SECTION A

THE ENGINE

GENERAL DESCRIPTION

The M.G. (Series MGA) twin-overhead-camshaft engine is built in unit construction with an 8 in. (20·3 cm.) Borg & Beck clutch.

The valves, which are fitted with bucket-type tappets, are inclined at an included angle of 80° in the detachable aluminium-alloy cylinder head and are directly operated by the chain-driven camshafts. The valve clearances are adjusted by means of hardened-steel shims, which are supplied in a range of sizes. The shims are inserted between the top of the valve stem and the under side of the tappets. Each camshaft runs in three renewable white-metal bearings and is driven by a $\frac{3}{8}$ in. pitch duplex roller chain from a half-speed shaft situated in the left-hand side of the cylinder block. The drive is taken from the crankshaft to the half-speed shaft through a pair of reducing gears. The tachometer, oil pump, and distributor are driven from the half-speed shaft.

Two idler sprockets are employed with the camshaft chain, one permanently located and the other mounted on a fulcrum arm, the position of which can be adjusted by means of a manually operated chain tensioner.

The aluminium-alloy pistons carry three compression rings and one slotted oil control ring. The gudgeon pins are of the fully floating pattern and the connecting rods are fitted with renewable lead-indium- or lead-tin-plated bearings. Three renewable bearings, also of lead-indium or lead-tin, support the forged-steel counterbalanced crankshaft. The thrust is taken by special washers at the centre main bearing. The renewable-element full-flow filter is secured by its centre-bolt to the right-hand side of the cylinder block.

A centrifugal water pump fitted with a fan is driven by the dynamo belt.

The two semi-downdraught H6 S.U. carburetters are supplied with fuel by a large-capacity S.U. electric pump.

LUBRICATION SYSTEM

An eccentric-type oil pump inside the crankcase is driven from the half-speed shaft by a short vertical shaft. Oil is drawn into the pump through a gauze strainer and is delivered through crankcase drillings to a non-adjustable plunger-type relief valve located at the rear of the engine on the left-hand side. From the relief valve the oil passes through an internal drilling across the rear of the block and through an external oil pipe to the main oil filter. The filter bowl is filled with oil at full pressure which passes through the element into the annular space around the centre-bolt and from there into the main oil gallery; drillings supply oil to the main, big-end, and half-speed shaft bearings.

Oil is fed to the camshaft bearings from the main oil gallery through an external pipe. The timing gears are sprayed with oil from a small drilling in an oil distributor pillar attached to the engine front plate. Oil is also taken through pipes from this distributor pillar to the timing chain idler sprocket bearing and the chain adjuster sprocket pivot bearing.

Section A.1

DRAINING THE SUMP

The sump on new and reconditioned engines must be drained and then filled with new oil after the first 500 miles (800 km.) and at intervals of every 3,000 miles (4800 km.). The hexagon-headed drain plug is at the rear of the sump on the right-hand side. The sump should be drained when the engine is hot as the oil will flow more readily; allow to drain for at least 10 minutes before the drain plug is replaced.

The capacity of the sump is given in the **'GENERAL DATA'** section.

Section A.2

OIL PRESSURE

Under normal running conditions the oil pressure should not drop below 30 lb./sq. in. (2·1 kg./cm.²) on the gauge at normal road speeds, whilst approximately 10 lb./sq. in. (·7 kg./cm.²) should be shown when the engine is idling. New engines with new oil will give considerably higher readings at low speeds.

Should there be a noticeable drop in pressure, the following points should be checked:

(1) That there is a good supply of the correct grade of oil in the engine sump.

(2) That the strainer in the sump is clean and not choked with sludge.

(3) That the bearings, to which oil is fed under pressure, have the correct working clearances. Should the bearings be worn and the clearances excessive, the oil will escape more readily from the sides of the bearings, particularly when the oil is warm and becomes more fluid. This will cause a drop in pressure on the gauge as compared with that shown when the bearings are in good order.

The automatic relief valve in the lubrication system deals with any excessive oil pressure when starting from cold. When hot the pressure drops as the oil becomes more fluid.

Should the oil filter become blocked, two relief valves in the filter blow off to enable the oil to by-pass the filter and pass direct into the main gallery.

Continuous cold running and unnecessary use of the mixture control are often the cause of serious oil dilution by fuel, with a consequent drop in pressure.

Particular attention is called to the recommended change of oil every 3,000 miles (5000 km.).

Section A.3

OIL PRESSURE RELIEF VALVE

The non-adjustable oil pressure relief valve is situated at the rear of the left-hand side of the cylinder block and is held in position by a domed hexagon nut sealed by two fibre washers. The relief valve spring maintains a valve cup against a seating machined in the block.

The valve should be examined to ensure that the cup is seating correctly and that the relief spring has not lost its tension. The latter can be checked by measuring the length of the spring. To give the correct relief pressure of 50 lb./sq. in. (3·52 kg./cm.²) this should not be less than 3 in. (7·6 cm.). Fit a new cup and spring if necessary.

Section A.4

WATER PUMP

The water pump is of the centrifugal impeller type and is mounted on a common spindle with the fan. The pump and fan assembly, together with the cast-aluminium inlet pipe, is attached to the front of the timing case by three studs and one bolt around the pump casing and one bolt on the inlet pipe, and may be withdrawn and serviced as detailed in Sections C.7 and C.8.

If the gasket is damaged as the pump body is withdrawn from the timing case ensure that all traces of it are removed before a new gasket is fitted and the pump replaced.

Section A.5

CARBURETTERS

Removal

Disconnect the fuel supply pipe and the flexible connecting pipe at the rear carburetter union.

Remove the two set screws and spring washers securing each air cleaner and remove the air cleaners. Remove the split pin and flat washer and release the mixture cable and clevis pin from the mixture control linkage and release the mixture outer cable abutment complete with bracket.

Remove the split pin from the jet lever interconnecting link to separate the two jet levers. Detach the throttle return spring and release the throttle cable.

Unscrew the union nut and disconnect the ignition vacuum control pipe from the front carburetter.

Remove the nut and flat washer on top of each float-chamber to release the vent pipes.

Remove the four nuts, spring washers, and plain washers securing each carburetter flange and withdraw the carburetters. The throttle cable abutment bracket and throttle return spring bracket will also be withdrawn.

Replacement

Replacement is a reversal of the above instructions.

Do not attempt to remove the carburetters and induction manifold as an assembly. The induction manifold is secured by two studs inside the intakes and cannot be released until the carburetters are removed (Fig. A.1).

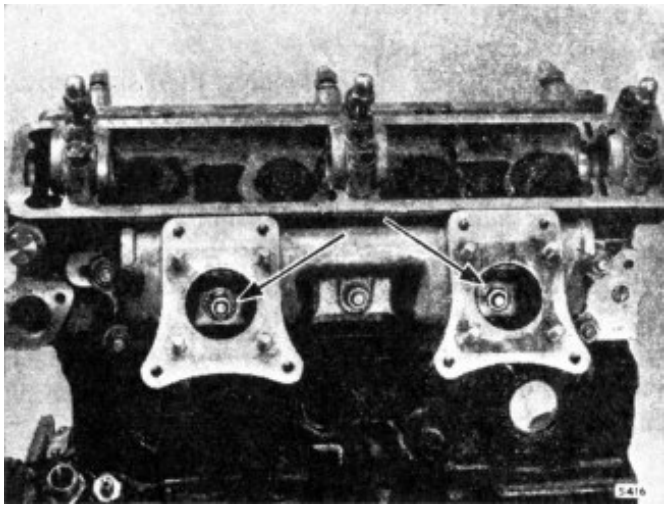


Fig. A.1

Two of the manifold securing nuts (arrowed) are fitted inside the intakes

Section A.6

INLET MANIFOLD

Removal

Remove the air cleaners and carburetters as detailed in Section A.5.

Seven studs secure the inlet manifold to the cylinder head. Remove the nuts, spring washers, and flat washers, noting that two studs pass through the manifold, the nuts being located inside the intakes (see Fig. A.1).

Replacement

Replacement of the manifold is a reversal of these instructions. A new gasket should be used.

Section A.7

HEADER TANK

Removal

Remove the heater air intake pipe.

Slacken the hose clips between the thermostat housing cover and the header tank.

Remove the two set screws, spring washers, and plain washers securing the header tank mounting bracket at the rear of the tank. Release the overflow pipe at the rubber connection to the filler neck and lift out the header tank.

Replacement

Replacement is a reversal of the above instructions.

Section A.8

THERMOSTAT HOUSING

Removal

Remove the heater air intake pipe, thermostat cover, and header tank as detailed in Section A.7.

Slacken the heater water pipe union nut and release the pipe from the thermostat housing. Release the thermal transmitter bulb olive nut and withdraw the thermal transmitter. Release the hose clip securing the hose between the thermostat housing and cylinder head.

Remove the three bolts, nuts, and spring washers securing the thermostat housing to the front engine plate. Push the housing into a position which will enable the clip on the by-pass hose to be slackened.

The thermostat housing can now be removed.

Replacement

Replacement is a reversal of the above instructions.

Section A.9

EXHAUST MANIFOLDS

Removal

Drain the cooling system. Remove the header tank as detailed in Section A.7 and the thermostat housing as described in Section A.8. Remove the heater water intake pipe if fitted. Remove the six nuts and washers connecting the exhaust pipes to the manifolds. Release the exhaust pipe bracket from the gearbox mounting plate. Remove the nuts and washers securing the exhaust manifold to the cylinder head and withdraw the manifolds.

Replacement

Replacement is a reversal of the above instructions. A new gasket should be used.

Section A.10

CAMSHAFT DRIVING SPROCKETS

Disconnecting

When the camshafts or cylinder head are removed it is necessary to first disconnect the camshaft driving sprockets from the driving flanges on the camshafts. Proceed as follows.

Remove the three set screws, spring washers, and plain washers securing the front end of each camshaft cover and the three domed nuts and copper washers along the top of the covers. Lift off the camshaft covers. Mark the camshaft sprockets and the driving flanges so that the sprockets may be replaced in their original positions on assembly.

Slacken the timing chain tensioner adjusting screw right off.

Remove the locking wire from the two set screws securing each camshaft driving sprocket to the camshaft flange and slacken the screws. Slacken the two nuts securing the camshaft sprocket support plate to the timing chain cover. Pull the camshaft sprocket and support spindle away from the camshaft flange and engage the thread on the spindle with the support plate (see Fig. A.2). Remove the driving sprocket set screws completely.

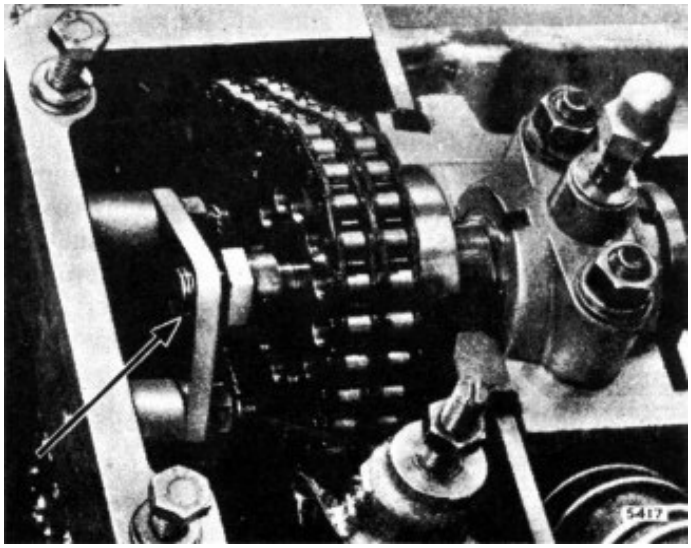


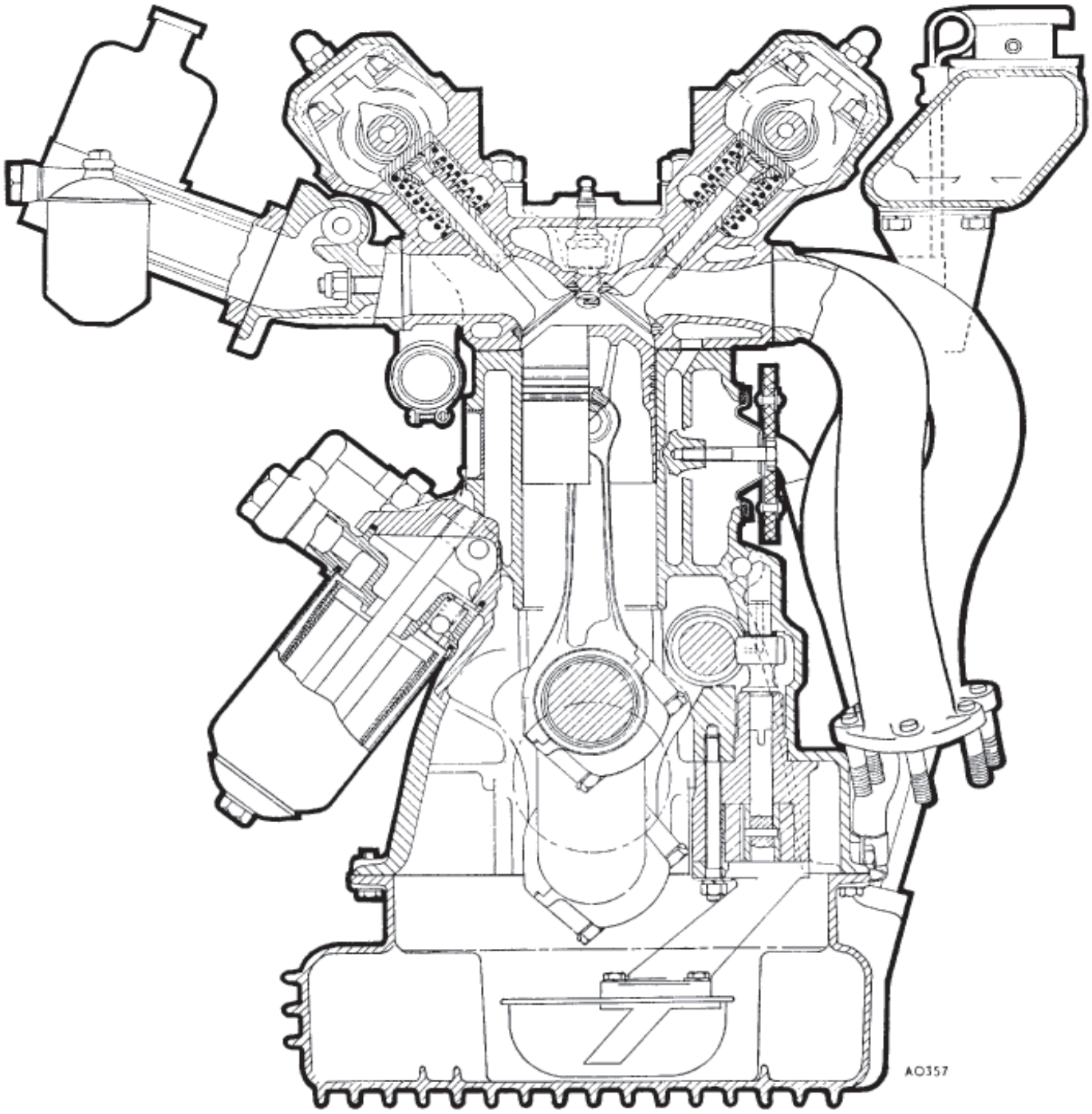
Fig. A.2

The sprocket support spindle thread engaged in the support plate

Reconnecting

When reassembling the driving sprockets to the camshaft, line up the marks (made on removal) on the flanges before fitting the sprocket securing screws. Rewire the screws after final tightening.

THE M.G. Series MGA (Twin Cam) ENGINE
(Transverse Section)



Section A.11

CAMSHAFTS

Remove the camshaft covers and disconnect the camshaft driving sprockets (see Section A.10). Slacken the camshaft bearing cap nuts a turn at a time to allow the camshaft to rise evenly on the studs. Commence at the **rear** bearing and work towards the front. If this is not done the camshaft thrust flange may cause damage to its housing or the camshaft may suffer distortion or breakage.

Before replacing the camshaft set the crankshaft to 90° B.T.D.C. on No. 1 cylinder to obviate an open valve fouling a piston crown. Position the camshaft with the timing slots in the cap and shaft approximately in line. Tighten the bearing cap nuts a turn at a time, commencing with the **front** bearing, to fit the camshaft evenly and to prevent the thrust flange fouling the thrust slot. Finally tighten the nuts to the torque loading figures given in **'GENERAL DATA'.**

The camshaft bearing caps are marked, and care must be taken to replace them in their correct positions. After assembly check and adjust the valve timing (Section A.19).

Section A.12

CAMSHAFT BEARINGS

Each camshaft runs in three non-adjustable white-metal shell bearings.

To renew the bearings disconnect the camshaft driving sprockets and remove the camshafts (see Section A.11), when the bearings may be extracted.

Care should be exercised to see that the bearing journals, etc., are throughly cleaned before installing new bearings. No scraping is required, as the bearings are machined during manufacture to give the correct diametrical clearance.

Section A.13

CYLINDER HEAD

Removal

Drain the cooling system and remove the header tank, thermostat housing, and exhaust manifolds as detailed in Section A.9. Remove the air cleaners and carburetters as described in Section A.5. Unscrew the cylinder head oil feed pipe at the right-hand rear of the head.

Remove the two bolts, spring washers, and plain washers securing the cylinder head water intake pipe at the rear of the head.

Detach the high-tension cables and remove the sparking plugs, taking care not to damage the porcelain insulators.

Remove the camshaft covers and disconnect the camshafts from their driving sprockets (see Section A.10).

Remove the 10 cylinder head retaining nuts and the cylinder head. When lifting the head a direct pull should be given to withdraw it evenly up the studs.

Replacement

When refitting the cylinder head it is advisable to use a new gasket. The seals fitted between the front camshaft bearings and the engine front plate should be examined, and renewed if necessary.

Tighten the cylinder head nuts in the correct sequence (see Fig. A.3), using a torque wrench. The torque wrench settings are given in the **'GENERAL DATA'** section.

Reassembly continues in the reverse order to the dismantling procedure. After final tightening of the cylinder head nuts check the valve clearances, and adjust if necessary (see Section A.18).

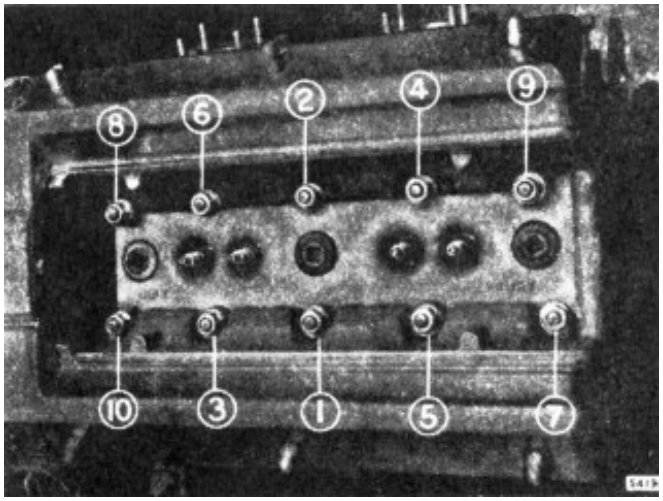


Fig. A.3

The correct order of tightening and slackening the cylinder head nuts

Section A.14

DECARBONIZING

Remove the cylinder head as described in Section A.13.

Withdraw the valves as described in Section A.15.

Remove the cylinder head gasket and plug the waterways with a clean rag.

If special equipment is not available for decarbonizing it will be necessary to scrape the carbon deposit from the piston crowns and cylinder head, using a blunt scraper.

A ring of carbon should be left round the periphery of the piston crown and the rim of carbon round the top of the cylinder bore should not be touched. To

facilitate this an old piston ring can be sprung into the bore so that it rests on top of the piston.

The cylinder head is next given attention. The sparking plugs must be removed, cleaned, and adjusted. Clean off the carbon deposit from the valve stems, valve ports, and combustion spaces of the cylinder head. Remove all traces of carbon dust with compressed air or by the vigorous use of a tyre pump and then thoroughly clean with paraffin (kerosene) and dry off.

Fit a new cylinder head gasket.

Section A.15

VALVES

Removal

Remove the cylinder head (Section A.13) and remove the camshafts (Section A.11).

Withdraw the tappets with a valve grinding suction tool and remove the tappet adjusting shims (see Fig. A.5). Keep the tappets, adjusting shims, and valves in their relative positions to ensure replacement in their original locations.

Compress the valve springs with a suitable compressor and remove the two valve retainers. Release the valve springs and remove the compressor, the valve spring cup, the inner and outer valve springs, and the valve spring thrust washer.

Withdraw the valve from the guide.

Refitting

To replace the valves place each valve in its guide and replace the thrust washer, the valve springs, and the valve spring cup.

Compress the valve springs with the compressor and refit the valve spring retainers. Remove the compressor and refit the tappet adjustment shim and the tappet. The valve clearances should be checked and adjusted after final assembly (see Section A.18).

Section A.16

VALVE GUIDES

Removal

Disconnect the camshaft driving sprockets and remove the cylinder head as detailed in Section A.13. Remove the appropriate camshaft, valve, and springs as in Section A.15.

The valve guides are shouldered and can therefore only be removed by driving through from the combustion chambers.

Rest the camshaft cover joint face of the cylinder head on a smooth wooden block of sufficient thickness

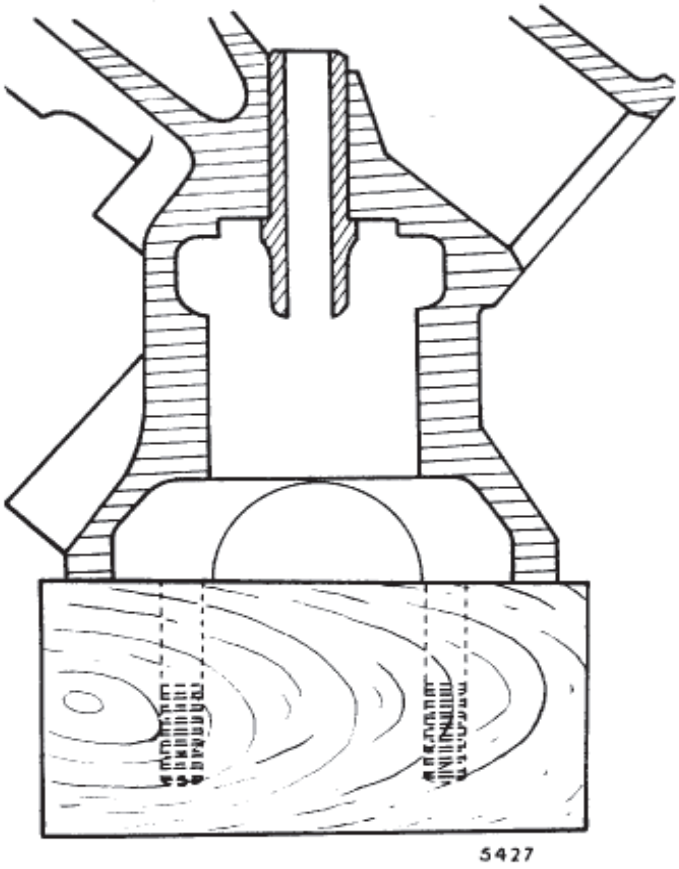


Fig. A.4

The camshaft housing (sectioned) positioned on a wooden block for valve guide removal

to keep the camshaft bearing cap studs clear of the press table (see Fig. A.4) and drive the valve guide through from the combustion chamber with a suitably sized drift. This should take the form of a hardened-steel punch $\frac{9}{16}$ in. (14 mm.) in diameter and not less than 4 in. (10 cm.) in length, with a locating spigot $\frac{5}{16}$ in. (8 mm.) diameter machined on one end for a length of 1 in. (2·5 cm.) to engage the bore of the guide.

Replacement

When fitting new valve guides they should be pressed in from the top of the cylinder head until the flange registers on the bottom of the valve spring recess.

Section A.17

VALVES AND SEATINGS

Grinding and testing

Remove the valves as in Section A.15.

Each valve must be cleaned thoroughly and carefully examined for pitting. Valves in a pitted condition should

be refaced with a suitable grinder or new valves should be fitted.

If valve seats show signs of pitting or unevenness they should be trued by the use of a suitable grinder or special cutter. When using a cutter care must be exercised to remove only as little metal as is necessary to ensure a true surface.

When grinding a valve onto its seating the valve face should be smeared lightly with fine- or medium-grade carborundum paste and then lapped in with a suction grinder (special tool 18G29). Avoid the use of excessive quantities of grinding paste and see that it remains in the region of the valve seating only.

A light coil spring placed under the valve head will assist considerably in the process of grinding. The valve should be ground to its seat with a semi-rotary motion and occasionally allowed to rise by the pressure of the light coil spring. This assists in spreading the paste evenly over the valve face and seat. It is necessary to carry out the grinding operation until a dull, even, matt surface, free from blemish, is produced on the valve seat and valve face.

On completion the valve seat and ports should be cleaned thoroughly with a rag soaked in paraffin (kerosene), dried, and then thoroughly cleaned by compressed air. The valves should be washed in paraffin (kerosene) and all traces of grinding paste removed.

After replacing the valves test them by pouring a small quantity of paraffin (kerosene) through the ports. If there is any leakage of paraffin (kerosene) past the valve seatings the valve should be removed and examined and, if necessary, reground.

Section A.18

TAPPET CLEARANCES

If the engine is to give its best performance and the valves are to retain their maximum life it is essential to maintain the correct tappet clearances. Accordingly it is recommended that the clearance be checked at regular intervals and any necessary adjustments made.

The clearance figure for both inlet and exhaust valves is shown in the **'GENERAL DATA'** section. The engine is designed to operate with this clearance and no departure from it is permissible.

The valve clearances are adjusted by means of hardened-steel shims interposed between the under side of each tappet and the top of the valve stem.

Turn the engine and check the clearance of each tappet with a feeler gauge. Care must be taken to ensure that the clearance is measured on the back of the cam, i.e. opposite the peak. Take note of the clearance figures.

To adjust the tappet clearances disconnect the camshaft driving sprockets (Section A.10) and remove the camshafts. Withdraw one of the tappets which requires adjustment, using a valve grinding suction tool (see Fig. A.5), and remove the shim. Insert a new shim of suitable thickness to correct the valve clearance and replace the tappet. Correct the other valve clearances in a similar manner and replace the camshafts.

Re-check the valve clearances after finally tightening the camshaft bearing nuts, and carry out any further adjustments if necessary.

Variations in the tappet clearances have a marked influence upon the valve timing and it is therefore advisable to check the timing (see Section A.19) after adjusting the tappets.

The shims are available in 16 sizes and the thickness of a shim is indicated by a stamped number.

The numbers, with corresponding sizes, are detailed in the table below:

Number on shim	*Size*
1	·086 in. (2·182 mm.)
2	·088 in. (2·233 mm.)
3	·090 in. (2·284 mm.)
4	·092 in. (2·335 mm.)
5	·094 in. (2·386 mm.)
6	·096 in. (2·437 mm.)
7	·098 in. (2·488 mm.)
8	·100 in. (2·540 mm.)
9	·102 in. (2·591 mm.)
10	·104 in. (2·642 mm.)
11	·106 in. (2·693 mm.)
12	·108 in. (2·744 mm.)
13	·110 in. (2·795 mm.)
14	·112 in. (2·846 mm.)
15	·114 in. (2·897 mm.)
16	·116 in. (2·948 mm.)

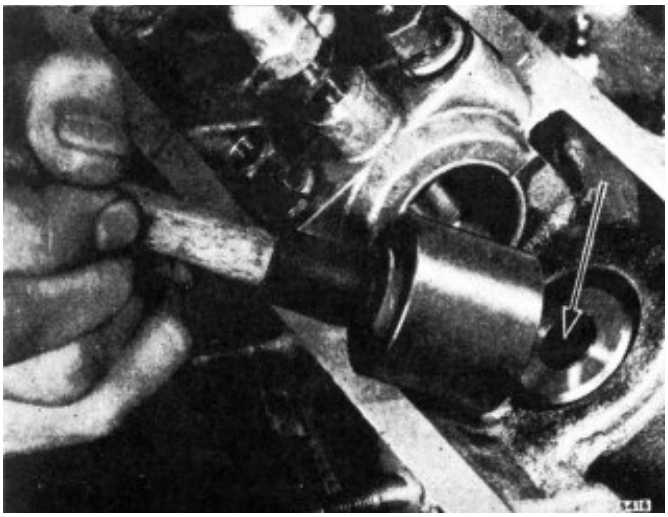


Fig. A.5

Withdrawing a tappet with a valve grinding suction tool. The adjusting shim is indicated by the arrow

Section A.19

VALVE TIMING—CHECKING AND ADJUSTING

Excessive stretch in the timing chain or variations in the tappet clearances will have a considerable effect on the valve timing and cause the performance of the car to suffer. The valve timing should therefore be checked at regular intervals and adjusted if necessary.

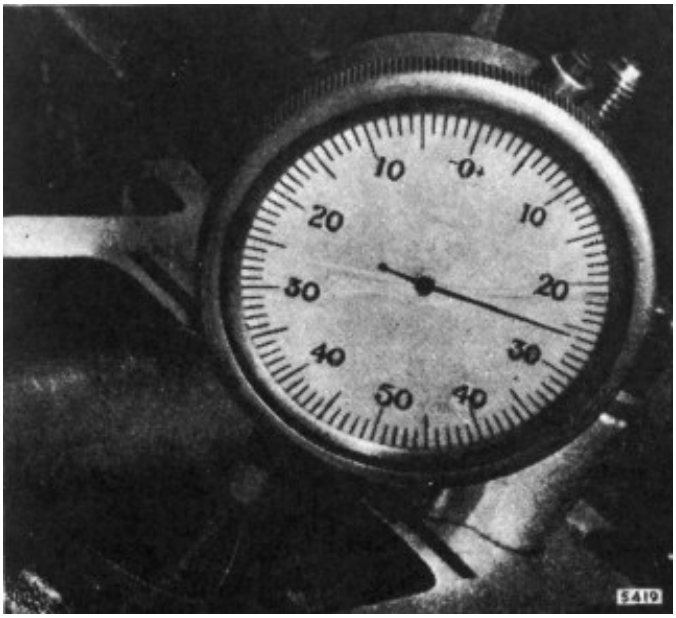


Fig. A.6

The use of a dial indicator to check the valve timing. The indicator needle has moved in an anti-clockwise direction, showing a total tappet displacement of ·074 in. (1·882 mm.) in this example

Proceed as follows.

Remove the camshaft covers and check the tappet clearances as detailed in Section A.18; adjust them if necessary.

Mount a dial indicator to a suitable fixed point on the cylinder head with the indicator foot resting on No. 1 inlet valve tappet. Make certain that the cam is clear of the tappet and set the dial indicator to '0'. Turn the engine until No. 1 piston is at T.D.C. with the valves rocking (i.e. No. 4 piston at T.D.C. on compression stroke) and line up the notch in the crankshaft pulley with the projection in the timing cover (see Fig. A.7).

If the timing of the inlet camshaft is correct the dial indicator will show that the tappet has moved between ·072 and ·083 in. (1·831 and 2·108 mm.) (see Fig. A.6).

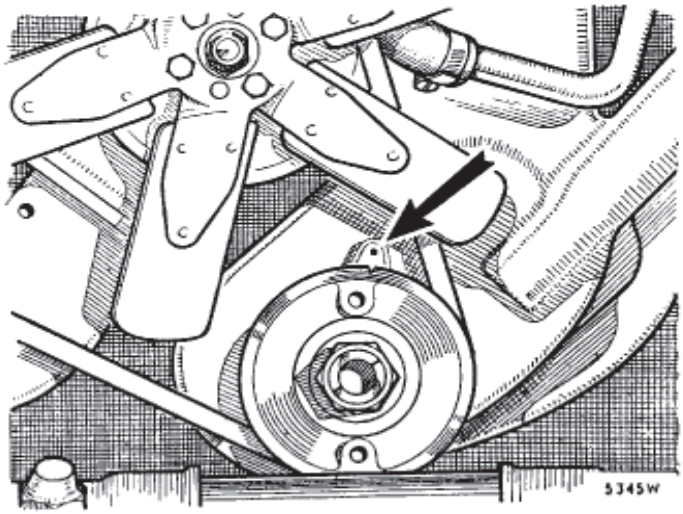


Fig. A.7

When the groove in the crankshaft pulley coincides with the small projection on the timing case Nos. 1 and 4 pistons are at T.D.C

Transfer the dial indicator to No. 1 exhaust tappet without moving the engine from T.D.C. and set the dial indicator to '0'. Turn the engine until the tappet has risen fully (until the cam is clear of the tappet) and check the displacement. This should be within the tolerance shown above for the inlet tappet.

If the timing is incorrect it can be reset in the following manner.

Remove the timing chain cover as detailed in Section A.21. Knock back the tab washer on the chain adjuster securing bolts and remove the chain adjuster. Swing the adjuster sprocket fork clear of the timing chain.

Turn the camshafts until the slots in the inner flanges line up with the slots in the front camshaft bearing housings. If the timing chain has been removed make certain that the pistons are half-way down the bores, otherwise there is danger of the valves fouling the piston

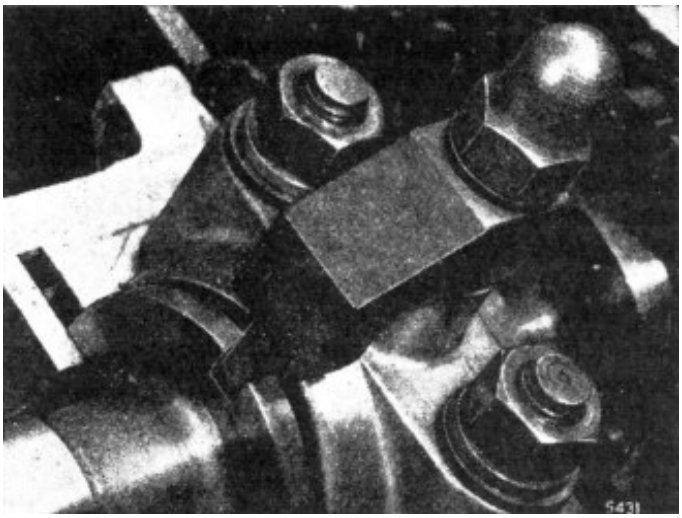


Fig. A.8
The camshaft locking tool (18G551) in use. See Section A.35 for dimensions

crowns as the camshafts are turned. Lock both camshafts, using the tool described in Section A.35 (service tool 18G551).

Check that the 'T' markings on the crankshaft and half-speed shaft gears are in their correct relationship (see Fig. A.9) and that No. 1 piston is at T.D.C.

Remove the camshaft sprocket securing screws and slacken the sprocket support spindles.

Turn the inlet camshaft sprocket in a clockwise direction to pull the timing chain tight between the half-speed shaft sprocket and the inlet camshaft sprocket. If two opposite holes in the sprocket do not line up exactly with the tapped holes in the camshaft flange it will be necessary to use the vernier arrangement provided by the holes in the camshaft sprocket.

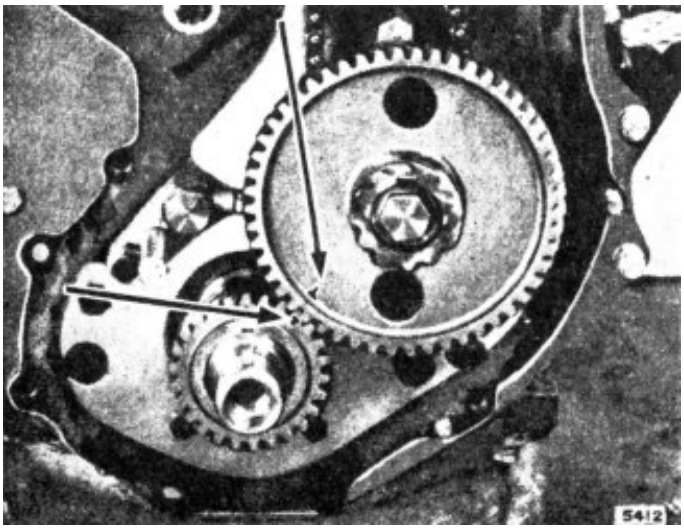


Fig. A.9
When replacing the timing gears the 'T' markings must be in line as shown

Lift the chain away from the sprocket and turn the sprocket to select a pair of holes which will line up exactly with the tapped holes in the camshaft flange **when the chain is tight.**

When the correct holes have been selected fit the sprocket securing screws and tighten the support spindle.

Adjust the timing of the exhaust camshaft in a similar manner to that adopted for the inlet camshaft, ensuring that the **chain tension between the exhaust, inlet, and half-speed shaft sprockets is retained.**

Fit the exhaust sprocket screws and tighten the support spindle.

Swing the sprocket adjuster fork to its correct position and replace the chain tensioner.

Adjust the chain tension as detailed in Section A.20.

Finally, check the valve timing, using the dial indicator as described at the beginning of this section. If the readings are slightly outside the tolerance given it will usually be found that advancing or retarding one hole will correct it. Rewire the sprocket securing screws and fit the timing chain cover and camshaft covers.

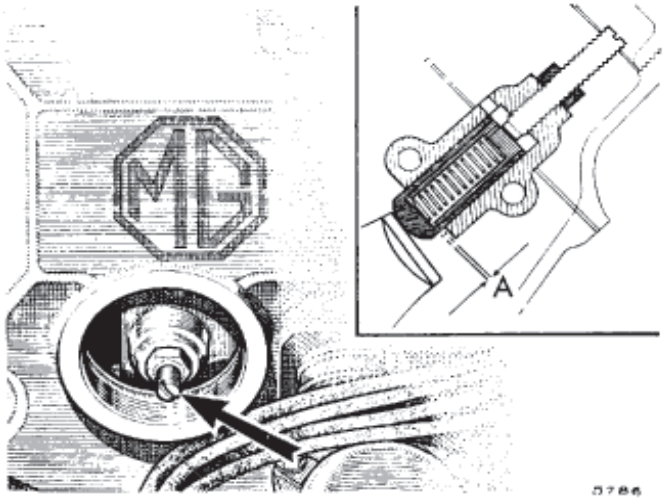


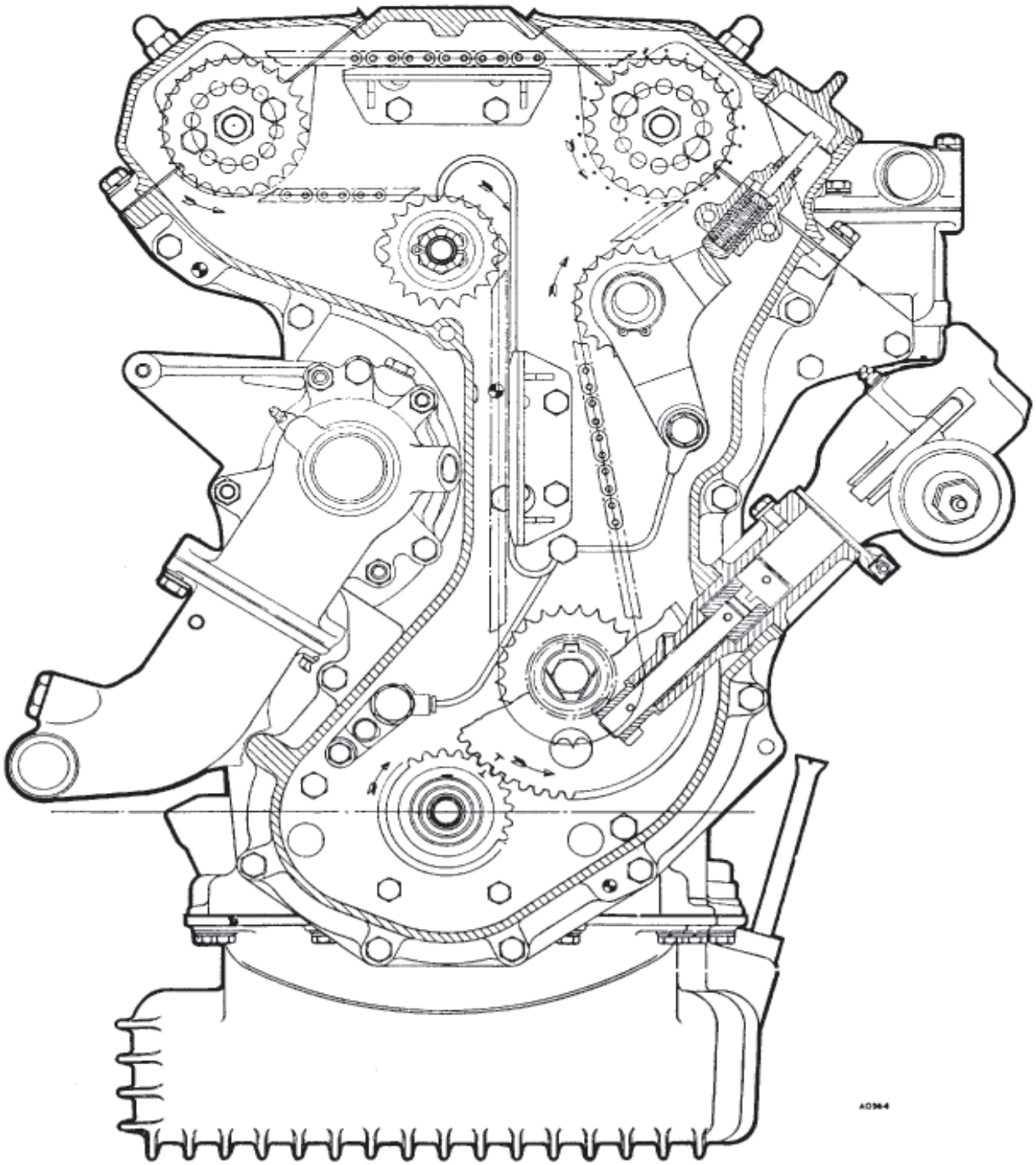
Fig. A.10
The timing chain adjuster screw is located beneath the engine oil filler cap. A clearance of $\frac{1}{32}$ in. (·80 mm.) should be maintained at (A) (see Section A.20) to prevent the inner sleeve bottoming and the spring becoming inoperative

Section A.20

TIMING CHAIN—ADJUSTING

The amount of free play in the timing chain is controlled by means of a manually operated chain tensioner.

THE TIMING CHAIN, TENSIONER, AND DISTRIBUTOR DRIVE GEAR



Remove the oil filler cap at the front of the exhaust camshaft cover to gain access to the adjuster screw and locknut. Release the locknut and carefully turn the adjuster screw in a clockwise direction until a change in resistance is felt. Turn the screw back (anti-clockwise) three-quarters of a turn to obtain the required clearance of $\frac{1}{32}$ in. (·80 mm.) (see Fig. A.10).

If the threads in the housing are worn or damaged, a new chain adjuster (Part No. AEH27) must be fitted.

Section A.21

TIMING CHAIN COVER

Removal

Drain the cooling system and remove the radiator as detailed in Section C.4.

Slacken the clamp bolt on the steering column top universal joint and remove the four nuts and bolts securing the steering rack to the frame. The steering rack may now be pulled forward clear of the crankshaft pulley.

Remove the water pump and by-pass pipe (see Section A.4) and the distributor and distributor drive gear and housing. Remove the camshaft covers.

Bend back the tab washer on the starting dog nut and remove the nut with a suitable tool (such as service tool 18G98). Withdraw the crankshaft pulley.

Remove the set screws, bolts, nuts, and washers securing the timing chain cover to the front mounting plate. The timing chain cover may now be withdrawn.

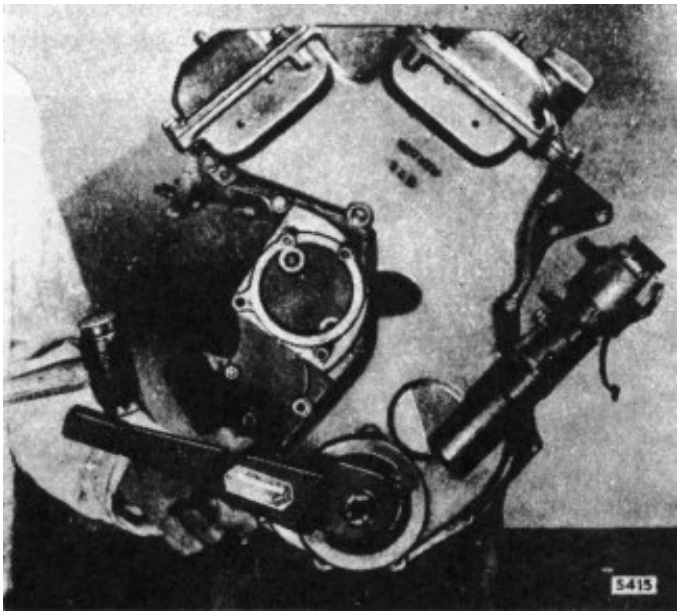


Fig. A.11

Removal of the starting dog nut, using service tool 18G98

If the gasket or the crankshaft oil seal shows signs of damage it should be renewed.

Replacement

Replacement of the timing chain cover is a reversal of the above instructions. Refer to Section A.31 for instructions covering the replacement of the distributor drive gear.

Section A.22

TIMING CHAIN

Removal

Disconnect the battery.

Drain the cooling system and remove the radiator as detailed in Section C.4.

Remove the water pump and by-pass pipe (Section A.4), the distributor drive gear and housing, and the camshaft covers. Remove the timing chain cover as detailed in Section A.21.

Knock back the tab washer on the chain adjuster securing bolts and remove the chain adjuster. Swing the adjuster sprocket fork clear of the timing chain. Remove the locking wire from the camshaft driving sprocket securing screws and remove the sprockets.

Remove the bolt, locking washer, and distance pieces securing the half-speed shaft gear and the distributor drive gear and withdraw the gears. Both gears are located on Woodruff keys. The timing chain may now be removed.

Replacement

When replacing the half-speed shaft driving gear the 'T' markings must be lined up as shown in Fig. A.9. After replacing the timing chain the valve timing should be checked, and adjusted if necessary as detailed in Section A.19.

Refit the distributor drive gear by the method described in Section A.31.

Reset the timing chain tension adjustment after final assembly (see Section A.20). If a new chain has been fitted the tension should be checked again after initial running to take up the stretch.

Section A.23

ENGINE FRONT PLATE

Removal

Remove the power unit (see Section A.24).

Remove the water pump and by-pass pipe (Section A.4), the distributor drive gear and housing, and the camshaft covers.

Remove the timing chain cover (Section A.21) and the timing chain (Section A.22).

Remove the timing chain driving sprocket from the half-speed shaft, take out the three set screws and shake-proof washers, and remove the half-speed shaft locating washer and shims.

Remove the securing bolt and the oil pipe banjo bolt from the oil feed pillar.

Remove the engine mounting brackets.

Remove the set screws and spring washers securing the engine front plate to the cylinder block and remove the plate.

Replacement

Replacement is a reversal of these instructions.

Section A.24

POWER UNIT

Removal

Remove both seats and frames. Remove all the floor covering from the toeboards, floorboards, and gearbox cover and remove the toeboards, floorboards, and propeller shaft cover.

Release the hand brake cable adjuster nut and remove the hand brake cable from the relay lever. Mark the propeller shaft and gearbox flanges and disconnect the propeller shaft from the gearbox. Remove the gear lever knob, rubber draught excluder, and gearbox remote control cover. Remove the screws securing the gearbox cover to the frame and the four nuts, bolts, and spring washers securing the left-hand sides of the cross-brace plates to the gearbox cover. The gearbox cover is removed by springing out its rear end to allow the cross-brace plates to be pulled past the propeller shaft.

Disconnect the speedometer drive cable from the gearbox.

Remove the two set screws securing the clutch slave cylinder to the gearbox casing and remove the cylinder. The clutch cylinder push-rod can be left attached to the clutch operating fork.

Drain the oil from the engine and gearbox and remove the gearbox remote control assembly from the gearbox extension. Detach the bonnet from the bonnet hinges. Drain the radiator and cylinder block. Remove the radiator as described in Section C.4. Remove the air cleaners and carburetters as detailed in Section A.5. Remove the heater air intake pipe, header tank, and thermostat housing cover.

Unscrew the union nut on the heater water intake pipe and remove the pipe from the thermostat housing. Remove the thermal transmitter bulb from the thermostat housing.

Disconnect the tachometer drive cable from the rear of the cylinder block. Release the exhaust pipes from the exhaust manifolds and from the steady bracket on the engine rear mounting plate.

Slacken the exhaust pipe clamp bolt at the joint between the front and rear pipes and remove the front pipe from the vehicle.

Disconnect the flexible oil gauge pipe from the union at the rear of the cylinder block on the right-hand side. Disconnect the cables from the dynamo, ignition coil, distributor, and starter motor.

Remove the bolts from the clamps at the base and top of the steering-column and the nut, bolt, and spring washer from the rear end of the steering-column universal joint. Withdraw the steering-column.

Remove the dipper switch mounting bracket. Release the petrol pipe clip from the steering-column dust seal retainer plate. Withdraw the throttle cable.

Remove the nine set screws and washers from the toeboard support plate and remove the plate.

Remove the four bolts, nuts, and spring washers securing the mounting plates on each side of the engine.

Place a rope sling around the power unit and attach the lifting tackle. Arrange the sling so that the unit may be lifted slightly and moved forward and finally lifted from the frame at a sharp angle with the front considerably higher than the rear.

Take the weight of the unit and remove the nut, bolt, and spring washer to release the gearbox from the mounting bracket on the frame cross-member.

The power unit is now free to be manœuvred from the chassis.

Replacement

Replacement is a reversal of these instructions. Refill the engine and gearbox with oil to Ref. A (Section P).

Section A.25

SUMP AND OIL PUMP STRAINER

Removal

Drain the oil from the engine sump.

Remove the bolts and withdraw the sump from the crankcase.

To remove the oil strainer remove the three bolts securing it to the pump cover.

Clean out the sump and strainer with paraffin (kerosene) and a stiff brush; never use rag.

Replacement

When refitting the sump to the engine give particular attention to the gasket. If the gasket is in good condition and has not been damaged during removal of the sump it may be used again, but it is always advisable to fit a new one. Before fitting a new gasket remove all traces of

the old one from the sump and crankcase faces. Smear the face of the crankcase joint with grease and fit the gasket. Lift the sump into position on the crankcase, insert the securing bolts, and tighten them evenly.

Section A.26

MAIN AND BIG-END BEARINGS

Unless the bearing journals are badly worn the big-end bearings may be renewed without removing the crankshaft. To renew the main bearings it is necessary to withdraw the crankshaft as detailed in Section A.33. Liners are used both for the main and the big-end bearings, which are of the shimless type and therefore non-adjustable.

Big-end bearings

Drain the engine oil and remove the sump as in Section A.25.

As the bearings are of the shimless type it is essential that no attempt should be made to adjust bearings which are worn. Always fit new bearings in place of worn parts. If the crankshaft journals are found to be in a worn condition it is advisable to fit a new crankshaft, complete with main and big-end bearings, as supplied by the Factory.

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

To detach the big-end bearings bend down the locking strips so that the bolts may be removed. Remove the connecting rod caps and extract the bearings. Care should be exercised to see that the bearing journals, etc., are thoroughly cleaned before installing new bearings. No scraping is required, as the bearings are machined to give the correct diametrical clearance (see **'GENERAL DATA'**).

Main bearings

Remove the engine from the car and remove the clutch and flywheel (Section A.32) and the gearbox mounting plate. Remove the sump, oil strainer, timing chain cover, timing chain, and engine front plate (Section A.23).

Remove the self-locking nuts securing the main bearing caps to the cylinder block.

Note that a thrust washer is fitted one each side of the centre main bearing to take the crankshaft end-thrust. These thrust washers each consist of two semicircular halves, one half having a lug which is located in a recess in the detachable half of the bearing and the other being plain.

When fitting new bearings no scraping is required as the bearings are machined to give the correct diametrical clearance (see **'GENERAL DATA'**).

In the case of a 'run' bearing it is always essential to clean out thoroughly all the oilways in the crankshaft and block, wash out the engine sump with paraffin (kerosene), and clean the oil pump and sump strainer to ensure that no particles of metal are left anywhere in the lubricating system. Replace each main bearing and cap, replacing the thrust washers in their correct positions at the centre main bearing with the oil grooves away from the bearing. Refit the locking strip or locking plates to each bearing cap and bend them to lock the bolts after tightening.

[See Addendum for additional information.]

Section A.27

PISTONS AND CONNECTING RODS

Removal

Remove the cylinder head as in Section A.13. Drain and remove the sump and oil strainer as in Section A.25.

The pistons and connecting rods must be withdrawn from the top of the cylinder block.

Unlock and remove the big-end bolts and remove the bearing caps. Release the connecting rod from the crankshaft.

Withdraw the piston and connecting rod from the top of the cylinder block and refit the bearing cap. The big-end bearing caps are offset, and the caps on the big-ends in Nos. 1 and 3 cylinders are interchangeable when new, as are those for Nos. 2 and 4 cylinders. When used parts are replaced after dismantling it is essential that they should be fitted in their original positions. In order to

Fig. A.12

A connecting rod bearing. Note the bearing locating tab

ensure this, mark the caps and connecting rods on their sides which are fitted together with the number of the cylinder from which each was taken.

Dismantling

Remove the two circlips securing each gudgeon pin in its piston and press the gudgeon pin out. Mark the gudgeon pins and pistons for reassembly to their original positions and to their original connecting rods.

Check the gudgeon pin and the connecting rod little-end bearings for wear with the dimension given in the **'GENERAL DATA'** section. If the bush is worn it should be removed and a new bush fitted. A light press is most suitable for this operation.

Reassembly

When pressing in the new bush ensure that the oil hole in the bush is in line with the oil hole in the connecting rod.

Replacement bushes must be finish-reamed to size after pressing into the connecting rod (see the **'GENERAL DATA'** section for the correct dimensions). The piston gudgeon pin bosses must not be reamed as oversize gudgeon pins are not supplied.

Assemble the pistons to the connecting rods by inserting the gudgeon pins, which should be a hard hand-push fit at a room temperature of 68° F. (20° C.). Secure each gudgeon pin in position with the two circlips, ensuring that they fit well into their grooves.

Replacement

Replacement of the piston and connecting rod is a direct reversal of the above, but the piston ring gaps should be set at 180° to each other.

If the piston rings have been removed from the piston they must be replaced as detailed in Section A.28.

It is essential that the connecting rod and piston assemblies should be replaced in their own bores and fitted the same way round, i.e. with the big-end cap facing the half-speed shaft side of the engine.

Refit the big-end bearings in their original positions.

Section A.28

PISTON RINGS

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

Raise one end of the ring out of its groove. Insert the steel strip between the ring and the piston. Rotate the strip around the piston, applying slight upward pressure to the raised portion of the ring until it rests on the land above the ring grooves. It can then be eased off the piston.

Do not remove or replace the rings over the piston skirt, but always over the top of the piston.

Before fitting new rings clean the grooves in the piston to remove any carbon deposit. Care must be taken not to remove any metal or side-play between the ring and the groove will result, with consequent excessive oil consumption and loss of gas-tightness.

When refitting the rings note that the second and third compression rings are tapered and marked with the letter 'T' (top) for correct reassembly.

New rings must be tested in the cylinder bore to ensure that the ends do not butt together. The best way to do this is to insert the piston approximately 1 in. (2·54 cm.) into the cylinder bore and push the ring down onto the top of the piston and hold it there in order to keep the ring square with the bore. The correct ring gap is ·008 to ·013 in. (·20 to ·33 mm.).

[See Addendum for additional information.]

Section A.29

HALF-SPEED SHAFT

Removal

Disconnect the battery.

Drain the cooling system and remove the radiator as detailed in Section C.4.

Remove the water pump and by-pass pipe (Section A.4), the distributor drive gear and housing, and the camshaft covers. Remove the timing chain cover (Section A.21) and the timing chain (Section A.22).

Draw off the timing chain driving sprocket with a suitable drawer. Remove the sump, oil pump, and oil pump drive shaft (see Section A.31).

Take out the three set screws and shakeproof washers which secure the half-speed shaft locating plate and withdraw the half-speed shaft. Note that shims are fitted behind the locating plate to control the half-speed shaft end-float.

If the half-speed shaft bearing clearances are excessive new bearings should be fitted. Ensure that the oil holes in the bearings line up with the oil passages in the cylinder block. The bearings must be reamed to give the correct diametrical clearance (see **'GENERAL DATA'**).

Replacement

Replacement of the half-speed shaft is a reversal of the above procedure. Adjust the half-speed shaft end-float if necessary by increasing or decreasing the thickness of the shims fitted behind the half-speed shaft locating plate. See **'GENERAL DATA'** for the correct end-float measurement.

Section A.30

DISTRIBUTOR DRIVE GEAR

Fitting

Turn the engine until No. 4 piston is at T.D.C. on its compression stroke. When the valves on No. 1 cylinder are 'rocking' (i.e. exhaust just closing and inlet just opening) No. 4 piston is at the top of its compression stroke. If the engine is set so that the notch in the crankshaft pulley is in line with the projection in the timing chain cover the piston is exactly at T.D.C., giving the correct ignition setting (see Fig. A.7).

Turn the drive gear to the position shown in Fig. A.13. The driving slot will be horizontal with the large offset uppermost.

As the gear engages the half-speed shaft the slot will turn in an anti-clockwise direction until it is in the two o'clock position.

Secure the drive gear housing with the two nuts, spring washers, and flat washers. Refit the distributor, referring to Section B.7 for retiming instructions if the distributor clamp plate has been released.

Section A.31

OIL PUMP

Remove the sump and oil pump strainer (see Section A.25).

Two bolts secure the oil pump cover and three studs secure the pump to the crankcase.

Unscrew the stud nuts and remove the pump and drive shaft.

When refitting the pump use a new joint washer.

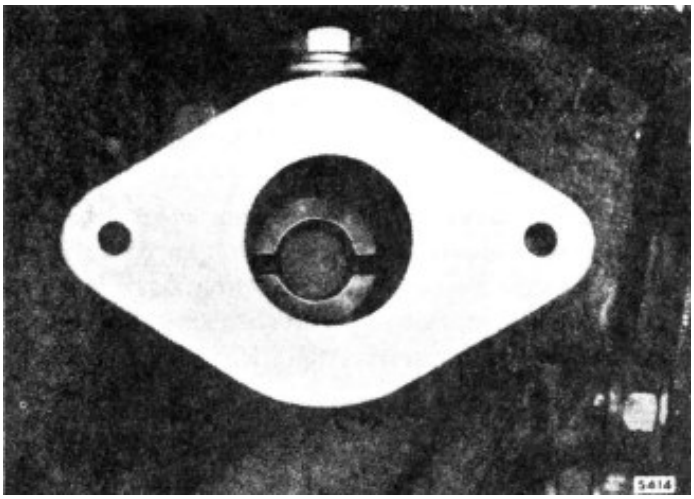


Fig. A.13

Replacing the distributor drive gear. The slot is horizontal with the large offset uppermost

Dismantling and reassembling

The oil pump cover is attached to the body of the pump by two bolts and spring washers, and when these are removed the oil pump cover, the outer rotor, and the combined oil pump shaft and inner rotor may be extracted.

NOTE.—If a new or reconditioned oil pump is being fitted it is necessary to remove the half-speed shaft (see Section A.29) to enable a check of the pump gear end-float and 'free spin' to be made. After removing the half-speed shaft mount the pump with drive gear and thrust washer in position and tighten down to the correct torque figure (275 lb. in.). Check that the shaft rotates freely and that the end-float is not excessive. The oil pump must be assembled in the dry condition but lubrication should be used on the oil pump driving gear spindle in the cylinder block. Refit the half-speed shaft, etc., as detailed in Section A.29.

Section A.32

FLYWHEEL

Remove the power unit (see Section A.24).

Remove the gearbox from the gearbox mounting plate.

Mark the clutch and flywheel to allow the two components to be reassembled in their original positions. Remove the six set screws securing the clutch to the flywheel and remove the clutch.

Mark the flywheel and crankshaft flange. Unlock and remove the six nuts and three lock plates which secure the flywheel to the crankshaft mounting flange and remove the flywheel.

Replacement of the flywheel is a reversal of the above instructions. Take care to fit the flywheel and clutch in their original locations by lining up the marks made when dismantling, otherwise engine vibration will result.

To release the special flywheel bolts the engine sump and rear main bearing cap must be removed.

Section A.33

CRANKSHAFT

Removal

Remove the engine from the car and remove the clutch and flywheel (Section A.32) and the gearbox mounting plate.

Remove the sump, oil strainer, timing chain cover, timing chain, and engine front plate (Section A.23).

Remove the big-end bearing cap and then take off the main bearing caps (see Section A.26).

Mark the big-end bearing cap and bearing to ensure that it is reassembled to the correct journal, taking care, in the case of the bearings, that they are not damaged or distorted when marking. Punches should not be used for this purpose.

Lift the crankshaft out of the bearings.

Replacement

Replacement of the crankshaft is a reversal of the above operations. If the oil seal fitted in the rear main bearing cap shows any signs of damage it should be renewed.

Before replacing the crankshaft thoroughly clean out all oilways.

Section A.34

CAMSHAFT LOCKING TOOL

To set the valve timing accurately it is necessary to lock both camshafts in the correct timing position as described in Section A.19. A suitable tool is illustrated in Fig. A.14 and two will be required, one for each camshaft.

Section A.35

FLYWHEEL STARTER RINGS

To remove the old starter ring from the flywheel flange split the ring gear with a cold chisel, taking care not to damage the flywheel. Make certain that the bore of the new ring and its mating surface on the flywheel are free from burrs and perfectly clean.

To fit the new ring it must be heated to a temperature of 300 to 400° C. (572 to 752° F.) indicated by a light-blue surface colour. If this temperature is exceeded the temper of the teeth will be affected. The use of a thermostatically controlled furnace is recommended. Place the heated ring on the flywheel with the lead of the ring teeth uppermost. The expansion will allow the ring to be fitted without force by pressing or tapping it lightly until the ring is hard against its register.

This operation should be followed by natural cooling, when the 'shrink fit' will be permanently established and no further treatment required.

Section A.36

CONNECTING ROD ASSEMBLIES

Each connecting rod assembly has a standard weight of 1 lb. 15 oz. 6 dr. (889·47 gm.) but may vary above or below this weight approximately plus or minus 1 oz. (28·35 gm.).

Complete sets of connecting rod assemblies for replacement should all be of identical weight (as in case of production), but, where one of a set is changed, it is essential that the replacement connecting rod does not differ from the others by more than 3 dr. (5·32 gm.).

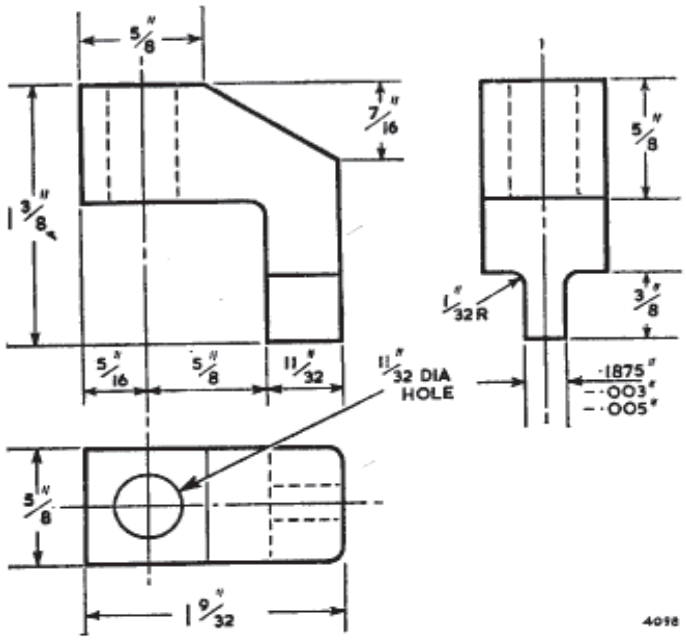


Fig. A.14
A camshaft locking tool

To facilitate identification, assemblies now being produced, **if not to standard weight,** will be stamped as follows:

+1, +2, etc., to indicate drams **above** standard.

1, 2, etc., to indicate drams **below** standard.

Only six weights of rod, right-hand and left-hand (12 in all), are serviced and the table shows how these sizes cater for all contingencies.

NOTE.—This table must be strictly adhered to if correct replacements are to be ensured.

To replace	*Use only*
Standard: +1, +2, +3, +4, +5	+2
+6, +7, +8, +9, +10	+7
+11, +12, +13, +14, +15, +16	+13
1, 2, 3, 4, 5	2
6, 7, 8, 9, 10	7
11, 12, 13, 14, 15, 16	13

Section A.37

MODIFIED ENGINE MOUNTING

Commencing at Chassis No. MGA528, a packing plate (Part No. AHH5896), together with longer set screws (Part No. HZS0506), is fitted under the engine mounting on the left-hand side only.

This packing plate is introduced to give an increased clearance between the starting dog (on the crankshaft pulley) and the steering-rack housing.

The modification can be fitted to chassis prior to the one given above.

Section A.38

MODIFIED HALF-SPEED SHAFT AND OIL PUMP DRIVING SPINDLE

In cases of excessive wear on the oil pump driving spindle and half-speed shaft skew gearing, a modified shaft (Part No. AEH619) and spindle (Part No. AEH620) may be fitted. The number of teeth on the oil pump driving spindle has been increased from 10 to 11 and on the half-speed shaft from 9 to 10.

This modification was incorporated from Engine No. 315 and also on Engine No. 313. The new components can be fitted on earlier engines provided that they are both fitted at the same time.

Section A.39

MODIFIED PISTONS AND RINGS

To improve oil consumption, twin-segment scraper rings (Part No. AEH615) were introduced at Engine No. 446 and twin-segment scraper rings fitted with expander rings (Part No. AEH672) at Engine No. 2057. These rings are interchangeable with the micro-land scraper rings previously fitted.

To overcome any tendency to piston noise, piston assemblies (Part No. AEH640) incorporating new top rings (Part No. AEH649) were fitted at Engine No. 606.

Piston assemblies, complete with twin-scraper rings, expander rings, and the new top rings, are available under Part No. AEH673 and may be interchanged in sets of four with those originally fitted.

Section A.40

MODIFIED CRANKCASE BREATHER PIPE

A new crankcase breather pipe was introduced at Engine No. 657. The purpose of this modification is to overcome any possibility of oil leakage from the engine breather onto the exhaust system, thus causing fumes to enter the car.

Fitting the modified breather pipe (Part No. AEH628) necessitates the use of a new clip (Part No. 1G1309) and a longer clutch bell housing bolt (Part No. HBZ0511) in substitution for the clip and bolt which previously secured the original breather pipe to the crankcase.

Fit the breather pipe to the vent pipe on the engine rear side cover, slide the clip over the end of the pipe, fasten the clip to the gearbox mounting plate with the longer bolt specified, and secure with the existing nut and spring washer.

Section A.41

MODIFIED TAPPETS

To increase the tappet contact area with the cylinder head and eliminate the possibility of tappet fracture the length of the tappets has been increased by ·25 in. (·635 mm.) to 1·5 in. (38·1 mm.).

This modification was introduced at Engine No. 1087. The new tappets (Part No. AEH651) may be fitted to earlier engines in complete sets of eight.

Commencing at Engine No. 1587, tappet bushes have been fitted to the cylinder head to reduce tappet wear to a minimum. Each bush is locked in the head with a screwed plug.

Section A.42

MODIFIED TIMING COVER GASKET

To obviate complete dismantling of the timing gear each time a new timing cover gasket is fitted, a gasket that is partially cut to provide four sections has been produced under Part No. AEH377.

The gasket may be fitted in the same way as the previous gasket, or alternatively any one or more of the four sections may be detached and used separately.

Section A.43

ALTERNATIVE PISTONS

A domed-top piston giving a compression ratio of 8·3 : 1 has been introduced for standard use; the piston is available under Part No. AEH690 and must be operated with a static ignition setting of 8° B.T.D.C.

Pistons to Part No. AEH681 giving a compression ratio of 9·9 : 1 are still available, but their use should be confined to competition work with 100-octane fuel only. The static ignition setting for 9·9 : 1 compression ratio pistons remains at T.D.C.

Section A.44

PISTON AND PISTON RING HISTORY

The piston and piston ring history of the MGA (Twin Cam) engine is as follows:

Piston assembly	*Top ring*	*Second ring*	*Third ring*	*Scraper ring*	*Expander ring*	*Engine Nos.*		*Remarks*
						Commencing	*Finished*	
AEH554 9·9 : 1 comp. ratio	AEH556 (chrome)	AEH557	AEH557	AEH558	—	101	445	Use AEH681 in place of AEH554. If less than four pistons are being renewed, use AEH682 and AEH672 in place of AEH556 and AEH558 on the remaining pistons.
AEH616 9·9 : 1 comp. ratio	AEH556 (chrome)	AEH557	AEH557	AEH615 (twin segments)	—	446	605	Use AEH681 in place of AEH616 or AEH640. Use AEH682 in sets to replace AEH556 or AEH649. Use AEH672 where replacement of AEH615 is required. Fit expander ring AEH680 behind AEH615 where necessary.
AEH640 9·9 : 1 comp. ratio	AEH649 (chrome)	AEH557	AEH557	AEH615 (twin segments)	—	606	2042. Was also fitted to 2044 to 2052 and 2056	
AEH673 9·9 : 1 comp. ratio	AEH649 (chrome)	AEH557	AEH557	AEH672 (twin segments)	AEH680	2043. Was not fitted to 2044 to 2052 or 2056	—	Use AEH681 in place of AEH673. Use AEH682 in sets to replace AEH649. If less than four pistons are being renewed use AEH682 in place of AEH649 on the remaining pistons.
AEH681 9·9 : 1 comp. ratio	AEH682 (plain)	AEH557	AEH557	AEH672 (twin segments)	AEH680	2251	—	To be used as single replacements for AEH554, AEH616, AEH640, AEH673, and AEH681 or in sets for competition purposes with 100-octane fuel.
AEH690 8·3 : 1 comp. ratio	AEH682 (plain)	AEH557	AEH693	AEH692 (twin segments)	AEH680	—	—	Use in sets for Service replacements of AEH554, AEH616, AEH640, AEH673, and AEH681 when fuel below 95 octane is to be used.

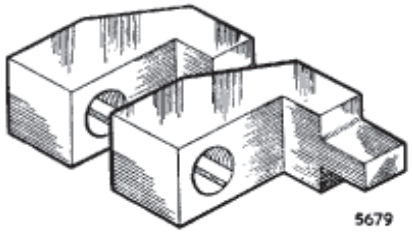
Gudgeon pin (Part No. AEH441) and circlip (Part No. CCN214) are common to all the above-mentioned assemblies.

[See Addendum for more information on Reconditioned Engines]

SERVICE TOOLS

18G551. Camshaft Timing Keys

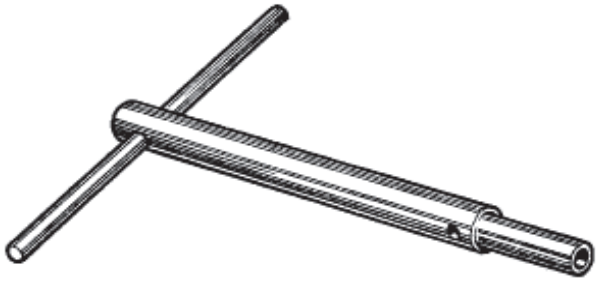
Supplied in pairs to lock the camshafts in position when adjusting the valve timing.



18G551

18G27. Handle

A standardized type of handle for use with a wide range of cutters, including those below.



18G27

18G174D. Pilot

For use with all the cutters listed below.

18G174D

18G28. Valve Seat Finishing Cutter—Inlet

18G28A. Valve Seat Glaze Breaker—Inlet

18G28B. Valve Seat Narrowing Cutter—Top—Inlet

18G174. Valve Seat Finishing Cutter—Exhaust

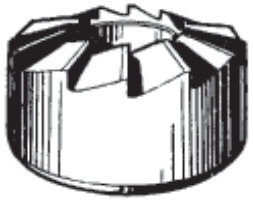
18G174A. Valve Seat Glaze Breaker—Exhaust

18G174B. Valve Seat Narrowing Cutter—Top—Exhaust

The use of these cutting tools will save lengthy and wasteful grinding in when the valve seats are pitted. The narrowing cutters will enable the width of the valve seats to be maintained at their original dimensions.

18G28 and 18G174

18G28A and 18G174A



18G28B and 18G174B

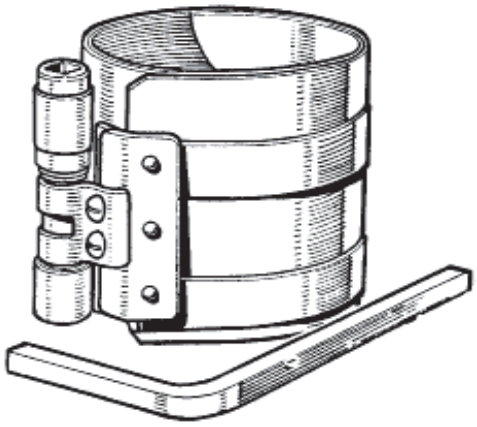
18G29. Valve Grinding-in Tool

This suction-type tool has a rubber handle of convenient length to enable it to be rotated backwards and forwards between the palms of the hands when grinding the valves into the seats. The detachable rubber suction pads 18G29A may be obtained separately.

18G29

18G55A. Piston Ring Compressor

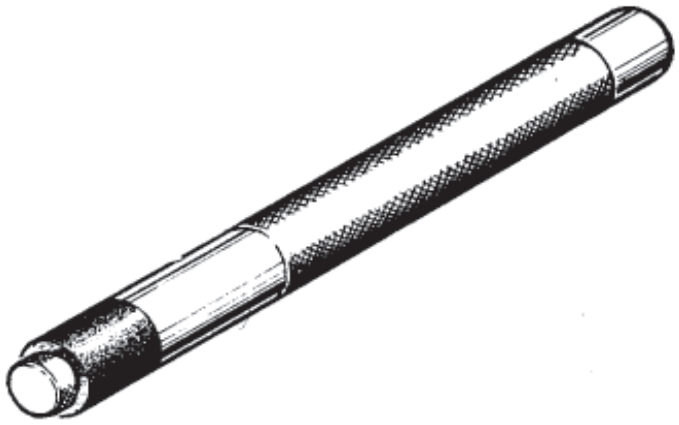
A clamping device to compress the piston rings enabling the operator to insert the piston assembly into the cylinder bore with the minimum of pressure, thus preventing damage to the piston and the piston rings.



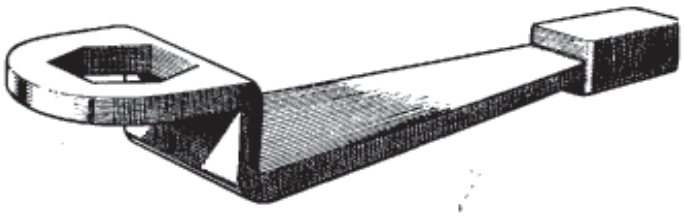
18G55A

18G69. Oil Pump Relief Valve Grinding-in Tool

This tool is designed for the removal and grinding in of the oil relief valve. Tightening the knurled set screw will expand the rubber plunger, which ensures that the tool is a tight fit when inserted into the hollow oil relief valve.



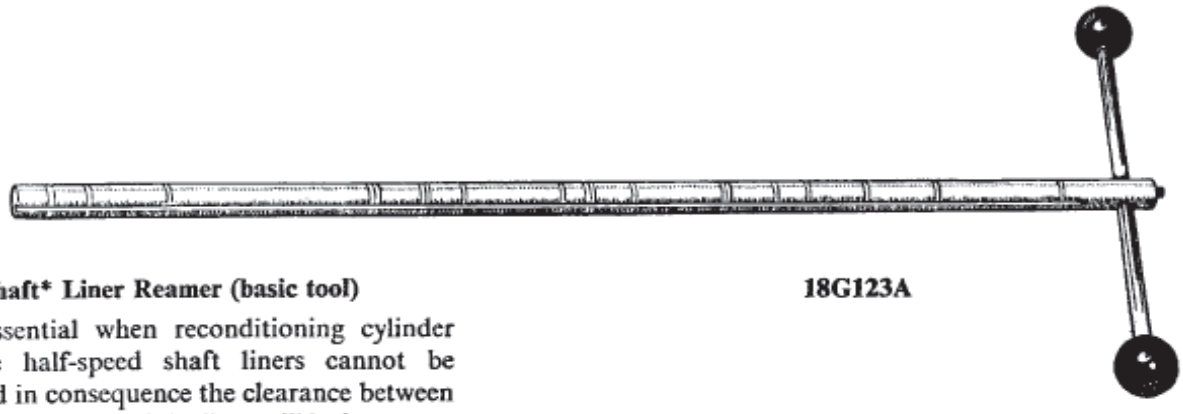
18G69



18G98. Starting Dog Nut Spanner

A shock-type spanner designed to remove and replace the starting dog without having to lock the crankshaft by improvised means, which invariably damages the engine components.

18G98



18G123A

18G123A. Camshaft* Liner Reamer (basic tool)

This tool is essential when reconditioning cylinder blocks, otherwise half-speed shaft liners cannot be reamed in true and in consequence the clearance between the half-speed shaft journal and the liner will be incorrect.

The cutters and pilots for use with this basic tool are supplied separately.

18G123E. Camshaft* Liner Reamer Cutter—Front

18G123B. Camshaft* Liner Reamer Cutter—Rear

18G123L. Camshaft* Liner Reamer Pilot—Front

18G123AB. Camshaft* Liner Reamer Pilot—Centre

18G123AC. Camshaft* Liner Reamer Pilot—Rear

18G123E
18G123B
18G123L
18G123AB
18G123AC

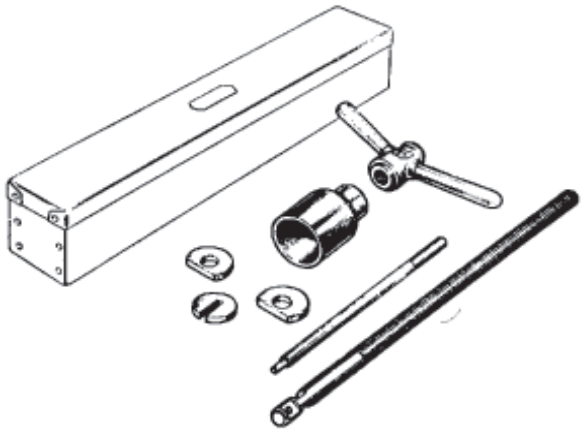
The above cutters and pilots are required for use with basic tool 18G123A to line-ream the front and rear half-speed shaft liners.

18G123F. Camshaft* Liner Reamer Cutter—Centre

18G123T. Camshaft* Liner Reamer Pilot—Front

18G123AD. Camshaft* Liner Reamer Pilot—Rear

18G123F
18G123T
18G123AD



18G124A

18G124A. Camshaft* Liner Remover and Replacer (basic tool)

Half-speed shaft liners can be removed and replaced accurately and without the damage invariably associated with the use of improvised drifts. Adaptors for use with this basic tool are supplied separately.

* For use on the half-speed shaft bearings only—not on camshafts (see Section A.12).

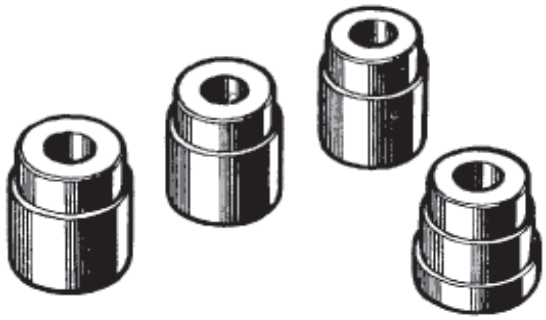
18G124F. Camshaft* Liner Remover Adaptor—Front

18G124C. Camshaft* Liner Remover Adaptor—Centre

18G124B. Camshaft* Liner Remover Adaptor—Rear

18G124H. Camshaft* Liner Remover Adaptor

The adaptors 18G124F, 18G124C and 18G124B are used in conjunction with the basic tool 18G124A to remove old and worn liners and to pilot new liners into position. Adaptor 18G124H is a pilot to be inserted into the front bearing when the centre liner is being removed or replaced.

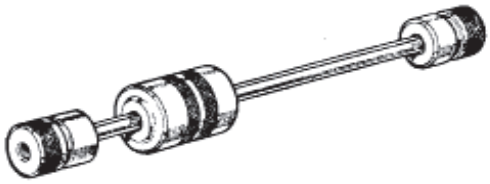


18G124F
18G124C
18G124B

18G124H

18G284. Impulse Extractor—UNF. (basic tool)

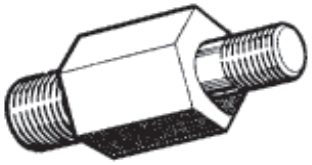
This extractor with the adaptor positioned in the screwed end will remove the most difficult main bearing cap quickly and without damage.



18G284

18G284A. Main Bearing Cap Removal Adaptor

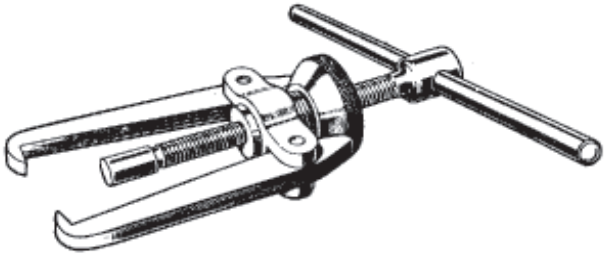
For use with impulse extractor 18G284.



18G284A

18G309. Extractor

For use when removing the half-speed shaft sprocket, distributor drive gear, and crankshaft gear.



18G309

* For use on the half-speed shaft bearings only—not on camshafts (see Section A.12).

Addendum:

From time to time there were additions, deletions, and corrections to the Workshop Manual. The following notes will detail some of these changes. Notice that when certain Sections were added or deleted the Section numbers couild change.

Section A.26 - last paragraph:

Issues 1 and 2 of the Manual had an error noting that crankshaft thrust washers, should be installed with oil grooves TOWARD the bearing. This copy (Issue 3) has corrected this error, noting the thrust washers should be installed with oil grooves AWAY from the bearing (toward the rotating flange of the crankshaft). Refer to Confidential Service Memrandum MG-416.

Section A.29 - from prior issues:

This section was printed in prior issues but was not included in Issue 3:

Section A.29

PISTON SIZES AND CYLINDER BORES

Oversize pistons are marked with the actual oversize dimensions. A piston stamped ·020 is only suitable for a bore ·020 in. (·508 mm.) larger than the standard bore, and similarly pistons with other markings are only suitable for the oversize bore indicated.

After reboring an engine, or whenever fitting pistons differing in size from those removed during dismantling, ensure that the size of the piston fitted is stamped clearly on the top of the cylinder block alongside the appropriate cylinder bore.

Oversize pistons are supplied in the sizes indicated in the following table:

Piston marking	*Suitable bore size*	*Metric equivalent*
STANDARD	2·9683 to 2·9698 in.	75·393 to 75·431 mm.
OVERSIZE		
+·010 in. (·254 mm.)	2·9783 to 2·9798 in.	75·647 to 75·685 mm.
+·020 in. (·508 mm.)	2·9883 to 2·9898 in.	75·901 to 75·939 mm.
+·030 in. (·762 mm.)	2·9983 to 2·9998 in.	76·155 to 76·193 mm.
+·040 in. (1·016 mm.)	3·0083 to 3·0098 in.	76·409 to 76·447 mm.

Section A.44 - from prior issues:

This section was printed in prior issues but was not included in Issue 3:

Section A.44

RECONDITIONED ENGINES

On reconditioned engines the bore and crankshaft sizes are indicated by code letters appearing either under or after the engine number. The bore size is indicated by the first letter and the crankshaft size by the second letter.

The code is as follows:

Code	*Bore oversize*	*Crankshaft undersize*
A	Standard	Standard
B		·010 in. (·254 mm.)
C		·015 in. (·381 mm.)
D	·020 in. (·508 mm.)	·020 in. (·508 mm.)
E		·025 in. (·635 mm.)
F	·030 in. (·762 mm.)	·030 in. (·762 mm.)
G		·035 in. (·889 mm.)
H	·040 in. (1·016 mm.)	·040 in. (1·016 mm.)
J		·045 in. (1·143 mm.)
K		·050 in. (1·270 mm.)
L		·055 in. (1·397 mm.)
M	·060 in. (1·524 mm.)	·060 in. (1·524 mm.)

Thus, Engine No. 29D/RU/H12345 M.E. would indicate a reconditioned engine having a cylinder bore ·060 in. oversize and a crankshaft ·025 in. undersize.

Reconditioned engines may also be fitted with ·010 in. oversize valve guides and can be identified by 'VG+·010' stamped on the outside of the cylinder head.

The oversize guides are identified by a shallow groove around their outer diameter.