

## SECTION AAA

### THE ENGINE

(2½ LITRE—Series RMF)

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## GENERAL DESCRIPTION

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

It has a robust four-throw crankshaft carried in three main bearings which are thick white-metal-lined bronze shells dowelled in the crankcase. The rear bearing takes the end thrust, the bearing being flanged at both ends.

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

The pistons are of aluminium alloy and are fitted with two compression and two oil control rings.

Each camshaft is supported in three bronze bushed bearings and is driven from the crankshaft by means of an endless duplex roller chain.

The valves are operated from the camshafts via hollow cylindrical tappets, short, light push-rods and rockers. Tappet adjustment takes place at the rocker.

Cooling is by pump and fan-assisted thermo-siphon action.

## THE LUBRICATION SYSTEM

The engine oil is carried in the ribbed aluminium sump below the crankcase and an oil level dipstick is fitted to the left-hand side of the block. The combined oil filler and crankcase breather is also on the left-hand side at the front of the engine.

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

From the pump, oil is delivered by an external pipe to a 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 release valve is located on the side of the oil pump body.

## Section AAA.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 14 pints (8 litres) of oil are required to refill it.

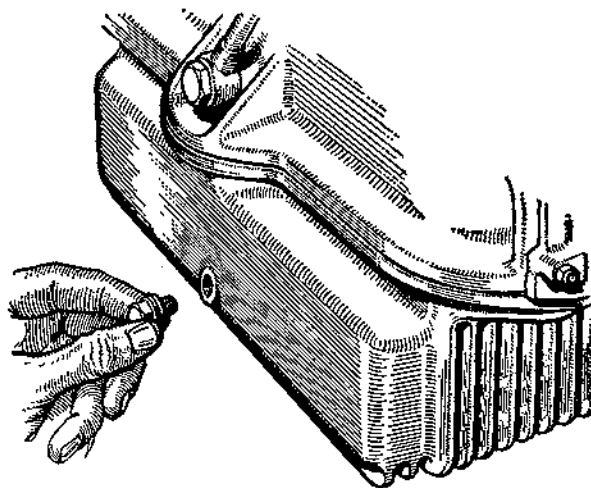


Fig. AAA.1.  
The engine drain plug.

## Section AAA.2

### REMOVAL AND REPLACEMENT OF THE SUMP

To clean the sump, take out the drain plug and allow the oil to drain away. The sump is located by sixteen hexagon-headed bolts and spring washers inserted from the underside of the flange. Removal of these allows the sump to be withdrawn. Remove the tray and thoroughly clean the sump with paraffin and a clean brush.

When the sump has been dried, refit the tray and drain plug.

A new gasket should be used when replacing the sump.

## Section AAA.3

### REMOVAL AND REPLACEMENT OF THE OIL PUMP

In order to remove the oil pump, it is first necessary to take off the sump, as described in Section AAA.2.

Take off the two pump flange nuts and washers, and then withdraw the pump assembly, complete with shaft, gear and oil pump pick-up.

If any difficulty is found in withdrawing the oil pump assembly, the oil pump shaft cap (see Fig. AAA.2) may be removed if the two bolts which locate it are taken out. The shaft may then be driven downwards.

Replacement of the oil pump is a reversal of the above procedure.

## Section AAA.4

### DISMANTLING AND REASSEMBLING THE OIL PUMP

Remove the oil pump as detailed in Section AAA.3, withdraw the split pin, and remove the oil pump pick-up.

Next take off the bottom cover and tap the shaft downwards so that the gear is exposed. Tap the driving gear down the shaft to a collar to give access to the retaining split ring and extract the split ring holding the driving gear in position. Pull off the gear wheel and remove the Woodruff key, then pull out the shaft.

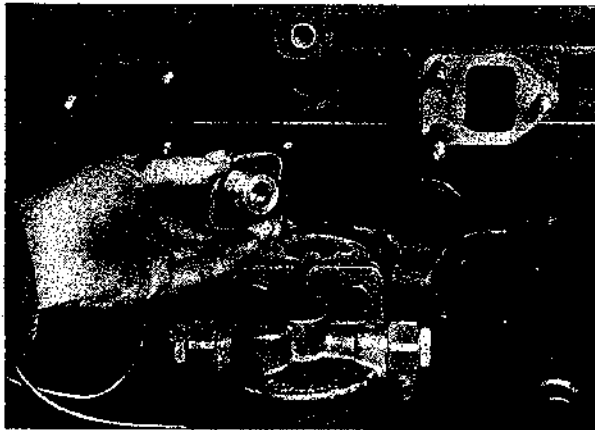


Fig. AAA.2  
The cap on the oil pump shaft.

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

1. Measure the diametrical clearance between the teeth of the gears and the pump body (see Fig. AAA.3). This should not be more than .006 in. (.15 mm.).
2. Check the end float on the gears by placing a straight-edge across the face of the pump body, and measuring the clearances with feelers, as shown in the illustration (Fig. AAA.4). 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, note that the tapped holes are not symmetrically placed, and the cover-plate can therefore only be replaced one way.

Reassembly is a reversal of the above process. Do not forget to refit the oil pump shaft cap, if it has been removed.

It is advisable to clean the pick-up gauze with petrol and a stiff brush (do not use rag), before reassembly. Allow it to dry thoroughly before replacing it.

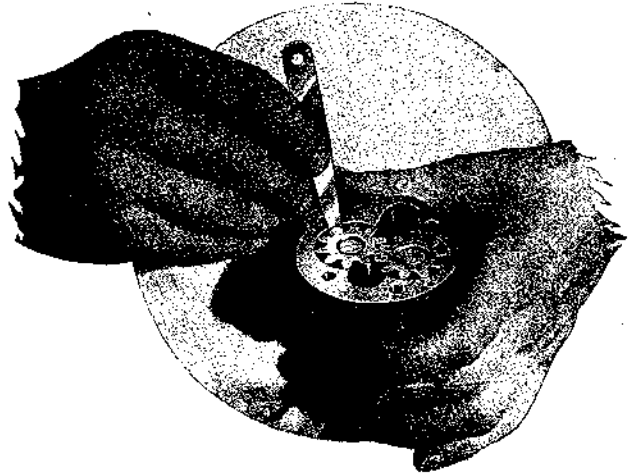


Fig. AAA.3.  
Checking the diametrical clearance between the oil pump gears and the oil pump body.

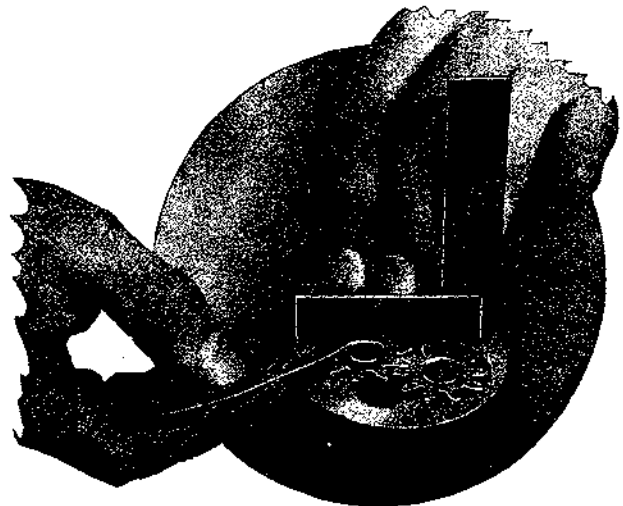


Fig. AAA.4.  
Checking the end float on the oil pump gears.

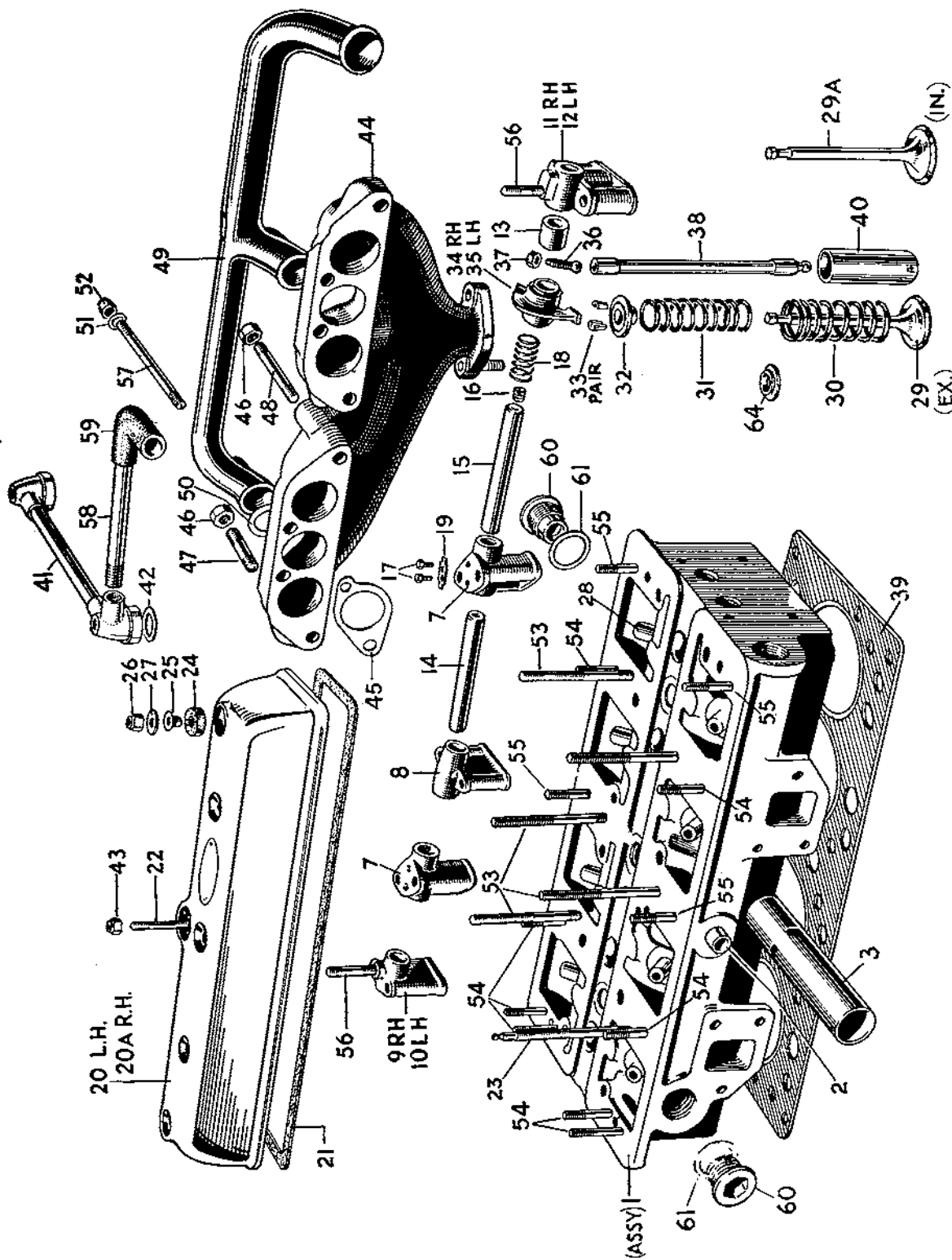
It will be seen that the oil pressure release valve is mounted on the oil pump body, and if it requires attention, this can be given when dealing with the oil pump. Overhauling procedure for the release valve is given in Section AAA.5.

## Section AAA.5

### THE OIL PRESSURE RELEASE VALVE

This is provided to prevent the building up of excessive oil pressure when the oil is cold. It is located

**THE CYLINDER HEAD, VALVE AND MANIFOLD COMPONENTS**  
 (2½ LITRE—Series RMF)



**KEY TO CYLINDER HEAD, VALVE AND MANIFOLD COMPONENTS (2½ LITRE—Series RMF)**

No.	Description	No.	Description	No.	Description
1.	Cylinder head bore.	24.	Insert—rocker cover.	43.	Nut—breather stud.
2.	Insert—hot spot.	25.	Ferrule—rocker cover insert.	44.	Manifold—exhaust.
3.	Tube—hot spot (in head).	26.	Nut—rocker cover insert.	45.	Gasket—exhaust manifold.
7.	Bracket—rocker-shaft (inter.).	27.	Washer—rocker cover insert.	46.	Nut—exhaust manifold stud.
8.	Bracket—rocker-shaft (inter.).	28.	Guide—valve.	47.	Stud—exhaust manifold.
9.	Bracket—rocker-shaft (rear), R/H.	29.	Valve (exhaust).	48.	Stud—exhaust manifold.
10.	Bracket—rocker-shaft (rear), L/H.	29a.	Valve (inlet).	49.	Manifold—water inlet.
11.	Bracket—rocker-shaft (front), R/H.	30.	Spring—valve—outer.	50.	Washer—water inlet manifold (fibro).
12.	Bracket—rocker-shaft (front), L/H.	31.	Spring—valve—inner.	51.	Washer—water inlet manifold stud (copper).
13.	Distance-piece—rocker-shaft.	32.	Cup—valve spring.	52.	Nut—water inlet manifold stud.
14.	Shaft—rocker—inner.	33.	Split collar.	53.	Stud—rocker-shaft bracket (long).
15.	Shaft—rocker—outer.	34.	Rocker—valve, R/H.	54.	Stud—rocker-shaft bracket (short).
16.	Plug—rocker-shaft.	35.	Rocker—valve, L/H.	55.	Stud—rocker-shaft bracket (short).
17.	Screw—rocker-shaft.	36.	Ball pin—valve rocker.	56.	Stud—rocker-shaft bracket.
18.	Spring—rocker-shaft.	37.	Nut—valve rocker ball pin.	57.	Stud—water inlet manifold.
19.	Tab washer—rocker-shaft screw.	38.	Valve push-rod assembly.	58.	Tube—breather.
20.	Cover—rocker, L/H.	39.	Gasket—cylinder head.	59.	Hose—breather.
20a.	Cover—rocker, R/H.	40.	Tapped—valve.	60.	Plug—hot spot sealing.
21.	Gasket—rocker cover.	41.	Breather (rocker cover).	61.	Washer—hot spot sealing plug.
22.	Stud—breather.	42.	Washer—breather.	64.	Washer—valve spring locating.
23.	Stud—high-tension wire clip.				

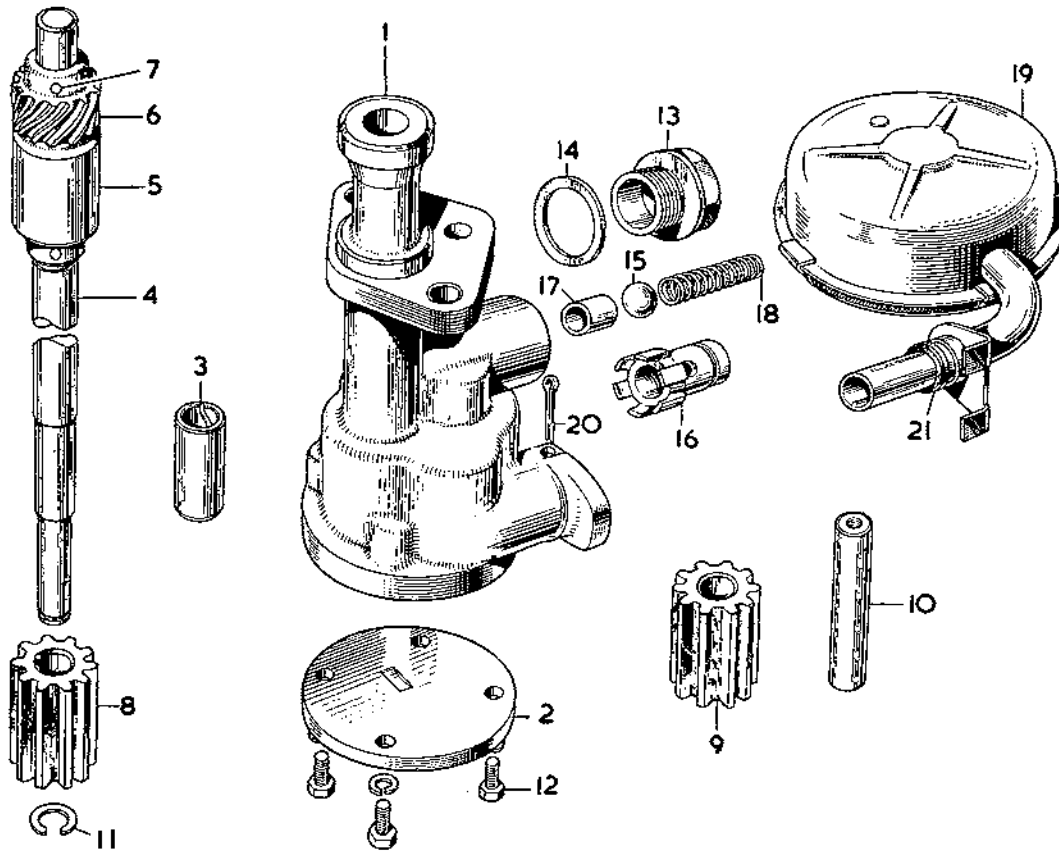


Fig. AAA.5. COMPONENT PARTS OF THE OIL PUMP.

- |                         |                                      |                                    |
|-------------------------|--------------------------------------|------------------------------------|
| 1. Body—oil pump.       | 8. Gear—driver—oil pump.             | 15. Ball—release valve.            |
| 2. Cover—oil pump.      | 9. Gear—driven—oil pump.             | 16. Guide—release valve ball.      |
| 3. Bush—oil pump shaft. | 10. Spindle—driven gear.             | 17. Seat—release valve ball.       |
| 4. Shaft—oil pump.      | 11. Circlip.                         | 18. Spring—release valve.          |
| 5. Bush—oil pump shaft. | 12. Set screw—cover fixing.          | 19. Filter—oil floating.           |
| 6. Gear—oil pump.       | 13. Plug—oil pressure release valve. | 20. Split pin—floating oil filter. |
| 7. Pin—oil pump gear.   | 14. Washer—release valve plug.       | 21. Felt washer.                   |

on the oil pump body. It is of the non-adjustable type, being pre-set to give the correct release pressure.

To dismantle the assembly, remove the large retaining nut, when the washer, spring, ball-guide and ball may be removed. The actual ball seating is pressed into the pump body, but is renewable. To remove it, tap a hole in the seating  $\frac{7}{16}$  in. and withdraw it with a bolt and nut.

Engines from No. RMB2/884 onwards are fitted with a modified ball guide, Part No. I66551, which is made of cast iron, and replaces the previous type, Part No. 24118. This modification reduces the noise made by flutter of the pressure release valve ball.

## Section AAA.6

### REMOVAL AND REPLACEMENT OF THE MAIN BEARINGS

The crankshaft has three main bearings consisting of thick bronze shells, white-metal lined. They cannot be changed whilst the crankshaft is in position.

The top halves of all bearings are dowed in position, as are the two lower halves of the front and centre bearings.

To remove the bearings, take out the split pins and remove the castellated nuts. Take off the bearing caps and lift out the crankshaft, having previously removed the timing chain as detailed in Section AAA.20, the clutch and flywheel as detailed in Sections AAA.30 and AAA.31, and the pistons and connecting rods as in AAA.8.

New bearings are supplied with a fitting allowance for line-boring or hand-scraping.

## Section AAA.7

### REMOVAL AND REPLACEMENT OF THE CYLINDER HEAD

Drain the water from the cooling system by means of the three taps provided : one on the inlet manifold, one on the cylinder block above the starter motor and the other at the base of the radiator.

Take off the bonnet, as detailed under Section D.2, and the radiator steady rods ; this will provide plenty of clearance. Next remove the bonnet sides as detailed under Section R.14.

Remove the air silencer, fume extractor pipe, distributor head and ignition harness together with the aluminium casting forming the air intake between the two carburetters.

Detach the throttle control rod slow-running cable, and the mixture control cable. Disconnect the fuel line at the T-piece between the two float-chambers and remove the carburetters. Do not disturb the interconnecting rod between the two throttles.

Take off the inlet manifold, noting the two rubber washers between the manifold and the cylinder head. These washers should be renewed each time the cylinder head is removed.

Disconnect the two water-hose connections, one at the thermostat, and the other at the water pump outlet. Disconnect the exhaust pipe at the manifold.

Next, take out the sparking plugs and remove both rocker covers.

Remove all the push-rods by seeing that each valve is closed, and then depressing the spring with a lever, at the same time moving the rocker to one side. Mark the push-rods so that they can be replaced in the positions from which they were removed.

Slacken each cylinder head holding-down nut a slight amount and then remove them all. Lift off the head and the gasket.

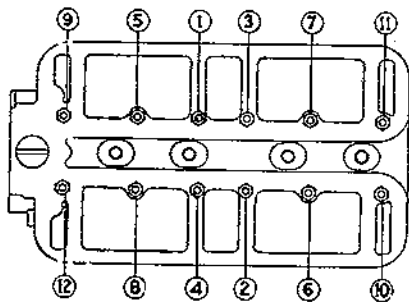


Fig. AAA.6.

Sequence for tightening the cylinder head stud nuts.

The cylinder head is now ready for decarbonisation and valve grinding, as detailed in Sections AAA.26 and AAA.27.

Replacement of the head is a reversal of the above process, but the holding-down nuts must be tightened down gradually in the sequence shown in the diagram Fig. AAA.6.

If a torque spanner is used, the correct tightening figure is 900 in./lbs. (10.35 m./kgs.).

## Section AAA.8

### REMOVAL OF PISTON AND CONNECTING ROD

On engines prior to No. RMB.2/945 the big-end will not pass up the cylinder bore, neither will the piston pass the crankshaft.

Engines from No. RMB.2/945 onwards are fitted with modified connecting rods which will pass up the cylinder bore (see Section AAA.37).

The procedure, when it is desired to remove the piston and connecting rod assemblies of the earlier type, is as follows :—

Remove the cylinder head as detailed in Section AAA.7.

Drain the engine sump as explained in Section AAA.1.

Remove the sump as detailed in Section AAA.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 the connecting rod. Remove the fixing bolts and push the connecting rod up the cylinder bore until the gudgeon pin is just clear of the top face of the clock.

Remove a circlip and tap out the gudgeon pin with a drift, taking care to support the piston at the same time, otherwise the connecting rod may be bent. The piston can then be withdrawn upwards from the cylinder, and the connecting rod downwards through the crankcase.

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

## Section AAA.9

### REMOVAL AND REPLACEMENT OF THE PISTON RINGS

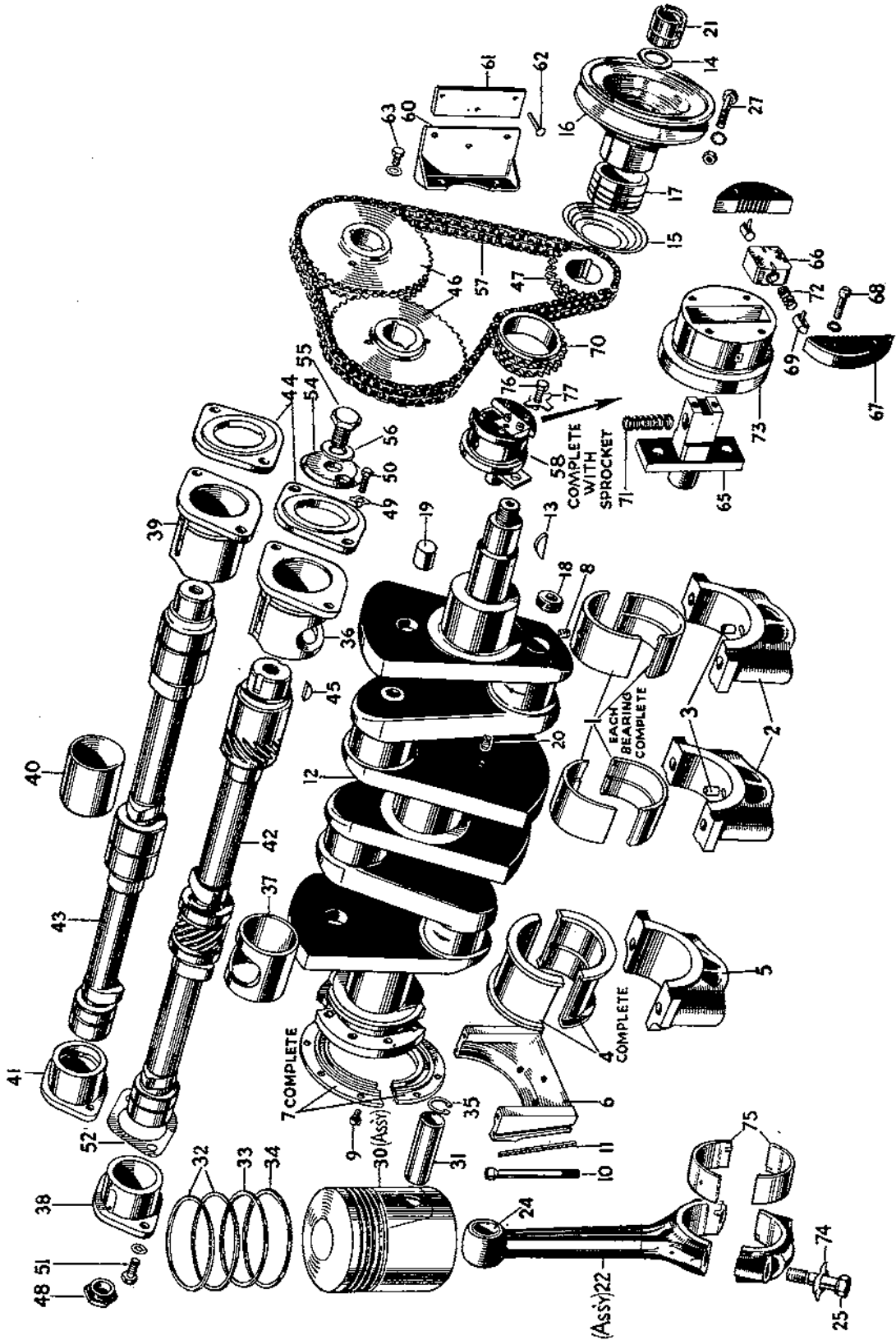
If no special piston ring remover is available, use a piece of thin steel such as a suitably ground hacksaw blade, or disused .020 in. (.50 mm.) feeler gauge.

Raise one end of the ring, and insert the steel strip between ring and piston. Rotate the strip round the piston, applying slight upwards 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 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. There must be no play between the

**THE CRANKSHAFT, CAMSHAFT AND PISTON ASSEMBLY COMPONENTS**  
 (2½ LITRE—Series RMF)





**KEY TO CRANKSHAFT, CAMSHAFT AND PISTON COMPONENTS (2½ LITRE—Series RMF)**

No.	Description	No.	Description	No.	Description
1.	Bearing—crankshaft.	27.	Bolt—crankshaft pulley.	52.	Packing—camshaft bush.
2.	Cap—crankshaft bearing.	30.	Piston complete.	54.	Washer—camshaft wheel retaining.
3.	Dowel—crankshaft bearing cap.	31.	Pin—gudgeon.	55.	Set screw—camshaft.
4.	Bearing—crankshaft (rear).	32.	Ring—compression (std.).	56.	Lock washer—camshaft set screw.
5.	Cap—crankshaft bearing.	33.	} Ring—scraper.	57.	Chain—timing.
6.	Plate—crankshaft bearing cap.	34.		58.	Adaptor and sprocket assembly.
7.	Seal—crankshaft bearing cap plate.	35.	Circlip—gudgeon pin.	60.	Bracket—chain damper.
8.	Dowel—crankshaft bearing hollow.	36.	Bush—inlet camshaft (front).	61.	Pad—chain damper.
9.	Set screw—crankshaft bearing cap plate.	37.	Bush—inlet camshaft (centre).	62.	Rivet—chain damper pad.
10.	Screw—crankshaft bearing cap plate.	38.	Bush—inlet camshaft (rear).	63.	Set screw—chain damper bracket.
11.	Crankshaft oil retaining washer.	39.	Bush—exhaust camshaft (front).	65.	Shank—timing chain adjuster.
12.	Crankshaft.	40.	Bush—exhaust camshaft (centre).	66.	End plate—timing chain adjuster.
13.	Key—crankshaft—Woodruff.	41.	Bush—exhaust camshaft (rear).	67.	Retaining plate—timing chain adjuster.
14.	Washer—crankshaft pulley nut.	42.	Camshaft—inlet.	68.	Screw—timing chain adjuster.
15.	Oil thrower—crankshaft.	43.	Camshaft—exhaust.	69.	Peg—timing chain adjuster.
16.	Pulley—crankshaft.	44.	Flange—camshaft thrust.	70.	Sprocket—timing chain adjuster.
17.	Bush—crankshaft sprocket retaining.	45.	Key—camshaft.	71.	Spring—timing chain adjuster slide block.
18.	Plug—crankshaft journal.	46.	Wheel—timing (camshaft).	72.	Spring—timing chain adjuster pawl.
19.	Plug—crankshaft blanking.	47.	Wheel—timing (crankshaft).	73.	Slide block—timing chain adjuster.
20.	Plug—crankshaft oilway.	48.	Plug—camshaft bush (rear).	74.	Tab washer—connecting rod.
21.	Nut—crankshaft pulley.	49.	Lock washer—camshaft bush (front).	75.	Bearing—connecting rod.
22.	Connecting rod assembly.	50.	Set screw—camshaft thrust flange.	76.	Bolt—chain adjuster to block.
24.	Bush—connecting rod (small-end).	51.	Set screw—camshaft rear bearing.	77.	Tab washer—chain adjuster bolt.
25.	Bolt—connecting rod.				

rings and their grooves but they must nevertheless be free to move without restriction.

**Important.**—New rings should be tested in the cylinder bore in order to check for correct clearance at the ends.

To do this effectively the piston should be inserted approximately 1 in. (2.5 cm.) down the cylinder and each ring then pushed down on to the top of the piston and held there in order to keep the ring square with the bore.

The end gap should be between .008 in. and .012 in. (.2 mm. and .3 mm.).



Fig. AAA.7.  
Checking the piston ring gap.

## Section AAA.10

### FITTING THE GUDGEON PINS AND REASSEMBLING THE PISTON AND CONNECTING ROD

The piston and connecting rod are replaced by partly inserting the piston in the cylinder from the top and introducing the connecting rod upwards from the crankcase. The two are then coupled together by the gudgeon pin.

The gudgeon pin is a push fit in the little-end and light drive fit in the piston at room temperature.

Gudgeon pins .002 in. oversize (Part No. 166516) 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.

Take care when tapping the gudgeon pin into

position in the piston to support the piston adequately so as not to damage it, or the connecting rod.

## Section AAA.11

### REMOVAL AND REPLACEMENT OF THE CARBURETTORS

Detach the forward end of the bonnet release rod and then take off the bonnet side by undoing the nut and bolt at the forward end and the two bolts at the rear. See Section R.14.

Take off the ignition harness and remove the air silencer. Remove the cast aluminium air intake between the carburetters. The forward end is held by set screws, the rear by nuts and studs.

Disconnect the fuel line at the T-piece between the float-chambers and detach the rich mixture control cable from both carburetters.

Remove the throttle control rod from the rear carburetter and undo the set screws holding the hand throttle cable at the quadrant. Undo the four nuts and take off the carburetters.

Replacement of the carburetters is merely a reversal of the above procedure. The carburetters are fully dealt with in Section B.

## Section AAA.12

### REMOVAL OF THE INLET MANIFOLD

Remove the carburetters as detailed in Section AAA.11.

Drain the cooling system by means of the three drain taps, which are situated, respectively, on the inlet manifold, on the cylinder block above the starter and at the base of the radiator.

Undo the six nuts which hold the manifold in position. Having done this, withdraw the casting over the studs, being careful to give a straight pull to avoid damaging the studs.

Renew the two rubber sealing washers, and when replacing the inlet manifold make quite sure that the open end of the brass ferrule in the cylinder head is pointing forward.

## Section AAA.13

### REMOVAL OF THE EXHAUST MANIFOLD

In order to remove the exhaust manifold, it is first necessary to drain the cooling system by means of the three drain taps, as in Section AAA.12. Having done this, remove the cooling water inlet pipe.

Next disconnect the exhaust pipe at the manifold, and undo the retaining nuts. The manifold will then be free to be lifted off.

**Section AAA.14****REMOVAL AND DISMANTLING OF THE WATER PUMP**

To detach the pump, first remove the fan after removing the four nuts and washers, and then take off the belt as in Section AAA.16.

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

To dismantle the pump, take off the Simmonds nut and washer holding the fan pulley, draw off the fan pulley, and extract the Woodruff key.

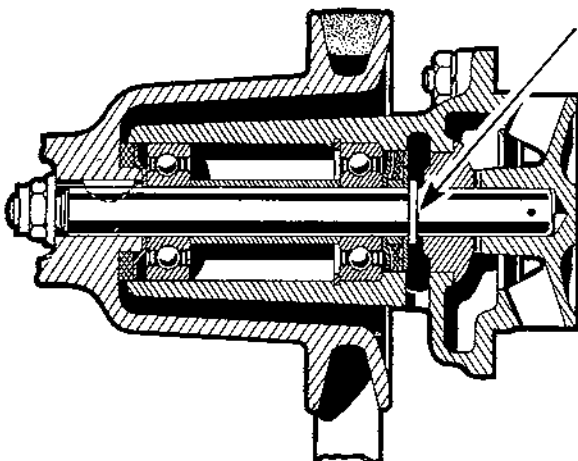
There is a felt washer behind the pulley, which must be taken off if it remains on the pump body before the shaft is pressed out towards the rear of the pump.

The shaft may now be withdrawn, complete with the sealing gland, flat washer, and two split collets.

The two ball races and the distance piece will remain in the shaft housing, with, in all probability, the felt washer, felt washer spacer and cup washer.

The front ball race may be withdrawn from the front end of the shaft housing, together with the distance-piece. To remove the rear ball race, first extract its retaining circlip, and then withdraw the race through the front of the housing. The impeller is attached to the shaft by a pin, and the seal facing is brazed to the impeller.

**Note.**—On engines prior to No. 531 a circlip was fitted instead of the split cotters (see Fig. AAA.8). This does not alter the dismantling procedure.

**Section AAA.15****SETTING THE TAPPETS**

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

The tappets are set by slackening back the locknut and screwing the ball-ended adjuster in or out as required. Set the clearance to .011 in. (.28 mm.) for both the inlet and exhaust valves, with the engine hot.

**Section AAA.16****REMOVAL OF THE DYNAMO AND FAN BELT**

Before removing the belt, first disconnect one battery lead. Remove the front engine stay from the engine mounting bracket, and then slacken the four dynamo attachment bolts.

It will be possible to ease the belt over one of the pulleys, assisting this process by turning the engine with the starting handle.

**Section AAA.17****REMOVAL OF THE CRANKSHAFT PULLEY**

Take out the bolt through the pulley and its fixing nut. Unscrew the nut, which has a right-hand thread,

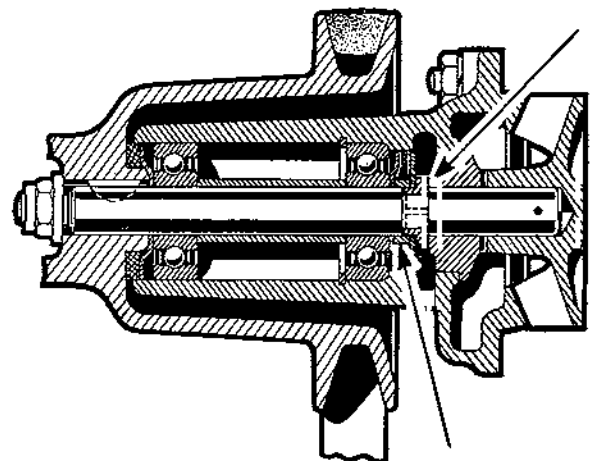
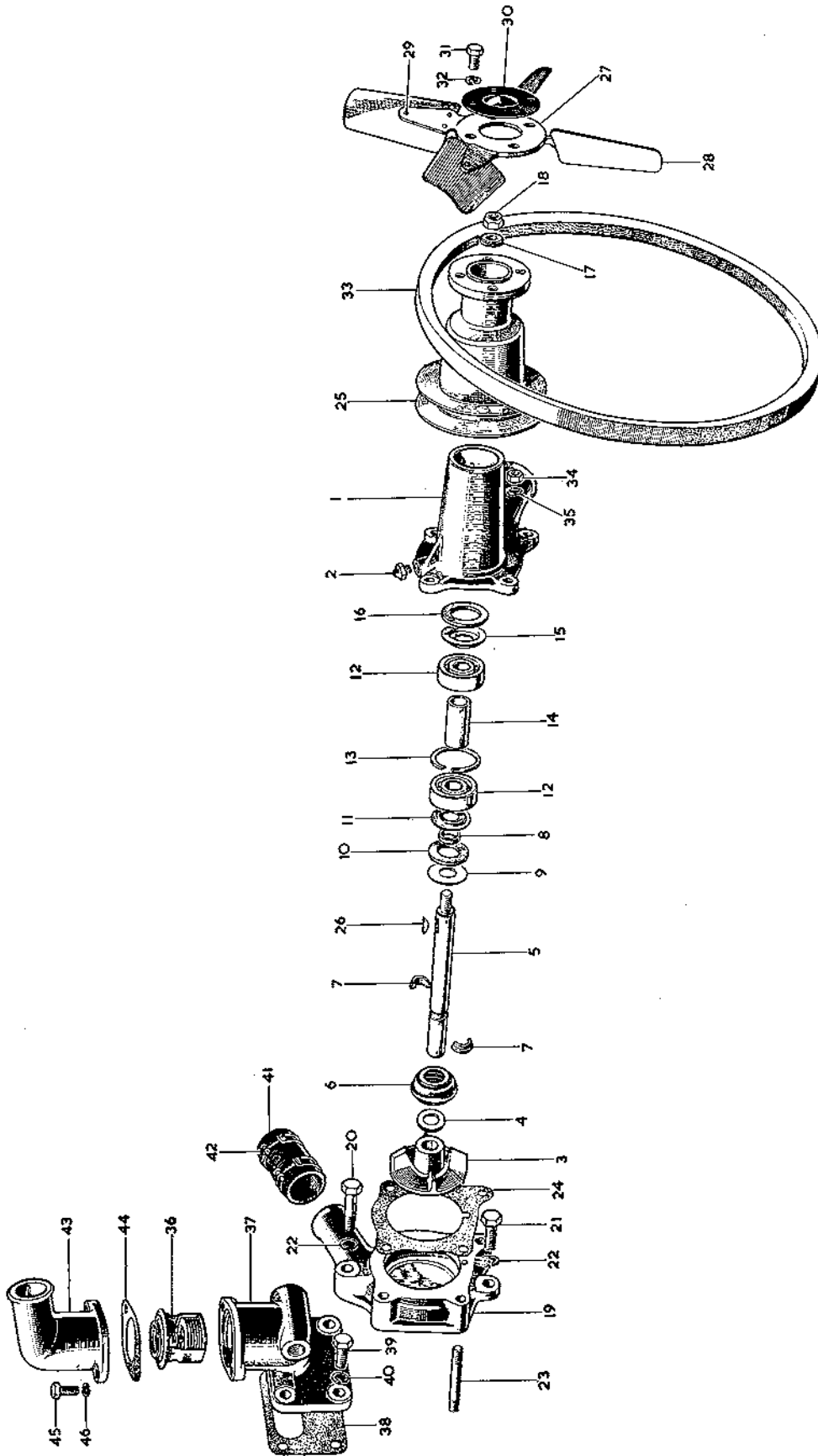


Fig. AAA.8. THE WATER PUMP.

The left-hand illustration is a section of the early type water pump, showing the circlip mentioned in Section AAA.14. The right-hand section is of the later type, showing the split collets, which are retained by the felt washer spacer as shown.

**THE WATER PUMP AND FAN COMPONENTS**  
 (2½ LITRE—Series RMF)



## KEY TO WATER PUMP AND FAN COMPONENTS (2½ LITRE—Series RMF)

No.	Description	No.	Description	No.	Description
1.	Body—water pump.	17.	Washer—water pump spindle.	32.	Washer—fan assembly bolt.
2.	Greaser—water pump body.	18.	Nut—water pump spindle.	33.	Bolt—fan.
3.	Impeller—water pump.	19.	Housing—impeller.	34.	Nut—washer pump body stud.
4.	Washer (brass)—water pump impeller.	20.	Bolt—impeller housing (long).	35.	Washer—water pump body stud.
5.	Spindle—water pump.	21.	Bolt—impeller housing (short).	36.	Thermostat.
6.	Seal assembly—water pump.	22.	Washer—impeller housing bolt.	37.	Housing—thermostat.
7.	Collar (split)—water pump spindle.	23.	Stud—water pump body.	38.	Gasket—thermostat housing.
8.	Collar—water pump spindle.	24.	Gasket—water pump body to impeller housing.	39.	Bolt—thermostat housing.
9.	Dust excluder (flat)—water pump spindle.	25.	Pulley—fan.	40.	Washer—thermostat housing bolt.
10.	Packing—dust excluder.	26.	Key—fan pulley.	41.	Hose—water pump to water manifold.
11.	Dust excluder (small)—spindle.	27.	Fan casters.	42.	Clip—hose.
12.	Bearing—water pump.	28.	Blade—fan.	43.	Pipe—water pump outlet to radiator.
13.	Clutch (large)—bearing.	29.	Rivet—fan blade.	44.	Gasket—water pump outlet pipe.
14.	Distance tube (bearing).	30.	End plate—fan.	45.	Bolt—water pump outlet pipe.
15.	Dust excluder (large)—water pump.	31.	Bolt—fan assembly.	46.	Washer—water pump outlet pipe.
16.	Packing—dust excluder.				

and withdraw the pulley, which is on a parallel shaft with a Woodruff key.

## Section AAA.18

### REMOVAL OF THE TIMING CHAIN COVER

Before removing the timing chain cover, it is first necessary to support the engine by means of a sling or a jack and block of wood placed under the engine sump.

Remove the crankshaft pulley and belt, as described in Sections AAA.16 and AAA.17.



Fig. AAA.9.

Frontal view of the engine, showing the arrangement of the dynamo and fan belt.

Disconnect the dynamo leads, and remove the dynamo. Loosen the spring clips on the hose which connects the water pump to the water inlet pipe.

Remove the two bolts, nuts and spring washers, and the two nuts and spring washers, and remove the engine mounting bracket. Remove the water pump by unscrewing its retaining nuts and bolts.

Remove the set screw which is now exposed, and the fourteen nuts round the timing cover, plus the set screw which screws into the sump.

The cover may now be lifted off. Note that there is no gasket, and also note the positions of the crankshaft sprocket retaining bush and the oil thrower. The latter has its dished portion towards the engine.

## Section AAA.19

### REMOVAL OF THE CRANKSHAFT CHAIN WHEEL

Remove the dynamo and fan belt, crankshaft pulley and timing cover as indicated in Sections AAA.16 to AAA.18.

Remove the timing chain as explained in Section AAA.20 and draw off the wheel, which is on a parallel shaft with a Woodruff key, using a suitable extractor, ST.58, to avoid damage.

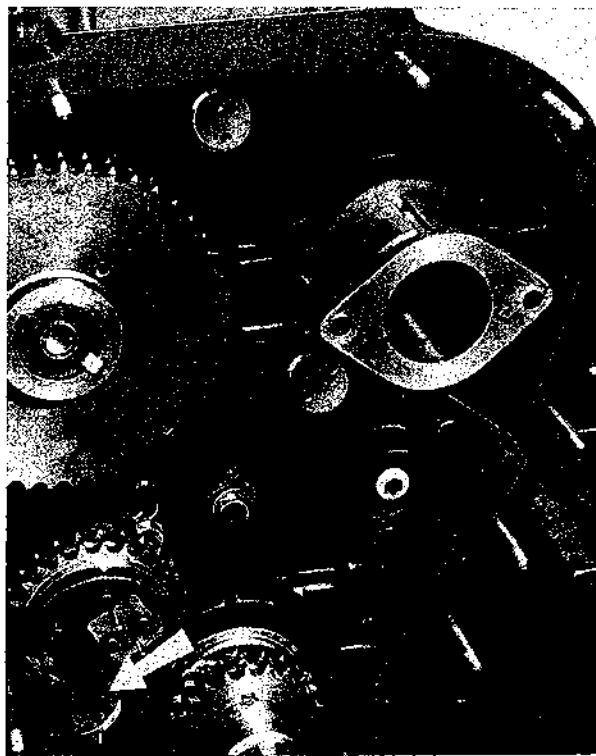


Fig. AAA.10.

This illustration shows the tensioner wedge and the camshaft bush, which is partially withdrawn from the crankcase.

## Section AAA.20

### REMOVAL AND REPLACEMENT OF THE TIMING CHAIN

Take off the timing cover and crankshaft pulley. Then wedge the tensioner wheel in its extreme position, with the ratchets removed, so that the chain falls slack. Undo the lock washer and set screw holding one of the camshaft chain wheels and then withdraw the wheel. The chain may then be lifted off.

When replacing the chain, it is, of course, essential that the timing remains correct. In order to facilitate this, each of the three wheels over which the chain

passes is marked with a "T." In addition, three of the links of the chain are brightly polished.

The two camshaft chain wheels and the crankshaft chain wheel must be in such positions that the "T" on each wheel meshes up with one of the bright links on the chain.



Fig. AAA.11. The setting of the crankshaft and camshafts for correct valve timing. Note the timing marks on the camshaft and crankshaft sprockets and the bright chain links.

## Section AAA.21

### REMOVAL OF THE CHAIN TENSIONER

Remove the dynamo belt, crankshaft pulley and timing cover as explained in Sections AAA.16 to AAA.18. Take off the ratchet portion of the tensioner and withdraw the wheel, taking care not to lose the spring. The square stub upon which the wheel slides is held to the cylinder block by countersunk screws.

One of the ratchet plates on the adjuster is provided with slotted holes so that when the tension of the timing chain is set the plungers are located so that while one is at the bottom of the ratchet tooth the other rests on the top of a tooth on the other plate. Thus the slightest amount of wear in the chain will be taken up immediately.

The timing tensioner bracket, No. S.309 on later models, is fitted with slots instead of holes. When fitting one of the modified brackets it is essential to fit a plate to Part No. 166554 together with longer bolts, Part No. FS.104/4Z.

## Section AAA.22

### REMOVAL OF THE CAMSHAFTS

Take off the engine pulley, timing cover and timing chain as described under Sections AAA.16, AAA.18 and AAA.20. Remove the cylinder head as indicated in Section AAA.7.

Lift out the tappets from the top, making sure that each is marked for subsequent reassembly in the same position.

Remove the camshaft chain wheels as indicated in Section AAA.20.

With the chain wheels removed, undo the set screws which hold the camshaft and front bearing assembly to the block. See illustration No. AAA.10. The camshaft is then ready for removal. In the case of the exhaust camshaft the distributor must first be removed (see Section C.7).

## Section AAA.23

### REMOVAL OF THE ROCKER GEAR

Take off the ignition harness and remove the breather pipe and rocker covers.

Depress each valve in turn, move the rocker aside and extract the push-rods. Undo all the securing nuts for the rocker pedestals and lift the assembly away complete.

The rockers are of two types, left-hand and right-hand. Each rocker-shaft is in four sections carried in five pedestals, the sections being located by set screws on the second and fourth pedestals, the front and rear of which are not interchangeable with each other or side for side. They are drilled for rocker lubrication, the oil passing up a hollow stud. Note that flats are machined on the rocker-shafts. These flats must face towards the valves.

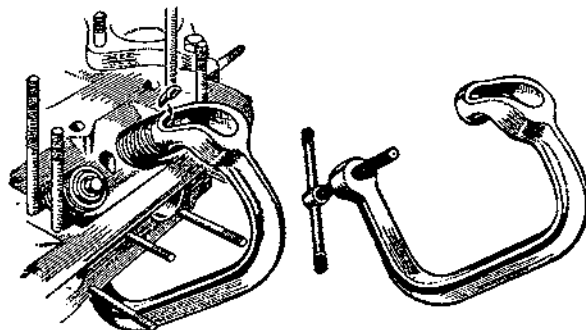


Fig. AAA.12.  
Valve spring compressor.

## Section AAA.24

### REMOVAL OF THE VALVES

The valve springs are retained in position on the valves by means of a collar and two split collets.

Support the head of the valve inside the combustion chambers, apply a suitable compressor to compress the springs and caps, and the collets may be removed. The valve springs are not of constant pitch and must be refitted with the close coiled end at the bottom.

Later engines are fitted with valve spring locating washers. Such engines have different inner valve springs, and care should be taken to obtain the correct kind when fitting new ones.

## Section AAA.25

### REMOVAL AND REFITTING OF THE VALVE GUIDES

The valve guides are interchangeable and quite plain, without any shoulder. They may be tapped out with a drift, and when fitting a replacement guide the new one should be pressed in until the top is  $\frac{1}{8}$  in. (20.64 mm.) above the spring seat for both inlet and exhaust. The extra length of the exhaust valve guide should project into the valve port.

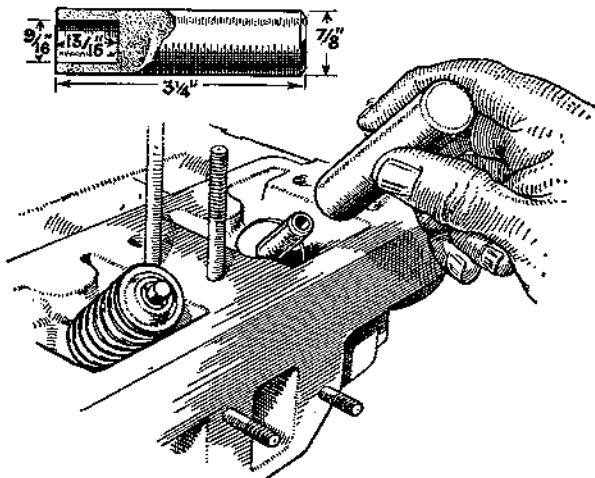


Fig. AAA.13.

A special tool may be made for fitting the valve guides correctly.

## Section AAA.26

### DECARBONISING

Remove the cylinder head as explained in Section AAA.7.

Take out the valves as indicated in Section AAA.24.

Lift off the cylinder head gasket, and plug all water holes and the tappet guides with cloth plugs.

Scrape the carbon off the piston crowns, cylinder heads and inlet and exhaust ports. Take care that the pistons are not scratched by the use of a sharp tool. It is also advisable to polish the combustion chambers with emery cloth, but great care must be taken to clean away all traces of abrasive dust.

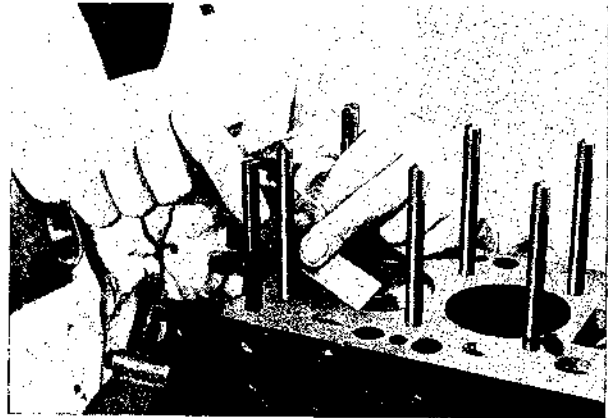


Fig. AAA.14.

Removing the carbon.

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 by placing a piston ring on the top, and the carbon round the top of the cylinder bores should also be retained intact.

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.

## Section AAA.27

### GRINDING AND TESTING THE VALVES AND THEIR SEATINGS

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

Clean each valve carefully and examine the seating for signs of pitting. If pitting is apparent then the valve

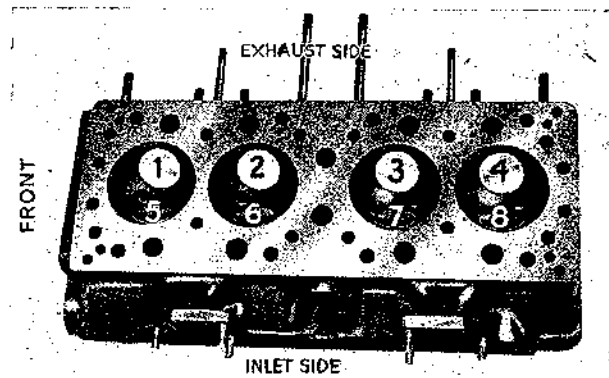


Fig. AAA.15.

The numbering of the valves is shown in this illustration.

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.

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

After having ground in each valve, the ports, seatings 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 guides.

## Section AAA.28

### ADJUSTING THE DYNAMO AND FAN BELT

Slacken the four dynamo attachment bolts. The belt tension may now be adjusted by exerting gentle hand pressure on the dynamo, to take up slack in the belt.

Do not use force, or excessive belt tension will result.

## Section AAA.29

### REMOVAL AND REPLACEMENT OF THE ENGINE AND GEARBOX

Disconnect the battery.

Drain the cooling system as described in Section D.1.

Remove the bonnet tops (Section D.2) and sides as explained under Section R.14.

Disconnect the hoses on the intake side of the water pump and on the thermostat and remove the radiator stays.

Remove the radiator and shell as explained under Section D.2.

Disconnect the cable from the coil to the distributor and remove the coil from the frame.

Remove the wire stay between the frame and forward engine mounting.

Take off the air filter and carburettors as explained in Section AAA.11. Take off the cables to the dynamo and starter motor and disconnect the exhaust pipe at the manifold. Then remove the dipstick.

Undo the dynamo adjusting bolts and remove the dynamo. Place a single rope sling around the middle of the engine. Then take off the mounting plate on the front of the engine and the bracket shown in Fig. AAA.16.



Fig. AAA.16.  
Method of removing the mounting.

Unscrew the union on the oil pressure gauge line and uncouple the throttle control rod at the bell crank on the side of the block.

Slide both front seats right back and remove them from the car. Then remove the carpets and unscrew the knob on the gear lever.

Remove the gearbox cowl by sliding back the forward catches and unscrewing the small plate at the rear. Then take up the floorboards.

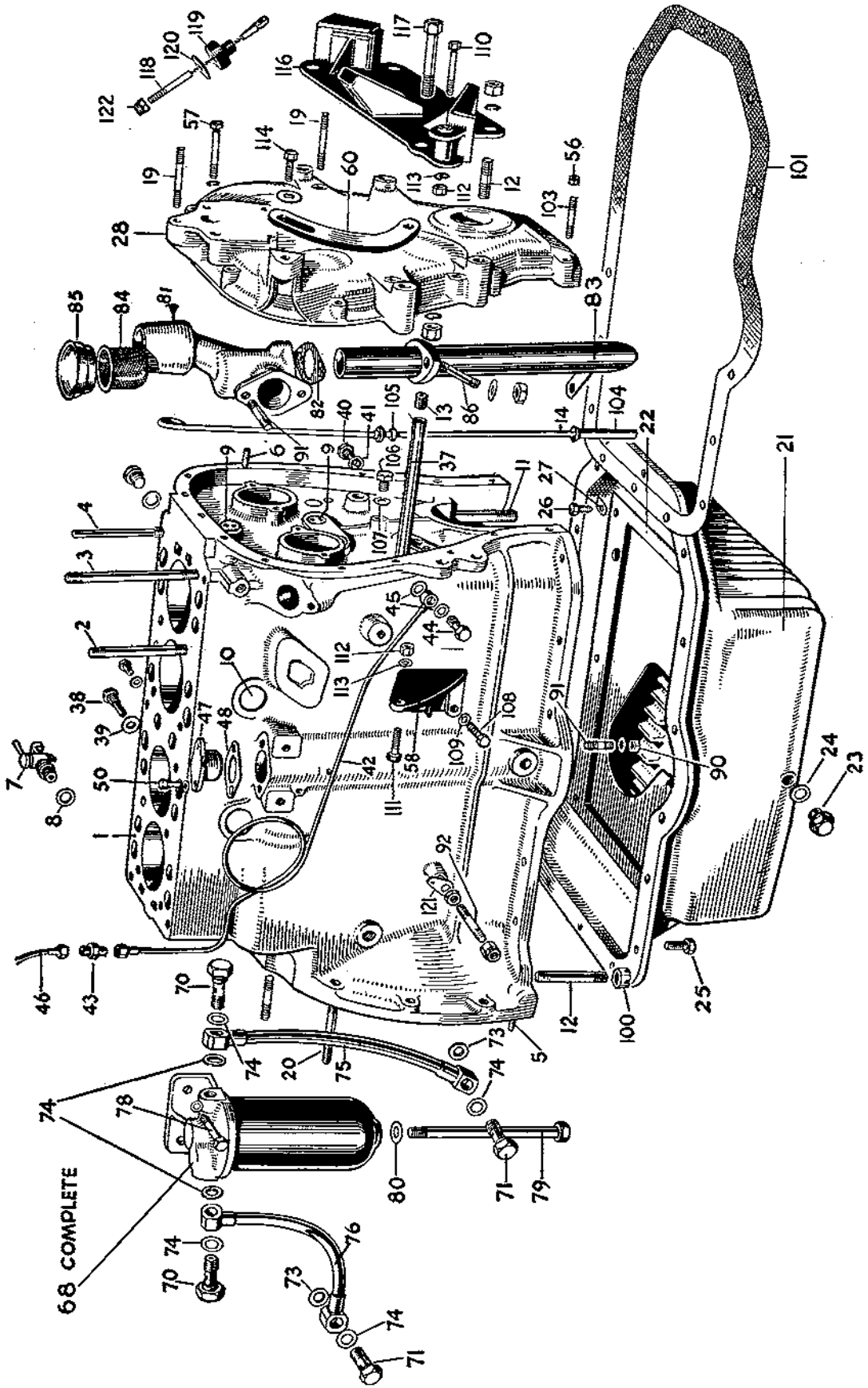
Disconnect the front end of the intermediate drive shaft and unscrew the reversing light cables from the switch unit on top of the gearbox. Remove the speedometer drive gear from the gearbox and undo the nut on the wire stay.



Fig. AAA.17.  
The method of replacing the engine mounting rubbers before lowering the engine into position.

Extract the pin on the clutch cross-shaft universal joint and then remove the gear lever complete by lifting out the spring ring in the gear lever ball housing and the two set screws at either side. When lifting

**THE CRANKCASE AND ENGINE SUMP COMPONENTS**  
 (2½ LITRE—Series RMF)



## KEY TO CRANKCASE AND ENGINE SUMP COMPONENTS (2½ LITRE—Series RMF)

No.	Description	No.	Description	No.	Description
1.	Block assembly.	40.	Bolt and plug—oil feed pipe (front).	84.	Filter—oil filler.
2.	Stud—cylinder head (short).	41.	Washer—oil feed pipe bolt and plug.	85.	Cap—oil filler.
3.	Stud—cylinder head (long).	42.	Pipe—oil—engine to adaptor.	86.	Stud—breacher tube (to body).
4.	Stud—rocker-shaft lubricating.	43.	Union—oil pipe (double-ended).	90.	Nut—stud.
5.	Dowel—bell housing to crankcase.	44.	Bolt—oil pipe banjo (block).	91.	Stud—oil filler body.
6.	Dowel—clining cover.	45.	Washer—oil pipe banjo bolt.	92.	Stud—ball crank lever.
7.	Drain tap—cylinder.	46.	Pipe—oil—adaptor to gauge.	100.	Nut—crankshaft bearing stud.
8.	Washer—cylinder drain tap.	47.	Flange—oil pump top.	101.	Gasket—sump.
9.	Plug—water jacket.	48.	Gasket—oil pump top flange.	103.	Stud—clining cover (long).
10.	Plug—wash core.	50.	Set screw—oil pump top flange.	104.	Guide—dipstick.
11.	Stud—crankshaft bearing.	54.	Nut—clining cover stud.	105.	Washer (flat) for dipstick.
12.	Stud—crankshaft bearing.	57.	Set screw—clining cover.	106.	Plug for chain roller.
13.	Plug—oil feed pipe (Allen).	58.	Bracket—dynamo support.	107.	Washer—chain roller plug.
14.	Dipstick.	60.	Bracket—dynamo adjusting.	108.	Bolt—dynamo rear bracket.
19.	Stud—clining cover.	64.	Filter—oil (complete).	109.	Washer—dynamo rear bracket bolt.
20.	Stud—ball housing to crankcase.	70.	Bolt—oil filter pipe banjo.	110.	Bolt—dynamo pivot.
21.	Sump.	71.	Bolt—oil filter pipe banjo.	111.	Bolt (rear)—dynamo pivot.
22.	Plate—sump baffles.	73.	Washer—banjo bolt.	112.	Nut—dynamo pivot bolt.
23.	Plug—sump drain.	74.	Washer—banjo bolt (large).	113.	Washer—dynamo pivot bolt.
24.	Gasket—sump drain plug.	75.	Pipe—oil filter (inlet).	114.	Bolt—dynamo adjusting link.
25.	Set screw—sump to block.	76.	Pipe—oil filter (outlet).	116.	Plate—engine mounting front.
26.	Set screw—baffle plate to sump.	78.	Bolt—oil filter flange.	117.	Bolt—front engine mounting plate.
27.	Tab washer—sump gaskets.	79.	Bolt—centre—for filter.	118.	Cable—engine steady (front).
28.	Cover—clining.	80.	Washer—bolt—centre—for filter.	119.	Rubber—engine steady cable.
37.	Pipe—oil feed (in crankcase).	81.	Body—oil filter.	120.	Washer—engine steady cable rubber.
38.	Bolt and plug—oil feed pipe (rear).	82.	Washer—oil filler.	121.	Plate—circuit spring anchor.
39.	Washer—oil feed pipe bolt and plug.	83.	Tube assembly—breacher.	122.	Nut—engine steady cable.

the lever out, take care not to lose the small spring-loaded ball in the crank.

Take out the rear mounting bolts under the gearbox and then the complete gearbox and engine unit may be tilted downwards and drawn out to the front.

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

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

## Section AAA.30

### REMOVAL OF THE CLUTCH

Take off the gearbox as described in Section F.1.

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

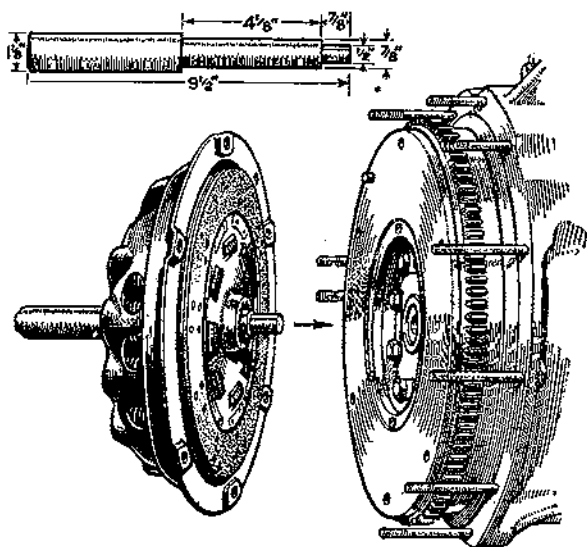


Fig. AAA.18.

The method of lining up the clutch when refitting it to the flywheel.

## Section AAA.31

### REMOVAL OF THE FLYWHEEL

Take off the gearbox as explained in Section F.1.

Detach the clutch as in Section AAA.30.

Bend back the locking tabs and unscrew the eight fitted bolts. The flywheel, complete with cast-iron friction face, may then be either drawn or tapped off its spigot on the crankshaft.

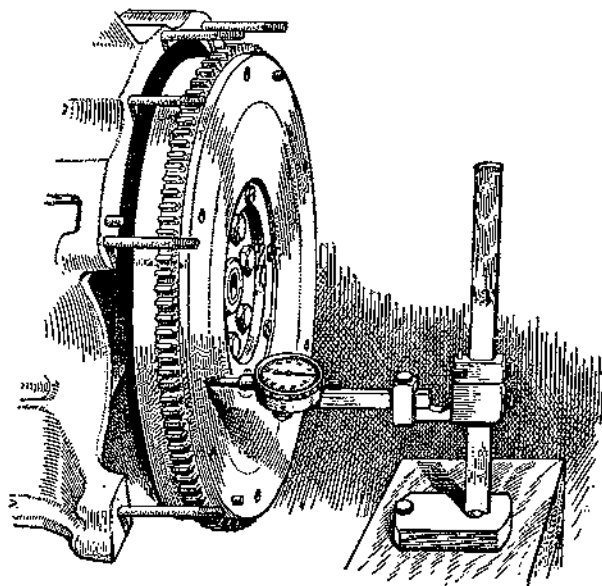


Fig. AAA.19.

The flywheel run-out should not exceed .004 in. (.1 mm.).

## Section AAA.32

### REMOVAL OF THE CRANKSHAFT

Take out the engine unit as described in Section AAA.29.

Drain and remove the sump as indicated in Sections AAA.1 and AAA.2.

Take off the gearbox. (See Section F.1.)

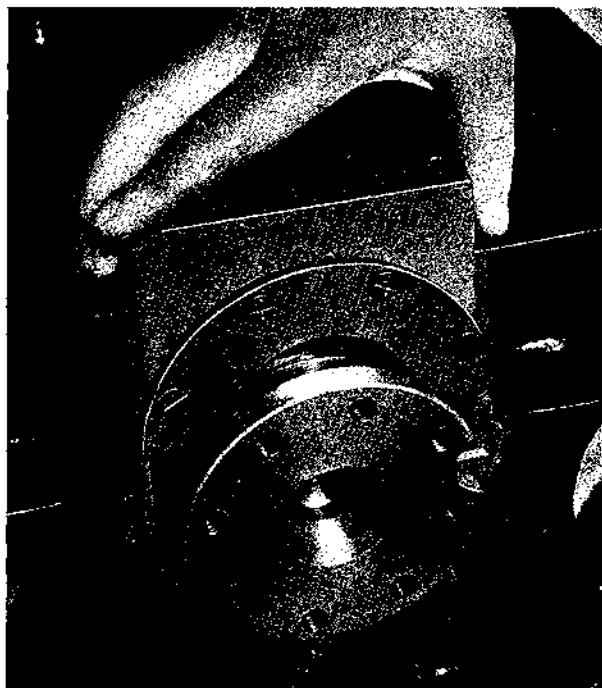


Fig. AAA.20.

The split sealing plate.

Remove the clutch and flywheel as described in Sections AAA.30 and AAA.31.

Disconnect the connecting rods from the crankshaft. (See Section AAA.8.)

Remove the crankshaft pulley. (See Section AAA.17.)

Take off the timing chain cover (Section AAA.18) and remove the timing chain. (See Section AAA.20.)

Take out the split pins from the main bearing cap nuts and undo the nuts.

Lift off the bearing caps, noting that they are marked for subsequent correct assembly, and detach the split sealing plate at the rear. This is held by two long screws with tapered heads.

Lift out the crankshaft.

## Section AAA.33

### OIL PRESSURE

Under normal running conditions the oil pressure should not drop below 30 lb./sq.in. (2.11 kg./cm.<sup>2</sup>) on the gauge, whilst approximately 12 lb./sq. in (.9 kg./cm.<sup>2</sup>) 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 AAA.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 clearance. 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 is often the cause of serious oil dilution by fuel, and 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. Oil of the correct grade as specified on page P.2 must be used.*

## Section AAA.34

### REGROUNDING 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 AAA.35

### LOCATING TROUBLES

The system of locating troubles in the earlier type of engine, as detailed in Section A.36, is applicable to the Series RMB.2 engines.

## Section AAA.36

### PISTON SIZES AND CYLINDER BORES

Details of piston sizes and cylinder bores are given in Section A.37.

## Section AAA.37

### THE MODIFIED CONNECTING RODS

Engines from No. RMB.2/945 onwards are fitted with modified connecting rods which have offset big-ends, enabling the connecting rod to be withdrawn up the cylinder bore. The procedure for removing a connecting rod is as follows :—

Remove the cylinder head and drain and remove the sump (Sections AAA.1 and AAA.2). Remove the big-end bolts and tab washers, and take off the bearing cap. The connecting rod and piston may now be pushed up the cylinder bore and removed.

It will be noted that on the modified connecting rod the top bearing shell is made from lead-bronze, while the lower shell is white-metal lined. The locating tabs are so arranged that the shells may only be replaced in their correct positions.

It is imperative that the connecting rod and piston assemblies are replaced in their own bore and fitted the same way round, that is with the long off-set side of the connecting rod to the left-hand side of the engine, and with the bolt heads to the right.