.

After setting the belt to the tension indicated in Fig. AA.22, tighten all the fixing bolts.

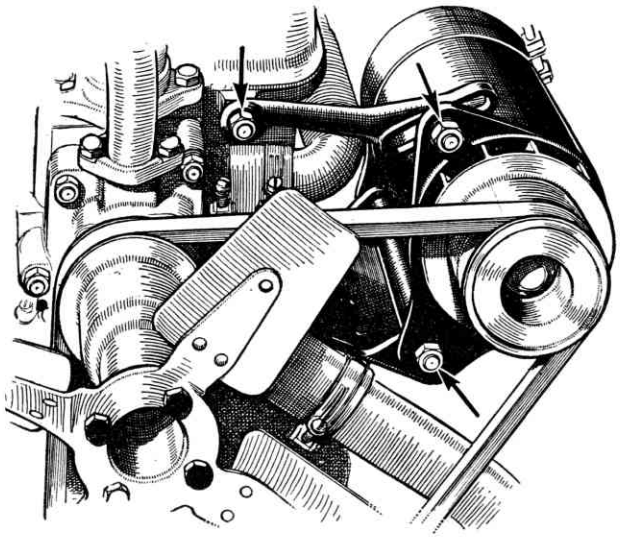


Fig. AA.22.
Set the fan belt so that there is ½ in. (13 mm.) slack on its longest run. The arrows indicate the three dynamo attachment bolts which must be slackened for adjustment.

Section AA.29

REMOVAL OF ENGINE AND GEARBOX

Drain the water from the radiator and engine by means of the two drain taps. (See Section D.1.)

Remove the bonnet tops complete as in Section D.2.

Disconnect the battery.

Unclip the radiator water temperature gauge pipe from the radiator steady.

Take off both radiator steadies by detaching the bolts at the front and the nuts at the rear.

Take off the radiator top hose.

Take off the bottom hose at the radiator base.

At the top of the radiator grille will be seen two small nuts and bolts holding the grille to the radiator. These should be removed.

Nearby are two bolts holding the bonnet sides to the radiator. These bolts should also be removed.

Take off the ignition harness and distributor cap.

Disconnect the L.T. lead at the distributor.

Take off the air silencer by undoing the rocker cover breather pipe and the two nuts on the inlet manifold which hold the air silencer in place.

Now remove the carburetter intake elbow.

Disconnect the water thermo-couple unit at the thermostat.

Disconnect the throttle operating rod at the carburetter and take off the return spring.

Remove the slow-running cable and rich mixture control from the carburetter.

Disconnect the fuel pipe at the pump and disconnect the manual advance/retard control at the distributor.

Take off the radiator grille. There are two bolts on the under side holding the grille to the undershield and two 2 B.A. bolts and nuts at the bottom and entering from the side. These 2 B.A. bolts pass through the wing, grille and beading.

Now remove the radiator by undoing the two nuts on the under side. Note the four rubber packing washers.

Disconnect the exhaust pipe at the manifold and detach the two cables to the starter, one of which is an earthing strip.

Undo the oil pressure gauge pipe at the adaptor and undo the dynamo cables.

Take off the dynamo and its belt.

Undo the front engine steady.

Now, sling up the engine. The sling should pass under the bell housing at the rear and round the crankshaft pulley at the front.

Take off the front suspension cross-member which is held by six bolts which screw into nut plates welded to the cross-member.

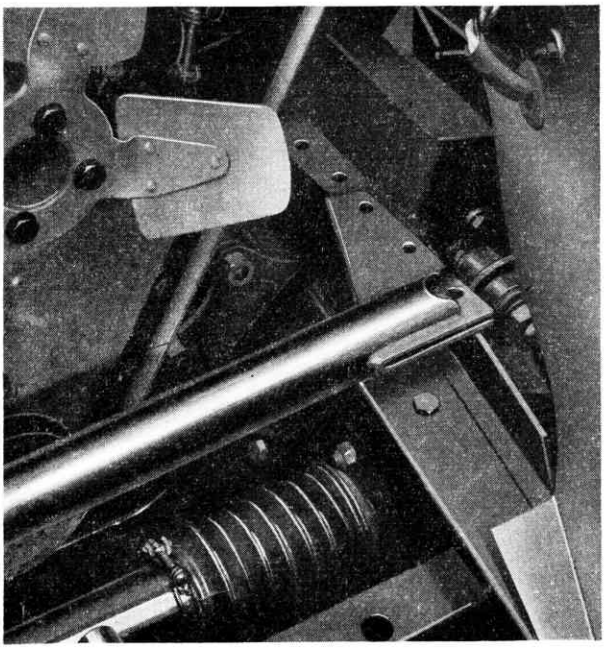


Fig. AA.23.
The cross-member.

Remove the engine mounting brackets at the front. These are held by four large bolts and nuts to the timing case and by eight set screws to the front suspension unit.

Note.—*These brackets cannot be removed until the weight of the engine is taken on the sling.*

Now take out the front seats and unscrew the gear lever knob. Take up the front mats and underfelt.

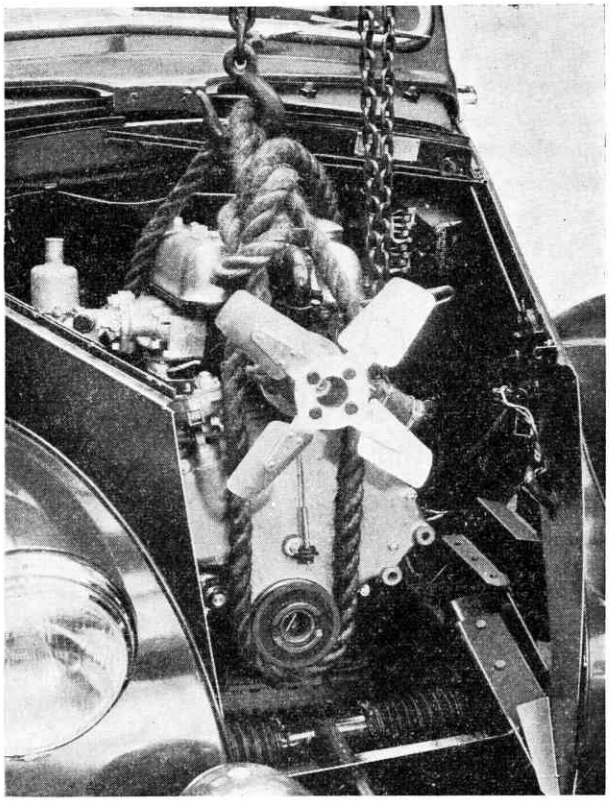


Fig. AA.24.
Lifting the engine from the frame.

Remove the small retainer plate at the rear of the gearbox tunnel and lift off the tunnel.

Take up the toeboard on the passenger's side (held by one screw) and remove the metal floorboards after taking out the screws.

Note that the floorboards have lips at the rear edges and must consequently be moved forward before they can be lifted out.

Take off the metal toeboard.

Undo the six nuts on the gearbox cover and remove it complete with gear lever. Take care that the three selector ball springs do not drop into the gearbox.

If the paper washer is damaged it should be renewed.

Make a temporary cardboard cover to fit over the gearbox so that nothing will drop inside.

Disconnect the intermediate shaft at the forward end by removing the four Simmonds nuts and knocking the bolts out. See Section A, Fig. A.20.

Disconnect the speedometer drive and the reverse light cables.

Take out one of the pins on the clutch cross-shaft and disconnect the rear engine steady.

Now undo the two bolts holding the rear engine mounting to the chassis—it is not necessary to detach the mounting from the gearbox. The unit is then ready for removal from the chassis.

It will be found that it is necessary to lift the engine well up to clear the suspension unit at the front.

Assembly is a reversal of this process, but note the rubber buffers under the radiator; the thick ones must be above the mounting and the thin ones below. Tighten the Simmonds nuts sufficiently to just nip the rubber.

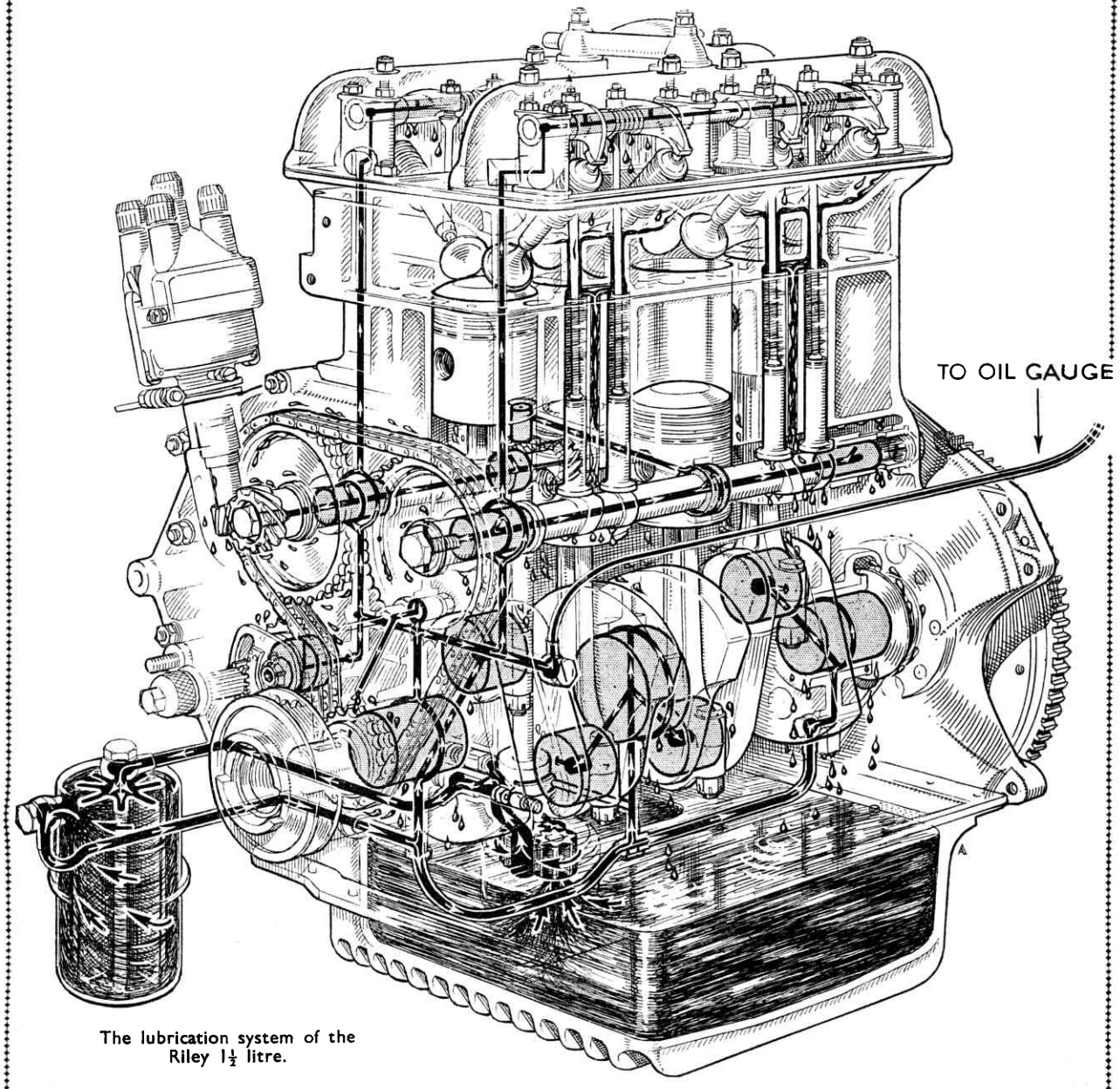
Tighten the engine mounting bolts fully and see that the steady cables at front and rear are just in tension.

Section AA.30

REMOVAL OF THE CLUTCH

Take off the gearbox by undoing the retaining nuts and pulling the box away from the engine.

Slacken back the retaining screws holding the clutch cover-plate to the flywheel. The screws should be undone a turn at a time evenly and diagonally to prevent the spring pressure straining the clutch cover-plate.



The lubrication system of the Riley 1½ litre.

Section AA.31

REMOVAL OF THE FLYWHEEL

Detach the clutch as in Section AA.30.

Bend back the locking tabs on the six fitted bolts. Take out the bolts and remove the flywheel from its spigot on the crankshaft.

When refitting make sure the flywheel and spigot are perfectly clean and undamaged. The flywheel should run true to within ·004 in. (·1 mm.) on the clutch face when checked with a dial gauge.

Section AA.32

OIL PRESSURE

Under normal running conditions the oil pressure should not drop below 30 lb./sq. in. (2·11 kg./cm.^{2}) on the gauge, whilst approximately 12 lb./sq. in. (·9 kg./cm.^{2}) should be shown when the engine is idling.

Should there be a noticeable lack of pressure, the following points should be checked over :—

1. That there is a good supply of the correct grade of oil in the engine sump.
2. That the pump gears are in order and have the correct clearances. (See Section AA.4.)
3. That the gauze oil pump filter is clean and not choked with sludge.
4. That the bearings on the delivery side to which oil is fed under pressure have the correct working clearances. Should the bearings be worn and the clearances excessive, the oil will escape more readily from the sides of the bearings, particularly when the oil is warm and fluid. This will cause a drop in the pressure recorded on the gauge, as compared with that shown when the bearings are in good order.

Note.—*The automatic release valve deals with any excessive oil pressure when the engine and oil are cold.*

Cold running and unnecessary use of the mixture control are often the cause of serious oil dilution by petrol, and of a consequent drop in pressure.

New engines with new oil will produce considerably higher pressure readings than those given.

Particular attention is called to the recommended change of oil every 3,000 miles (5000 km.). This is a most important factor in attaining long and trouble-free service from the engine.

Section AA.33

REGRINDING THE CRANKSHAFT

Crankshafts are provided either —·020 in. (—·50 mm.) or —·040 in. (—1·1 mm.) undersize on the main bearings with standard size big-ends and —·020 in. (—·50 mm.) or —·040 in. (—1·1 mm.) undersize on the main bearings with either —·020 in. (—·50 mm.) or —·040 in. (—1·1 mm.) undersize big-end bearing journals.

Section AA.34

LOCATING TROUBLES

Engine will not start

A. If the starter will not turn the engine, check the following :—
   1. Battery discharged, and/or defective.
   2. Disconnected or broken leads.
   3. Faulty starter switch.
   4. Faulty starter motor.
   5. Starter cables shorting to earth.
   6. Battery terminals badly corroded or battery leads loose.

B. If starter turns engine very slowly, check :—
   1. Partly discharged battery.
   2. Loose terminals or connections.
   3. Dirty or corroded connections.
   4. Faulty insulation on starter cables.
   5. Tightness in engine.
   6. Faulty starter brushes.

C. If starter turns engine smartly, but it will not fire, check :—
   1. Plugs not sparking.
   2. Spark at the coil. If the coil gives a good spark, check :—
      (*a*) Gaps in plugs too wide or too close.
      (*b*) Plugs oiled up.
      (*c*) Plug insulators damaged, or excessively dirty.
   3. If poor spark at coil, check :—
      (*a*) Low-tension or high-tension leads from coil to distributor loose or corroded.
      (*b*) Distributor points dirty, worn or out of adjustment.
      (*c*) Carbon brush not making contact.
      (*d*) Rotor cracked.
      (*e*) Faulty condenser (substitute a condenser known to be in order).
      (*f*) Faulty coil (substitute a coil known to be in order).
   4. Check the carburetter for fuel supply. If no fuel in float-chamber, check :—
      (*a*) Functioning of the fuel pump.
      (*b*) Air leak in pipe line, indicated by rapid action of the pump.
      (*c*) Float-chamber needle sticking.

5. If fuel is reaching float-chamber, check :—
   (*a*) For choked jet.
   (*b*) Water in the fuel.
   (*c*) Dirt in the carburetter.
   (*d*) Air leak in induction system.
   (*e*) Check adjustment of carburetter control.

If engine starts, but runs erratically

A. Check the following ignition points :—
   1. Loose high-tension leads to sparking plugs.
   2. Incorrect setting of plug points.
   3. Damaged plug or moisture on plugs.
   4. Loose connection on battery or in ignition circuit.
   5. Faulty high-tension leads.
   6. Battery charge low.
   7. Battery connections faulty.
   8. Defective contact breaker.
   9. Defective distributor.
   10. Faulty condenser.

B. Check the following carburetter points :—
   1. Water in float-chamber.
   2. Choked filters in carburetter or fuel pump, indicated by slow pumping of fuel pump.
   3. Action of fuel pump. Suspect if sluggish.
   4. Jet partially choked.
   5. Carburetter set too rich, indicated by sooty exhaust.
   6. Vents on fuel tank filler caps choked.
   7. Obstruction in fuel feed pipe.
   8. Air leak into induction system.

C. Check the following mechanical points :—
   1. Sticking valves.
   2. Incorrect valve clearance.
   3. Burnt or broken valves.
   4. Incorrect valve timing.
   5. Incorrect ignition timing.
   6. Broken or weak valve spring.
   7. Valve guides worn, causing air leaks.
   8. Cylinder head gasket for leaks.
   9. Back pressure due to damaged exhaust system.

If engine starts and stops

A. Check the following ignition points :—
   1. Loose low-tension leads.
   2. Loose distributor clamp screw.
   3. Faulty ignition switch contact.

B. Check the following carburetter points :—
   1. Incorrect setting of carburetter controls.
   2. Blocked fuel pipe.
   3. Water in float-chamber.
   4. Sticking needle valve.
   5. Fuel pump failing to function regularly.
   6. Air leak into fuel line.
   7. Fuel level low in tank.

If engine will not idle or run slowly

A. Check the following carburetter points :—
   1. Throttle stop screw incorrectly set.
   2. Hand throttle control requires adjustment.
   3. Throttle controls incorrectly set.
   4. Weak mixture or over-rich mixture.
   5. Faulty functioning of fuel pump.

B. Check the following mechanical points :—
   1. Sticking valves.
   2. Incorrect valve tappet clearance.
   3. Air leak in induction system.
   4. Burnt or broken valves, indicated by loss of compression.
   5. Broken valve spring.
   6. Damaged cylinder head or gasket.

C. Check the following ignition points :—
   1. Loose high-tension leads.
   2. Incorrect setting of plug points.
   3. Damaged plugs or moisture on plugs.
   4. Loose leads on battery or in ignition circuit.
   5. Faulty high-tension leads.
   6. Battery charge low.
   7. Battery connections faulty.
   8. Defective contact breaker, or burnt points.
   9. Defective distributor.
   10. Defective condenser.

Engine fails to give full power

A. Check the following carburetter points :—
   1. Faulty or insufficient fuel supply.
   2. Air leaks in induction pipe or fuel pipe.
   3. Partly choked jet.

B. Check the following mechanical points :—
   1. Incorrect valve tappet clearance.
   2. Burnt valve or badly seating valve.
   3. Cylinder head stud nuts not tight.
   4. Damaged cylinder head gasket.
   5. Valve timing incorrect.
   6. Broken or weak valve spring.
   7. Excessive carbon deposit.
   8. Excessively worn pistons and cylinders.

C. Check the following ignition points :—
   1. Ignition retarded too far.
   2. High-tension leads shorting, or loose.
   3. Dirty sparking plugs.
   4. Sparking plug points incorrectly set.

5. Contact breaker points incorrectly set.
6. Contact breaker points pitted.
7. Faulty coil.
8. Faulty condenser.
9. Low-tension connection or leads faulty.
10. Battery run down or faulty.

Engine knocks

A. Check the following :—
1. Ignition timing too far advanced.
2. Excessive carbon deposit.
3. Fuel unsuitable or mixture weak.
4. Loose or worn bearings, or pistons.
5. Defective or unsuitable plugs.
6. Valve timing incorrect or tappet clearance incorrect.

Engine backfires

A. Check the following ignition points :—
1. High-tension cables defective or connections loose.
2. High-tension leads incorrectly fitted.
3. Low-tension wiring defective or connections loose.
4. Switch contact faulty.
5. Distributor gap incorrect or points pitted or dirty.
6. Contact breaker arm sticking or defective.
7. Distributor cover cracked or loose.
8. Distributor not correctly timed.
9. Rotor brush pick-up defective or worn.
10. Clearance between rotor arm and distributor studs excessive.
11. Coil defective or wet.
12. Defective condenser.
13. Plugs overheated, unsuitable, or points incorrectly set.

B. Check the following carburation points :—
1. Jet choked or restricted.
2. Jet incorrectly set, causing weak mixture.
3. Water in fuel.
4. Check fuel filters.
5. Inlet manifold joint leaking, or manifold cracked.
6. Air cleaner passages blocked.
7. Engine running temperature too cold.
8. Throttle not closing completely (indicated by engine backfiring when proceeding downhill with throttle shut).

C. Check the following mechanical points :—
1. Valve timing incorrect.
2. Valve tappet clearance incorrectly set.
3. Valve sticking.
4. Valve seats pitted or faulty.
5. Valve spring weak or broken.
6. Valve guides excessively worn, causing air leaks.
7. Excessive carbon deposit.

Section AA.35

VALVE TIMING MODIFICATIONS

Engines from No. A.10311 onwards are fitted with camshafts having cams of a modified form. This necessitates a different tappet setting, the correct clearance now being ·015 in. (·38 mm.) for both the inlet and exhaust valves with the engine hot, instead of ·003 in. (·08 mm.) and ·004 in. (·10 mm.) for the inlet and exhaust valves respectively.

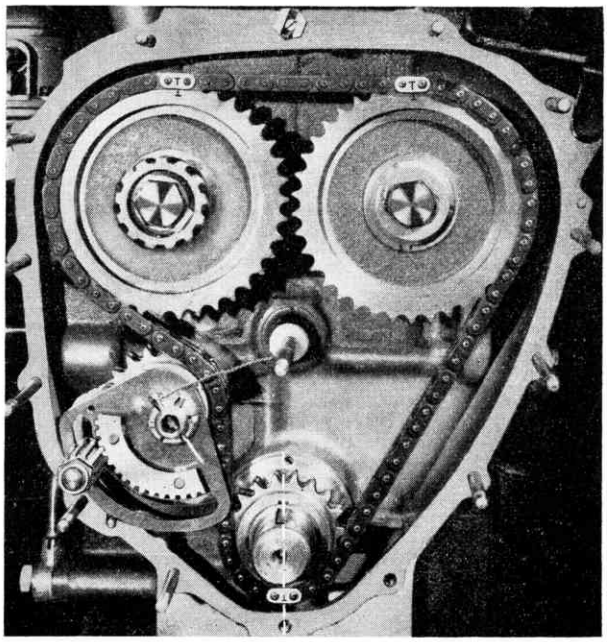


Fig. AA.25
The camshaft timing wheel markings and bright links on later engines.

In addition, the valve timing marks also have been modified on engines from No. A.10311 onwards. The camshaft timing wheels now have "T" marks on them which must coincide with bright links in the timing chain. At the same time, the crankshaft keyway must be vertical, and the remaining bright link in the chain must be in line with the crankshaft keyway as in Fig. AA.25.

Section AA.36

PISTON SIZES AND CYLINDER BORES

The same system of cylinder bore and piston size marking is used on the 1½ litre Riley models as is used on the 2½ litre models and the same remarks concerning selection and fitting apply. (See Section A.37.)

The only difference is in the actual dimensions which are tabulated below.

The standard cylinder bore diameter, indicated by the symbol " S.T.D.", is 2·71649 in. (69 mm.) and the following range of standard bore sizes is provided :—

Standard

Piston marking	*Bore size*
To suit standard bore	2·71649 in. to 2·71700 in.
To suit +·0005 in. bore	2·71700 in. to 2·71751 in.
To suit +·0010 in. bore	2·71751 in. to 2·71799 in.
To suit +·0015 in. bore	2·71799 in. to 2·71850 in.

1st Oversize (+·010 in.)

Piston marking	*Bore size*
To suit +·010 in. bore	2·72649 in. to 2·72700 in.
To suit +·0105 in. bore	2·72700 in. to 2·72751 in.
To suit +·0110 in. bore	2·72751 in. to 2·72799 in.
To suit +·0115 in. bore	2·72799 in. to 2·72850 in.

2nd Oversize (+·020 in.)

Piston marking	*Bore size*
To suit +·020 in. bore	2·73649 in. to 2·73700 in.
To suit +·0205 in. bore	2·73700 in. to 2·73751 in.
To suit +·0210 in. bore	2·73751 in. to 2·73799 in.
To suit +·0215 in. bore	2·73799 in. to 2·73850 in.

3rd Oversize (+·030 in.)

Piston marking	*Bore size*
To suit +·030 in. bore	2·74649 in. to 2·74700 in.
To suit +·0305 in. bore	2·74700 in. to 2·74751 in.
To suit +·0310 in. bore	2·74751 in. to 2·74799 in.
To suit +·0315 in. bore	2·74799 in. to 2·74850 in.

4th Oversize (+·040 in.)

Piston marking	*Bore size*
To suit +·040 in. bore	2·75649 in. to 2·75700 in.
To suit +·0405 in. bore	2·75700 in. to 2·75751 in.
To suit +·0410 in. bore	2·75751 in. to 2·75799 in.
To suit +·0415 in. bore	2·75799 in. to 2·75850 in.