BRITISH LEYLAND

TRIUMPH

SERVICE TRAINING NOTES

LUCAS PETROL INJECTION

TR 5 . TR 6

2.5

SALOON AND ESTATE

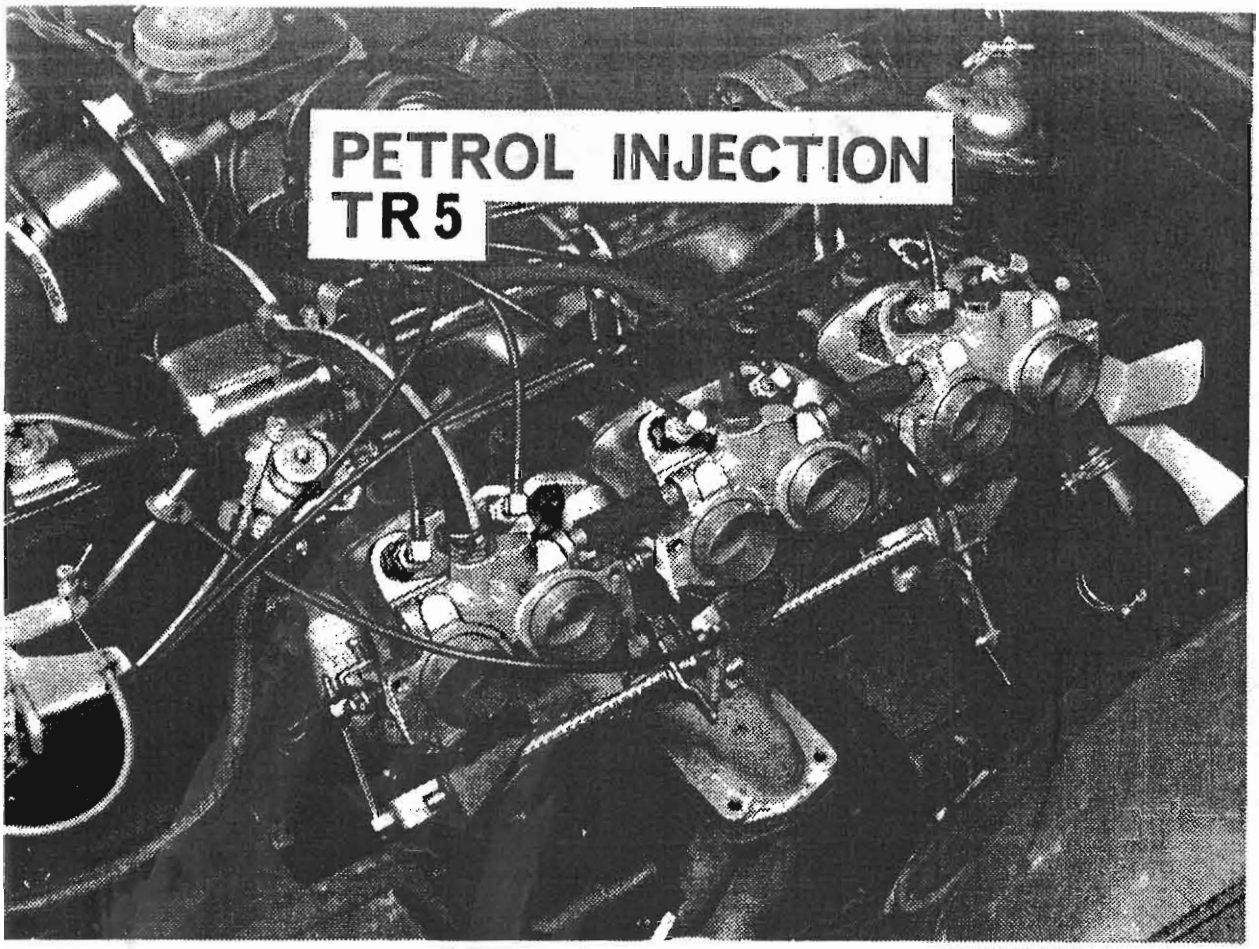
Issued by:

SALES AND SERVICE TRAINING CENTRE

BRITISH LEYLAND MOTOR CORPORATION LIMITED

RADFORD, COVENTRY, ENGLAND

Lithographed in England by The Nuffield Press Limited, Cowley, Oxford
25/7 (81684) 5/71—1,000



INTRODUCTION

This booklet and it's accompanying filmstrip show the main features of the Petrol Injection Systems used on Triumph cars.

The book is split into three main parts.

Part 1 TR5

Part 2 TR6

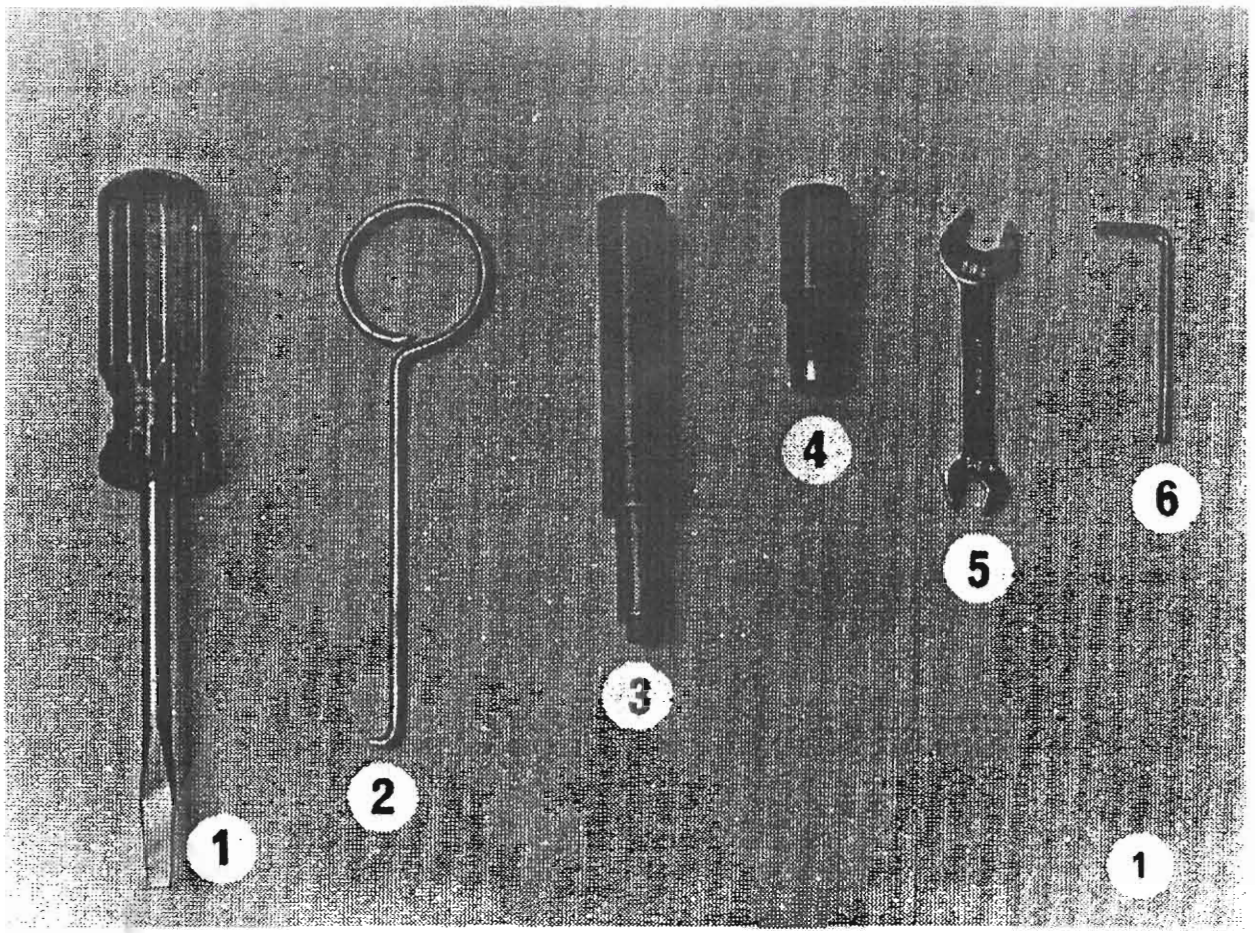
Part 3 2.5 Saloon and Estate Cars.

Part 1 of the booklet deals with the complete servicing and setting procedures used on the TR5. Parts 2 and 3 deal with the differences in servicing peculiar to the relevant models.

At the end of the book there is a fault finding section giving the methods of checking and rectification.

It is intended that the filmstrip should form the backbone of a lecture. The subject matter can be elaborated or abbreviated to suit the standard of the audience.

The booklet by itself provides a handy pocket manual for ready reference.

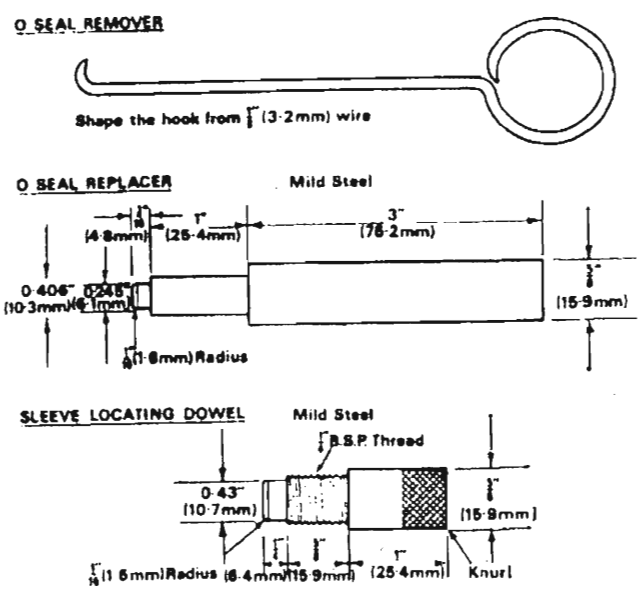


FRAME 1

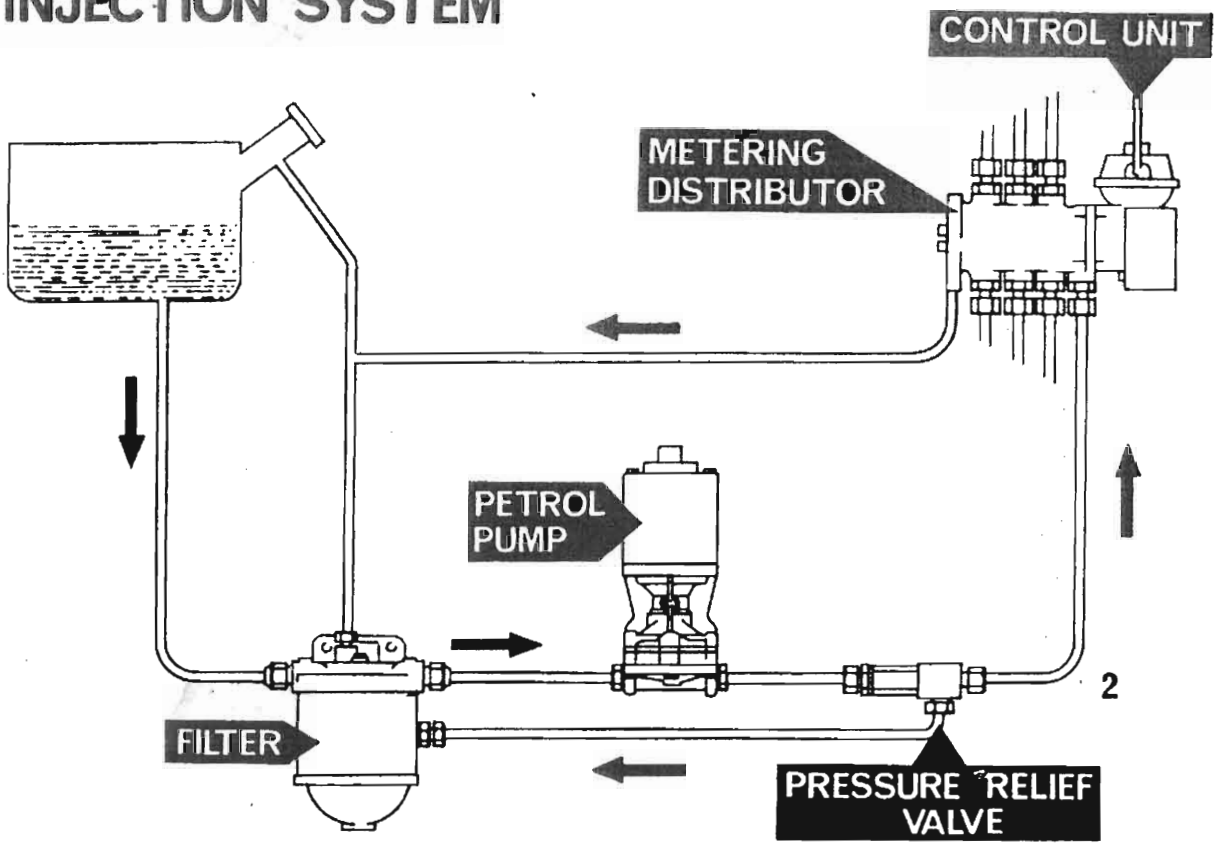
PART 1

Shown are the main tools required for servicing the metering unit:

1. 4" Screwdriver
2. Metering distributor hook for removing sealing rings
3. Tool for fitting sealing rings
4. Tool for locating inner sleeve
5. Open ended spanner 4 BA/2 BA
6. Allen Key $\frac{1}{32}$" (3.0 mm)



TR5 PETROL INJECTION SYSTEM



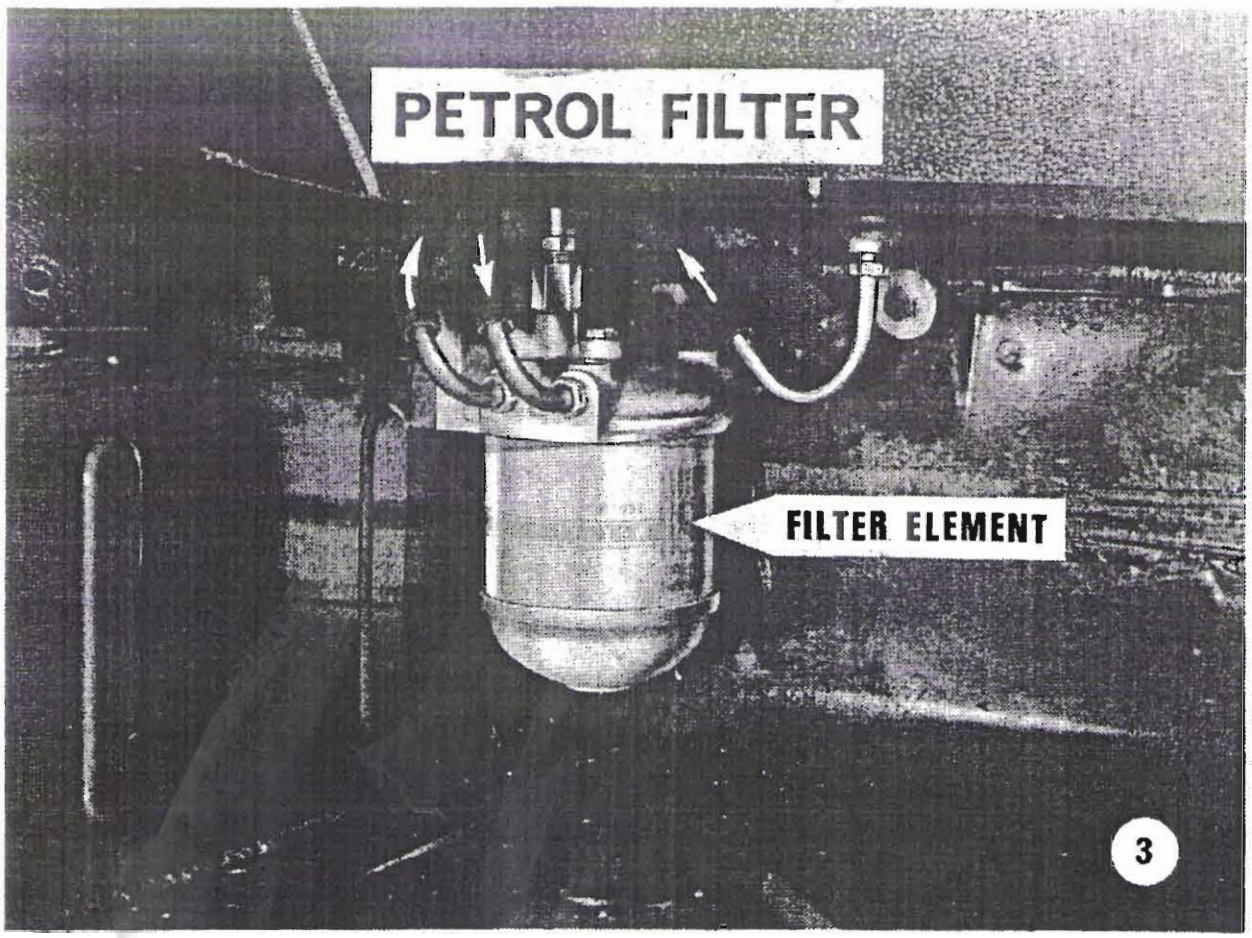
FRAME 2

A simplified schematic illustration of the Petrol Injection system as fitted to the TR5 is shown above.

An electric pump draws fuel from the tank, through a paper element filter. The fuel is pressurized by the pump, line pressure being maintained at 106 - 110 lbs. sq. in. (7.42 - 7.70 kg. sq. cm) by a relief valve, excess fuel being returned through this valve to the filter.

The metering distributor is driven off the engine distributor drive gear and delivers accurately metered and timed fuel charges to each injector in turn. Fuel used to lubricate the metering distributor is returned to the tank.

The fuel quantity is determined by a mixture control unit mounted integral with the metering distributor.

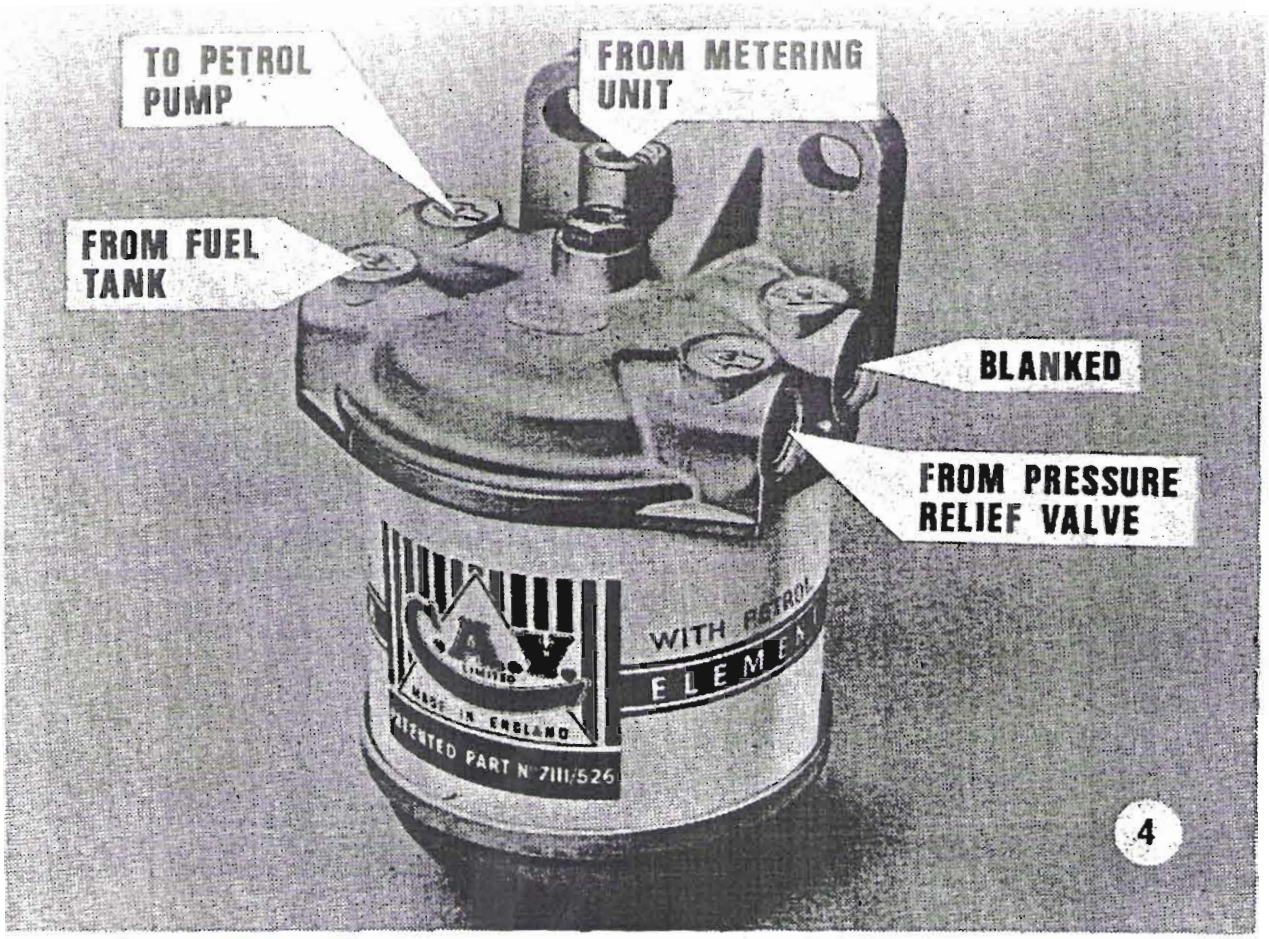


FRAME 3

PETROL FILTER

The petrol filter which is gravity fed, is situated in the boot underneath the petrol tank.

When changing the filter element it is ESSENTIAL that the flexible feed pipe between the petrol tank and filter is clamped.



FRAME 4

The filter unit is shown with the pipe connections labelled.

It is very important when replacing an element to check that the words "FOR USE WITH PETROL" are printed on it as shown. The element for diesel fuel looks the same, but the resins in the paper dissolve in petrol and would cause trouble in the system.

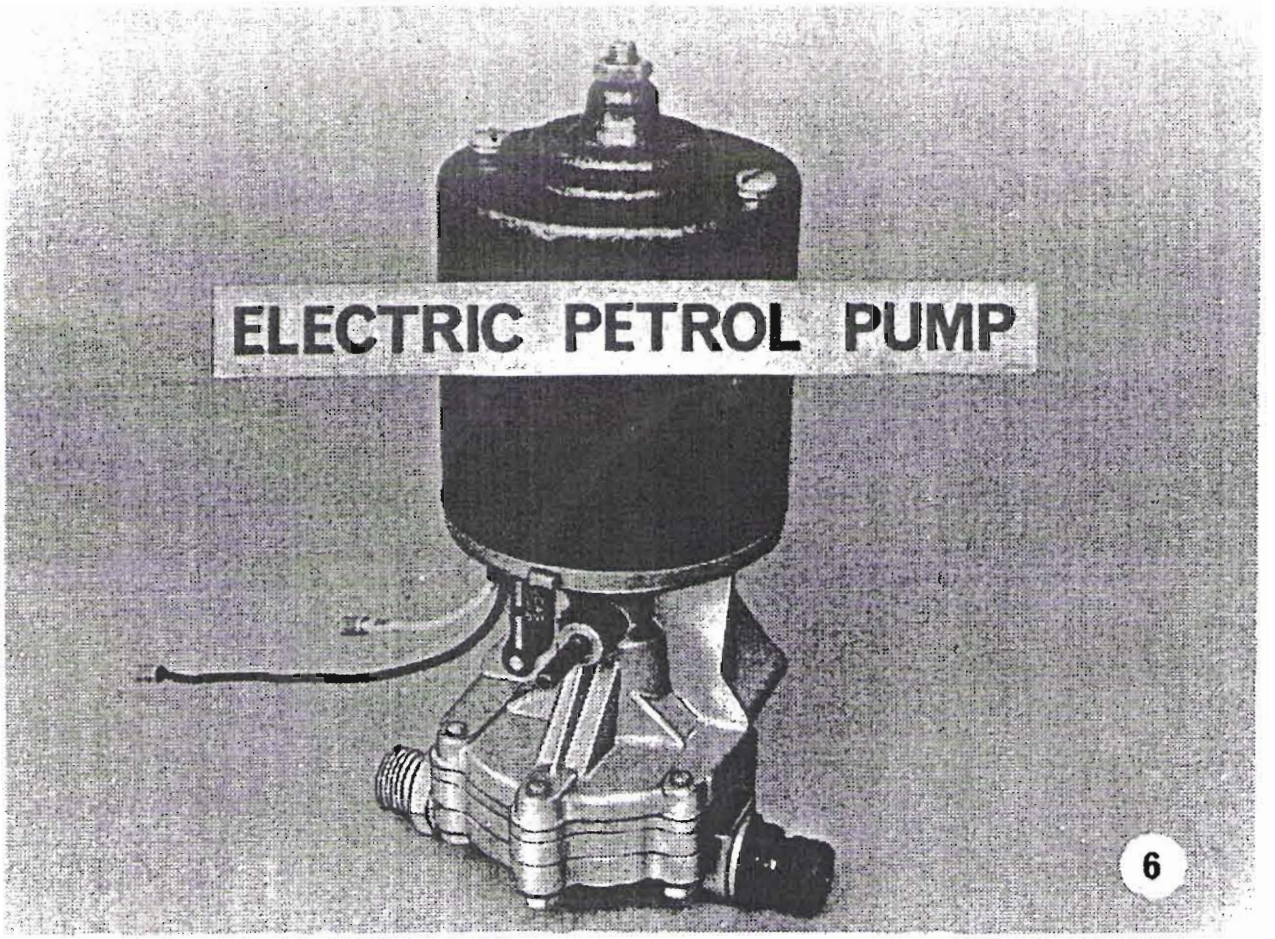
FRAME 5

The petrol filter is shown dismantled.

When changing the element at the prescribed mileages the following details should be attended to:

1. Cut the fuel supply from the petrol tank by clamping the flexible pipe
2. Place tray under filter to catch surplus petrol
3. Remove element
4. Replace sealing rings and ensure all surfaces are clean and free from damage.
5. Check that element is labelled for use with petrol.

NOTE:—There are three sealing rings to change.

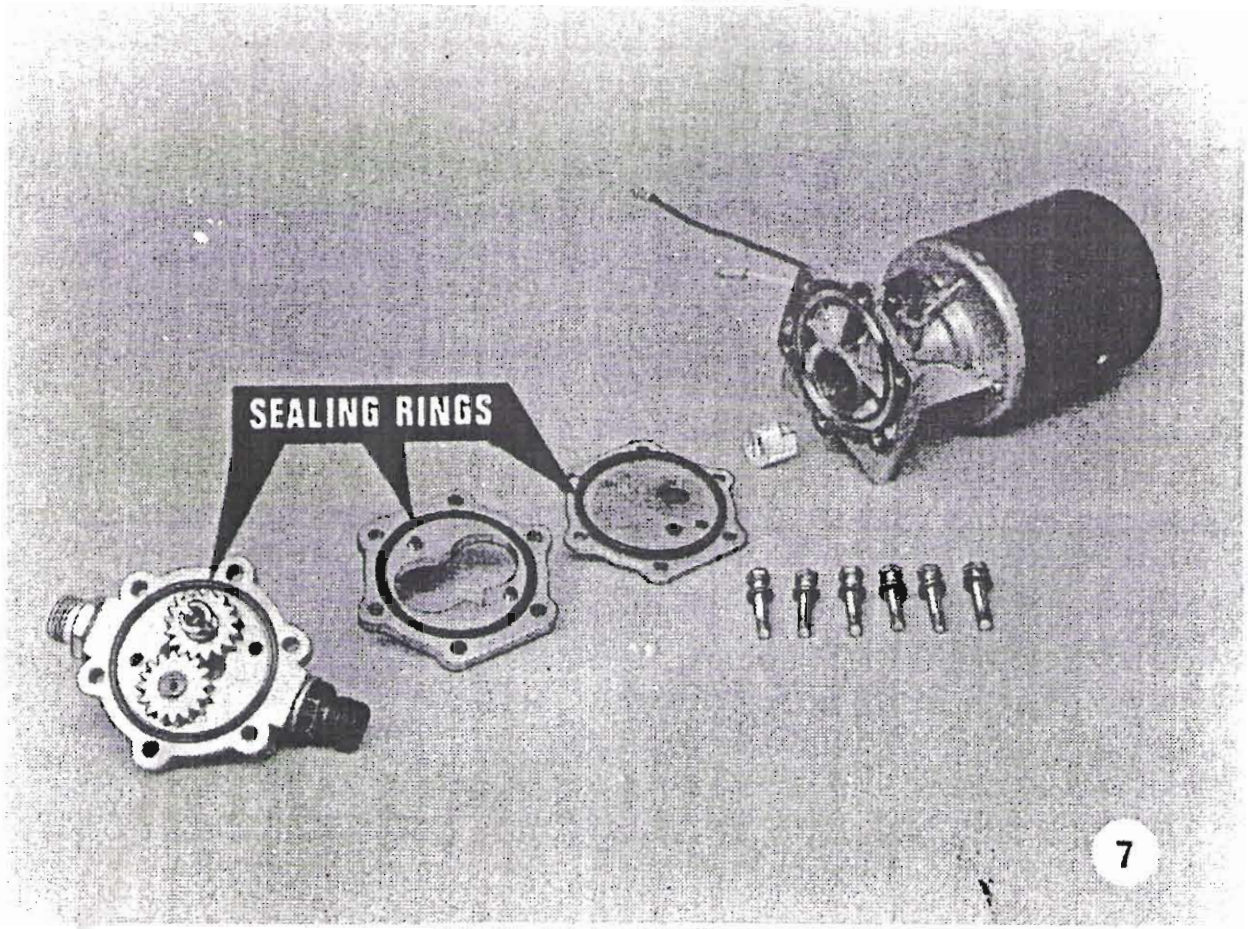


FRAME 6

PETROL PUMP

This unit is a conventional gear type pump driven by an electric motor.

Gear Pump Details	16 Imperial Gallons per hour 19.2 U.S. Gallons per hour 72.74 Litres per hour
Electric Motor	Permanent magnet field motor D.C. 9 - 13.5 Volts 5.0 Amps



FRAME 7

SERVICING PUMP UNIT

Petrol sealing between pump and electric motor is by a lip type seal.

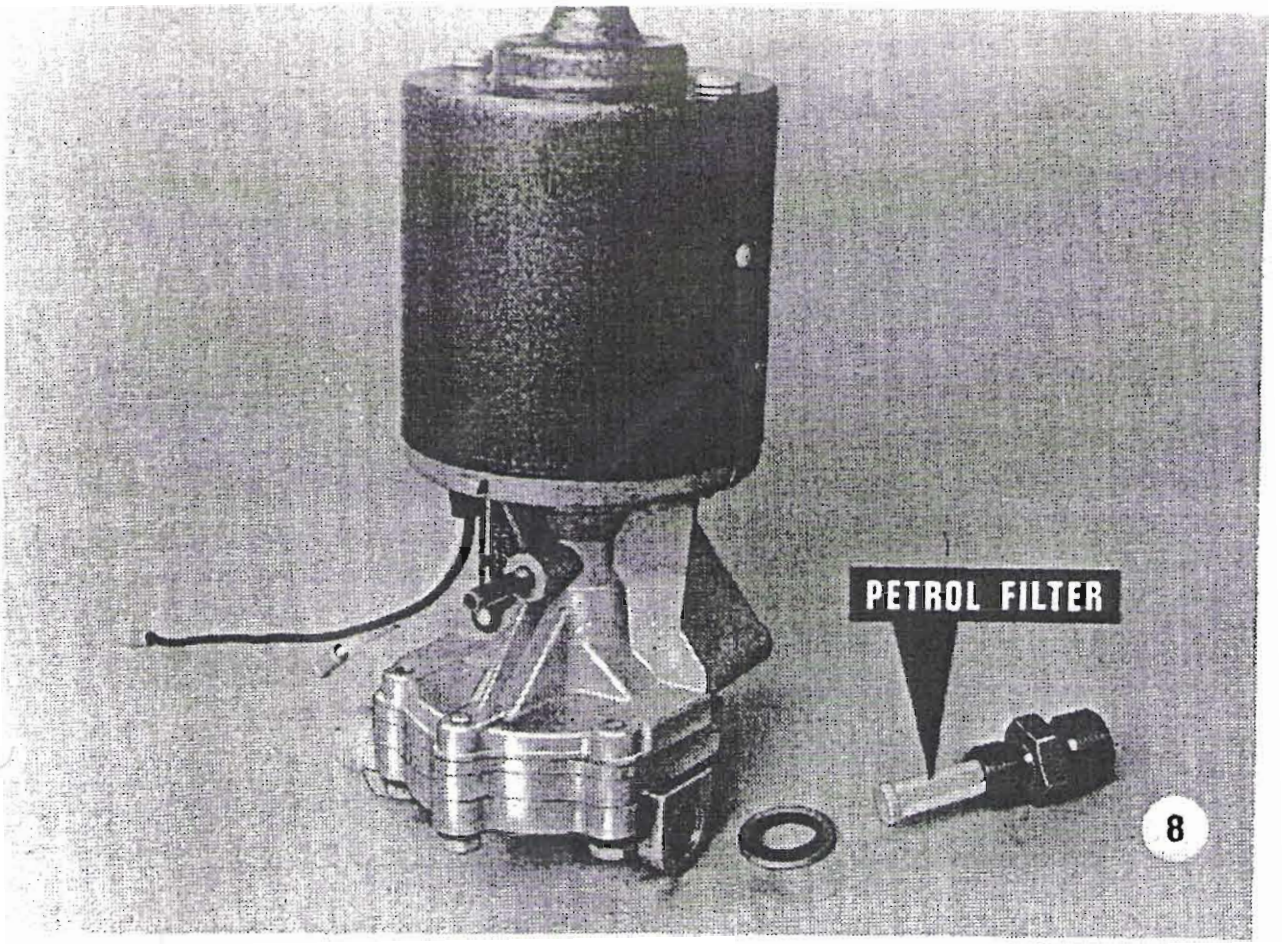
Leakage of petrol will be detected from the overflow pipe on the motor side of the seal, a flexible pipe is fitted to the pump and the pipe end is found underneath the boot on the left-hand side behind the rear wheel arch.

If petrol is found leaking, switch off ignition immediately, and rectify fault.

CHECKING SEAL LEAKAGE

1. Connect pump inlet to a paraffin supply
2. Connect a pipe to pump outlet and immerse free end in paraffin
3. Connect motor to a 12 volt supply
4. While pump is running hold it well above paraffin supply and if seal is leaking a discharge of bubbles will be detected from the outlet pipe.

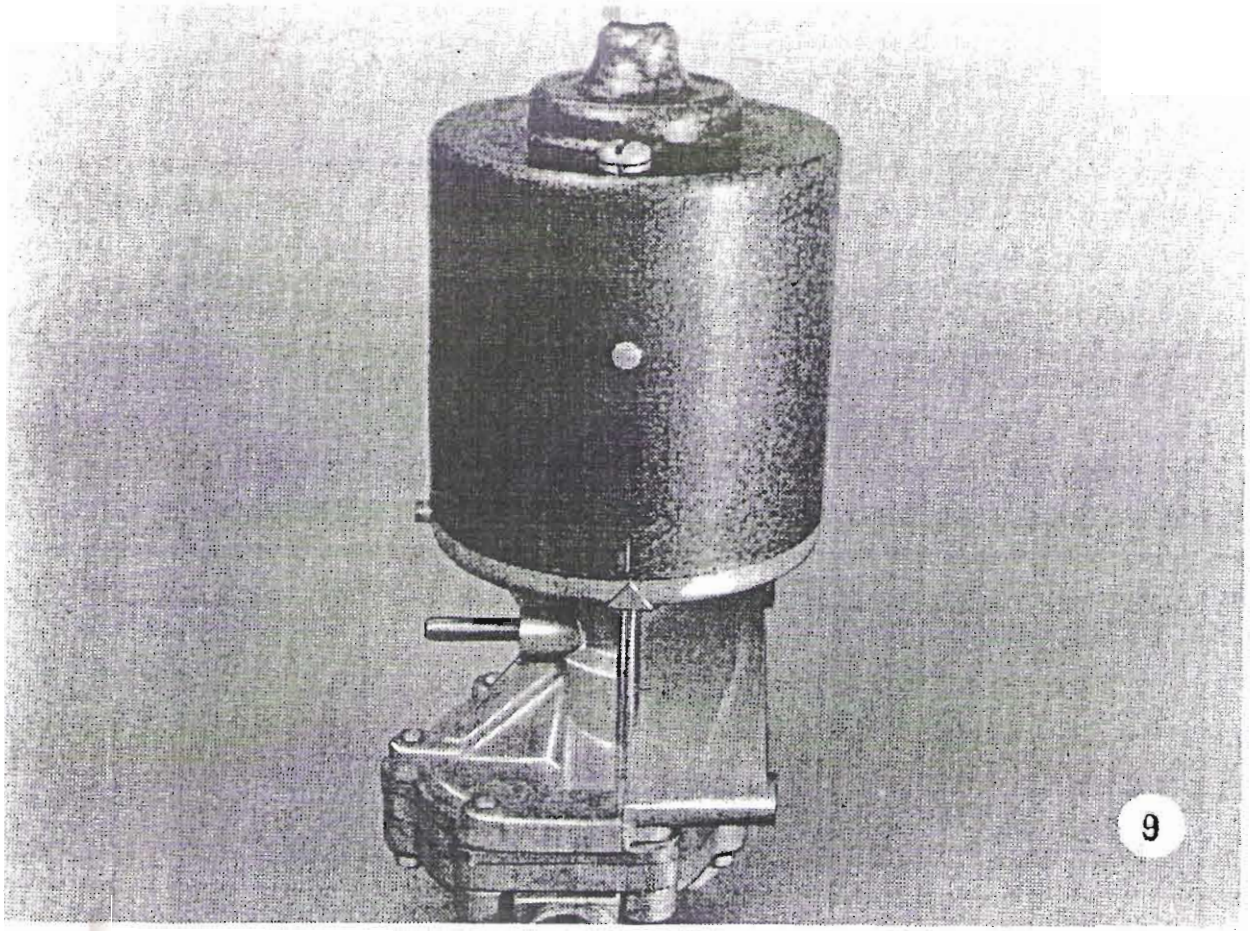
Pump Gear and Housing should be checked for scores on gear end faces and plates. Any parts that are defective must be replaced with a new pump unit. Always renew the three 'O' rings if pump is dismantled, they are obtainable in kit form.



FRAME 8

Petrol entering the pump from the petrol tank is passed through a fine nylon strainer.

When changing the main filter element always remove strainer and thoroughly clean it, also check sealing washer fitted between pump body and strainer.

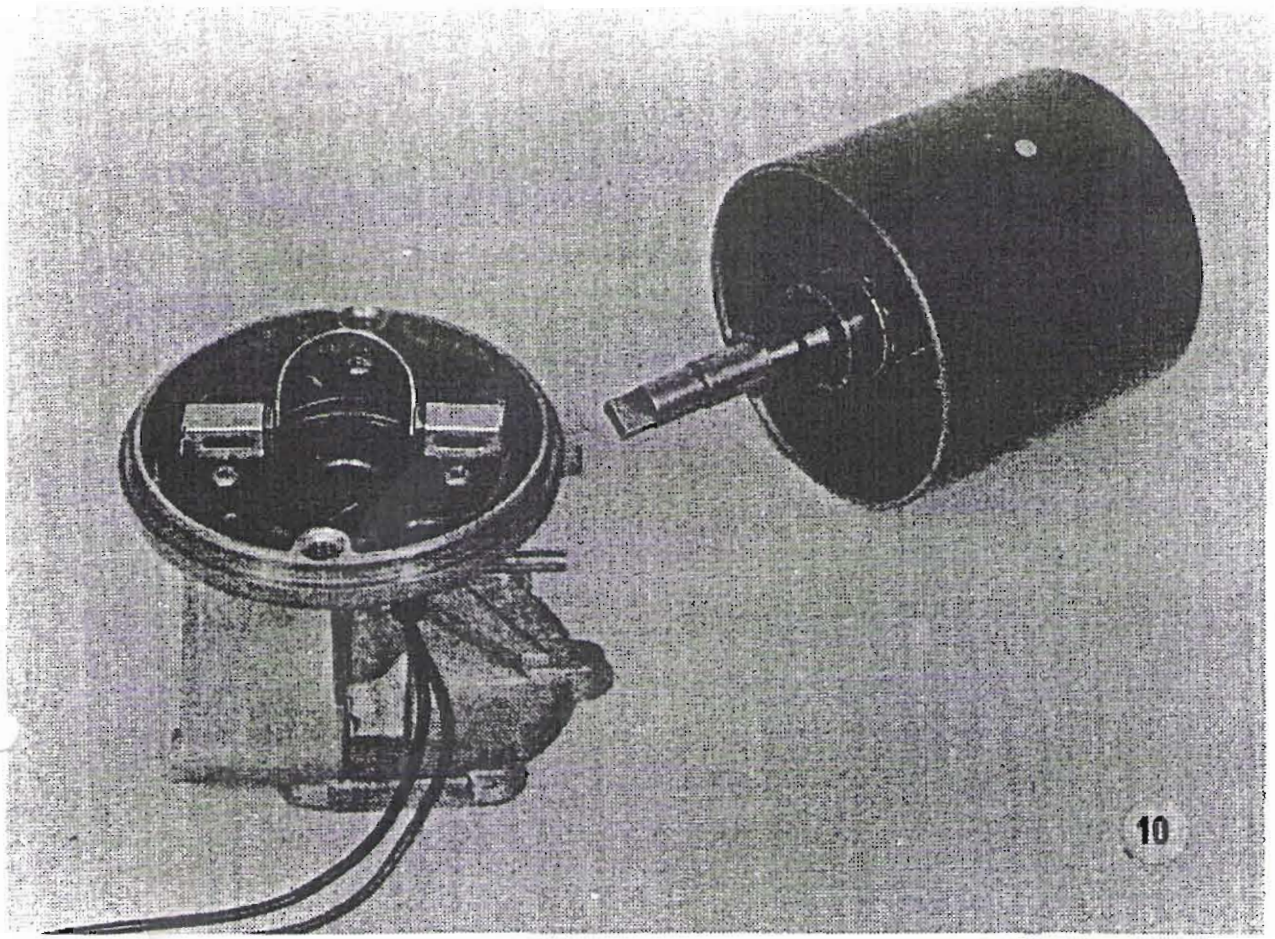


FRAME 9

SERVICING PETROL PUMP MOTOR

Before dismantling the motor check that the end flange in relation to the housing which contains the permanent magnets is marked as shown. If there are no marks scribe a line to enable correct assembly.

If the housing was assembled 180° out of alignment, the motor would run in reverse.



FRAME 10

When separating armature and housing from alloy base, care must be taken to prevent damaging motor brushes which become trapped behind the circlip.

To get the brushes past the circlip they must be held back. This can be done by bending some soft wire into a horseshoe shape and inserting the free ends between the two brushes as shown. The same procedure helps in assembly.

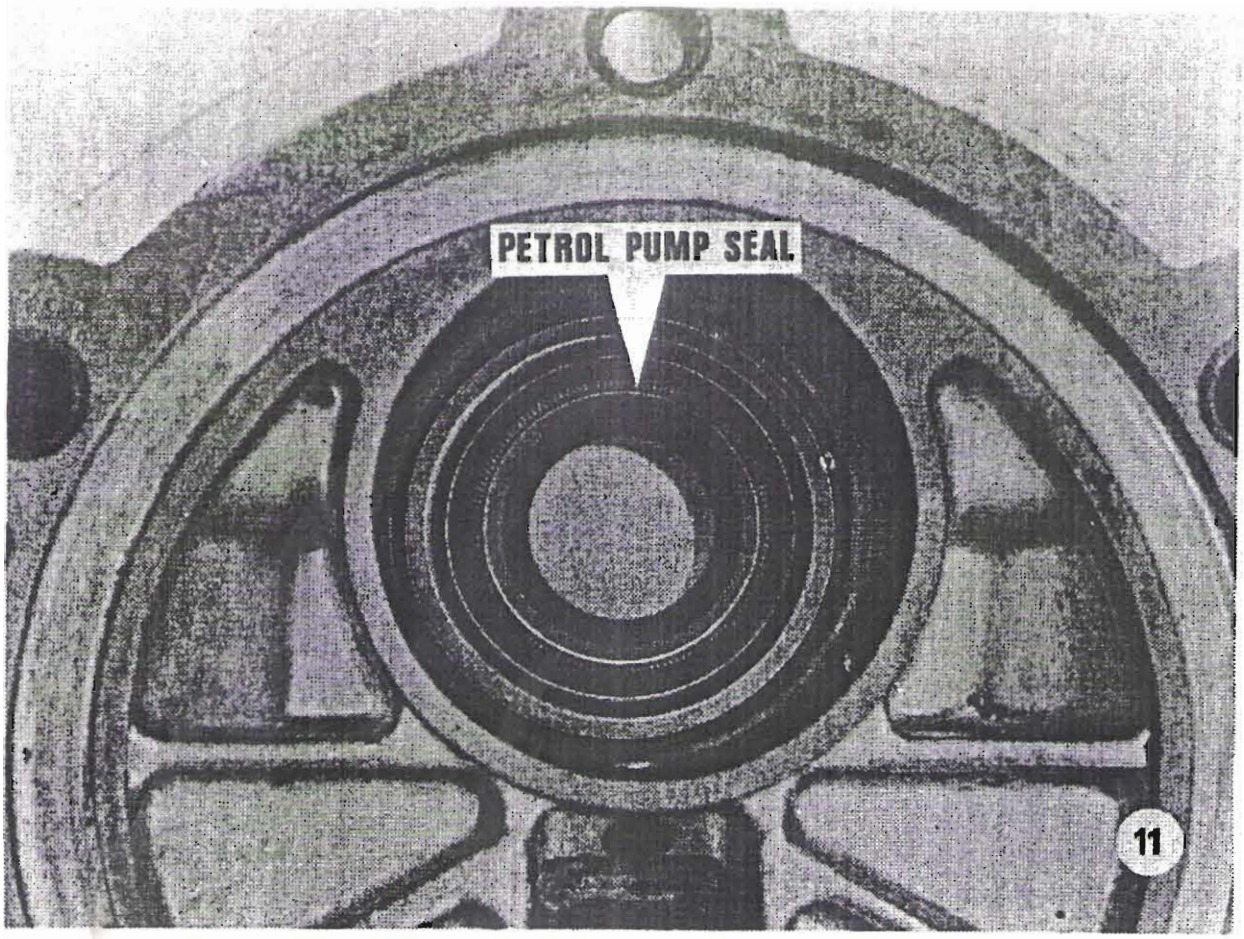
NOTE.—On pump side of circlip there is a flat thrust washer and care must be taken not to lose it.

The brushes must be replaced when worn to $\frac{1}{8}$" (3.17 mm).

Brush spring tension should be 5 - 7 ozs (142 - 198 g) when compressed to 0.158" (4.0 mm).

The armature insulation should be checked with a 15 watt 110 volt AC mains test lamp between any commutator bar and armature shaft.

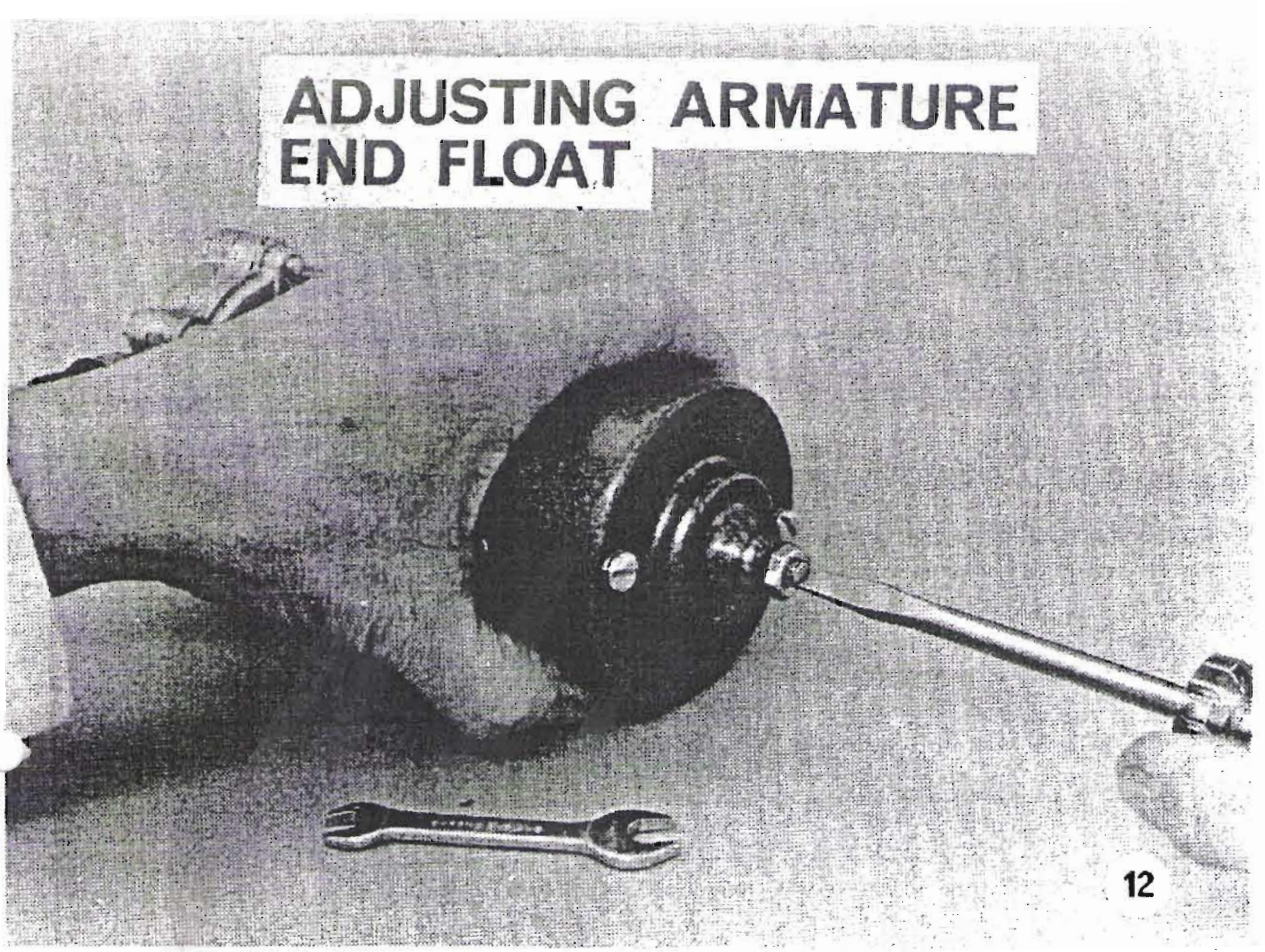
Brush wear must be checked at prescribed mileages.



FRAME 11

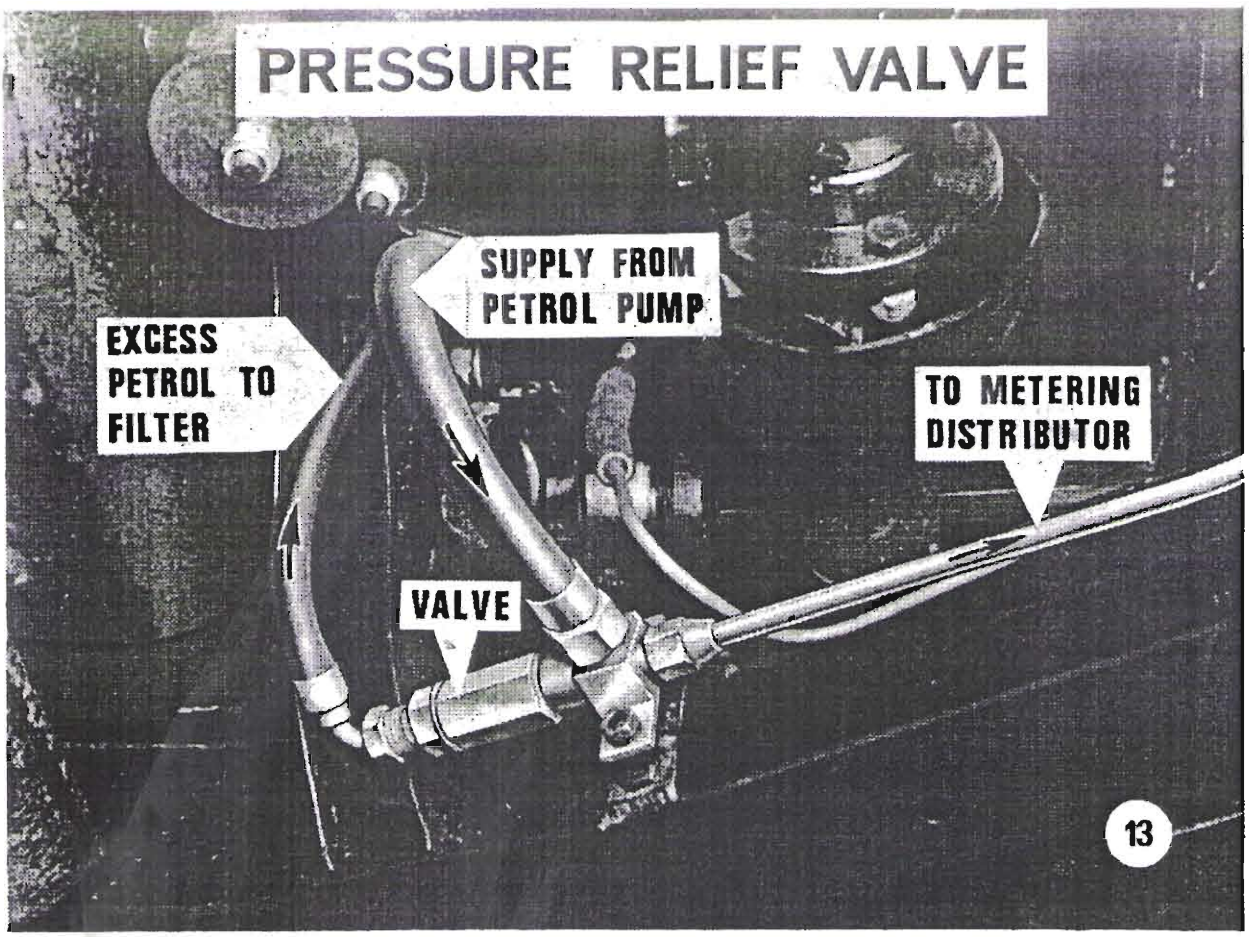
1. On re-assembly pass armature shaft through base casting, avoiding damage to seal by drive shaft tag. Smear seal with Shell 6266 grease before assembling and cover end of shaft.

2. Line up base casting flange mark to motor housing and tighten locating screws evenly.



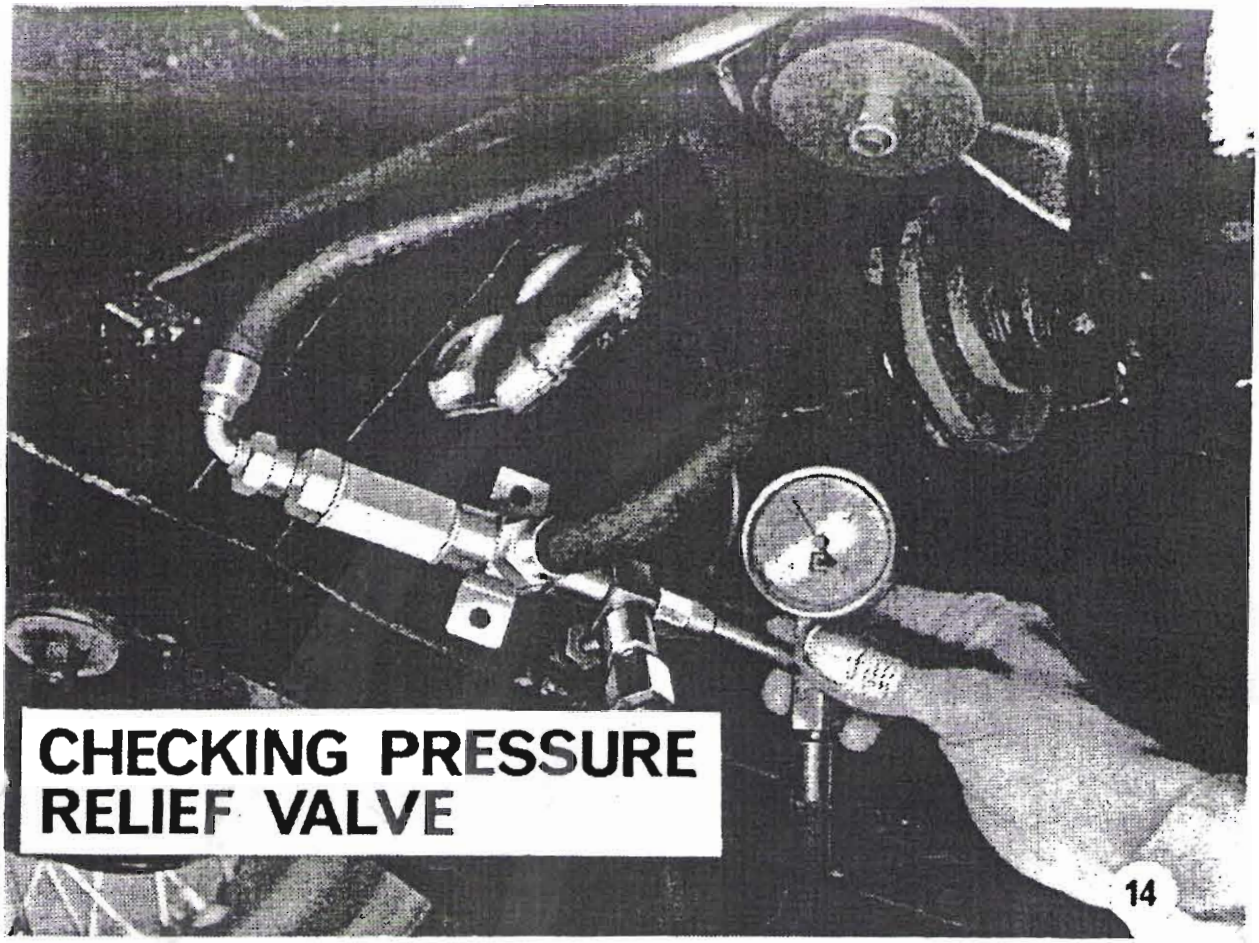
FRAME 12

3. Adjust armature endfloat by releasing lock-nut and turning screw in until shaft is just nipped. Then turn back $\frac{1}{4}$ turn and tighten lock-nut giving an endfloat of 0.004" - 0.010" (0.101 - 0.254 mm).



FRAME 13

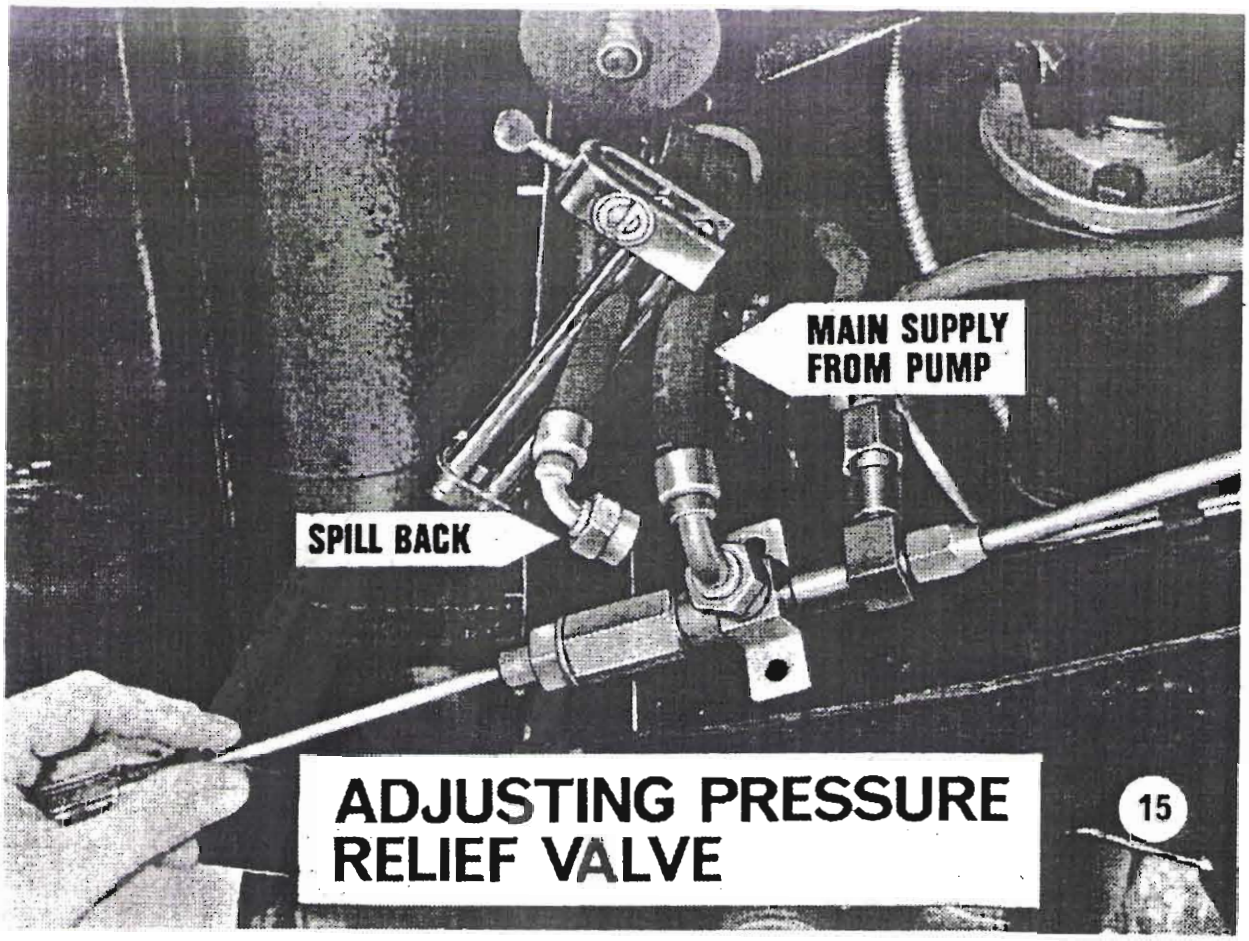
The pressure relief valve is situated underneath the car on the left-hand side behind the universal drive coupling.



FRAME 14

CHECKING PRESSURE RELIEF VALVE

1. Clamp supply pipe from pump
2. Disconnect fuel pipe at the valve assembly on metering distributor side and fit a 'T' connection with a pressure gauge.
   Remove clamp from pipe.
3. Switch ignition on and gauge should record a pressure of 106 - 110 lbs. sq. in. (7.42 - 7.70 kg. sq. cm)



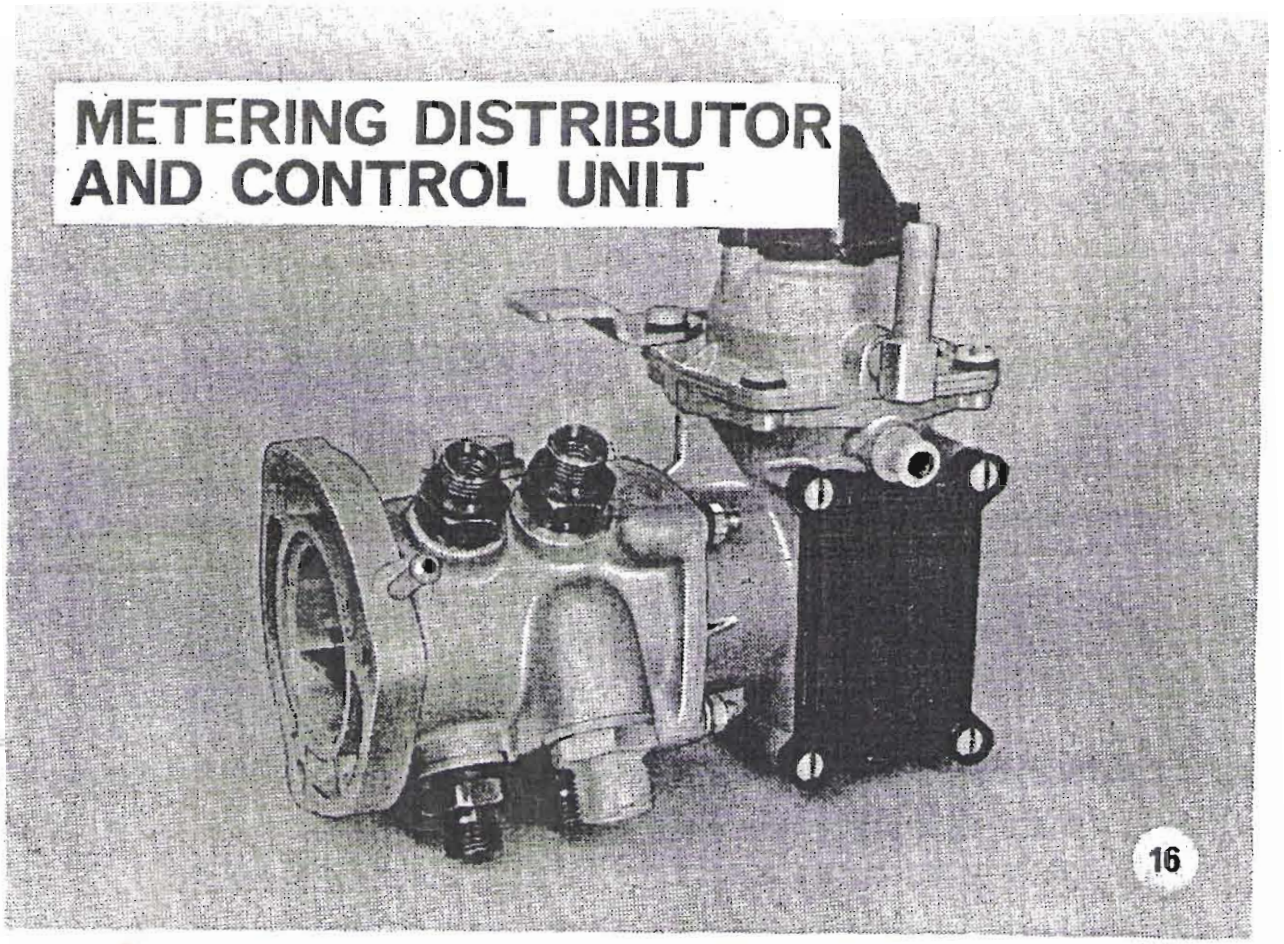
FRAME 15

ADJUSTING PRESSURE RELIEF VALVE

1. Clamp return pipe to filter

2. Disconnect spill back pipe at valve end

3. With a Phillips type screwdriver adjust the nylon screw $\frac{1}{4}$ turn at a time. It is most important to reconnect the spillback pipe ***before*** switching the ignition on to check the pressure
   Pressure reading on gauge should be 106 - 110 lbs. sq. in. (7.42 - 7.70 kg. sq. cm)



FRAME 16

METERING DISTRIBUTOR AND CONTROL UNIT

This unit is divided into two assemblies:

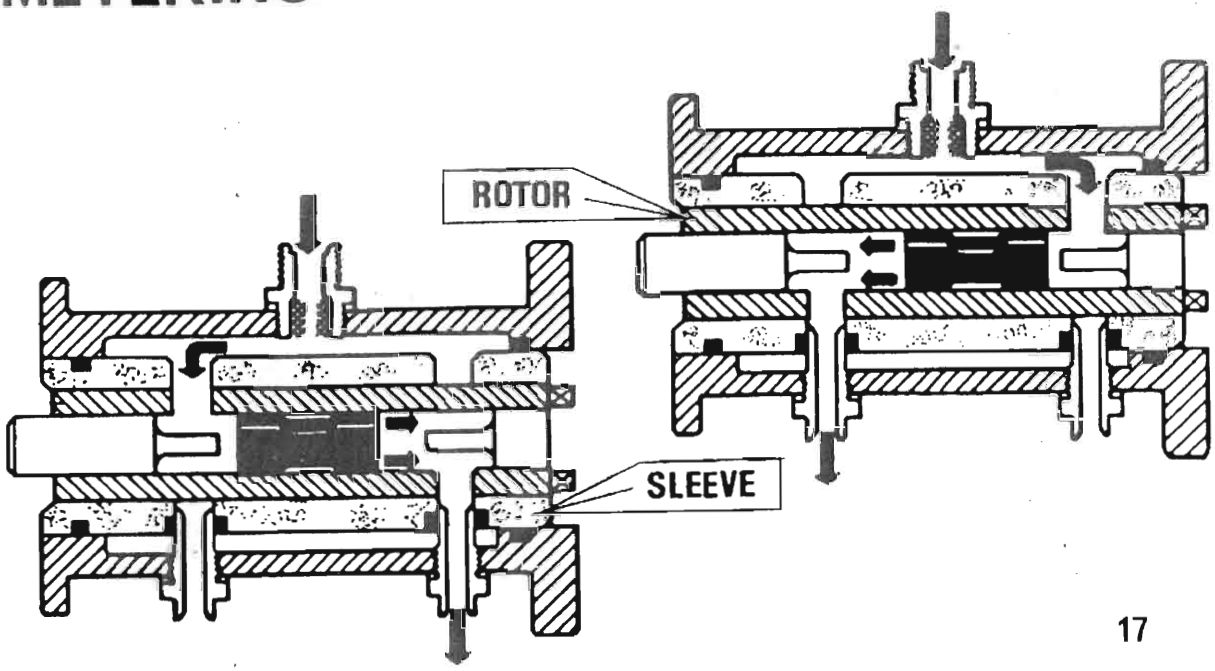
1. The metering distributor is the horizontal cylindrical assembly consisting of a shuttle which forces fuel to the injectors and a rotor which distributes the fuel to the appropriate cylinder in sequence of engine firing order.

2. The control unit is the upright end assembly, which includes a fuel cam to control the amount of fuel at any given engine speed.

   The cam is controlled by a diaphragm which is connected by a pipe to inlet manifold depression, against spring pressure.

Working and servicing details are shown in the following frames.

THE PRINCIPLE OF SHUTTLE METERING



17

FRAME 17

DESCRIPTION

1. The rotor is driven by the camshaft at half engine speed.
2. The rotor has radial ports which line up with adjacent ports in the sleeve as it rotates.
3. The shuttle is situated within the rotor and is free to move between a fixed stop and an adjustable stop.
4. The housing which supports the rotor and sleeve forms a reservoir of fuel at a pressure of 106 - 110 lbs. sq. in. (7.42 - 7.70 kg. sq. cm).

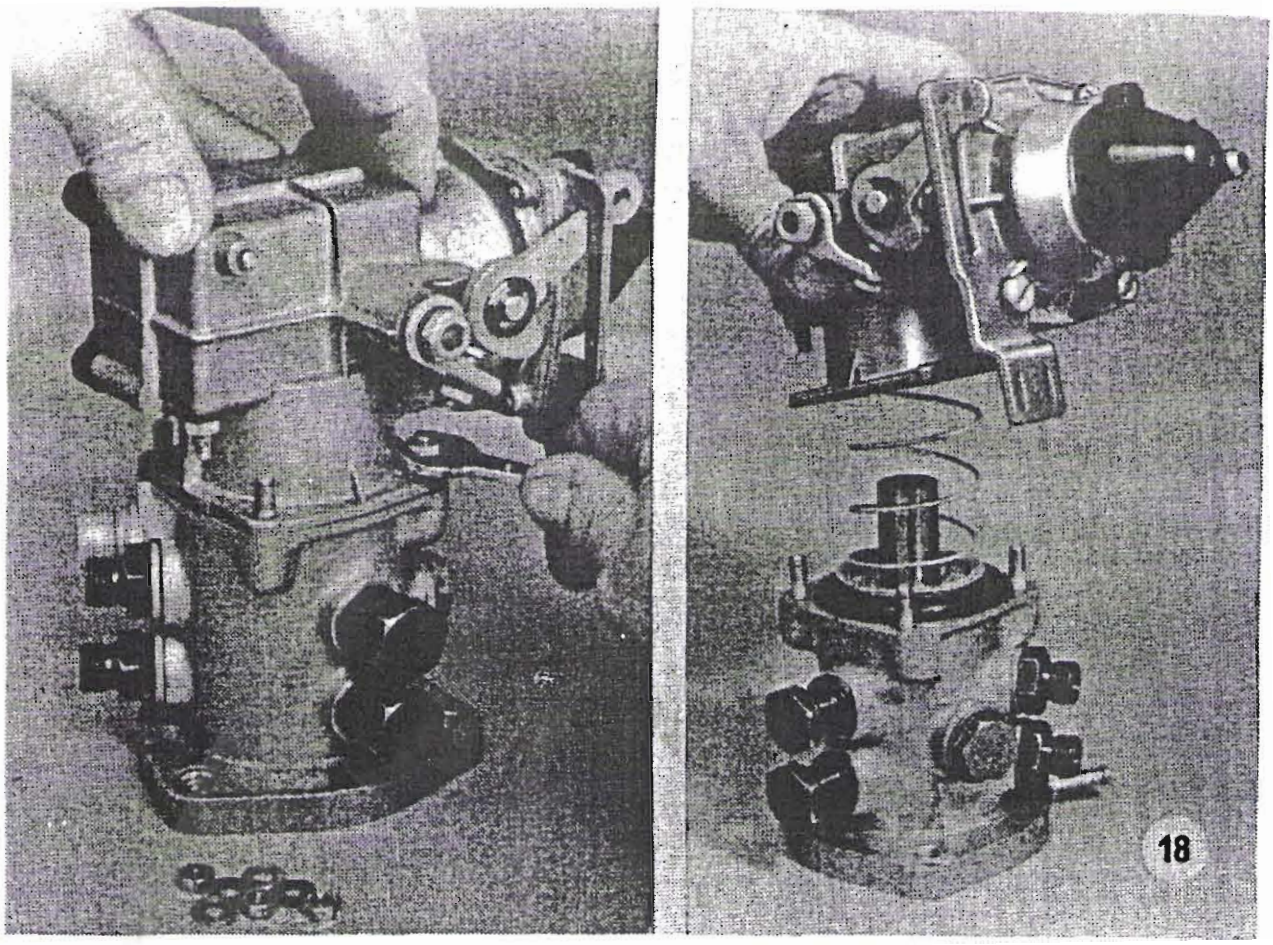
OPERATION

For simplicity of description the diagram shows a two cylinder unit.

The top diagram shows the inlet port open and fuel entering the rotor at 106 - 110 lbs. sq. in. pushing the shuttle to the left. The fuel to the left of the shuttle is being displaced and forced out to No. 1 injector.

The bottom diagram shows the rotor turned so that left inlet port is now open and fuel entering the rotor is reversing the direction of the shuttle. As the right inlet port is closed the fuel is being displaced and forced out to No. 2 injector, the cycle of operation is now complete.

The amount of fuel injected is controlled by the adjustable stop which limits movement of the shuttle and consequently the amount of fuel displaced.



FRAME 18

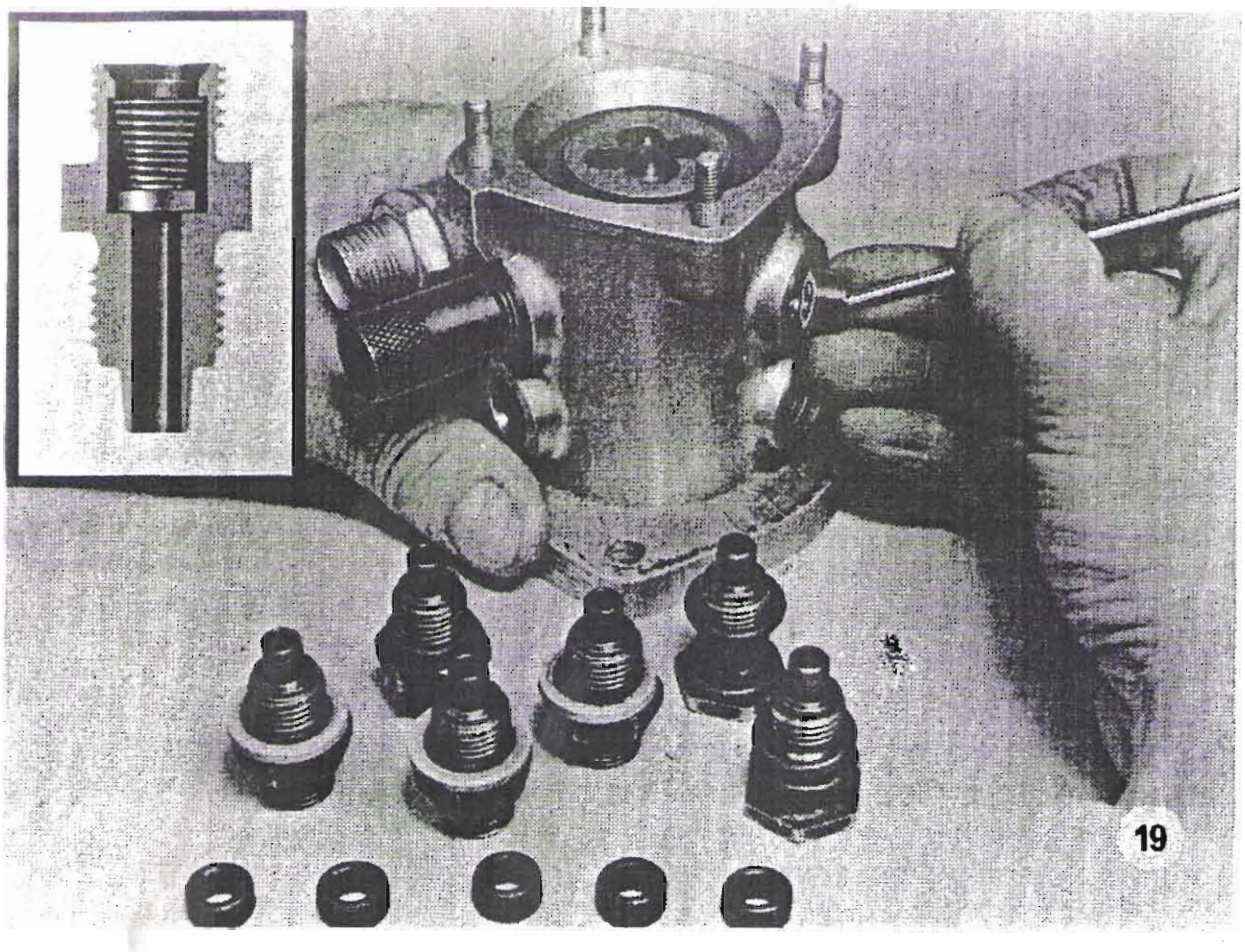
SEPARATING METERING DISTRIBUTOR FROM MIXTURE CONTROL UNIT

Stand the assembly on its flange and hold control unit firmly while removing the four 4 BA nuts and washers (left-hand picture).

Lift control unit carefully removing seal, plate and spring (right-hand picture).

Check position of the two units relative to each other before separating to facilitate correct assembly.

NOTE:—All dismantling and assembling must be done on a CLEAN bench with CLEAN containers to hold the components. It is imperative that all the finely machined parts are handled with care as damage may result in costly replacement of the whole assembly.



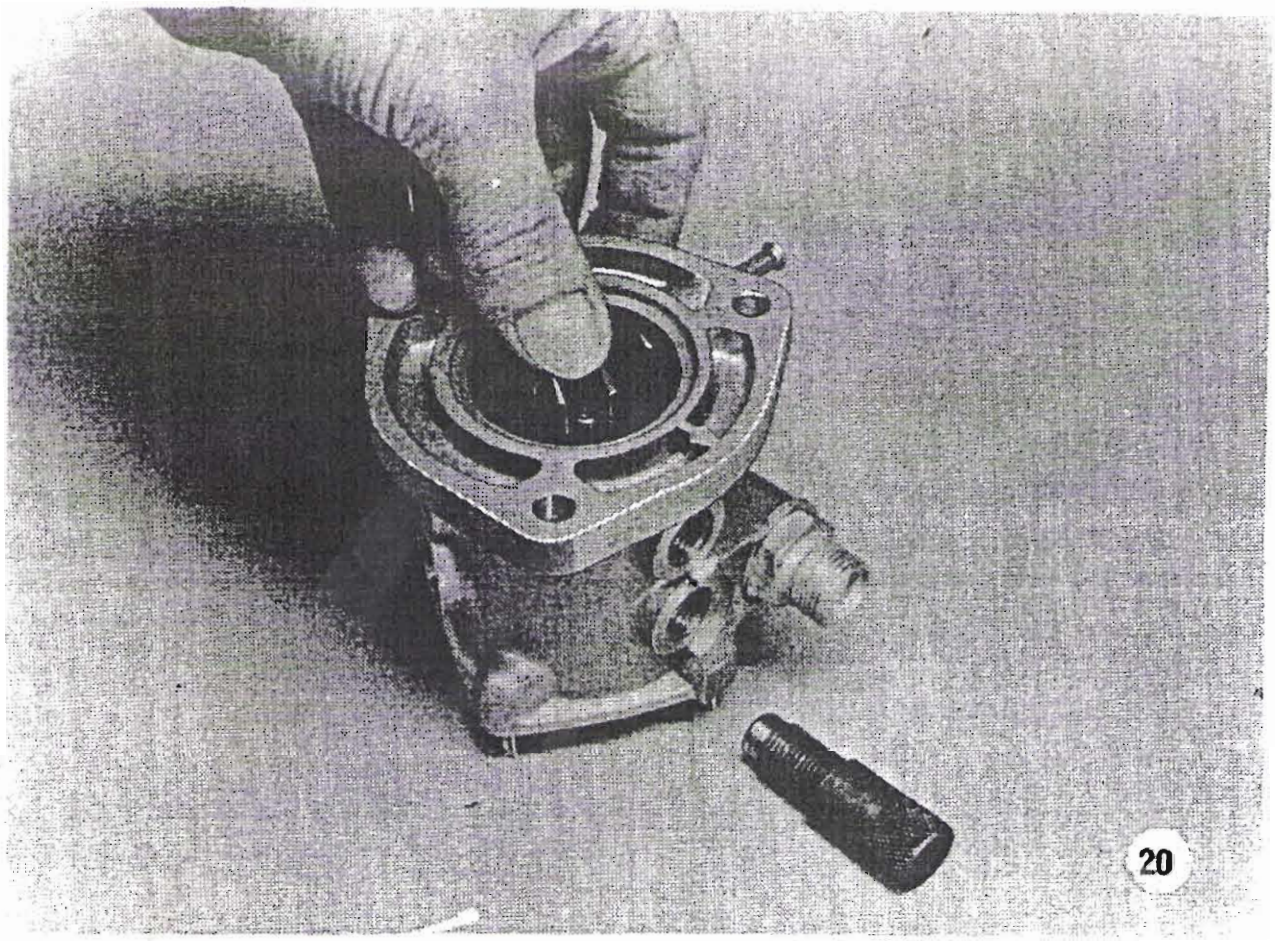
FRAME 19

The method of removing injector pipe adaptors is as follows:

1. Remove one of the pipe adaptors using hook as shown on page 3
2. With the hook remove one inner sealing ring
3. Fit sleeve locating tool
4. Now that the inner sleeve is located remove the other five adaptors and inner sealing rings as shown.

NOTE:—Position of the two banjo connections for correct assembly procedure.

In the pipe adaptor body is a non-return valve, shown in inset. When the engine is stopped, the valve prevents fuel draining out of the pipe line, which, when re-starting the engine, would cause misfiring.

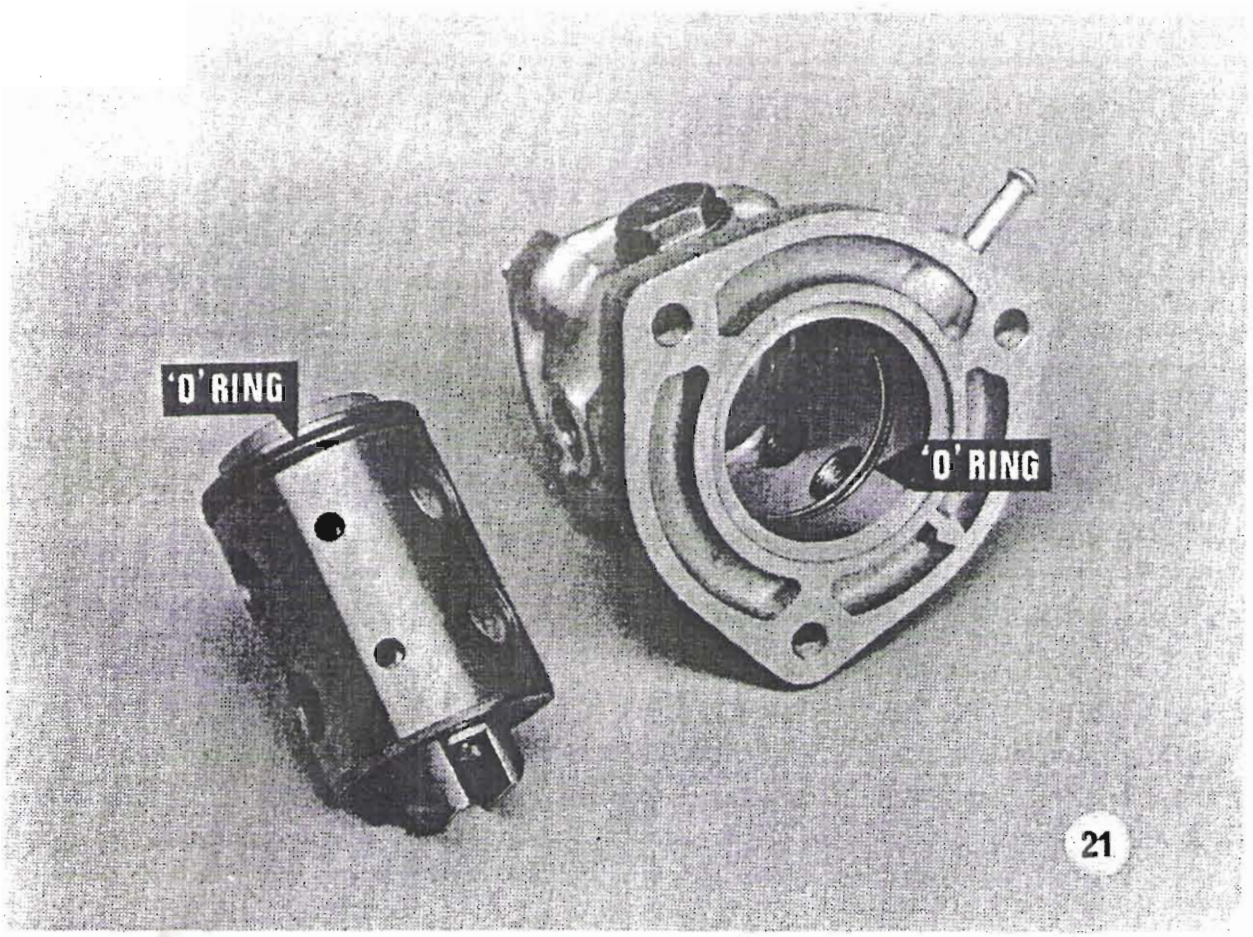


FRAME 20

To remove the sleeve and rotor assembly the method is as follows:

1. Using a clean bench stand the housing on the four studs as shown.
2. Remove sleeve locating tool
3. Apply pressure with the thumb on the end of the rotor drive dog, until assembly contacts bench.
4. Carefully lift housing and remove rotor assembly.

NOTE:—The rotor assembly must NOT be pressed out from the other end as the sealing 'O' ring will become trapped in housing. Forceful methods would be required to separate rotor from housing which could result in damage to seal etc.

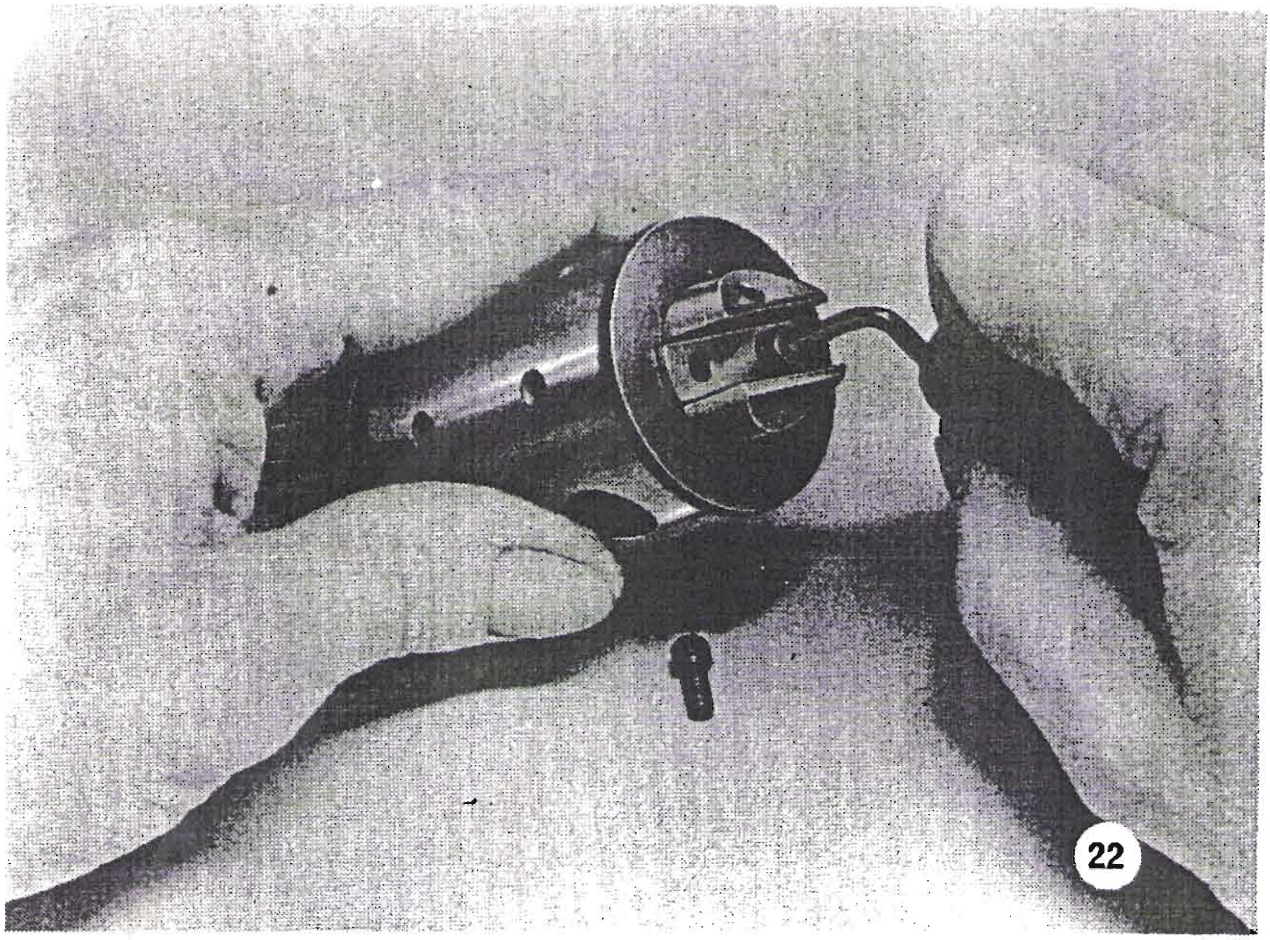


FRAME 21

Sealing of fuel between sleeve and housing is by 'O' rings.

The 'O' ring at the drive end is located in a groove in the housing.

The 'O' ring at the other end is located in a groove in the sleeve.

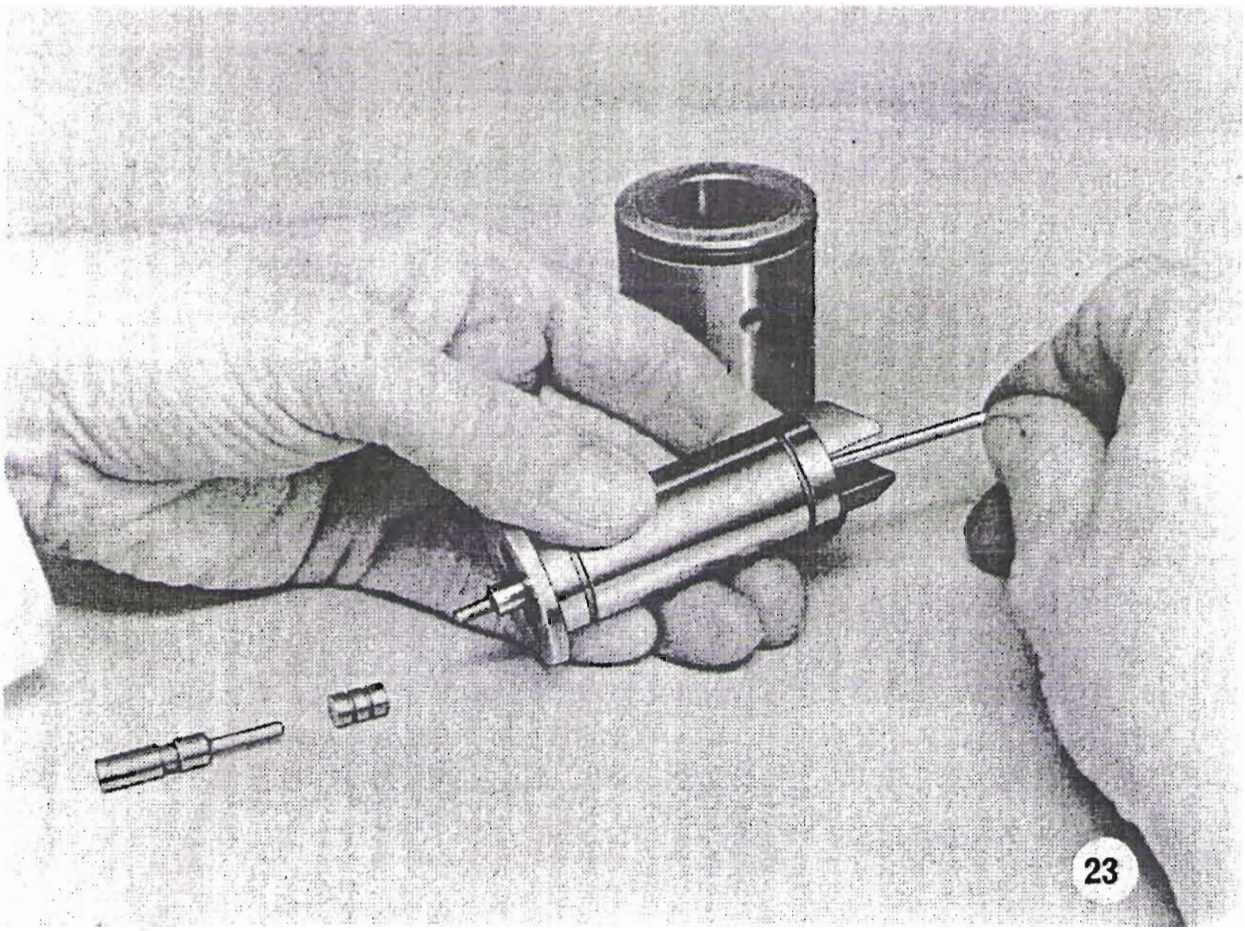


FRAME 22

SEPARATING ROTOR FROM SLEEVE

1. Undo the two Allen screws at the rotor drive end
   When refitting the two Allen screws the use of Loctite is recommended.
2. Remove rotor locating plate.
3. Push rotor out of sleeve

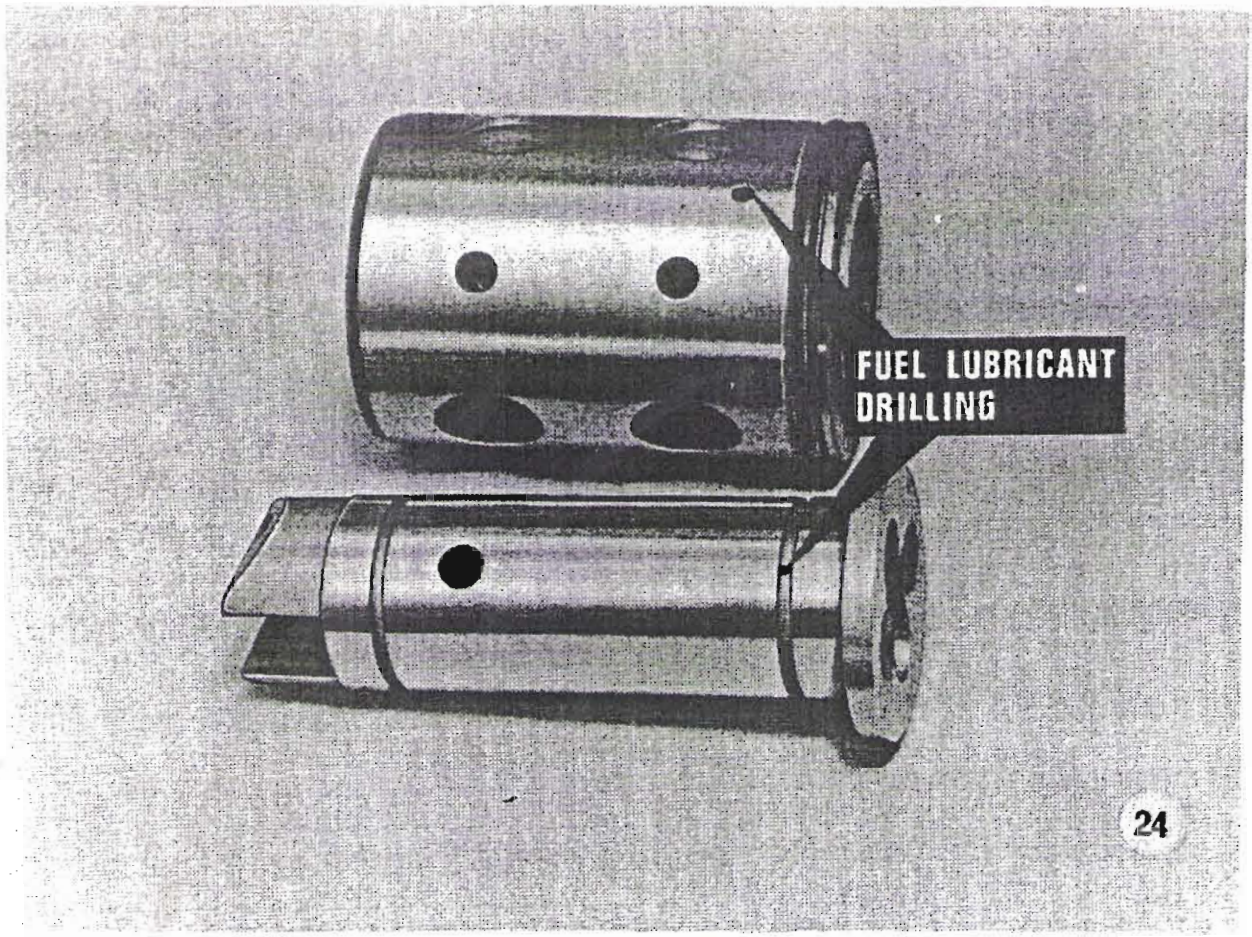
NOTE:—There is no need to remove rotor thrust plate which is located by two sunken screws.



FRAME 23

With the rotor removed from the sleeve, push the control stop, shuttle and fixed stop from the rotor with plastic knitting needle, as shown, from the drive end.

It is recommended that the rotor should only be handled when immersed in a bath of oil to prevent surface finish contamination by skin oils.



FRAME 24

CLEANING OF ROTOR AND SLEEVE

1. Wash all surfaces with white spirit or a solvent.

NOTE:—As the surfaces are machined to close tolerances abrasives must NOT be used.

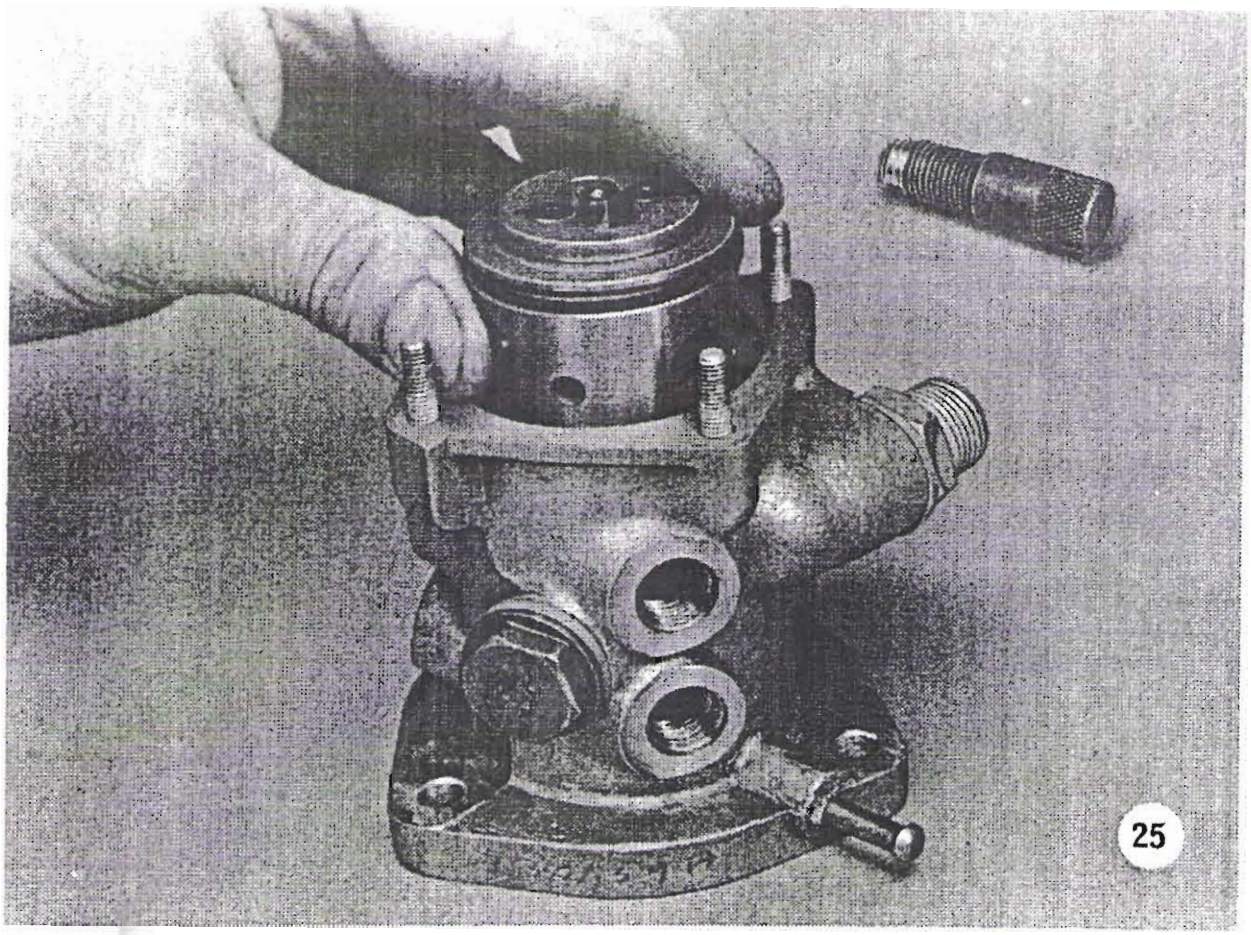
2. Assemble rotor to sleeve lubricating all surfaces.
3. Locate rotor by fitting locking plate and tightening the two Allen screws using Loctite on the threads.

NOTE:—This plate is a pressing and must be fitted with the radiused face towards the rotor to prevent scoring of the sleeve.

LUBRICATION OF ROTOR

Machined at either end of the rotor is a groove and in one groove is a small drilling for the petrol to lubricate the adjustable stop.

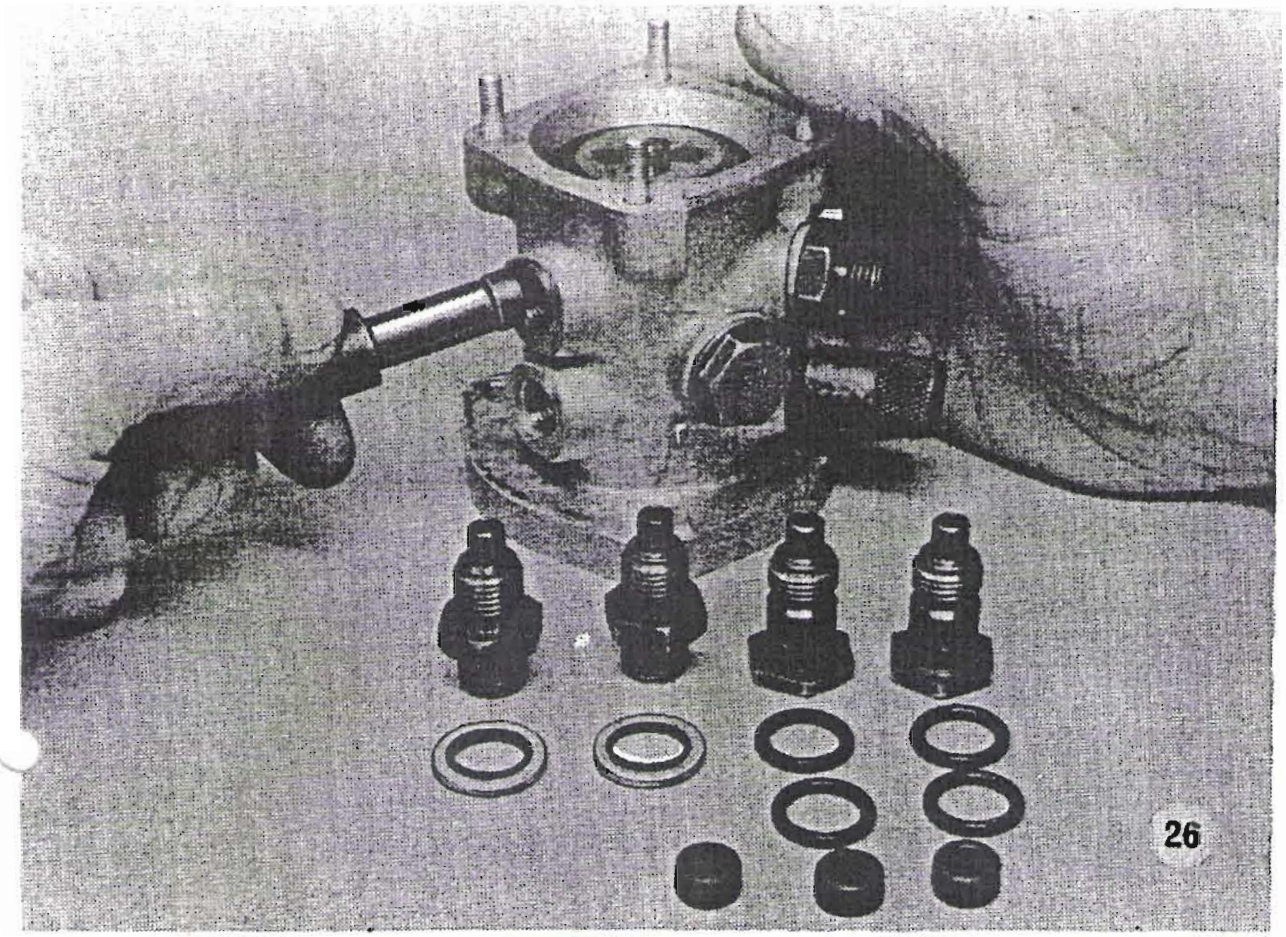
A drilled hole through the sleeve enables petrol in the housing to reach the rotor grooves.



FRAME 25

Fit the rotor/sleeve assembly to the housing in the following way :

1. Place the housing on its flange
2. Align sleeve outlet ports with housing ports lowering assembly into position until drive end contacts bench.
3. Fit sleeve retaining tool into one of the ports before removing assembly from the bench.



FRAME 26

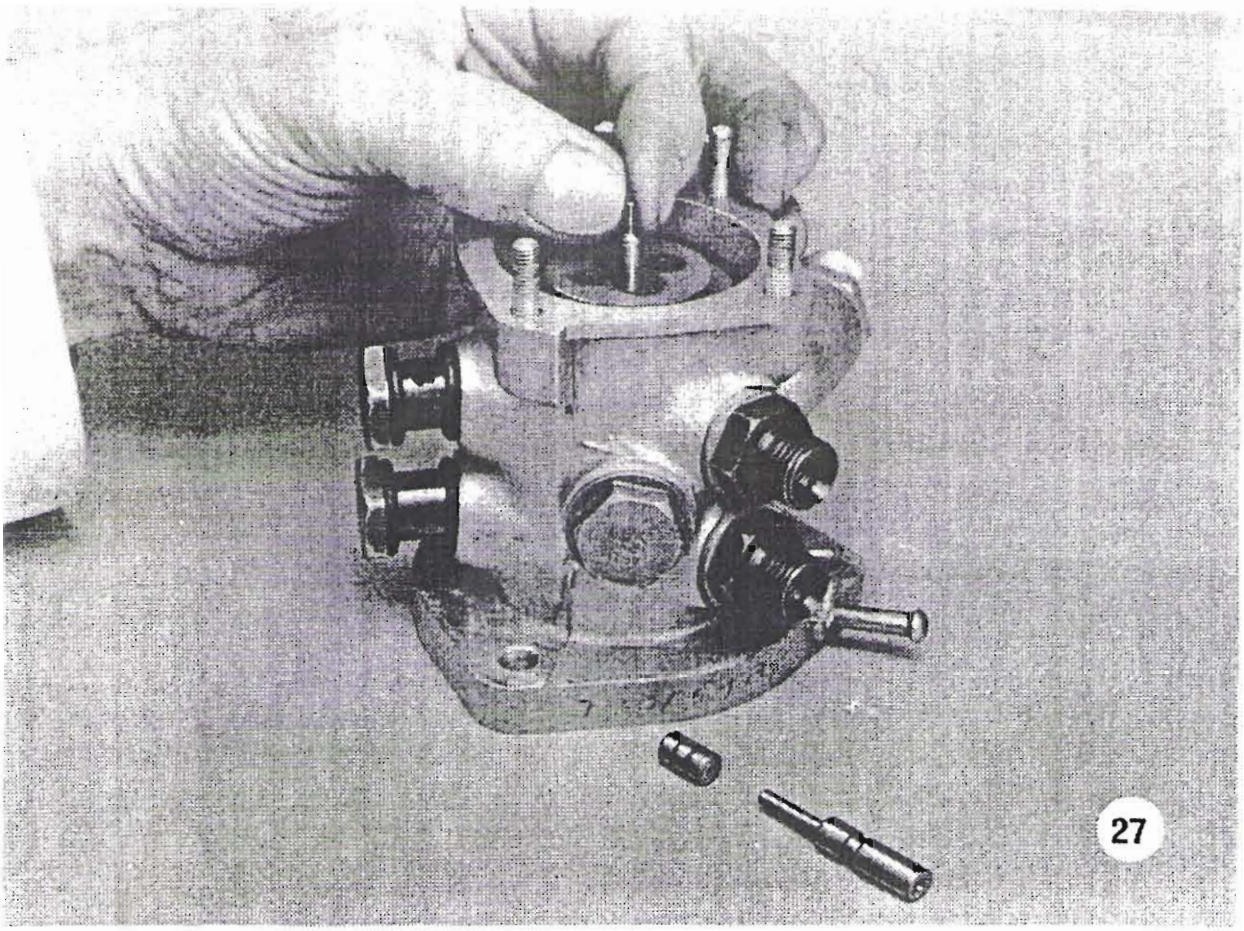
FITTING PIPE ADAPTORS

1. Fit one inner sealing ring with the aid of special tool.

VOTE:—Inner seal must not be fitted direct to pipe adaptor as it will expand ınd be prevented from locating correctly in the sleeve.

2. Check outer seal rubber ring, then place on pipe adaptor.
3. Fit adaptor into housing in the same hole as inner seal was fitted and tighten up.
4. Remove sleeve retaining tool.
5. Fit the other five inner sealing rings with special tool.

IOTE:—Ensure that the two banjo pipe adaptors are fitted on the engine ylinder block side of the metering unit.

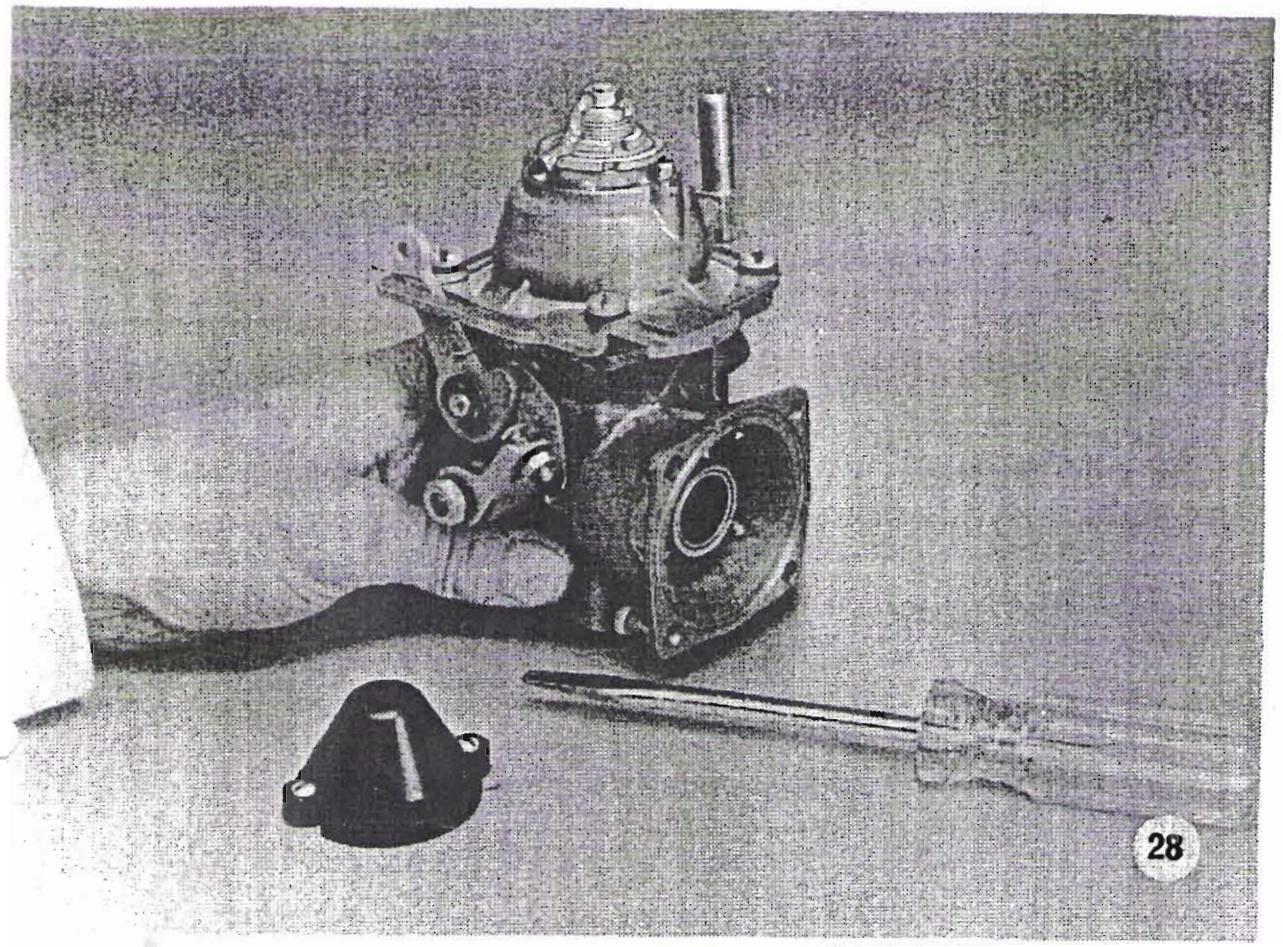


FRAME 27

Finally fit the stops and shuttle into the rotor in the following order:

1. Short stop (fixed stop)
2. Shuttle
3. Long stop (control stop)

To prevent them falling out, place assembly safely standing on flange end as shown until the control unit is ready for fitting.

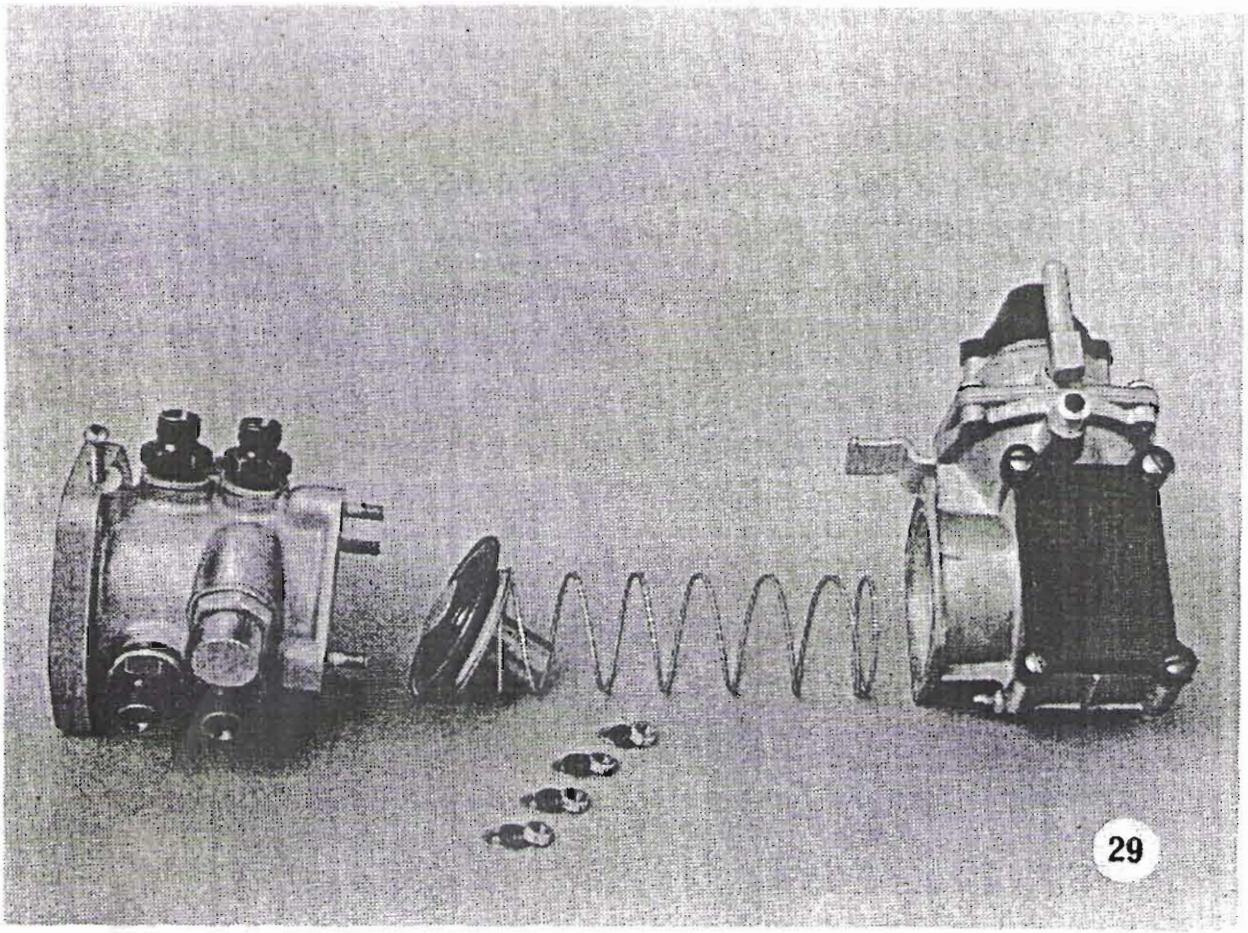


FRAME 28

The control unit should be thoroughly cleaned and examined.

If the sealing strip under the top cover has been broken the unit cannot be serviced and must be returned to the makers for re-calibration.

If the sealing strip is in position replace the top cover to protect it and carry out cleaning, inspecting and adjusting as described in the following frames.



FRAME 29

Shown are the two units ready for assembly.

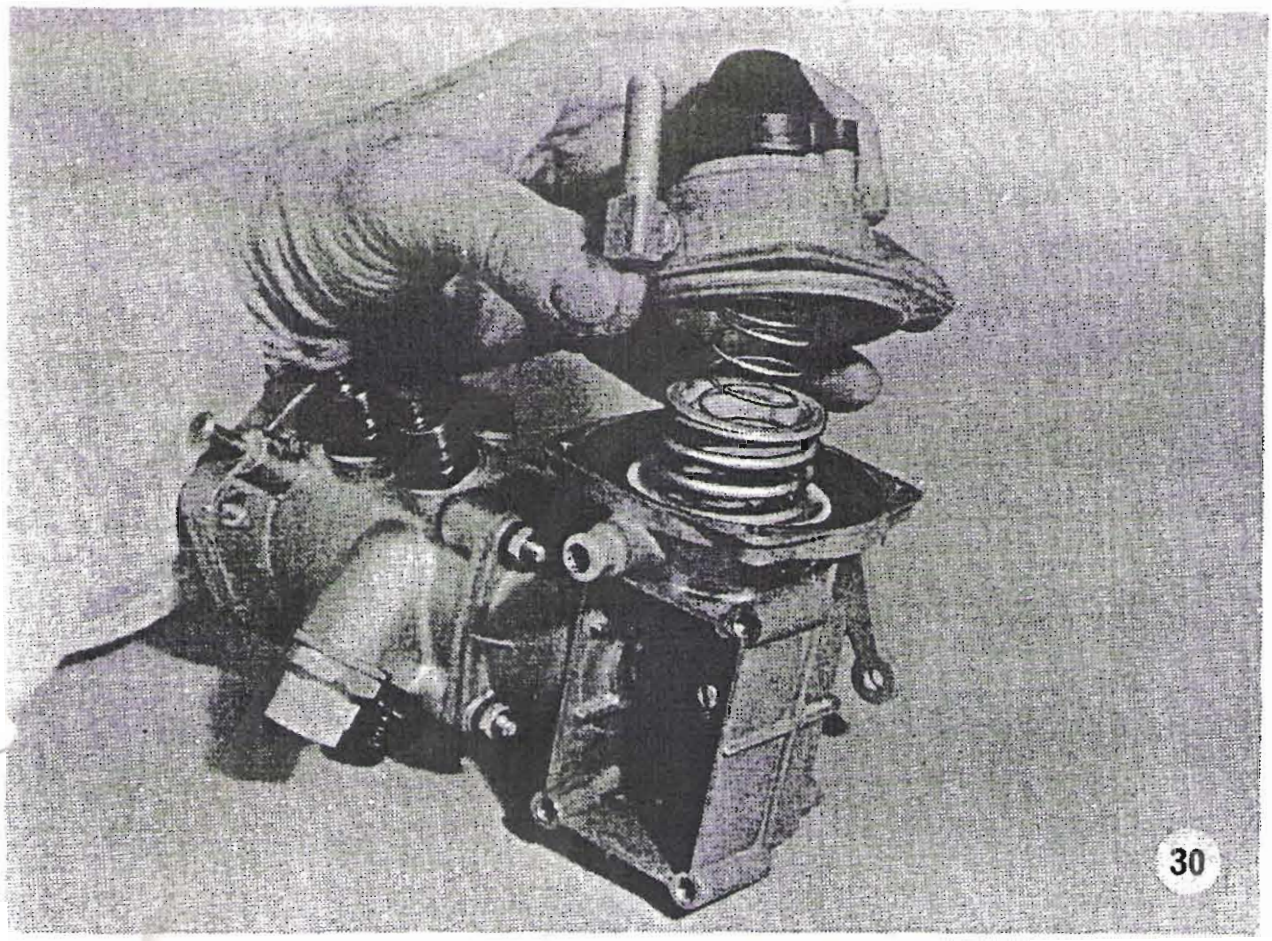
The following details should be noted:

1. Check that the seal is free from cracks, this is important as it is the only seal preventing petrol from entering the control unit.

2. The spring must be fitted correctly into dished washer and between seal and control unit.

   This spring is fitted to reduce the effective loading onto the fuel cam by the plunger, which has a force of 106 - 110 lbs. sq. in. (7.42 - 7.70 kg. sq. cm) reacting from the petrol.

3. Place metering unit flange downwards onto bench, fit seal and spring into metering unit, then lower control unit onto the four studs of the metering unit ensuring seal is positioned correctly before fitting washers and nuts.



FRAME 30

Before removing the diaphragm cover, note the position of the vacuum take-off relative to the atmospheric on the body. The position of the vacuum take-off differs on the Triumph 2.5.

Carefully lift off cover releasing spring tension and noting spring arrangement.

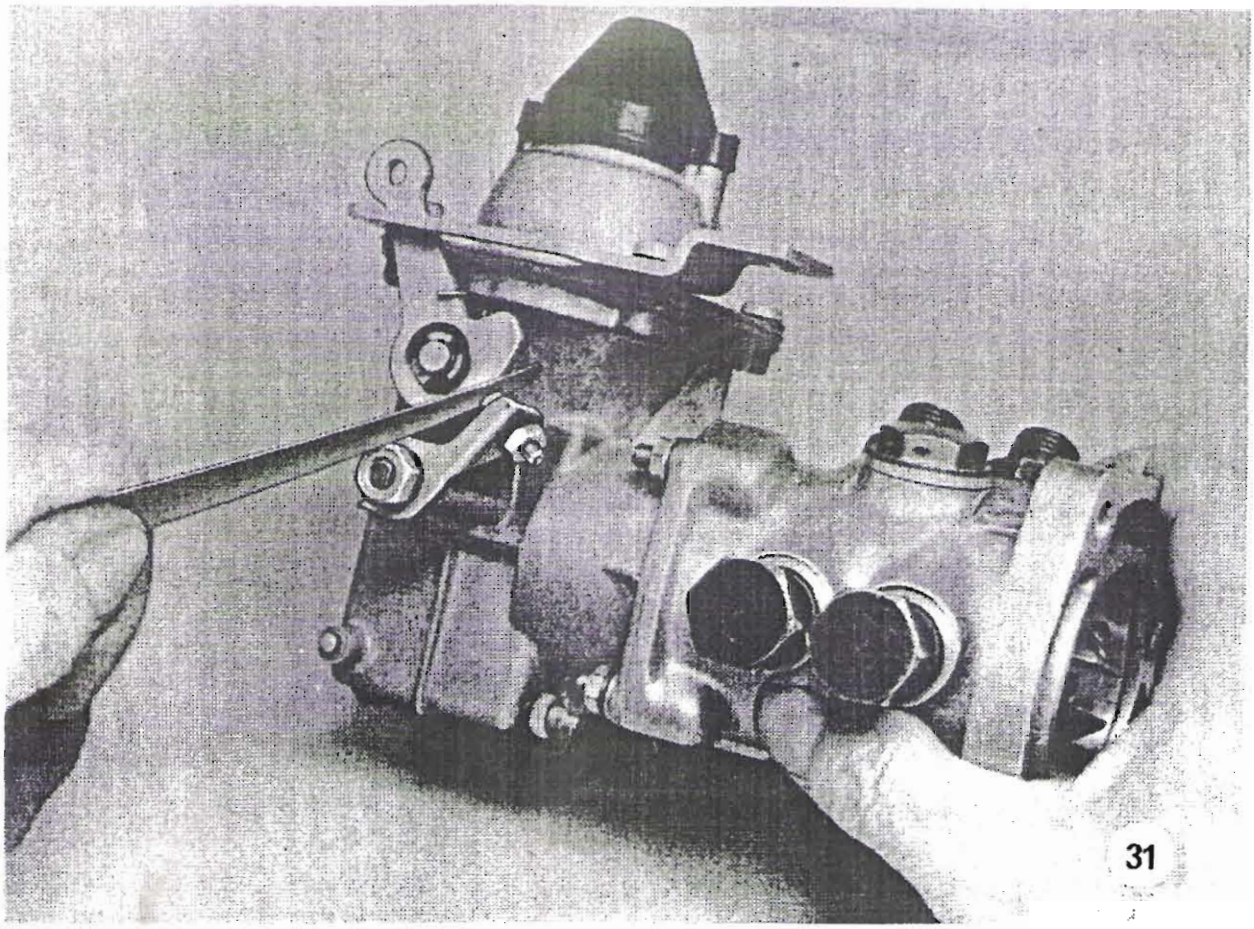
Remove diaphragm and examine for defects, if any signs of cracks are found replace diaphragm.

Thoroughly clean all parts in petrol and dry with compressed air, not rag.

Carefully position diaphragm beading into housing before fitting spring and cover.

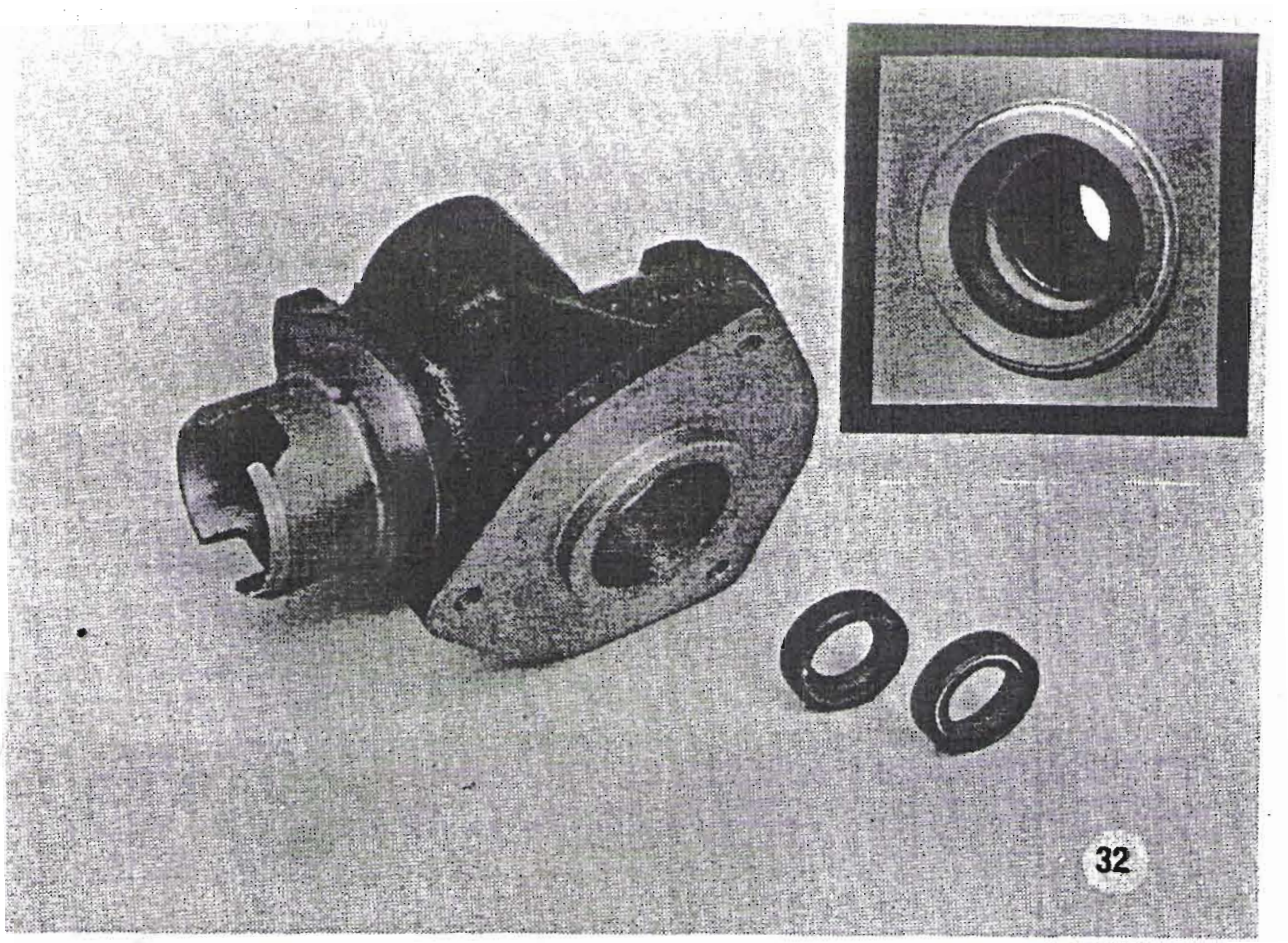
Make sure cover is squarely in position and tighten the four screws evenly.

NOTE:—Ensure that the excess fuel lever is correctly located by its bracket which is secured by the two longer screws.



FRAME 31

With feeler gauges check that the clearance between the excess fuel lever and cam is set to 0.004″ - 0.008″ (0.101 - 0.203 mm) when the cam lever is in its normal position.



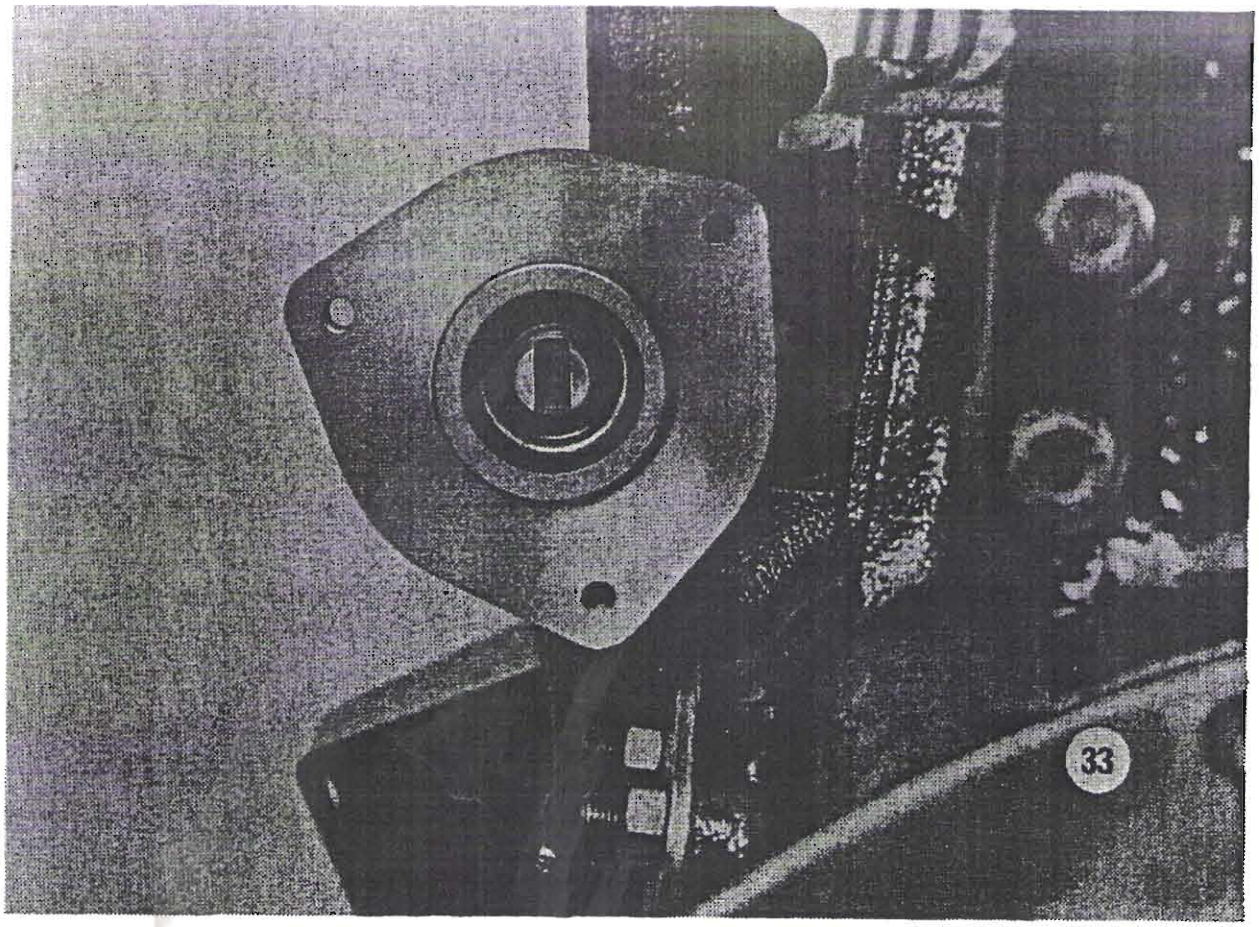
FRAME 32

The distributor and fuel metering transmission housing has four seals.

The fuel metering locating flange has an 'O' ring which locates into a groove in the metering distributor housing (not shown).

The other ''O'' ring will be found on the end plug which retains the drive gear for the metering unit.

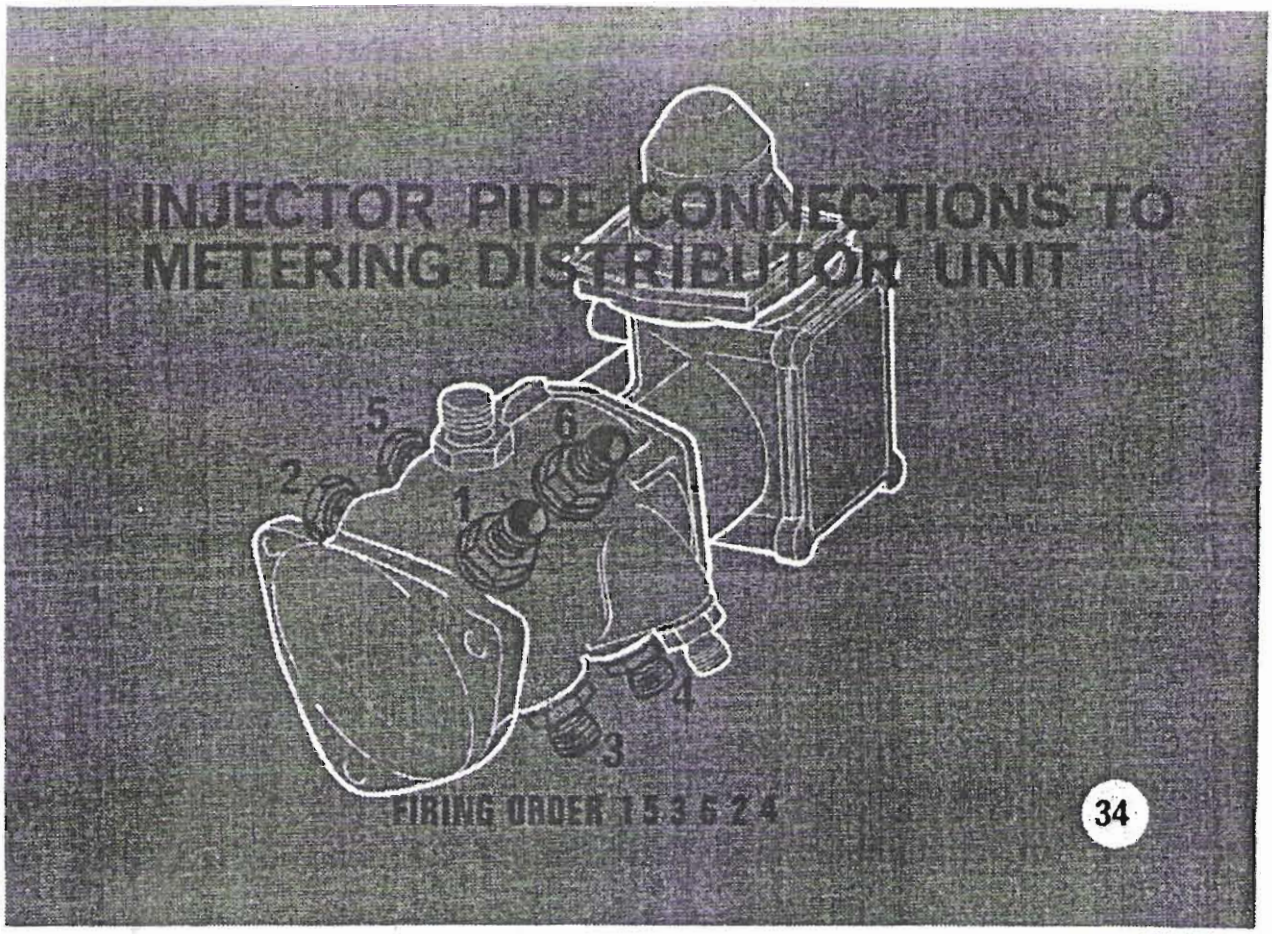
The two lip seals are pressed into the housing placed opposite to each other as shown, in insert to prevent petrol getting into the crankcase and also to prevent oil in the opposite direction entering the fuel metering unit.



FRAME 33

TIMING DISTRIBUTOR AND DRIVE GEAR FOR METERING UNIT

1. Position No. 1 piston on T.D.C. with both valves closed and check that valves Nos. 11 and 12 are on the rock.
2. Set distributor drive gear with small off set towards the front and slot in line with No. 9 push rod.
3. Fit gear housing ensuring correct distributor gear endfloat.
4. Position metering drive gear with the slot in the vertical position as shown.
5. Fit thrust pad and secure with locating washer and bolt.

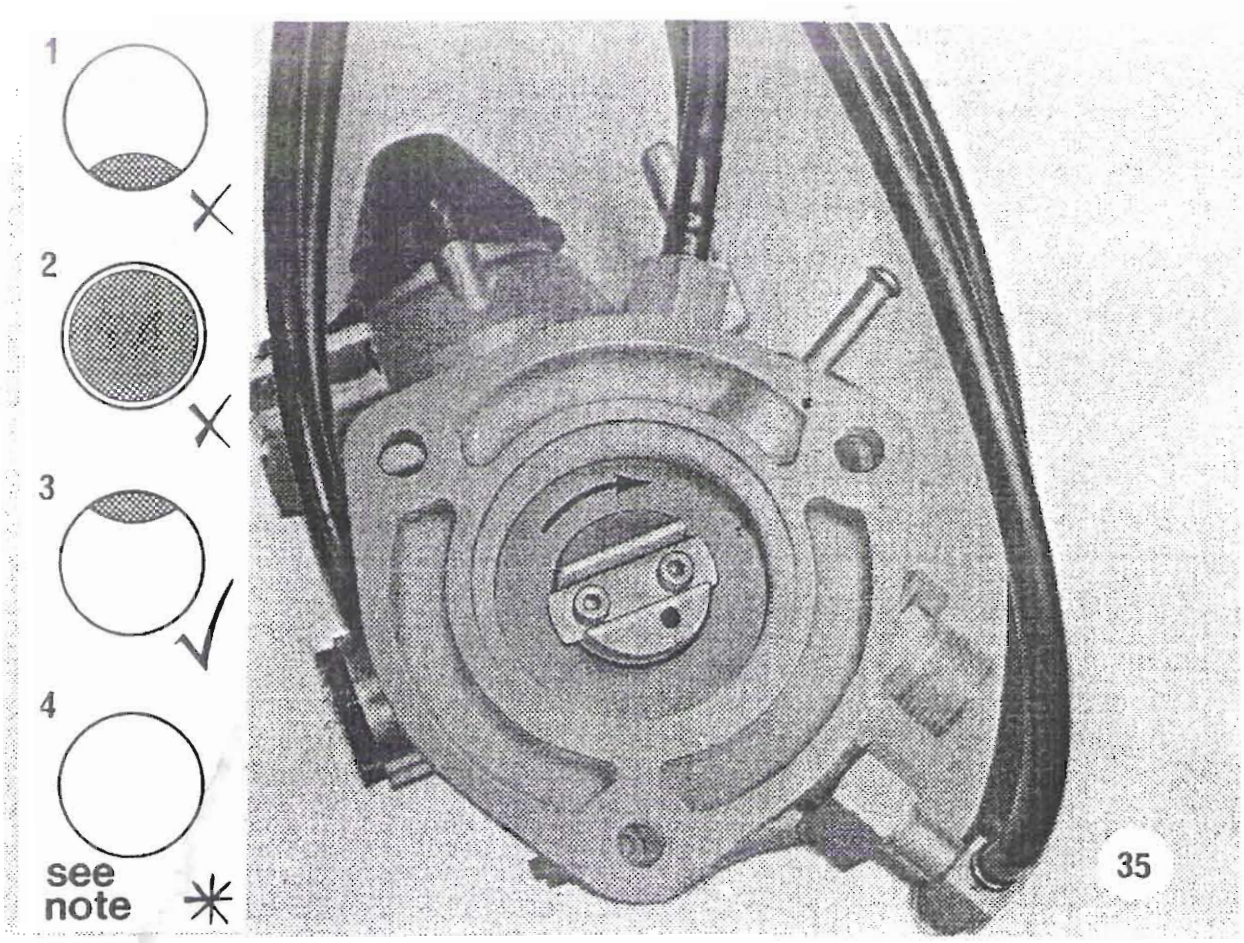


FRAME 34

This illustration shows the pipe connections for each respective cylinder.

The firing order is 1 5 3 6 2 4

When No. 1 cylinder is at T.D.C. firing, No. 6 outlet port on metering unit is at the start of its injection position.



FRAME 35

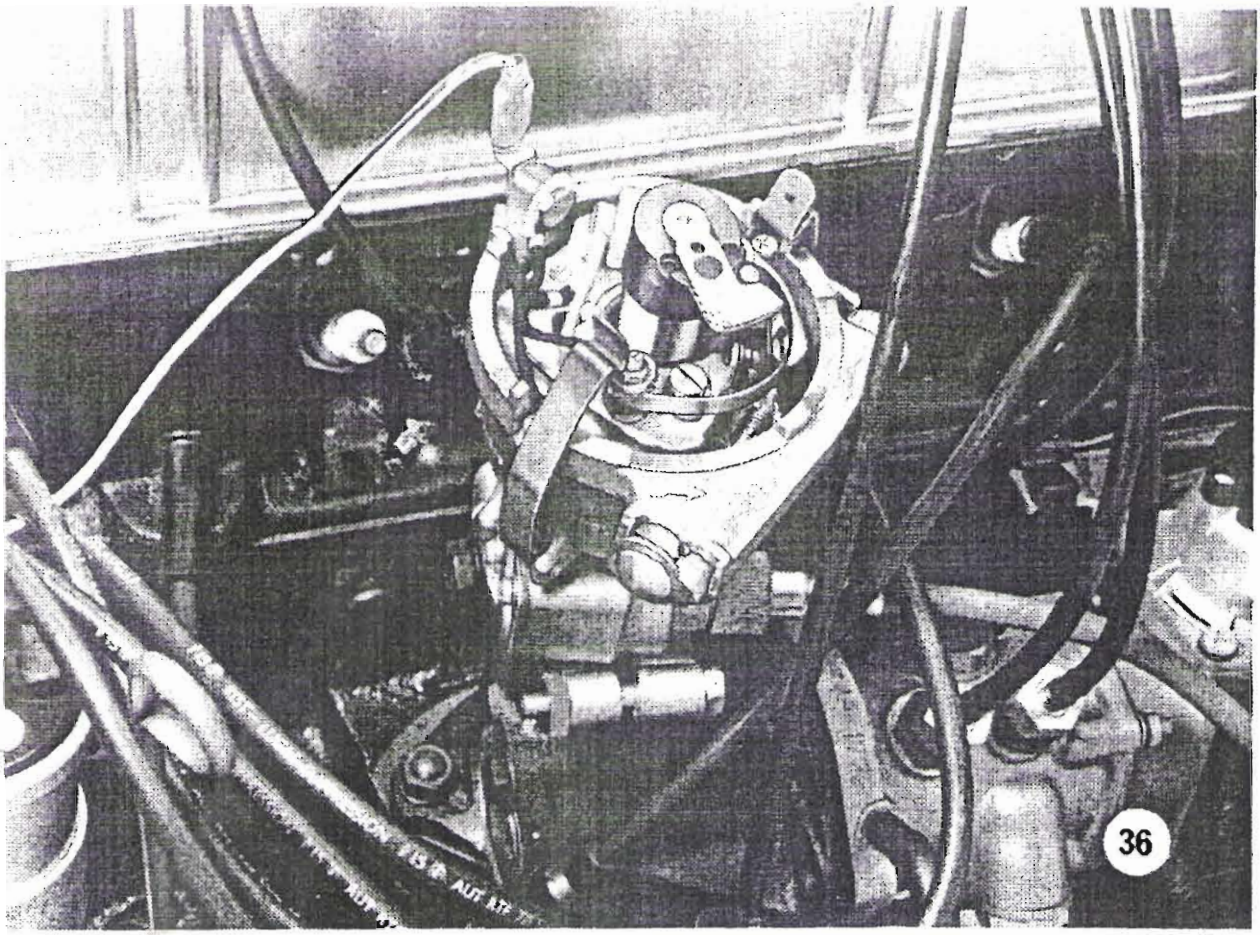
FITTING METERING UNIT TO DRIVE GEAR

1. Turn rotor so that the drive slot is approximately in the horizontal position and the bleed hole in the rotor to the bottom. (When metering unit has been fitted it will be necessary to check the timing, see NOTE.)
2. Fit nylon shear key to rotor and offer up assembly to gear drive housing, ensuring that 'O' ring seal is correctly located between metering unit and housing.
3. The unit is now timed to the engine and may be secured with the three bolts.

NOTE

Removal of the No. 6 outlet adaptor will show the rotor hole at the start of its injection position, as shown in No. 3 inset of the illustration.

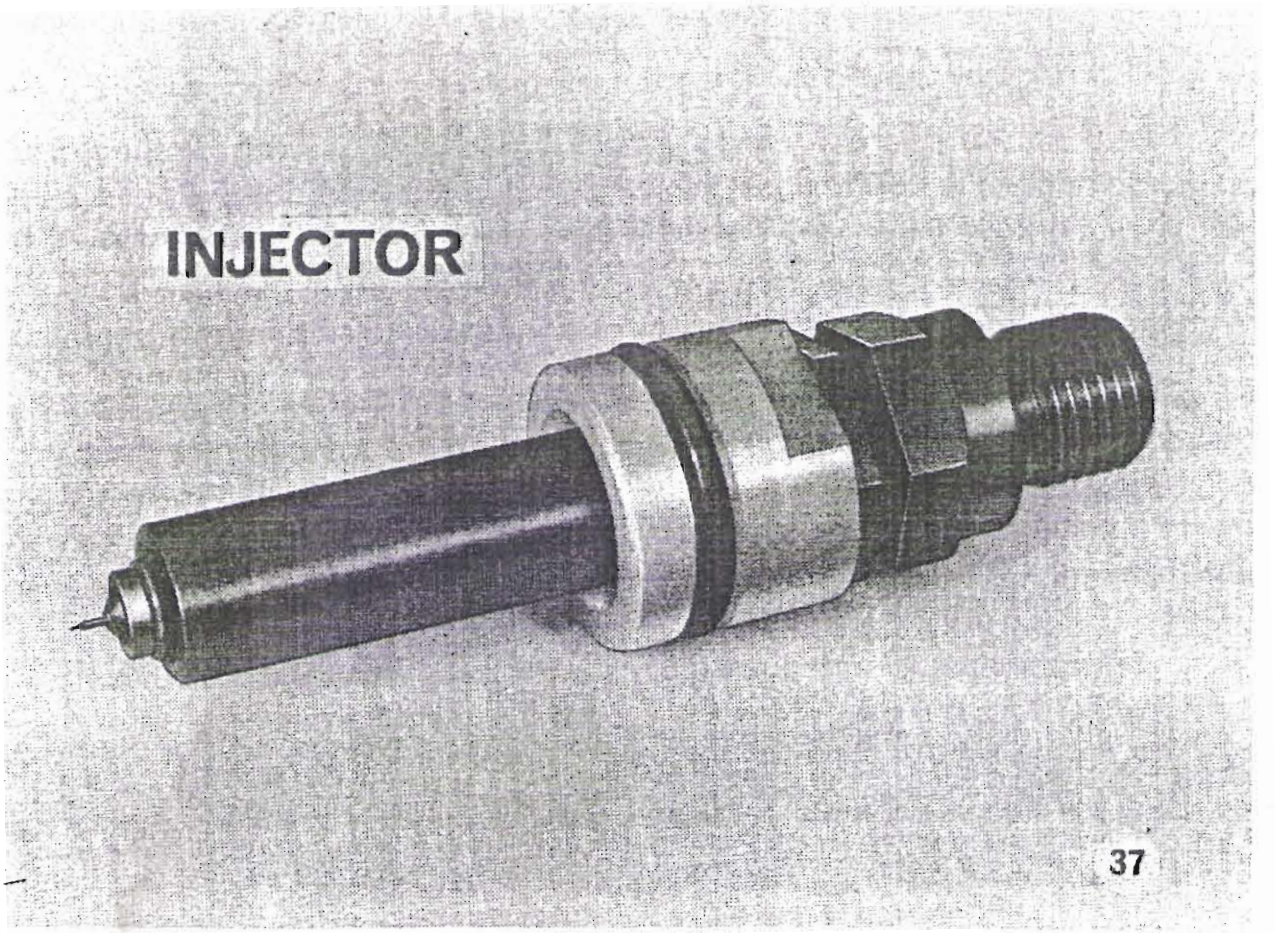
If a FULL hole is observed (No. 2 inset) change timing by one tooth (in the opposite direction to the direction of rotation shown in the illustration) i.e. no hole being visible (No. 4 inset) with the engine set at No. 1 and 6 T.D.C. with No. 1 cylinder firing.



FRAME 36

Fit distributor into gear housing so the distributor rotor points to No. 1 segment in distributor cap.

The static ignition timing can now be set to 11° B.T.D.C.



FRAME 37

INJECTORS

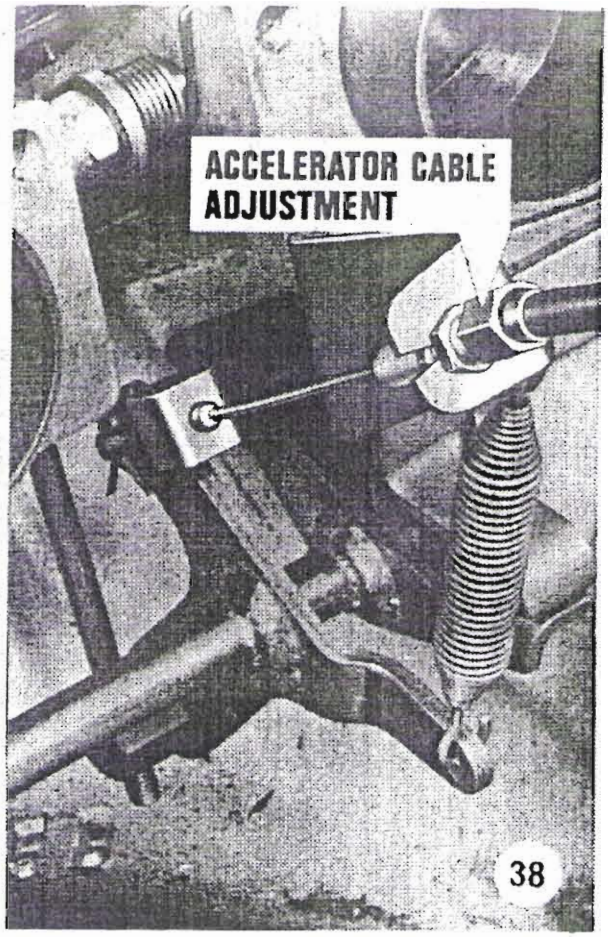
They are sealed units and cannot be dismantled for servicing.

Their function is to give good atomisation of fuel in the path of air entering the inlet port. This is all important to good engine performance.

Opening pressure of the injector is 50 lbs. sq. in. (3.5 kg. sq. cm). The spray form is a 60° hollow cone.

NOTE:—If the injector sticks due to foreign particles on the seat, connect the injector to a dry filtered air supply and blow through at a pressure of 80 lbs. sq. in. (5.6 kg. sq. cm). If this does not rectify the injector, fit a new one.

The nylon heat insulator with 'O' ring can be fitted the other way round enabling the flat to be more accessible for tightening with a spanner. *Note:* Do not overtighten.



FRAME 38

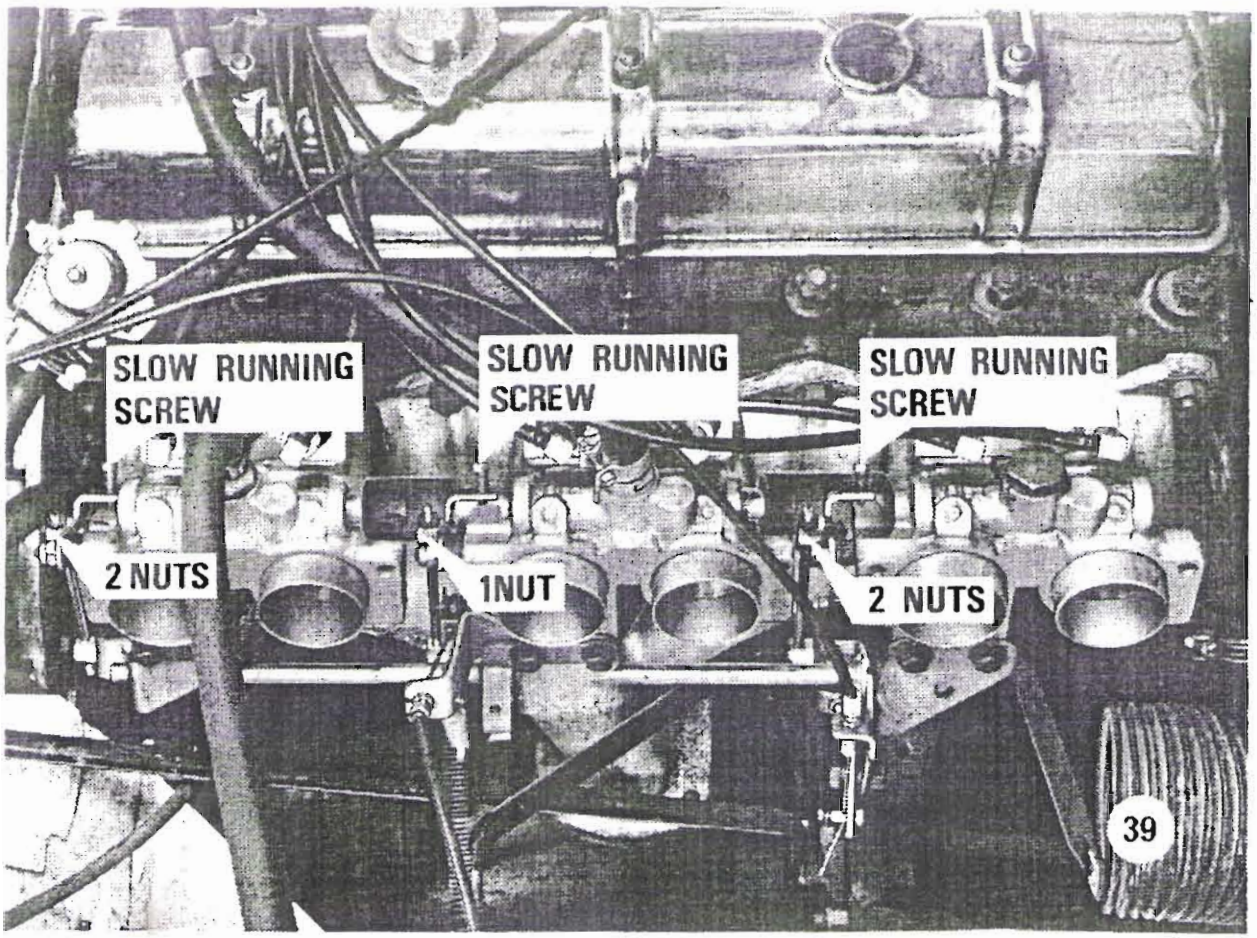
THROTTLE AND COLD START SETTINGS

Before any adjustments are made the engine should be at normal running temperature.

Ensure that the cold start knob on the dash is fully in and the excess fuel lever on the control unit is fully off.

Slacken cam adjusting screw so that it is clear of cam as shown in the left-hand picture.

Slacken the accelerator cable adjustment.



FRAME 39

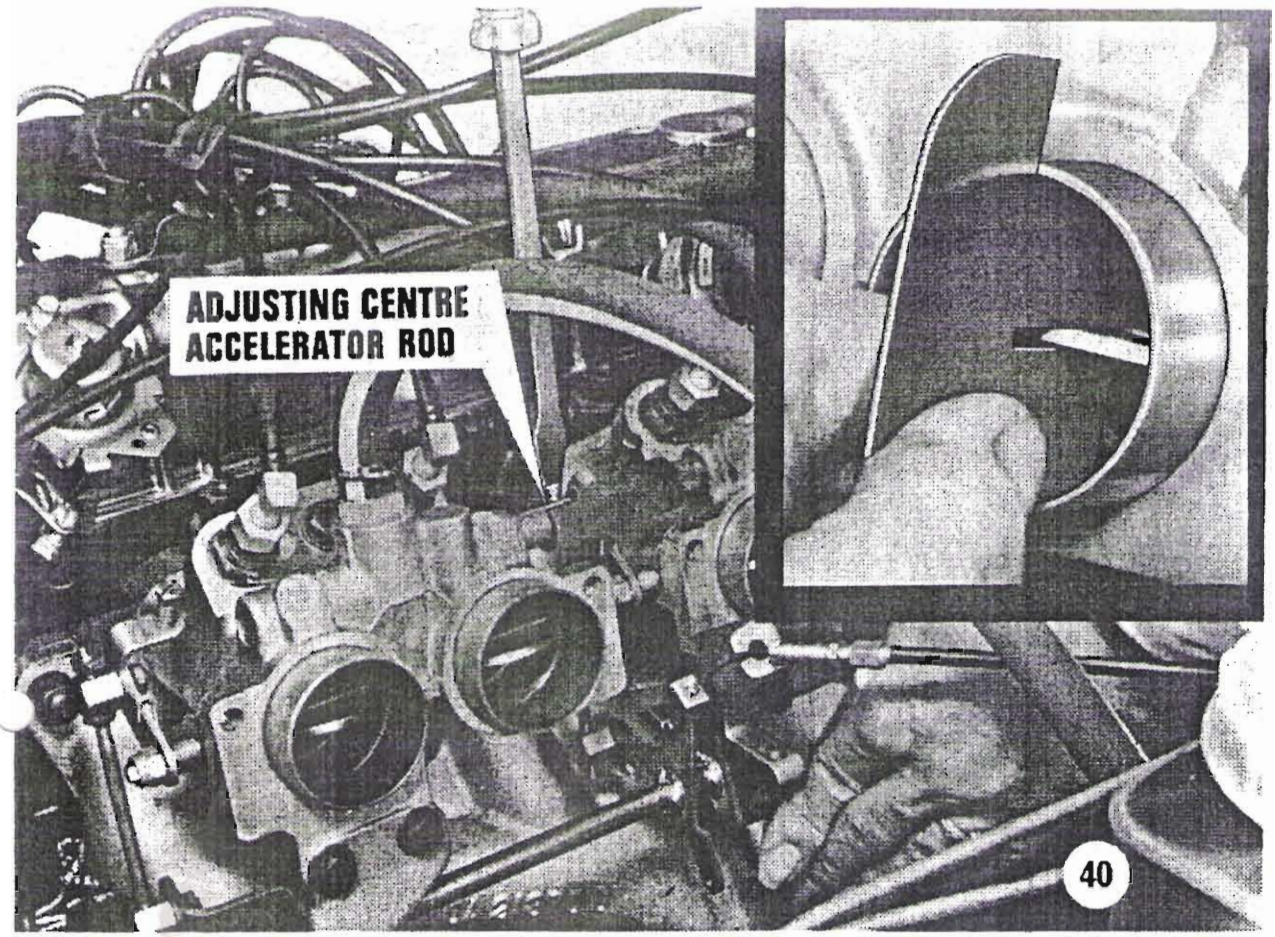
Slacken the three slow running screws back so that the butterflies are fully closed.

Slacken the five lock-nuts on the accelerator adjusting rods.

NOTE:—The centre rod has a threaded trunnion block screwed onto either end, the rod being locked into position by means of a nut acting on the top trunnion.

On the two outer adjusting rods the top trunnions are not threaded and are held in position by two lock-nuts.

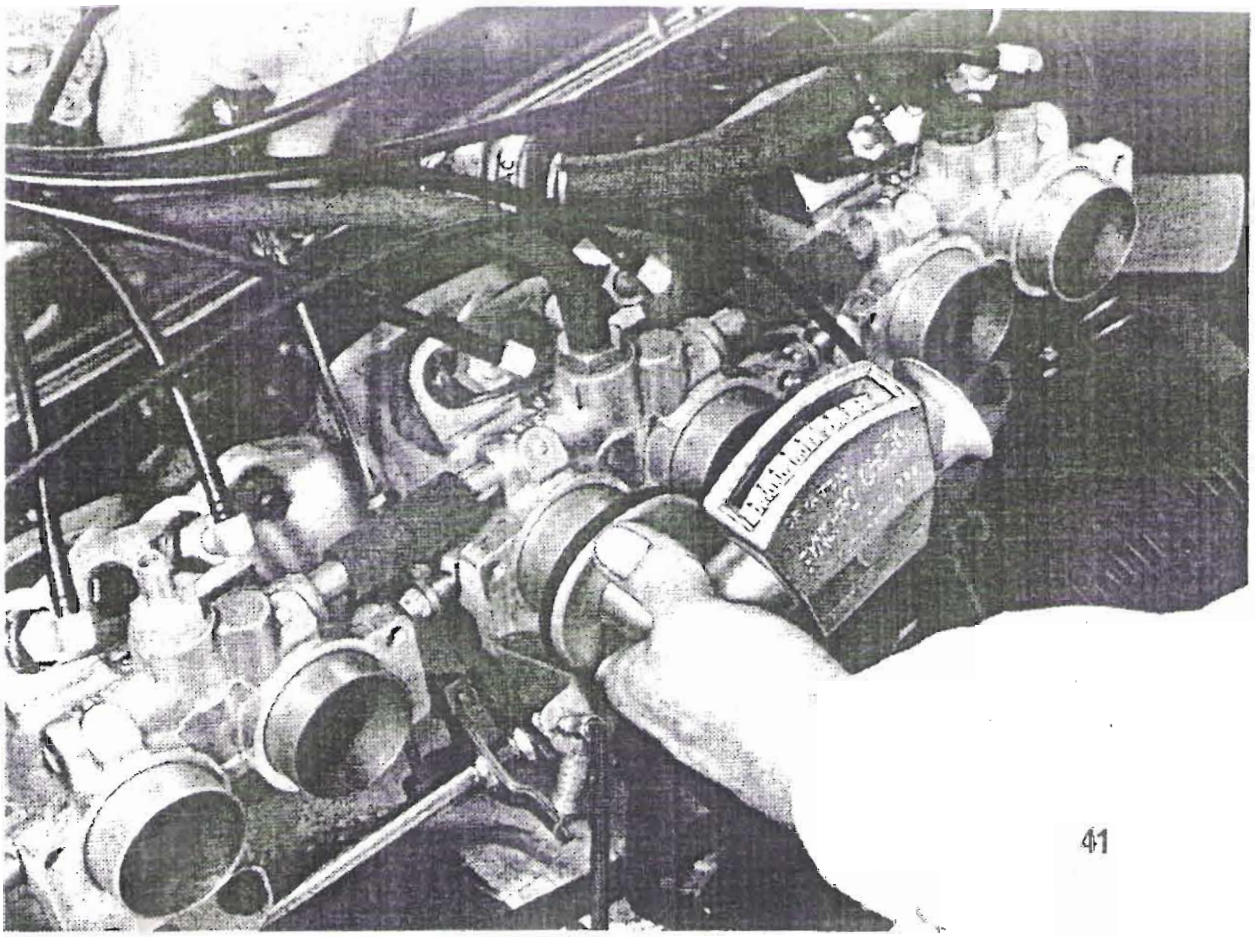
Ensure that the lock-nuts on the adjusting rods are slackened and well clear of the trunnion blocks.



FRAME 40

Press the accelerator cross-shaft with a finger as shown until it is hard against the back stop and hold in this position. With a screwdriver adjust centre rod until the centre pair of butterflies are horizontal (fully open) then tighten locknut.

The inset shows a simple gauge which may be made up to check the horizontal position.



41

FRAME 41

Using the centre pair of air intakes as the master unit and using a balance meter as shown, adjust the three slow running screws until equal breathing is obtained on all three units at 750 - 800 r.p.m. idling.

Tighten the lock-nuts on the outer control rods.

Care should be taken not to put a loading on the control rods when tightening the lock-nuts.

Increase engine speed to 1500 r.p.m.

Again using the centre intakes as the master unit, check that equal breathing is obtained on both outer units.

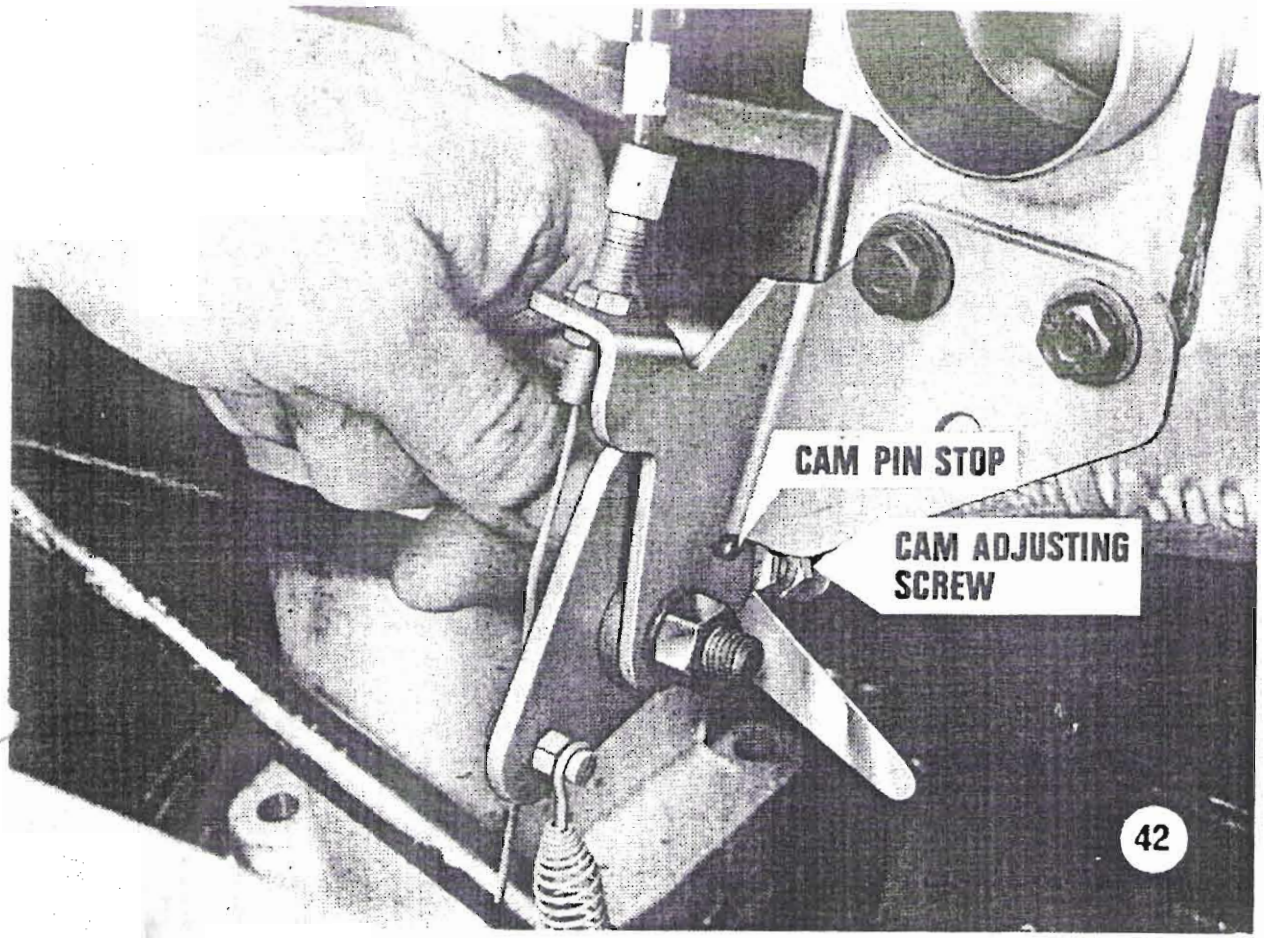
If adjustment is required screw the lock-nuts up or down on the appropriate outer control rod.

DO NOT ALTER CENTRE CONTROL ROD.

Reduce engine speed to idle and recheck for equal breathing.

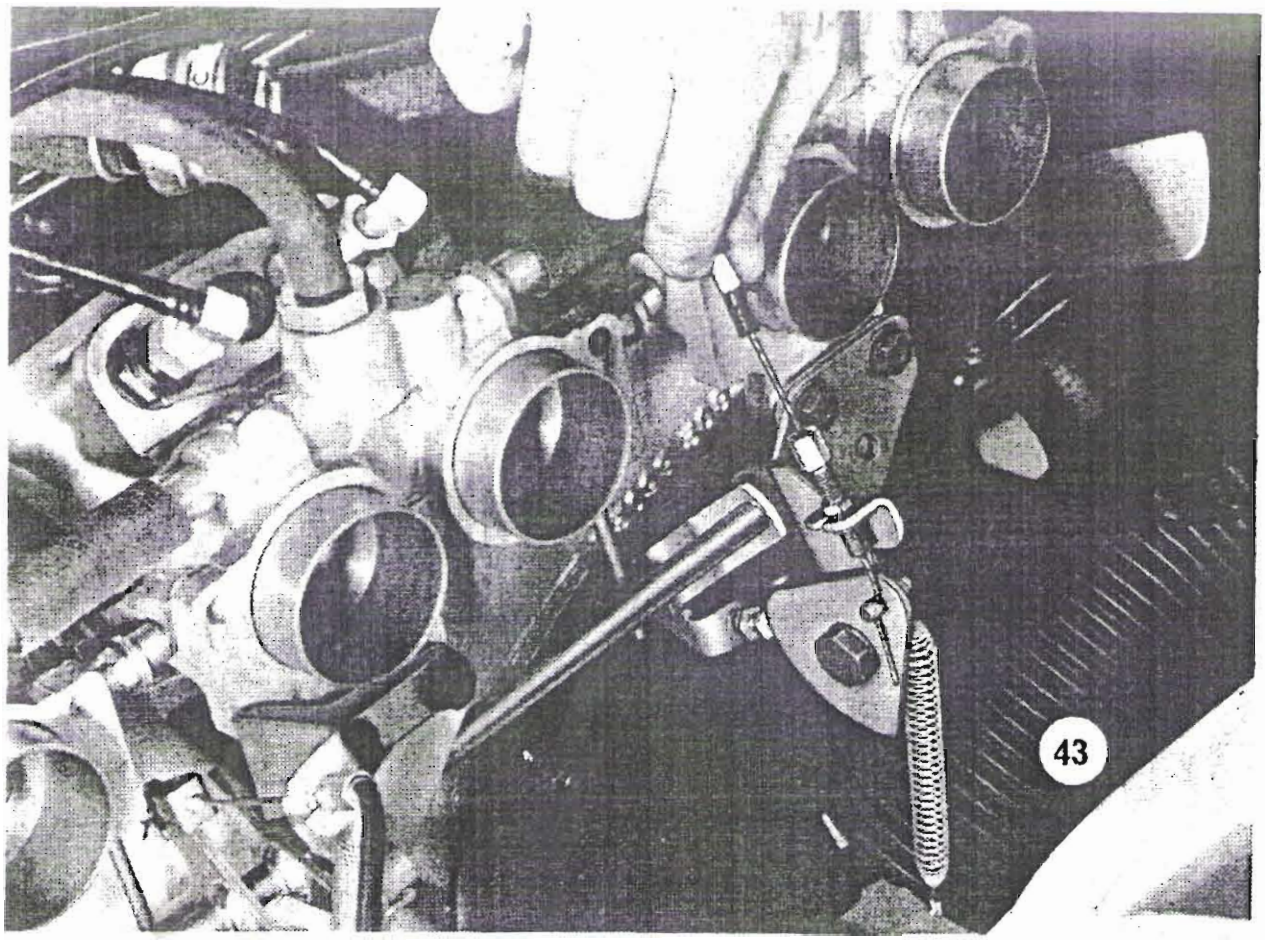
Eliminate excessive slack in throttle cable and tighten lock-nut.

NOTE:—With the type of meter shown the needle will fluctuate due to air impulses and an average needle reading must be taken for each pair of intakes.



FRAME 42

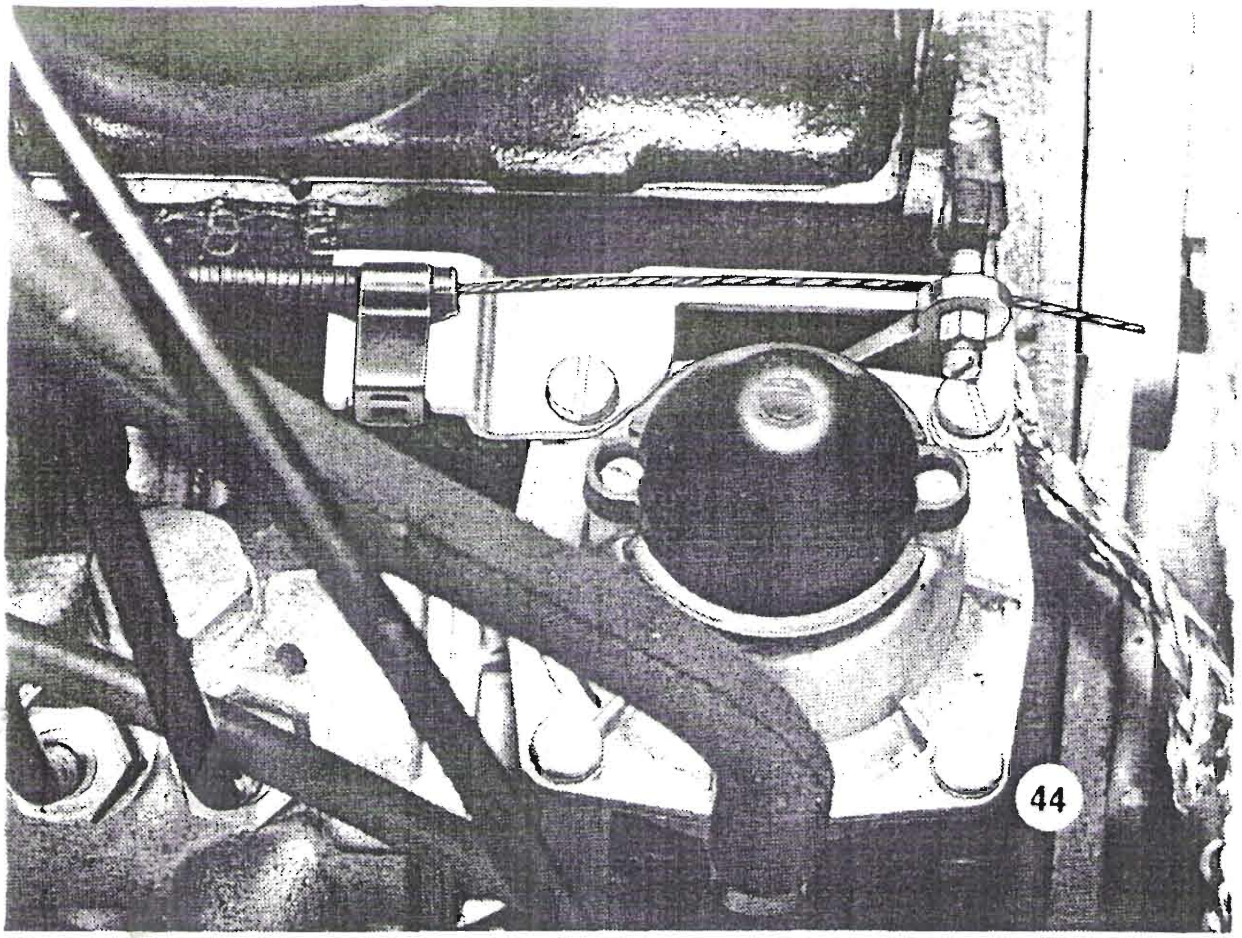
With feeler gauges adjust clearance between cold start cam and screw to 0.002" (0.05 mm) then tighten locking nut.



FRAME 43

With the engine idling pull out cold start cable as shown and engine speed should rise to approximately 1500 r.p.m.

Release cable, then eliminate excessive slack and tighten cable lock-nut.

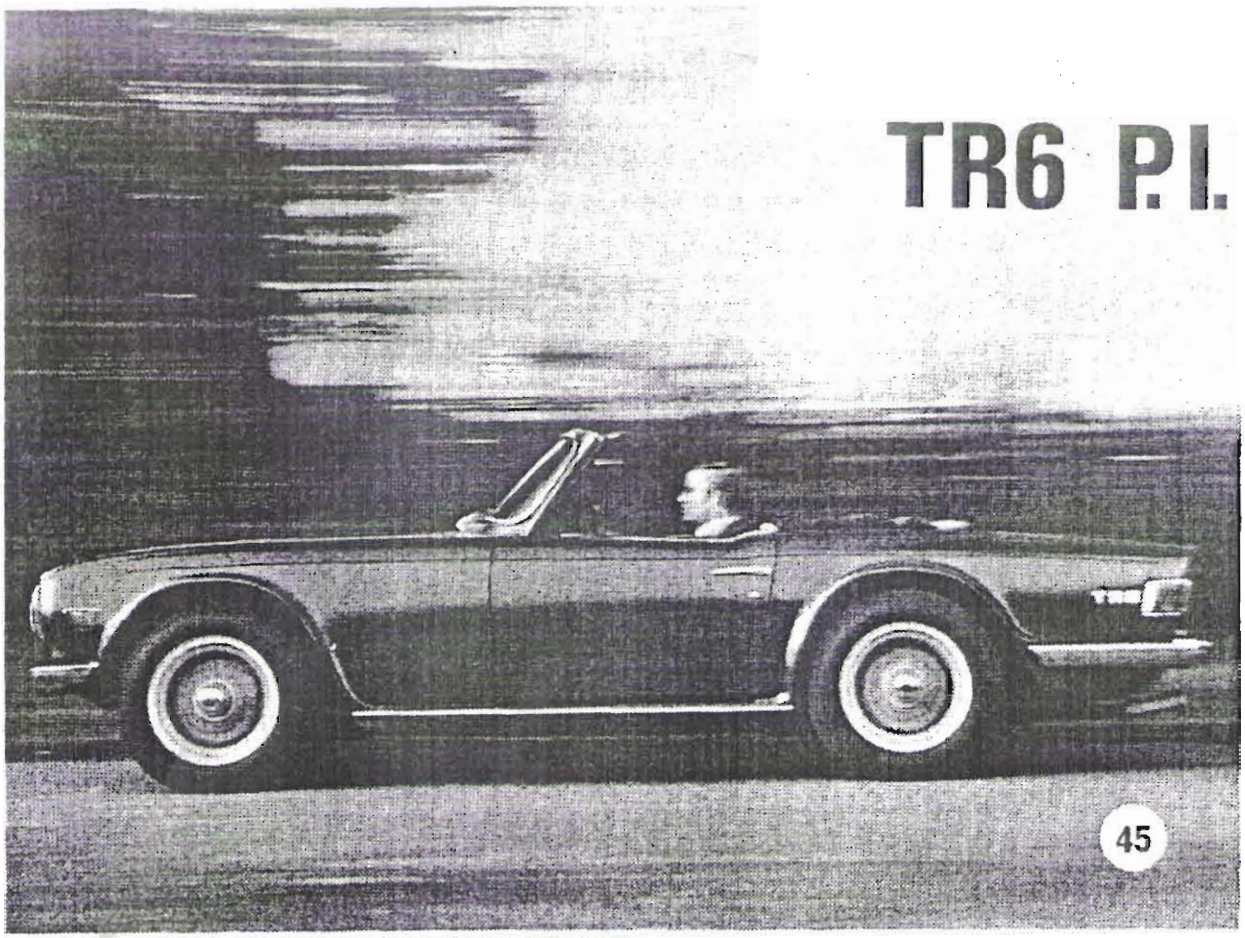


FRAME 44

Finally adjust excess fuel lever cable on control unit giving lever full travel.

NOTE:—Check that first movement of cold start knob opens throttle valves, at the same time taking up the 0.004" - 0.008" (0.1016 mm - 0.2032 mm) clearance previously set on the excess fuel lever. Further movement will then operate the excess fuel device.

Replace air intake manifold.

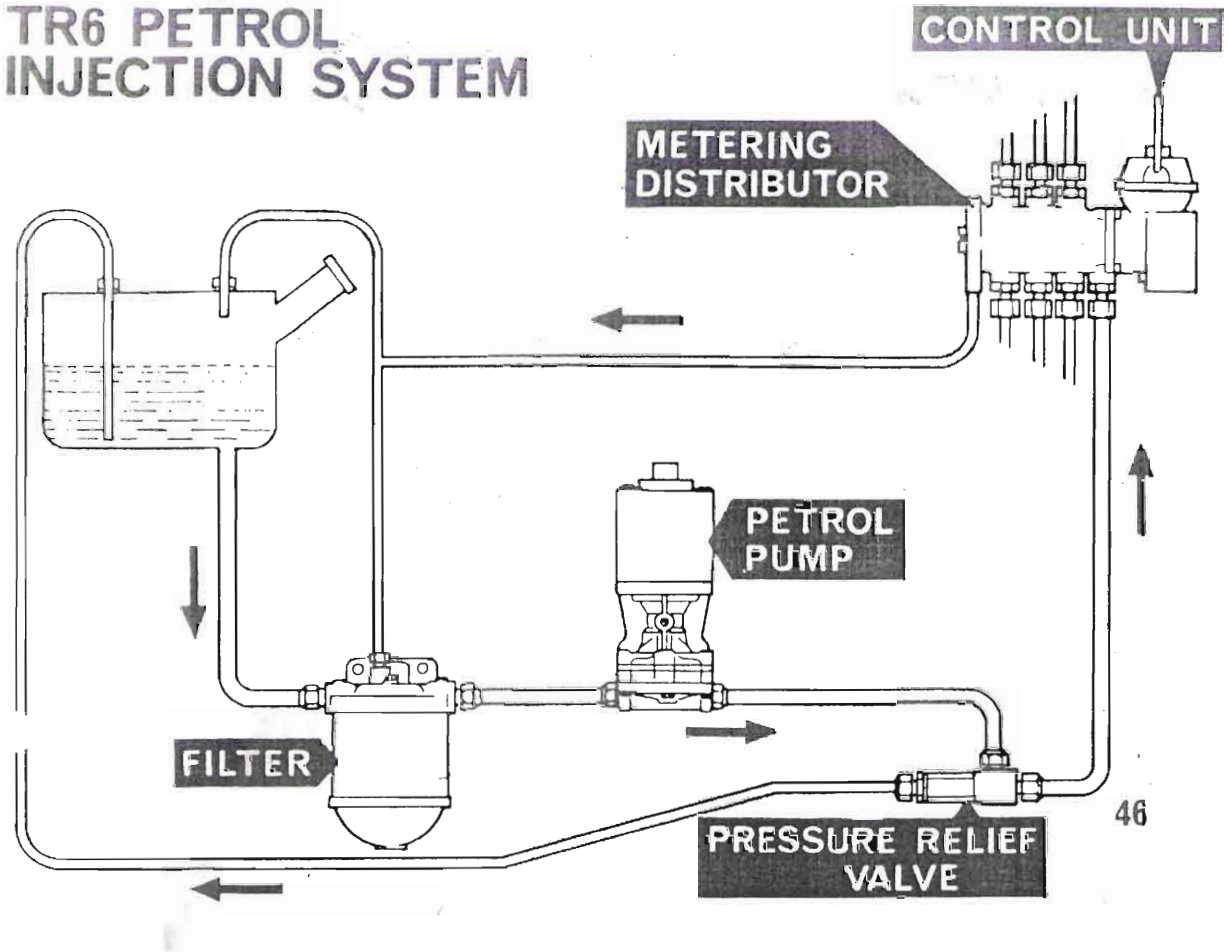


FRAME 45

PART 2

The 2498 cc six-cylinder petrol injection engine formerly fitted to the TR5 P.I. has been retained for the TR6 P.I. This engine has proved exceptionally reliable in service, and it's power and torque characteristics make it one of the most advanced engines fitted to a British production sports car.

The fuel supply system has detail alterations to the siting of the relief valve and piping, which is now adjacent to the petrol pump in the luggage compartment as shown in the following frames.



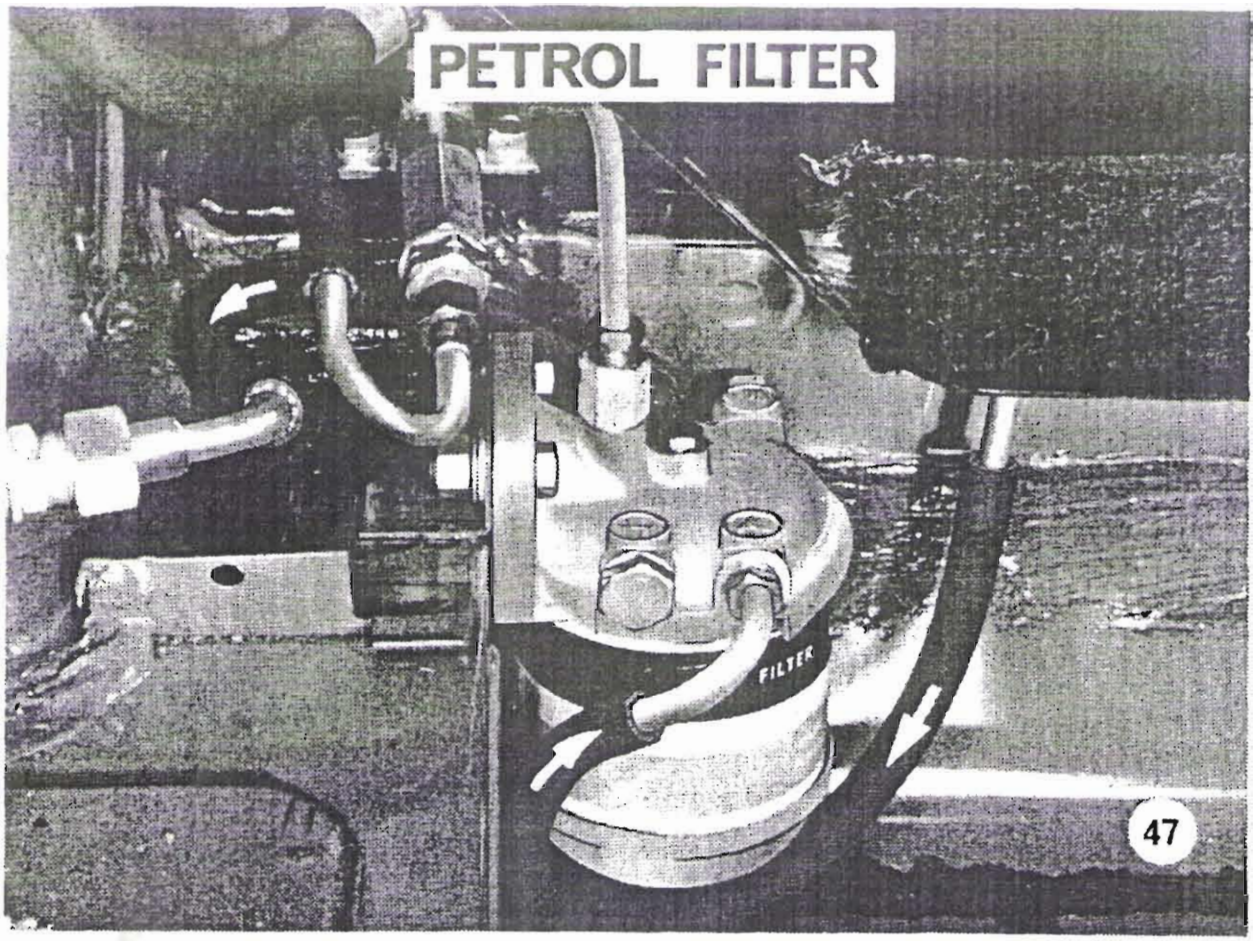
FRAME 46

A simplified schematic illustration of the petrol injection system as fitted to the TR6 is shown above.

An electric pump draws fuel from the tank, through a paper element filter. The fuel is pressurized by the pump, line pressure being maintained at 106 - 110 lbs. sq. in. (7.42 - 7.70 kg. sq. cm) by a relief valve, excess fuel being returned through this valve to the petrol tank.

The metering distributor is driven off the engine distributor drive gear and delivers accurately metered and timed fuel charges to each injector in turn. Fuel used to lubricate the metering distributor is returned to the tank.

The fuel quantity is determined by a mixture control unit mounted integral with the metering distributor.

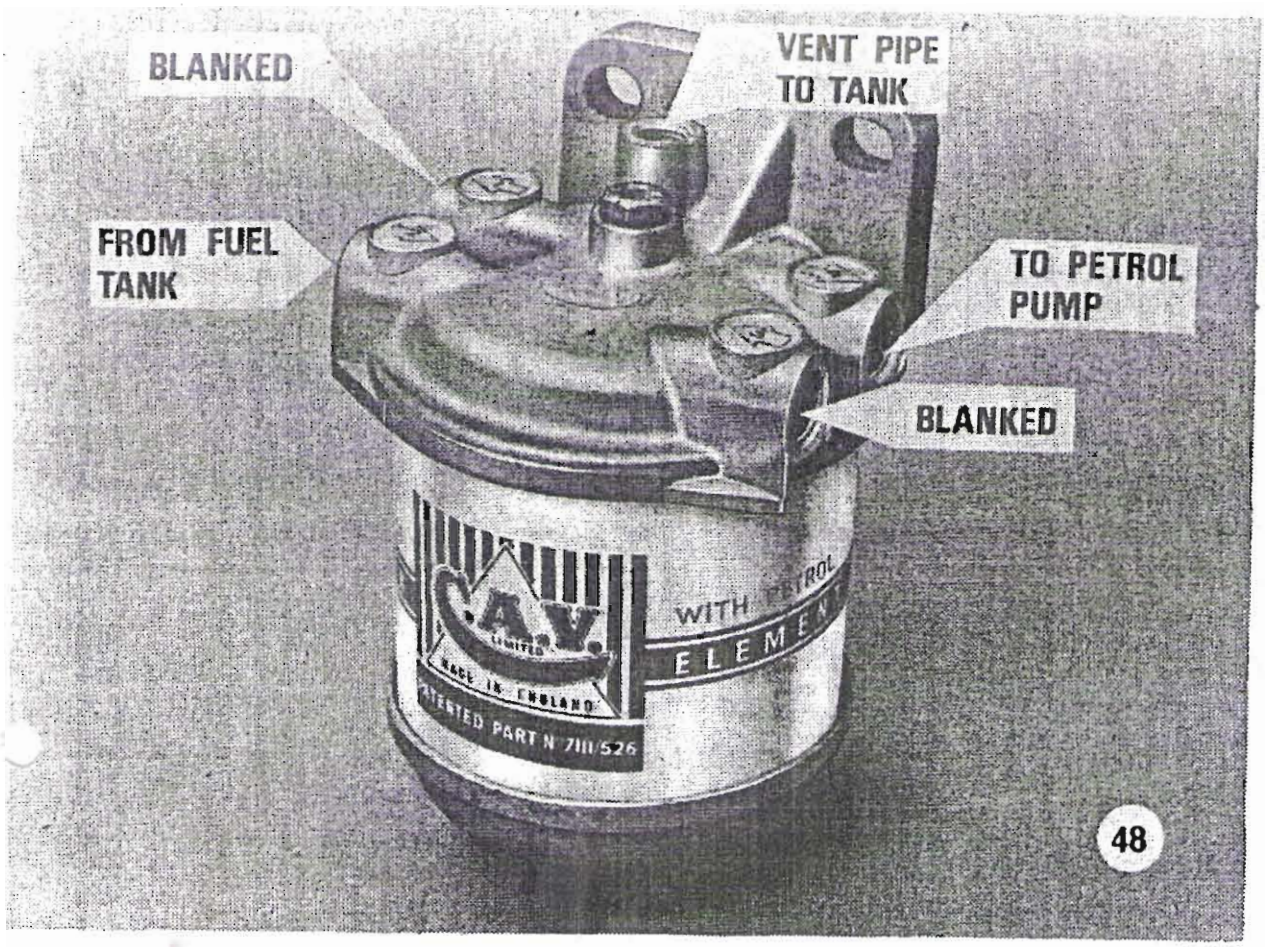


FRAME 47

PETROL FILTER

The petrol filter, which is gravity fed, is situated in the spare wheel compartment underneath the petrol tank in the luggage compartment.

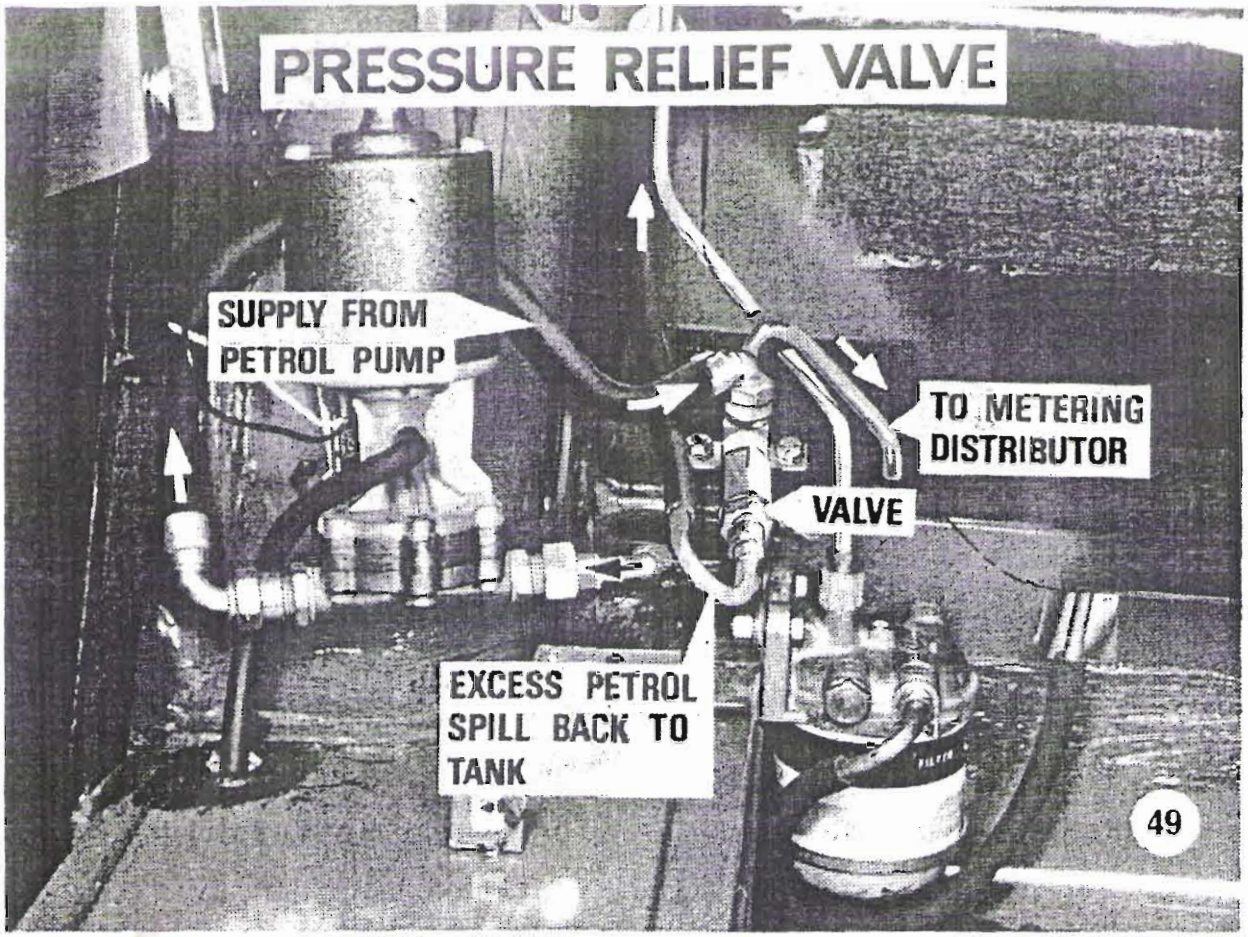
When changing the filter element it is ESSENTIAL that the flexible feed pipe between the petrol tank and filter is clamped.



FRAME 48

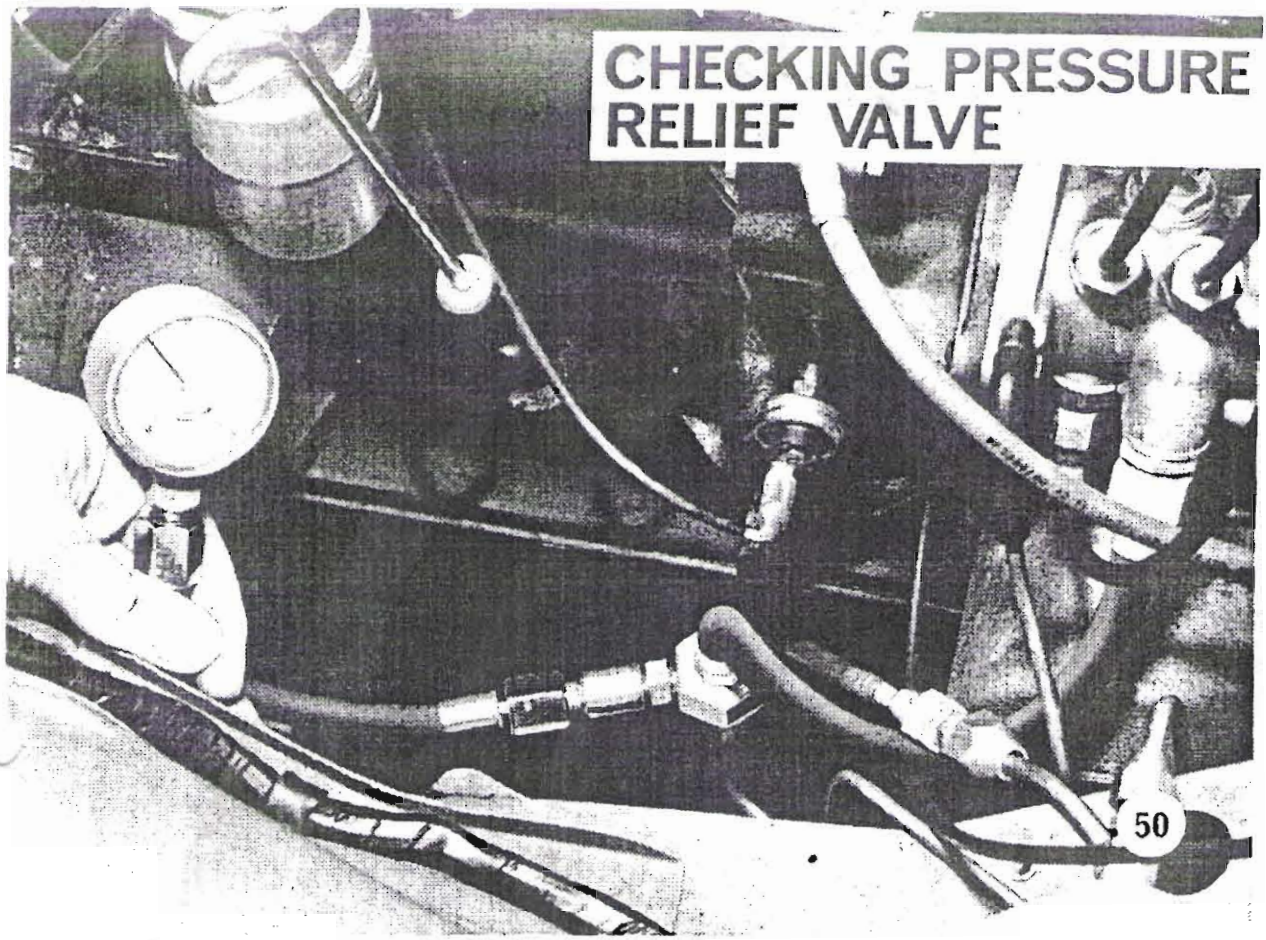
The filter unit is shown with the pipe connectors labelled.

When replacing a filter element ensure that the words "FOR USE WITH PETROL" are printed on it as shown.



FRAME 49

The pressure relief valve is situated in the luggage compartment adjacent to the petrol pump.



FRAME 50

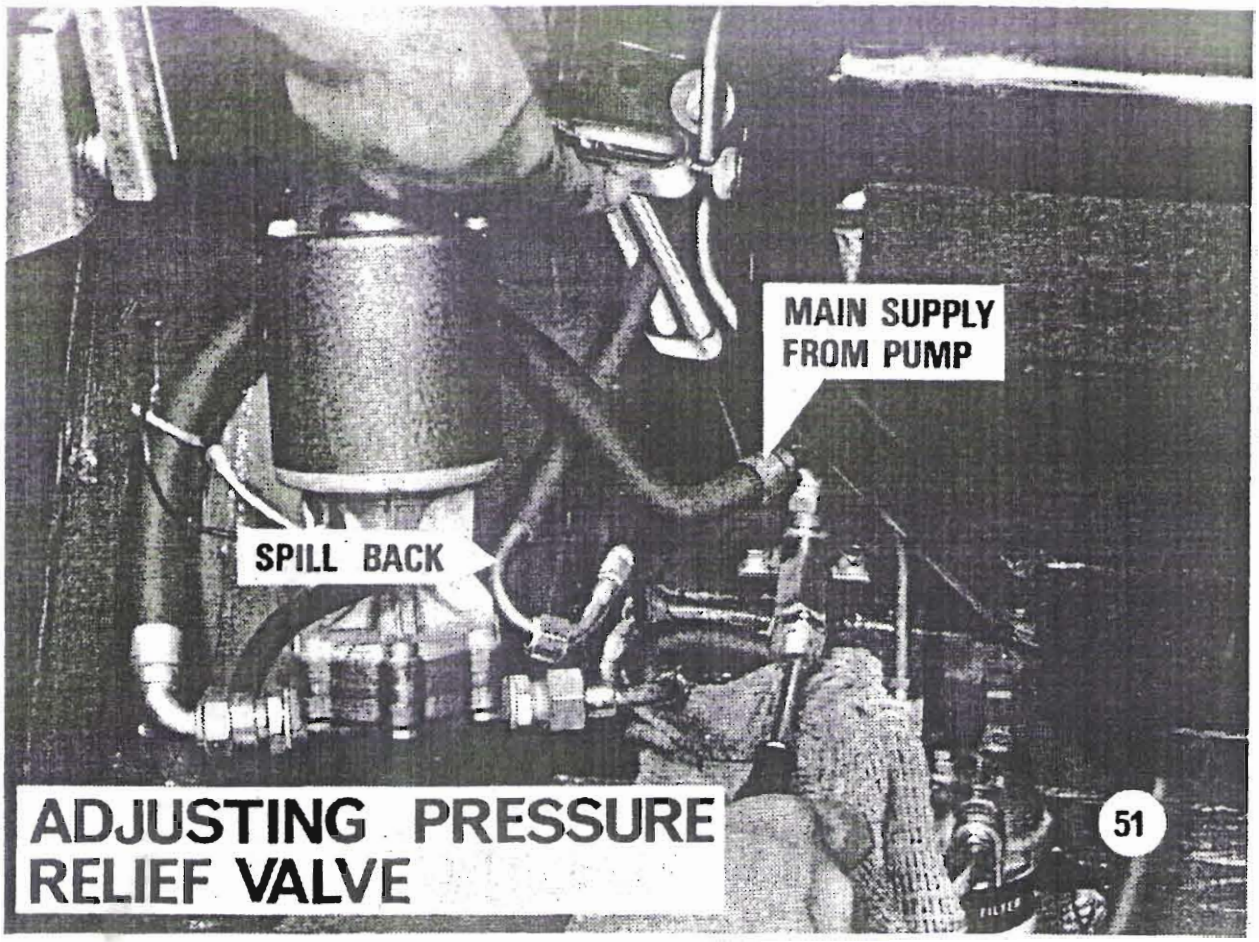
CHECKING PRESSURE RELIEF VALVE

1. Clamp flexible supply pipe from pump (in luggage compartment).

2. Open the bonnet and disconnect the flexible petrol pipe at the main feed pipe union and fit a 'T' connection with a pressure gauge as shown.

3. Remove clamp from supply pipe. Switch on ignition and gauge should record a pressure of 106 - 110 lbs. sq. in. (7.42 - 7.70 kg. sq. cm).

NOTE:—Ensure battery is fully charged before commencing pressure check.



FRAME 51

ADJUSTING PRESSURE RELIEF VALVE

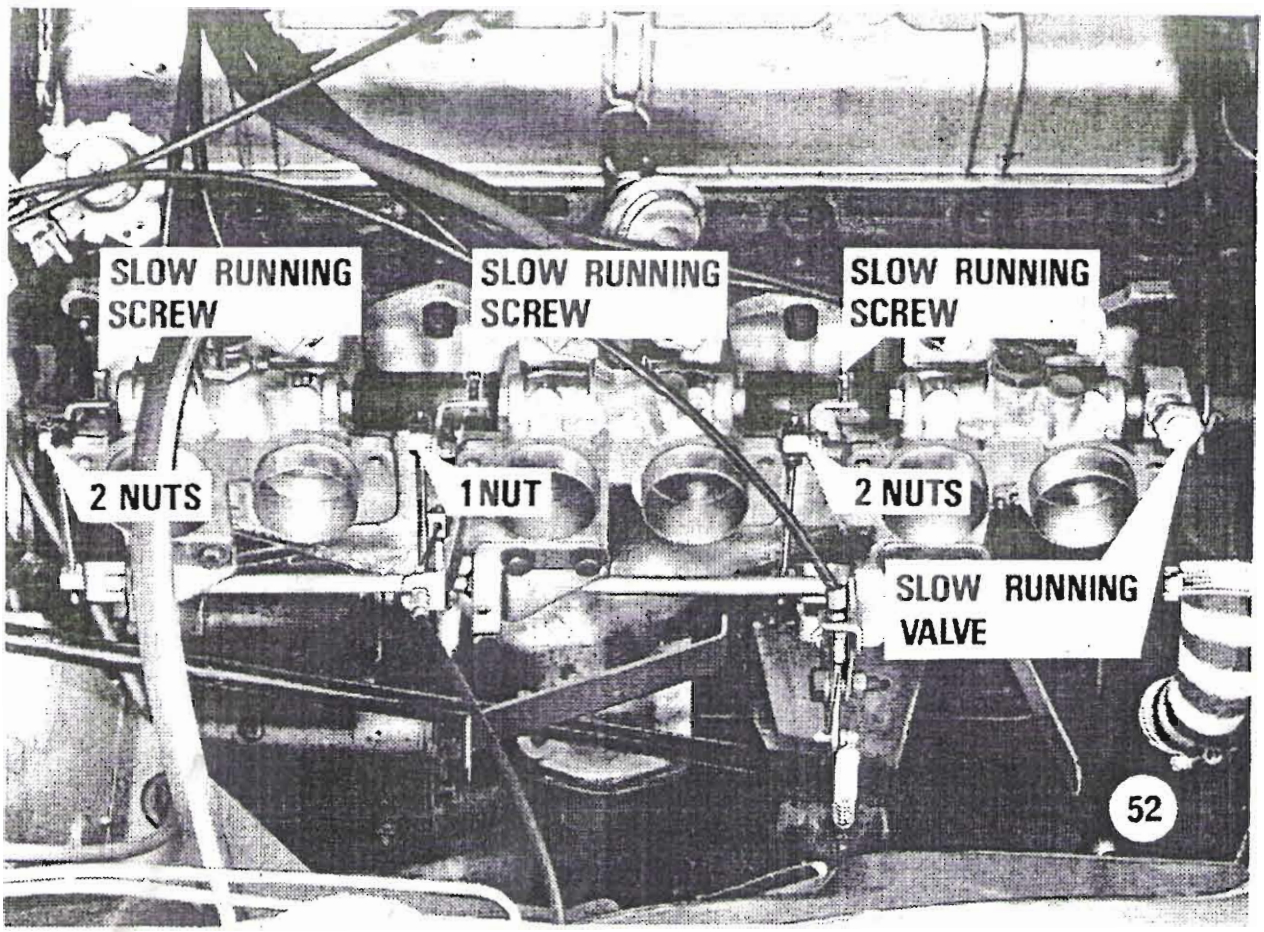
If the pressure reading is low turn the relief valve adjustment screw clockwise to increase, and anticlockwise to decrease pressure.

1. Clamp fuel spill back pipe.

2. Disconnect fuel spill back pipe at valve end.

3. With a Phillips type screwdriver, turn the nylon screw in the appropriate direction, refit spill back pipe and release clamp.

   Switch on ignition and recheck pressure.



FRAME 52

THROTTLE AND COLD START SETTINGS

Start engine and warm up to normal running temperature.

Stop engine and remove air cleaner.

Ensure that the cold start knob on the dash is fully in and the excess fuel lever on the control unit is fully off.

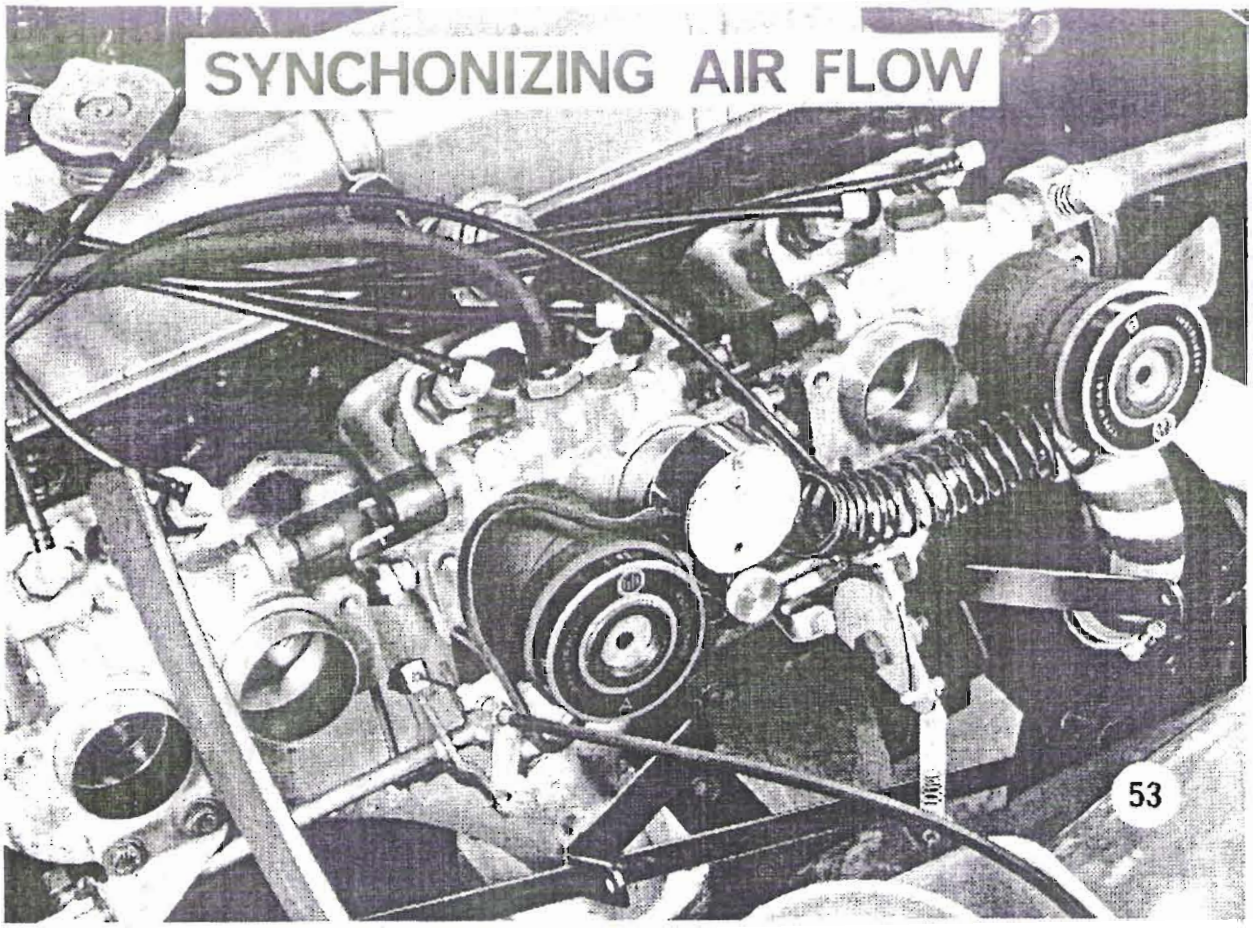
Slacken the cold start cam adjusting screw until it is well clear of the cam.

Slacken the accelerator cable adjustment.

Slacken the five lock-nuts on the accelerator adjusting rods well clear of the trunnion blocks.

NOTE:—The centre rod has a threaded trunnion block screwed onto either end, the rod being locked into position by a lock-nut acting on the top trunnion. On the two outer adjusting rods the top trunnions are not threaded and are held in position by two lock-nuts.

Press the accelerator cross-shaft hard against the back stop and with a screwdriver adjust the centre rod until the centre pair of butterflies are fully open (horizontal) then tighten lock-nut.



FRAME 53

Open the slow running valve approximately five turns.

Start engine and using either the Twin-Tune or similar air balance equipment, adjust the three slow running screws until no air is passing the butterflies.

The screws should be just seating, to take the accelerator return spring load off the butterflies.

Tighten lock-nuts on outer adjusting rod finger tight. If engine revs rise a load has been applied to the trunnion blocks and the locknuts should be slackened and re-tightened.

Set slow running to 750 - 800 r.p.m. using valve on manifold.

Increase engine speed to 1500 r.p.m.

Using the centre intakes as the master unit, check that equal breathing is obtained on both outer units.

If adjustment is required screw the lock-nuts up or down on the appropriate outer control rods. Fully tighten lock-nuts. DO NOT ALTER SETTING OF CENTRE CONTROL ROD.

Reduce engine speed to idle and adjust if necessary using the air valve.

Eliminate excessive slack on the accelerator cable and tighten lock-nut.

Using feeler gauges adjust clearance between cold start cam and screw to 0.002" (0.05 mm) then tighten lock-nut.

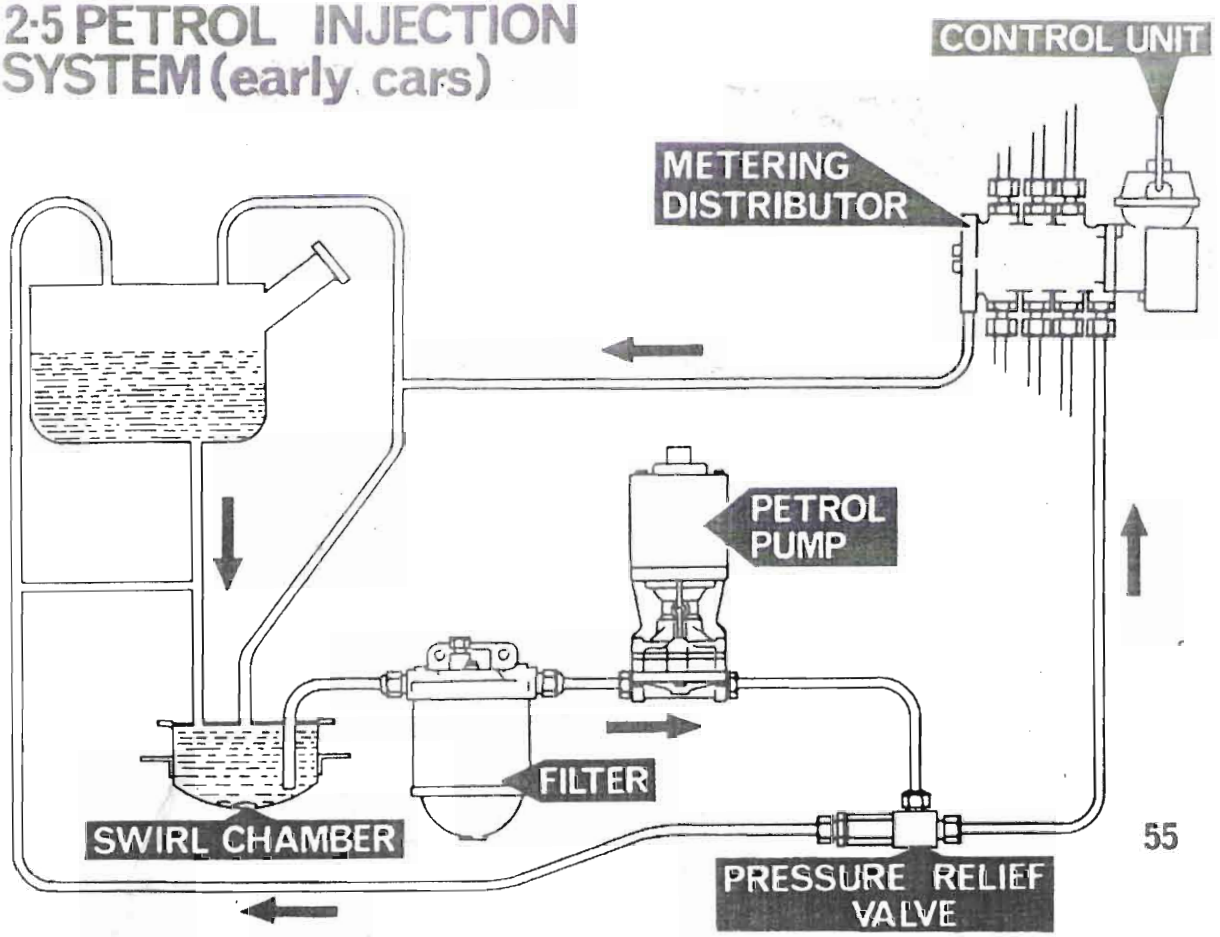
FRAME 54

PART 3

The Triumph 2.5 P.I. was the first British saloon car to be fitted with petrol injection.

Although the engine is basically the same as the TR5, it has been detuned slightly to give 132 b.h.p. This is to ensure that the saloon car does not lose any of it's flexibility in the process of gaining more performance.

2·5 PETROL INJECTION SYSTEM (early cars)



FRAME 55

A simplified schematic illustration of the Petrol Injection system as fitted to 2.5 Saloon (early cars) is shown above.

Fuel is gravity fed from the petrol tank into a swirl chamber. The spill back pipe is also interconnected to the swirl chamber feed pipe. This ensures that a quantity of fuel is available to feed the pump even under severe cornering with a low fuel condition.

An electric pump draws fuel from the swirl chamber through a paper element filter. The fuel is pressurized by the pump, line pressure being maintained at 106 - 110 lbs. sq. in. (7.42 - 7.70 kg. sq. cm) by a relief valve, excess fuel being returned through this valve to the petrol tank.

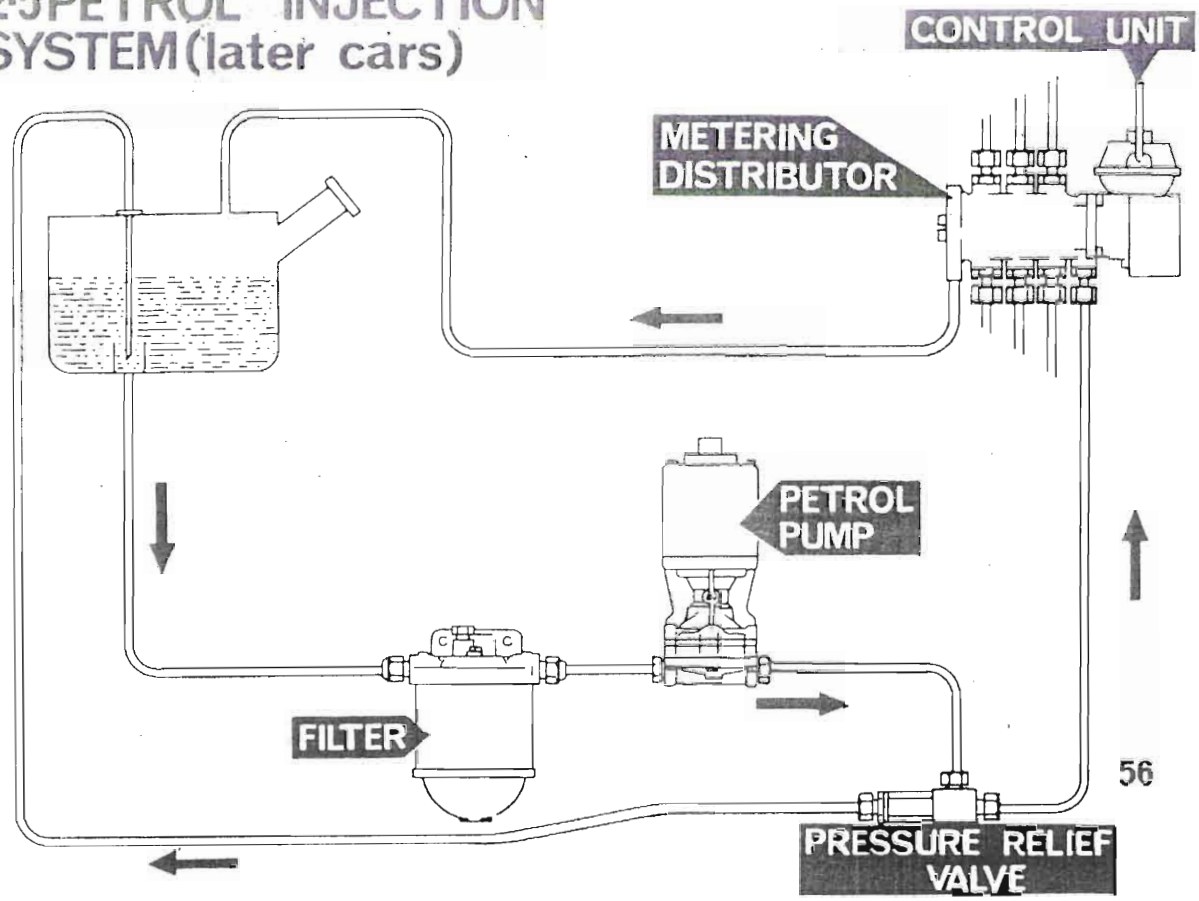
The metering distributor is driven off the engine distributor drive gear and delivers accurately metered and timed fuel charges to each injector in turn. Fuel used to lubricate the metering distributor is returned to the tank.

The fuel quantity is determined by a mixture control unit mounted integral with the metering distributor.

To prevent ingress of water into the petrol tank and injection system a filter has been fitted to the petrol tank vent pipe system.

The filter does not require any maintenance.

2·5 PETROL INJECTION SYSTEM (later cars)



FRAME 56

A simplified schematic illustration of the Petrol Injection system as fitted to 2.5 Saloon (later cars) is shown above.

An electric pump draws fuel from the tank, through a paper element filter. The fuel is pressurized by the pump, line pressure being maintained at 106 - 110 lbs. sq. in. (7.42 - 7.70 kg. sq. cm) by a relief valve, excess fuel being returned through this valve to the petrol tank.

The swirl chamber has been incorporated in the main petrol tank. This ensures fuel is available to feed the pump even under severe cornering with a low fuel condition.

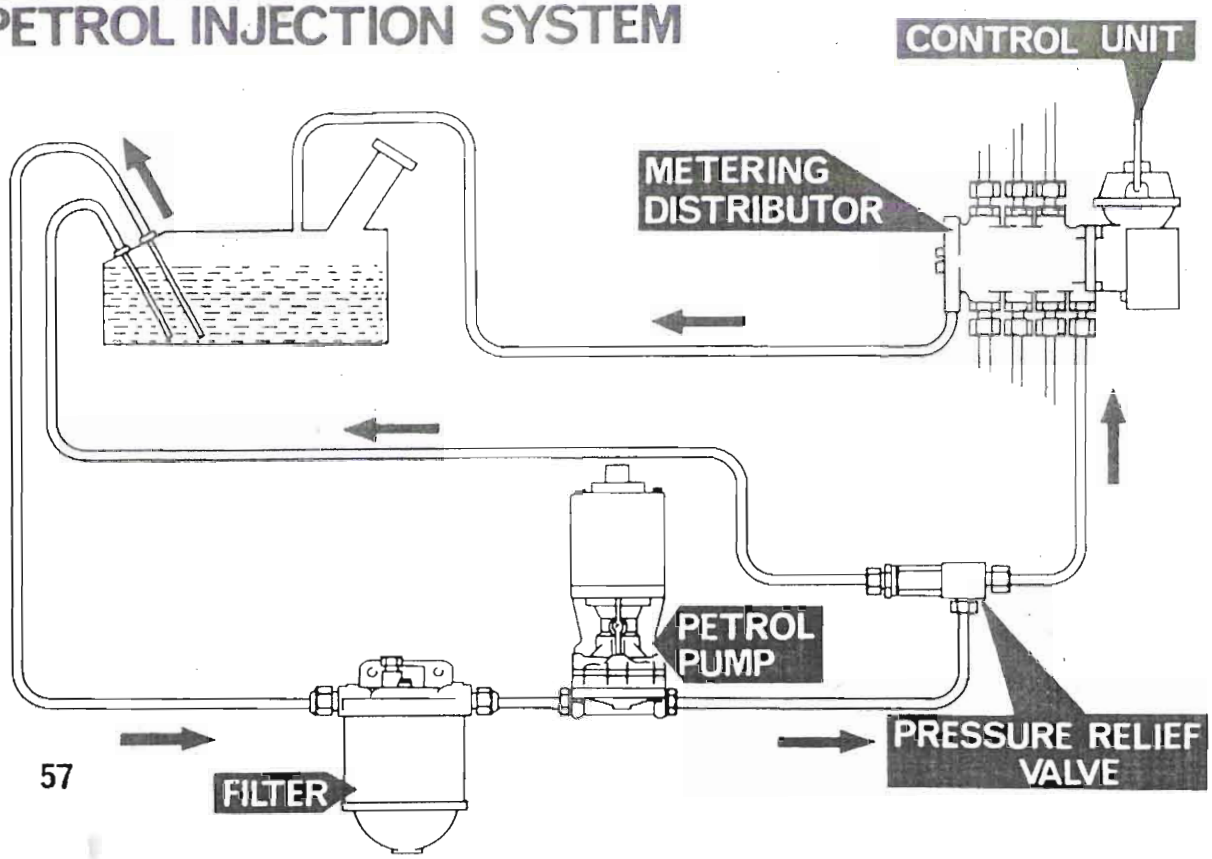
The metering distributor is driven off the engine distributor drive gear and delivers accurately metered and timed fuel charges to each injector in turn. Fuel used to lubricate the metering distributor is returned to the tank.

The fuel quantity is determined by a mixture control unit mounted integral with the metering distributor.

To prevent ingress of water into the petrol tank and injection system a filter has been fitted to the petrol tank vent pipe system.

The filter does not require any maintenance.

2·5 ESTATE CAR PETROL INJECTION SYSTEM



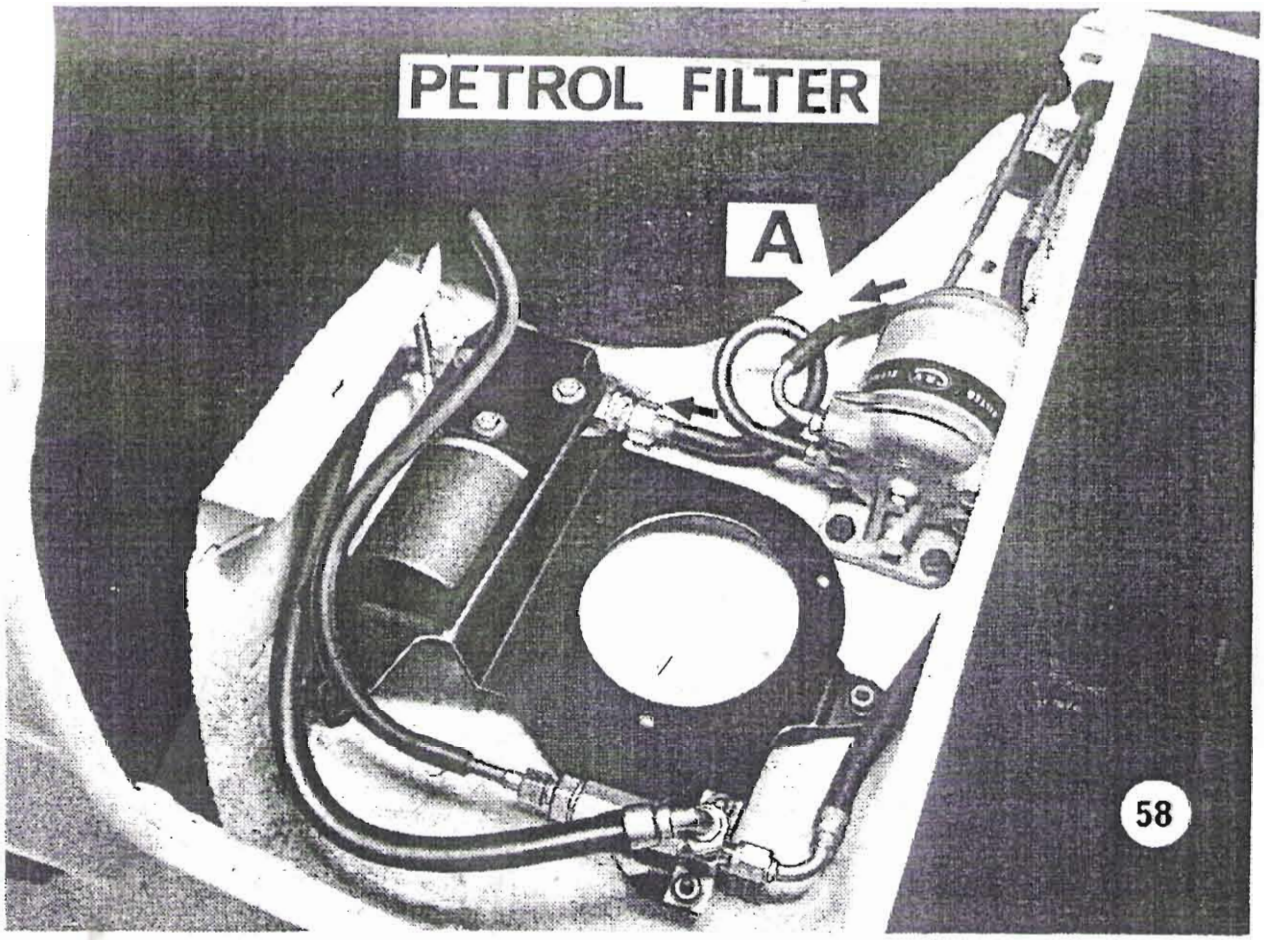
FRAME 57

A simplified schematic illustration of the Petrol Injection system as fitted to 2.5 Estate Cars is shown above.

An electric pump draws fuel from the tank, through a paper element filter The fuel is pressurized by the pump, line pressure being maintained at 106 - 110 lbs. sq. in. (7.42 - 7.70 kg. sq. cm) by a relief valve, excess fuel being returned through this valve to the petrol tank.

The metering distributor is driven off the engine distributor drive gear and delivers accurately metered and timed fuel charges to each injector in turn Fuel used to lubricate the metering distributor is returned to the tank.

The fuel quantity is determined by a mixture control unit mounted integra with the metering distributor.



FRAME 58

PETROL FILTER

The Petrol Filter is situated in the luggage compartment of the 2.5 P.I. Saloon under the floor panel on the left-hand side.

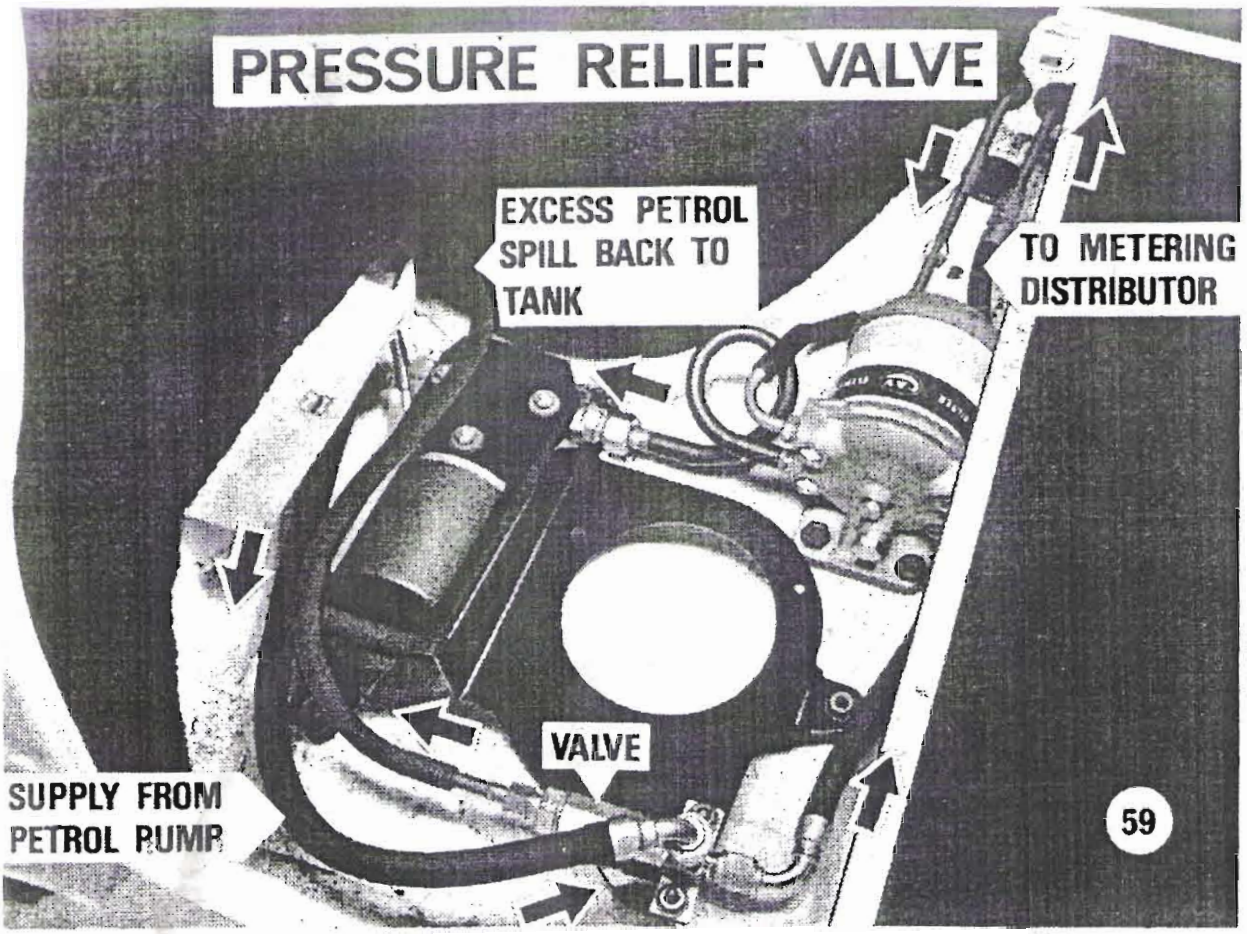
The filter should be changed at the prescribed mileages and the following points noted.

1. Cut the fuel supply from the petrol tank by clamping the flexible pipe at 'A' as shown above.

2. Remove the two bolts securing the filter body to the boot floor.

3. Place a tray under the filter to catch surplus petrol.

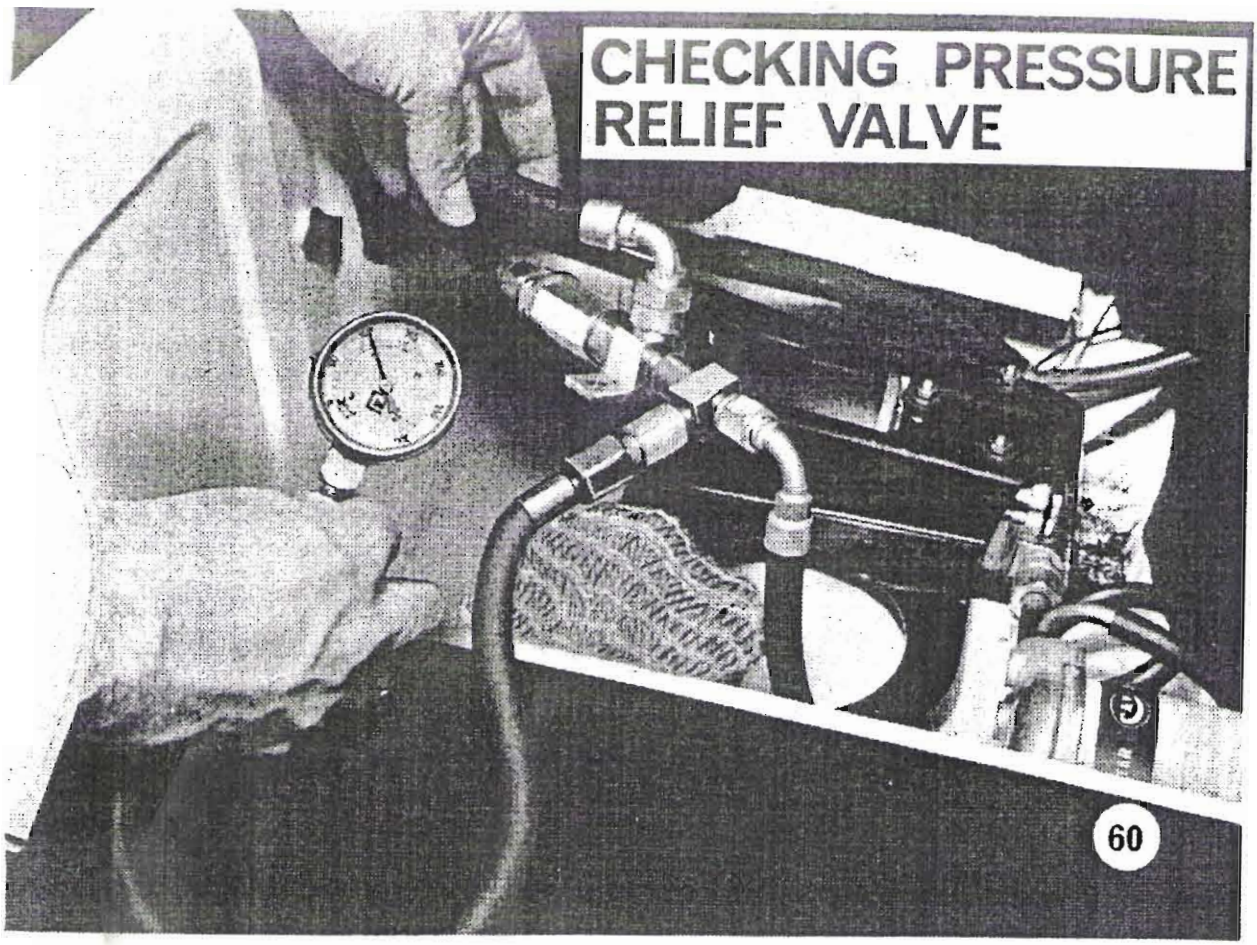
4. Remove the filter element and ensure that the replacement element is suitable for petrol.



FRAME 59

On the Triumph 2.5 P.I. Saloon the pressure relief valve is situated in the luggage compartment under the floor panel on the left-hand side.

The flow of petrol through the pipe and relief valve is shown above.



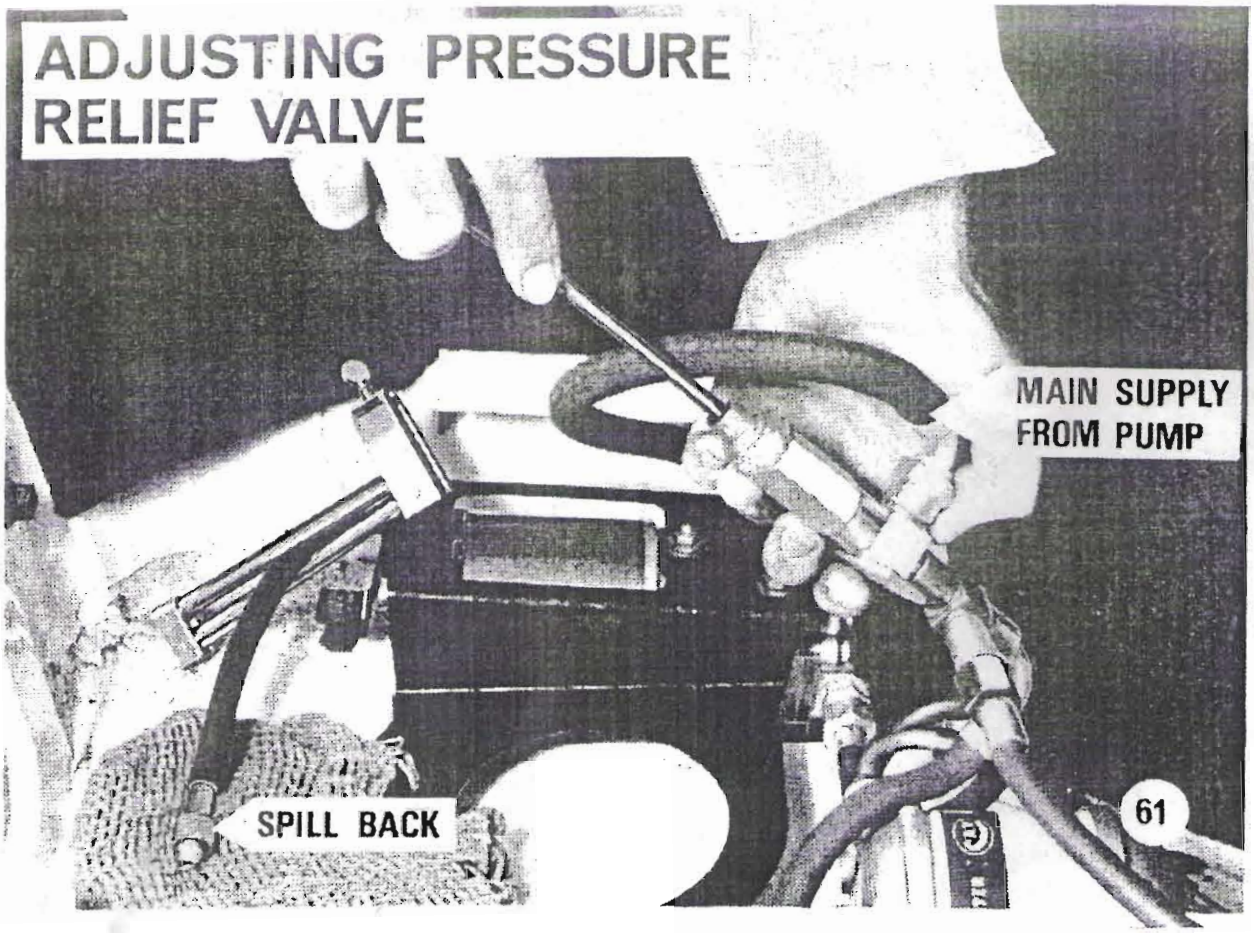
FRAME 60

CHECKING PRESSURE RELIEF VALVE

1. Disconnect fuel pipe at the valve assembly on metering distributor side and fit a 'T' connection with pressure gauge.

2. Remove clamp, switch on ignition and gauge should record a pressure of 106 - 110 lbs. sq. in. (7.42 - 7.70 kg. sq. cm).

NOTE:—Ensure battery is fully charged before commencing pressure check.



FRAME 61

ADJUSTING PRESSURE RELIEF VALVE

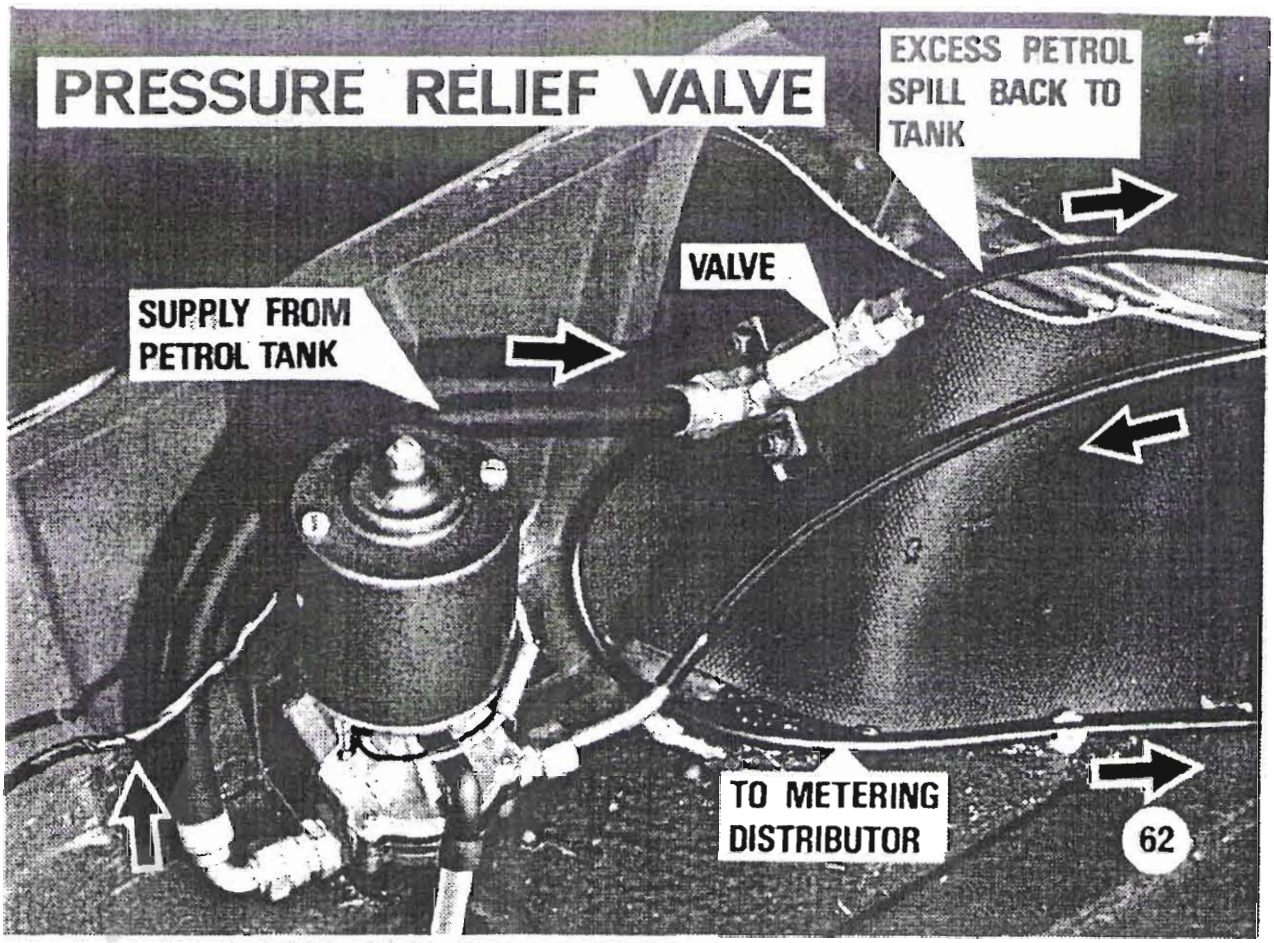
If the pressure reading is low turn the adjustment screw clockwise to increase and anticlockwise to decrease pressure.

1. Clamp the spill back pipe as shown above.

2. Disconnect spill back pipe at valve end.

3. With a Phillips type screwdriver turn the nylon screw in the appropriate direction, refit spill back pipe to relief valve and release clamp.

   Switch on ignition and recheck pressure.



FRAME 62

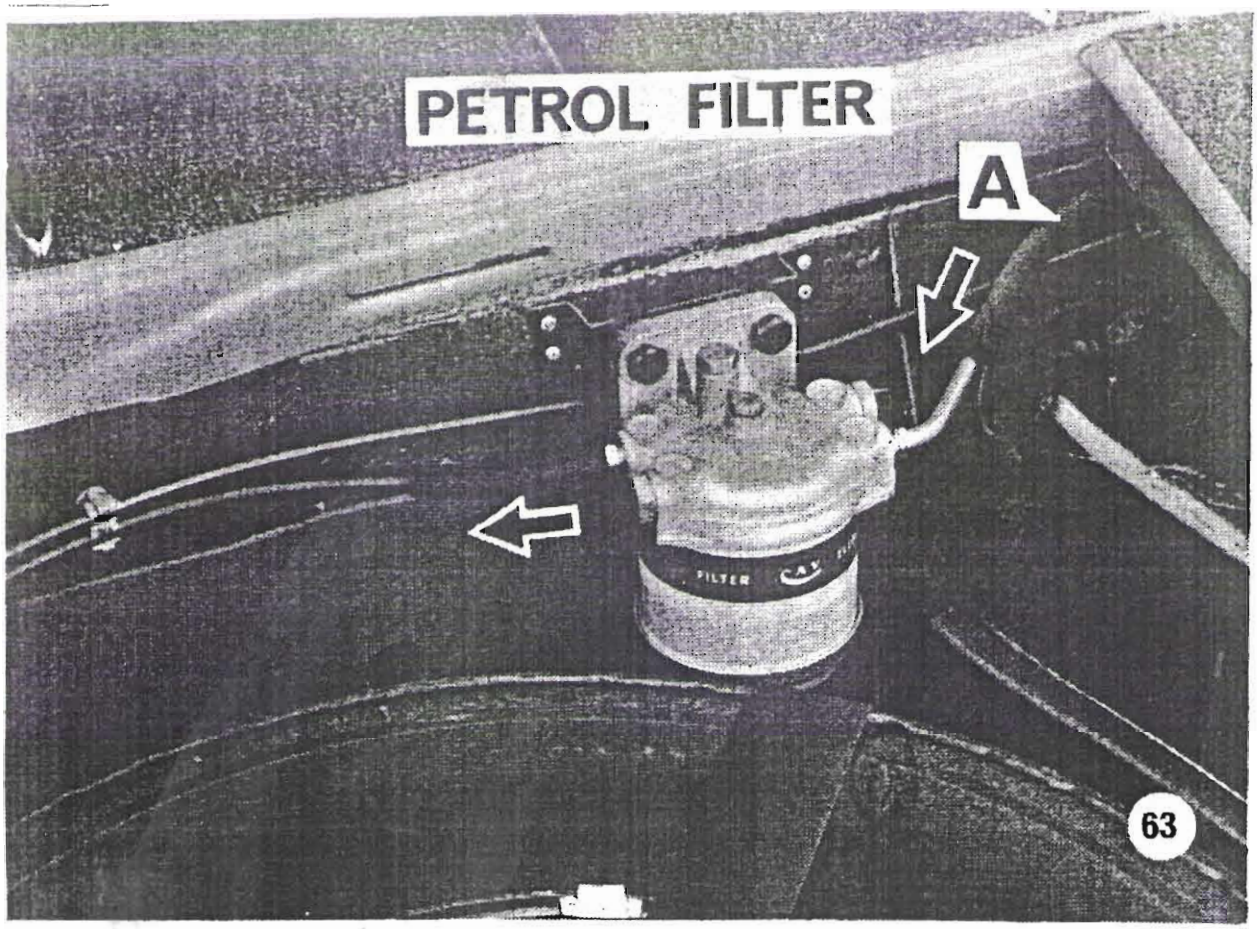
On the Triumph 2.5 Estate Car the pressure relief valve is situated under the floor panel on the left-hand side adjacent to the spare wheel.

The flow of petrol through the pipes and relief valve is shown above.

Should the pressure require regulating the spill back pipe should be clamped at the rubber pipe connecting the spill back pipe to the petrol tank. —

DO NOT USE A CLAMP ON ANY OF THE NYLON PIPES.

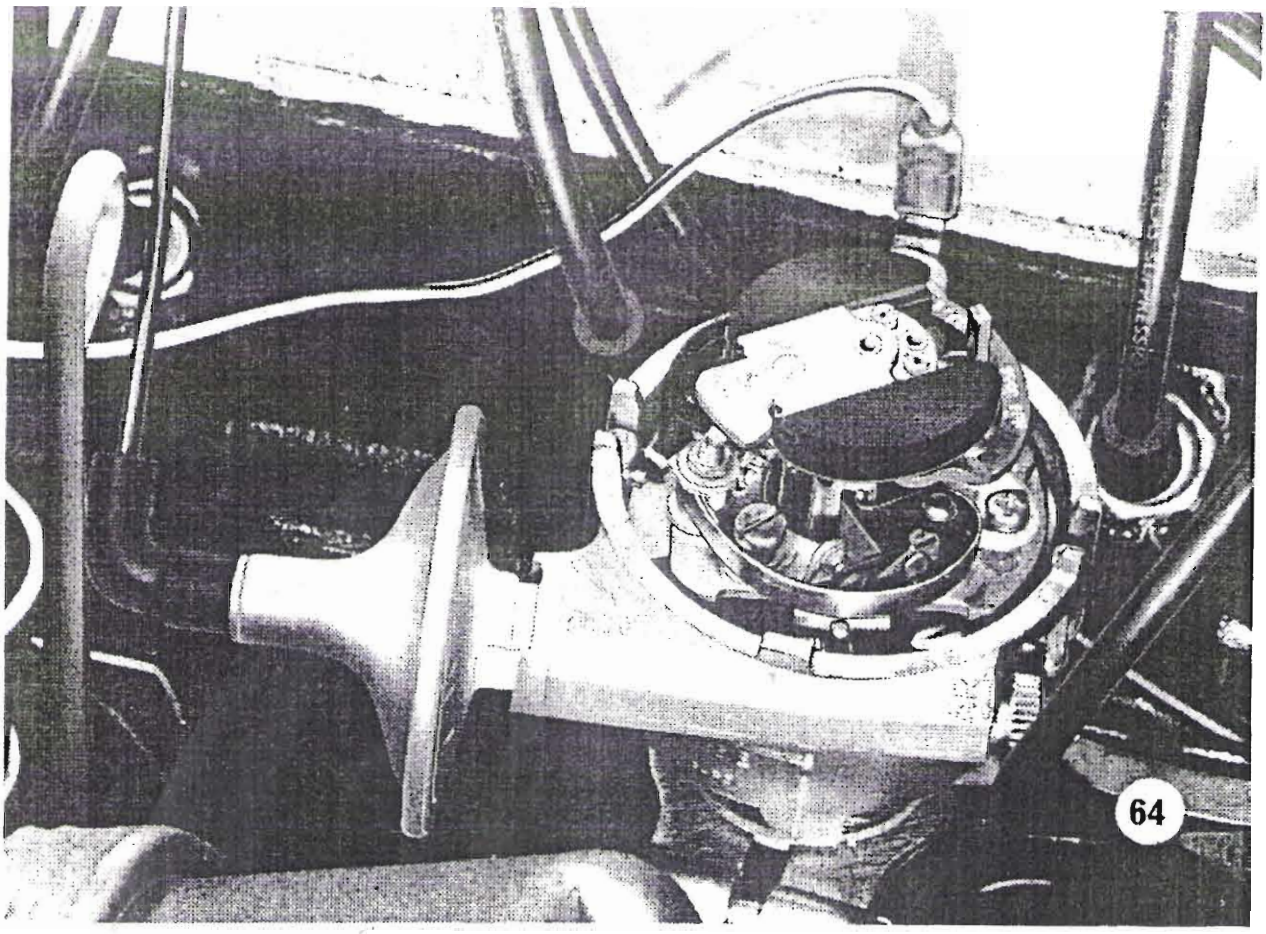
The pressure relief valve is regulated in the same way as the Triumph 2.5 Saloon.



FRAME 63

On the 2.5 Estate Car the petrol filter is situated under the rear floor panel adjacent to the spare wheel and petrol tank as shown above.

The flexible pipe 'A' should be clamped and a tray placed under the filter to collect excess petrol before changing the filter element.

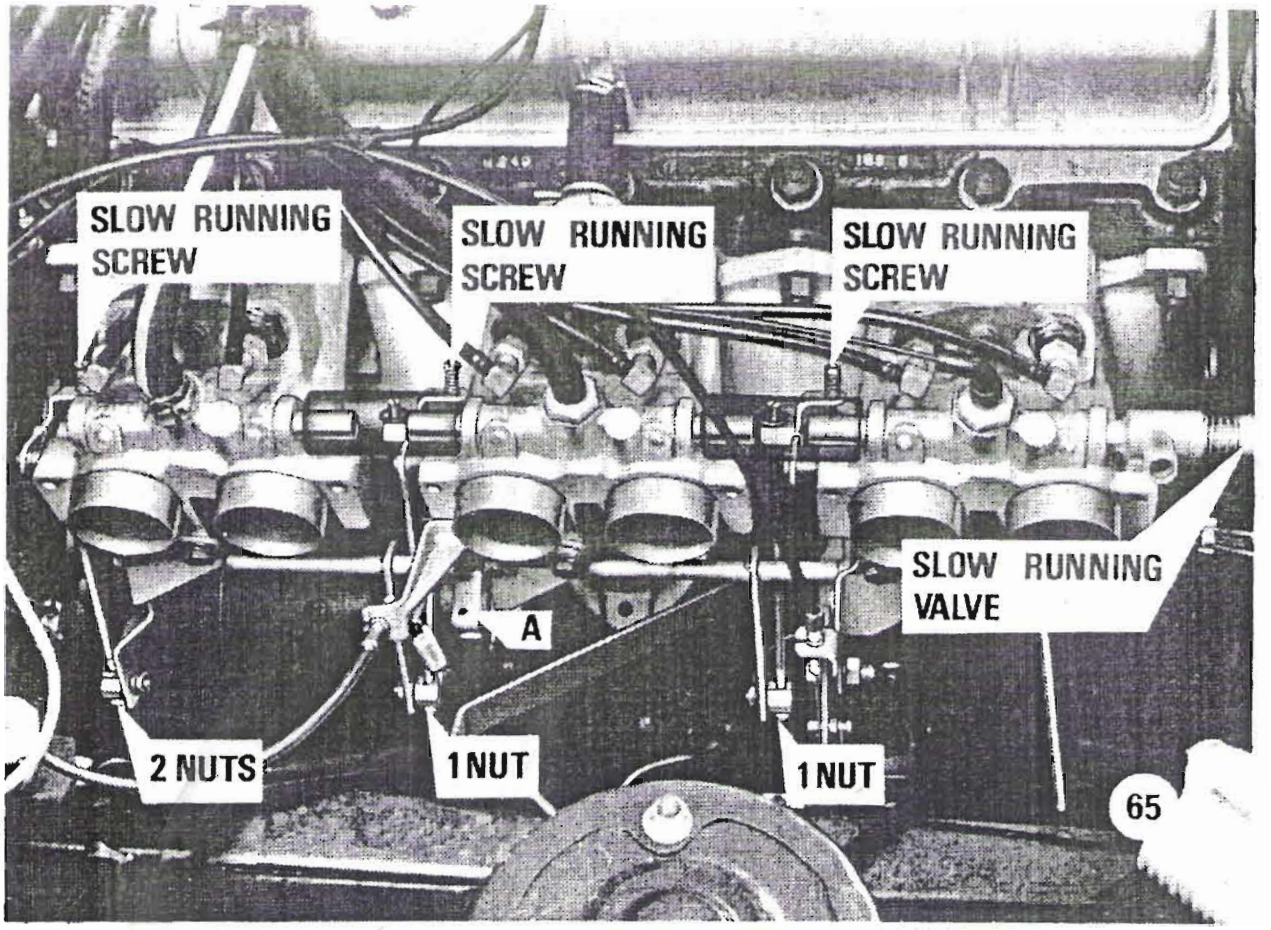


FRAME 64

IGNITION TIMING

The static ignition setting on the Triumph 2.5 P.I. Saloon and Estate car is 8° B.T.D.C.

On early cars the distributor rotor arm is fitted with an engine revolution limiting device, as shown above, which comes into operation between 5700 - 5900 r.p.m.



FRAME 65

THROTTLE AND COLD START SETTINGS

The throttle and cold start setting procedures for early Triumph 2.5 Saloon and Estate Cars, fitted with the manifold air valve, is the same as previously described for the TR6.

On later cars fitted with an accelerator linkage as shown above proceed as follows:

Start engine and warm up to normal running temperature.

Stop engine and remove air cleaner.

Ensure that the cold start knob on the dash is fully in and the excess fuel lever on the control unit is fully off.

Slacken the cold start cam adjusting screw until it is well clear of the cam.

Slacken the accelerator cable adjustment.

Slacken the lock nuts, on the three accelerator adjusting rods, well clear of the trunnion blocks.

NOTE:—The accelerator adjusting rod nearest the bulkhead has two lock-nuts.

Open the slow running air valve approximately five turns.

Start engine and using either the Twin-Tune or similar air balancing equipment, adjust the three slow running screws until no air is passing the butterflies.

The screws should be just seating to take the accelerator return spring load off the butterflies. To check that the above operation has been done correctly place a finger over the air valve orifice and the engine should stall.

Set the slow running to 750 - 800 r.p.m. using the air valve on manifold.

Increase engine speed to 1500 r.p.m. by temporarily using a screw in the hole provided at point 'A' on the throttle linkage as shown in the illustration.

Using air balancing equipment check that equal breathing is obtained on all air intakes.

The front two pairs of intakes are adjusted by screwing the rods further into or out of the trunnion blocks.

On the rear pair of intakes the rod is adjusted by screwing the lock-nuts up or down.

Care should be taken when tightening the lock-nuts to ensure that the settings are not disturbed.

Remove temporary fast idle screw from throttle linkage and re-adjust slow running if necessary using the air valve.

Eliminate excessive slack on the accelerator cable and tighten lock-nut.

Using feeler gauges adjust clearance between cold start cam and screw to 0.002" (0.05 mm) then tighten lock-nut.

With the engine idling pull out cold start cable and the engine speed should rise to approximately 2800 r.p.m.

Release cable, eliminate excessive slack and tighten cable lock-nut.

Finally adjust excess fuel lever cable.

FAULT FINDING INSTRUCTIONS

(i) General

The following instructions deal solely with the adverse effect caused by malfunctioning of some part of the petrol system on the vehicle. The assumption is made that there is sufficient clean fuel available in the tank, the ignition system is in good order, the battery is in reasonable condition and state of charge, and that the wiring associated with the petrol pump circuit is satisfactory. This is important because these conditions, if not fulfilled, may present symptoms very similar to those that arise when some part of the petrol injection system is faulty.

(ii) Test Equipment Required

Pressure Gauge	Range 0 - 120 lbf/in² (8436.8 gf/cm²)
'T' - Piece	Having two ½" UNF. outlets, one male and one female, and a suitable connexion for the pressure gauge.
Ammeter	Range 0 - 5 amperes
Voltmeter	Range 0 - 15 volts
Container	

(iii) Service Precautions

The fuel pump should never be switched on while any normally pressurized part of the fuel system is dismantled. Neither should the pump be run for long periods with the engine not running. To safeguard against this:

DISCONNECT THE PUMP MOTOR FEED CABLES AT THE IN-LINE CONNECTOR WHENEVER WORK IS TO BE DONE THAT INVOLVES DISMANTLING PIPES AND WHEN THE IGNITION MUST BE ON FOR LONG PERIODS BUT THE ENGINE NOT STARTED.

Other precautions to be taken:

ALWAYS COVER EXPOSED FUEL PASSAGES WITH BLANKING PLUGS. DO NOT RE-FIT PREVIOUSLY USED PETROL SEALS BUT ALWAYS FIT **NEW** SEALING RINGS.

FOLLOWING DISMANTLING AND RE-ASSEMBLY IT MAY TAKE SOME TIME TO RE-PRIME THE SYSTEM AND THEREBY RE-ESTABLISH NORMAL WORKING. THEREFORE CRANK WITH FULL CHOKE IN SUCH CASES. DO NOT ATTEMPT TO RE-PRIME WITH A BATTERY IN A LOW STATE OF CHARGE.

DO NOT DISTURB THE ADJUSTMENT SCREWS ON THE END OF THE CONTROL UNIT.

(iv) **Effects of a Fault in the Petrol Injection System**

A fault will usually be revealed in one of four ways:

a. The engine cannot be started or can only be started with difficulty.

b. The engine starts but runs erratically over the whole or part of the speed range.

c. Fuel consumption is excessive.

d. The engine starts but does not respond to movement of the throttle.

Overfuel Control lever check

Faults a, b and c may be due to incorrect operation of the overfuel control lever. Check that it is fully responsive to manual control over its full range and that when in the "off" position there is a clearance of 0.004" - 0.008" (0.1016 mm - 0.2032 mm) between the lever and the adjustment screw upon which it bears.

(v) **Engine fails to start or can only be started with difficulty**

a. Switch on the ignition and check (audibly or by touch) that the fuel pump motor is running.

b. If the pump motor is running, disconnect one of the low tension cable connections at the coil but leave the ignition switch on.

c. Grip each injector feed line in turn lightly with the hand and crank the engine.

A distinct pulsation should be felt with each line as fuel is injected.

Note: Feed lines that are cleated together must be separated to avoid the misleading effect of reflected pulsations.

If obvious pulsations are felt in each line the petrol injection system is unlikely to be the cause of failure to start and some other cause must be found.

If pulsations cannot be felt in any line although the pump motor is working apparently normally, check fuel pressure. If pressure and relief valve setting are satisfactory, switch off ignition and remove metering distributor control unit for examination of the drive coupling, which may have broken

Finally, remember to restore the coil low-tension connection.

(vi) **Engine starts but runs erratically over the whole or part of the speed range**

a. Check the setting of the overfuel control lever. Erratic running may otherwise be caused by:

An irregularity in the fuel supply to one cylinder only. Some failing which is affecting all cylinders. In the former case, the fault is most likely to be a stuck-open injector and fouling of the associated spark plug will almost certainly have occurred.

b. Short circuit each plug to earth in turn and if one does not affect the engine running when shorted out, remove, clean and re-fit this plug.

c. Withdraw the associated injector from the engine and detach from its feed line.

d. Connect the injector to a dry, filtered air supply, at a pressure of 80 lbf/in² (5624 gf/cm²), in the forward (injection) direction. This will invariably cure a faulty injector (sticking open due to a foreign particle becoming trapped) and if it does so the injector can be re-fitted to the engine. If it does not, a new injector must be fitted.

Note: **Plastic feedpipes must not be heat-treated to enable fitment but must be put on cold.**

e. Where the failure effects all cylinders but is more pronounced with higher speed, check pressure and relief valve setting. If the metering distributor/control unit has recently been removed check that it has not been fitted 180° out as regards timing.

f. Provided that the timing is correct, the overfuel control lever working correctly, the injectors are in good order and fuel pressure is satisfactory, then it is the control unit that is faulty and a new complete metering distributor/control unit must be fitted.

NO ATTEMPT SHOULD BE MADE TO ALTER THE CONTROL UNIT SETTING.

(vii) **Fuel Consumption Excessive**

This may not necessarily arise from a defect in the petrol injection system and the fault must be correctly traced before taking remedial action. The following checks are therefore, given on the assumption that other likely causes have been checked first.

a. Check for correct operation of the overfuel control lever.

b. Check for relief valve setting.

If the above (a and b) are satisfactory then the control unit is suspect and a replacement metering distributor control unit should be fitted.

This latter step should be taken when other likely causes such as plugs, points, leaking pipes, etc, have been eliminated.

Issued by:

SALES AND SERVICE TRAINING CENTRE

BRITISH LEYLAND MOTOR CORPORATION LIMITED

RADFORD, COVENTRY, ENGLAND

Lithographed in England by The Nuffield Press Limited, Cowley, Oxford
25/7 (81684) 5/71—1,000