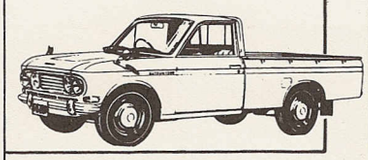
SERVICE MANUAL

DATSUN PICK-UP

MODEL 520 SERIES



NISSAN MOTOR CO., LTD.

ENGINE

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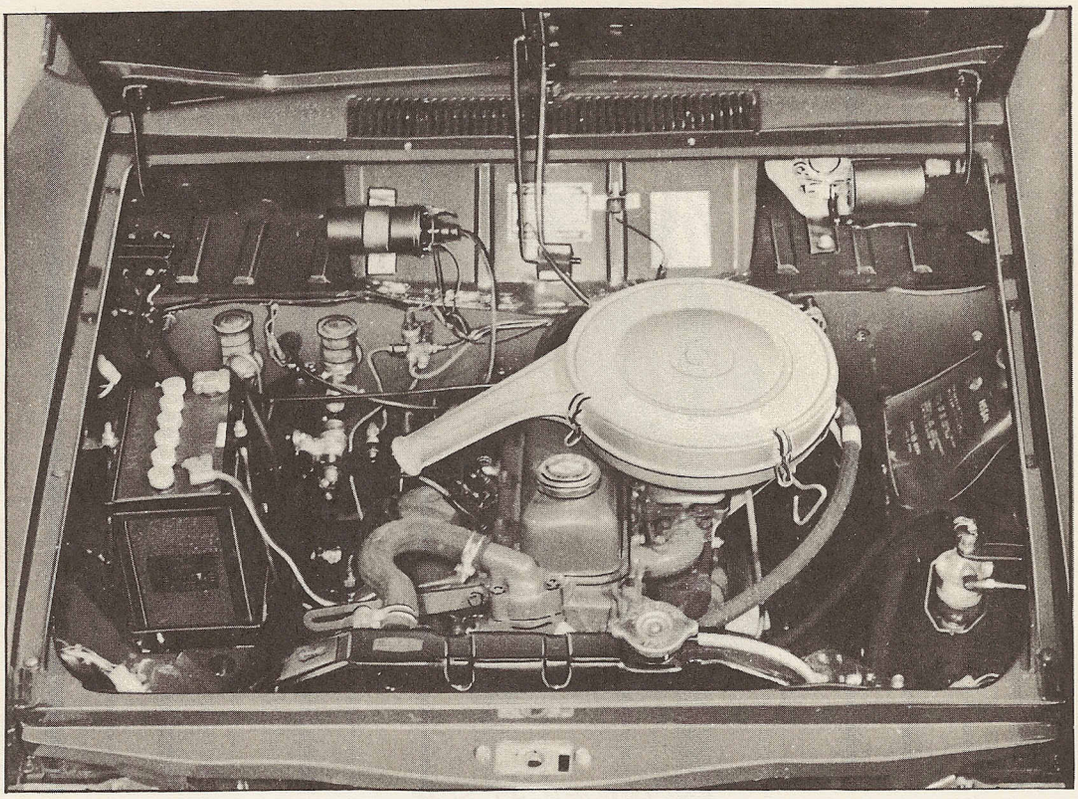
ENGINE



The engine is of monobloc construction, and the valve are set in line in the cylinder head and are operated by rockers and push rods from the camshaft in the left hand side of the engine.

The camshaft, running in three steel backed whitemetal bearings, is chain-driven and has a rubber chain tensioner.

The distributor and oil pump are driven from the camshaft.

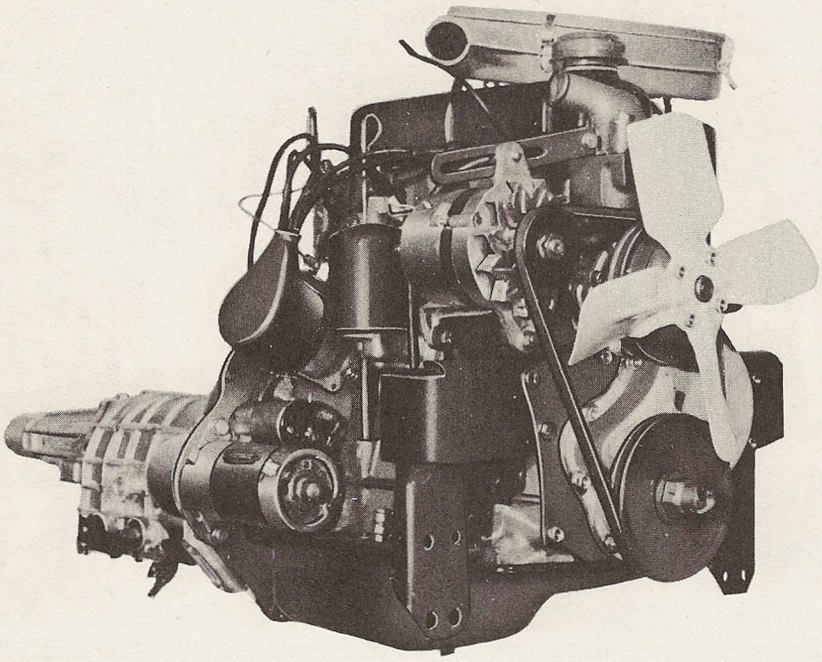
The pistons are the split skirt type of aluminum alloy, and carry two compression rings and a slotted oil control ring.

The piston pins are bolted in connecting rods, which have steel backed lead and copper alloy, changeable big end bearings.

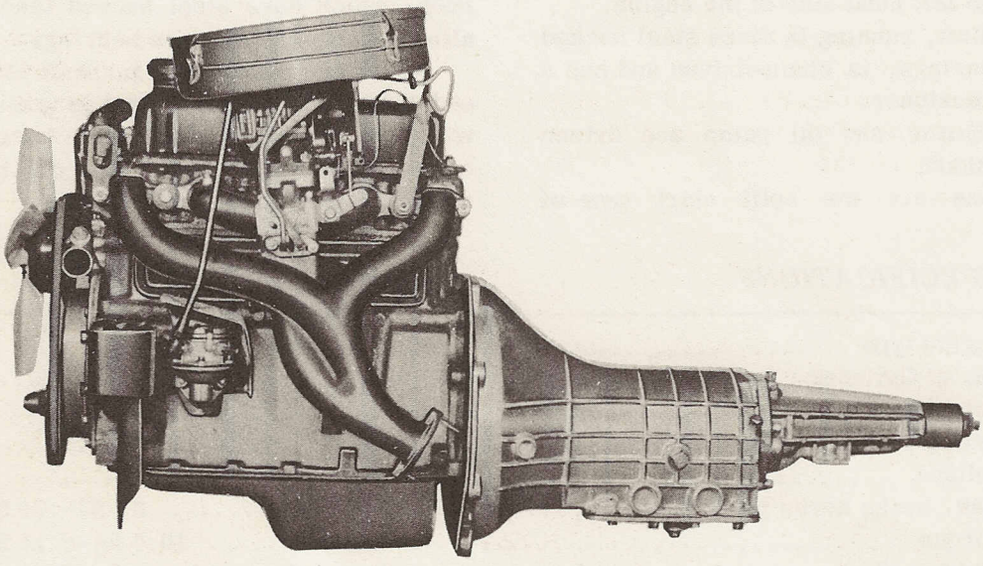
A counter balanced crankshaft is fitted. The end thrust on this component is taken by special washers at the center main bearing. The centrifugal water pump and cooling fan are driven by the generator belt.

GENERAL SPECIFICATIONS

Engine type	J type
No. of Cylinder	4
Bore (mm)	73 mm
Stroke	77.6 mm
Volume	1.299
Max. brake horse power	67 HP. at 5200 r.p.m.
Torque	10.6 kg-m at 2800 r.p.m.
Firing order	1-3-4-2
Valve arrangement	Overhead valve, push rod type
Compression pressure	163 lbs.per sq.in. (11.5 kg/cm^2) at 350 r.p.m.
Compression ratio	8.2 : 1

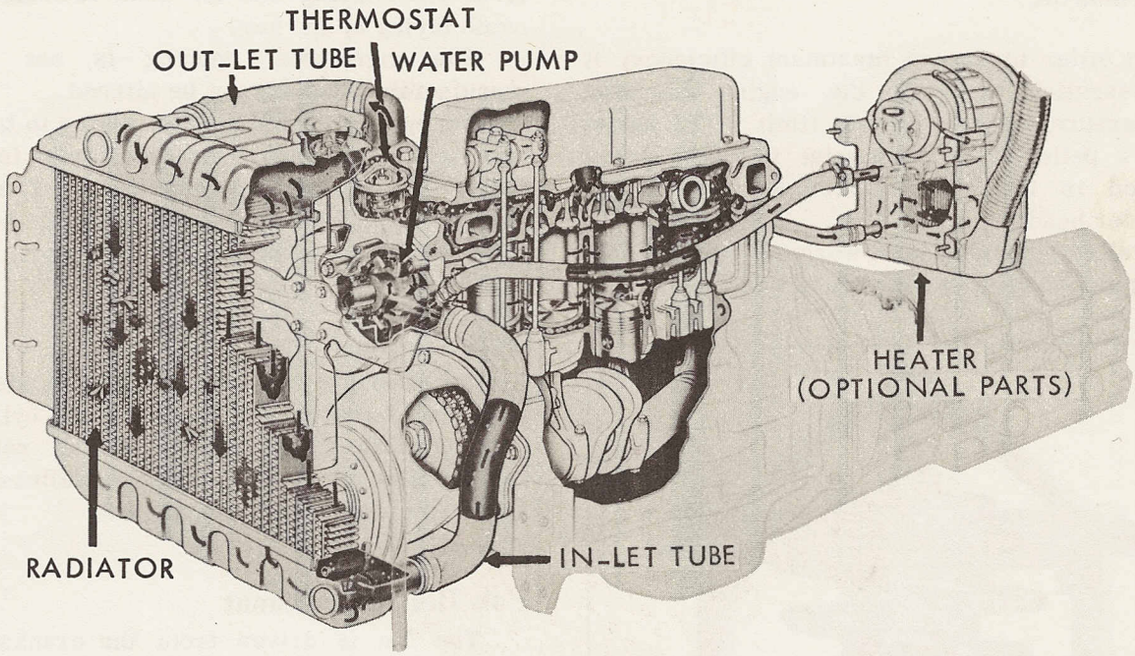


ENGINE-RIGHT SIDE



ENGINE-LEFT SIDE

COOLING SYSTEM



An efficient cooling system is of major importance to ensure the satisfactory running of the engine and it is therefore necessary to pay particular attention to its maintenance.

Description

The cooling system is maintained by water pump circulation, combined with an efficient fan cooled radiator and thermostat.

The system is pressurised and the relief valve, incorporated in the radiator filler cap, controls the pressure at approximately 0.4 kg per sq. cm. Do not remove the filler cap if the temperature of the coolant is above boiling point or if the engine is running. Topping-up should only be required occasionally to replace water lost through the overflow pipe. Top-up when the engine is cold, and if possible use clean soft water.

Fill to within 1/2" of the bottom of the filler plug well. Overfilling when the engine is cold may cause water to flow through the overflow pipe. The capacity of the system is approximately 5.2 litres.

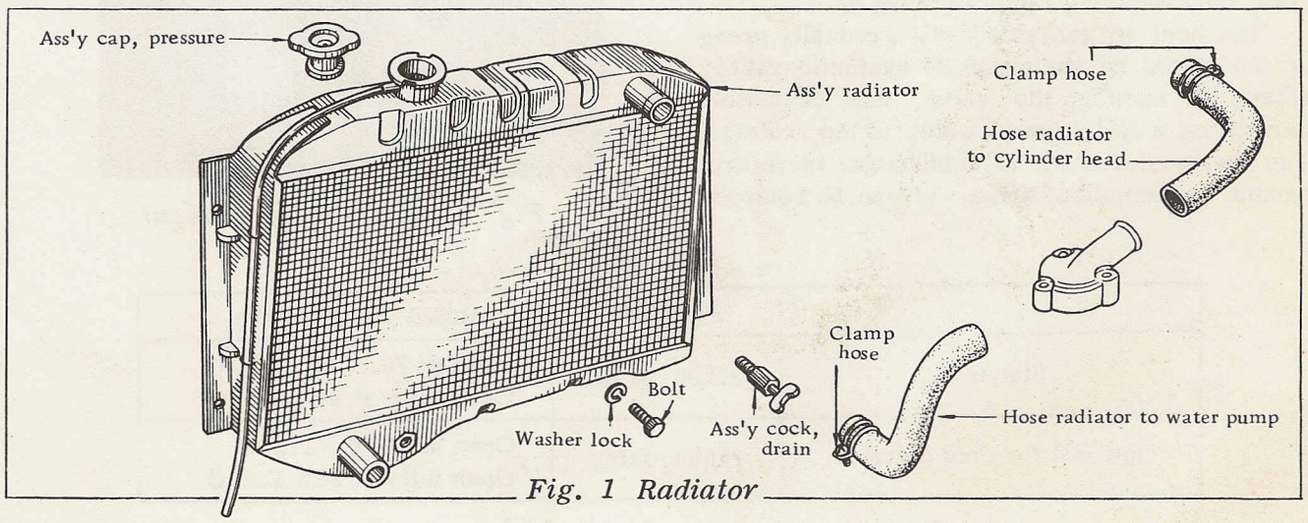


Fig. 1 Radiator

Thermostat

In order to ensure maximum efficiency, it is essential to keep the engine operating temperatures within certain limit. To assist this a pellet type thermostat is fitted, being located in the water outlet at front of the cylinder head.

Pellet type thermostat works by the principle of rapid variation of solution of wax.

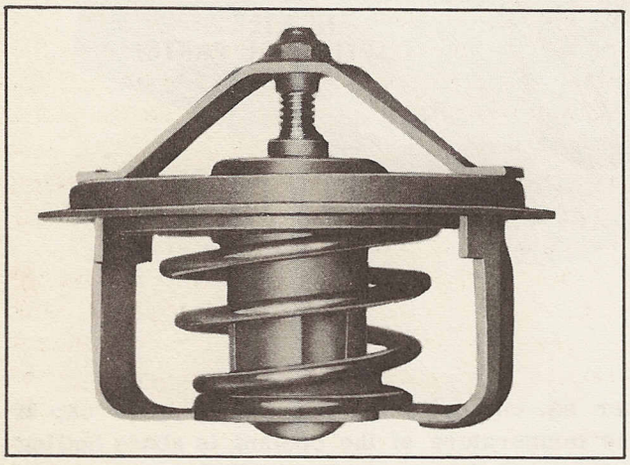


Fig. 2 Pellet Type Thermostat

The device consists of metalic pellet, filled with the wax, which controls a mash-room valve by solution of wax.

When the engine is cold this valve is closed and on starting the engine the flow of water to the radiator is temporarily restricted.

Due this, the temperature of the water in the cylinder head and cylinder jackets will quickly rise, thus ensuring rapid warming up.

The heat so generated will gradually press up the piston by shrinkage of synthetic rubber sleeve so opening the valve, and ultimately permitting a full flow of water to the radiator. The thermostat itself is detachable; therefore, should be occasion arise, it can be removed from its housing and the hose reconnected to avoid laying up the car.

The thermostat opening is set by the manufacturer and can not be altered.

During decabonising it is policy to test this opening by immersing the thermostat in water raised to requisite temperature. The valve should open under these conditions, but if it fails to open a new unit should be fitted.

Overheating

Overheating may be caused by a slack fan belt, excessive carbon deposit in the cylinders, running with the ignition too far retarded, incorrect carburetor adjustment, failure of the water to circulate or loss of water.

Fan Belt Adjustment

The fan is driven from the crankshaft by a "V" belt, this also driving the alternator.

A new belt can be fitted by first loosening the clamp bolts (Fig. 3), which hold the dynamo in position, and moving the dynamo towards the engine. Slide the belt over the fan and onto the fan pulley.

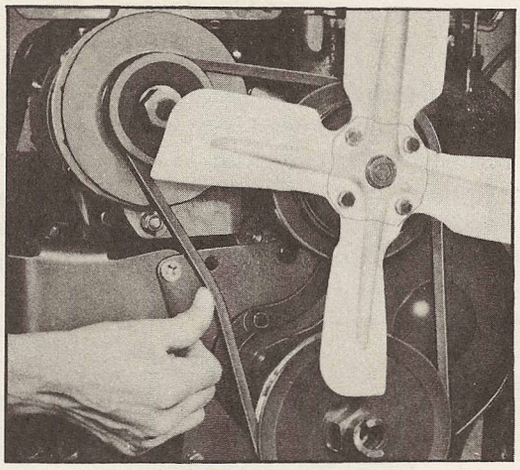


Fig. 3 Fan Belt Adjustment

	Part No.	Rated Temperature
Standard	21200 61001	Open at 76.5 °C ± 1.5 °C Open fully at 90 ± 1.5 °C
Optional for cold district	21200 61001	Open at 82 °C ± 1.5 °C Open fully at 95 ± 1.5 °C

Adjustment is then made by bringing the alternator away from the engine. The belt should be sufficiently tight to prevent slip, yet the belt should have 10 to 15 mm slack between the generator and crankshaft pulley when the midspan is pushed firmly.

After the correct tension has been obtained, securely lock it in position again.

Frost Precautions

Freezing may occur first at the bottom of the radiator or in the lower hose connections.

Ice in the hose will stop water circulation and may cause boiling. A muff can be used to advantage, but care must be taken not to run with the muff fully closed, or boiling will result. When frost is expected or when the car is to be used in a very low temperature, make sure that the strength of the solution is, in fact, up to the strength advised by the manufacturers. The strength of the solution must be maintained by topping-up with anti-freeze solution as necessary. Excessive topping-up with water reduces the degree of protection afforded. Solution must be made up in accordance with instructions supplied with the container.

Top-up when the system is cold.

If the cooling system has to be drained, run the mixture into a clear container and use again.

Protection by Draining

On cars where anti-freeze is not used the following precautions must be taken during frosty weather to obviate any damage due to freezing of the cooling system.

When heavy frost is imminent, the cooling system must be completely drained. It is not sufficient merely to cover the radiator and engine with rugs and masks. There are two drain cocks one on the left-hand side of the cylinder block and the other at the base of the radiator block. Both taps must be opened to drain the system and the car must be on level ground while draining.

The drain taps should be tested at frequent intervals by inserting a piece of wire to ensure that they are clear. This should be done immediately the taps are opened, so that any, obstruction freed by the wire may be flushed out by the water. The draining should be carried out when the engine is hot.

When completely drained the engine should be run for a timed minute to ensure that all water has been cleaned from the system.

A suitable notice should be then affixed to the radiator, indicating that the water has been drained.

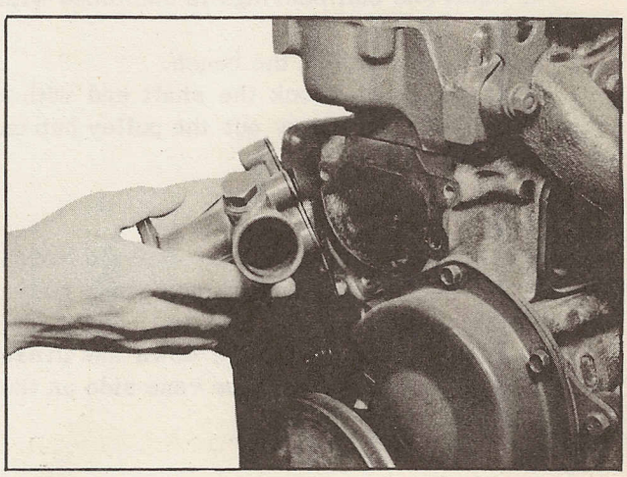
Flushing the Radiator

To ensure efficient circulation of the coolant and to reduce the formation of scale and sediment in the radiator, the system should be periodically flushed with clear running water, preferably before putting in anti-freeze in the winter and again when taking it out in the spring. The water should be allowed to run through until it comes out clear from the drain taps. At intervals a stiff piece of wire should be inserted into the taps during draining to ensure that they are not becoming clogged with sediment.

This method of radiator flushing may serve well, but in cases where the "furring" up is excessive the operator will find it more efficient practice to remove the radiator completely and flush in the reverse way to the flow, turn the radiator upside down and let the water flow in through the bottom hose connection and out of the top connection.

Water Pump

After draining the water from the radiator, remove the pump unit from the cylinder block by taking off the fan belt and releasing the setbolts with spring washers and hinge bolts to dynamo.



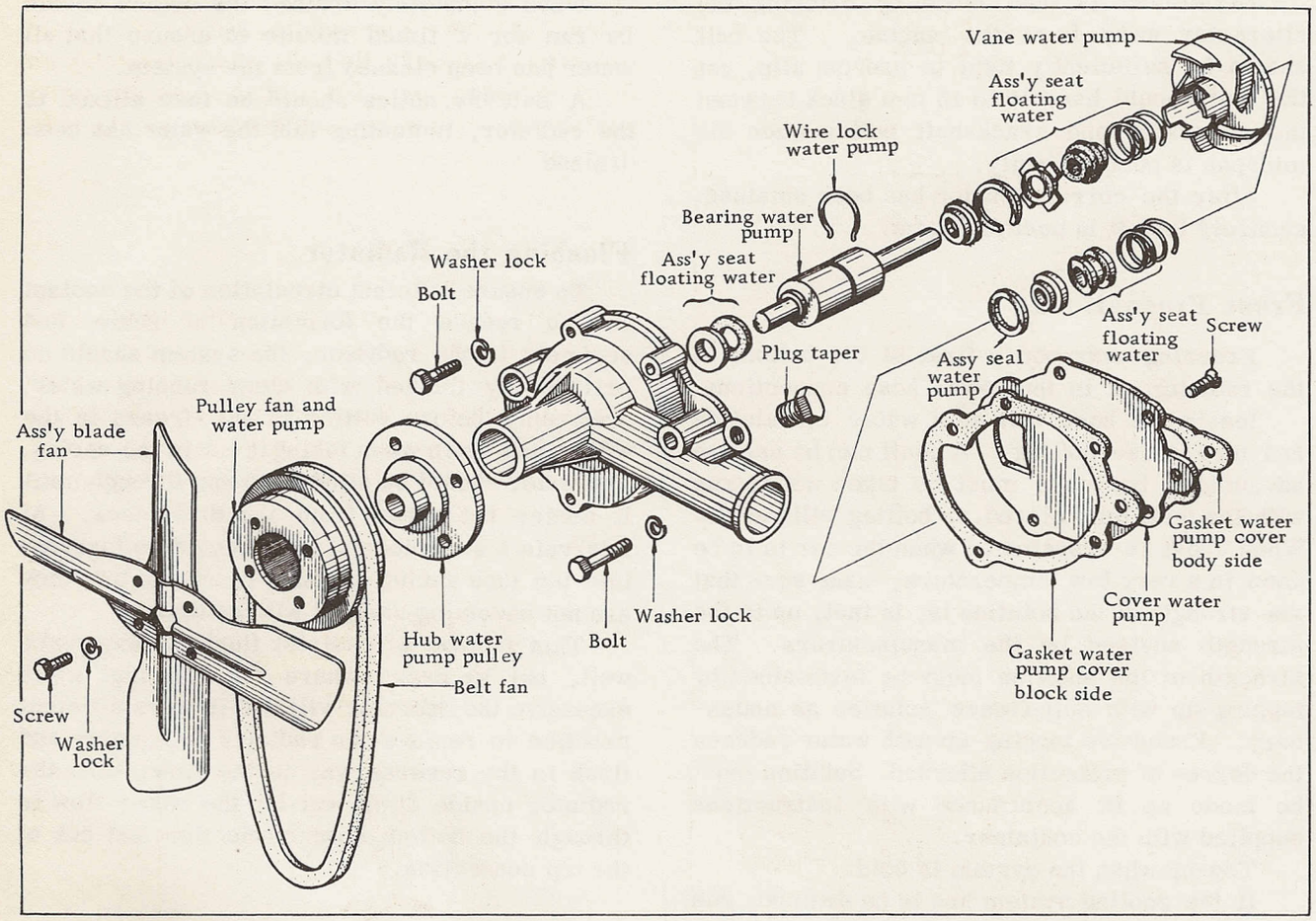


Fig. 4 Water Pump

Removing the Pump Shaft Assembly

Disconnect the fan blades, pulley and cover.

The shaft and ball bearings is combined with one unit.

Put the pulley hub on the bench.

First, press or knock the shaft end with a drift (hard bar) and draw out the pulley hub on the U type bench.

Take out the set pin from the slit which locked the shaft assembly to the pump body. (See Fig. 6)

Next, turn the body upside down and press out the shaft assembly from the vane side on the U type bench.

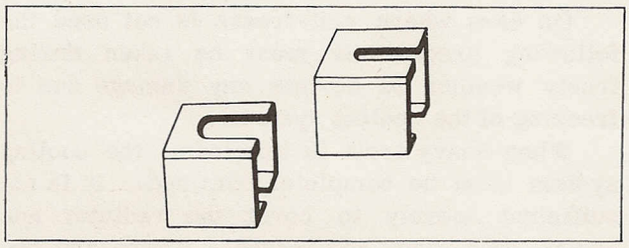


Fig. 5 Example of the Bench for Pump Body

The shaft and ball bearing assembly can be drew out from the body.

Thus take out the vane, floating seal and seal which remained the pump body.

Reassembly

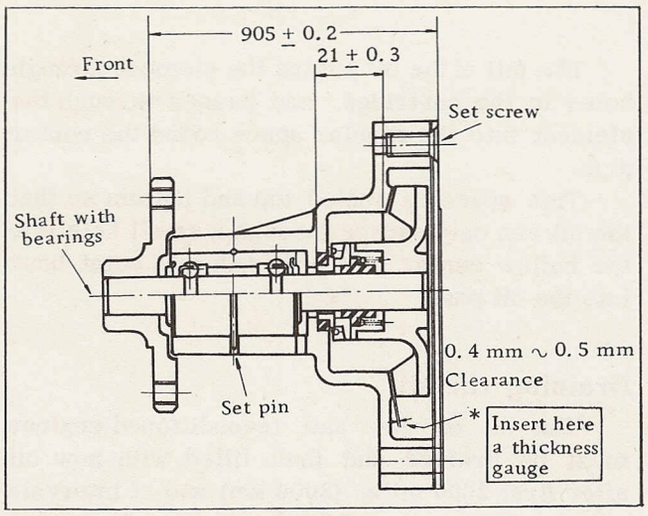


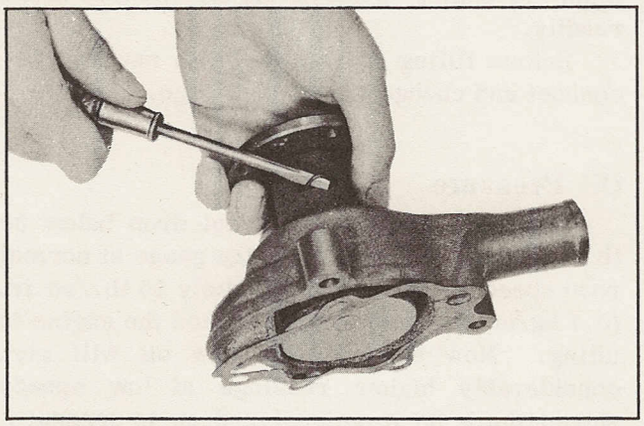
Fig. 6

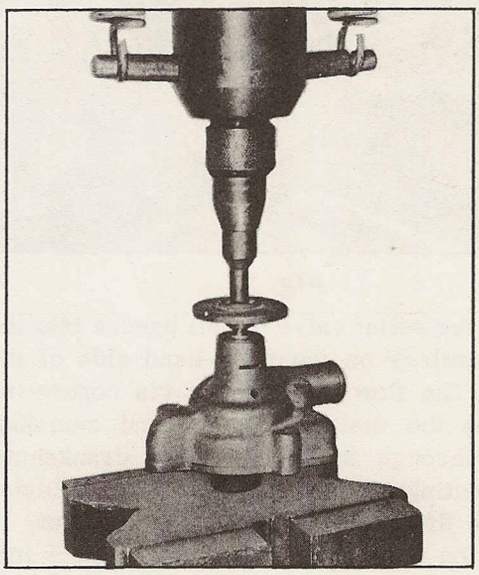
The reassembling of the pump is a reversal of the disassembly procedure, but a care should be taken to ensure that the shaft assembly is fitted correctly for a slit (a hole of set ring) with a groove of shaft so as to insert and set the said ring correctly.

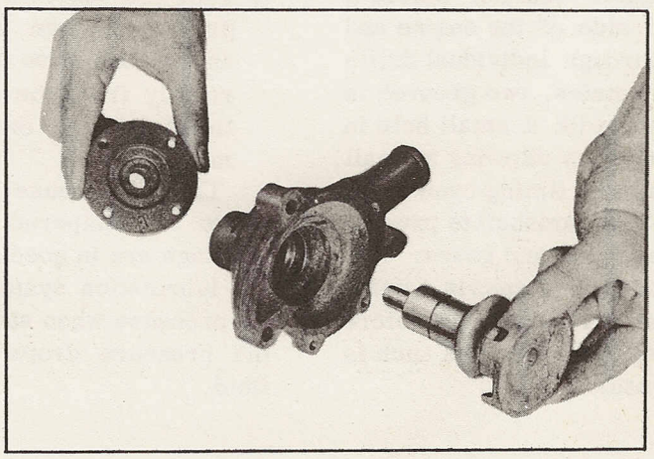
Adjusting Clearance the Vane End and Body

First, press down the shaft fitting with a groove line to insert the set pin.

Inserting thickness gauge (Thickness 0.4-0.5 mm) between the vane end on the U block bench. Take out the thickness gauge and find out good condition. Screw up with the cover and cork washer.







LUBRICATION

Circulation

Pressure lubrication is used throughout the unit and is provided by an ecentric non-draining oil pump. The oil pump is bolted into the left-hand side of the crankcase, and is driven from the camshaft gear by a short vertical shaft.

The oil is drawn into the pump via the filter and is delivered through internal oilways to the relief valve which is situated at the cover of oil pump.

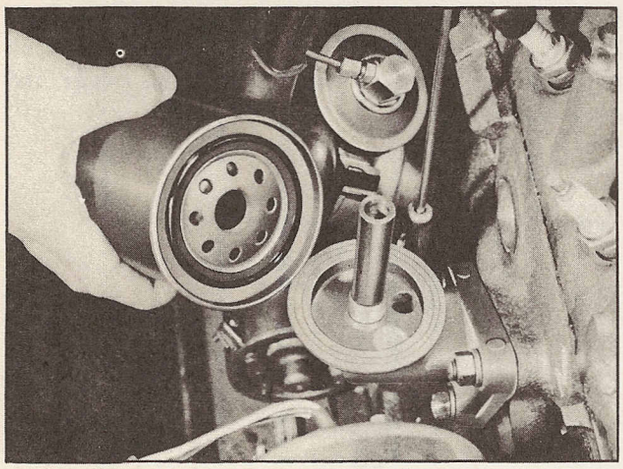


Fig. 1

From the relief valve the oil passes into the main oil gallery on the right-hand side of the engine. The flow then passes via connecting oilways to the main, big end and camshaft bearings through drillings in the crankshaft. The connecting ends are drilling in the cylinder block and the rear rocker shaft bracket, to lubricate the rockers, and then drains back into the oil pan via the push rod apertures. The oil from the center camshaft bearing enters a gallery on the left-hand side of the engine and lubricates the tappets through individual drillings. As the camshaft rotates, two grooves in the front journal register with a small hole in the camshaft thrust plate thus allowing a small amount of oil to pass into the timing case twice during case revolution of the camshaft to provide lubrication for the timing chain and gears.
From the timing case the oil returns via a drain hole abck to the oil pan. The filter therefore forms part of the main oil gallery and as such is filled with oil under pressure.

The full of the oil enters the element through holes in the cartridge, and passes through the element into the annular space round the center pipe.

This space is sealed top and bottom so that the oil can only escape through a small hole into the hollow center pipe and from this point back into the oil pan.

Draining the Oil

The oil on new and reconditioned engines must be drained and then filled with new oil after first 2000 miles (3000 km) and at intervals of every 3000 miles (5000 km). The drain plug is at the oil pan. The oil should be drained when the engine is hot as the oil will flow more readily.

Before filling the oil pan with new oil disconnect and change the oil cartridge.

Oil Pressure

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. (0.7 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:

a) That there is a good supply of the correct grade of oil in the oil pan.
b) That the strainer in the oil pan is clean and not choked with sludge.
c) That the bearings, to which oil is fed under pressure, have the correct working 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 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.

Check for Low Oil Pressure

Check the level of oil in the engine sump by means of the dip-stick and top up if necessary. If the warning light is still on after refilling the sump, switch off and ascertain that the gauge strainer in the sump is clean and not chocked with sludge, sale that no air leakage exists at the strainer union on the suction side of the oil pump being defective, remove the unit and rectify the fault.

Removing the Filter

A new filter cartridge should be changed after first 2, 000 miles (3, 000 km) and then every 10, 000 km after this.

The filter forms part of the main oil gallery of the engine. The element of oil filter is sealed in the container as a unit, it can easily removed by hand. Take care not to lose the rubber sealing ring.

The filtered oil in the element of filter cartridge is sent to the oil passage in the cylinder block, delivered to all the lubrication system,crankshaft journal, crank pin, cylinder bore, locker arm, camshaft journal and chain tensioner, and finally returned to the oil pan.

The oil filter is provided with a relief valve. If the temperature of lublicant oil is low at starting, oil viscosity is high, or if the filtration resistance of the oil filter element is large caused by its choke up, the relief valve will be opened with pressure difference to bypass oil.

Removing the Oil Pan

The sump capacity is 3.1 litres. Drain the oil and replace the drain plug.

Remove the set screw bolts which are inserted from the underside of the securing flange, and the lower bolts from the bottom edge of the bell housing. Lower the oil pan from the engine, taking care not to damage the joint washers in the process.

Removing the Strainer

With the snup lowered it is, possible to remove the oil strainer through which oil is drawn into the oil pump. To remove the strainer unto the union connecting the oil pick-up to the pump and unscrew the securing bolts.

The strainer may be dismantled for cleaning purpose by removing the delivery pipe flange bolts.

Notice that there are the dowel pins to the cover which must be positioned correctly when refitting.

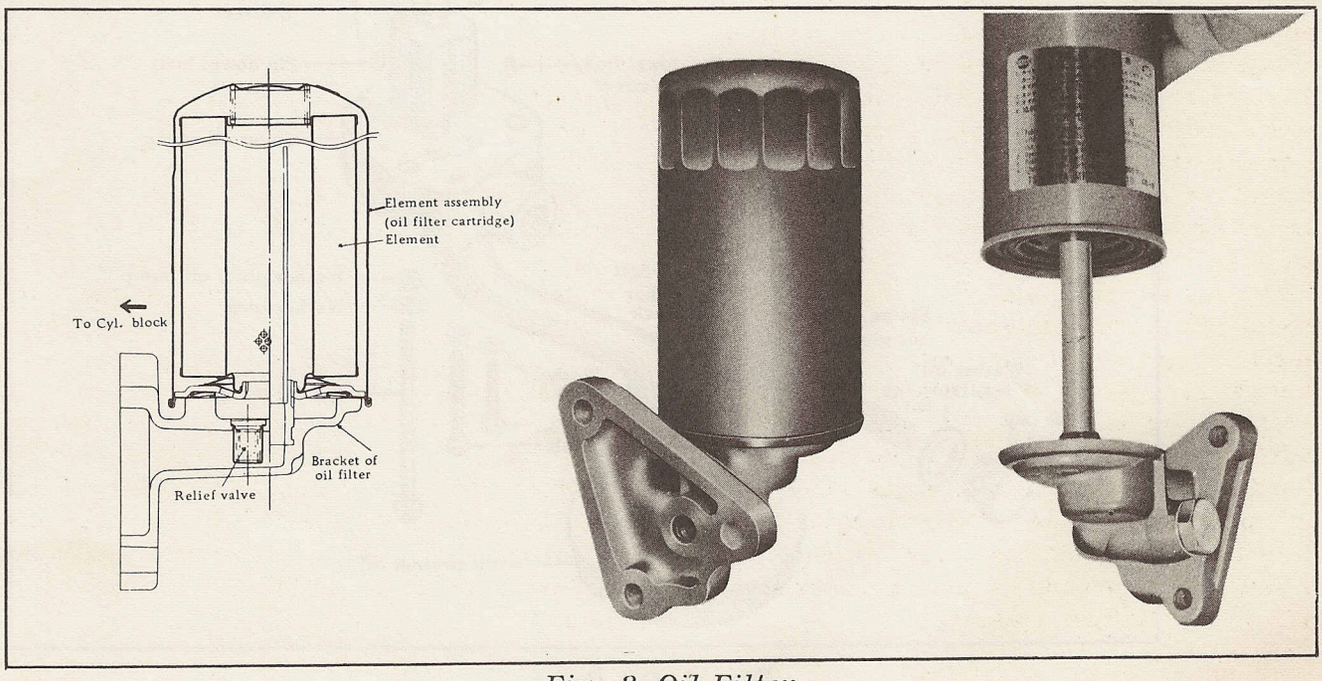


Fig. 2 Oil Filter

Removing the Oil Pump

Remove the oil pan and pick-up strainer. Three of the five bolts securing the oil pump bottom cover are long enough to secure the pump to the crankcase. Fig. 3 illustrates the pump in explosed form. Unscrew the long bolts and remove the pump with its drive shaft.

Dismantling the Oil Pump

Remove the setscrews and spring washers which secure the cover to the body and take off the cover. On tilting the body upside down the inner rotor with its drive shaft, and the outer rotor with slide out.

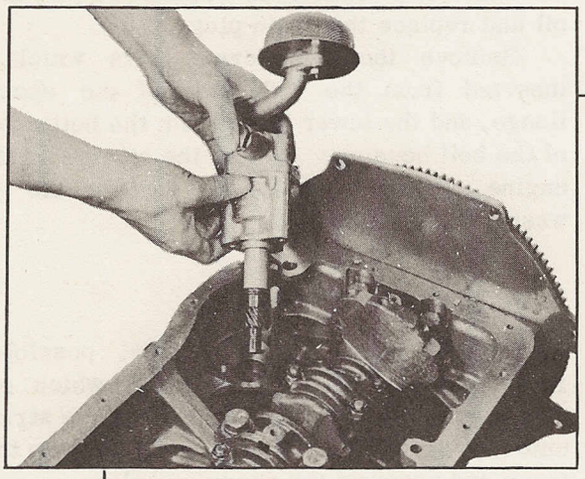


Fig. 3

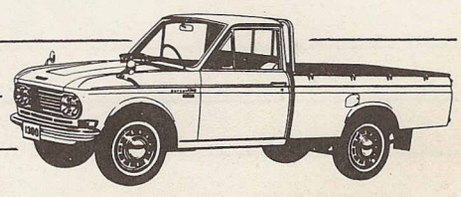
Fig. 4 Oil Pump

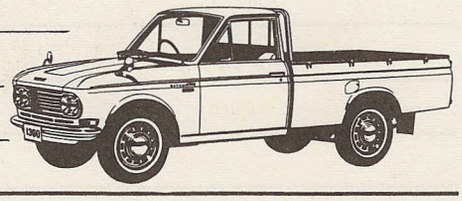
Refitting the Pump

Clean out the sump by washing it in paraffin, the care to remove any traces of the paraffin before refitting the oil pan to the engine. Pay particular attention to the oil pan and crankcase joint faces, and remove any traces of oil jointing material. Examine the joint washer and renew it if necessary. The oil joint washer can be used again if it is sound, but it is advisable to fit a new one. Smear the faces of the joint with grease and fit the joint washer. Lift the oil pan into position and insert the setscrews into the flange tighting them up evenly.

Reassembling the Oil Pump

The outer rotor has a chamfered edge. It is of great important that this chamber be towards the base of the body, failure to assemble in this way will result in the cover is tightened down. Insert the slotted end of the drive shaft into the body and bring the rotors into mesh.





SERVICE OPERATION WITH ENGINE IN POSITION

Removing Starting Nut and Pulley

Remove the radiator. Slacken the dynamo attachment bolts and remove the fan belt.

Bend back the tab on the nut locking washer. Unscrew the bolt by using Heavy duty "Shock type" Spanner.

A few sharp blows in an anti-clockwise direction will slacken the nut.

Pull off the crankshaft pulley.

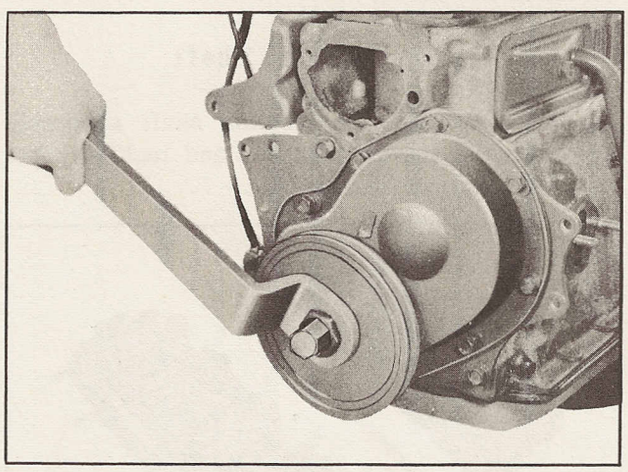


Fig. 1

Removing the Timing Cover

The timing cover is secured by set-screw bolts, each having a shakeproof washer and a special plain-washer. Note that the special washer is of elongated shape and is fitted next to the timing cover flange.

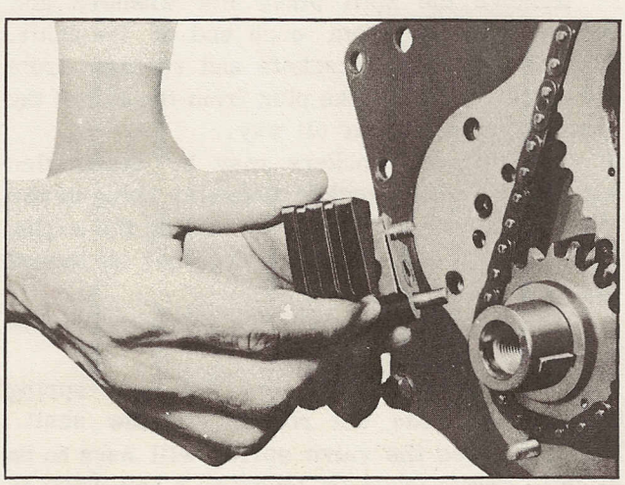


Fig. 2

The spring washers are immediately below the bolt heads.

Take out the set-screw bolts, remove the cover and its joint washer. Care should be taken not to damage the washer when breaking the joint. If damage does occur fit a new washer, cleaning of the faces of the joint surfaces beforehand.

Removing the Timing Gear

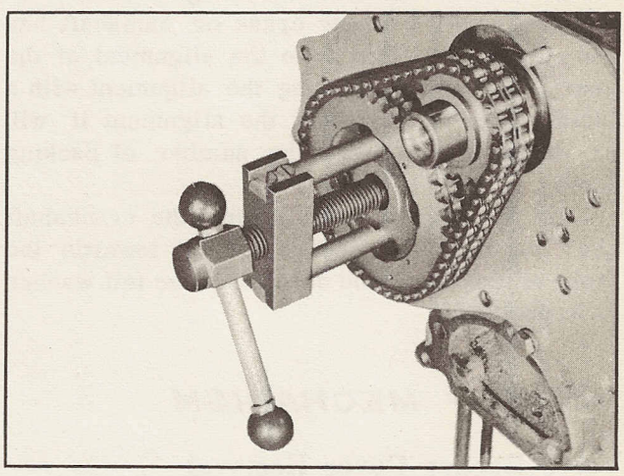


Fig. 3

The timing chain is endless, and it is necessary to remove both the crankshaft and camshaft gears together. Before doing this, notice the timing marks on both gears and their relationship to each other.

Draw off both the gears a little at a time, first removing the crankshaft gear retaining nut.

As the gears are withdrawn care must be taken not to lose the packing washers from behind the crankshaft gear. Between the camshaft gear teeth, is a rubber ring which acts as a tensioner, and ensures silent operation of the chain drive. Examine the felt washer and renew it if oil has been lost be seepage.

Refitting the Timing Gear

Replacing the components of the timing gear is largely a reversal of the dismantling process, but special attention should be paid to the following points.

Fit the crankshaft and camshaft gears into their respective shafts. Ensure the timing marks are opposite and in line.

Turn the engine crankshaft until the keyway is at T.D.C. and the camshaft with its keyway in approximately the one o'clock position.

Place the gears into position, ensuring that the keys are present in keyways on the shaft. Ensure that the timing marks on the gears are opposite to each other and in line. Drive the gears home.

The same number of packing washers taken from behind the crankshaft gear must be replaced unless a new crank or camshaft has been fitted. In this case the alignment of the gear faces and measuring the alignment with a feeler gauge. To adjust the alignment it will be necessary to vary the number of packing wash

Fit the oil thrower behind the crankshaft gear so that its concave face it towards the front of the car, and check that the felt washer is in position.

ROCKER MECHANISM

Valve Rocker Cover Removal

Remove the air cleaner. Unscrew the cap nuts securing the engine lifting brackets. Remove the rocker cover and the cork joint washer.

Removing the Rocker Assembly

Drain the cooling system. If anti-freeze is in use, use a clean container for the fluid if it

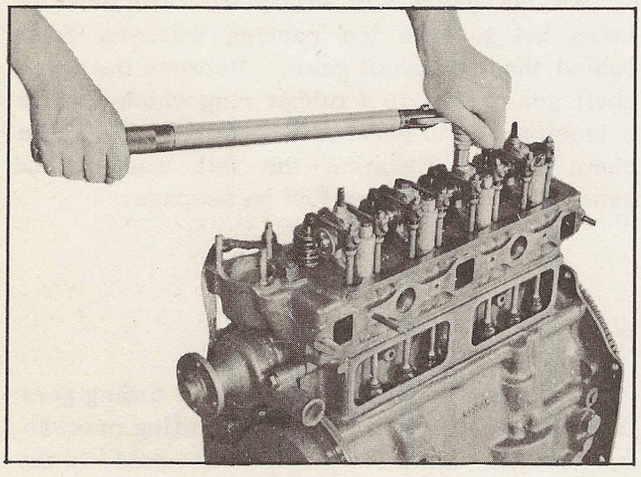


Fig. 4

It is necessary to drain the system and slacken the cylinder head nuts, because four of the rocker shaft fixing nuts also secure the cylinder head.

If the cylinder head nust are not slackened distonation may result and allow water to find its way from the cooling system into the cylinders and pump.

Notice that under the right-hand rear rocker stud nut is a special locking plate. Completely unscrew the rocker-shaft blacket nuts and remove the rocker assembly. Complete with brackets and rockers.

Dismantling the Rocker Shaft Assembly

To dismantle the rocker shaft assembly first remove the grub screw and locking plate from the rear rocker bracket.

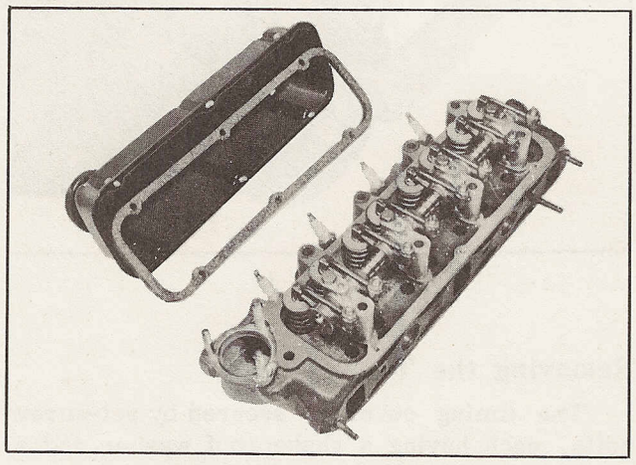


Fig. 5 Cylinder Head

Remove the split pins, flat washers and spring washers from each end of the shaft. Slide the rockers, brackets and springs from the shaft. Unscrew the plug from the end of the shaft and clean out the oil way.

The two end rockers may be dismantled without the whole rocker assembly being drawn out. This may be achived by turning the engine by hand until No. 1 push rod reacher its lowest position.

Unlock the tappet adjusting screw and screw it back as far as it will go.

Withdraw the split pin, flat and spring washer and slide the rocker off the shaft.

Sometimes the valve spring will have to be slightly compressed by levering a screwdriver under No.2 rocker, thus allowing the end rocker

to slide off the shaft easily. Repeat the procedure for No. 8 rocker.

Reassembling the Rocker

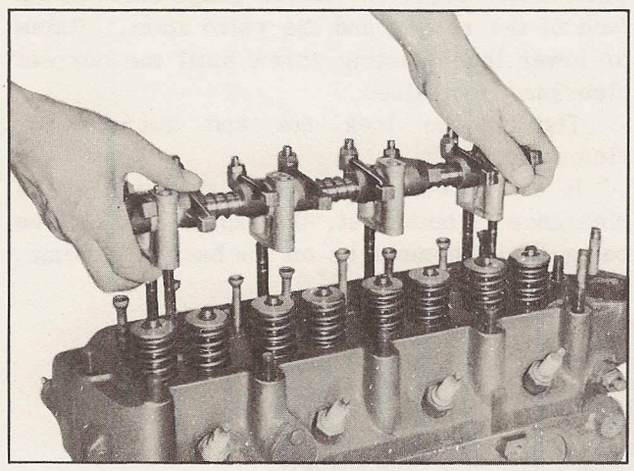


Fig. 6

On reassembly tighten the pedestal bracket securing nuts a little at a time working diagonally from nut to nut, left nut of No. 1 pedestal bracket, right nut of No. 2, left of No. 3 and so on returning from the left nut of No. 4 bracket and repeating the process until they are all tight. If the rocker assembly has been completely stripped down and rebushed, the oil holes will have to be redrilled and the bushes reamed down to size before assembly on the shaft.

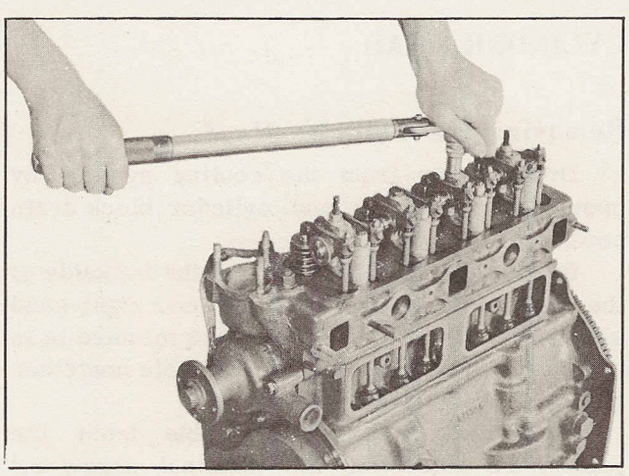


Fig. 7

The rockers and spring must be replaced in their original position on the ends of the shaft. Remember to replace the rocker shaft locating screw and lock plate.

Replace the spring and flat washers with the split pins on the ends of the shaft. Replace the rocker cover and gasket.

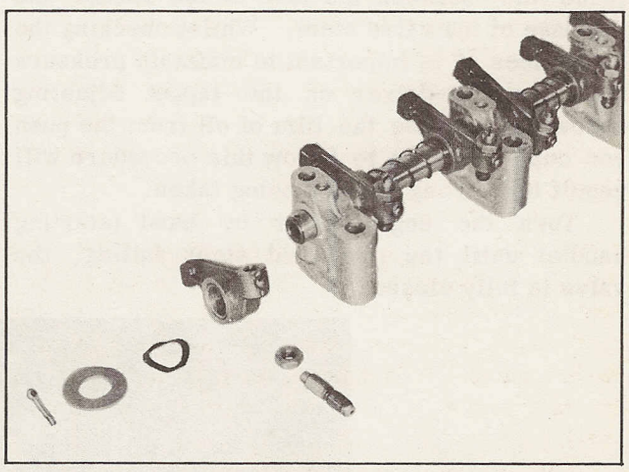


Fig. 8 Reassembling the Cylinder Head

The vent pipe should be at the front of the engine. Secure the cover by means of the two cap nuts, ensuring that the rubber bushed and engine lifting plates are in position. If the rocker cover gasket or the rubber bushes are found to be faulty, they must be renewed otherwise oil leaks will result.

Push Rod Removal

If the valve rocker assembly has already been removed all that remains is for the push rods to be lifted out. They may on the other hand be taken out without detaching the rocker assembly.

Remove the air cleaner and rocker cover.

Slacken all the tappet adjusting screw to their full extent; then using a screwdriver, with the rocker shaft as a fulcrum, depress the valve spring, slide the rocker side ways and lift out the push rod.

All but the end push rods can be withdrawn in this way. These will have to be withdrawn after the removal of the two end rockers from the shaft. When replacing push rods ensure that the ball ends register in the tappet cups. From here onwards, reassembly is a straight forward reversal of the dismantling process.

Adjusting Valve Rocker Clearances

Remove the air cleaner and rocker cover.

There should be a clearance of 0.014 in. (0.35 mm) between the face of the rocker and the base of the valve stem. Whilst checking the clearances it is important to maintain pressure with a screw-driver on the tappet adjusting screw to disperse the film of oil from the push rod cup. Failure to follow this procedure will result in a wrong reading being taken.

Turn the engine over by hand (starting handle) until the push rod stops falling, the valve is fully closed.

To adjust (Fig. 9) insert a screw driver in the adjusting screw slot and slaken the lock nut. Then insert 0.014 in. feeler gauge between the face of the rocker and the valve stem. Raise or lower the adjusting screw until the correct clearance is obtained.

Tighten the lock nut and recheck the clearance.

It is important to note that while the clearance is being set, the tappet of the valve being adjusted must be on the back of the cam, opposite to its peak.

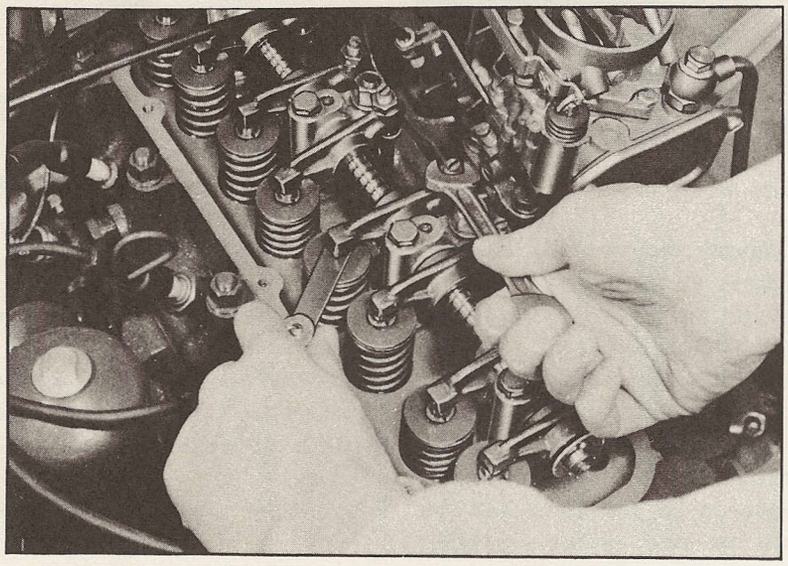


Fig. 9 Adjusting the Rocker Clearance

Rocker shaft	
-Length	356.4
-Outer diameter	15.85～15.88 mm
Rocker arm bush	
-Outer diameter (before mounting)	19.01～19.04 mmø
-Inner diameter (Reamer-finished dimension after mounting)	15.89～15.90 mmø
-Clearance	0.01-0.05 mm
Rocker arm	
-Bore	19.012-19.037 mm
-Lever ratio	1.43

CYLINDER HEAD

Removing the Cylinder Head

Drain water from the cooling system by opening the radiator and cylinder block drain cocks.

One is situated inlet tube at the backside of the radiator and other at the rear right-hand side of the engine. If anti-freeze mixture is in use it should be drained into a suitable container and retained for future use.

Disconnect the negative cable from the battery be extracting the terminal screw and removing the lug from the battery terminal post.

Slacken both the retaining clips on the hose connecting the radiator to the thermostat housing and remove the hose.

Extract the thermostat housing securing nuts and remove the housing and thermostat.

Remove the aircleaner, carburetor, rocker cover and the inlet and exhaust manifolds.

Detach the high tension cables and remove the sparking plugs, also disconnect the water temperature gauge connection from the thermostat housing.

Take off the rocker assembly not forgetting to slacken the external cylinder head nuts at the same time.

Withdraw the push rods keeping them in the order of removal.

The cylinder head can now be lifted off the cylinder block. To facilitate breading the cylinder head joint, tap each side of the head with a hammer using a piece of wood interposed to take the blow. Do not use excessive force. When lifting the head a direct pull should be given so that the head is pulled evenly up the studs. Remove the cylinder head gasket.

Decarbonising

Remove the cylinder head. With the valves still in position remove the carbon from the combustion chambers and the valve faces.
Leaving the valves in position for this operation ensures that damage cannot be caused to the seats by the wire brush which should be used for the removal of carbon.

If the exhaust valve heads are coated with a very hard deposit this may be removed by using a chisel shaped piece of hardwood.

Remove the valves, and using the wire brush clean out the carbon from the inlet and exhaust ports.

Blow out all traces of carbon dust with compressed air or type pump, and finally clean the ports with gasoline and dry them out. The carbon should now be removed from the piston crowns. Rotate the engine until the piston to be worked on is at T.D.C. Protect the other cylinder bore from the entry of carbon particles by pushing a non-fluffy rag into them.

Using a chisel shaped piece of hardwood. Carefully remove the carbon from the piston crowns. A ring of carbon should be left round the periphery of each piston, and the deposit round the top of the cylinder bore should not be touched. An indication as to when decarbonisation is require is generally given by an all round loss of power. Cars used mainly on short runs will require this attention more often than those used for long runs.

Removal and Replacement of the Valves

Whilst the cylinder head is removed the valves can be taken out. To do this compress the valve spring with the special valve spring compressor as shown in Fig. 1.

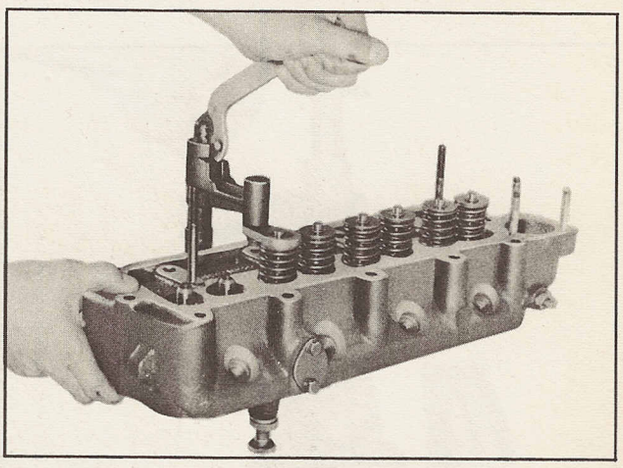


Fig. 1 Valve Spring Compressor

Removal

Remove the two cap retaining collets.
Release the valve spring, the valve spring cap, valve oil seal (Inlet valve only) and its retainer. Withdraw the valve from the guide.

Keep the valves in their relative positions when removed from the enigne, to ensure replacement in their original valve guides.

Replacement

Note that the diameter of the exhaust valve heads are smaller than the inlet valve. To replace the valves, insert each valve into its guide and replace the spring, oil seal and retainer. Fit oil seal chamfered side down wards. The oil seals are more easily fitted if they have been soaked in engine oil for a short period before use. The oil seal is used for the intake valve only.

Replace the valve spring and compress the valve spring.

Refit the cap retainers and secure them by means of the valve cotters. Remove the compressor.

	Inner Sp.	Outer Sp.
Free length mm	50 mm	52 mm
Length in use and loaded	36.9 mm - ± 0.7 kg	38.9 mm - ± 1.5 kg
Turning Nos. of coil	8.5	6.5
Effective turn of coil	6.5	4.5
Dia. of coil wire	2.8 mmø	4 mmø
Diameter of coil	24 mmø	25.2 mmø

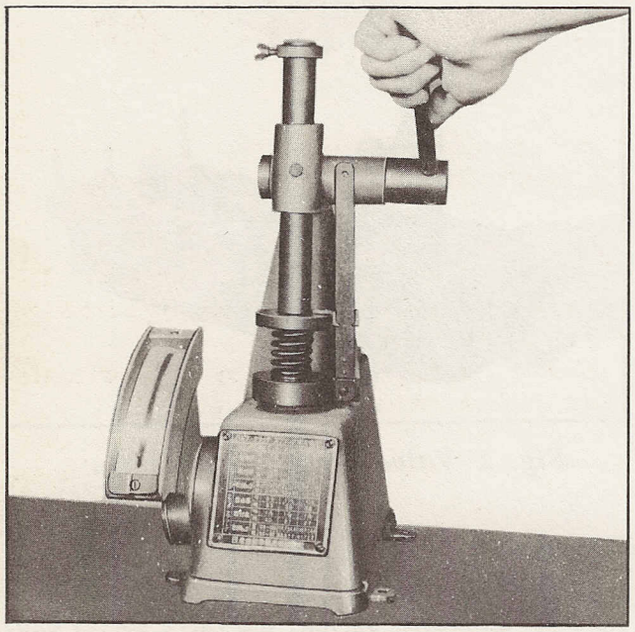


Fig. 2 Checking Spring Tension

Valve Grinding

Before replacement of the cylinder head the valves and their seats should be examined for signs of pitting or burnt patches and distortion.

If these conditions are present, the valve seats must be recut before attemoting to grind in the valves, whilst distorted valve heads should be trued or the valve renewed. Only the minimum amount of metal should be removed in the turning process.

When grinding a valve onto its sealing, the valve face should be smeared lightly with grinding paste and then lapped in with a suction type grinding tool. The valve must be ground to its seat with a semi rotary motiron. A light coil spring interposed between the valve head and the port will assist considerably when lifting the valve in order to rotate the face to a different position. This should be done frequently to spread the grinding compound evenly.

It is necessary to continue the grinding process until an even matt surface is produced on the seating and the valve face.

On completion, the valve seats and ports should be throughly cleaned with gasoline soaked rag;and dried, and the subjected to a compressed air blast. The valves should be washed in gasoline and all traces of grinding compound removed.

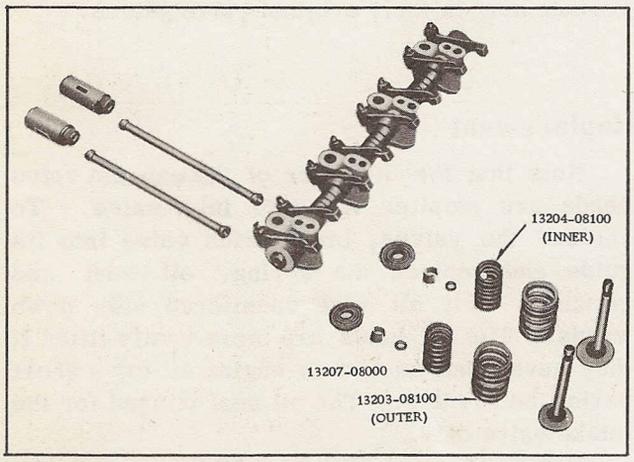


Fig. 3 Valve Spring & Valve Ass'y

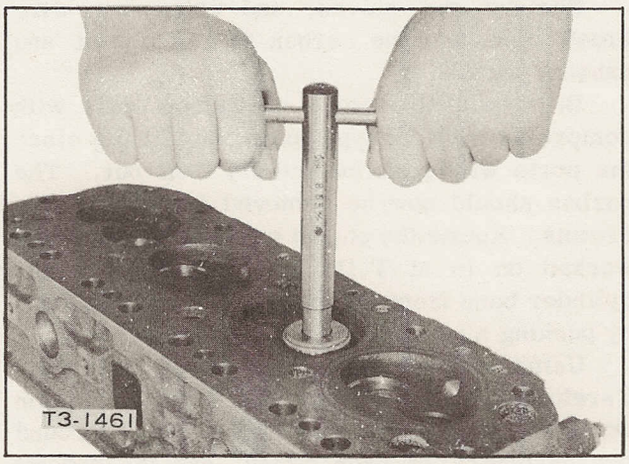
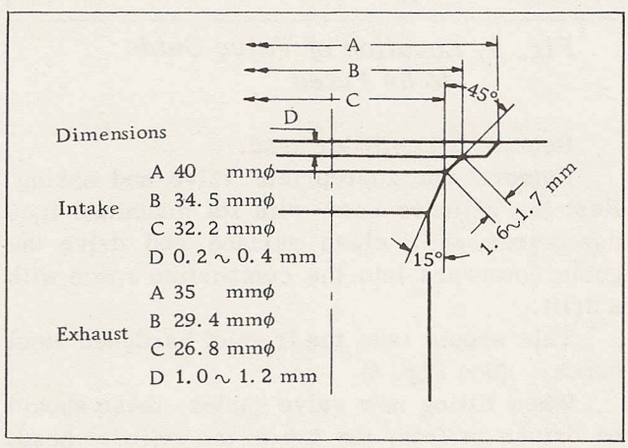


Fig. 4 Turning the Valve Seating

VALVES

Valve head diameter	
Intake valve	34.9 mm
Exhaust valve	30 mm
Valve seat width	1.63 ± 0.015 mm
Valve stem outer diameter (both intake and ex.)	8.7 mmø (-0.01, -0.02)
Overall length	
Intake valve	109.54 mm
Ex. valve	108.74 mm



VALVE GUIDE

Length Intake valve	47.6 mm
Exhaust valve	56 mm
Outer diameter (both intake and exhaust)	14.31-14.33 mm
Inner diameter (both intake and exhaust)	8.74-8.76 mm
Inner diameter at guide inlet to insert (both intake and exhaust)	14.3 mm
Clearance of valve stem and guide (both intake and exhaust)	0.04 ~ 0.07 mm
Height of valve guide (from face of the spring seat)	15.5 ~ 15.9 mm

Refitting the Cylinder Head

Ensure that the cylinder head and cylinder block joint faces are clean.

The cylinder head gasket is marked "Top" so that it will be placed head in correctly.

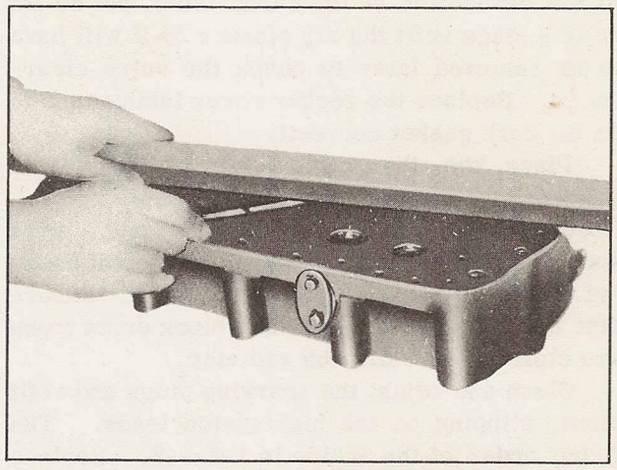


Fig. 5 Cylinder Head Distortion Measurement

Place the gasket into position and lower the cylinder head into place. Fit the cylinder head securing nuts finger tight.

Insert the push rods, replacing them in the positions from which they were taken.

Screw back all the tappet adjusting screws. Replace the rocker assembly and screw down the securing nuts finger tight. Evenly tighten the eleven cylinder head nuts a little at a time in the order given in Fig. 6, finally pulling them down with a torque wrench set to 45 lbs./ft.

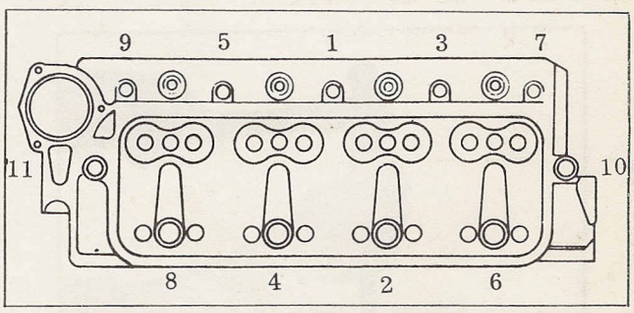


Fig. 6 The Order of Tightening the Cylinder Head Nuts

Reset the valve clearances, and finally check them when the engine is not hot or cold. The cylinder head nuts may pull down slightly more after the engine has attained its normal working temperature, in which case the valve clearances will have to be checked again and reset if necessary.

Refit the inlet and exhaust manifolds.

Fit the craburetor and reconnect the control linkage. Refit the ignition advance suction pipe

to the connection on the carburetter, but do not at this stage refit the air cleaner or it will have to be removed later to check the valve clearances. Replace the rocker cover taking care to fit the cork gasket correctly.

Place the thermostat and its housing in position and secure with the three nuts.
Reconnect the water temperature gauge wire and fit the radiator hose to the thermostat housing. Connect the cables to the battery. Ensure that the radiator and cylinder block drain tapes are closed, and refill the radiator.

Clean and adjust the sparking plugs and refit them, clipping on the hightension leads. The firing order of the engine is 1-3-4-2. Replace the clip which secures part of the electrical wiring harness to the side of the head.

The ignition can now be switched on and the engine started. When the normal operating temperature has been reached switch off and remove the rocker cover so that the valve clearances may be rechecked. Replace the rocker cover and fit the air cleaner when the final check has been made.

Whilst the engine is running check that the water hose connections and fuel line unions do not leak. Tighten them if necessary.

Removing and Refitting Valve Guides

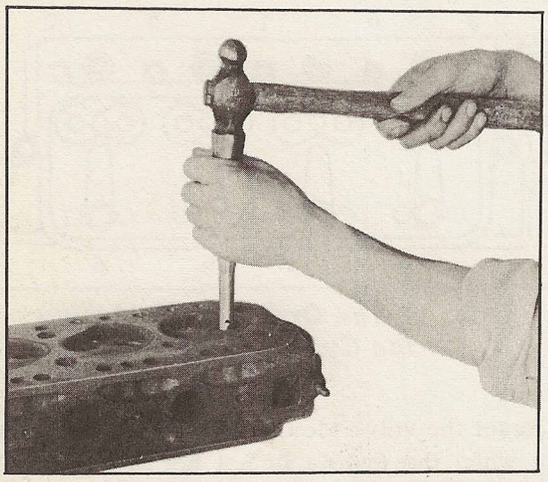


Fig. 7 Fitting Position of a Valve Guide

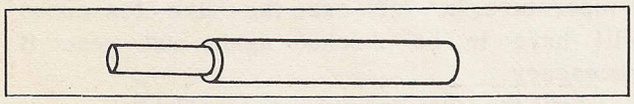


Fig. 8 Hardened Steel Punch

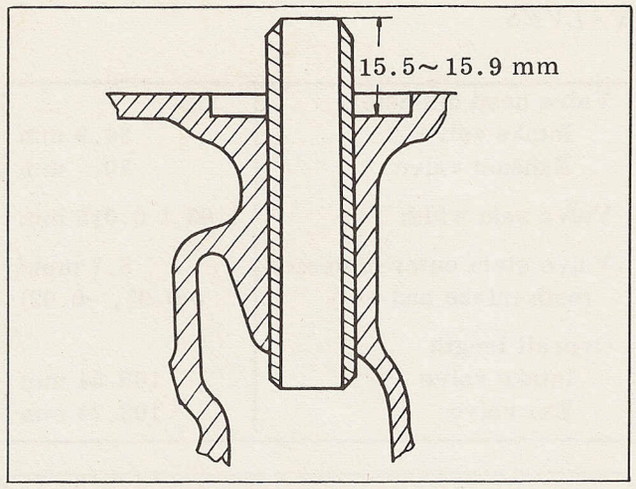


Fig. 9 Location of Valve Guide to be Fixed

Remove the cylinder head.

Remove the appropriate valve and spring. Rest the cylinder head with its machined face downwards on a clean surface and drive the guide downward into the combustion space with a drift.

This should take the from of hardened steel punch. (See Fig. 8)

When fitting new valve guides, these should be driven in from the top of the cylinder head.

Removing a Valve Spring in Position

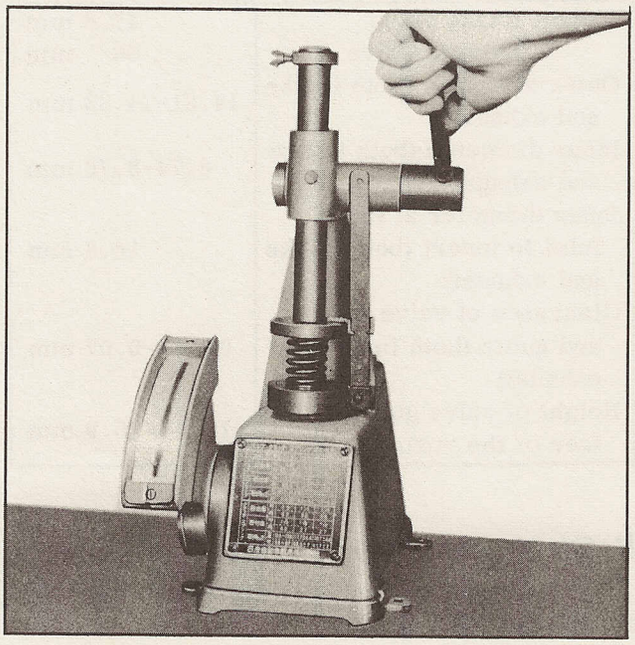
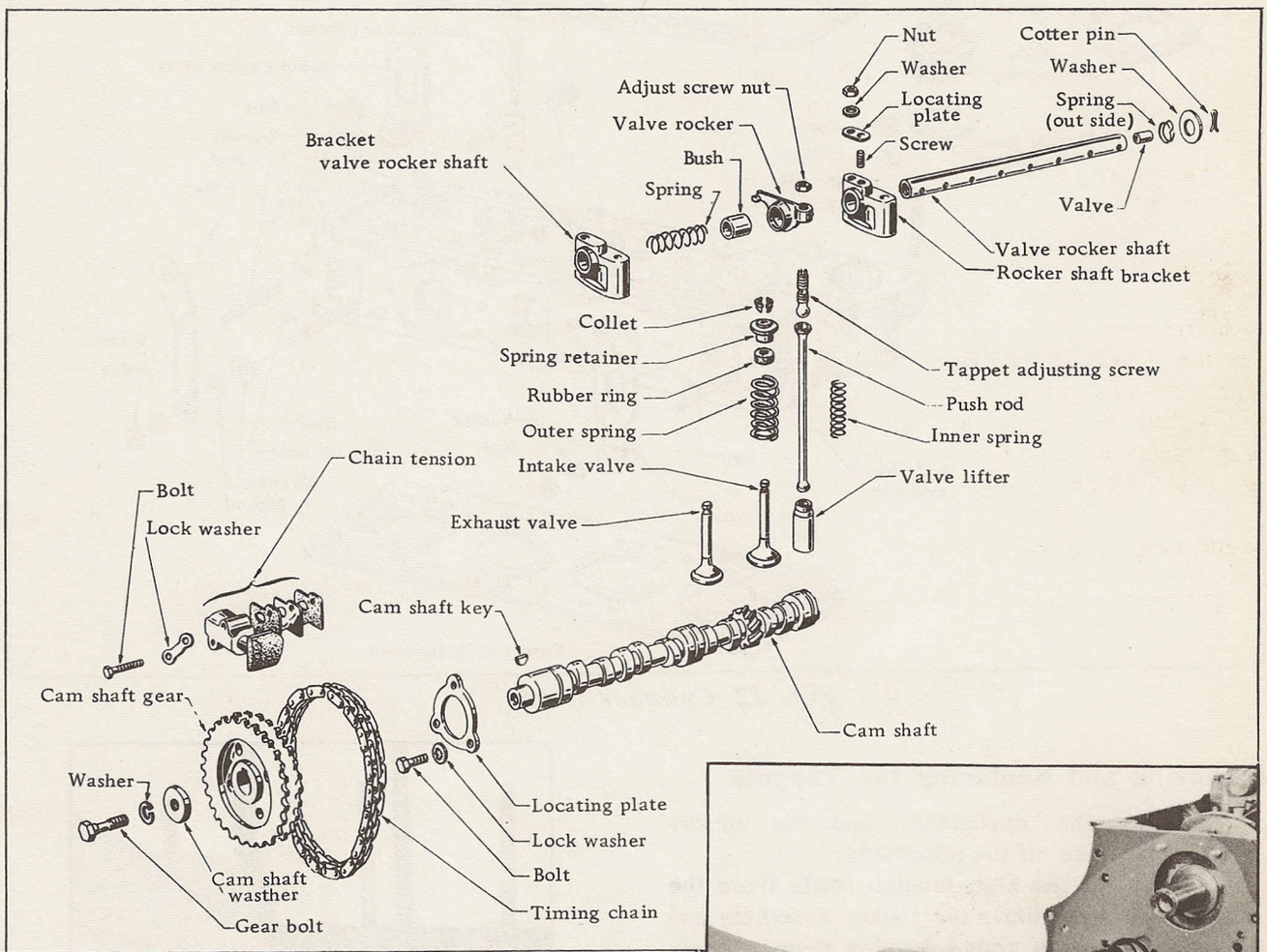


Fig. 10 Checking Spring Tension

In an emergency a new valve spring can be fitted without removing the cylinder head. When doing this, the applicable piston must be brought to its T.D.C. position to eliminate any possibility of the valve falling into the cylinder.

Remove the spark plug from the cylinder concerned. Hold the valve onto its sealing with the aid of a suitable tool such as a bent screw-driver which will pass through the sparking plug orifice, and locate on the valve head. By using the rocker shaft, as a fulcrum point, the spring can be compressed with two screwdrivers or a fork ended bar.

Withdraw the valve cotters and renew the valve spring.



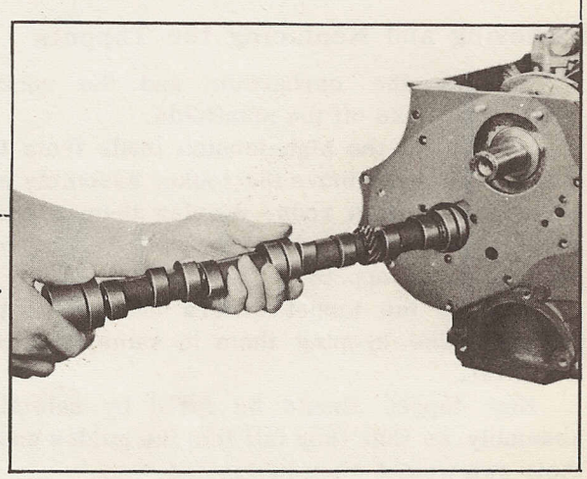


Fig. 11 Camshaft & Valve Gear

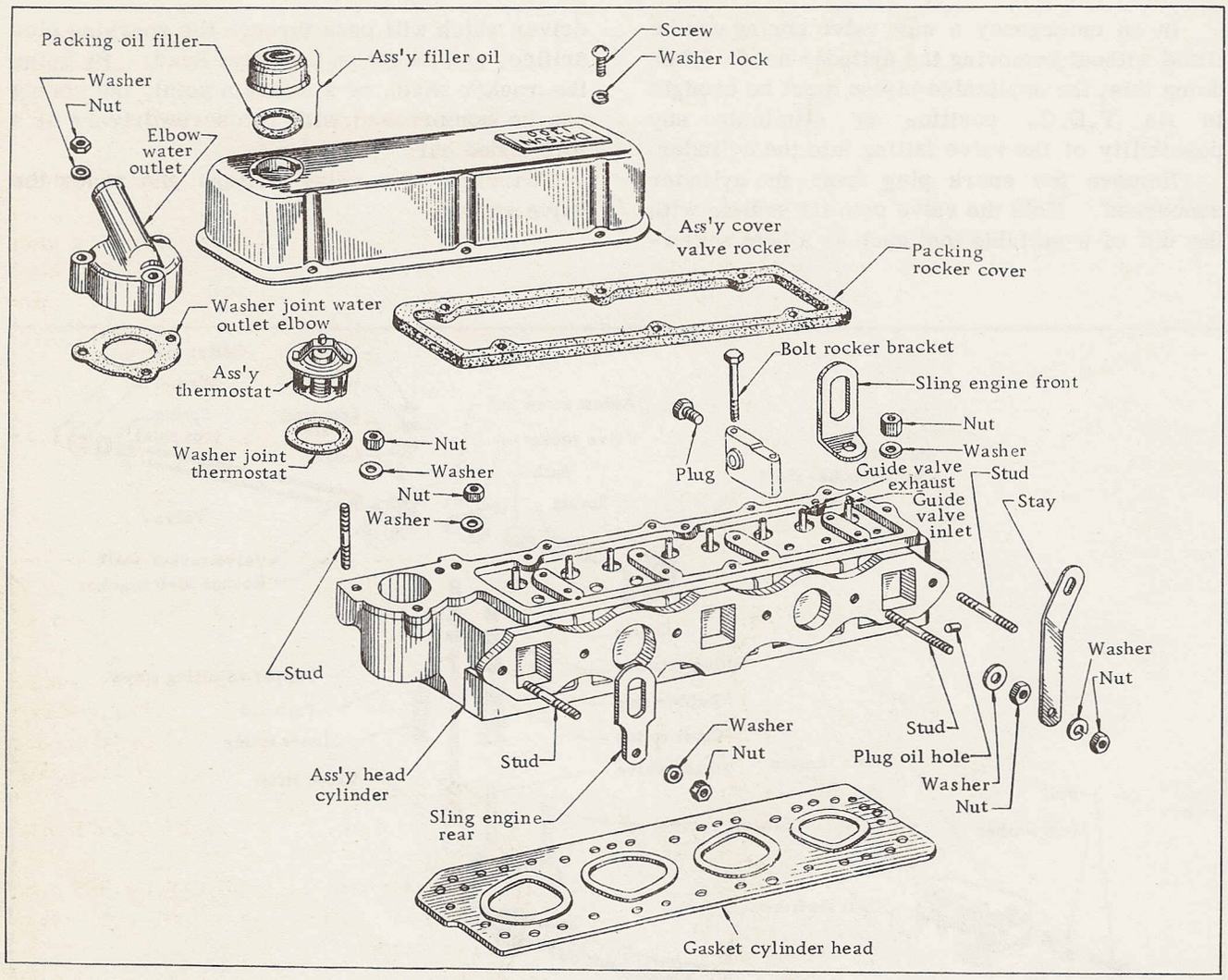


Fig. 12 Cylinder Head

Removing and Replacing the Tappets

Remove the carburetor and the rocker cover, then take off the manifolds.

Disconnect the high-tension leads from the sprking plugs, remove the rocker assembly and withdraw the push rods, keeping them in their respective positions so that they will be replaced onto the same tappets.

Remove the tappet covers and lift out the tappets, also keeping them in same locations (Fig. 13).

New tappet should be fitted by selective assembly so that they fall into the guides under their own weight when lubricated.

Assembly is a reversal of the above procedure, but car should be taken to see that tappet cover, joints are oil tight, and that the

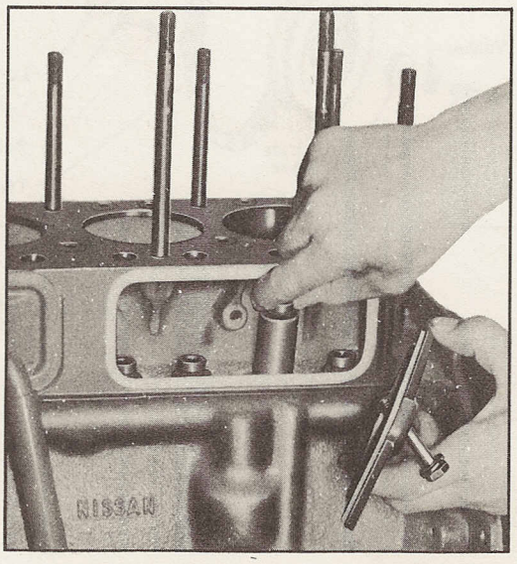


Fig. 13 Removing a Tappet

rockers are adjusted to give the correct valve clearance.

Dia. of tappet 22.48~22.49 mmø
Dia. of cyl. side hole 22.50~22.52 mmø
Clearance of the hole 0.01~0.04 mm

Piston and Connecting Rod Removal

Drain the cooling water from the engine and radiator. Drain and remove the sump from the engine, then disconnect and remove the oil strainer. Take out the setscrews and rock washers from the big-ends and withdraw the caps. It will be noted that the caps are off-set; When used parts are replaced after dismantling it is essential they are fitted into their original positions. To ensure correct refitting mark the caps and connecting rods on the sides to identify them together. The piston and connecting rods must be with drawn upwards through the cylinder bores.

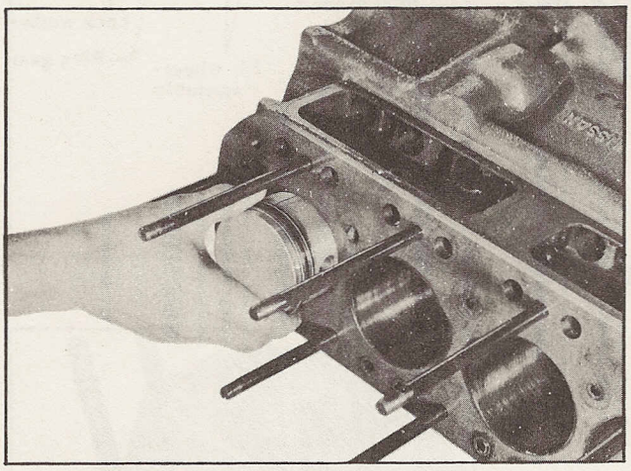


Fig. 14 Removing Connecting Rod with Piston

Release the connecting rod from the crankshaft and slowly push the piston and rod upwards through the cylinder bore.

NOTE:

It may be necessary to remove the ring of carbon or lip from the top of the cylinder bore with a hand scraper to avoid risk of piston ring breakage.

Remove the assembly from the top of the cylinder block.

Check the crankpins for oval with a pair of micro meter calipers, and examine the bearing surface for scoring, either defect will necessitate the removal of the crankshaft for regrinding.

CONNECTING ROD

Distance between center of large end and small end	150±0.03 mm
Large end bearing	
Type	Clevite (F500)
Overall width	22±0.1 mm
Thickness	1.87~2.34 mm
Outer diameter	51.35 mm
Width of large end	31 mm
End play of large end	0.20-0.31 mm
Finishing dimension of inner diameter of small end bush Standard	17.450-17.462 mm

CRANKSHAFT

Clearance of bearing periphery to cylinder block hole	-0.013-0.050 mm
Material	White metal (Block side) Clevite metal (Cap side)
Clearance of bearing inner diameter and crank journal	0.0127-0.0508 mm
Diameter of main journal	50.813-50.825 mm
End play of crankshaft	0.051-0.076 mm
Crank pin diameter Standard	47.640-47.652 mm
Difference of crank pin diameter	Less than 0.012 mm
End play, flywheel is installed	Less than 0.05 mm

The shell bearing are removable by hand. The bearings are require no "bedding in" it is being only necessary to ensure that the housings are scrupulously clean and dry, and to place the bearings into position with the tangs located in their corresponding slots. Always renew bearings if they are scored or damaged in any way, or following the regrinding of the crankshaft bearing surfaces. In the latter case undersize bearings will be required and the kinds of sizes available are -8, -12, -25, -50, -75 and -100 (with punched mark).

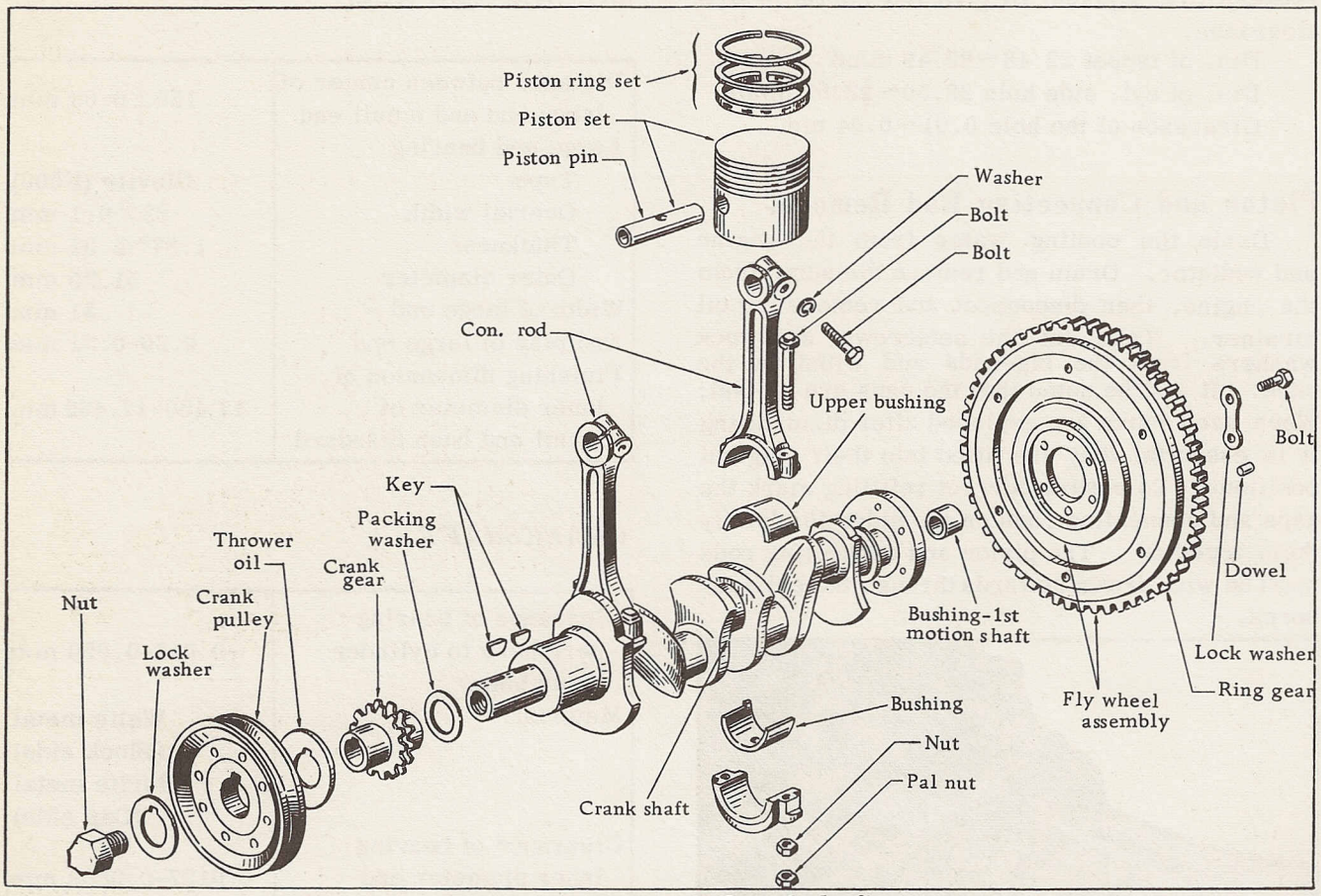


Fig. 15 Piston & Crankshaft

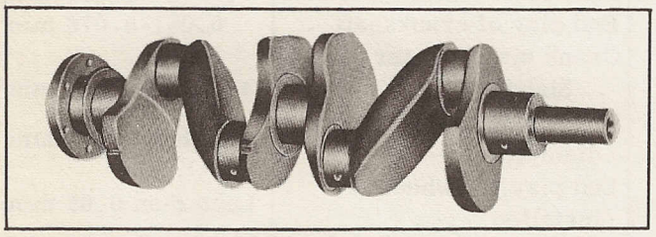


Fig. 16 Crankshaft

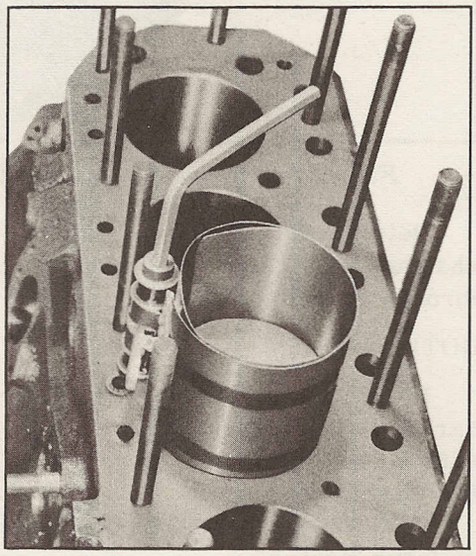


Fig. 17 Inserting the Piston

PISTON

Replacing Pistons and Connecting Rods

Insert each piston and connecting rod assembly into the cylinder from which it was taken; it is essential that the split in the skirt of the piston is positioned towards the camshaft.

Compress the piston rings with inserting piston using tool (Fig. 18), and gently tap the crown of the piston with the wooden end of a hammer handle, until the piston is clear of the piston ring clamp.

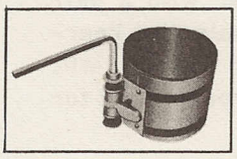


Fig. 18 Piston Adapter

Now push the piston down the cylinder block until the big end of the connecting rod just protrudes through the bottom of the cylinder bore, then position upper half bearing shells.

NOTE:

Each upper & lower bearing has two oil holes, there by ensuring sufficient and it is of the greatest importance that the corresponding oil hole in the bearing shell registers with the oilway to provide an unobstructed passage.

Pull the connecting rod onto the crankpin taking care not to injure the bearing surface. Insert the shell into the connecting rod cap; position the cap and the locking washers.
Insert the setscrews and tighten with a torque wrench to 21.7-24.6 lbs./ft.

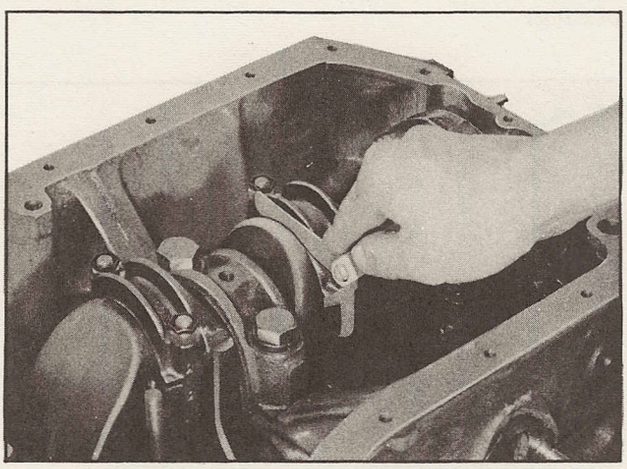


Fig. 19 Measuring Thrust Clearance of Connecting Rod

Finally knock back the lock washers.

Check the connecting rod big end for side clearance (7/1000 in.) and see that the shell bearings are not binding on the crankpin when rotating the crankshaft. If it is difficult to turn, undo the big end and examine the shell and seat for dirt or grit.

Before reassembling always apply a little clean oil to the piston surfaces and into the cylinder bore. Never file the connecting rod caps or their mating surfaces as this creates oval in the bearing.

Removing a Piston

Remove the clamping bolt from the small end of the connecting rod and push out the gudgeon pin. The gudgeon pin is a push fit in piston at 70° F. (21.1° C.)

When reassembling, ensure the gudgeon pin is positioned in the connecting rod so that its groove is in line with the clamp screw hole. Check that the spring washer fitted under the head of the pitch bolt is not damaged.

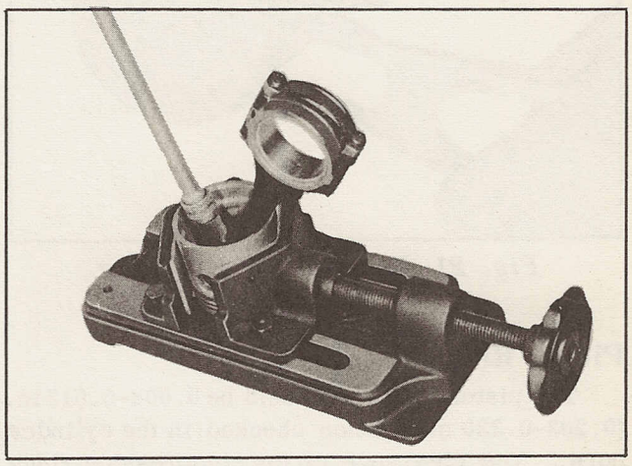


Fig. 20 Re-assembling Pistons and Connecting Rods

PISTON PIN

Diameter		17.41 mmø
Over size	1	0.125
	2	0.250
	3	0.375
Length		65.3 mm
Clearance of pin and pin hole		Degree to be able to push it by finger at 20° C.
Clearance of pin and connecting rod bush hole		0.01 mm

Piston and Bores

Insert "Feeler gauge", 0.04 mm thick, between cylinder bore and piston, and measure at the lower portion of the cylinder bore at right angle to the piston pin.

There should be a clearance of 0.015~0.030 mm.

Pull out with feeler gauge by the spring scale and then inspect if the reading is within regulations (0.5-1.5 kg) or not.

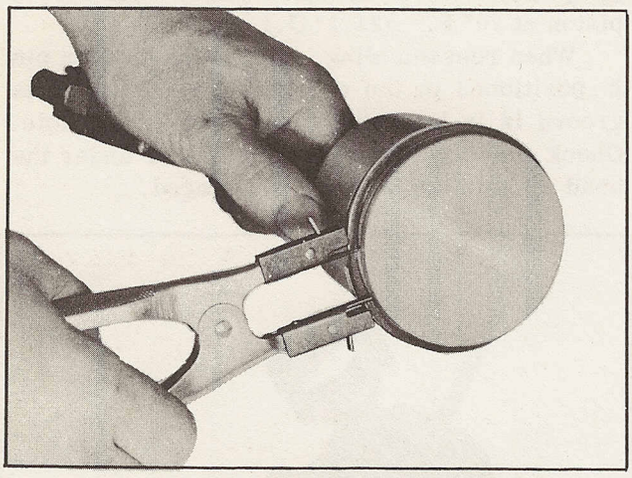


Fig. 21 Removing Piston Ring

Piston Rings

The piston ring gap should be 0.008-0.013 in. (0.203-0.330 mm) when checked in the cylinder bore. The clearance of the compression rings in their grooves should amount to 0.0015-0.0035 in. (0.038-0.089 mm) and the oil control ring 0.0016-0.0036 in. (0.041-0.092 mm).

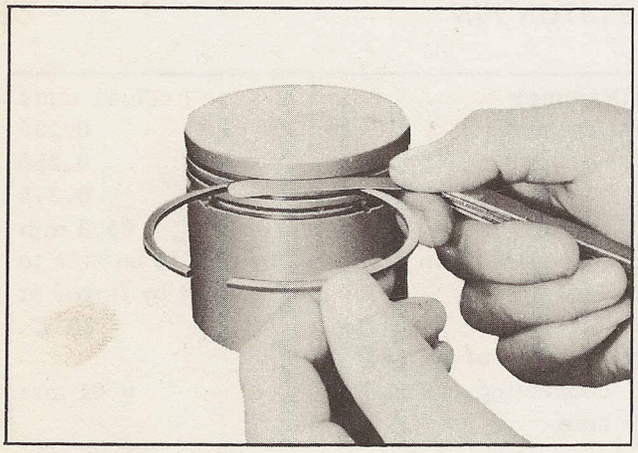


Fig. 22 Clearance Between Ring and Groove

Because the piston rings do not travel to the end of the cylinder bores a "lip" is eventually formed due to wear.

This may be checked with a dial gauge and must be removed. If this is not done there will be a tendency to noisy operation or a fractured ring, caused by the top piston ring striking the lip.

Piston and rings are available in. 0.010 in. (0.254 mm) 0.020 in. (0.508 mm) 0.030 in. (0.762 mm), and 0.040 in. (1.016 mm) oversizes. The piston rings should always be fitted from the crown of the piston and never pushed upwards over the skirt. Before fitting the rings, remove any carbon deposit from the grooves in the piston. When fitting, note that the second compression is tapered type and oil control ring is slat type processed by chromium plating.

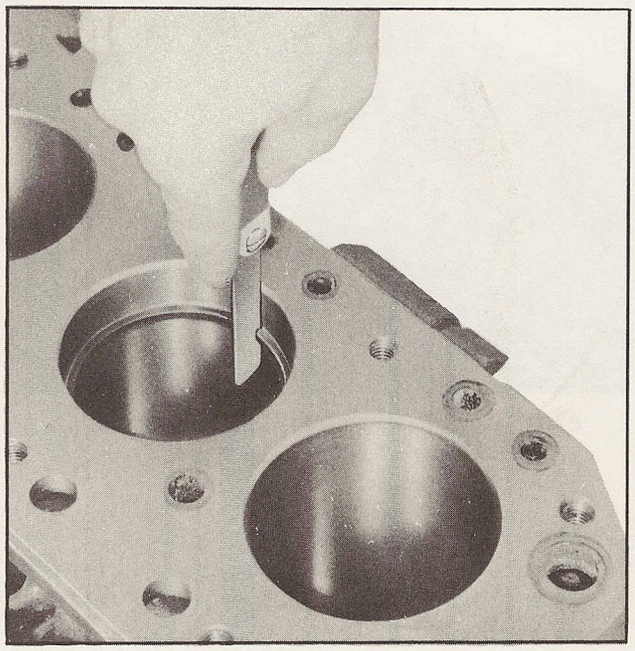


Fig. 23 Measuring Clearance of Ring Joint