

ENGINE: OVERHAUL PROCEDURES

CONSUL CLASSIC 315

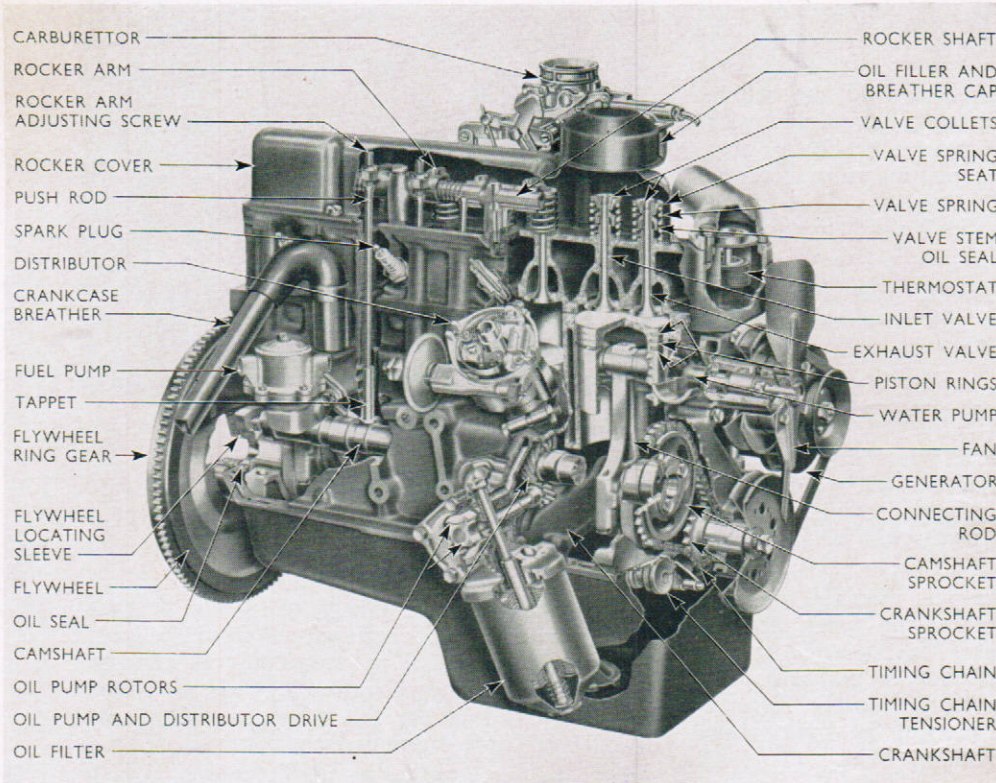


Fig. 1

Sectioned View of Engine

The engine is of the overhead valve type, being a 4-cylinder unit of 1340 c.c. capacity, 3.187 in. (80.96 mm.) diameter bore and 2.562 in. (65.07 mm.) stroke.

The valves are mounted vertically in the cylinder head, the valve guides being cast integral. The heads of the inlet valves are of larger diameter than those of the exhaust valves.

Pistons are of the autothermic solid skirt type, the piston pins being fully floating and retained by means of end circlips fitted in the piston pin bosses.

A single row chain drives the camshaft from the crankshaft and a mechanically operated timing chain tensioner is fitted.

The distributor, which incorporates both mechanical and vacuum advance, is mounted on the right-hand side of the engine and is driven through skew gears by an eccentric on the engine camshaft, which also operates the fuel pump located on the right-hand side of the engine towards the rear.

The following sheets provide complete instructions for the removal, replacement, dismantling and reassembling operations which may be necessary on this engine. Specifications will be found at the end of this Bulletin.

The following major operations can be carried out with the engine in place :

Remove Cylinder Head Assembly

Remove the air cleaner, rocker cover and rocker shaft assembly, lift out the push rods and unscrew the cylinder head bolts (see continuation sheet 3).

Remove and Overhaul Oil Pump

Remove the three bolts securing the oil pump and filter assembly to the cylinder block, and withdraw the oil pump (see sheet 2).

Remove Cylinder Front Cover, Timing Chain, Sprockets or Tensioner

Access to the above components can be gained after removing the radiator.

Remove Water Pump

First remove the fan belt and fan.

Remove Sump

The sump can be removed to gain access to the main and the connecting rod big-end bearing caps, thrust washers, the oil pump inlet pipe and filter screen, etc.

Drain the sump and remove the sump shield (where fitted), the engine splash shield and the starter motor. Support the weight of the engine with suitable lifting tackle, and remove the bolts, nuts and washers securing the engine mounting brackets to the front crossmember. Raise the front of the engine approximately 2 in. (50.8 mm.), to clear the crossmember.

Remove the set screws securing the sump to the cylinder block, turn the engine over to allow the sump to clear the crankshaft webs, and remove the sump.

LUBRICATION SYSTEM

An eccentric bi-rotor type oil pump is incorporated in the head of the full flow filter fitted to the engine and is driven by a skew gear on the engine camshaft. A full description of this pump will be found on sheet 2 of this Bulletin.

Oil from the engine sump is drawn through a gauze screen on the bottom of the pump pick-up pipe and into the oil pump. Incorporated in the oil pump is a pressure relief valve, which when open, allows oil to return direct to the sump. This oil returns via a pipe to the base of the sump, thus preventing aeration of the oil.

Oil from the pump is fed under pressure to the full flow filter, then through a cross drilling above the centre main bearing to the main oil gallery on the left-hand side of the engine. Oil is also fed via

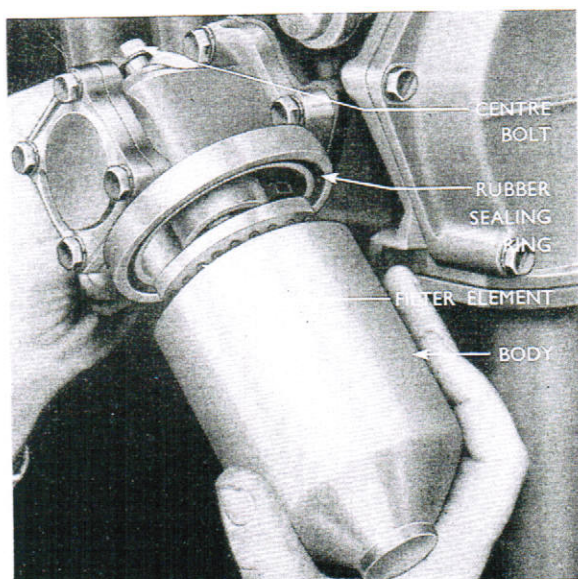


Fig. 2

The Engine Oil Filter

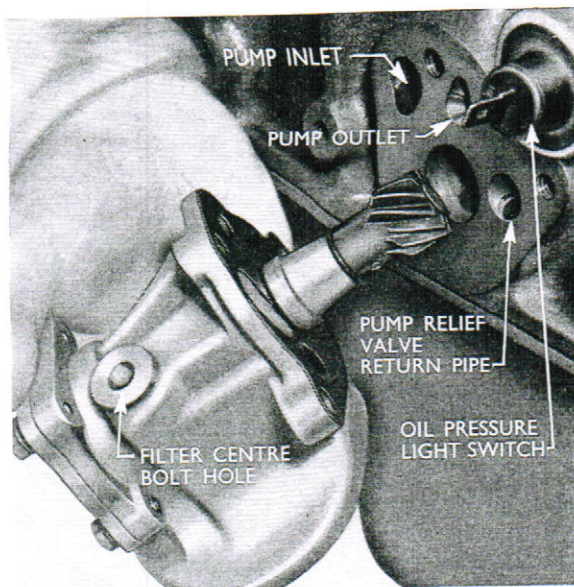


Fig. 3

Removing the Oil Pump

a short gallery to the oil pressure switch sender unit on the right-hand side of the engine.

From the main oil gallery oil passes through drillings to each main bearing, and from the main bearings via further drillings to each big end bearing. A small drilling in each connecting rod web allows a jet of oil to lubricate the non-thrust side of the cylinders each revolution of the crankshaft.

The camshaft bearings are fed via drillings in the cylinder block from the three main bearings.

By means of a flat incorporated in the front camshaft journal, oil is fed through drillings in the cylinder block and head to the front rocker shaft pedestal, thence to the hollow rocker shaft to lubricate the valve rockers. Drillings in each rocker allow for lubrication of the valve stems and push rod ends. This oil feed to the rocker gear is at a reduced pressure, the system being pressurised once per revolution of the camshaft.

The timing sprockets and chain are lubricated by a constant bleed from the drilling between the crankshaft and camshaft front bearings.

THE OIL FILTER

The oil filter is bolted to the underside of the oil pump which is attached to the right-hand side of the cylinder block.

The filter is of the full-flow type and is located in the lubrication circuit between the pump inlet port and the outlet to the main oil gallery.

The oil filter element should be renewed and the filter body thoroughly cleaned after every 5,000 miles (8,000 kms.), when the engine oil is changed, or more frequently if the lubricant has become excessively fouled. To remove the filter, unscrew the hexagon-headed bolt, and withdraw the filter body and element (see Fig. 2).

Remove the existing "O" ring from its recess in the oil pump housing, then locate the new ring (supplied with the replacement element) in the groove at four diametrically opposite points.

Do not fit the ring at one point and then work it round the groove, as the rubber may stretch, thus leaving a surplus which may cause an oil leak.

Thoroughly clean the filter body, insert a new element, and refit the filter assembly to the oil pump body.

THE OIL PUMP

The oil pump and filter assembly is bolted to the right-hand side of the cylinder block, the oil pump being incorporated in the head of the unit and driven by a skew gear on the engine camshaft.

The pump is of the eccentric bi-rotor type and the suction port is connected directly to the gauze strainer located in the engine sump. A full flow filter is incorporated in the assembly between the pump inlet port and the outlet to the main oil gallery of the engine. A non-adjustable plunger type relief valve is fitted between the pump outlet and filter inlet, oil passing this valve is returned via a pipe to the base of the sump to prevent oil aeration.

The pump consists of two rotors housed in the pump body. The inner rotor, which is pinned to the drive shaft, has four lobes machined on it, the outer rotor has five internal segments machined in it, with which the lobes of the inner rotor mesh. The outer rotor is located in a machined recess in the pump body and the centre of it is offset to the centre of the inner rotor and drive shaft, so that as the inner rotor revolves the outer rotor is also rotated.

The operation of the pump is shown in Fig. 4. The inlet port on the right is connected to the sump,

the outlet port on the left is connected via the full flow filter to the main oil gallery of the engine. In the first position, oil is drawn via the inlet port into the space between the inner and outer rotors. As the rotors revolve, the oil is carried round between them and in the second position, due to the offset between the centre of the rotors, the space between them starts to decrease so that oil is forced through the outlet port and filter into the engine. The action of the pump is a continuous repetition of this process, oil flowing into the space between the rotors from the inlet port is carried around in the space between the rotors and as this decreases the oil is then forced into the pump outlet port.

A non-adjustable pressure relief valve is incorporated between the pump outlet port and the full flow filter to prevent excessively high pressures being built up.

To Overhaul the Oil Pump

1. Unscrew the three bolts securing the pump to the cylinder block and detach the pump and gasket.
2. Detach the oil filter body and the element after unscrewing the centre bolt.
3. Remove the four bolts and lockwashers retaining the end plate and pull off the plate. Remove the rubber "O" ring from the sealing groove in the pump body.
4. Check the clearance between the lobes of the inner and outer rotors. This should be checked in two positions as shown in Figs. 5 and 6, and must not exceed 0.006 in. (0.152 mm.). Check the clearance between the outer rotor and the housing, this should not exceed 0.0075 in. (0.19 mm.).

The rotors are supplied as a matched pair only so that if the clearance is excessive a new rotor assembly must be fitted. Similarly, if the clearance

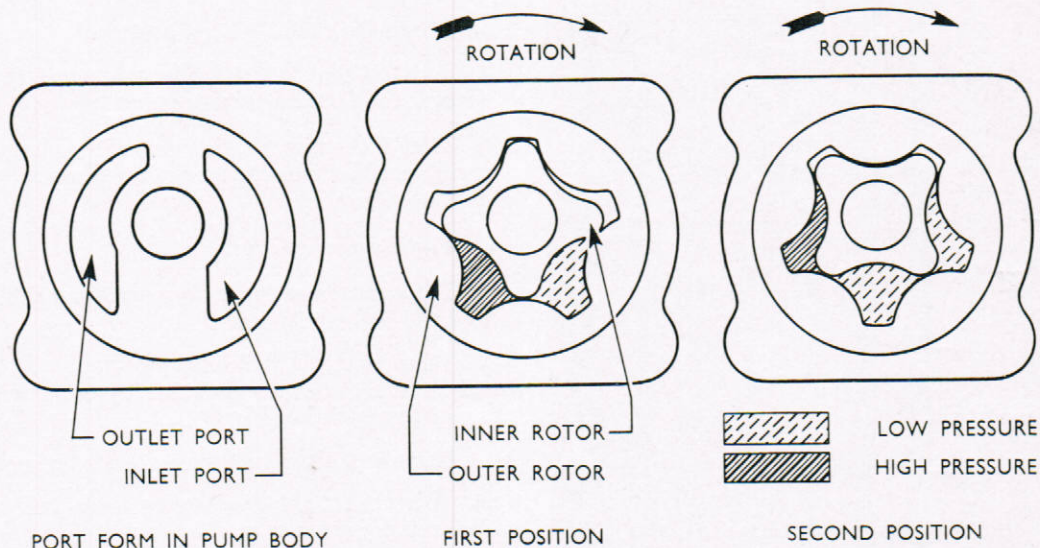


Fig. 4

Oil Pump Operating Sequence

between the outer rotor and pump body is excessive a new rotor assembly and/or pump body should be fitted.

5. Place a straight edge across the face of the pump body and check the clearance between the face of the rotors and the straight edge (see Fig. 8). This should not exceed 0.005 in. (0.127 mm.). If this clearance is excessive, the face of the pump body can be carefully lapped on a flat surface.

6. If it is necessary to renew the rotors, drive out the pin securing the skew gear to the drive shaft, and pull off the gear.

7. Remove the inner rotor and drive shaft (serviced only as an assembly) and withdraw the outer rotor.

8. Install the outer rotor with its chamfered face inwards, towards the pump body. Fit the inner rotor and drive shaft assembly, position the skew gear on the end of the drive shaft and install the pin. Pein the pin securely at both ends to prevent it becoming loose in service.

9. Position the rubber "O" ring in the groove in the pump body.

10. Fit the end plate (machined face towards the rotors), secure it in place with four bolts and lockwashers.

11. Locate a new filter sealing ring in the groove in the pump body at four diametrically opposite points. Do not fit the sealing ring at one point and then work it round the groove, as the rubber may stretch, thus leaving a surplus which could cause an oil leak.

NOTE.—Normally, the pump relief valve will not require attention; if necessary the valve and spring can be withdrawn after carefully extracting the spring seat which is a press fit in the body. Similarly, the filter relief valve, which is also a press fit in the body, need not normally be removed (see Fig. 7).

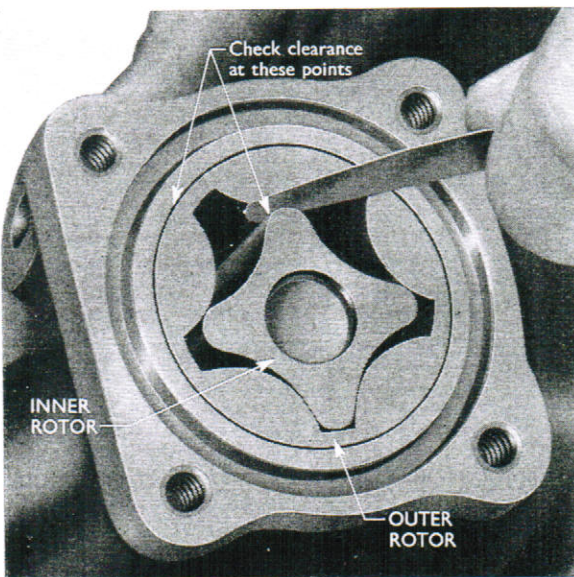


Fig. 5

Checking Rotor Clearances (a)

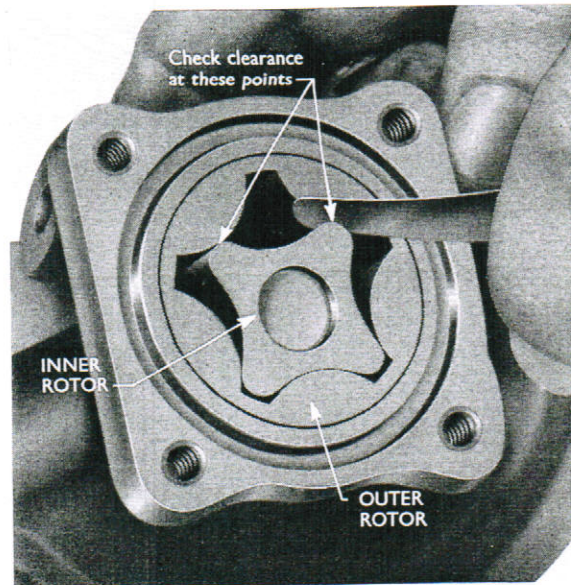


Fig. 6

Checking Rotor Clearances (b)

Refit the oil filter body and element.

Locate a new gasket on the cylinder block, fit the oil pump and filter assembly to the block and secure in place with three bolts and lockwashers.

THE ENGINE

To Remove the Engine

1. Remove the bonnet. Disconnect the bonnet support at the lower end by removing the pivot bolt, nut and washer, then unscrew the two hinge bolts, one on either side and remove, together with the flat washers.
2. Disconnect the battery.
3. Drain the engine oil and coolant.
4. Jack up the front of the vehicle and fit stands beneath the forward jacking points.
5. Detach the upper and lower radiator hoses at the engine end, then remove four bolts and spring washers securing the radiator.
6. Remove the radiator.
7. Disconnect the hand brake primary cable from the hand brake relay lever.
8. Disconnect the fuel inlet pipe to the fuel pump and remove the engine breather by unscrewing one engine to clutch housing bolt.
9. Remove the top bolt from the starter motor.
10. Disconnect the spark plug leads and remove Nos. 2 and 3 spark plugs.
11. Unclip and lift off the distributor cap. Disconnect the high tension lead from the coil terminal and the low tension lead from the contact breaker terminal of the distributor.

12. Disconnect the oil warning light sender lead *and remove the oil pump and filter by unscrewing the three mounting bolts.*

13. Remove both heater hoses, one from the water pump and one from the cylinder head.

14. Remove the air cleaner. Three types of air cleaner are fitted in production. The gauze type and paper element type may be removed by slackening the retaining clamp at the base and lifting the air cleaner clear of the carburettor.

In certain export territories an oil bath type air cleaner is fitted. This type should be removed in the following manner :—

- (a) Remove the cover retaining screw and slacken the lower clamp securing the air cleaner hose to the top of the carburettor.
- (b) Lift the air cleaner clear of its platform on the rocker cover taking care not to tilt the body.

NOTE.—When an air cleaner of the oil bath type is fitted it will be necessary to also remove the rocker cover, otherwise the air cleaner platform will foul the lifting bracket mentioned below.

15. Disconnect the temperature gauge sender unit lead and the two generator leads.

16. Unscrew the exhaust pipe clamp bolts and disconnect the exhaust pipe from the manifold, then uncouple the choke and throttle controls at the carburettor end. Unscrew the two nuts and spring washers and detach the carburettor.

17. Remove the second and fourth cylinder head bolts on the left-hand side of the head. Locate the bracket ends of the lifting bracket, Tool No. P.6115A,

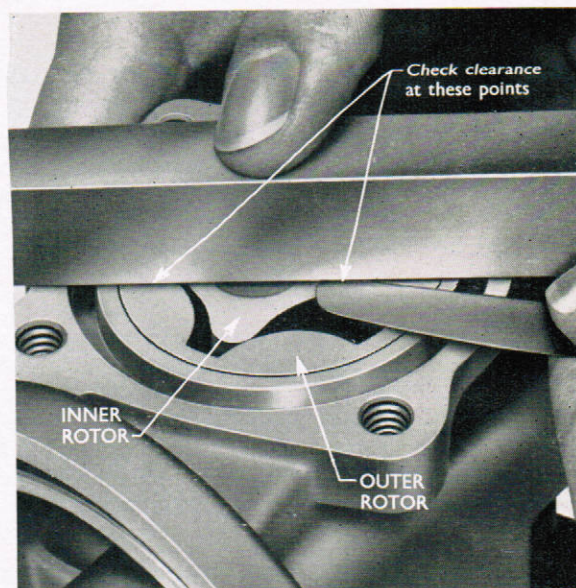


Fig. 8
Checking Rotor End Clearances

in the plug recesses and secure the bracket to the cylinder head and block, using bolts $\frac{1}{2}$ in. (12.7 mm.) longer than those removed.

If a lifting bracket is not available, position a rope sling around the engine and support the weight of the engine on suitable tackle.

18. From underneath the car remove the four bolts retaining the sump shield (where fitted), then remove the eight self-tapping screws and flat washers retaining the engine splash shield.

19. Unscrew the lower starter motor mounting bolt, disconnect the starter lead and withdraw the starter motor forwards.

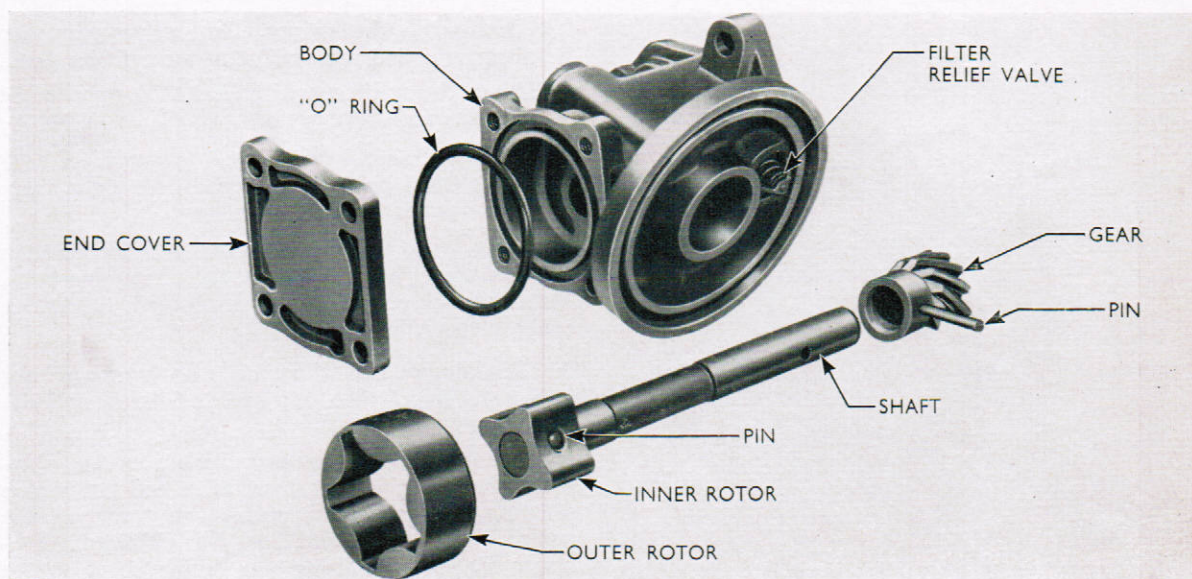


Fig. 7
The Oil Pump—Exploded

20. Suitably support the gearbox.
21. Remove the eight remaining bolts and lock-washers securing the engine to clutch housing.
22. Remove the two bolts, flat washers and nuts on each engine mounting, securing the engine mountings to the front cross member, pull the engine unit forward off the main drive gear and lift the assembly from the engine compartment.

Dismantling the Engine

1. (a) **Detach the generator**, engine drain tap and left-hand engine support bracket, bolt the universal stand adaptor (Tool No. P.6107) to the cylinder block at these locations and fit the engine on the universal stand.

(b) **Remove the distributor**. Disconnect the vacuum pipe, unscrew the one bolt securing the clamp plate to the block and lift out the distributor.

(c) **Detach the fuel pump** after unscrewing the two bolts and lockwashers securing it to the cylinder block.

(d) **Unscrew the oil pressure gauge unit**.

(e) **Remove the inlet and exhaust manifold assembly**. The exhaust manifold is mounted on studs at each end retained by bolts at its other locations. Note a gasket is fitted between the manifold and head.

(f) **Detach the water outlet elbow and gaskets**, then lift the thermostat from its location in the cylinder head.

2. (a) **Slacken the four rocker shaft support bolts** evenly to prevent distortion. Remove the bolts and lift off the rocker shaft assembly.

(b) **Withdraw the push rods** from their locations in the cylinder block, taking care to keep them in their correct order.

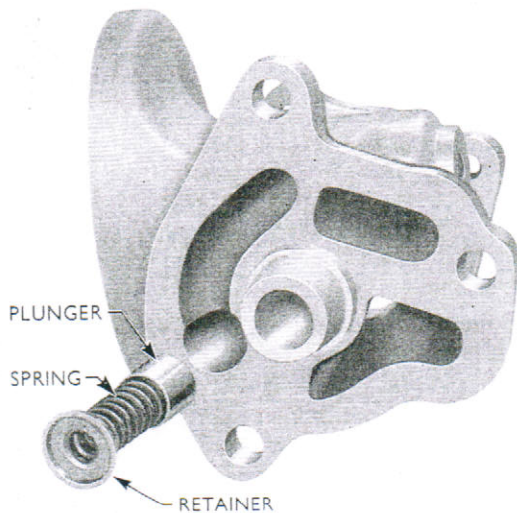


Fig. 9

The Oil Pump Relief Valve

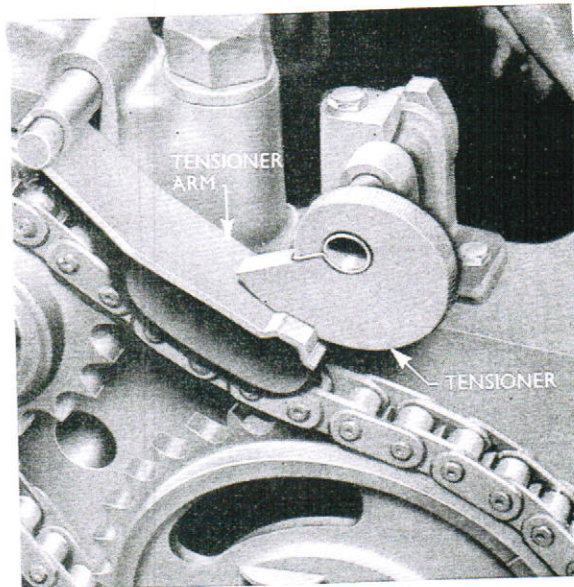


Fig. 10

The Timing Chain Tensioner

(c) **Dismantle the rocker shaft assembly**; proceed as follows :—

Remove the split pin from one end of the shaft and detach the flat washer, spring cup washer and second flat washer which bear against the end rocker arm. The rocker shaft supports, rocker arms and springs can now be removed from the shaft if necessary, but must be retained in sequence ready for reassembly.

3. **Unscrew the cylinder head bolts** evenly in the reverse order to that shown in Fig. 25. Lift off the cylinder head and gasket.

4. **Dismantle the valves**. The valves may now be dismantled and removed from the cylinder head.

Extract the split tapered collets then remove the spring seats and valve springs.

An umbrella-type rubber seal is fitted on each valve stem and must be removed before the valve can be extracted from the valve port.

5. **Dismantle the water pump** and fan from the cylinder block, unscrewing the three retaining bolts. Note that one retaining bolt also secures the timing cover to the cylinder block.

6. **Withdraw the dipstick and remove the sump** and detach the sump gaskets from the cylinder block face.

7. **Detach the pulley and timing cover**. Unscrew the retaining bolt, lockwasher and flat washer securing the crankshaft pulley and draw off the pulley, using the puller (Tool No. CP.6041). Unscrew the bolts securing the timing cover to the cylinder block, (two of the cover retaining bolts passing up through the sump flange have already been removed) and withdraw the timing cover. Remove the crankshaft oil slinger.

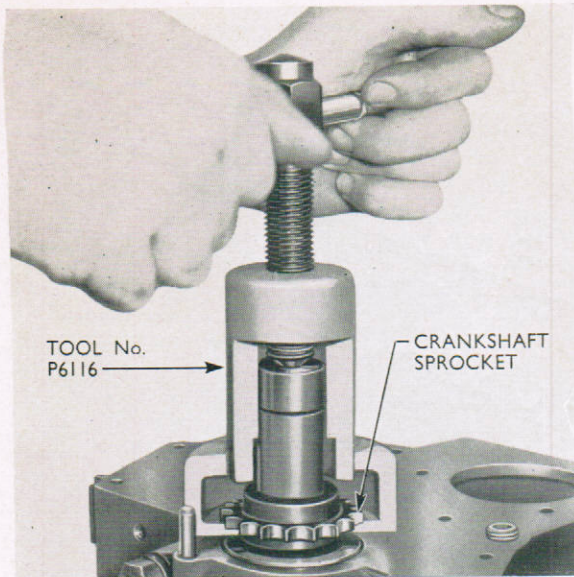


Fig. 11

Removing the Crankshaft Sprocket

NOTE.—Two of these bolts are dowel bolts, and can be identified by the machined shanks.

8. (a) **Detach the clutch assembly** (a compressor is not required). Unscrew the pressure plate bolts evenly and detach the pressure plate and clutch disc. Note that the clutch pressure plate is located by three dowels on the face of the flywheel.

(b) **Remove the flywheel.** This is secured by four bolts and a locking plate, and is located by a sleeve and dowel in the crankshaft rear flange. Bend back the tabs on the locking plate, unscrew the bolts and gently tap the flywheel off the crankshaft flange.

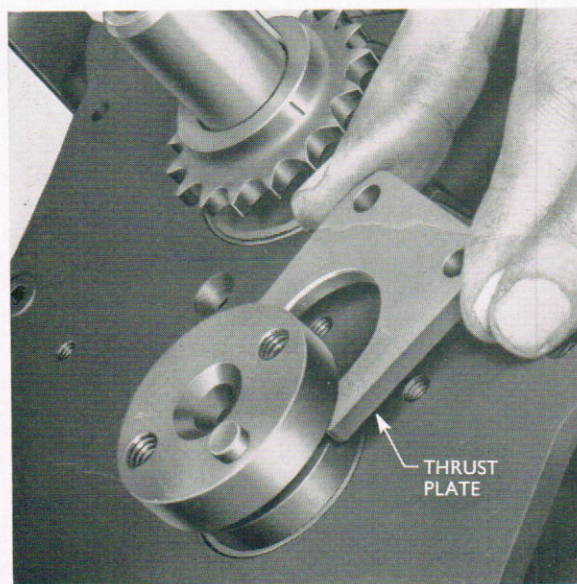


Fig. 12

Removing the Camshaft Thrust Plate

NOTE.—The ring gear is normally serviced as an assembly with the flywheel. In no circumstances should pressure be applied in an attempt to dismantle the gear for repositioning on the flywheel.

9. **Detach the engine rear plate.** Unscrew the one bolt and spring washer and detach the rear plate from the tubular dowels.

10. **Remove the timing chain tensioner.** Unscrew the two bolts, then remove the bracket. The tensioner arm may then be detached from the pivot pin (see Fig. 10).

11. (a) **Remove the camshaft sprocket and chain.** Bend back the camshaft sprocket locking plate tabs and unscrew the two retaining bolts. Remove the locking plate and pull the camshaft sprocket off its locating dowel on the camshaft flange. Detach the timing chain from the crankshaft sprocket.

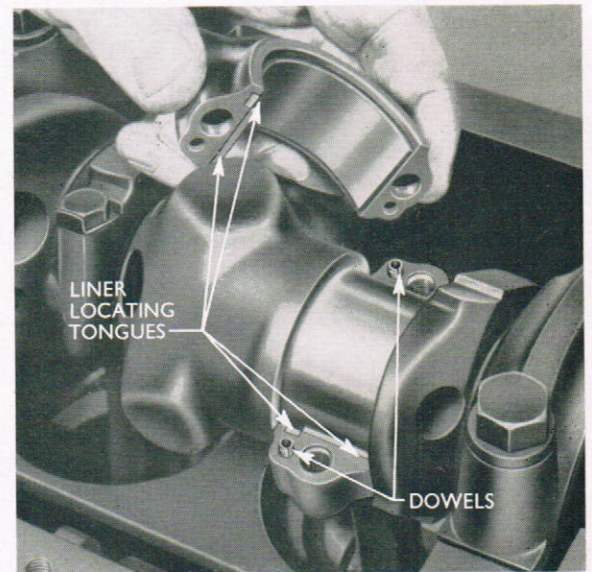


Fig. 13

A Connecting Rod and Cap

(b) **Remove the crankshaft sprocket,** using Tool No. P.6116, shown in Fig. 11, and remove the crankshaft sprocket key.

(c) **Remove the camshaft and thrust plate.** Bend back the thrust plate bolt locking tabs, unscrew the two bolts and withdraw the thrust plate from the groove behind the camshaft flange. Set the engine vertically on the stand, rotate the camshaft to fully lift the tappets and withdraw the camshaft. Remove the tappets from the cylinder block noting their correct locations. Instructions for camshaft bush replacement commence on continuation sheet 4.

12. (a) **Withdraw the piston and connecting rod assemblies.** Release the locking tabs on the big end bolts, unscrew the bolts two to three threads and tap them to release each connecting rod from its cap. Each cap is located on its rod by dowels

(see Fig. 13). Finally, completely remove the bolts and detach the big end caps. Push the pistons along the cylinder bores and withdraw the assemblies. .

(b) **Dismantle the piston and connecting rod assemblies.** First remove the piston rings. Extract the two piston pin circlips and push the pin out of each piston. It may be necessary to warm the pistons slightly by immersing in hot water or oil to enable the piston pins to be removed.

13. (a) **Check that each main bearing cap is marked correctly** for its location on the cylinder block. Unscrew the bearing cap bolts evenly and lift off each cap.

(b) **Lift out the crankshaft.** Two half thrust washers are located, one on either side of the centre main bearing journal, in the cylinder block; these can now be withdrawn. Remove the bearing liners.

14. **Remove the crankshaft rear bearing oil seal.** Unscrew the four bolts securing the oil seal housing to the cylinder block and detach the housing and gasket. Note that the two lower bolts in the housing are dowelled to ensure correct alignment.

15. **If necessary, dismantle the oil pump inlet pipe and relief valve return pipe** from the cylinder block.

To remove the inlet pipe, straighten the tab on the washer, unscrew the union nut and withdraw the pipe. The filter screen can be removed after relieving the swaging on the cover.

The return pipe is a press fit in the block.

To Reassemble

Before reassembling the engine, the cylinder block and all components should be thoroughly cleaned,

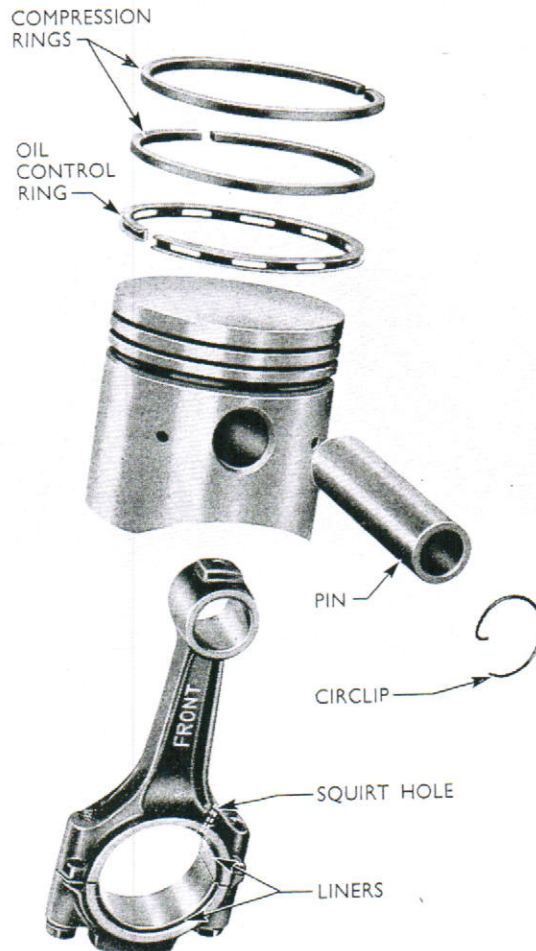


Fig. 15
A Connecting Rod and Piston Assembly—
Exploded

and all oil-ways checked to ensure that they are clear. All wearing parts should be dimensionally checked against the Specification at the end of this Bulletin and new parts selected where necessary.

All gaskets, oil seals and locking plates must be renewed.

Prepare the two halves of the rear main bearing oil seal by coating them with graphite paste. In no circumstances should this oil seal be fitted dry, otherwise the crankshaft bearing surface may be scored.

1. **Fit new camshaft bearing liners** (using Tool No. P.6031 with adaptor set P.6031-3), shown in Fig. 14, if those at present fitted require replacement.

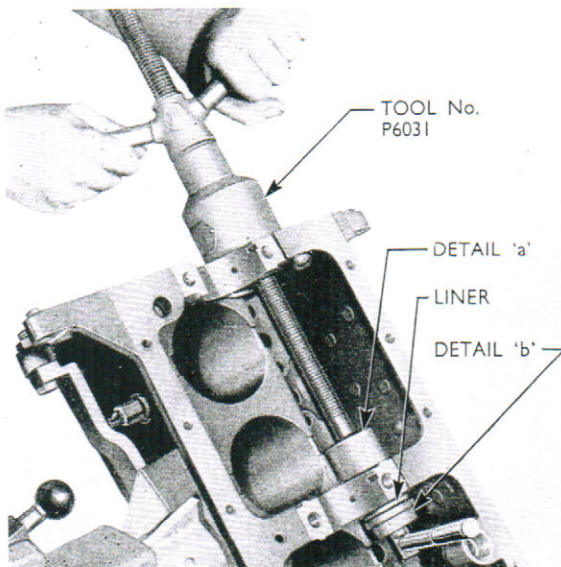


Fig. 14
Fitting Camshaft Bearing Liners

Ensure that the oil holes in the liners and cylinder block are correctly aligned before fitting the liners.

2. (a) **Replace the valve tappets.** Set the engine vertically on the stand and insert the tappets in the bores from which they were originally removed.

(b) **Slide the camshaft into position** after ensuring that all tappets are clear. Take care not to damage the edges of the bearing liners or the journals and cams of the camshaft. Rotate the camshaft to ensure that it revolves freely in its bearings after fitting.

(c) **Locate the camshaft thrust plate** in the camshaft groove and secure it to the cylinder block with the locking plate and two retaining bolts. Check the camshaft end-float. This should be between 0.002 and 0.007 in. (0.051 and 0.18 mm.).

If the camshaft end-float is correct, bend up the locking tabs to secure the retaining bolts. If end-float is incorrect, renew the camshaft thrust plate.

3. (a) **Turn the engine on the stand** so that the crankcase is upwards.

(b) **Fit the crankshaft rear bearing oil seal** to its housing, ensure that it is pressed fully home and that the ends of the seal protrude $\frac{1}{32}$ in. (0.79 mm.) above the face of the housing.

(c) **Fit a new oil seal housing gasket** to the rear face of the cylinder block and secure the housing to the block with four spring washers and the correct bolts, see Fig. 16. Note that the two bolts adjacent to the sump flange are dowel bolts to ensure correct alignment and these must be "nipped" first. Equally tighten the four bolts.

4. (a) **Position the upper halves of the main bearing liners** in their block locations. Wipe clean the liner locations in the block and fit the liners so that the locating tongues engage the machined locating grooves, see Fig. 16.

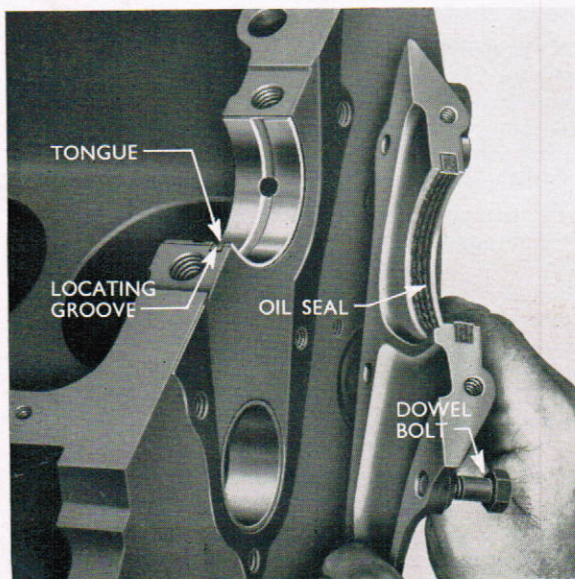


Fig. 16

The Crankshaft Rear Oil Seal

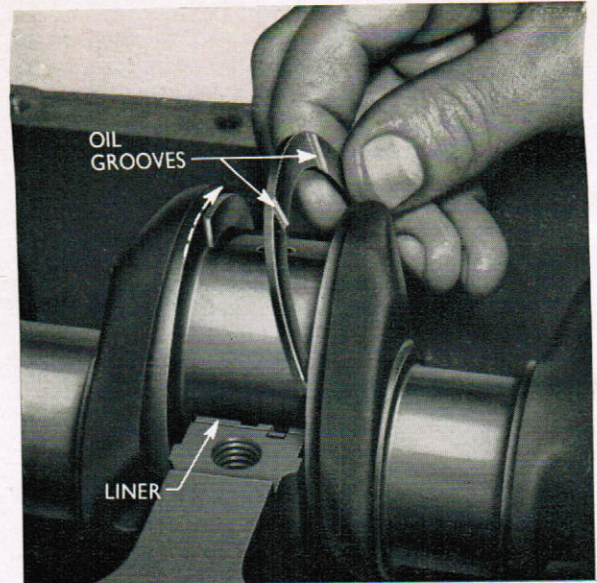


Fig. 17

The Crankshaft Thrust Washers

Lightly oil the main bearing liners **after** they have been fitted to the cylinder block.

NOTE.—An oil feed is provided to the crankshaft rear thrust washer. The centre main bearing cap is provided with a 30° chamfer 0.03 in. (0.76 mm.) to 0.04 in. (1.02 mm.) thick between the bearing locating notch and the rear face of the cap.

Oil is fed into the groove formed by this chamfer through a "vee" notch 0.07 in. (1.78 mm.) deep in the oilway at the locating tab end of the liner.

(b) **Replace the crankshaft** in the cylinder block and fit new end-float thrust washers. The thrust washers locate in recesses on either side of the main bearing in the cylinder block and should be fitted with the oil grooves facing the crankshaft flange. (See Fig. 17.) Check the crankshaft end-float which should be 0.003 to 0.011 in. (0.076 to 0.279 mm.).

(c) **Clean and position the lower halves of the main bearing liners** in the appropriate caps, engaging the locating tongues in the machined locating grooves.

Refit the main bearing caps in accordance with the mating marks and with the cast arrows pointing to the front of the engine. Tighten the cap bolts to the correct torque (see Specification), and check crankshaft rotation.

5. **Select pistons** for the individual bores. Each piston should be fitted to its individual cylinder bore by direct measurement.

The cylinder bores are measured at a point 3.5 in. (8.9 cm.) from the top face of the cylinder block across the axis of the crankshaft. Grade numbers are stamped in accordance with the sizes at the end of this Bulletin. Pistons are also graded and stamped on the crown with the appropriate grade number.

Pistons of the same grade number are fitted to the appropriate bore. This gives the specified fit of 0.0005 in. to 0.0011 in. (0.0127 to 0.0275 mm.) clearance, when measured at the bottom of the skirt on the thrust axis.

When re-boring cylinders in service, to suit oversize pistons, it is essential that each cylinder bore is machined to suit the individual piston to give the specified fit. The piston skirt measurement at right angles to the piston pin holes must be measured accurately, the maximum measurement being taken as the piston skirt is cam ground.

6. Piston Fit. Pistons (rings not fitted) are to be fitted to cylinder bores so that when a steel feeler blade $\frac{1}{8}$ in. (12.7 mm.) wide and 0.0015 in. (0.038 mm.) thick is inserted between the piston, (at right angles to the axis of the piston pin) and the cylinder wall, a pull of 8 to 11 lbs. (3.63 to 4.99 kg.) is required to remove the blade.

The feeler must project, inside the bore, farther than the piston.

(i) Insert the 0.0015 in. (0.038 mm.) feeler blade (supplied with the pull scale, Tool No. 512), together with the piston, into the bore in which it is to operate, positioning the blade at right angles to the centre line of the piston pin. (see Fig. 18). Holding the connecting rod as shown in Fig. 18, apply a steady pull to the piston scale, observing the poundage required to remove the feeler blade.

(ii) Select a piston for each bore to give a pull of between 8 and 11 lbs. (3.63 to 4.99 kg.).

Locate the piston compression and oil control rings in the unworn portion of the cylinder bore and check the ring gaps, which should be between 0.009 to 0.014 in. (0.229 to 0.356 mm.).

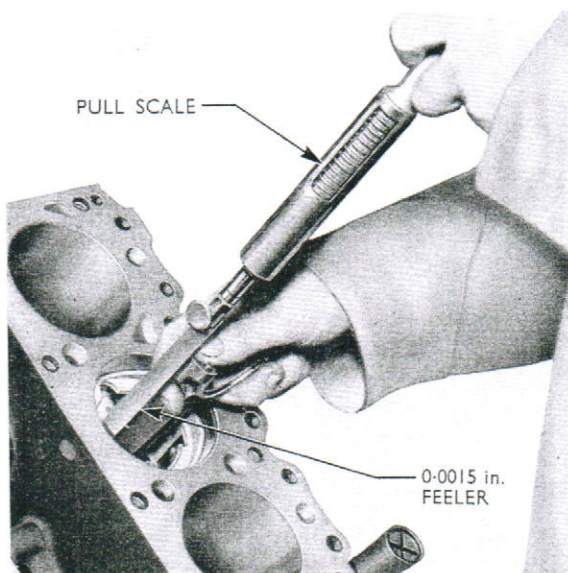


Fig. 18
Checking Piston Fit

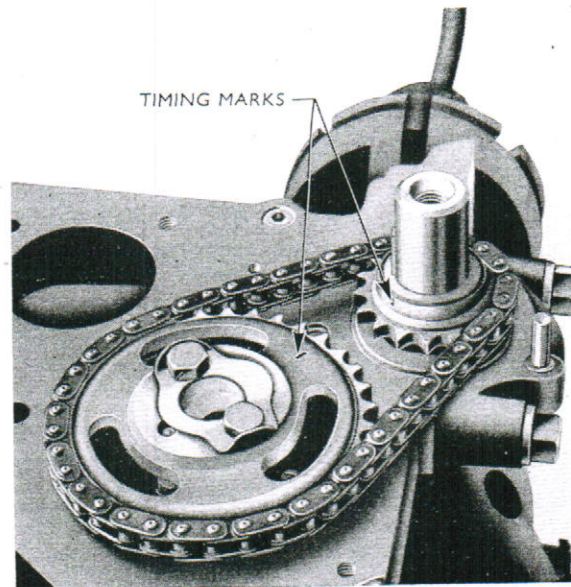


Fig. 19
Valve Timing Marks Location

Check piston ring to groove clearances, which should be as follows :—

Top compression ring	} 0.0016 to 0.0036 in. (0.0406 to 0.0914 mm.)
Lower compression ring	
Oil control ring	0.0018 to 0.0038 in. (0.0457 to 0.0965 mm.)

Fit a circlip in position in one of the piston pin bosses and locate the connecting rod in the piston with the marking FRONT on the connecting rod on the same side of the assembly as the arrow mark in the piston crown. Heat the piston in water or oil and slide the piston pin through the pin bosses and connecting rod small end until it abuts the circlip already fitted. Fit the second circlip.

Assemble the piston rings, noting that the compression rings are marked TOP and that the upper compression ring is chromium plated. The lower compression ring is "stepped" on the bottom face. This "step" must face the piston skirt on assembly. Space the ring gaps at 120° .

Fit the piston and connecting rod assemblies to the appropriate bores, with the arrow on the crown of each piston pointing towards the front of the engine. Compress the piston rings using the ring squeezer, Tool No. P.6108 and push each piston down its cylinder bore.

7. (a) Fit the connecting rod liners, locating the tabs of the liners in the machined grooves of the rod and cap. Check that the oil hole in the upper half of each liner coincides with the oil squirt hole in the connecting rod.

(b) Turn the crankshaft as necessary to fit the connecting rod big ends to the crank pins. Locate the big end caps on the connecting rod dowels, fit new "D" shaped locking plates to the connecting rod bolts and enter the bolts into the connecting rod.

Tap the big end caps right home on the dowels and tighten the connecting rod bolts to the correct torque, see *Specification*.

Lock the bolts with the tabs on the locking washers.
Check rotation of engine.

8. (a) **Fit the crankshaft** key and sprocket to the front end of the crankshaft, pressing the sprocket into position, timing mark face to the front, using the sprocket replacer, Tool No. P.6032.

(b) **Turn the crankshaft** until the marked tooth of the sprocket is on the centre line between the crankshaft and camshaft centres (see Fig. 19) and temporarily fit the camshaft sprocket on the dowel. Turn the camshaft until the marked tooth is on the centre line between the two sprockets, then again remove the camshaft sprocket.

(c) **Fit the timing chain** around the camshaft sprocket, locate the chain around the crankshaft sprocket and fit the camshaft sprocket to the camshaft boss. Check that the timing marks are towards the centre and in line as illustrated in Fig. 19.

(d) **Fit the locking plate** and retaining bolts to the camshaft sprocket. Tighten the bolts securely and bend up the locking plate tabs.

9. **Position the tensioner arm** on the hinge pin on the front main bearing cap and secure the timing chain tensioner to the cylinder block with two bolts and two spring washers. (On initial assembly, tension will have been applied to the cam spring by rotating the spring approximately two and a half turns from the "free" position.)

10. (a) **Renew the crankshaft front oil seal.** Extract the old seal carefully, taking care not to damage the cover and use Tool No. P.6111 to press the new seal into the cover so that the lipped edge is inwards. Support the cover adequately around the oil seal location when pressing in the seal to avoid distortion. Fit the oil slinger to the crankshaft so that the outer circumference is dished towards the timing cover and the crankshaft pulley.

(b) **Replace the cylinder front cover** and gasket. Position the gasket on the cylinder block face, fit the cover and secure it in place with the retaining screws and spring washers. Note that the two dowel bolts should be fitted and "nipped" first.

11. (a) **Replace the oil pump inlet pipe** (if removed). Fit a new tab washer (see Fig. 20) to the union nut, also ensure that this pipe is located so that the filter screen housing will not foul the pump baffles. Securely tighten the union retaining it in place with a tab on the washer.

(b) **Fit new gaskets on the block flange**, taking care that the tongues on the gaskets are correctly located at the front and rear of the block. Fit the cork packing strip at the front and, at the rear, the rear main bearing seal in its location in the end of the sump.

NOTE.—The two sump gaskets should enter the recess for the cork packing in the front cover and abut the crankshaft at the rear. The gaskets will then be "nipped" by the cork packing strip at the front end of the engine, and by the rear main bearing seal at the rear end.

(c) **Refit the sump** securing it in place with the retaining bolts, lockwashers and flat washers.

12. **Locate the rear engine plate** on the tubular dowels and secure it to the cylinder block with one bolt and lockwasher.

13. (a) **Refit the flywheel** complete with locating sleeve (see Fig. 22), after first checking that the pilot bearing is in the crankshaft end and that the mounting flange and crankshaft flange are clean and free from burrs. Locate the flywheel squarely upon the dowel in the crankshaft flange, tap it into place, fit the locking plate and retaining bolts tightening them evenly to the correct torque (see *Specification*).

(b) **Check the flywheel run-out**, using the gauge Tool No. P.4008 at the rim, and on the clutch face adjacent to the rim. The flywheel run-out

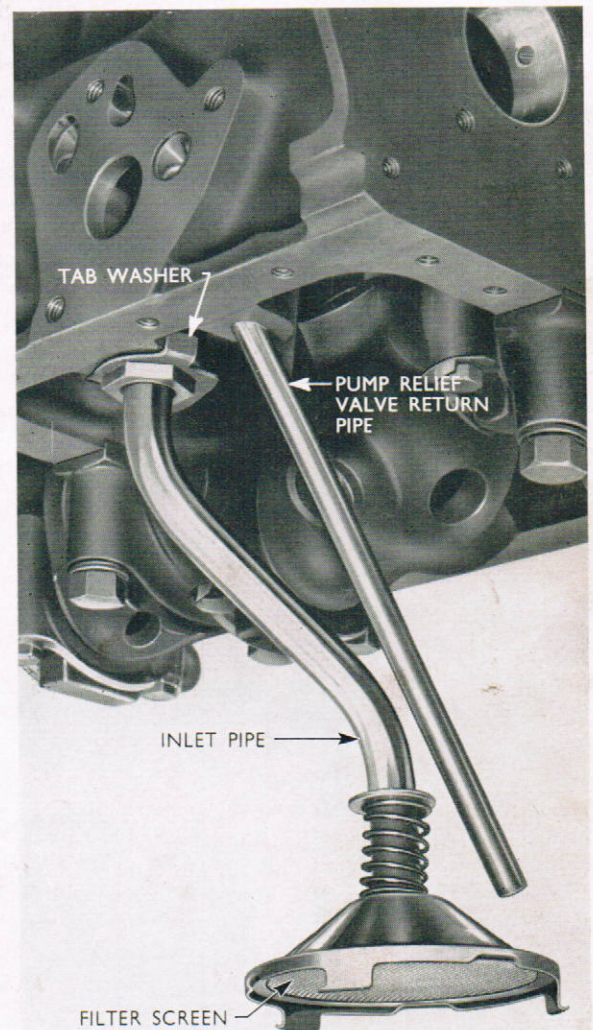


Fig. 20

The Oil Pump Inlet and Return Pipes

should not exceed 0.006 in. (0.153 mm.) total indicator reading.

If the flywheel run-out is within the limit, bend up the locking plate tabs to secure the retaining bolts, if the run-out is incorrect, remove the flywheel and check its mounting faces and the crankshaft flange for dirt or burrs.

(c) **Replace the clutch assembly** on the flywheel. Fit the clutch disc with the hub assembly away from the flywheel using the locating Tool No. P.7091.

(d) **Locate the clutch pressure plate assembly** on the three dowels on the flywheel, and enter the securing bolts and spring washers. Tighten the bolts evenly to a torque of 12 to 15 lbs. ft. (1.658 to 2.073 kg.m.), then remove the clutch disc locator.

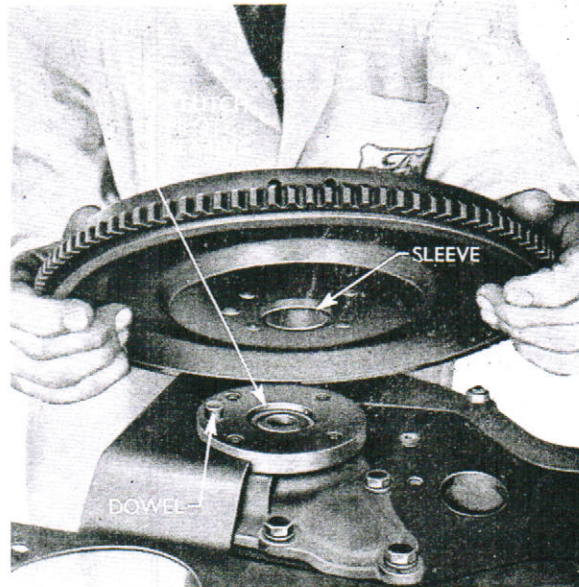


Fig. 22

Refitting the Flywheel

14. Valve Replacement. Where it is necessary to fit valve inserts, a suitable drift must be made to the dimensions given in Fig. 23. The insert must be pressed squarely into position, and it may therefore be found advantageous to extend the end of the drift into the valve stem guide. Valve seat inserts are serviced for both inlet and exhaust valves.

The recesses for the replacement valve seat inserts should be cut in the cylinder head to the dimensions given in the table at the end of this Bulletin. It should not be necessary to freeze the inserts before fitting.

(a) **Fit replacement inserts if required.** Enter the insert in the recess, chamfered edge first, and press it into position with the appropriate tool.

Valve guide bores are machined direct in the cylinder head and to compensate for wear, valves with stems 0.003 in. (0.076 mm.) and 0.015 in. (0.351 mm.) oversize are available in service; this oversize is marked on the valve stem. To enable the 0.015 in. (0.38 mm.) oversize valves to be fitted it is necessary to ream the valve guide bores.

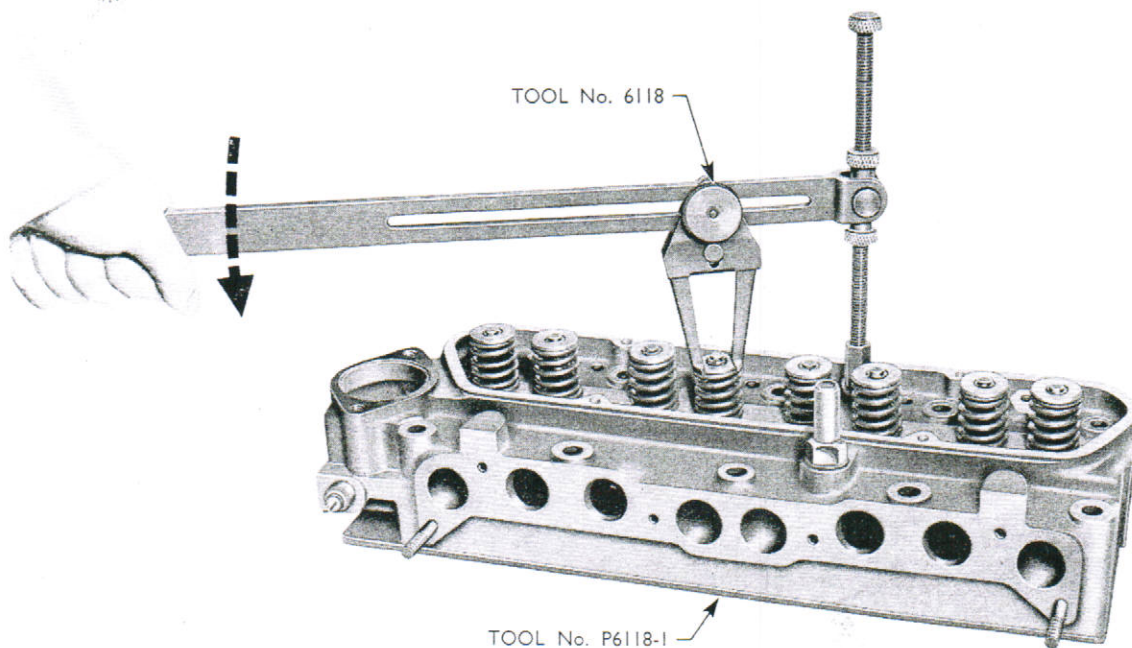
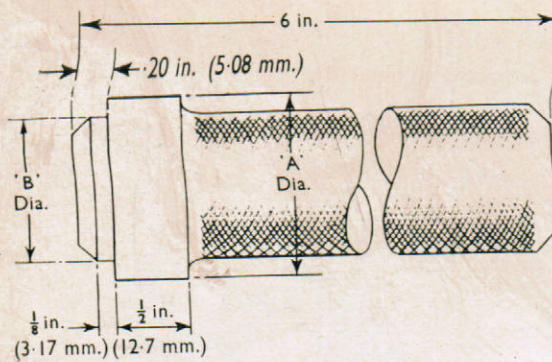


Fig. 21

Removing and Replacing Valve Cottoers



Valve	'A' Dia.	'B' Dia.
Inlet	1.41 in. (35.80 mm.)	1.14 in. (28.96 mm.)
Exhaust	1.26 in. (32 mm.)	1.03 in. (26.16 mm.)

Fig. 23

Valve Seat Insert Replacer Tool

(b) If it is required to ream the valve guide bores in the cylinder head, this should be carried out with Tool No. P.6056. A reamer is supplied 0.015 in. (0.381 mm.) oversize with a standard size pilot. A small tap wrench should be used with the reamer and care should be taken to ream in line with the existing bore

(c) After reaming, recut the valve seats in line with the valve guide bores.

(d) Reassemble the valves after regrinding and cleaning the valve seats, etc. Lubricate each valve stem, and pass the valve stem through the appropriate valve port into position against the seat. Fit the

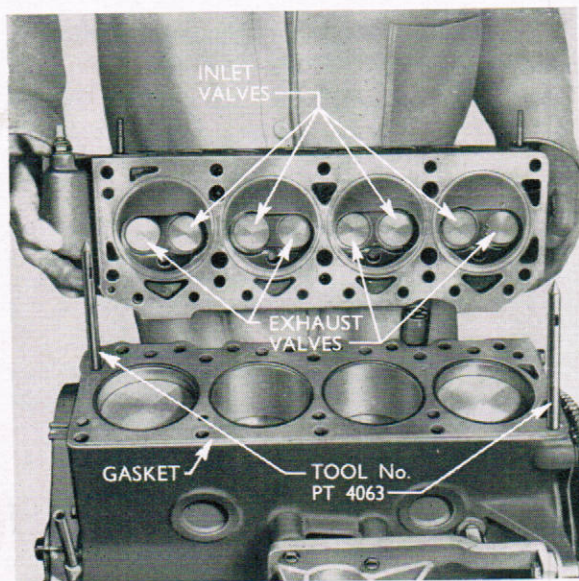


Fig. 24

Refitting the Cylinder Head

umbrella type oil seals to the valve stems with the open ends to the head.

(e) Place the valve springs in position around the valves and fit a valve spring seat on the top of each valve spring (see Fig. 21).

(f) Compress the valve springs and place the split taper collets in the top groove of each valve stem with the tapers engaging in the tapered valve spring seat (see Fig. 21).

15. (a) Refit the cylinder head and gasket. Check the head and block faces for burrs, etc., and locate the cylinder head gasket in position steel face downwards with the water port holes in the block

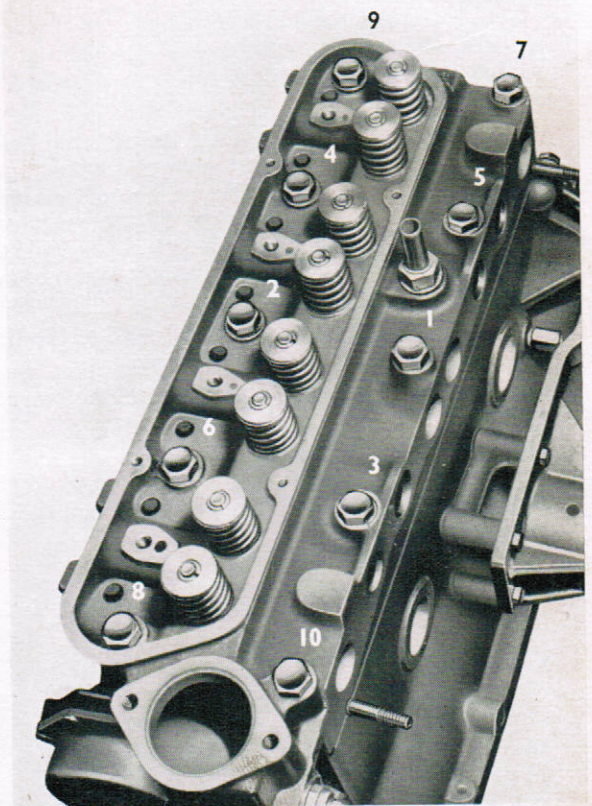


Fig. 25

Cylinder Head Bolt Tightening Sequence

and gasket in line. Screw the locating studs PT.4063 into diagonally opposite bolt holes on the block face to locate the cylinder head gasket (see Fig. 24).

(b) **Install the cylinder head assembly** and refit the cylinder head bolts before removing the locating studs. Tighten down the head bolts evenly a little at a time, working outwards from the centre in the order shown in Fig. 25. Finally tighten the bolts down to the correct torque, see Specification.

16. Reassemble the rocker shaft. Note that the rocker arms are "handed" and if the original parts

are being refitted they should be assembled in the locations from which they were originally removed, see continuation sheet 3. Each rocker arm must abut a support with a compression spring between the rocker arms, except at each end, where the rocker arm is held against the support by two thrust washers and a spring cup washer.

(a) Build up the rocker shaft assembly, first fitting a split pin in the hole at one end of the shaft. Fit a flat washer, spring cup washer and another flat washer on the shaft to abut the split pin, slide a rocker arm onto the shaft followed by a rocker shaft support. The bolt hole through the rocker shaft support must be on the same side as the valve stem adjuster.

(b) Next fit a rocker, spring and rocker followed by a support and complete the assembly in this manner.

(c) After the last rocker arm has been fitted, fit a flat washer, spring cup washer and another flat washer on the shaft securing them in place with a split pin.

(d) **Locate the push rods** in the push rod bores, ball ends first, to engage in the cupped tappet ends. Place the rocker shaft assembly on the cylinder head, ensuring that the cupped ends of the push rods correctly engage with the adjusters, fit and tighten the rocker shaft retaining bolts evenly to the correct torque.

(e) Adjust the valve clearances, see Specification.

17. Replace the water pump, noting that one of the retaining bolts also secures the timing cover in position.

18. Replace the crankshaft pulley, aligning the pulley slot with crankshaft key. Replace the pulley securing bolt, lock and flat washers, and tighten securely.

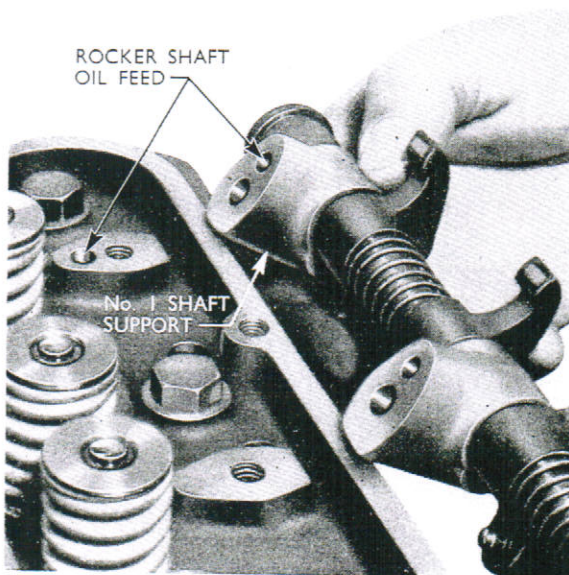


Fig. 26

Assembling the Rocker Shaft to the Cylinder Head

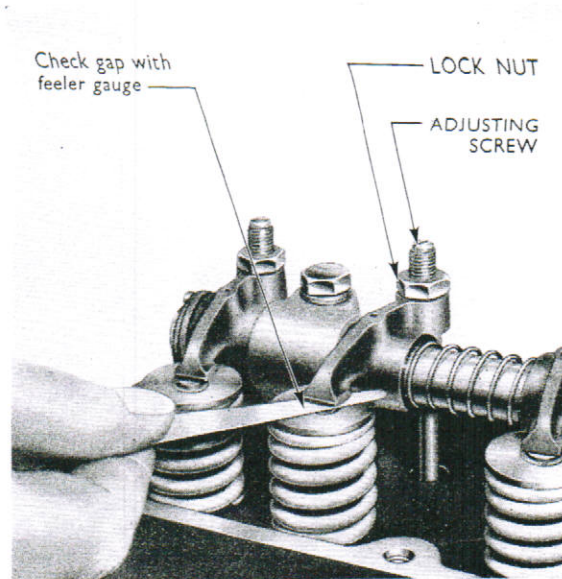


Fig. 27

Adjusting Valve Clearances

19. Retime the ignition

(a) Turn the engine until the timing mark on the crankshaft pulley is in line with the lower or outer pointer on the timing cover with number one piston on compression stroke (check by observing valve positions or by feeling compression at No. 1 cylinder spark plug hole) (see Fig. 29).

(b) Fit the distributor into position so that the rotor is pointing towards No. 1 segment in the distributor cap with the contact breaker points just opening. To allow for the helical gear drive, first set the distributor with the tip of the rotor adjacent to the low tension terminal and the vacuum unit spindle parallel to the cylinder block, see Fig. 28. Secure the distributor to the cylinder block with one bolt and lockwasher through the clamp plate.

NOTE.—Two distributors are available for high and low compression engines. Check distributor type, see "Distributor Repair Procedure Bulletin" Section 10.

(c) Slacken the body clamp bolt, take up any lost motion in the drive and adjust the distributor body so that the contact breaker points are just opening. Tighten the clamp bolt to secure the body in this position.

20. (a) Refit the fuel pump. Locate a new gasket on the fuel pump and secure the pump to the cylinder block with two bolts and lockwashers.

(b) **Refit the oil pressure gauge unit.**

(c) **Refit the inlet and exhaust manifold assembly.** A gasket is fitted at this location and the manifold faces should be coated with a suitable sealer. Locate the manifold on the two studs at the front and rear of the cylinder head, fit a flat washer and a new self-locking nut to each stud. Secure the manifold to the cylinder head with flat washers, lockwashers and securing bolts at the other locations.

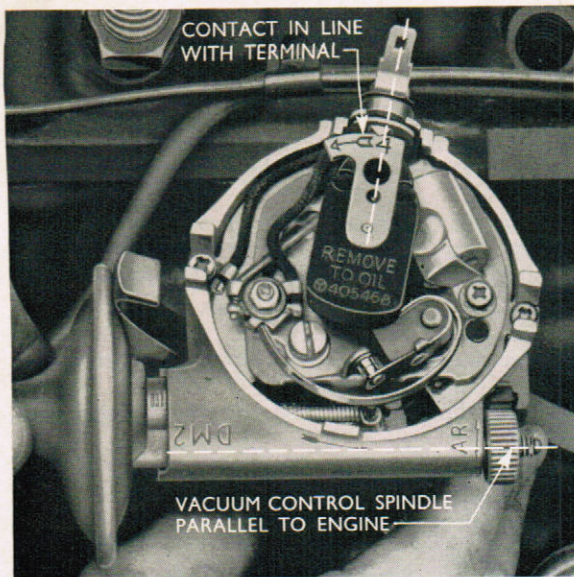


Fig. 28

Fitting the Distributor

- (d) **Insert the thermostat** in the cylinder head water outlet, position the new gasket and refit the water outlet connection, two bolts and lockwashers.
- (e) **Lift the engine from the universal stand** and remove the support bracket from the engine.
- (f) **Refit the generator**, adjusting the fan belt tension so that there is $\frac{1}{2}$ in. (12.7 mm.) total movement between the generator and water pump pulleys.
- (g) **Refit the engine mountings** to the cylinder block and refit the drain tap.

To Refit the Engine

1. To prevent the engine rear plate from being dislodged from the two tubular dowels, temporarily secure the rear plate to the cylinder block with two bolts and nuts. Fit the bolts through the hole above each tubular dowel with the bolt head facing **forwards** and secure with a nut. When the engine unit has been located securely on the main drive gear, these nuts and bolts can be removed, see operation 2.
2. Raise the engine by the lifting bracket Tool No. P.6115A and suitable lifting tackle, and lower it into the engine compartment, locate the unit on the main drive gear, ensuring that the tubular dowels are correctly located in the clutch housing and fit the clutch housing bolts.
3. Secure the engine mounting brackets to the crossmember with two bolts, two flat washers and self-locking nuts in each bracket.
4. Refit the starter motor to the gearbox securing it in place with the lower mounting bolt. Reconnect the lead to the starter motor terminal.
5. Remove the engine lifting bracket, Tool No. P.6115A, and replace the second and fourth cylinder head bolts, tightening them to the correct torque.
6. Locate the exhaust pipe on the exhaust manifold, fit the clamp and secure with two bolts and nuts. Tighten securely.

Fit a new carburettor gasket to the carburettor flange, fit the carburettor securing it in place with two nuts and a lockwasher.

7. Reconnect the throttle linkage and choke control cable to the carburettor. Refit the rocker cover and gasket.
8. Reconnect the leads to the 'D' and 'F' terminals of the generator and the lead to the temperature gauge sender unit.
9. Inspect the rocker cover gasket and, if necessary, renew. Replace the rocker cover, tightening the four retaining screws securely.
10. Fit the air cleaner. Three types of air cleaner are fitted in production. The "wetted" gauze and the "paper element" types are fitted to the carburettor body and located with the 'spout' pointing forward and slightly to the left. Secure to the carburettor with a hose clamp.

The "oil bath" type air cleaner must be fitted to the rocker cover and carburettor in the following manner :—

- (a) Locate the body on the rocker cover platform, ensuring that the dowel at the base engages in the hole provided in the platform.
- (b) If empty, refill the cleaner body with fresh engine oil to the level mark, fit the cover, locating the air cleaner hose over the top of the carburettor, tightening the hose clamps securely.
- (c) Insert the cover retaining screw and tighten fully.

11. Connect up the two heater hoses. The upper hose on the heater box must be attached to the connection on the cylinder head, the lower hose must be coupled to the connection on the water pump. Tighten the hose clamps securely.

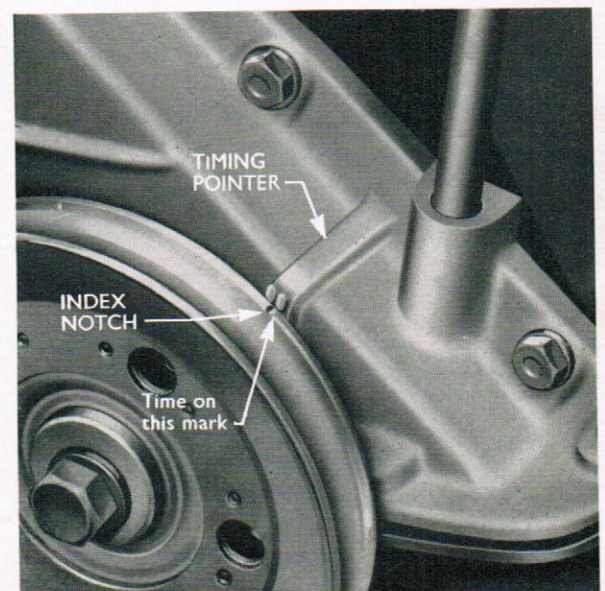


Fig. 29

Correct Engine Timing Position

12. Position the oil pump gasket on the cylinder block and fit the oil pump and filter assembly securing it in place with three bolts and lockwashers. Re-connect the lead to the oil pressure switch unit.

13. Connect up the high tension lead to the distributor cap, also the low tension lead to the contact breaker terminal of the distributor. Refit the distributor cap and secure with the two clips.

14. Fit numbers 2 and 3 spark plugs complete with copper washers and tighten securely. Couple the plug leads to their respective plugs.

15. Insert the starter motor upper mounting bolt and tighten this bolt and the lower bolt already fitted.

16. Connect up the fuel inlet pipe to the fuel pump, locate the engine breather pipe and secure to the clutch housing with a bolt and spring washer.

17. Couple up the handbrake primary cable to the relay lever and refit the radiator securing it with four

bolts and spring washers. Fit the upper and lower radiator hoses and tighten the hose clamps.

18. Refill the radiator with coolant, and refill the engine with the correct grade of engine oil (see Specification). Connect up the battery.

19. Run the engine and check for oil or water leaks. If satisfactory, locate the engine splash shield and secure with eight self-tapping screws and washers. Refit the sump shield (where fitted).

20. Replace the bonnet and locate with two hinge bolts and two flat washers. Attach the bonnet support to the body with one pivot bolt washer and nut.

21. Jack up the car, remove the stands and lower the car to the ground.

22. Run the engine and carry out any minor adjustments that are necessary.

SPECIFICATIONS, SERVICING AND REPAIR DATA

Type	4 cylinder-in-line O.H.V.
Bore	3.1875 in. (80.96 mm.)
Stroke	2.562 in. (65.07 mm.)
Cubic capacity	81.78 cu. in. (1340 c.c.)
Compression ratio	8.5 : 1 Standard 7.2 : 1 Optional
Maximum brake horse-power	54 at 4,900 r.p.m. (8.5 c.r.) 50.5 at 4,800 r.p.m. (7.2 c.r.)
Maximum torque	74.0 at 2,500 r.p.m. (8.5 c.r.) 71.6 at 2,500 r.p.m. (7.2 c.r.)
Firing order	1, 2, 4, 3
Location of No. 1 cylinder	Next to radiator
Engine mounting	3 point suspension on rubber mountings

Camshaft

Material	Special Ford cast alloy iron
Bearings	Steel-backed babbitt liners
Journal diameter	1.56 in. (39.63 mm.)
Bearing length—Front	0.79 in. (20.06 mm.)
Centre	0.68 in. (17.27 mm.)
Rear	0.79 in. (20.06 mm.)
Bearing I.D.	1.5615 to 1.5635 in. (39.662 to 39.713 mm.)
Bearing clearance	0.001 to 0.0035 in. (0.025 to 0.089 mm.)
Camshaft end-float	0.002 to 0.007 in. (0.051 to 0.178 mm.)
Camshaft thrust plate thickness	0.176 to 0.178 in. (4.47 to 4.52 mm.)
Camshaft drive	Single roller chain, with tensioner
Camshaft sprocket	Located by offset dowel and two bolts
Maximum cam lift—Inlet	0.21082 in. (5.3548 mm.)
Exhaust	0.21762 in. (5.5288 mm.)

Connecting Rods

Length between centres	.. .. .	4.283 to 4.285 in. (10.879 to 10.884 cm.)
Big end bearings	.. Steel-backed copper lead or lead bronze, with 0.001 in. (0.025 mm.) lead overlay	0.0005 to 0.0022 in. (0.0127 to 0.057 mm.)
Crankpin to bearing clearance	.. .. .	0.83 to 0.87 in. (2.11 to 2.21 mm.)
Bearing length (Effective)	.. .. .	2.0825 to 2.0830 in. (52.896 to 52.908 mm.)
Big end bore (housing)	.. .. .	0.0719 to 0.07225 in. (1.826 to 1.835 mm.)
Bearing wall thickness	.. .. .	Bronze bush, steel-backed
Small end	.. .. .	0.812 in. (20.62 mm.)
Diameter (Piston Pin)	.. .. .	0.0001 to 0.0003 (0.0025 to 0.0076 mm.) (selective)
Piston pin to small end clearance	.. .. .	0.002 to 0.008 in. (0.051 to 0.203 mm.)
End-float on crankpin	.. .. .

Crankshaft, Main Bearings

Crankpin journal length	1.062 to 1.064 in. (26.975 to 27.026 mm.)						
Main journal length	<table> <tr> <td>Front</td> <td>1.219 to 1.239 in. (31.16 to 31.47 mm.)</td> </tr> <tr> <td>Centre</td> <td>1.247 to 1.249 in. (31.67 to 31.72 mm.)</td> </tr> <tr> <td>Rear</td> <td>1.358 to 1.368 in. (34.49 to 34.75 mm.)</td> </tr> </table>	Front	1.219 to 1.239 in. (31.16 to 31.47 mm.)	Centre	1.247 to 1.249 in. (31.67 to 31.72 mm.)	Rear	1.358 to 1.368 in. (34.49 to 34.75 mm.)
Front	1.219 to 1.239 in. (31.16 to 31.47 mm.)							
Centre	1.247 to 1.249 in. (31.67 to 31.72 mm.)							
Rear	1.358 to 1.368 in. (34.49 to 34.75 mm.)							
Crankpin journal diameter	1.9370 to 1.9375 in. (49.200 to 49.213 mm.)						
Main journal diameter	2.1255 to 2.1260 in. (53.988 to 54.000 mm.)						
Bore for bearing liners	2.271 to 2.2715 in. (57.683 to 57.785 mm.)						
Main bearing liner wall thickness	0.07200 to 0.07225 in. (1.829 to 1.835 mm.)						
Bearing clearance	0.0005 to 0.0020 in. (0.013 to 0.051 mm.)						
Crankshaft end-float	0.003 to 0.011 in. (0.076 to 0.279 mm.)						
End-float thrust washer thickness	0.091 to 0.093 in. (2.311 to 2.362 mm.)						
Main bearing length (Effective)	0.724 to 0.800 in. (18.389 to 20.32 mm.)						

Cylinder Block

Type	.. .. .	Cylinders cast integral with top half of crankcase
Water jackets	.. .. .	Full length

Cylinder Head

Type	.. .. .	Cast iron with vertical valves. Separate inlet and exhaust ports
Combustion chamber	.. .. .	Fully machined

Flywheel Ring Gear

Type	.. .. .	Shrunk on
Number of teeth	.. .. .	110
Maximum run-out	.. .. .	0.006 in. (0.153 mm.)

Lubrication

Type	.. .. .	Pressure feed
Pressure fed bearings	.. .. .	Main, camshaft and connecting rod. Reduced pressure to rocker shaft
Piston pin and cylinder wall lubrication	.. .. .	Splash, with squirt holes in connecting rods
Timing chain lubrication	.. .. .	Controlled spray
Oil filter	.. .. .	Full flow incorporated with oil pump
Crankcase ventilation	.. .. .	Directed flow via road draught tube on right-hand side of engine
Grade of oil :		
Summer or winter	.. .. .	S.A.E. 20 or 20W
From 32°F. to -10°F.	.. .. .	S.A.E. 10W
Below -10°F.	.. .. .	S.A.E. 10W + 10% kerosene or S.A.E. 5W
Sump capacity	.. .. .	4 pints (2.27 litres)
Filter capacity	.. .. .	½ pint (0.284 litre)
Oil pump relief pressure	.. .. .	35 to 40 lbs./sq. in. (2.46 to 2.81 kg./sq. cm.)
Oil pressure warning light operates at	.. .. .	5 to 7 lbs./sq. in. (0.391 to 0.492 kg./sq. cm.)

Oil Pump

Oil pump type	.. .. .	Eccentric bi-rotor
Capacity	.. .. .	2 galls. at 2,000 r.p.m. (9.09 litres, 2.4 U.S. galls.)
Housing bore I.D.	.. .. .	0.500 to 0.501 in. (12.700 to 12.725 mm.)
Oil pump shaft diameter	.. .. .	0.4980 to 0.4985 in. (12.649 to 12.662 mm.)
Shaft to body clearance	.. .. .	0.0015 to 0.003 in. (0.038 to 0.076 mm.)
Clearance between lobes to inner and outer rotors, maximum	.. .. .	0.006 in. (0.152 mm.)
Clearance between outer rotors and housing, maximum	.. .. .	0.0055 to 0.0075 in. (0.14 to 0.19 mm.)
Shaft end-float, maximum	.. .. .	0.005 in. (0.127 mm.)

Pistons

Type	Autothermic aluminium alloy
Number of rings	Two compression, one oil control
Piston pin offset	0.040 in. (1.016 mm.)
Width of ring grooves :	
Compression—first ring	0.0796 to 0.0806 in. (2.022 to 2.047 mm.)
Compression—second ring	0.0796 to 0.0806 in. (2.022 to 2.047 mm.)
Oil control	0.1578 to 0.1588 in. (4.008 to 4.034 mm.)
Piston pin bore	0.8121 to 0.8124 in. (20.627 to 20.635 mm.)
Piston pin diameter	0.8120 to 0.8123 in. (20.625 to 20.632 mm.)
Piston pin to piston clearance (Selective)	0.000 to 0.0002 in. (0.000 to 0.005 mm.)

Piston grades :	<i>Standard Bore</i>	0.030 in. (0.762 mm.)	<i>Overize Bore</i>
Grade 1	3.1861 to 3.1864 in. (80.925 to 80.932 mm.)		3.2161 to 3.2164 in. (81.685 to 81.692 mm.)
Grade 2	3.1864 to 3.1867 in. (80.932 to 80.940 mm.)		3.2164 to 3.2167 in. (81.692 to 81.700 mm.)
Grade 3	3.1867 to 3.1870 in. (80.940 to 80.948 mm.)		3.2167 to 3.2170 in. (81.700 to 81.708 mm.)
Grade 4	3.1870 to 3.1873 in. (80.948 to 80.956 mm.)		3.2170 to 3.2173 in. (81.708 to 81.716 mm.)
Piston fit	8 to 11 lbs. (3.63 to 4.99 kg.) pull on	0.0015 in. (0.038 mm.)	feeler blade, 0.5 in. (12.7 mm.) wide

(Grade 3 and 4 pistons only are available in Service)

Piston Rings

Width of rings :	
Top compression	0.0775 in. (1.969 mm.)
Centre compression	0.0775 in. (1.969 mm.)
Oil control	0.1555 in. (3.950 mm.)
Ring to groove clearance :	
Top compression	0.0016 to 0.0036 in. (0.041 to 0.091 mm.)
Centre compression	0.0016 to 0.0036 in. (0.041 to 0.091 mm.)
Oil control	0.0018 to 0.0038 in. (0.046 to 0.097 mm.)
Ring gap	0.009 to 0.014 in. (0.229 to 0.356 mm.)
Ring to wall pressure	6.4 to 8.3 lbs. (2.900 to 3.765 kg.) upper compression 6.00 to 8.00 lbs. (2.272 to 3.629 kg.) lower compression 5.35 to 6.90 lbs. (2.427 to 3.130 kg.) oil control

Tightening Torques

Cylinder Head	65 to 70 lbs. ft. (8.987 to 9.679 kg.m.)
Main Bearings	55 to 60 lbs. ft. (7.604 to 8.295 kg.m.)
Big End Bearings	20 to 25 lbs. ft. (2.765 to 3.456 kg.m.)
Flywheel	45 to 50 lbs. ft. (6.221 to 6.913 kg.m.)
Manifold nuts/bolts	12 to 15 lbs. ft. (1.66 to 2.07 kg.m.)

Valves

Head diameter	1.262 to 1.272 in. (3.205 to 3.231 cm.) inlet 1.183 to 1.193 in. (3.004 to 3.030 cm.) exhaust
Stem diameter	0.3095 to 0.3105 in. (7.861 to 7.882 mm.) inlet 0.3086 to 0.3096 in. (7.838 to 7.864 mm.) exhaust
Valve guide bore I.D. :	
Inlet	0.3113 to 0.3125 in. (7.907 to 7.938 mm.)
Exhaust	0.3113 to 0.3125 in. (7.907 to 7.938 mm.)
Stem to guide clearance	0.0008 to 0.003 in. (0.023 to 0.076 mm.) inlet 0.0017 to 0.0039 in. (0.043 to 0.099 mm.) exhaust
Valve lift	0.3147 in. (7.989 mm.) inlet 0.3181 in. (7.999 mm.) exhaust
Valve seat angle (cylinder head and valve)	45° inlet and exhaust
Valve clearance (normal operating temperature)	0.010 in. (0.254 mm.) inlet 0.017 in. (0.432 mm.) exhaust
Valve clearance (cold)	0.008 in. (0.203 mm.) inlet 0.018 in. (0.457 mm.) exhaust
Valve springs—free length	1.48 in. (4.57 cm.)
Spring load at fitted length	46.5 lbs. (21.09 kgs.) at 1.263 in. (32.08 mm.)

Valve timing (at valve clearance of .015 in. (0.381 mm.) inlet and .027 in. (0.686 mm.) exhaust, cold)

Inlet opens	17° B.T.D.C.
Inlet closes	51° A.B.D.C.
Exhaust opens	51° B.B.D.C.
Exhaust closes	17° A.T.D.C.

Valve Seat Inserts

<i>Insert</i>	<i>Valve</i>	<i>I.D. of Recess in Head</i>	<i>Depth of Recess in Head</i>
Standard	Inlet Exhaust	1.4195/1.4200 in. (36.055/36.068 mm.) 1.2680/1.2685 in. (32.207/32.220 mm.)	0.2175/0.2225 in. (5.521/5.654 mm.) 0.2175/0.2225 in. (5.521/5.654 mm.)
0.010 in. (0.254 mm.) o/s dia. std. depth	Inlet Exhaust	1.4295/1.4300 in. (36.309/36.322 mm.) 1.2780/1.2785 in. (32.461/32.474 mm.)	0.2175/0.2225 in. (5.521/5.654 mm.) 0.2175/0.2225 in. (5.521/5.654 mm.)
0.010 in. (0.254 mm.) o/s dia. and depth	Inlet Exhaust	1.4295/1.4300 in. (36.309/36.322 mm.) 1.2780/1.2785 in. (32.461/32.474 mm.)	0.2275/0.2325 in. (5.781/5.904 mm.) 0.2275/0.2325 in. (5.781/5.904 mm.)
0.020 in. (0.508 mm.) o/s dia. std. depth	Inlet Exhaust	1.4395/1.4400 in. (36.563/36.576 mm.) 1.2880/1.2885 in. (32.715/32.728 mm.)	0.2175/0.2225 in. (5.521/5.654 mm.) 0.2175/0.2225 in. (5.521/5.654 mm.)
0.020 in. (0.508 mm.) o/s dia. and depth	Inlet Exhaust	1.4395/1.4400 in. (36.563/36.576 mm.) 1.2880/1.2885 in. (32.715/32.728 mm.)	0.2375/0.2425 in. (6.031/6.164 mm.) 0.2375/0.2425 in. (6.031/6.164 mm.)