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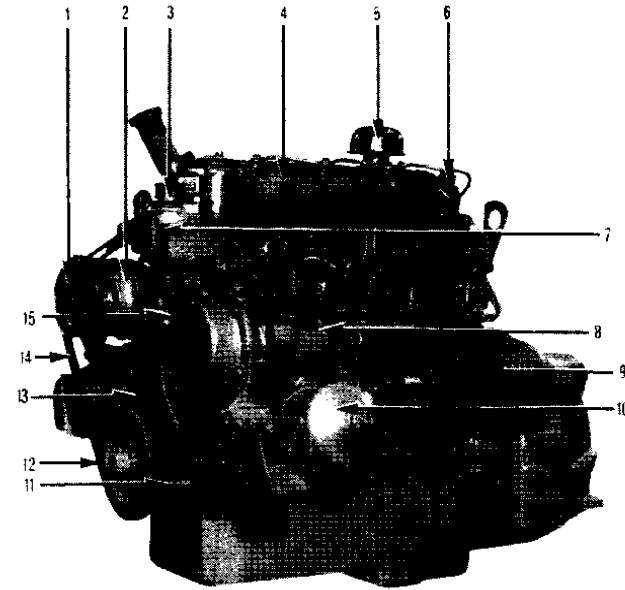
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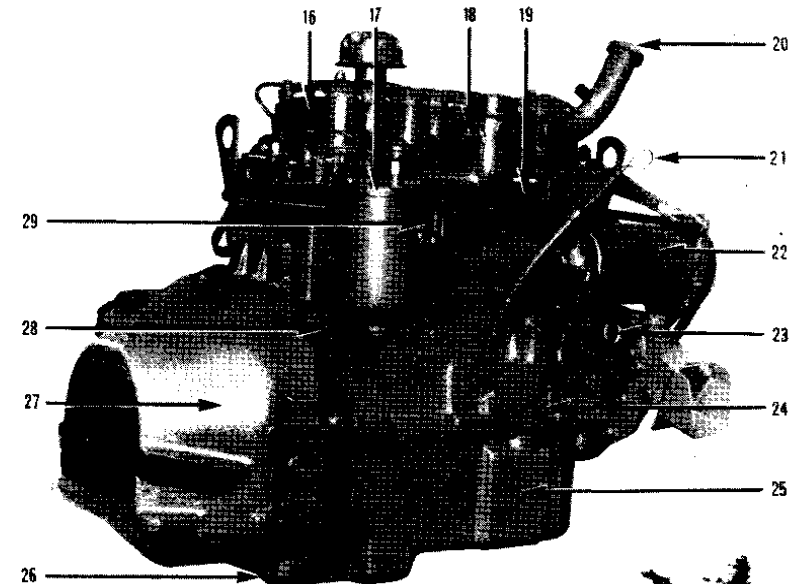
VIEW OF FUEL PUMP SIDE OF ENGINE

- 1 Dynamo Pulley
- 2 Water Pump Pulley
- 3 Water Outlet
- 4 Exhaust Manifold
- 5 Breather
- 6 Atomiser
- 7 Thermostat Housing
- 8 Fuel Injection Pump
- 9 Starter Motor
- 10 Lubricating Oil Filter
- 11 Timing Pin
- 12 Crankshaft Pulley
- 13 Timing Case
- 14 Fan Belt
- 15 Water Pump



VIEW OF CAMSHAFT SIDE OF ENGINE

- 16 Cylinder Head Cover
- 17 Fuel Oil Filter
- 18 Starting Aid
- 19 Induction Manifold
- 20 Lubricating Oil Filler
- 21 Dipstick
- 22 Dynamo
- 23 Water Inlet
- 24 Lubricating Oil Pump Locating Setscrew
- 25 Lubricating Oil Sump
- 26 Sump Drain Plug
- 27 Flywheel Housing
- 28 Cylinder Block Drain Tap
- 29 Fuel Lift Pump



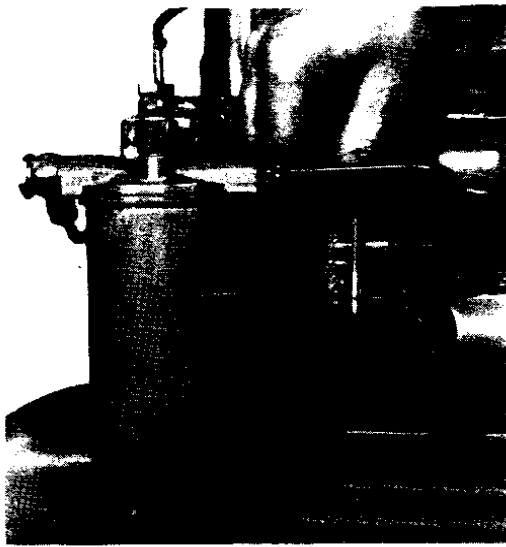


Fig. 15.
Operating the Hand Primer on the Fuel Lift Pump.

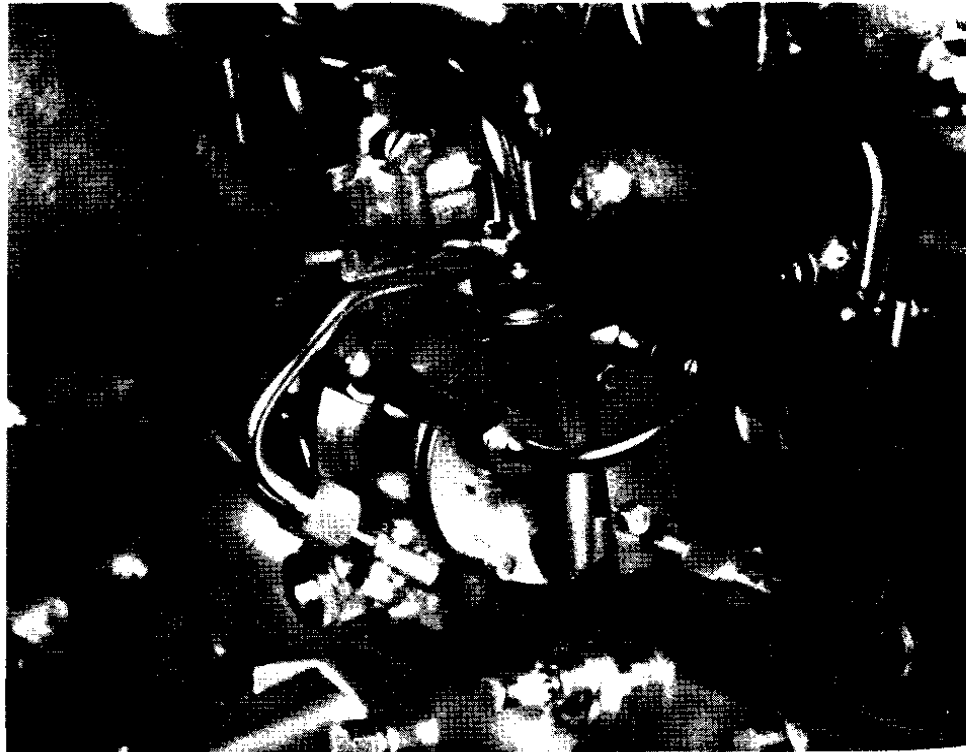


Fig. 16.
Slackening Pipe Union Nut at Fuel Injection Pump Inlet.

time will be dependent upon the speed of rotation and the effectiveness of the bleeding operation described above. A fully charged battery in a temperate or warm climate will rotate the engine at upwards of 280 rev/min, and under these conditions, the remaining air should be expelled in under 30 seconds. Cold conditions or partially discharged batteries may take longer.

Tighten the unions on the fuel pipes and the engine is ready for starting.

If after bleeding the fuel system, the engine starts and runs satisfactorily, but after a few minutes stops, then it can be assumed that air is trapped in the fuel injection pump and the bleeding procedure should be repeated, at the same time checking for air leaks on the suction side, such as loose connections or faulty joints.

frost precautions

Should it be the policy to protect engines from frost damage by adding anti-freeze to the cooling system, it is advisable that the manufacturers of the relevant mixture be contacted to ascertain that their products are suitable for use in Perkins engines and also that their products will have no harmful effects on the cooling system generally. It is our experience that the best results are obtained from anti-freeze which conforms to British Standard 3151.

After an anti-freeze has been used, the cooling system should be thoroughly flushed in accordance with the manufacturers instructions before refilling with normal coolant.

When draining the cooling system, it is not enough merely to open the radiator drain tap. The one on the cylinder block must also be opened. This tap is on the fuel pump side of the cylinder block in the middle, or on the camshaft side of the cylinder block near the flywheel housing. Where a pressurised radiator filler cap is used, this should be removed before draining the cooling system.

If the foregoing action is taken, no harmful effects should be experienced, but Perkins Engines Ltd. cannot be held responsible for any frost damage or corrosion which may be incurred.

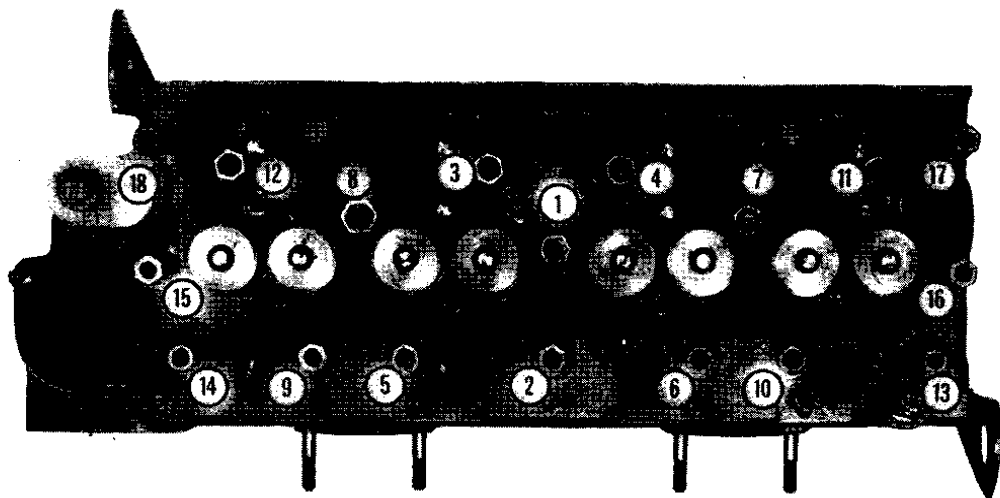


Fig. 1.
Torque tightening sequence for Cylinder Head Nuts.

data

Type	Four Cylinder, Four Stroke, Indirect Injection
Bore	3.125 in (79,735 mm) — nominal
Stroke	3.5 in (88,9 mm)
Compression Ratio	22 : 1
Cubic Capacity	107.4 in ³ (1,760 litre)
Firing Order	1, 3, 4, 2.
Valve Tip Clearance	0.010 in (0,25 mm) Hot 0.012 in (0,30 mm) Cold
Engine No. Location	Fuel Injection Pump Mounting Flange
Oil Pressure	30—60 lbf/in ² (2,1—4,2 kgf/cm ²) at maximum speed and normal operating temperature.
Sump Capacity	Varies according to application. Fill to Full Mark on dipstick with vehicle or machine standing on level ground.
Fuel Oil Specification	British Standard No. BS 2869 (1957) Class A.

running in

To obtain the best results from your new or replacement 4.108 engine, it should be operated within reasonable limits and not at maximum engine speed for the first 500 miles (800 km) or 12 hours.

post delivery checkover

After a customer has taken delivery of his engine, a general checkover must be carried out after the first 500 miles (800 km) or 12 hours in service and must include the retightening of the cylinder head nuts in the correct sequence. With the engine thoroughly warmed through, the checkover comprises the following :—

1. Drain the lubricating oil sump and refill to the correct level with clean new oil. (Do not overfill).

2. Remove the rocker assembly; tighten the cylinder head nuts in the correct sequence (see Fig. 1) and to the correct torque of 55—60 lbf ft (7,6—8,3 kgf m).
3. Reset the valve tip clearances to 0.010 in (0,25 mm) with the engine hot (see Page 32).
4. Check the tension of the fan belt (see Page 32).
5. Check the tightness of all external nuts, setscrews, mountings, etc.
6. Start the engine and check for any fuel, coolant or lubricating oil leaks.
7. Adjust idling speed if necessary.

operating instructions

STARTING THE ENGINE

If weather or engine is warm, switch on and ensure the engine stop control is in the run position. Adjust accelerator to the fully open position and engage the starter motor by turning the starter motor switch in a clockwise direction to the "start" position. (see Fig. 2).

As soon as the engine starts, release the starter switch to the "off" position.

Always be sure that the starter pinion and flywheel have stopped rotating before re-engaging the starter motor, otherwise the ring or pinion may be damaged.

TO STOP THE ENGINE

A spring loaded stop control is located near the normal engine controls and functions by cutting off the fuel at the fuel injection pump.

To operate, pull the knob and hold in this position until the engine ceases to rotate. Ensure that the control returns to the "run" position, otherwise difficulty may be experienced in re-starting the engine.

COLD STARTING

Switch on, ensuring the engine stop control is in the "run" position.

Turn on the fuel supply tap of the cold starting aid reservoir (where fitted).

Turn the starter switch to the "heat" position and hold it there for fifteen to twenty seconds.

With the accelerator in the fully open position, turn the starter switch to the "heat" and "start" position, thereby engaging the starter motor.

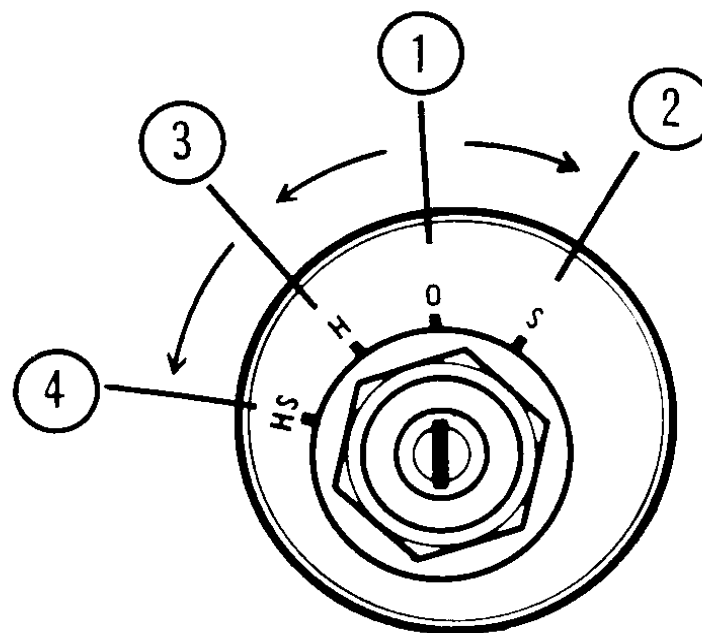


Fig. 2.
Combined Heat/Start Switch.

1. Off Position.	3. Heat Position.
2. Start Position.	4. Heat and Start Position.

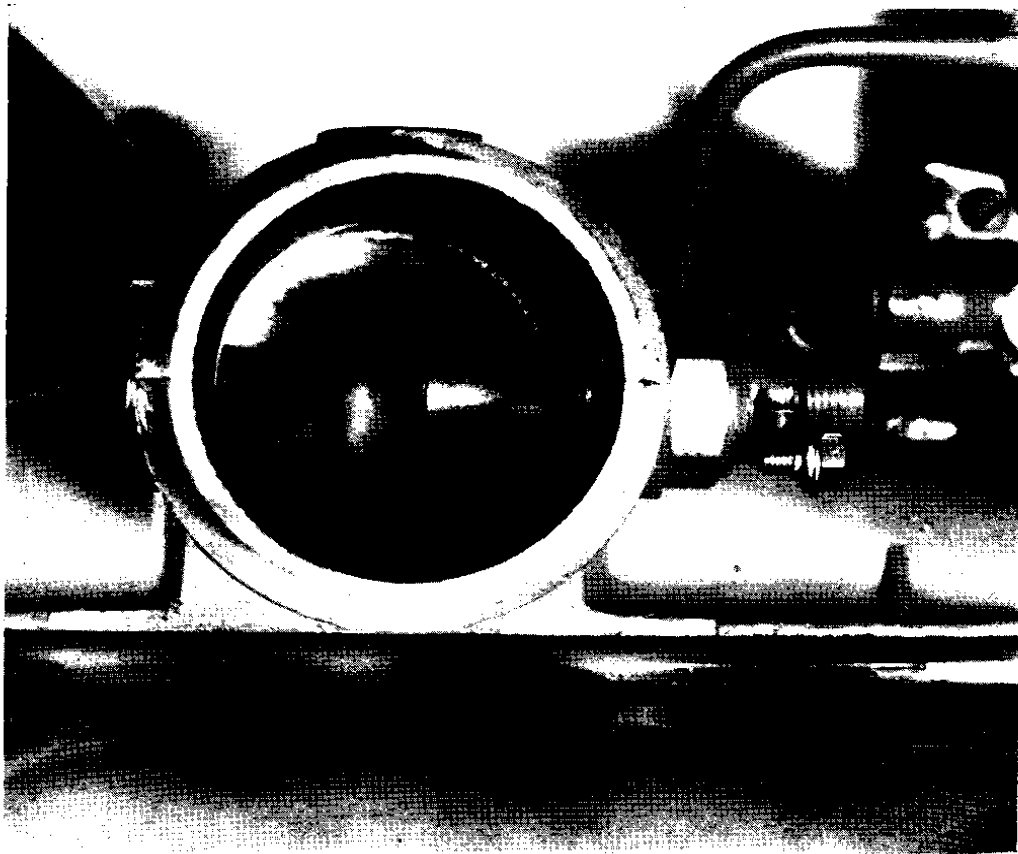


Fig. 3. Starting Aid location.

If the engine does not start after fifteen seconds, return the switch to the "heat" position, for ten seconds and then re-engage the starter motor by switching to the "heat" and "start" position.

As soon as the engine starts, the switch should be turned to the "off" position, and the tap on the cold starting aid reservoir (where fitted), turned off.

COLD STARTING (Alternative Method)

With some vehicles, a different starter switch is provided and the cold start aid is operated by means of a separate push button switch.

The cold starting procedure however is the same, i.e.

Switch on by turning the starter switch in a clockwise direction to the first position.

Press the heater button for fifteen to twenty seconds and then with the heater button still pressed, turn the starter switch in a further clockwise direction to engage the starter motor. As soon as the engine starts, release both starter switch and heater button.

THINGS TO NOTE

Ensure that the electrical connection to the cold starting aid is correct.

Always ensure that the reservoir feeding fuel to the cold starting aid is fully primed and not leaking.

Extended use of the cold starting equipment above the time periods already stated should be avoided or the engine will be starved of its clean air requirements.

In the event of difficult starting, check that the fuel is reaching the cold start aid in the induction manifold (see Fig. 3) by unscrewing the inlet fuel connection. An empty reservoir can have the effect of burning out a cold start aid, so ensure the reservoir is refilled before attempting to start the engine. If fuel is reaching it satisfactorily, then it may be that, the cold start aid itself is not working correctly. This can be checked, by removing the air cleaner and watching the cold start aid whilst the equipment is used. When the starting switch is turned to the "heat" position, the element should become red hot and on engagement of the starter motor, ignition of the fuel should be taking place.

4.108 engines are fitted with efficient cold starting equipment and no responsibility can be accepted for any damage caused by the use of unauthorised starting aids.

SLOW RUNNING ADJUSTMENT

The slow running should not be adjusted by the driver as this is associated with the proper running of the fuel injection pump and any interference with this sensitive equipment can result in expensive damage.

APPROVED LUBRICATING OILS

Normal Working Temperature S.A.E. Designation	0°F to 45°F (18°C to 7°C)	45°F to 80°F (7°C to 27°C)	80°F or over (27°C or over)
Esso Petroleum Co. Ltd. Imperial Oil Ltd.	Essolube HDX 10W Estor HDX 10W *AL 1783 10W	Essolube HDX 20 Essolube HDX 20 Estor HDX 20 *AL 1783 20/20W	Essolube HDX 30 Essolube HDX 30 Estor HDX 30 *AL 1783 30
Shell Mex	Shell Rotella T 10W *Shell Rotella S 10W	Shell Rotella T 20/20W *Shell Rotella S 20/20W	Shell Rotella T 30 *Shell Rotella S 30
B.P. Ltd.	B.P. DSI - 10W *B.P. Vanellus 10W/30 B.P. Vanellus 10W/30 B.P. Tractor Oil Universal S1	B.P. DSI - 20W *B.P. Vanellus 20W B.P. Vanellus 10W/30 B.P. Tractor Oil Universal 20W/30 B.P. Tractor Oil Universal S1	B.P. DSI - 30 *B.P. Vanellus 30 B.P. Vanellus 10W/30 B.P. Tractor Oil Universal 20W/30 B.P. Tractor Oil Universal S1
Alexander Duckham & Co. Ltd.	Fleetsol HDX 10W	Fleetsol HDX 20	Fleetsol HDX 30
Regent Oil Company Ltd. Caltex / Texaco	Super RPM DELO Special 10 Ursa Oil S-1 SAE 10W *RPM DELO Multi-Service 10W	Super RPM DELO Special 20 Ursa Oil S-1 SAE 20-20W *RPM DELO Multi-Service 20/20W	Super RPM DELO Special 30 Ursa Oil S-1 SAE 30 *RPM DELO Multi-Service 30
Mobil Oil Company Ltd.	*Delvac 1110 *Delvac Special 10W/30	*Delvac 1120 *Delvac Special 10W/30	*Delvac 1130 *Delvac Special 10W/30
Amoco (U.K.) Ltd. (formerly Vizzol Oil Co. Ltd.)	New Ace 10W American S1 Motor Oil 10W	New Ace 20 American S1 Motor Oil 20	New Ace 30 American S1 Motor Oil 30
Castrol Ltd.	Castrol CR 10 Deusol CRT 10	Castrol CR 20 Deusol CRT 20 *Deusol CRT 20	Castrol CR 30 Deusol CRT 30 *Deusol CRT 30
Germ Lubricants Ltd.	Germol D10/S1 *Super Germol 10W	Germol D20/S1B *Super Germol 20	Germol D30/S1B *Super Germol 30
Gulf Oil Group of Companies and British American Oil Company	Gulfube Motor Oil HD10W B-A Peerless Heavy Duty Motor Oil 10W B-A Dieselube Super Duty Motor Oil 10W	Gulfube Motor Oil HD20/30W B-A Peerless Heavy Duty Motor Oil 20-20W B-A Dieselube Super Duty Motor Oil 20-20W	Gulfube Motor Oil HD 30 B-A Peerless Heavy Duty Motor Oil 30 B-A Dieselube Super Duty Motor Oil 30

A

Where oils are marked thus * oil change periods may be extended to 3,000 miles, 120 hours or 2 months whichever is the shorter period, providing the lubricating oil filter element change is reduced to the same period. And other reputable detergent oils to approved specification including : Any lubricating oils which have passed Approval Tests for the U.S. Ordnance Specification MIL-L-2104A, with 1% sulphur fuel endorsement or Defence Specification D.E.F. 2101D in their S.A.E. 10 and 30 grades, with a viscosity index of 80 minimum shall be deemed equally acceptable. The lubricating oils listed above are at least Supplement 1 Detergent Heavy Duty Oils.

NOTE : Where normally aspirated engines operate satisfactorily on normal Detergent Heavy Duty Oils conforming to the U.S. Ordnance Specification MIL-L-2104A or British Ministry Tests DEF 2101 B, then these oils, if preferred, may continue to be used.

Supplement 1 oils are the minimum requirement for turbocharged engines. Where conditions of service warrant (e.g. continuous heavy load operation) then the grades shown in the right hand column may be used in lieu of those shown in the first and centre columns.

The above specifications are subject to alteration without notice

4.108 parts section

Whilst every effort is made to illustrate latest parts, owing to the company's policy of continuous improvement some slight variations may occur.

SOURCE OF SUPPLY

Parts are available from Perkins Overseas Companies, Perkins Distributors and Service Signholders. We are unable to deal direct with the operator and therefore parts should be obtained by placing a firm order with one of the aforementioned sources of supply, alternatively from the dealer who supplied the engine.

NOTE

When parts are required for your Perkins 4.108 engine always quote the engine number, the machine name, description and serial number so that your requirements can be identified.

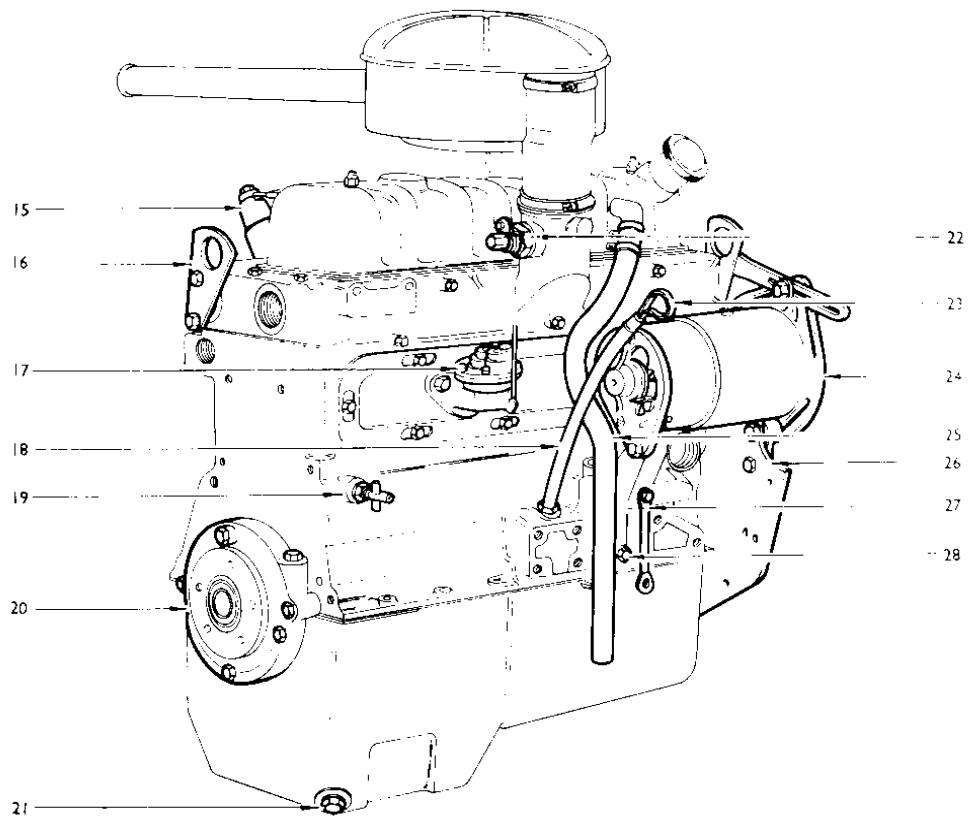


PLATE A
OFFSIDE VIEW OF ENGINE

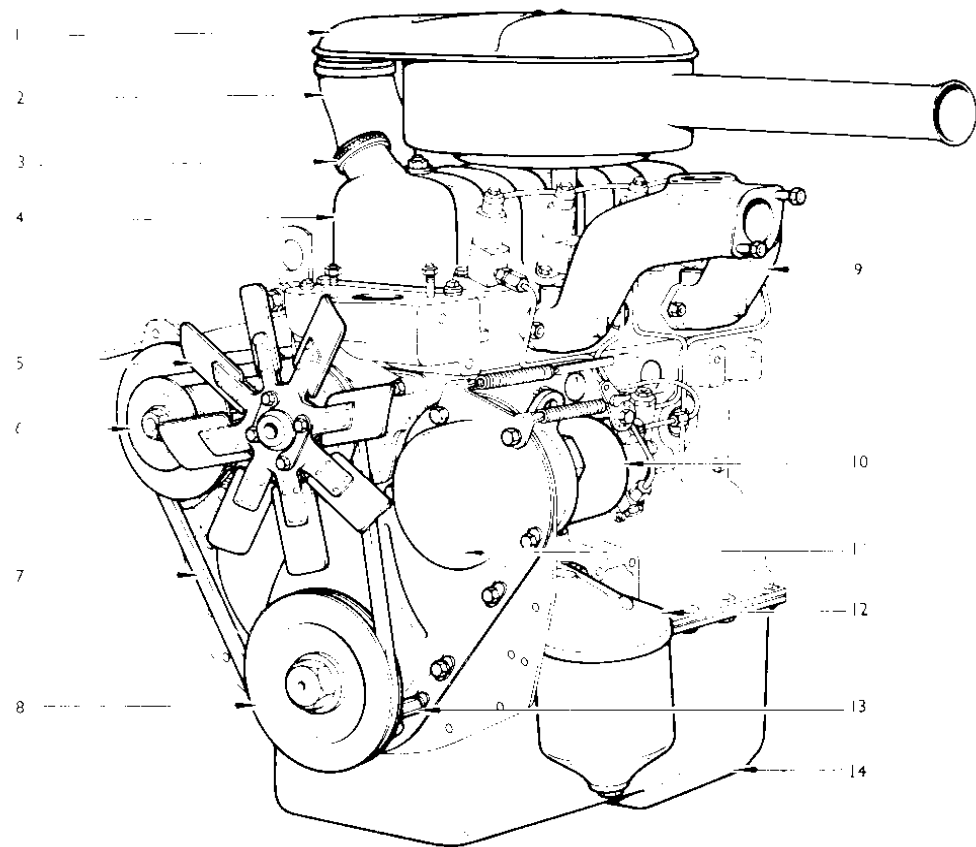


PLATE B
NEARSIDE VIEW OF ENGINE

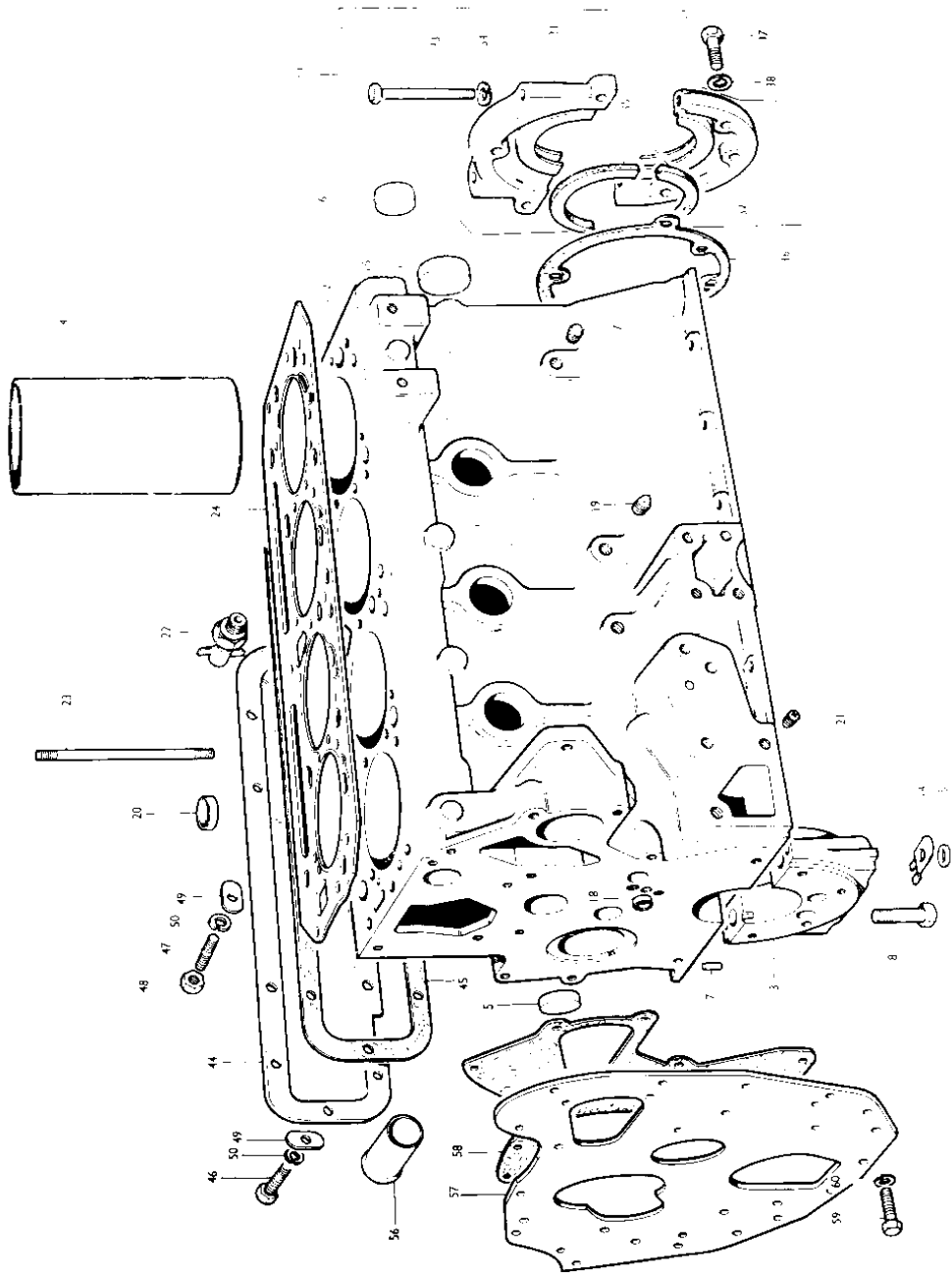


PLATE C
CYLINDER BLOCK SECTION

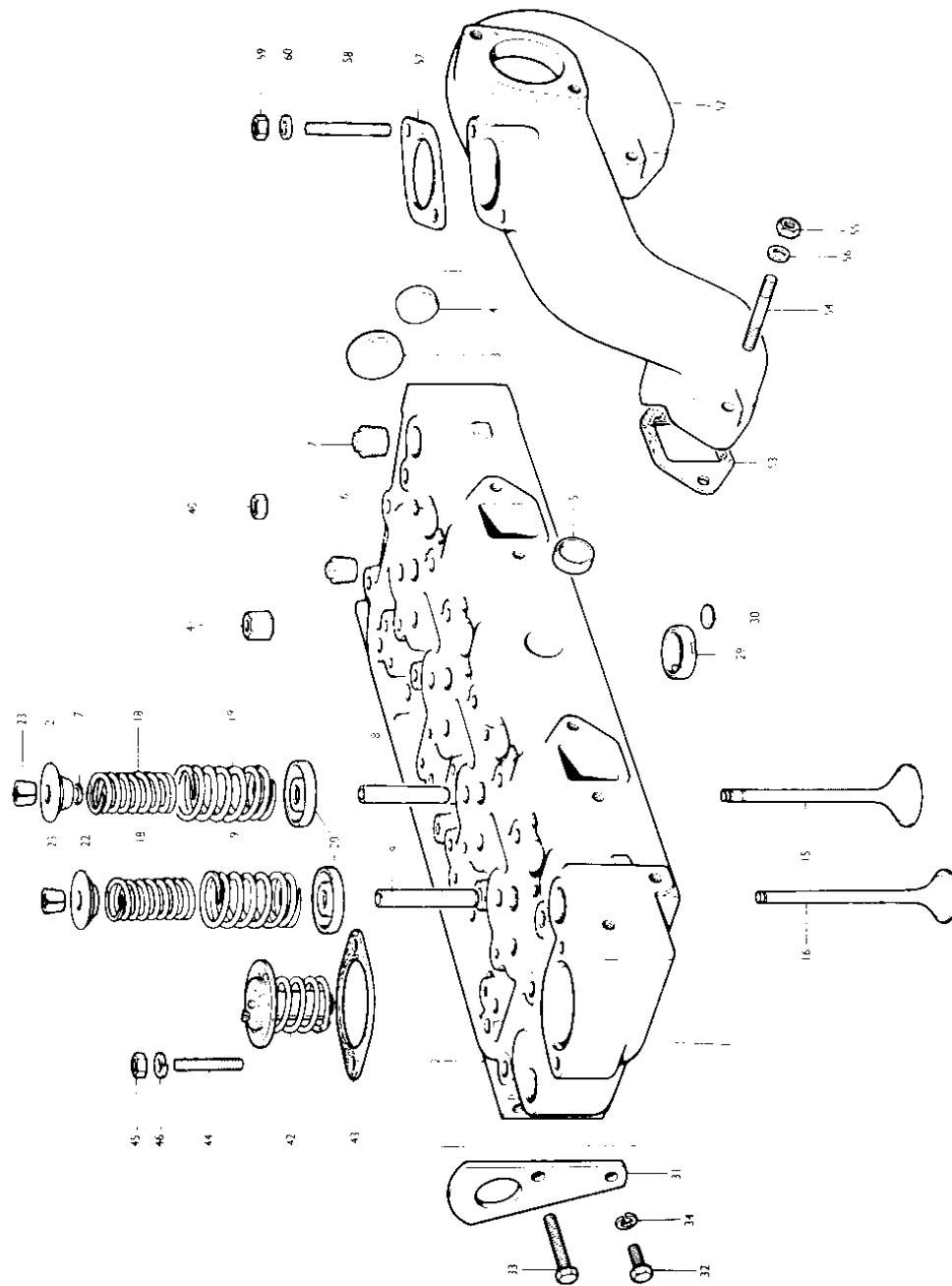


PLATE D
CYLINDER HEAD SECTION

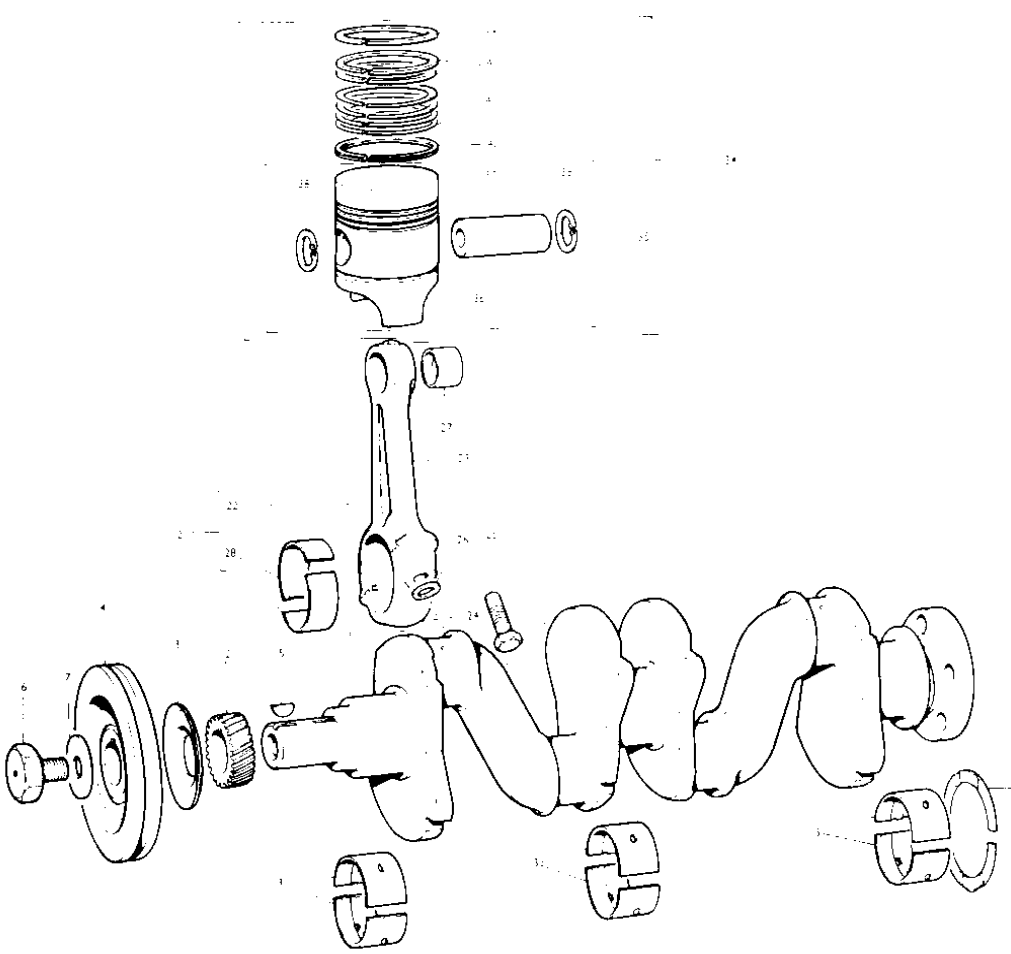


PLATE E
CRANKSHAFT SECTION

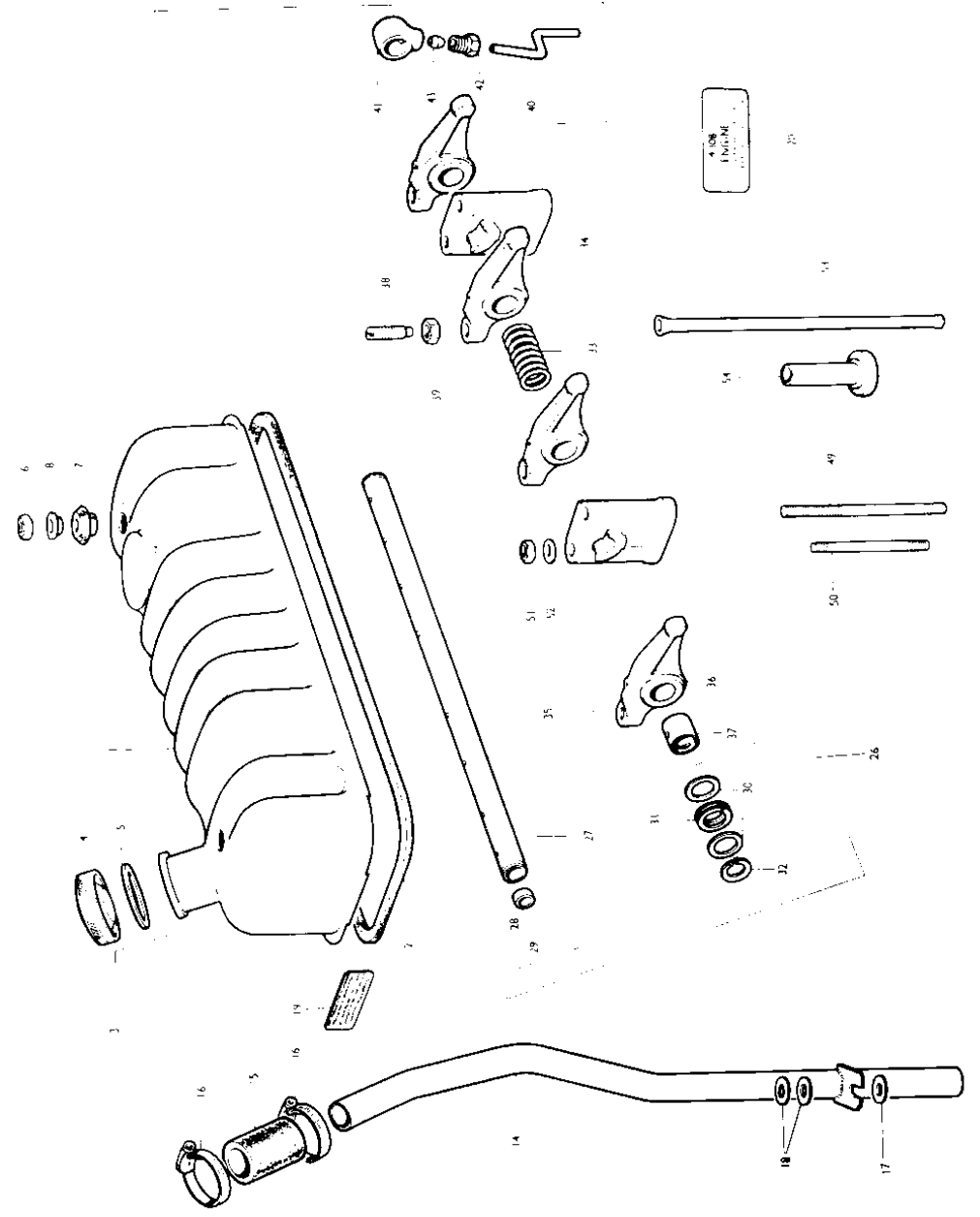


PLATE F
CYLINDER HEAD COVER SECTION

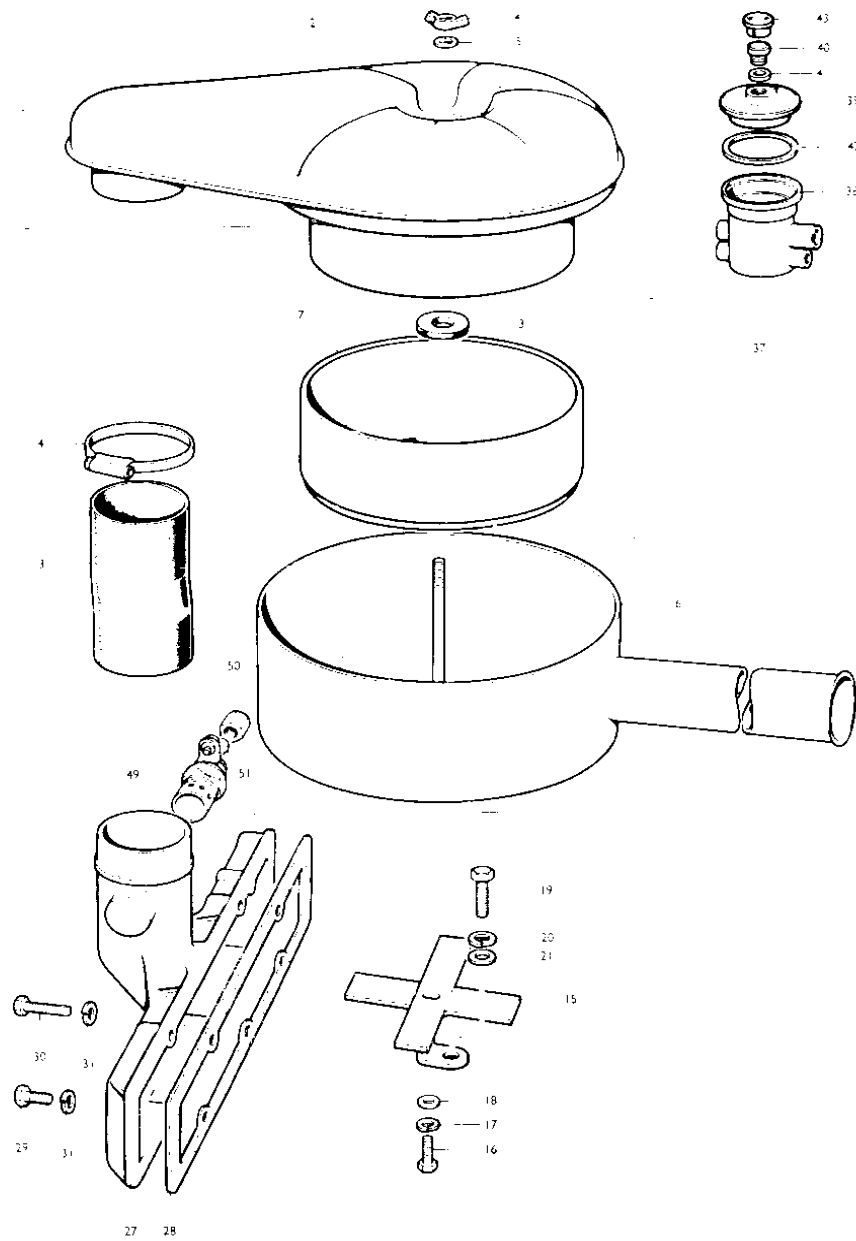


PLATE G
AIR INDUCTION SYSTEM

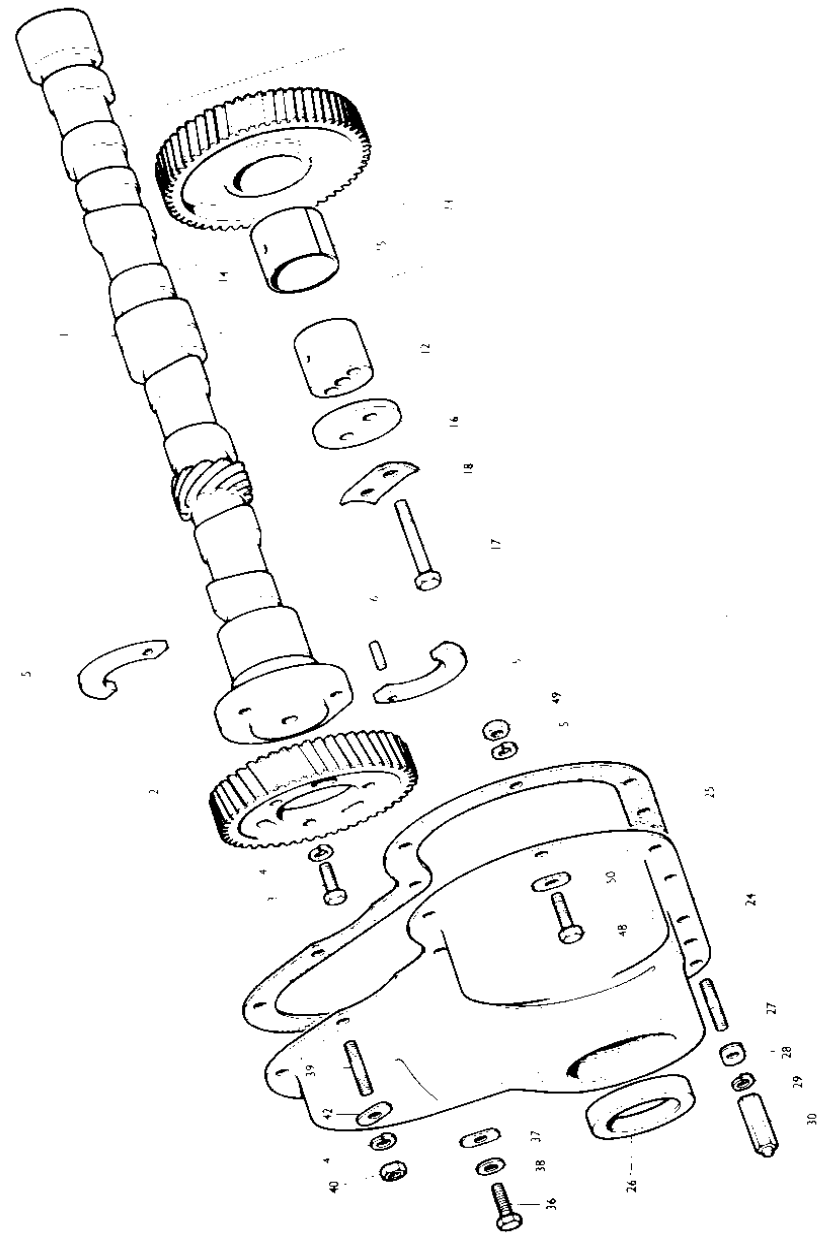


PLATE H
TIMING GEAR SECTION

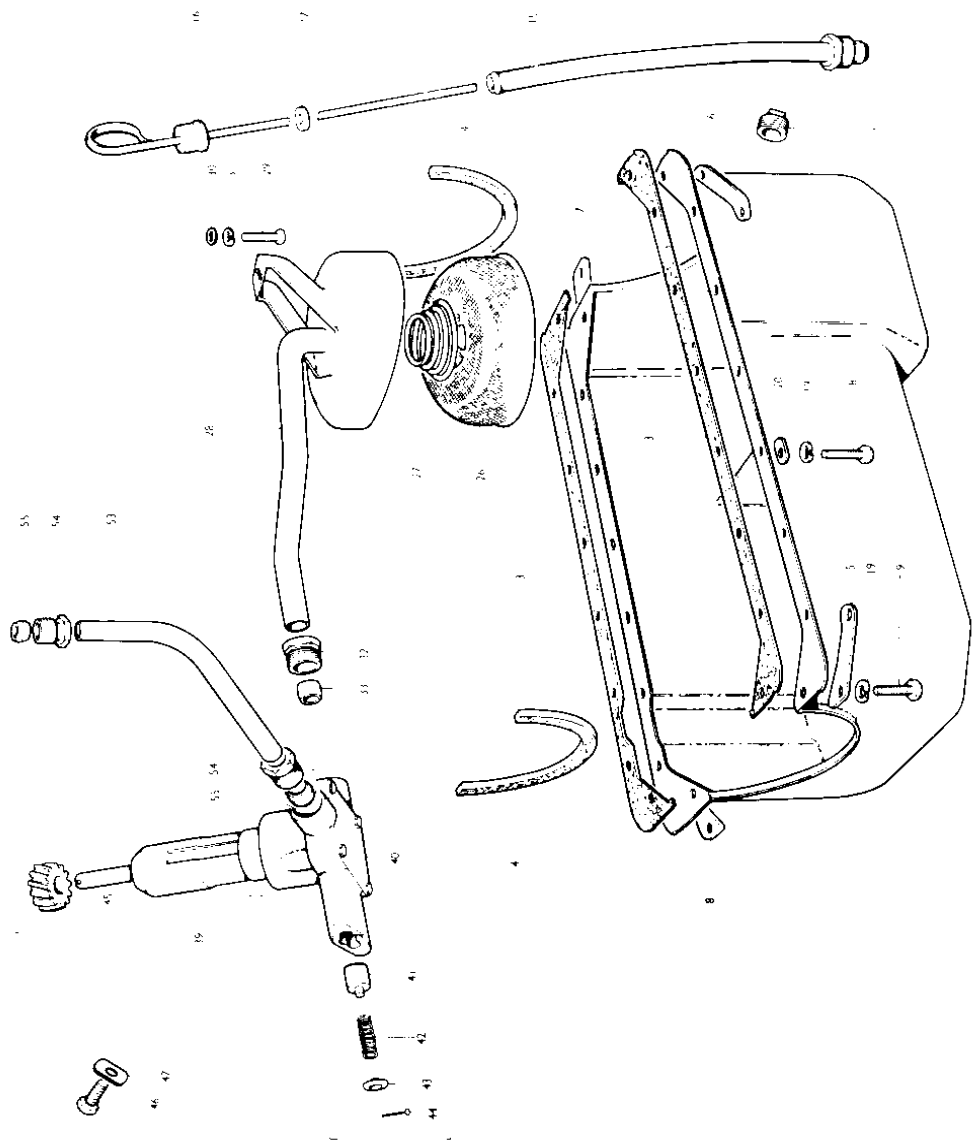


PLATE I
LUBRICATING OIL SUMP SECTION

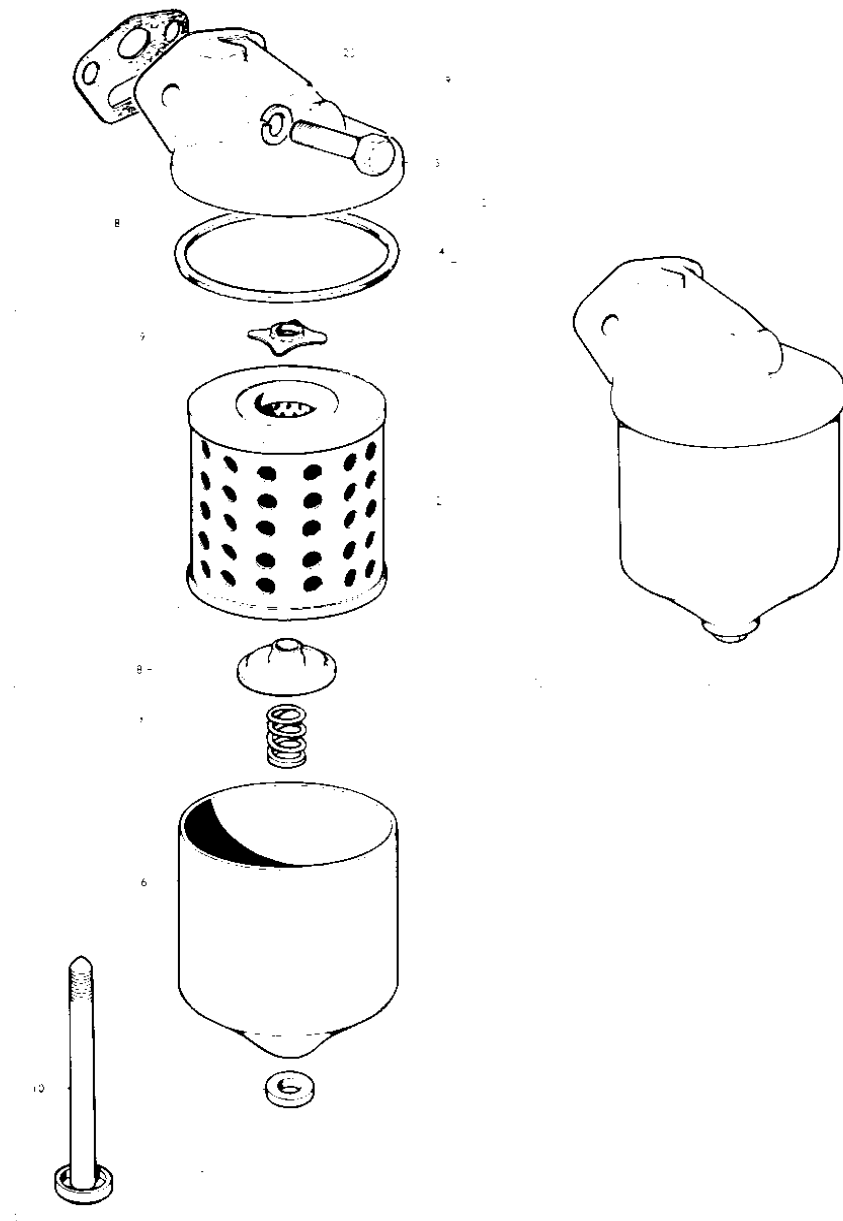


PLATE J
LUBRICATING OIL FILTER SECTION

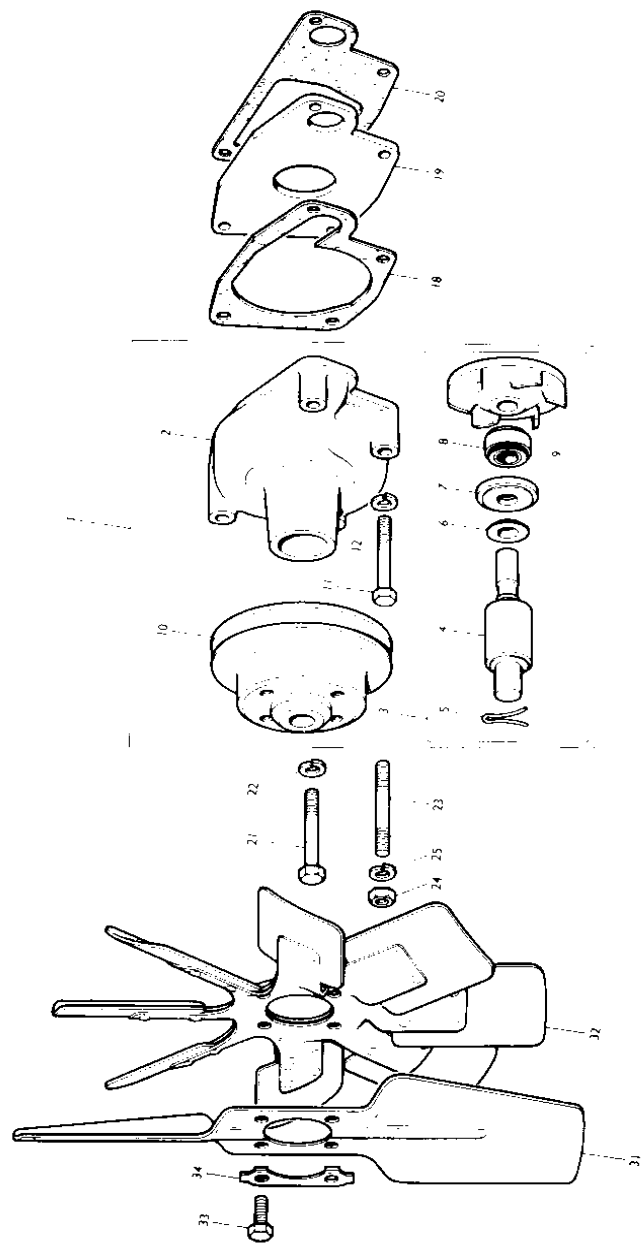


PLATE K
WATER PUMP SECTION

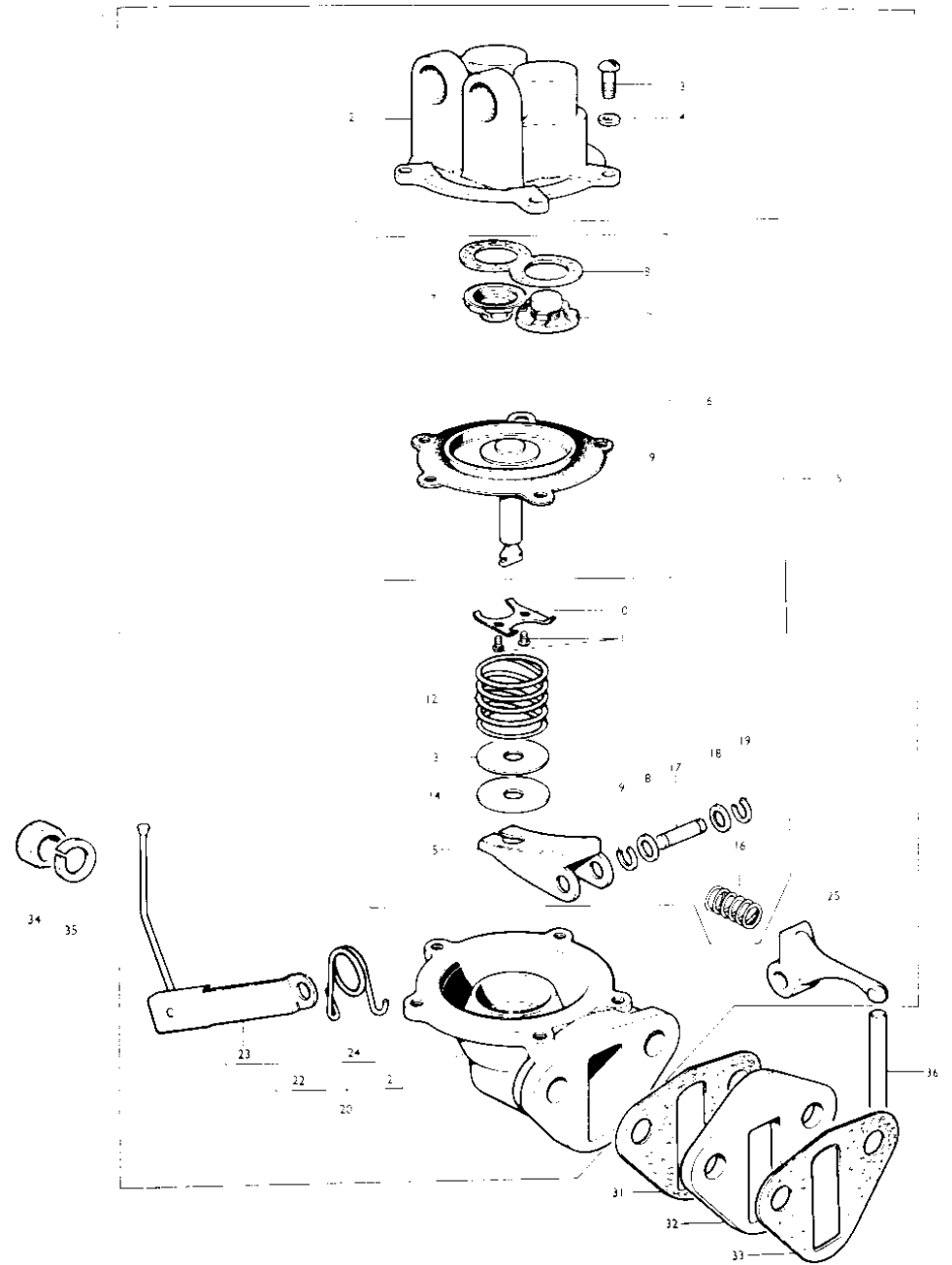


PLATE L
FUEL LIFT PUMP SECTION

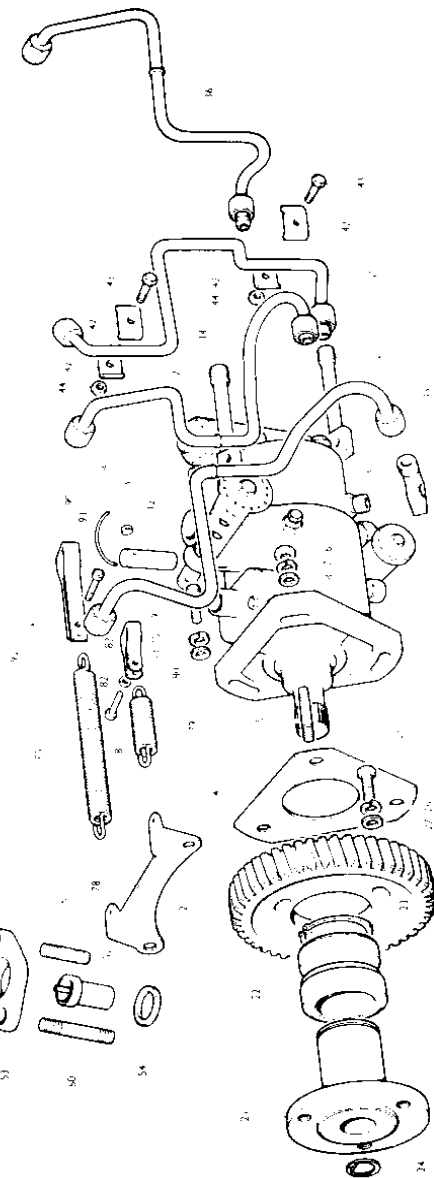
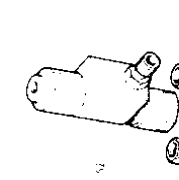
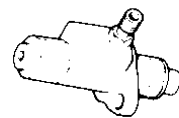
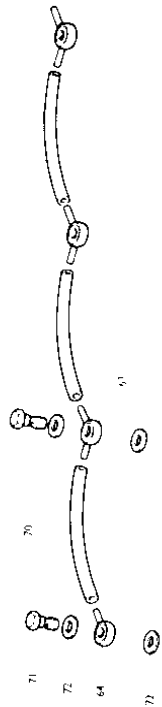
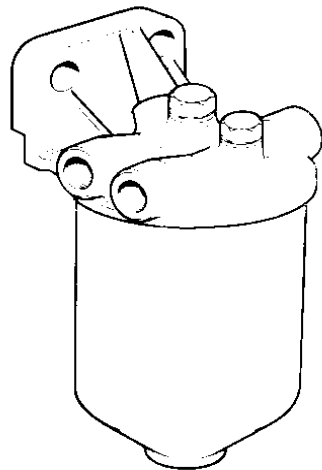
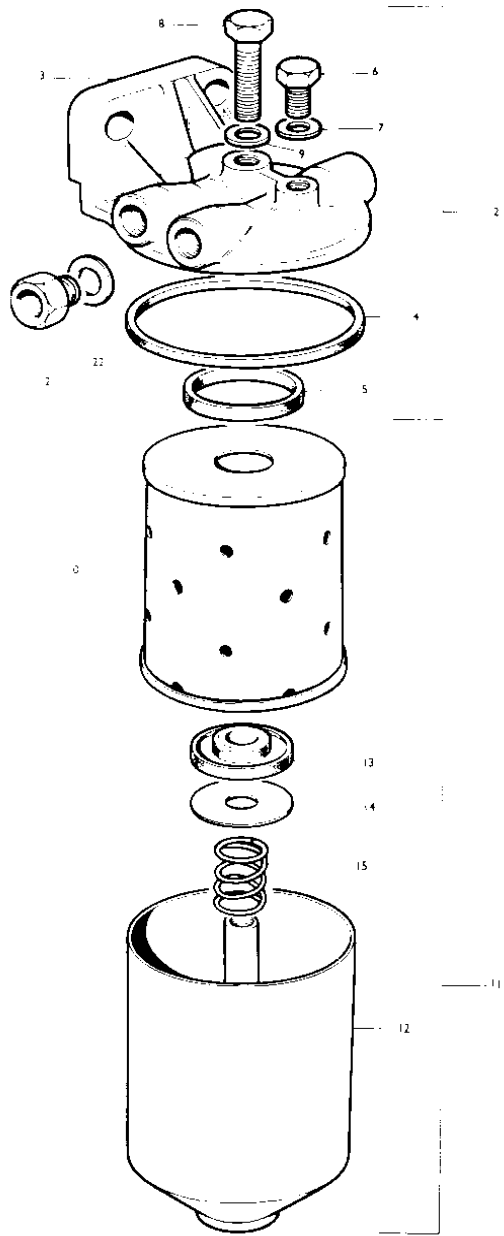


PLATE M
FUEL FILTER SECTION

PLATE N
FUEL INJECTION PUMP SECTION

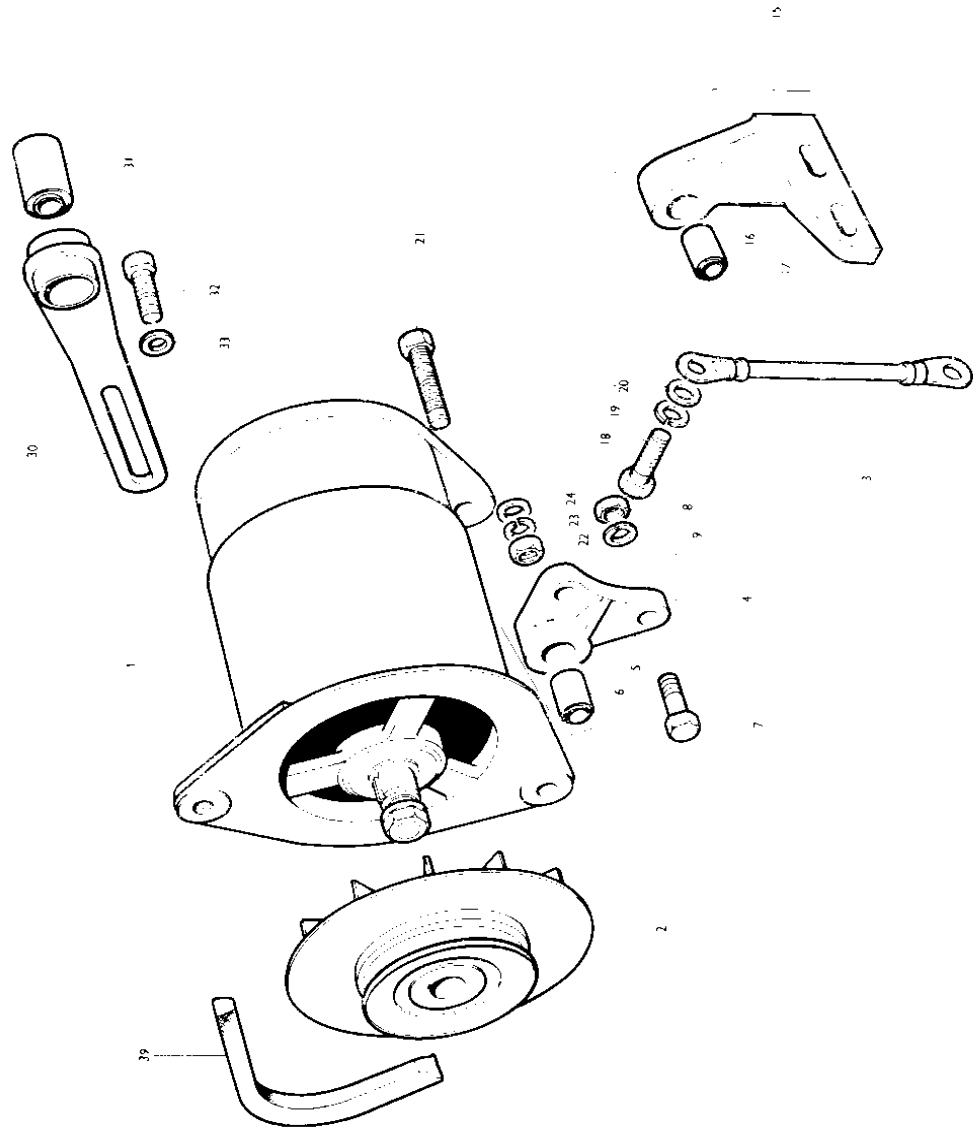


PLATE O
DYNAMO SECTION

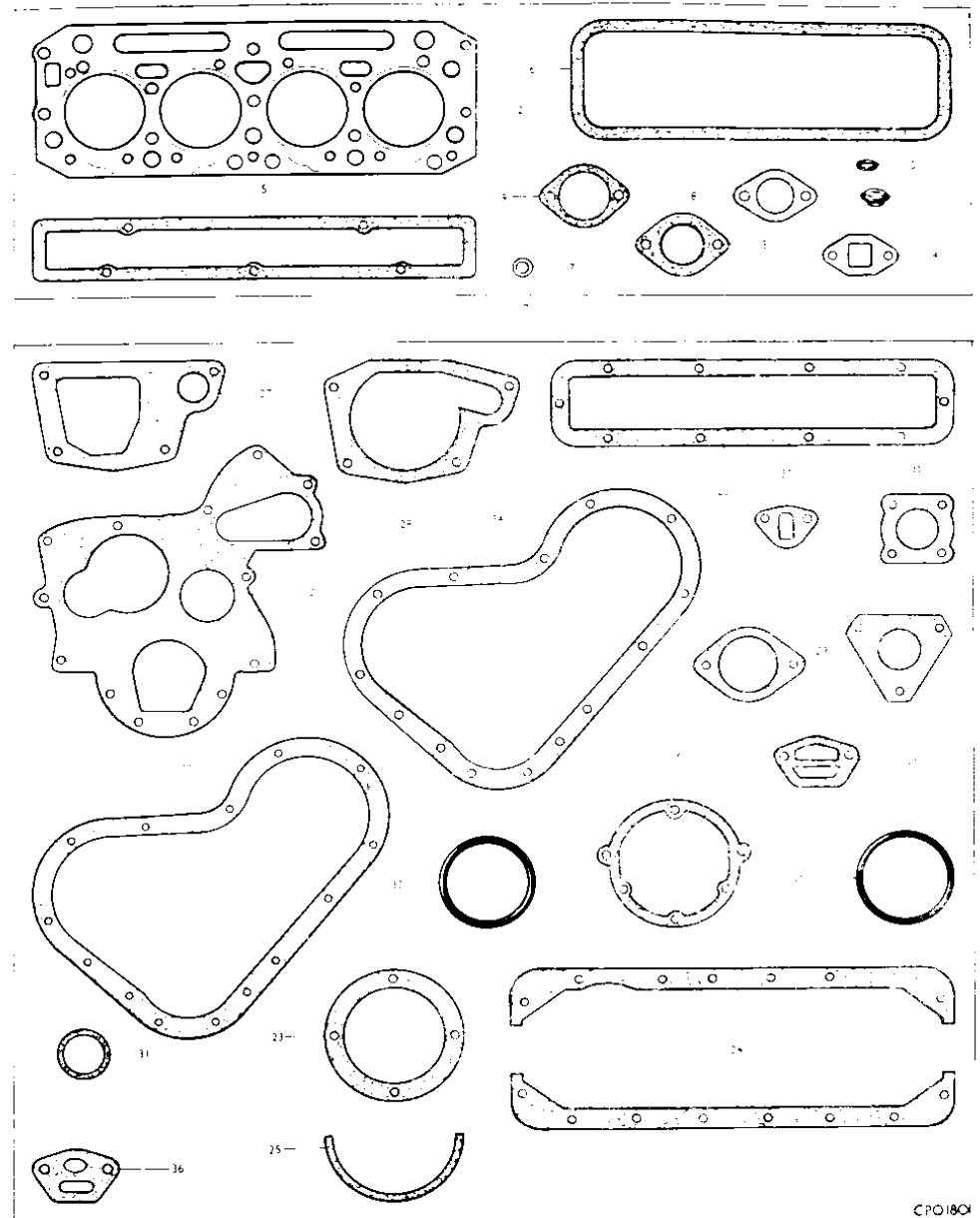


PLATE P
JOINTS AND GASKET SECTION

MAKE SURE THEY'RE GENUINE GUARANTEED PERKINS PARTS



overseas companies

AUSTRALIA

Perkins Engines Pty. Ltd.
P.O. Box 156, DANDENONG, Victoria, Australia.
Cables : Perkoil, Dandenong (Victoria), Australia.
Telephone : Dandenong 20431

BRAZIL

Motores Perkins S.A.
Caixa Postal 30.028, Estado de Sao Paulo, SAO PAULO, Brazil.
Telephone : 43-1499
Cables : Perkoil, Sao Paulo.
Via. Western Telegraph, Subsidiary of Cable & Wireless

CANADA

Perkins Engines Canada Ltd.
7 Meridian Road, Rexdale, Ontario, Canada.

FRANCE

Moteurs Perkins S.A.
55 Boulevard Ornano, 93 Saint-Denis, France.
Telephone : 243-04-40. Telex : 23083 Saint-Denis.
Cables : Perkoil, Paris.

GERMANY

Perkins Motoren G.m.b.H.
8752 Kleinostheim, Autobahnausfahrt, Aschaffenburg-West, Germany.
Telephone : (06027)-291. Telex : 4-188869.

ITALY

Motori Perkins S.p.A.
Via Pasquale Paoli, 9/A, COMO-CAMERLATA.
Cables : Perkoil, Camerlata. Phone : Como 51932 - 52597.

SOUTH AFRICA

Perkins Engines (Pty.) Ltd.
P.O. Box 9951, 4 Simmonds Southway, Park Central,
JOHANNESBURG.
Cables : Perkoil, Johannesburg. Telephone : Johannesburg 835-6071/2/3.
Telex : J0037.

SPAIN

Perkins Hispania S.A.
Avenida de Aragon 130, MADRID, 17.
Cables : Perkoil, Madrid Telephone : Madrid 2050040. Telex : 7324.

U.S.A.

Perkins Engines Inc.
27575 Wixom Road, P.O. Box 500, WIXOM, Michigan, U.S.A.
Cables : Perkoil, Wixom. Telephone : Detroit 349.4100.

ASSOCIATED COMPANIES AND MANUFACTURING LICENSEES

ARGENTINA

Perkins Argentina S.A.I.C.
Bolivar 368, BUENOS AIRES.
Cables : Perkinsa, Baires. Telephone : 30-7002/30-6978/30-6981.
Telex : B A 102.

INDIA

Simpson & Co. Ltd.
P.O. Box 303, 202-203 Mount Road, MADRAS.
Cables : Simpsons, Madras. Phone : 83021 (8 lines)

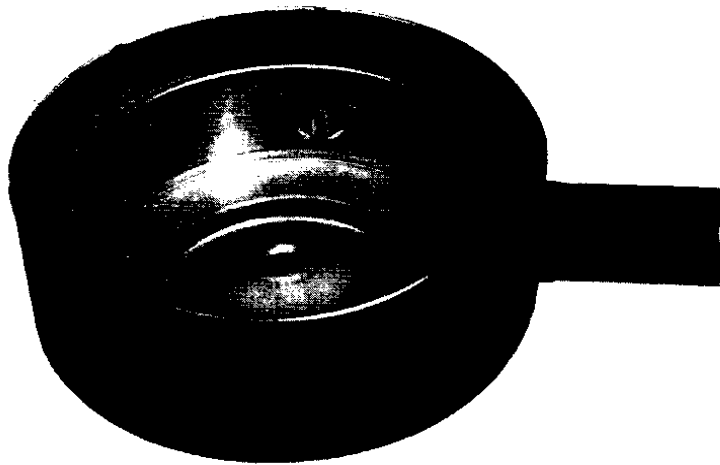


Fig. 4.

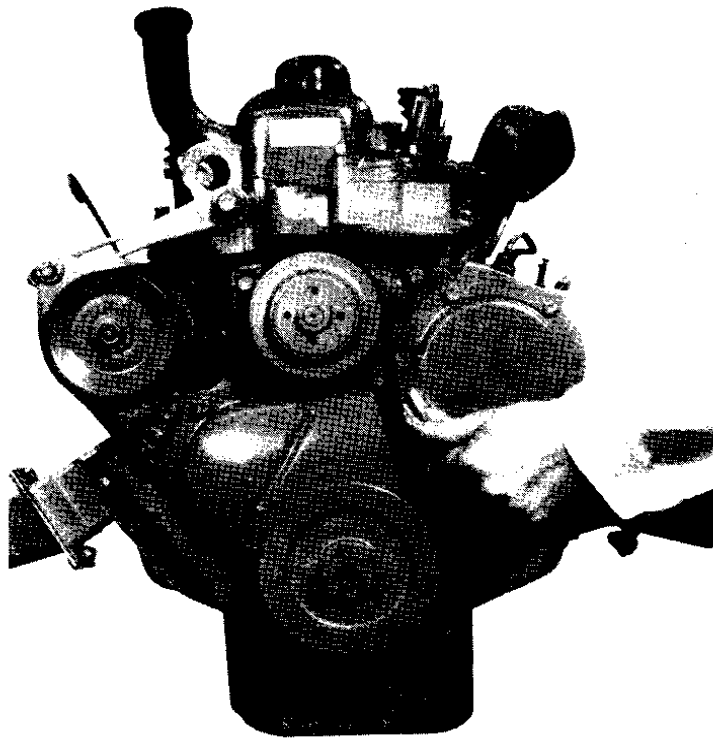


Fig. 5. Checking Fan Belt Tension.

maintenance

PERIODICAL ATTENTIONS

DAILY

Check fuel level in tank.

Check water level in radiator.

Check oil level in sump (make sure the vehicle or machine is standing level).

For adverse conditions and agricultural (combine and tractor) engines clean and refill air cleaner.

Under adverse agricultural conditions, clean chaff screens, radiators, centrifuge pre-filters and induction systems.

EVERY 2,000 MILES (3,000 km) OR 50 HOURS

Drain the lubricating oil from the sump and renew.

Clean air cleaner and renew oil (see this page).

Check fan belt tension (see page 32).

Top up batteries with distilled water.

Check the cylinder head cover joint for leaks.

Check water trap, fuel oil filters (where fitted).

EVERY 6,000 MILES (9,000 km) 150 HOURS

Renew the element in the lubricating oil filter (see page 32).

EVERY 10,000 MILES (15,000 km) 250 HOURS

Check valve tip clearances (see page 32).

Flush radiator with clean water.

Lubricate dynamo rear bush (see page 35).

EVERY 20,000 MILES (30,000 km) or 500 HOURS

Renew paper element in final fuel filter (see page 35).

Clean gauze trap in fuel oil filter when fitted.

Arrange for atomisers to be checked.

Operators of 4.108 engines are reminded that the above periodical attentions are general in application: Therefore the operator should compare the routine maintenance for his engine with the schedules specified by the manufacturer of the application to which the engine is fitted and where necessary adopt the shorter periods also bearing in mind that on stop-start low mileage work the hours run are more applicable than the mileage covered.

1 TO CLEAN THE AIR CLEANER

Remove the air cleaner from the engine and remove the top cover. Remove the steel wire element, which should be thoroughly washed in a suitable cleaning fluid, then either

allowed to drain or dry with compressed air. Clean oil reservoir and refill with clean new oil to level indicated (see Fig. 4). Clips, cork and rubber hose joints should be examined for efficiency. Where a pre-cleaner is fitted, ensure that this is thoroughly cleaned at the same time.

NOTE: Where engines operate under more dusty conditions than could be considered normal, then the time interval between servicings should be decreased accordingly.

2 TO ADJUST FAN BELT TENSION

Adjust by first slackening the dynamo adjusting lever setscrew the lever to the timing case setscrew and the dynamo to support bracket bolts.

Move the dynamo so that the tension obtained is such that without undue pressure, the thumb applied midway between the water pump and crankshaft pulley can depress the belt approximately $\frac{3}{8}$ in (10 mm) see Fig. 5. Tighten the dynamo adjusting lever setscrew and if the tension is still correct, tighten the remainder of the mounting bolts.

NOTE. When a new belt is fitted, it is advisable to recheck the adjustment after a short period of running. This is to allow for the initial stretch which is common to new belts: once this stretch has taken place, the belt should be checked as recommended.

3 TO RENEW ELEMENT IN LUBRICATING OIL FILTER

- (a) Unscrew the bolt at the bottom of the filter bowl (see Fig. 6).
- (b) Move filter bowl clear (see Fig. 7).
- (c) Remove element from filter bowl and discard.
- (d) Clean the inside of the bowl with a suitable cleaning fluid.
- (e) Fit the new rubber joint in the filter headcasting.
- (f) Re-assemble filter with new element; tighten filter bowl securing bolts. Run engine and check for lubricating oil leaks.

NOTE. The bolt securing the filter bowl should be checked for tightness after the first 1,000 miles (1,500 km) or 25 hours running.

4 TO CHECK VALVE TIP CLEARANCES

This is set between the top of the valve stem and the rocker arm (see Fig. 8) and should be 0.010 in (0.25 mm) with the engine warm.

When setting valve clearances, the following procedure should be adopted :---

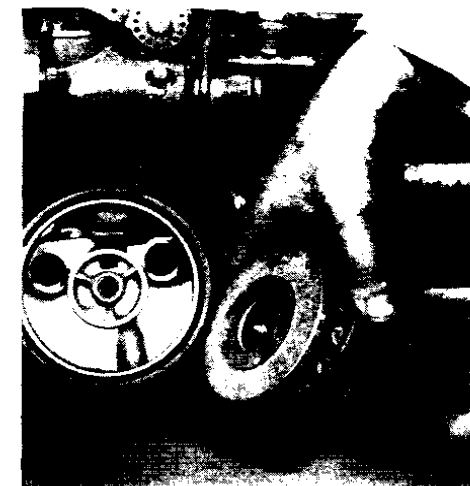
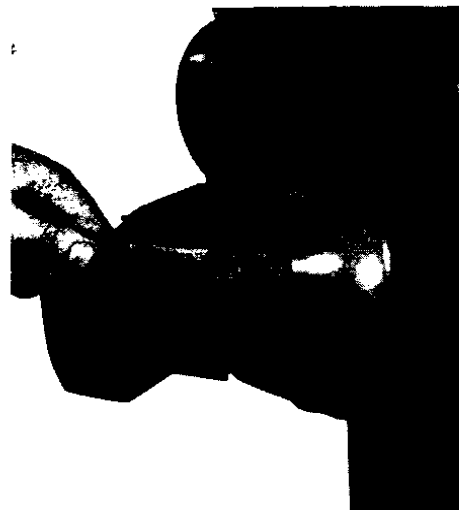


Fig. 6. Unscrewing the Oil Filter Bowl Securing Bolt. Fig. 7. Oil Filter with Filter Element Bowl removed.

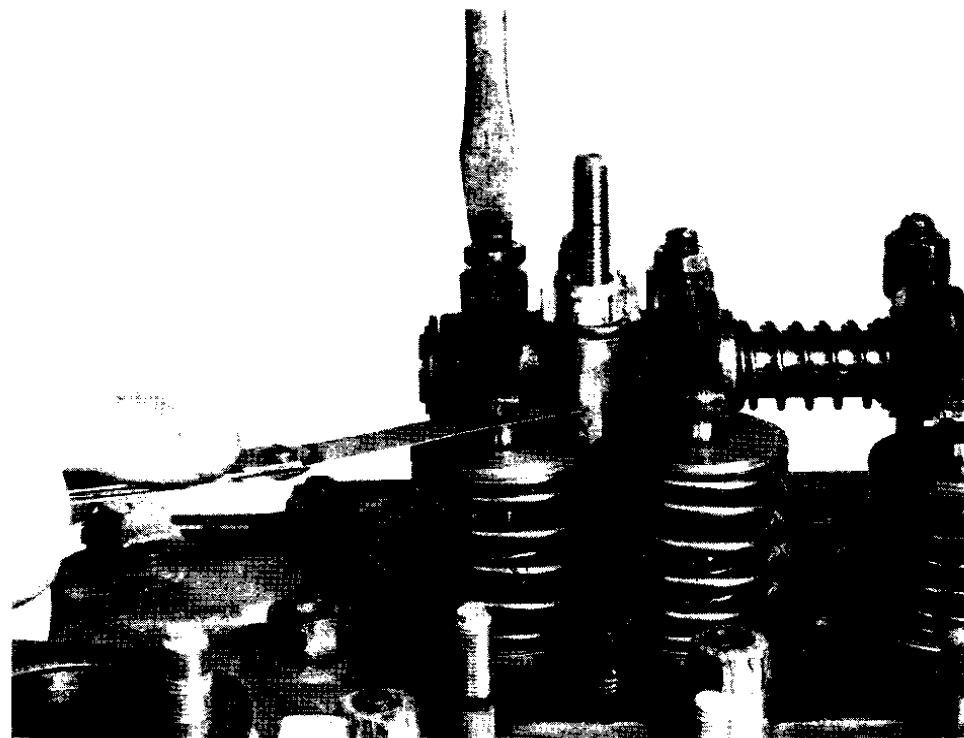


Fig. 8. Setting Valve Clearance.

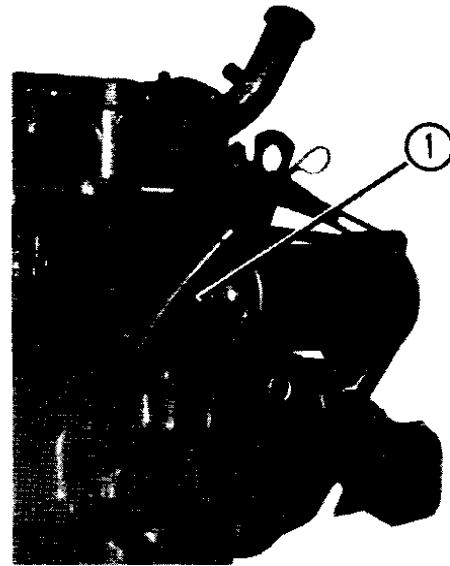


Fig. 9.
Lubricating Dynamo Rear Bush.
1. Location of Oil Hole.



Fig. 10.
Unscrewing the Filter Bowl Securing Bolt.



Fig. 11.
Removing the Filter Bowl.

- (a) With the valves rocking on No. 4 cylinder (i.e., the period between the opening of the inlet valve and the closing of the exhaust valve), set the valve clearances on No. 1 cylinder.
- (b) With the valves rocking on No. 2 cylinder, set the valve clearances on No. 3 cylinder.
- (c) With the valves rocking on No. 1 cylinder, set the valve clearances on No. 4 cylinder.
- (d) With the valves rocking on No. 3 cylinder, set the valve clearances on No. 2 cylinder.

With the engine running at fast idling, check that the oil flow to the rocker assembly is satisfactory.

5 TO LUBRICATE THE DYNAMO REAR BUSH

Remove the rubber plug and inject a few drops of high quality S.A.E. 30 engine oil into the hole marked "Oil" at the rear end of the commutator end bearing housing (see Fig. 9).

6 TO RENEW THE PAPER ELEMENT IN FINAL FUEL FILTER

- (a) Thoroughly clean the exterior of the fuel filter assembly.
- (b) Unscrew the filter bowl in the centre of the head (see Fig. 10).
- (c) Lower the filter bowl clear (see Fig. 11) and discard the fuel therein together with the old element.
- (d) Thoroughly clean the filter bowl in a suitable cleaning fluid.
- (e) Inspect the sealing rings and replace if damaged in any way.
- (f) Place the new element in position inside the filter bowl and offer up the bowl firmly and squarely so that the top rim of the filter bowl locates centrally against the sealing ring in the filter head.
- (g) Hold in this position whilst the securing bolt is located and screwed home.

If the sealing rings are in good order and the bowl is located correctly, no excessive tightening will be required to obtain a leak proof seal.

After the fuel filter has been reassembled, it is necessary to remove air from the fuel system. Unscrew by two or three turns the vent plug on top of the filter head. Operate the priming lever on the fuel lift pump and when fuel, free from air bubbles, issues from the vent point, tighten the vent plug. Slacken the pipe union nut at the fuel pump inlet, operate the priming lever. Retighten the nut when fuel, free from air bubbles, issues from around the threads. The engine is then ready for starting.

fuel system

FUEL OIL

The fuel oil should be clean, and should conform to British Standard No. BS 2869 (1957) Class A.

Fuel oil should be filtered before entering the tank.

Fuel oil should never be stored in a galvanised container.

BLEEDING THE FUEL SYSTEM

In the event of air entering the fuel system, it will be necessary to bleed the whole fuel system before starting can be effected. Air in the fuel system can be either due to running out of fuel or leakage on the suction side of the fuel supply line. To bleed the system, proceed as follows :—

Unscrew by two or three turns, the vent plug on top of the fuel filter cover (not the return pipe to the tank) (see Fig. 12).

Slacken the vent screw on the hydraulic head locking screw on the side of the fuel injection pump body (see Fig. 13).

Slacken the air vent screw near the top of the governor housing on the fuel injection pump (see Fig. 14).

Operate the priming lever of the fuel lift pump (see Fig. 15). (Note. If the cam on the engine camshaft driving the fuel lift pump is on maximum lift, it will not be possible to operate the hand primer, and the engine should be turned one complete revolution) and when fuel, free from air bubbles, issues from each vent point, tighten the connections in the following order :—

1. Filter head venting screw.
2. Head locking screw on fuel injection pump.
3. Governor vent screw on fuel injection pump.

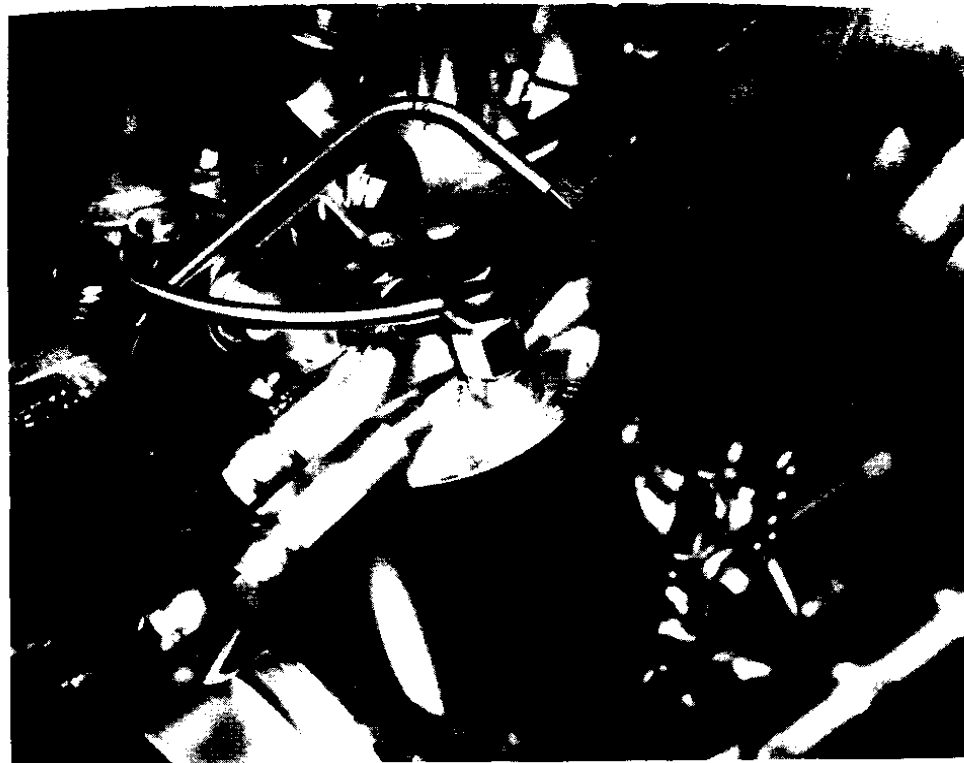
Slacken the pipe union nut at the fuel injection pump inlet (see Fig. 16), operate the priming lever on the lift pump and re-tighten when fuel, free from air bubbles, issues from around the threads.

It must be realised that this whole operation must be carried out completely and no action to tighten connections must be made until all signs of air bubbles have disappeared. Unless care is taken with this operation, and this could take some four or five minutes of hand priming, failure to start will result.

Slacken the unions at the injector ends of the high pressure fuel pipes.

Set the accelerator in the fully open position and ensure that the stop control is in the "run" position.

Rotate the engine with the starter motor until fuel oil, free from air bubbles, issues from all fuel pipes. Some 30 to 60 seconds of rotation may be necessary before this condition is reached, and the



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Fig. 12.

Slackening Vent Screw on Top of Final Fuel Filter.

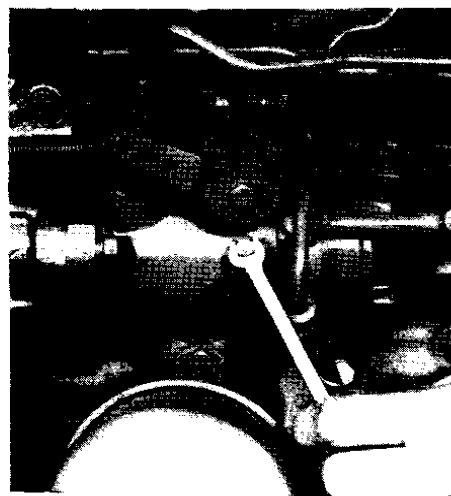


Fig. 13.

Slackening the Vent Screw on Hydraulic Head Locking Screw on Fuel Injection Pump.



Fig. 14.

Slackening Vent Screw on Fuel Injection Pump Governor Housing.

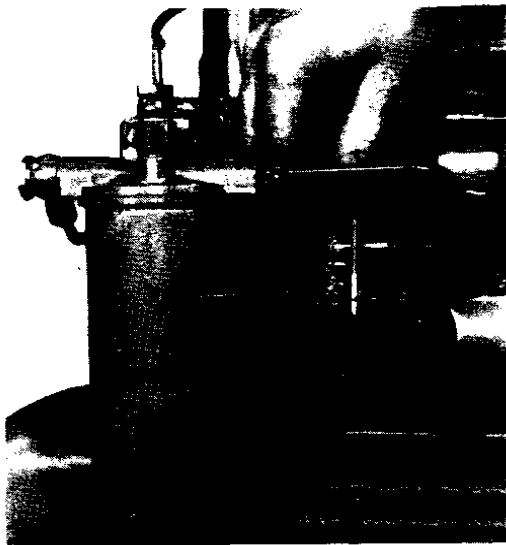


Fig. 15.
Operating the Hand Primer on the Fuel Lift Pump.

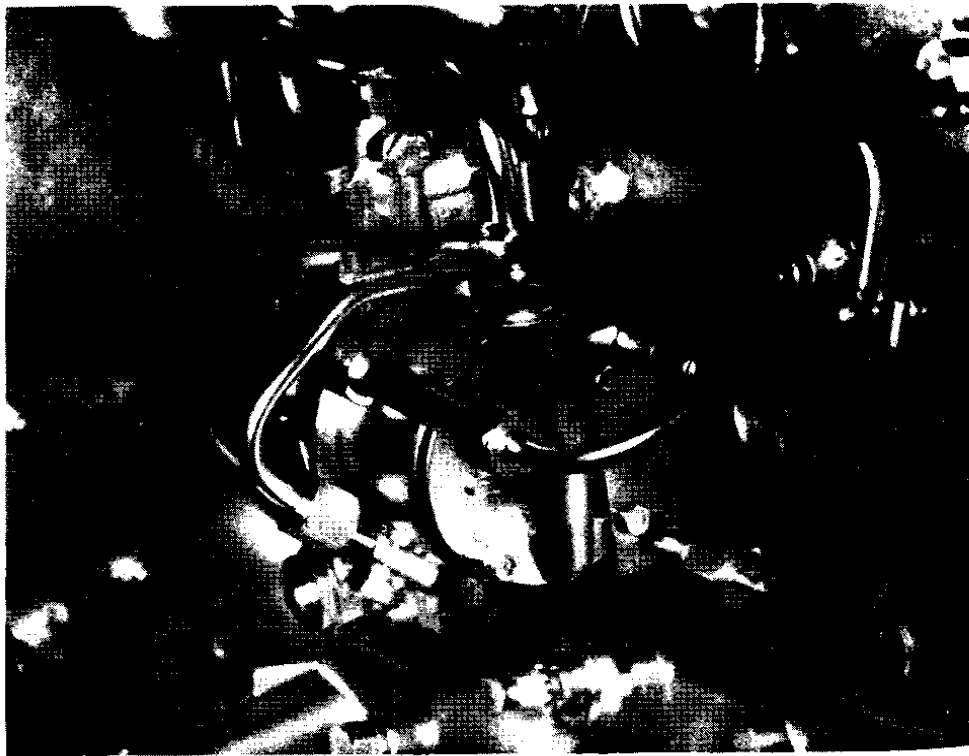


Fig. 16.
Slackening Pipe Union Nut at Fuel Injection Pump Inlet.

time will be dependent upon the speed of rotation and the effectiveness of the bleeding operation described above. A fully charged battery in a temperate or warm climate will rotate the engine at upwards of 280 rev/min, and under these conditions, the remaining air should be expelled in under 30 seconds. Cold conditions or partially discharged batteries may take longer.

Tighten the unions on the fuel pipes and the engine is ready for starting.

If after bleeding the fuel system, the engine starts and runs satisfactorily, but after a few minutes stops, then it can be assumed that air is trapped in the fuel injection pump and the bleeding procedure should be repeated, at the same time checking for air leaks on the suction side, such as loose connections or faulty joints.

frost precautions

Should it be the policy to protect engines from frost damage by adding anti-freeze to the cooling system, it is advisable that the manufacturers of the relevant mixture be contacted to ascertain that their products are suitable for use in Perkins engines and also that their products will have no harmful effects on the cooling system generally. It is our experience that the best results are obtained from anti-freeze which conforms to British Standard 3151.

After an anti-freeze has been used, the cooling system should be thoroughly flushed in accordance with the manufacturers instructions before refilling with normal coolant.

When draining the cooling system, it is not enough merely to open the radiator drain tap. The one on the cylinder block must also be opened. This tap is on the fuel pump side of the cylinder block in the middle, or on the camshaft side of the cylinder block near the flywheel housing. Where a pressurised radiator filler cap is used, this should be removed before draining the cooling system.

If the foregoing action is taken, no harmful effects should be experienced, but Perkins Engines Ltd. cannot be held responsible for any frost damage or corrosion which may be incurred.