BEFORE STARTING YOUR ENGINE FOR THE FIRST TIME, FOLLOW THE LUBRICATION INSTRUCTIONS ON PAGE 6 MOST CAREFULLY

You want the best out of this engine. Give this handbook to the man who has to look after it.

BOOK 103/171

PRICE 50p

INSTRUCTION BOOK AND PARTS LIST

Lister

DIESEL ENGINES

TYPES 6-1, 8-1, 12-2 & 16-2

R. A. LISTER & CO. LTD.
DURSLEY, GLOUCESTERSHIRE, GL11 4HS
ENGLAND

HAWKER SIDDELEY

Telephone: **Dursley 2371** Telex: **Home 43261** Telegrams & Cables: **Machinery, Dursley**
Export 43156

INDEX

INSTALLATION

The Engine must be installed where a generous supply of fresh air is assured.

A portable electric light is recommended in addition to the fixed lighting of the engine room.

The most convenient height for the crankshaft is 27 in. (68.5 cm.) above the ground.

Keep exhaust and water pipes as short and straight as possible.

Leave a space of about 3 feet all round the engine for ease of access and maintenance.

Foundations

Our standard foundation drawings give the dimensions of suitable concrete beds. These dimensions are the minimum for a good solid sub-soil and modifications will have to be made where the sub-soil is soft, water-logged, or otherwise of a special character.

Set the engine as level as possible, packing under the engine feet with thin metal strips, placed as close as possible to the holding down bolts.

Portable Models

Place portable models in as level a position as possible.

Belt Drive

Driving belts must be run as close up to the flywheel as possible to avoid undue strain on the bearings and crankshaft. Where "fast" and "loose" pulleys are used, drive the "fast" pulley from the side nearest the flywheel.

Tank Cooling

Arrange the water tank with the bottom pipe between the engine and the tank, level.

Maintain the water level above the top connection on the tank.

The connection from the top of the cylinder head to the top of the tank must slope upwards all the way (see Fig. 1).

After starting always check that the water is circulating.

To avoid air locks, turn on 3-way tap before refilling Tank.

In frosty weather drain cylinder jacket by turning 3-way tap so that cylinder jacket and pipes are drained, but water remains in the tank. Turn on water jacket drain cock.

When water pump is fitted, this must also be drained.

Through Cooling

The cooling of an engine by passing water through it to waste, with or without the use of a small tank, is totally unsuitable and must not be used under any circumstances.

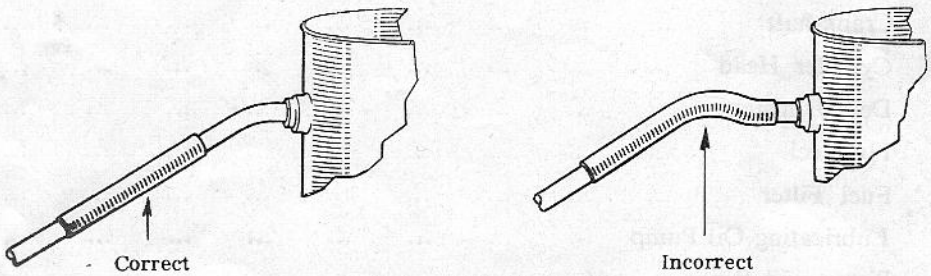


Fig. 1. Water Cooling

Radiator Cooling

Radiator fans are not designed to discharge against any head greater than that due to the resistance of the radiator itself. Sets must be installed so that the air is free to circulate.

Exhaust Pipes

If a longer exhaust pipe than standard must be fitted, this should at no point slope upward from the engine, unless a suitable moisture trap is fitted at the lowest part of the pipe. This is to prevent moisture, caused by condensation, draining back into the cylinder and causing damage.

If more than 10 feet of pipe is used, the bore of the pipe must be increased.

Pipe sizes

Up to 10 feet—2 in. (50.8 mm.) bore
10 feet to 20 feet—2½ in. (63.5 mm.) bore
over 20 feet—3 in. (76.2 mm.) bore

To facilitate cleaning the exhaust pipe during overhaul it must be erected in easily detached sections of about 4 feet in length, and not concreted in at any point.

FUEL SUPPLY

It has not been found practicable to recommend any particular fuel for universal use, but the fuel must be a distillate, and not a residual oil or a blend thereof. It should have a Specification conforming to British Standard No. 2869:1957 Class A.

Specification

The fuel must be a DISTILLATE, and not a residual oil or a blend thereof. It must conform with British Standard Specification 2869-1967 Class A1 or A2.

The main characteristics of these fuels are as follows:—

	Class A1	Class A2
Viscosity, kinematic at 37.8°C centistokes:—		
Min.	1.6	1.6
Max.	6.0	6.0
Cetane number, min.	50	45
Carbon residue, Conradson on 10% residue, % by weight, max.	0.2	0.2
Distillation, recovery at 357°C % by volume, min. ...	90	90
Flash point, closed, Pensky-Martens, min.	55°C	55°C
Water content, % by volume, max.	0.05	0.05
Sediment, % by weight, max.	0.01	0.01
Ash, % by weight, max.	0.01	0.01
Sulphur content, % by weight, max.	0.5	1.0
Copper corrosion test, max.	1	1

1. The purchaser must satisfy himself that his whole equipment is capable of dealing with the oil at the lowest temperature to which the oil will be exposed. In some cases Summer grade oil is unsuitable for use in Winter because it becomes cloudy and rapidly clogs the fuel filters in the engines.

2. Vaporising oils are not suitable as fuels for Lister diesel engines.

3. When Class A2 fuels are used, lubricating oil complying with MIL-L-2104A or Supplement 1, must be used.

4. In general, the fuel must be free from foreign matter and water. otherwise excessive wear may take place, particularly in the fuel injection system; certain fuels are unsuitable owing to the excessive temperatures, pressures, deposits and corrosion resulting from their use. The user is cautioned that although the engine may run satisfactorily for a short time on cheap fuel, excessive wear and damage will ultimately be suffered by the engine and its life materially shortened. For these reasons we can accept no responsibility for such damage or wear caused by the use of unsuitable or dirty fuels.

5. When in doubt as to the suitability of a fuel oil the local agent should be consulted.

CLEAN FUEL IS OF THE UTMOST IMPORTANCE IN ENSURING RELIABLE AND EFFICIENT PERFORMANCE.

Fuel Service Tank

An engine mounted fuel tank is supplied as standard; as an alternative, a fuel service tank can be supplied which should be mounted not less than 2ft. 6ins. (0.76 metres) and not more than 6ft. (1.8 metres) above the crankshaft and as close to the engine as possible.

This latter type is fitted with a sloping bottom to assist in draining off sludge by means of a drain plug. During overhauls examine the tank closely and clean out if necessary.

Clients providing their own fuel tanks should arrange for the fuel outlet to be 2in. above the bottom of the tank and that draining arrangements are provided at the lowest point.

Always fill fuel tanks through a fine strainer, preferably at the end of a run. If any sediment is stirred up during the process, this has time to settle before the engine is used again.

If cans are used, avoid tipping out the last few drops.

Funnels are very difficult to keep clean in dusty conditions. Wash them before and after use and wrap up when not required, or fill service tank direct from a small mouthed screw capped can such as a 2 gallon petrol can.

Tanks and piping should NOT be galvanized.

Before finally connecting up, blow out all fuel pipes to remove scale loosened during bending and fitting.

LUBRICATION

Specification

The engine must be run on good quality diesel engine heavy duty detergent lubricating oil.

The lubricating oils must meet specifications DEF2101C or BS1905 or MIL-L-2104A. Straight mineral oils are not suitable, neither are oils of less detergency than specified.

Supplement 1 or MIL-L-2104B oils are recommended for engines running at a high load factor, particularly in conjunction with high ambient temperatures. They must also be used if the sulphur content of the fuel exceeds 0.5%.

Series 3 oils must be used when oil changes are made at periods longer than 250 hours.

Multigrade oils must have a degree of detergency, equivalent to MIL-L-2104B or Supplement 1, and must not be used in heavy duty applications.

Viscosity

Starting temperatures	Viscosity
Up to 32°F (0°C)	S.A.E. 10W
Between 32°F and 85°F (0°C and 30°C)	S.A.E. 20/20W
Above 85°F (30°C)	S.A.E. 30

Branded Oils

Your local Lister Distributor or Agent, will be able to recommend the locally available brands of lubricating oil for your Lister engine; alternatively you may contact Listers direct at Dursley mentioning the Oil Company you prefer to deal with.

In cases where it is difficult to quickly ascertain which proprietary brands of lubricating oil meet the recommended specifications, it is permitted to temporarily employ the same lubricating oils which are used for the engines of diesel lorries and diesel tractors.

The use of good quality lubricants will give longer periods between overhauls and extend engine life.

Mixing of Oils

If an engine has been run on straight mineral oil for more than 250 hours since completely overhauled (or since new) before it is changed to Heavy Duty (Detergent) Lubricants, the deposits formed by the straight oils may be dislodged by the latter and choke the oilways and filters. For this reason it is necessary to flush the engine thoroughly with Heavy Duty (Detergent) oil and change the oil after 150 hours and then resume normal changes every 500 hours. The filters must receive frequent attention during this initial period.

Sometimes Heavy Duty (Detergent) oils increase the oil consumption, in which case a heavier grade may be used.

DO NOT MIX TWO DIFFERENT BRANDS OF OIL. THOROUGHLY DRAIN OFF OIL OF ONE BRAND BEFORE CHANGING TO ANOTHER LUBRICATING OIL ADDITIVES ARE NOT CONSIDERED NECESSARY AND SOME CAN HARM THE ENGINE.

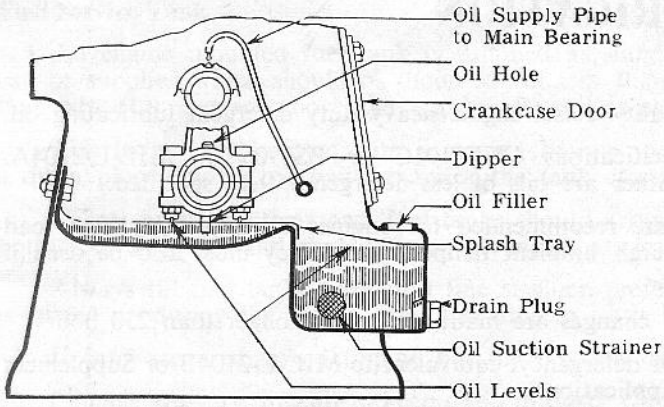


Fig. 2. Lubricating Oil System, 6/1 and 8/1

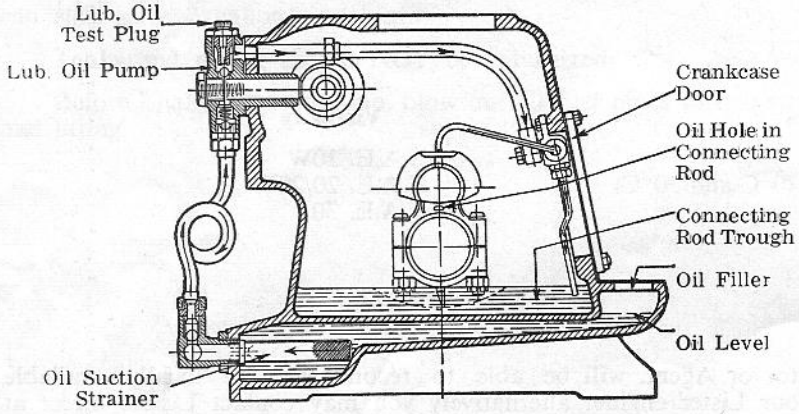


Fig. 3. Lubricating Oil System, 12/2 & 16/2

Lubricating Oil System

Lubrication is by a plunger type pump operated by a cam on the camshaft. The pump feeds a generous supply of oil to the main bearings and to the trough into which the dipper of the connecting rod big end dips. The big end bearings are lubricated from below by a hollow dipper in the 12/2 & 16/2 engines, and by oil holes from above in the single cylinder engines. The piston, cylinder and other working parts are lubricated by splash.

The lubricating oil pump of the single cylinder engines, mounted on the end of the crankcase below the fuel pump, is fitted with a hand priming lever. The two cylinder engine is primed from inside by reaching through the crankcase and working the oil pump plunger with the thumb until the oil is seen to flow down over the main bearings. The plug on the top of the pump fitting may be slackened if necessary to check that the pump is working. An oil pressure indicator gauge and tap can be supplied if specially ordered. The valve stems are lubricated from small oil reservoirs in the cylinder head. and the rocker shaft is provided with its own greaser.

Near the valve tappets is a brass plug marked " OIL ". This is for applying oil to the camshaft bearing if the engine has been standing idle for a long time. Tappet heads and push rod heads are cupped to enable them to hold their own supply of oil for a reasonable time.

Before Starting Engine for the First Time or After Overhaul

(a) Remove crankcase door and fill troughs under connecting rod (or rods) with lubricating oil.
(b) Apply oil to each oil hole in top of big end bearings.
(c) Open oil filler and fill engine sump to within $\frac{1}{2}$ in. (12.7 mm.) of the top of oil filler.
(d) Operate lubricating oil pump by hand or rotate engine by starting handle until oil flows down over main bearings and into dipper troughs on twin cylinder engines.
(e) Close up crankcase and fill recesses in cylinder head with engine oil for valve lubrication. Also fill cups in push rods and tappet heads.
(f) Remove brass plug near tappets, marked " Oil ", and pour in $\frac{1}{4}$ pint of oil.
(g) Fill rocker shaft greasers and give several turns to lubricate valve rockers.
(h) Lubricate any AUXILIARY MACHINERY driven by the engine.

Lubricating Oil Sump Capacities

6/1 and 8/1	5 pints (2.84 litres)
12/2 and 16/2	10 pints (5.7 litres)

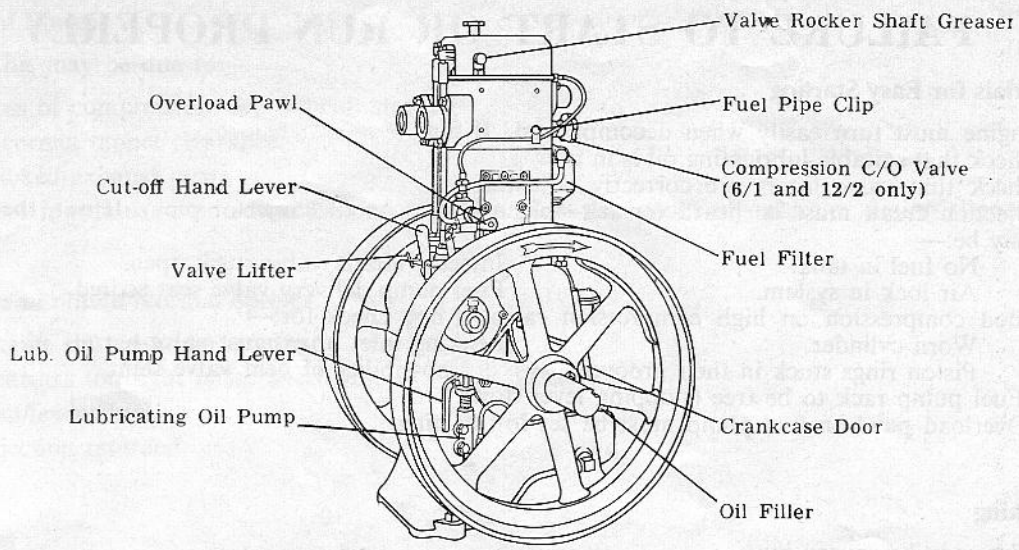


Fig. 4. Single Cylinder Engine

STARTING AND STOPPING

To Start Engine by Hand

(a) Make it a practice to check the lubricating oil level, the fuel level and the cooling water level before starting.
(b) If engine is being started for the first time ensure that all the foregoing points of lubrication have been attended to and that the fuel system is primed. (See page 18.)
(c) Swing valve lifter(s) under tappets.
(d) Screw in tightly the compression change-over valves on cylinder heads (6/1 and 12/2 only).
(e) Disengage cut-off hand lever by pushing it downwards and trip the overload pawl on the fuel pump.
(f) Place starting handle on the engine crankshaft extension and turn. Disengage exhaust valve lifter(s) as quickly as possible, and lock in off position. Engine should fire as soon as one valve has been released. Retain grip on starting handle and remove from crankshaft.
(g) Check oil indicator plug to see that oil pump is working. If oil pressure indicator gauge is fitted, open tap to check pump is working and quickly close it again (12/2 & 16/2 engines only).
(h) Check that cooling water is circulating.
(j) Load can be applied as soon as engine has attained full speed. Up to $\frac{1}{3}$ load, compression change-over valve(s) should remain screwed in, but when more than $\frac{1}{3}$ load is applied, screw change-over valve(s) out as far as it (they) will go. (8/1 and 16/2 engines are not fitted with compression change-over valves.)

To Stop Engine

(a) Lift cut-off hand lever.
(b) When engine is about to stop, engage valve lifter (see Fig. 4). Never stop engine by shutting off fuel supply or by lifting the exhaust valve.

Speed and Load Regulation

A slight adjustment of speed may be made. To increase speed, turn the knurled adjusting nut in a clockwise direction, increasing the tension of the spring. To reduce the speed, turn the knurled nut in the opposite direction.

THE SPEED MARKED ON THE ENGINE MUST NOT BE INCREASED BY MORE THAN $2\frac{1}{2}\%$ WITHOUT FIRST CONSULTING R. A. LISTER & CO. LTD.

FAILURE TO START OR RUN PROPERLY

Essentials for Easy Starting

(a) Engine must turn easily when decompressed. If not—
Check that suitable lubricating oil is in use.
Check that valve lifters are correctly adjusted.

(b) Injection creak must be heard (or felt—place fingers on fuel injector pipe). If not, the cause may be:—

No fuel in tank.
Air lock in system.
Injector nozzle valve stuck open.
Fuel pump delivery valve seat scored.

(c) Good compression on high compression ratio. If not, check for:—

Worn cylinder.
Piston rings stuck in their grooves.
Leaking inlet or exhaust valve—
possibility of bent valve stem.

(d) Fuel pump rack to be free (stopping lever down).

(e) Overload pawl on fuel pump must be set for starting.

Knocking

This may be caused by:—

(a) Valve, probably exhaust, sticking in guide, and hitting piston—clean valve stems and guides
(b) Slack bearing—fit new bearing.
(c) Insufficient clearance between piston and cylinder head—check and adjust. (See page 13.)
(d) Injection too early—check and adjust. (See page 18.)
(e) Flywheel loose on shaft—drive taper keys in tightly.

Carbon Deposit

Excessive deposit may be due to:—

(a) Choked exhaust system—dismantle and clean.
(b) Long period of idling—running too cool.
(c) Unsuitable fuel oil.
(d) Unsuitable lubricating oil.
(e) Injector not spraying correctly—clean nozzle.
(f) Late injection of fuel—check timing.

Smoky Exhaust

The exhaust gas should be clear at full load. If it is not, steps should be taken to clear it. Black smoke is due to incomplete combustion of fuel caused by:—

(a) Overload, causing an excessive quantity of fuel to be injected.
(b) Choked air intake.
(c) Poor atomisation due to a choked injector nozzle.
(d) Unsuitable fuel.

Blue smoke, when faint, is generally the result of light load or over-cooling.
Heavy blue smoke is caused by lubricating oil passing the piston rings because of either piston rings carboned in grooves or a worn cylinder.

Engine Stops

This may be due to:—

(a) Lack of fuel—tank empty, air or water in fuel system, fuel system choked.
(b) Overload.
(c) Overheating—shortage of water or lubricating oil.

Loss of Power

This may be due to:—

(a) Loss of compression. See difficult starting.
(b) Incorrect tappet clearance.
(c) Choked exhaust pipe.
(d) Fuel injection system. Injector out of order. Fuel pump out of order, or timing slipped.

Failure to obtain Normal Speed

(a) Engine started under overload.
(b) Bearings too tight (after overhaul).
(c) Insufficient fuel.
(d) Injection retarded.

Cooling

Occasionally examine flexible hose to see that it is clear. There is a danger of swelling inside. so obstructing the flow of water. and a good test is to compress the hose, which should give and not feel hard and solid.

In districts where the water is impure, the water jacket around the cylinder and in the cylinder head should be freed from any deposit.

To remove hard deposits in cylinder water jacket fill with a solution of washing soda in the proportion of $1\frac{1}{4}$ lbs. soda to 1 gallon of boiling water. Then wash the jacket out with fresh water.

Radiator Cooling

The radiator may be unable to perform its proper function for the following reasons:—

(a) Insufficient water in the system. Keep water level 2 ins. below the top of the filler. Attend to leaking hose connections.
(b) Fan belt slipping. Take out the slack. Every 1,000 hours re-pack fan hub bearings with grease.
(c) System obstructed with scale or swelling of the rubber hose. Change hose or treat for scale as above.
(d) Radiator element clogged with dust deposited by the air passing through. Brush out fins or take off radiator and wash.
(e) Engine room not adequately ventilated or radiator too close to a wall. Hot air off the radiator must be allowed to pass freely away. Note that a rise in room temperature from 65°F. to 95°F. will involve a loss of 6 per cent of power.
(f) Water pump (if fitted) may not be working properly. Belt slipping, ports choked, fluff and waste wrapped round the impeller.
Inspect the radiator periodically with the above points in mind.

Radiator Capacities

	Temperate	Tropical
6/1 and 8/1	$3\frac{1}{8}$ Gals. (14 litres)	$3\frac{1}{2}$ Gals. (15.8 litres)
12/2 and 16/2 ...	$4\frac{1}{4}$ Gals. (19.25 litres)	$4\frac{3}{4}$ Gals. (21.5 litres)

MAINTENANCE ROUTINE

When Engine is in regular use:—

Daily:

Check supply of fuel oil.
Check leaks of oil, water, fuel.
Check level and state of lubricating oil.
Check oil around valve stems.
Check oil in push rod cups.
Turn grease cups.
Check water circulation.
Check water temperature.
Check exhaust smoke.
Check lubricating oil circulation

100 Hours:

Clean air filters.
Check tightness of all nuts.

250 Hours:

Apply drop of oil to governor linkage and fuel pump side window.
Check driving belt, fan, water pump (if fitted).
Drain moisture trap in exhaust pipe (if fitted).
Lubricate auxiliary machinery.
Change engine oil.
Remove fuel injectors and check fuel spray

500 Hours:

Change engine oil.
Clean and renew oil in oil bath air cleauer.
Feel water hoses.
Adjust valve clearance.
Clean radiator fins.
Clean lubricating oil strainer.

1,000 Hours:

Decarbonise engine.
Grind in valves.
Check piston clearance if gasket is changed.
Clean out inlet manifold and exhaust pipe.
Check water jacket for scale.
Check free working of governor linkage.
Repack fan bearings with grease (radiator cooling).
Drain sediment from main fuel tank.
Drain and clean water tanks.
Renew fuel filter element.
Check injector nozzles for obstruction or wear in orifice.
Check big end and main bearings.

A reasonable amount of time spent in checking over the details as described in the foregoing is the user's best insurance against loss of valuable time and costly repairs.

MAINTENANCE

Changing Oil

Change lubricating oil after every 250 hours running.

Drain sump when engine is warm through drain plug to be found on 6/1 and 8/1 engines below the oil filler, and on 12/2 and 16/2 engines in the oil suction pipe elbow.

Remove crankcase door, splash plate (6/1 and 8/1) and lubricating oil strainer.

Wipe down inside of crankcase, including trough, as clean as possible.

If paraffin is used to clean out sludge, crankcase must be wiped dry before recharging with fresh oil.

Clean and replace oil strainer.

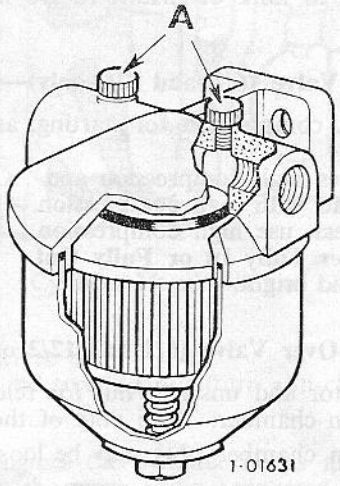


Fig. 5. Fuel Filter

The fuel filter is an essential part of a diesel engine. It must not be removed from the engine or used without a filter element.

Renew the filter element every 1000 hours—more frequently if the fuel is known to be dirty for any reason. When changing the element clean the inside of the filter bowl.

After carefully re-assembling the filter, the fuel should be turned on and all air vented from the system by slackening the two bleed screws on top of the filter body, and the single bleed screw in the outlet banjo. After all air has been displaced tighten the vent screws securely.

" Lister " Felt Air Filter (When Supplied)

The " Lister " air filter is suitable for average operating conditions, but where very dusty conditions prevail an " oil bath " filter should be fitted.

It is important that the air filter is cleaned regularly so that the passage of air to the engine does not become partially or wholly blocked. The time interval between cleanings will vary with the amount of dust in the air, but it is recommended that this operation should be performed once a month under the cleanest of conditions.

Remove felt from cleaner and shake vigorously, then beat dust and grit out of the felt.

If the felt is damp and oily it will be necessary to wash it in **paraffin** and to **thoroughly dry** before replacing in the cleaner. Fuel oil is **NOT** recommended for washing the felt as it will not readily evaporate and petrol vapour may cause detonation.

Oil Bath Type Air Filter (When Supplied)

Mount the filter in horizontal position and maintain the correct oil level as marked on the filter body. If the level is $\frac{1}{4}$ in. too high the engine will inhale the cleaning oil, which will cause excessive carbon deposits on the valves, pistons, etc. If too little oil is used, the cleaning action will not be efficient. Check the oil level weekly, and if necessary add fresh oil. Lubricating oil as

is used for the engine may be employed. Change the oil and clean completely every 500 hours' running, or more frequently if there is any sign of the oil becoming impregnated with sand or dirt. To clean, remove from engine and dismantle. Wash in paraffin and allow to dry. Examine cork and felt washers during dismantling and change if necessary.

Air tight joints, including those between the filter and the engine are essential for efficient air cleaning.

Vacuum Breather

The purpose of the vacuum breather on the crankcase door is to maintain a partial vacuum in the crankcase so that the lubricating oil will not work out through the bearings and joints.

If the thin metal disc should become stuck with paint or grime, remove and scrape clean on a flat surface, care being taken not to kink or distort it. Do not mislay the small distance piece which supports the cover.

Compression Ratio Change-Over Valve (6/1 and 12/2 only)—Optional Extra

This is a device to give a high compression for starting, and a lower compression for normal running.

The valve screwed "IN" gives high compression and "OUT" gives low compression.
Do NOT run under heavy load with high compression.
For long runs at $\frac{1}{3}$ load or less, use high compression.
Always see that valve is either **Fully In or Fully Out.**
Keep the screw thread clean and bright.

To Remove Compression Change-Over Valve (6/1 and 12/2 only)—Optional Extra

(a) Remove fuel pipes from injector and unscrew nut for releasing auxiliary chamber. This will withdraw the outer combustion chamber. Take note of the thin copper washer.

(b) The main or inner combustion chamber plug may be loosened by compression in the manner described for cylinder head.

Drive a hard wooden plug into the $\frac{1}{4}$ in. dia. hole in the centre to prevent air leakage and then replace the outer portions just removed with the handwheel in the "Out" position, and with the outer combustion chamber nut screwed into the head three or four turns, which will be sufficient to prevent the inner combustion chamber from being ejected too violently when subjected to the force of compression.

Stubborn cases will have to be treated by drilling and tapping with a fine $\frac{3}{8}$ in. thread and drawing out with a screw.

(c) Unscrew small nut in centre of handwheel to extract valve.

(d) Remove valve, taking care of spring, spring washer and woodruff key.

To Remove Cylinder Head

(a) Drain water. (If compression change-over valve is to be removed, loosen at this stage. See above).

(b) Remove cylinder head cover.

(c) Remove injector.

(d) Detach inlet pipe, exhaust pipe, water pipe and fan assembly if radiator cooled.

(e) Remove valve rocker assembly, push rods and valve caps.

(f) Undo cylinder head nuts.

(g) Lift off cylinder head. In obstinate cases, replace the injector (but not the fuel pipes), valve rockers, valve push rods and two cylinder head holding down nuts, and slacken each of these holding down nuts about two turns.

Next proceed as for starting. With valve lifter engaged, turn the starting handle quickly to get up a good speed and then smartly disengage valve lifter, when the compression in the cylinder should cause the loosening of the joint between cylinder head and cylinder block

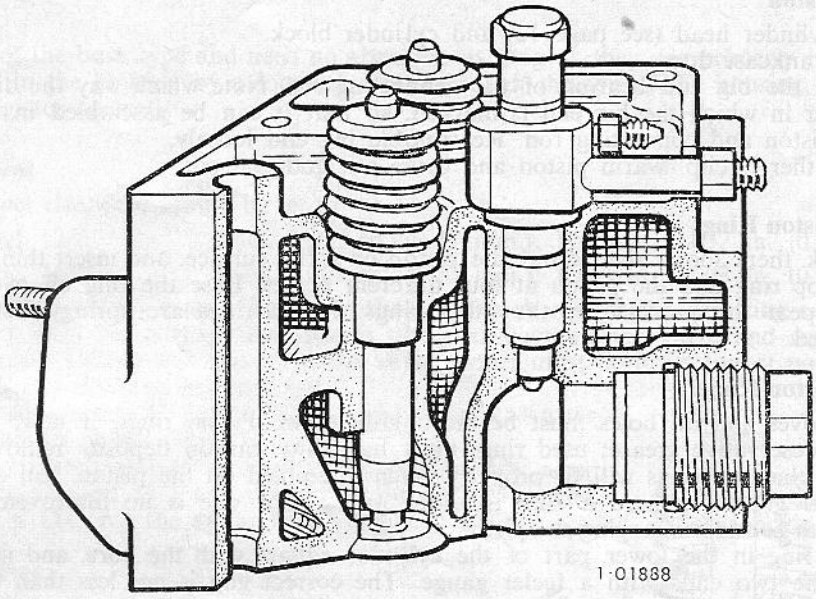


Fig. 6. Cylinder Head (6/1 and 12/2 engines)

To Remove Valve Guides

The inlet valve guide may be driven out.
The exhaust valve guide must be screwed out (turn anti-clockwise).

To Replace Cylinder Head

Note.—In the twin cylinder engines the cylinder heads are so arranged that the two inlet valves come together on the inside, the parts being connected by a common inlet manifold. The cylinder heads, therefore, must be replaced in their original positions.

(a) Refit valve guides, inlet and exhaust valves.
(b) See that cylinder head gasket is undamaged and in place, i.e. by position of dowel.
(c) Replace cylinder head on studs, and tighten nuts finger tight.
Note: Each cylinder head gasket must be replaced on its own cylinder. If these have been changed then the head clearance must be checked as below.
(d) Refit compression change-over valve, taking care that the copper washer between the two parts is in place.
(e) Fit inlet manifolds on twin cylinder engines to ensure correct alignment. Failure to carry out this step will probably lead to cracked or broken manifolds.
(f) Nuts to be tightened so that the cylinder head is pulled down flat, compressing the gasket evenly. This can be achieved by tightening the nuts in turn diagonally. Tighten each nut a little at a time and go over three or four times.
After the initial run, following the replacement of the cylinder head, and, while the engine is still hot, re-tighten the cylinder head nuts, as described above.
(g) Replace valve end caps, push rods and valve rocker gear and adjust valve clearances as under "Valve Adjustment".
Note: Inlet valve push rod is longer than exhaust valve push rod.

To Check Cylinder Head Clearance

Place two small pieces of lead on top of piston, above the line of the gudgeon pin and not beneath the valves or transfer port. Tighten down cylinder head and turn piston slowly past T.D.C. Remove cylinder head and measure thickness of lead; this should fall between 0.045 in. (1.14 mm.) and 0.050 in. (127 mm.) for types 6/1 and 12/2 and between 0.075 in. (1.9 mm.) and 0.080 in. (2.03 mm.) for the 8/1 and 16/2 engines. The clearance may be adjusted by the use of paper joints, placed between the cylinder block and the crankcase.

If the clearance is much too large it may be due to worn bearings or a bent connecting rod.

To Remove Piston

(a) Remove cylinder head (see page 12) and cylinder block.
(b) Remove crankcase doors.
(c) Disconnect the big end bearing of the connecting rod. Note which way the dipper faces and the manner in which the big end is marked, so that it can be assembled in the same way.
(d) Lift out piston and connecting rod. Reassemble big end loosely.
(e) Remove either circlip, warm piston and drive out gudgeon pin.

To Remove Piston Rings

First work them loose, then stand the piston on a flat surface, and insert thin strips of metal between the top ring and the piston at four different places. Ease the ring off over the strips of metal, and repeat the process for the other rings. Piston rings are springy but will break if roughly handled.

To Replace Piston Rings

(a) Piston grooves and oil holes must be thoroughly clean. Piston rings, if new, must be wiped clean of preservative grease; used rings must have any carbon deposits removed.
(b) To ensure that the rings will fit properly when assembled on the piston, roll each one round in its own groove. Where a ring is slack, and a new one is no improvement, it will be necessary to consider changing the piston.
(c) Place the ring in the lower part of the cylinder, square with the bore, and measure the gap between the two ends with a feeler gauge. The correct gap is not less than 0.012 in. (0.310 mm.).
(d) Wipe all parts clean and dry and assemble the rings in their grooves by sliding them over strips of metal as in removal.

To Reassemble

(a) Refit piston and connecting rod, noting numbering of big end bearing and in which direction the dipper faces. The dipper fitted to 6/1 and 8/1 engines is flattened in section and should cut the oil edgeways **not** broadside on. The hollow dipper in twin cylinder engines is a scoop, the opening of which is turned away from the crankcase door.
(b) Fit paper cylinder block joints equal to number removed (and 2 metal shims 0.015" (0.38 mm. thick for types 8/1 and 16/2). Place a flat bar across crankcase close to connecting rod and bring piston skirt kirmly down on to it.
(c) Oil piston rings and stagger the gaps. Place piston ring clamp in position and compress rings. The clamp should close quite easily. If any force is required it is better to take it off and try again.
(d) Oil cylinder bore, lift cylinder block over studs and lower into position pushing down piston ring clamp as far as the bar underneath the piston.
(e) Turn crankshaft to move piston up into cylinder.
(f) Support cylinder block, remove piston ring clamp and bar and allow cylinder block to drop in to position.
(g) Assemble cylinder head.

Connecting Rod Big End Bearing

These are steel back white metalled shells in the bottom half and lead bronze in the top half and **must not** be scraped or touched up in any way. The running clearance with the crankpin should not exceed 0.003 in. (0.076 mm.).

When assembling the bearings on the connecting rod it is most important that the backs are scrupulously clean and that there is interference between the bearing and the bore of the connecting rod. This interference, or nip, is measured by placing the bearing in the connecting rod, tightening both bolts to the normal extent, then slackening one bolt only and measuring the corresponding gap in the rod at the parting line. This gap should be between 0.004 in. (0.102 mm.) and 0.006 in. (0.152 mm.).

Ensure the dipper is secure before replacing the connecting rod cap; it is screwed in place and 4 dots punched into the circumference prevent turning. Place a cork over the end of the dipper whenever working in the crankcase and so avoid injury to the hands.

Main Bearings

These are of the bush type and need no attention as long as they are properly lubricated. The bush is located in the housing by a locating screw through the top of the housing, to ensure that the oil holes register correctly.

Valve Adjustment

Valve Tappet clearance should be set to

6/1 and 12/2 ... Inlet, 0.017 in. (0.43 mm.); Exhaust, 0.032 in. (0.82 mm.)

8/1 and 16/2 ... Inlet, 0.008 in. (0.20 mm.); Exhaust, 0.008 in. (0.20 mm.)

To do this, slack off the locknut on top of the valve rocker, turn the adjusting screw by means of a screwdriver until the correct clearance is obtained between the valve and rocker and then tighten the locknut. During this operation the valve tappet must be in its **lowest position,** and the rocker pressed firmly down on the push rod.

The inlet valve opens 5° before T.D.C. and closes 15° after B.D.C. on all engines of this range.

The exhaust valve opens 45° before B.D.C. and closes 5° after T.D.C. for types 6/1 and 12/2 and opens 55° before B.D.C. and closes 20° after T.D.C. for the 8/1 and 16/2 engines.

To Remove Valves

(a) Remove cylinder head. (See page 12).
(b) Lay head upright on bench.
(c) Depress valve spring carrier.
(d) Remove valve stem cone (in two halves).
(e) Remove valve spring carrier, and valve springs.
(f) Turn cylinder head over, and remove valves.

To Replace Valves

Replace components in the reverse order and check valve clearance under the face of the cylinder head.

Position of Valve Heads

Inlet and exhaust valve heads must not be less than 0.005″ (0.127 mm.) and not more than 0.100″ (0.254 mm.) under face of cylinder head to prevent valves from touching piston when using the valve lifter.

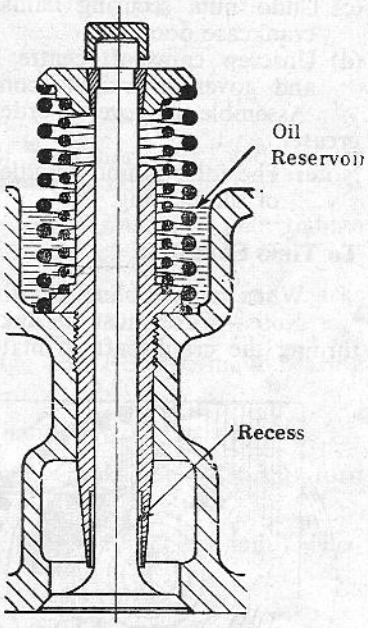


Fig. 7. Exhaust Valve Guide

Decarbonising

ENGINE SHOULD NOT BE RUN MORE THAN 1,000 HOURS WITHOUT DECARBONISING.

(a) Remove cylinder head and dismantle.
(b) Remove piston and rings.

ALL PARTS must be scraped clean of deposits of carbon and washed in paraffin before reassembly.

Special care must be taken with regard to:—

(a) Recess in bore of exhaust valve guide (see Fig. 7).
(b) Valve ports.
(c) Piston ring grooves.
(d) Inside of piston.

Regrind valve seats if not in perfect condition. This applies also to the compression change-over valve. (6/1 and 12/2 only).

Clean out all exhaust piping, expansion chambers, silencers, etc. Every part must be scrupulously clean before being placed in position.

To Remove Flywheel

(a) Remove flywheel key, clean end of crankshaft and keyway.
(b) Work flywheel to end of crankshaft and lift off.
(c) A very tight or damaged key may require to be drilled before flywheel can be removed by a special " strongback ".

In cases of difficulty the crankshaft can be withdrawn from either end of the engine with one flywheel still attached.

To Remove Camshaft

(a) Remove flywheel at governor end of engine. Turn off fuel and remove fuel pipe to pump and injector at this end of engine, also governor speeder spring. Slacken off valve rocker assembly and remove push rods.
(b) Remove cover (opposite end to governor) and collar, or in 12/2 and 16/2 engines remove fuel pump and cover and the pin securing fuel pump cam, and remove cam.
(c) Undo nuts securing camshaft end cover and remove complete with fuel pump. Remove crankcase door.
(d) Unscrew camshaft centre bearing locating pin in twin cylinder engines. Withdraw camshaft and governor weights complete. Remove tappets as camshaft passes underneath.

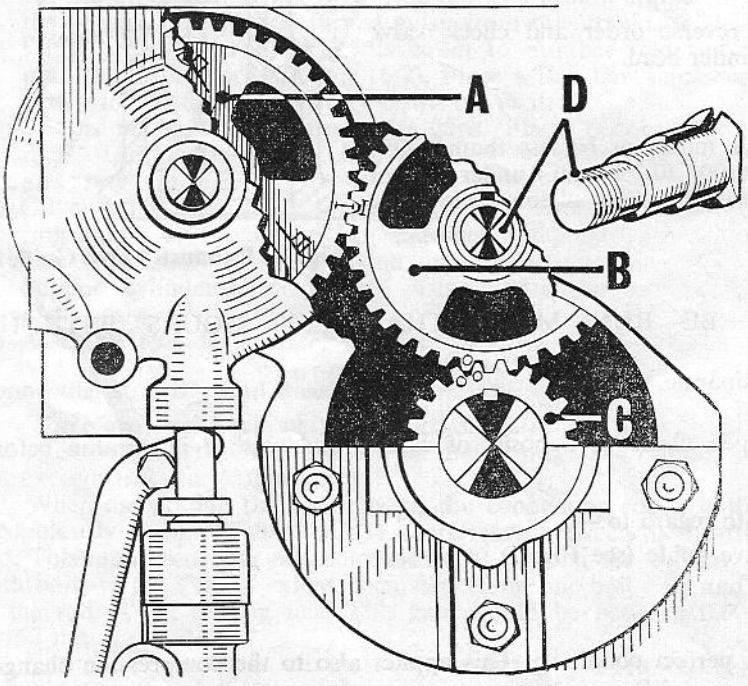
Assemble in reverse order, replacing tappets first. These may be held in position with thick grease.

Note: The idler pinion spindle has an oil groove which MUST be fitted at the top for lubrication of the bearing.

To Time Camshaft

When reassembling, the timing marks " I " and " O " **must** be matched as illustrated.

Note.—Care must be taken to ensure crank arm does not hit idler pinion spindle when turning the crankshaft to match the timing marks.



A—Camshaft Gearwheel

B—Idler Gear

C—Crankshaft Pinion

D—Idler gear spindle

Fig. 8. Camshaft Timing

To Remove Crankshaft

On single cylinder engines the crankshaft may, if desired. be removed without first drawing piston and connecting rod.

(a) Disconnect big end bearings and push piston up to top of cylinder.

(b) Remove flywheels and remove lubricating oil pump discharge pipes on 6/1 and 8/1 engines.

(c) Clean crankshaft ends thoroughly before drawing off main bearings. Undo nuts securing main bearing housings and withdraw, allowing crankshaft to rest on sides of crankcase.
In drawing off the main bearings, a certain amount of stiffness may be encountered from the oil thrower rings.

(d) Remove idler pinion. Remove crankshaft.

On twin cylinder engines the cylinder blocks, connecting rods and centre main bearing bolts have to be removed before removing the crankshaft.

To Refit Crankshaft

(a) Place crankshaft in crankcase. Fit main bearing housing at governor end, without oil thrower ring. Lift housing on to top stud and apply a nut finger tight.

(b) Fit main bearing housing at opposite end, also without oil thrower ring. Fit and tighten nuts on this bearing.

(c) Remove bearing housing at governor end, and camshaft end cover, to bring timing marks into view.

(d) Set in the manner illustrated and fit idler pinion (see Note page 16). Replace main bearing housing and camshaft end cover.

(e) Tighten bearing housing nuts. Crankshaft must turn freely by hand. Fit oil thrower rings.

(f) 12/2 and 16/2. Fit crankshaft centre bearing and tighten nuts; crankshaft must still turn freely by hand.

The crankshaft end play should be adjusted to 0.005″/0.010″ (0.127 mm./0.254 mm.) when fitting the flywheels.

Lubricating Oil Pump

This requires very little attention, but ball valves, seats and plunger must be renewed when worn, for efficient operation.

12/2 and 16/2 Engines.—It may be necessary to prime the pump after a major overhaul or renewal of lubricating oil. Unscrew pressure gauge or plug and pour oil into the pump discharge; replace pressure gauge or plug.

FUEL EQUIPMENT

To Prime Fuel System

Prime the fuel system by removing ALL air:—

(i) With fuel tank filled, prime filter by unscrewing vent screws on top of fuel filter until all air is released and oil flows freely. Retighten vent screws.

(ii) Vent fuel pipe at fuel pump. Turn engine as for starting, i.e. 3 to 20 turns until injector "creaks", and then attempt to start the engine. If the engine fails to start a more detailed method of priming must be used as follows:—

(a) With cut-off hand lever in "STOP" position disconnect fuel injection pipe from delivery valve holder on fuel pump by unscrewing union.

(b) Remove delivery valve holder and spring and with the fingers slightly raise delivery valve from its seating. As soon as this is done fuel should appear. Hold delivery valve off its seat until all air bubbles are out of the system and a solid column of fuel appears.

(c) Replace delivery valve holder and spring and tighten down holder firmly but not too vigorously.

(d) Connect fuel injection pipe again to fuel pump and loosen at injector union.

(e) Repeat for second cylinder of 12/2 and 16/2 engines.

(f) Place cut-off hand lever in "START" position (i.e. down).

(g) Engage starting handle and turn engine by hand until oil flows freely from injector unions.

(h) Tighten unions and continue turning until Injectors "creak" or a distinct "buzz" is felt in injector pipe.

Fuel Pump
To Time Injection

(a) Bring piston to T.D.C. compression stroke, that is with both valves closed, and swing cut-off lever downwards.

(b) Disconnect fuel injection pipe from delivery valve holder and remove delivery valve holder, delivery valve and spring. Fuel will flow from the pump.

(c) Turn flywheel a few degrees forwards until flow of fuel stops. Replace delivery valve holder (without valve and spring) and tighten lightly.

(d) Turn flywheel slowly backwards until fuel recommences to flow, then turn in direction of normal rotation until fuel flow ceases. Blow fuel from top of delivery valve holder to make sure that it has definitely stopped.

At this position the mark on the flywheel rim which indicates injection should be immediately opposite the centre line of the cylinder block.

The timing mark is 20° before TDC, or $4\frac{1}{8}$" (104.77 mm.) on the rim of a $23\frac{5}{8}$" (60 cms.) diam. flywheel and $4\frac{3}{8}$" (111.125 mm.) on the rim of a 25" (63.5 cm.) diam. flywheel for all engines except 16/2 which is 26° before TDC or $5\frac{1}{4}$" (133.35 mm.) on rim of $23\frac{5}{8}$" (60 cms.) diam. flywheel.

(e) If not, adjust the tappet underneath the pump until this condition is satisfied. Raise tappet to advance injection, lower tappet to retard.

(f) Replace delivery valve and spring after washing in clean fuel oil.

(g) Reconnect fuel injector pipe.

Repeat the process for second cylinder of 12/2 and 16/2 engines.

Fuel Pump Fault Location

FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
Pump does not deliver fuel.	1. Fuel tank empty.	
	2. Fuel inlet pipe choked or filter element dirty.	
	3. Air lock in pipe line.	Partly unscrew vent plug and turn engine until fuel flows freely, without any air bubbles.
	4. Delivery valve remains suspended.	Remove and examine valve face and guide, as well as seating face. If either is damaged, the pair should be replaced.
The pump does not deliver fuel uniformly.	5. Supply of fuel to pumps insufficient. (a) Inlet pipe choked or filter element dirty. (b) The "head" between the tank and the pump is too small.	Increase the "head".
	6. Air lock in pump shown by air bubbles issuing when the delivery valve holder has been unscrewed.	Proceed as at 3.
	7. Delivery valve spring broken.	Replace.
	8. Delivery valve damaged either on face or guide.	Fit new pair (i.e., new valve and seating complete).
Pump delivers insufficient fuel.	9. Delivery valve leaky.	Fit new pair (i.e., valve and seating).
	10. Leaky joints in the pressure system.	Clean joint faces and tighten down.

To Adjust Fuel Pump Linkage (12/2 & 16/2 Engine)

Fuel pumps are calibrated as indicated by two centre punch marks on the fuel pump rack. When these are equally disposed about the rack facings on the pump body, the pump is delivering fuel corresponding to full power. The procedure for adjustment is as follows:—

1. Ensure that both injectors are working satisfactorily.
2. Ensure that compression on both cylinders is satisfactory, if not engine should be decarbonised.
3. Remove split pin from joint pin and remove joint pin from upper governor connecting rod fork on right hand fuel pump, looking at engine from governor linkage side. Pull back governor connecting rod so that upper fork clears governor upper lever.
4. Loosen locknut on governor connecting rod and adjust fork by screwing up or down so that on re-assembly of governor fork onto upper lever and after insertion of joint pin, it is possible to lift cut-off hand lever to fullest extent, without straining linkage and further when in this position, by applying pressure to the end of the fuel pump rack, a slight movement is obtainable.
5. Re-assemble complete the upper fork as described under 3 reversed. Tighten locknut ensuring fork is free on governor lever.
6. Remove split pin, joint pin and fork from governor bottom lever and/or governor upper lever on left hand fuel pump and adjust either one or both of these as required, to obtain both pump racks in the same position in relation to pump bodies on both fuel pumps. This can be checked by setting the centre punch marks on the racks of the pumps equally for both pumps. When this has been achieved, it is important to observe that the governor rods, screwed ends, are into the forks by a distance not less than the diameter of the rods. This can be effected by screwing up or down the forks on the bottom and upper left hand levers equal amounts in opposite directions, without changing the relative pump rack positions. Re-assemble split pins and tighten up locknuts.
7. Start engine and put on full load. An approximate check that the cylinders are equally loaded can be found when engine is cold by starting it under load and by resting hands on cold exhaust manifolds, note which manifold warms up fastest and adjust pump racks accordingly. If engine speed falls off shorten governor links equally on both pumps half a turn at a time. Exhausts from both cylinders should remain clear, if not engine is running on overload and forks should be unscrewed equally on both pumps. **N.B.** — It is most important to ensure, with engine running on no load (and with racks set as above for full load), with engine running at correct speed, that there is still about $\frac{1}{4}$" free play on fuel pump racks, otherwise engine may 'race' at no load.

Fuel Injector

Examine the nozzle if trouble is suspected and clean if necessary. The use of absolutely clean fuel ensures the maximum of time with trouble free injectors. The injectors should be set to 90 atmospheres for 6/1, 8/1 & 12/2 engines and 150 atmospheres for 16/2 engines.

A faulty nozzle may result in one or more of the following:—

(a) Smoky exhaust (black)
(b) Loss of power
(c) Knocking in the cylinder
(d) Engine overheating
(e) Increased fuel consumption.

To test a nozzle, remove from cylinder head and reconnect to fuel injection pipe with nozzle exposed. Turn the engine until the nozzle sprays into the air away from the operator (the spray will easily penetrate the skin of the hands) when it will be seen if the spray is streaky or dribbling; a perfect spray is in the form of a fine mist.

The nozzle must only be cleaned with the necessary special tools and by a qualified service engineer.

Remove nozzle and valve, replace with a new pair and return the defective unit to a service depot for attention.

IMPORTANT

Apart from the attention given to the fuel pump delivery valve and the changing of defective injector nozzles and valves, ALL other work on the fuel injection system must be carried out by suitably equipped service depots.

INDEX TO PARTS LIST

IMPORTANT

SPARE PARTS—DIRECTIONS FOR ORDERING

1. Always quote the Engine No., Part No., and that part of the Description printed in bold type when ordering Spare Parts. The Engine No. will be found on the brass plate on the crankcase and stamped on the flywheel rim.

2. The engine components have been divided into convenient groups and illustrated. DO NOT quote illustration numbers when ordering.

3. The following sections are listed but not illustrated:— Fuel Tanks, Radiator, Silencer, Water Connections, Starting Handle.

4. Rotation is clockwise when looking at the engine with the exhaust on the left.

5. Reprocessed cylinder blocks with pistons and rings of 0.010″, 0.020″ or 0.040″ oversize are available for sale only in Great Britain provided worn cylinder blocks are returned in part exchange. Oversize pistons and rings are available only for cylinder blocks which have been reprocessed to an oversize. The use of oversize pistons and rings under any other circumstances is not recommended.

SPECIMEN ORDER FORM FOR SPARE PARTS

IMPORTANT — See Page 22

"SPARE PARTS — DIRECTIONS FOR ORDERING"

TO **FROM**

YOUR NORMAL SUPPLIER

ORDER No. ..... **DATE**.....

LISTER ENGINE SERIAL NUMBER **126122R10**

.....

Item No.	Description	Part No.	Quantity	Remarks
1	Inlet Valve Guide	010-03039	2	
2	Exhaust Valve Guide	010-03083	2	
3	Inlet and Exhaust Valve	010-03121	4	
4	Valve Stem Cap	010-03023	4	
5	Valve Rocker Bush	008-24165	4	

DESPATCH INSTRUCTIONS

SPARE PARTS LIST

See directions for ordering on Pages 22—23

PLATE 1—CAMSHAFT, GOVERNOR AND COVER—SINGLE CYLINDER ONLY

Illus. No.	Description of Part	Part No.	No. per Set 6/1	No. per Set 8/1	12/2 & 16/2
	AIR FILTER (Lister Felt Type)				
	Air Filter Complete	010-03139	1	1	1
	Felt Pad for Air Filter	010-03143	1	1	1
	Inlet Pipe for Air Filter (Tank Cooled)	008-03149	1	1	—
	Nipple for Air Filter (Rad. Cooled)	027-00245	1	1	1
	Elbow for Air Filter (Rad. Cooled)	027-00456	1	1	1
	Nipple for Air Filter (Tank Cooled)	027-00245	—	—	1
	Elbow for Air Filter (Tank Cooled)	027-00456	—	—	1
	AIR FILTER (Airmaze)				
	Airmaze Filter	027-02131	1	1	1
	Adaptor Pipe	008-03154	1	1	1
	1½″ B.S.P. **Elbow**	027-00456	1	1	1
	1½″ B.S.P. **Locknut**	027-01220	1	1	—
	1½″ **Plain Nipple** (6/1 and 8/1 Tank Cooled only and 12/2)	027-00245	1	1	1
	1½″ x 6″ **Pipe,** screwed both ends (6/1 and 8/1 Radiator Cooled only)	027-01319	1	1	—
	CAMSHAFT				
	Camshaft, complete	574-10870	1	—	
	Camshaft, complete	574-10880	—	1	
1	**Camshaft**	003-00151	1	1	
2	**Cam** for **Fuel Pump**	008-02124/001	1	1	
3	**Cam** for **Exhaust Valve**	003-00192	1	1	
4	**Cam** for **Inlet Valve**	003-00191	1	1	
5	**Governor Gearwheel**	003-00166	1	1	
6	Governor **Weight**	003-00167	2	—	
	Governor **Weight**	008-06106	—	2	
7	Governor Weight **Spindle**	003-00168	2	2	
8	Governor Weight Spindle **Split Pin**	027-00909	4	4	
9	Governor **Sleeve Assembly**	008-24227	1	1	
10	**Collar**	008-06054	1	1	
11	**Taper Pin No. 6** 1½″ for Cams	027-00367	4	4	
12	**Taper Pin** No. 6 1¾″ for Gear Wheel	027-00130	1	1	
	CAMSHAFT END COVER				
13	**Camshaft End Cover with Bush** 8-6-2	574-10090	1	1	
14	Camshaft End Cover **Bush**	008-06002	1	1	
15	Camshaft End Cover **Joint**	008-30172	1	1	
16	Camshaft End Cover **Nut,** ⅜″ Whit.	027-00006	3	3	
17	Camshaft End Cover **Oil Seal**	008-02177	1	1	
18	**Governor Inside Lever** (with Roller 3-172 & Pin 3-173)	574-10430	1	1	
19	Governor Inside Lever **Spindle**	008-06076	1	1	
20	Governor Inside Lever Spindle **Taper Pin**	027-00132	2	2	
21	Governor **Bottom Lever**	008-06078	1	1	
22	Governor Bottom Lever **Bush**	008-06077	1	1	

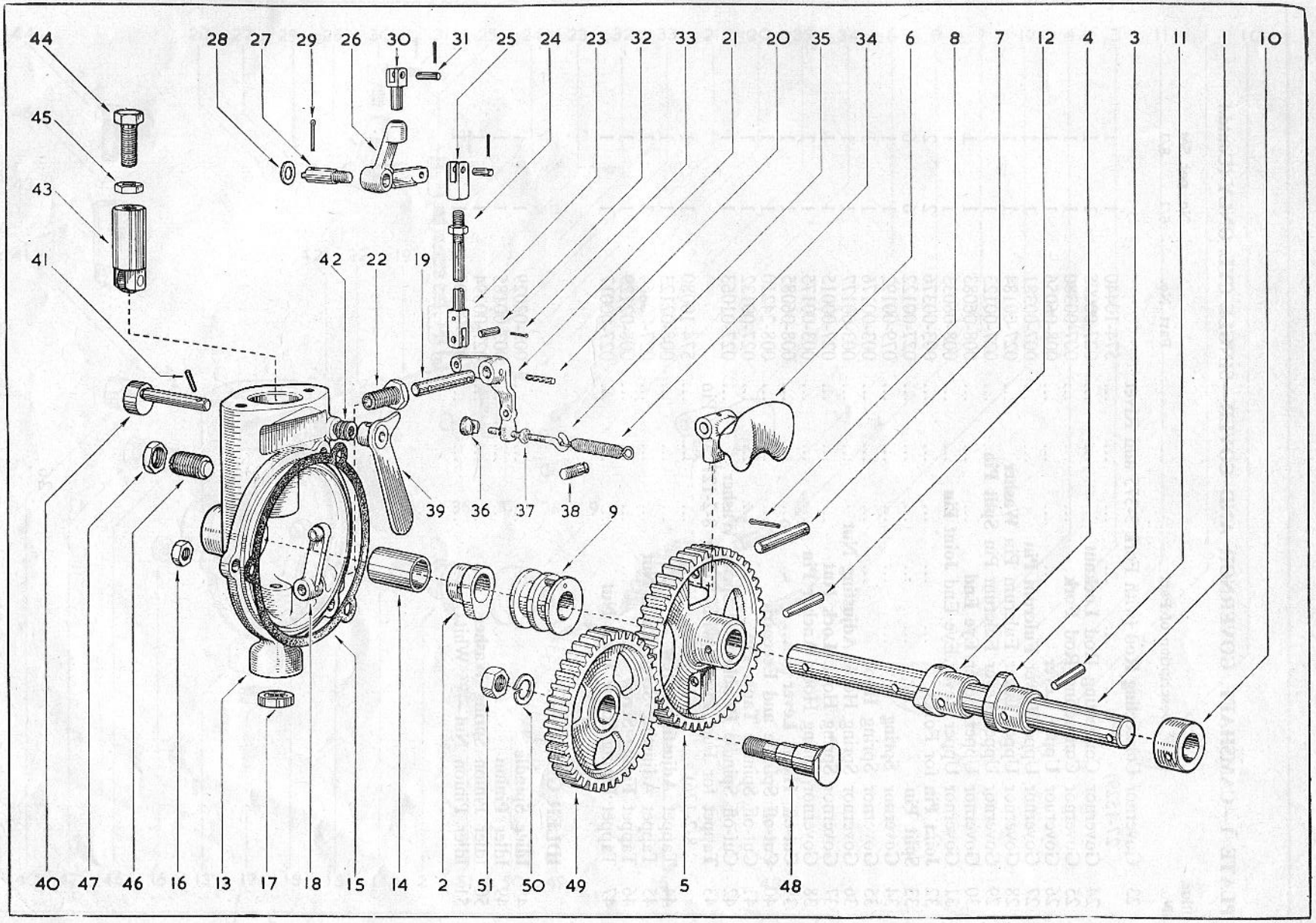


PLATE 1

CAMSHAFT, GOVERNOR AND COVER—SINGLE CYLINDER ONLY

PLATE 1—CAMSHAFT, GOVERNOR AND COVER—SINGLE CYL. ONLY (Contd.)

Illus. No.	Description of Part	Part No.	No. per Set 6/1	8/1
23	Governor **Connecting Rod** (with Fork 3-375 and Rivet 27-1529)	574-10440	1	1
24	Governor Connecting Rod **Locknut**	027-00008	1	1
25	Governor Connecting Rod **Fork**	007-00380	1	1
26	Governor **Upper Lever**	008-06056	1	1
27	Governor Upper Lever **Fulcrum Pin**	007-00381	1	1
28	Governor Upper Lever Fulcrum Pin **Washer**	027-00184	1	1
29	Governor Upper Lever Fulcrum Pin **Split Pin**	027-00123	1	1
30	Governor Upper Lever **Eye End**	008-06083	1	1
31	Governor Upper Lever Eye End **Joint Pin**	008-06033	1	1
32	**Joint Pin** for Forks	003-00376	2	2
33	**Split Pin**	027-00122	6	6
34	**Governor Spring**	079-00192	1	1
35	Governor Spring **Hook**	003-00176	1	1
36	Governor Spring Hook **Adjusting Nut**	003-00177	1	1
37	Governor Spring Hook **Lock Nut**	027-00015	1	1
38	Governor Spring Hook **Anchor Pin**	003-00175	1	1
39	**Cut-off Hand Lever**	008-06085	1	1
40	**Cut-off Spindle and Eccentric**	008-24210	1	1
41	Cut-off Spindle **Taper Pin**	027-00132	1	1
42	Cut-off Spindle **Double Coil Spring Washer**	027-01063	1	1
43	**Tappet** for Fuel Pump (with Roller 8-2-127 and Pin 8-2-126)	574-10080	1	1
44	Tappet **Adjusting Screw**	008-02123	1	1
45	Tappet Adjusting Screw **Lock Nut**	027-00864	1	1
46	Tappet **Fixing Screw**	008-02129	1	1
47	Tappet Fixing Screw **Lock Nut**	027-00017	1	1
	IDLER GEAR			
48	**Idler Spindle**	008-02029	1	1
49	Idler **Pinion**	003-00185	1	1
50	Idler Pinion **Spring Washer**	027-00394	1	1
51	Idler Pinion **Nut**—$\frac{1}{2}$" Whit.	027-00004	1	1

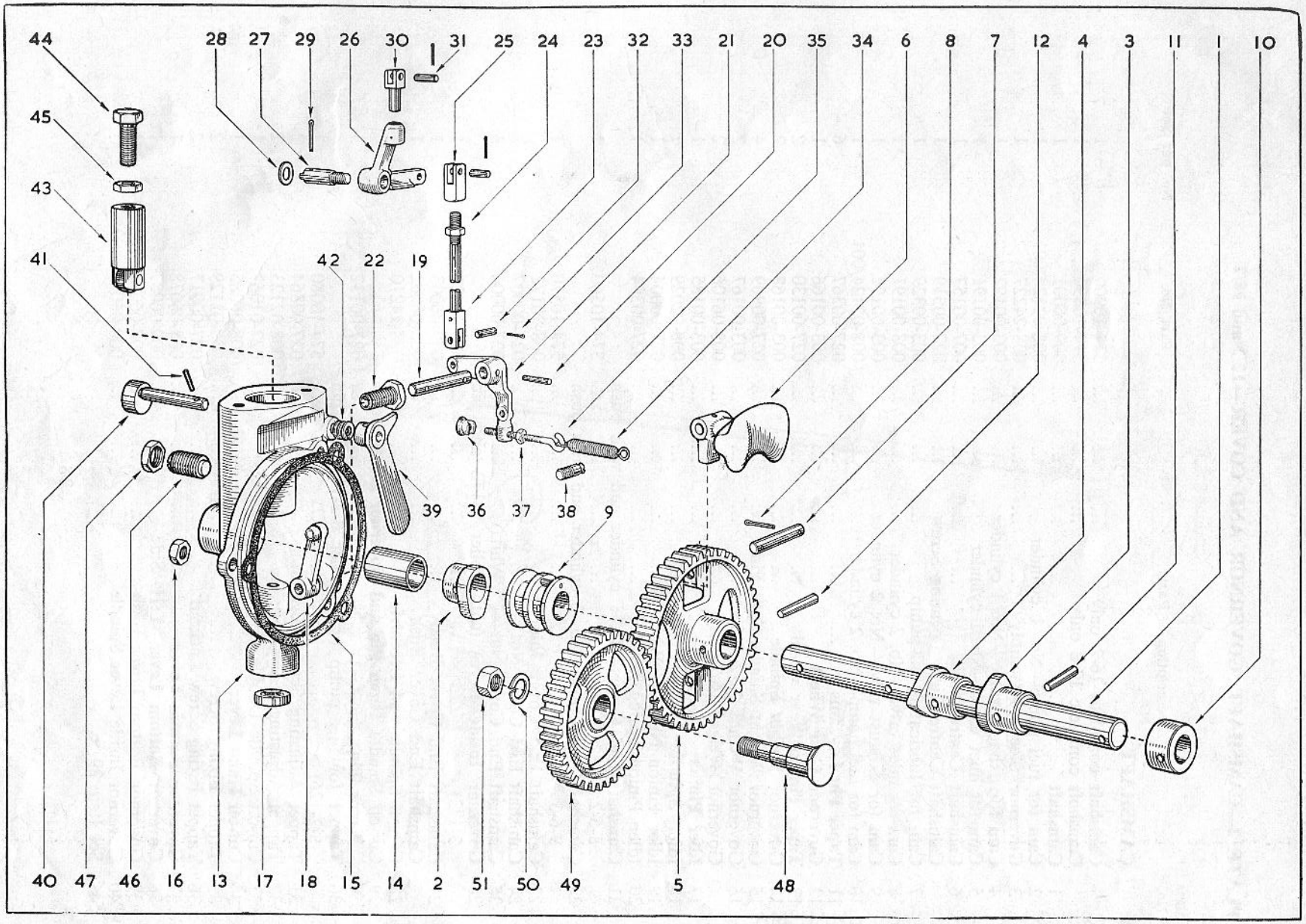


PLATE 1

CAMSHAFT, GOVERNOR AND COVER—SINGLE CYLINDER ONLY

PLATE 2—CAMSHAFT, GOVERNOR AND COVER—12/2 and 16/2

Illus. No.	Description of Part	Part No.	No. per Set
	CAMSHAFT		
	Camshaft complete 16-2 only	574-10900	1
	Camshaft complete 12-2 only	574-10890	1
1	**Camshaft**	009-06001	1
2	**Cam** for fuel pump—No. 1 cylinder	008-02124/001	1
3	**Governor Sleeve Assembly**	008-24227	1
4	**Cam** for exhaust valve—No. 1 cylinder	003-00192	1
5	**Cam** for inlet valve—No. 1 cylinder	003-00191	1
6	**Camshaft Centre Bush**	007-00157	1
	Camshaft Centre Bush **Locating Screw**	027-00519	1
7	**Cam** for lubricating oil pump	003-00329	1
8	**Cam** for inlet valve—No. 2 cylinder	003-00191	1
9	**Cam** for exhaust valve—No. 2 cylinder	003-00192	1
10	**Cam** for fuel pump—No. 2 cylinder	008-02124/001	1
11	**Taper Pin** for cams	027-00367	6
12	**Governor Gear Wheel**	003-00166	1
13	**Taper Pin** for gear wheel	027-00130	2
14	Governor **Weight Spindle**	003-00168	2
15	Governor Weight Spindle **Split Pin**	027-00909	4
16	Governor **Weight** 12-2 only	003-00167	2
	Governor **Weight** 16-2 only	008-06106	2
17	**Idler Pinion**	003-00185	1
18	Idler **Spindle**	008-02029	1
19	Idler Pinion **Nut**—$\frac{1}{2}$" Whit.	027-00004	1
20	Idler Pinion **Spring Washer**	027-00394	1
21	**Camshaft End Cover**—No. 1 cylinder end with bush 8-6-2	574-10560	1
22	Camshaft End Cover—No. 2 cylinder end with bush 9-6-3	574-10570	1
23	Camshaft End Cover **Joint**	008-30172	2
24	Camshaft End Cover **Nut**	027-00007	3
25	Camshaft End Cover Nut—$\frac{3}{8}$" Whit.	027-00006	3
26	**Governor Inside Lever** (with roller 3-172 and pin 3-173)	574-10430	1
27	Camshaft End Cover **Bush**	009-06003	1
	Camshaft End Cover Bush	008-06002	1
28	**Cut-off Spindle and Eccentric**	008-24210	1
29	Cut-off Spindle **Taper Pin and Governor Inside Lever Taper Pin**	027-00132	3
30	**Tappet** for fuel pump (with roller 8-2-127 and pin 8-2-126)	574-10080	2
31	Tappet Adjusting Screw **Locknut**	027-00864	2
32	Tappet Adjusting **Screw**	008-02123	2
33	Cut-off Spindle Double Coil **Spring Washer** ...	027-01063	1
34	**Cut-off Hand Lever**	008-06085	1
35	Tappet Fixing **Screw**	008-02129	2
36	Tappet Fixing Screw **Locknut**	027-00017	2
37	**Governor Bottom Lever**	008-06078	1
38	**Governor Bottom Lever**—L.H. Side	009-06087	1
39	Governor Bottom Lever **Bush**	008-06077	1
40	Governor Inside Lever **Spindle**	008-06076	1
41	See Item 29		

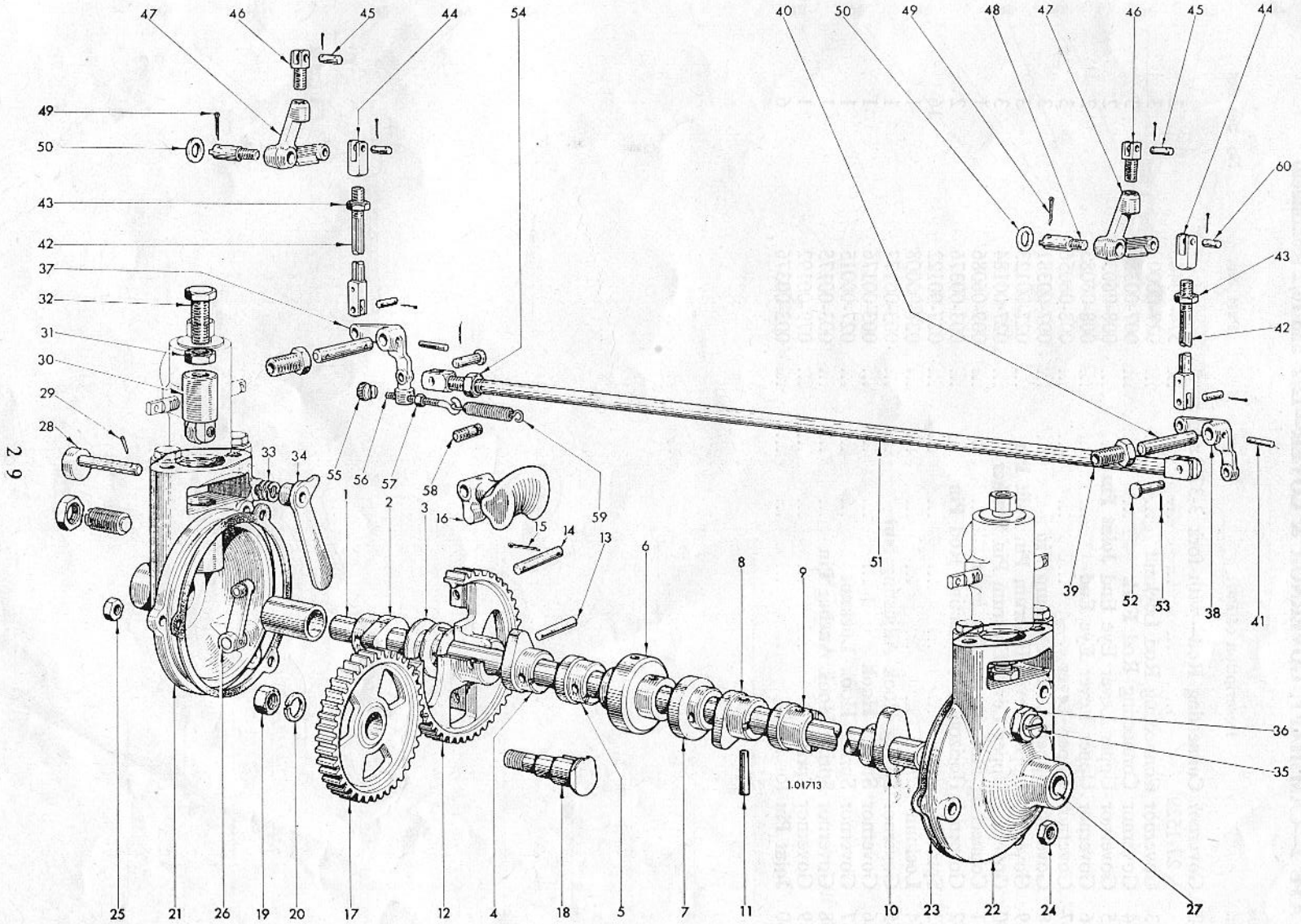


PLATE 2

CAMSHAFT, GOVERNOR & COVER—12/2 and 16/2

PLATE 2—CAMSHAFT, GOVERNOR & COVER—12/2 and 16/2 (continued)

Illus. No.	Description of Part	Part No.	No. per Set
42	**Governor Connecting Rod**—with fork 3-375 and rivet 27-1529	574-10440	2
43	Governor Connecting Rod **Locknut**	027-00008	3
44	Governor Connecting Rod **Fork**	007-00380	3
45	Governor Upper Lever Eye End **Joint Pin** ...	008-06033	2
46	Governor Upper Lever **Eye End**	008-06083	2
47	Governor Upper **Lever**	008-06056	3
48	Governor Upper Lever **Fulcrum Pin**	007-00381	3
49	Governor Upper Lever Fulcrum Pin **Split Pin** ...	027-00123	3
50	Governor Upper Lever Fulcrum Pin **Washer** ...	027-00184	3
51	**Connecting Rod** for bottom lever	009-06086	1
52	Governor Horizontal Connecting Rod **Pin**	003-00376	2
53	**Split Pin**	027-00122	16
54	**Locknut**	027-00008	1
55	Governor Spring Hook Adjusting **Nut**	003-00177	1
56	Governor **Spring Hook**	003-00176	1
57	Governor Spring Hook **Locknut**	027-00015	1
58	Governor Spring Hook **Anchor Pin**	003-00175	1
59	Governor **Spring**	079-00192	1
60	**Joint Pin** for Forks	003-00376	6

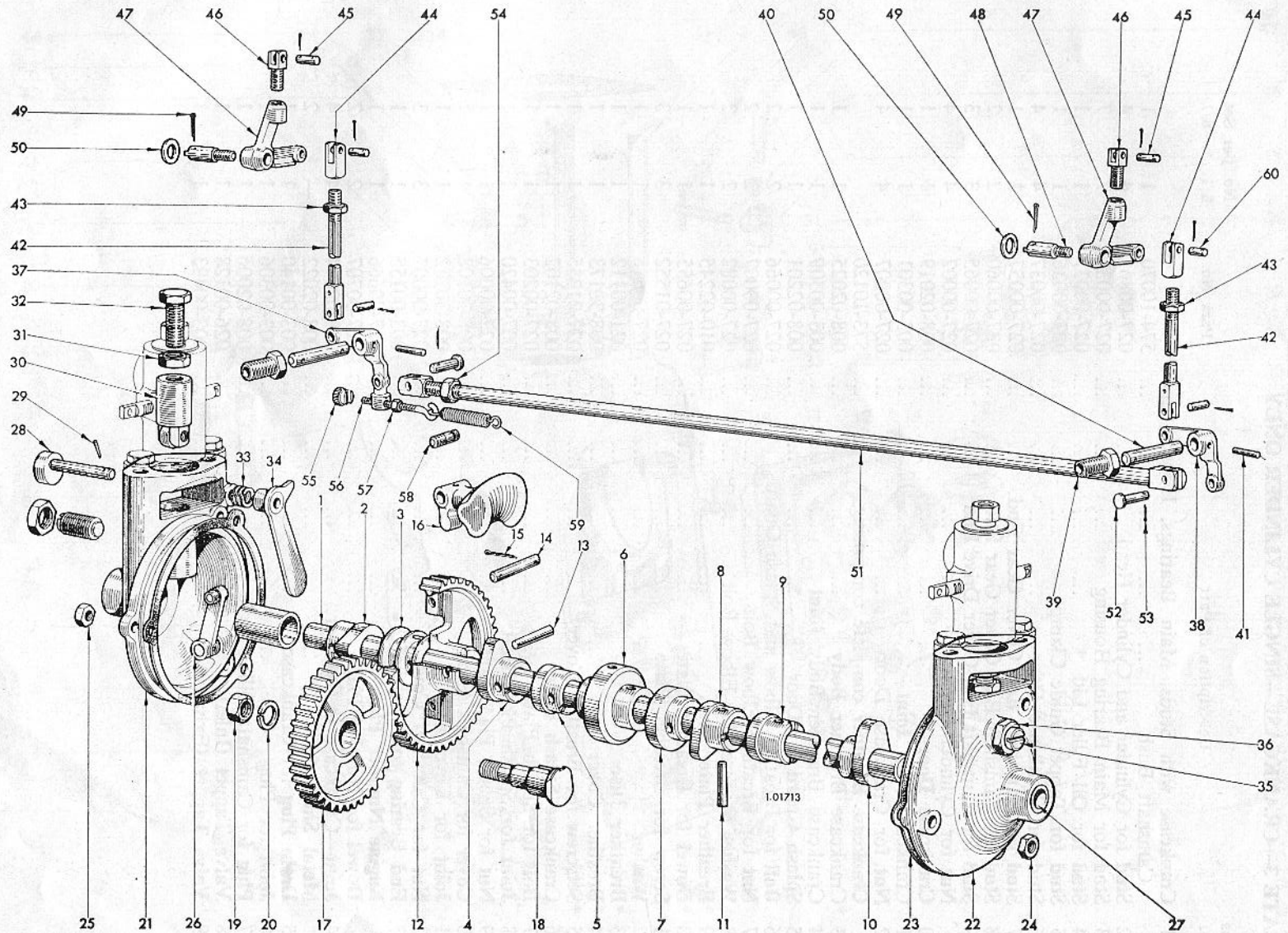


PLATE 2

CAMSHAFT, GOVERNOR & COVER—12/2 and 16/2

PLATE 3—CRANKCASE—SINGLE CYLINDER ONLY

Illus. No.	Description of Part	Part No.	No. per Set 6/1	8/1
1	**Crankcase** with Studs, Main Bearings, Housing and Camshaft Bush	574-10070	1	1
2	**Stud** for Cylinder and Cylinder Head	027-00861	4	4
3	**Stud** for Main Bearing Housing	027-00035	7	7
4	**Stud** for Oil Filler Lid	027-00037	1	1
5	**Stud** for Tappet Guide Clamp	027-00036	1	1
6	**Stud** for Crankcase Door	027-00037	4	4
7	**Stud** for Camshaft End Cover Gear End	027-00057	1	1
8	**Stud** for Camshaft End Cover Gear End	027-00060	2	2
9	**Stud** for Camshaft End Cover Drive End	027-00065	3	3
	Nut for Cylinder Head	027-00002	4	4
10	**Crankcase Door**	008-02019	1	1
11	Crankcase Door **Joint**	003-00301	1	1
12	**Nut** for Crankcase Door	027-00007	4	4
	Crankcase Breather complete comprising * ...	573-10120		
13	*Crankcase Breather **Body**	008-02025	1	1
14	Crankcase Breather Body **Joint**	003-00309	1	1
15	**Splash Guard** for Door	008-02201	1	1
16	**Bolt** for Breather Elbow and Splash Guard ...	027-00066	2	2
17	**Nut** for Breather Elbow Bolt	027-00007	2	2
18	**Washer** for Breather Elbow Bolt	027-00082	2	2
19	***Breather Plate**	010-02245	1	1
20	***Dowel** for Breather Plate	027-00655	1	1
21	**Screw** for Breather Plate	027-01552	3	3
22	**Washer**	027-00618	1	1
23	***Breather Disc**	021-00112	1	1
24	*Breather **Cover**	008-30173	1	1
25	***Setscrew** for Breather Cover	027-01285	1	1
26	**Crankcase Splash Plate**	008-02102	1	1
27	**Bolt** for Splash Plate	027-00203	1	1
28	**Joint** for Splash Plate Bolt	007-00420	1	1
29	**Nut** for Splash Plate Bolt	027-00006	1	1
30	**Cover** for Camshaft End	008-30108	1	1
31	**Joint** for Cover	008-30172	1	1
32	**Nut** for Camshaft Cover	027-00007	3	3
33	**End Bearing** for Camshaft	003-00155	1	1
	Engine Number Plate	027-00666	1	1
	Dowel for Number Plate	027-00707	2	2
34	**Joint**—Crankcase to Cylinder	008-02094	4	4
	Metal Shim .015"	008-02022	—	2
35	**Drain Plug** for Crankcase	003-00140	1	1
36	**Joint** for Plug	003-00306	1	1
37	**Plug** for Camshaft Oiling Hole	008-02006	1	1
38	**Valve Tappet** (Inlet)	026-00128	1	1
39	**Valve Tappet** (Exhaust)	003-00493	1	1

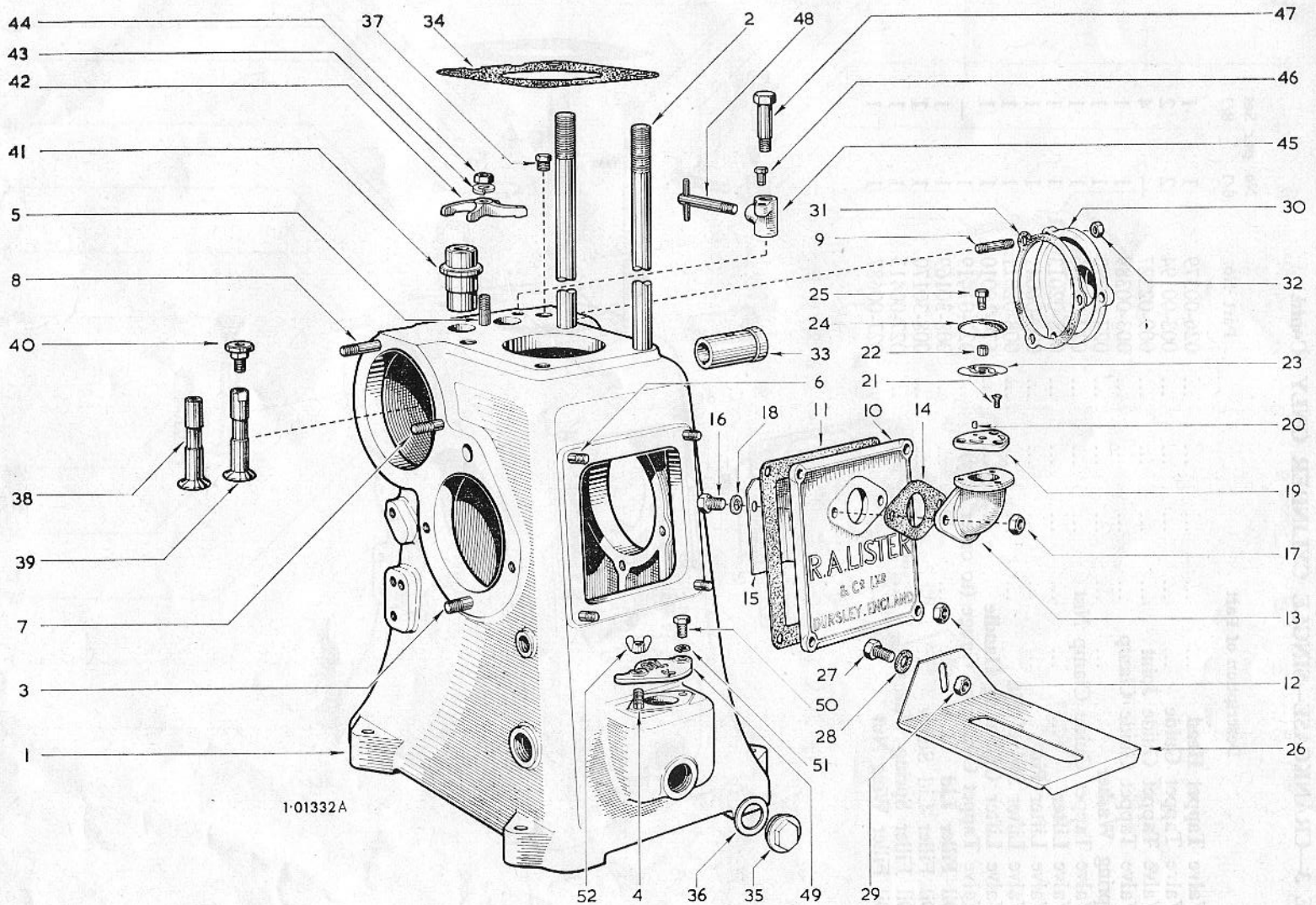


PLATE 3

CRANKCASE—SINGLE CYLINDERS ONLY

PLATE 3—CRANKCASE—SINGLE CYLINDER ONLY (Contd.)

Illus. No.	Description of Part	Part No.	No. per Set 6/1	8/1
40	**Valve Tappet Head**	026-00379	1	1
41	Valve Tappet **Guide**	003-00194	2	2
	Valve Tappet Guide **Joint**	009-02227	—	4
42	Valve Tappet Guide **Clamp**	003-00389	1	1
43	Spring **Washer**	027-00393	1	1
44	Valve Tappet Guide Clamp **Nut**	027-00006	1	1
45	Valve **Lifter**	008-02013/001	1	1
46	Valve Lifter **Pin**	008-06041	1	1
47	Valve Lifter **Swivel Pin**	008-02011	1	1
48	Valve Lifter **Operating Handle**	574-10010	1	1
	Valve **Tappet Clearance Gauge** (to order only) ...	027-01419	1	—
49	**Oil Filler Lid**	008-30169	1	1
50	Oil Filler Lid **Screw**	008-30170	1	1
51	Oil Filler **Spring Washer**	027-00413	1	1
52	Oil Filler **Wing Nut**	027-00687	1	1

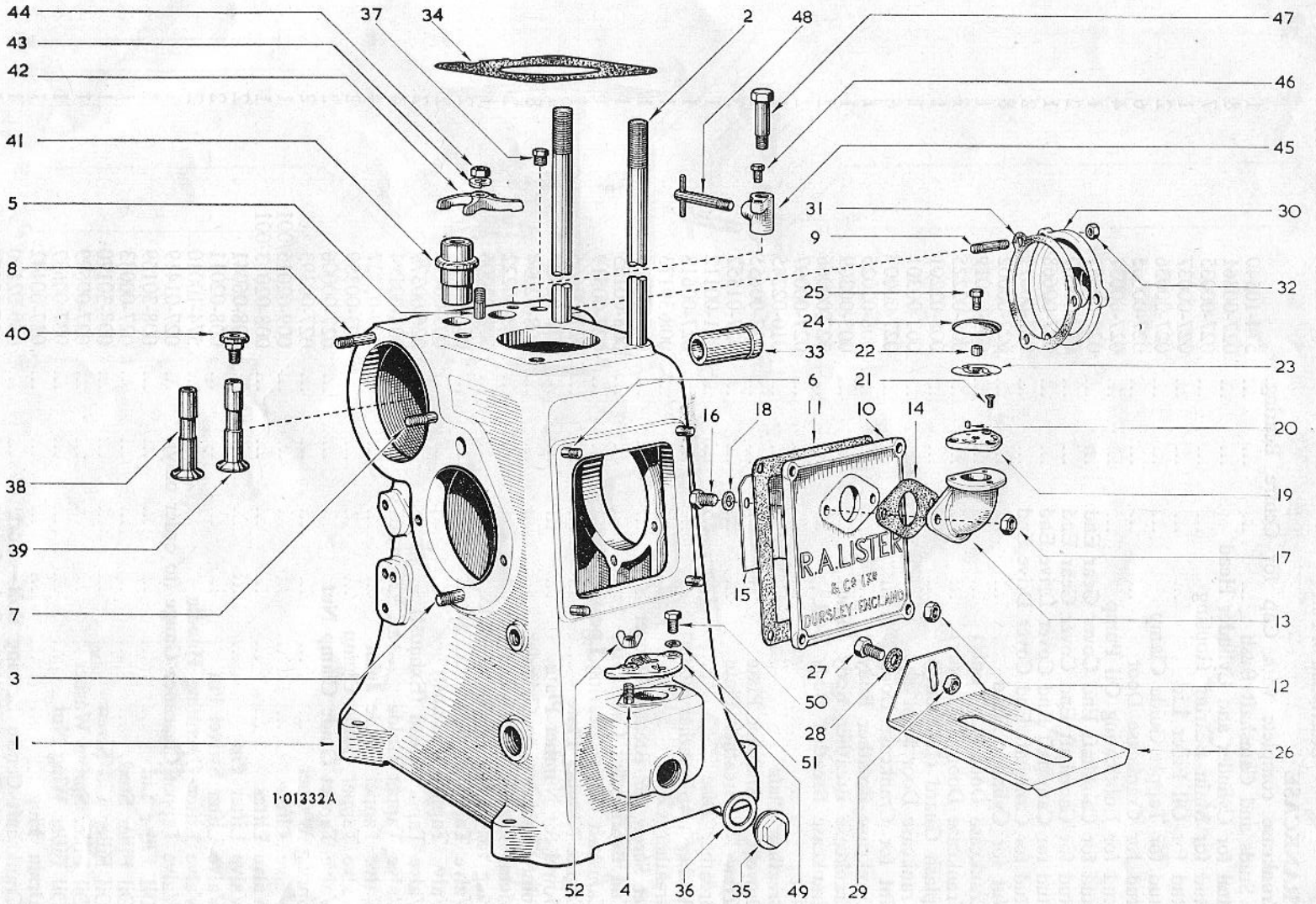


PLATE 3

CRANKCASE—SINGLE CYLINDERS ONLY

PLATE 4—CRANKCASE—12/2 and 16/2

Illus. No.	Description of Part	Part No.	No. per Set
	CRANKCASE		
1	**Crankcase** complete with Cap for Centre Bearing, Studs and Camshaft Bush	574-10540	1
2	**Stud** for Cylinder and Cylinder Head	027-00861	8
3	Stud for Main Bearing Housing	027-00035	7
4	Stud for Oil Filler Lid	027-00037	1
5	Stud for Tappet Guide Clamp	027-00036	2
6	Stud for Crankcase Door	027-00065	6
	Stud for Lubricating Oil Pump	027-00037	4
7	Stud for Camshaft End Cover Gear End	027-00057	1
8	Stud for Camshaft End Cover Gear End	027-00060	2
	Stud for Camshaft End Cover Drive End	027-00668	1
	Stud for Camshaft End Cover Drive End	027-00071	2
	Nut for Cylinder Head	027-00002	8
9	**Crankcase Door** (12/2 only)	009-02019	1
	Crankcase Door (16/2 only)	009-02225	1
	Splash Guard (16/2 only)	008-02201	1
10	Crankcase Door **Joint**	007-00301	1
11	**Nut** for Crankcase Door	027-00007	6
12	Crankcase **Breather Body**	008-02025	1
13	Crankcase Breather Body **Joint**	003-00309	1
14	Crankcase Breather Body **Bolt**	027-00066	2
	Nut	027-00007	2
15	**Breather Plate**	010-02245	1
16	**Dowel** for Breather Plate	027-00655	1
17	**Screw** for Breather Plate	027-01552	3
18	Breather **Disc**	021-00112	1
19	**Washer** for Breather Plate	027-00618	1
20	Breather **Cover**	008-30173	1
21	**Set Screw** for Breather Cover	027-01285	1
22	**End Bearing** for Camshaft	003-00155	1
	Camshaft Centre Bearing **Locating Pin**	027-00519	1
	Engine Number Plate	027-00666	1
	Dowel for Number Plate	027-00707	2
23	**Joint** Crankcase to Cylinder	008-02094	8
	Metal Shim .015″ (16/2 only)	008-00222	2
24	**Plug** for Camshaft Oiling Hole	008-02006	1
25	**Valve Tappet** (Inlet)	026-00128	2
26	Valve Tappet (Exhaust)	003-00493	2
27	Valve Tappet **Head** (Exhaust)	026-00379	2
28	Valve Tappet **Guide**	003-00194	4
	Valve Tappet Guide **Joint**	009-02227	4
29	Valve Tappet Guide **Clamp**	003-00389	2
30	Valve Tappet Guide Clamp **Nut**	027-00006	2
30A	Spring Washer	027-00393	2
31	Valve **Lifter**	009-02015/001	1
—	**Valve Lifter**	008-02013/001	1
32	Valve Lifter **Pin**	008-06041	2
33	Valve Lifter **Swivel Pin**	008-02011	2
34	Valve Lifter **Operating Handle**	574-10010	2
	Valve Tappet **Clearance Gauge** (to order only) ...	027-01419	1
35	**Oil Filler Lid**	008-30169	1
	Oil Filler **Stud**	027-00033	1
36	Oil Filler Lid **Screw**	008-30170	1
37	Oil Filler **Spring Washer**	027-00699	1
38	Oil Filler **Wing Nut**	027-00687	1
39	**Drain Plug**	027-00142	1
41	Crankshaft Centre Bearing **Bolt**—short	009-02180	1
42	Crankshaft Centre Bearing Bolt—long	009-02179	1
43	Crankshaft Centre Bearing **Nut**	027-01316	2
44	Crankshaft Centre Bearing **Split Pin**	027-01363	2

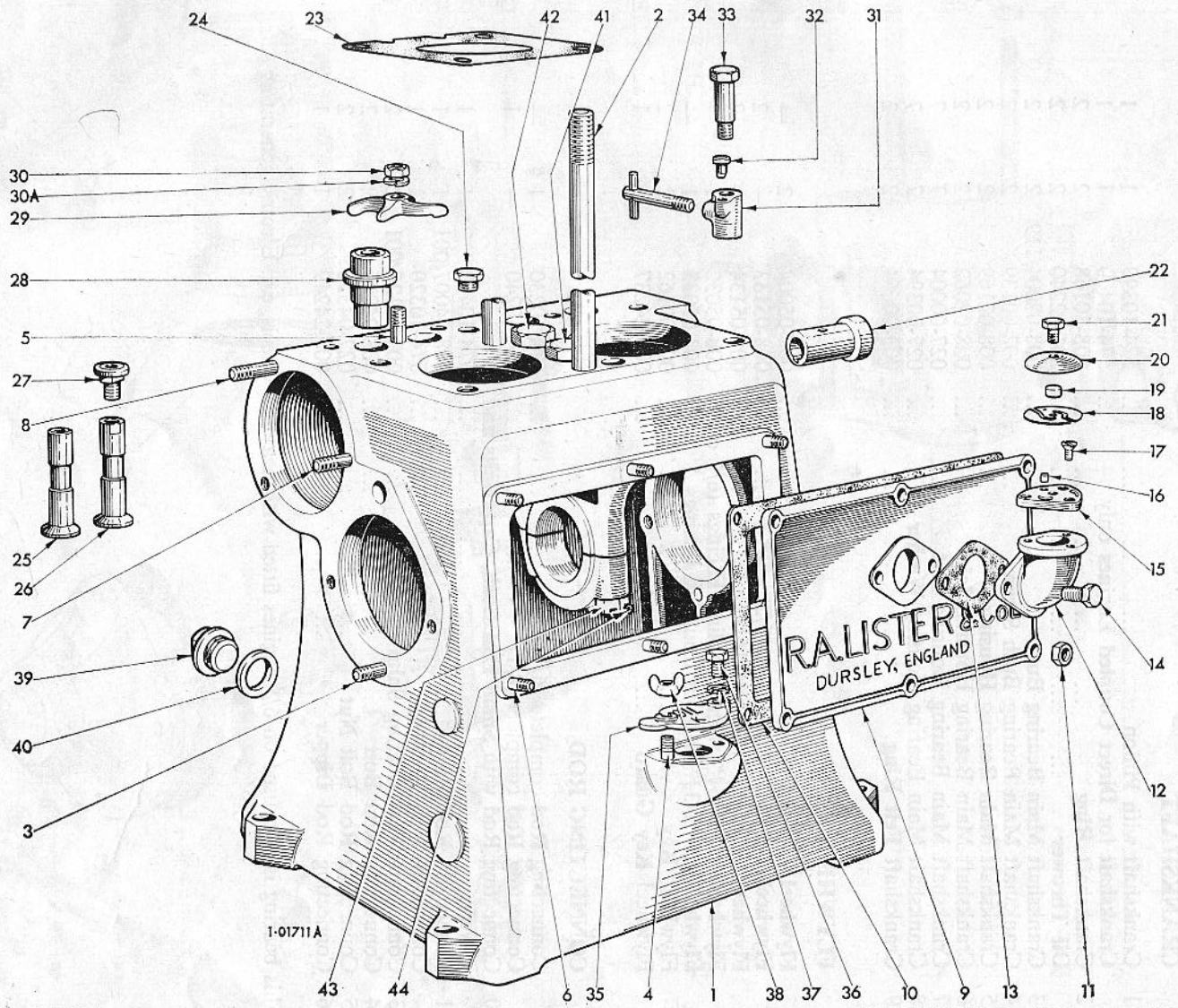


PLATE 4

CRANKCASE—12/2 and 16/2

PLATE 5—CRANKSHAFT, CONNECTING ROD, PISTON AND CYLINDER

Illus. No.	Description of Part	Part No.	No. per Set 6/1	8/1
	CRANKSHAFT			
1	**Crankshaft** with Pinion	574-10390	1	1
	Crankshaft for **Direct Coupled Engines** only	574-10400	1	1
2	Crankshaft **Ring**	008-30168	2	2
	Oil Thrower	201-12240	2	2
3	Crankshaft **Main Bearing Bush**	008-02004/119	2	2
4	Crankshaft Main Bearing Bush **Screw**	002-00129	2	2
5	Crankshaft **Main Bearing Housing**	008-02169	2	2
6	Crankshaft Main Bearing Housing **Joint**	008-02062	2	2
7	Crankshaft Main Bearing Housing **Nut**	027-00004	7	7
8	Crankshaft Main Bearing Housing **Washer**	027-00394	7	7
9	Crankshaft **Felt Ring**	003-00664	2	2
	FLYWHEEL			
	Flywheel $23\frac{5}{8}$″ x $3\frac{1}{2}$″	008-05004	2	—
	Flywheel $23\frac{5}{8}$″ x $3\frac{1}{2}$″ (8/1 and 16/2)	008-05133	—	2
	Flywheel 23″ x $3\frac{1}{2}$″ (8/1 and 16/2)	008-05134	—	2
	Flywheel 25″ x $3\frac{3}{4}$″ with Coupling Facings (6/1 only)	008-05032	1	—
	Flywheel 25″ x $3\frac{3}{4}$″ without Coupling Facings	008-05033	1	—
	Flywheel **Key**	004-00162	2	2
	Flywheel **Key Guard**	008-24237	1	1
	CONNECTING ROD			
	Connecting Rod complete (6/1)	574-10230	1	—
	Connecting Rod complete (8/1)	574-10240	—	1
10	Connecting Rod with **Small End Bush, Cap, Bolts and Nuts**	574-10460	1	1
11	Connecting Rod **Bush**	008-04007/001	1	1
	*Connecting Rod **Bearing**	574-10320	1	1
13	Connecting Rod Bearing **Shim**	003-00125/001	2	2
14	Connecting Rod **Bolt**	008-04006	2	2
15	Connecting Rod Bolt **Nut**	027-04356	2	2
16	Connecting Rod **Dipper**	008-24249	1	1

*This bearing is also used on 6/1 engines fitted with heavy flywheels, e.g. Electric generating sets.

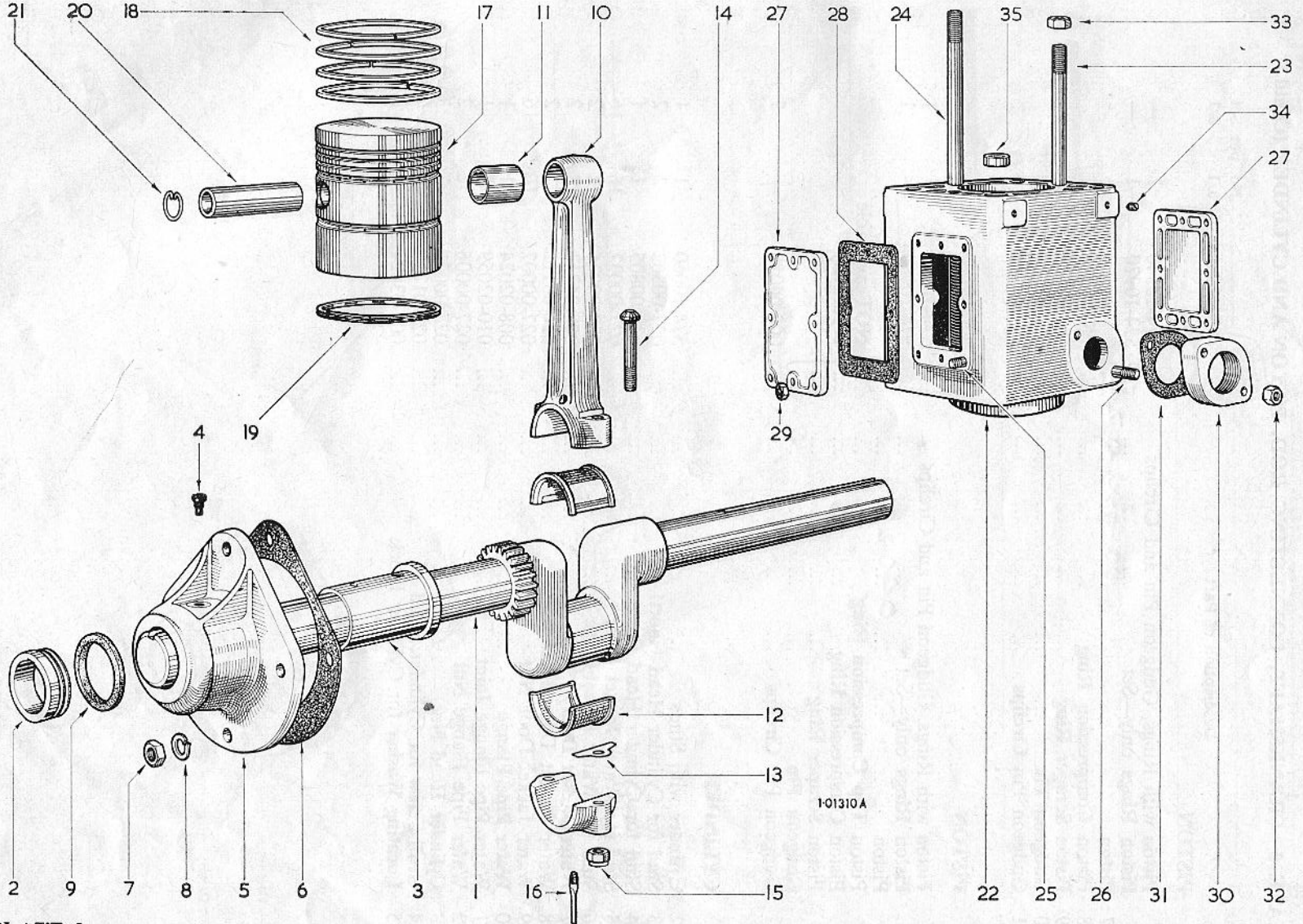


PLATE 5

CRANKSHAFT, CONNECTING ROD, PISTON & CYLINDER

PLATE 5—CRANKSHAFT, CONNECTING ROD, PISTON AND CYLINDER (Contd.)

Illus. No.	Description of Part	Part No.	No. per Set 6/1	8/1
	PISTON			
	Piston with Rings, Gudgeon Pin and Circlips ...	574-10340	1	—
	Piston Rings only—Set	574-10970	1	—
17	**Piston**	NOT available separately		
18	Piston **Compression Ring**			
19	Piston **Scraper Ring**			
20	**Gudgeon Pin**			
21	Gudgeon Pin **Circlips**	008-04010	2	—
	PISTON			
	Piston with Rings, Gudgeon Pin and Circlips ...	574-10350	—	1
	Piston Rings only—Set	574-10980	—	1
	Piston	NOT available separately		
	Piston **Top Compression Ring**			
	Piston **Compression Ring**			
	Piston **Scraper Ring**			
	Gudgeon Pin			
	Gudgeon Pin **Circlips**	008-04010	—	2
	CYLINDER			
22	**Cylinder** with Studs	574-10060	1	1
23	**Stud** for Cylinder Head (short)	027-00862	2	2
24	**Stud** for Cylinder Head (long)	027-00805	1	1
25	**Stud** for Water Jacket Door	027-00037	16	16
26	**Stud** for Water Pipe Flange	027-00036	2	2
27	**Water Jacket Door**	008-24213	2	2
28	Water Jacket Door **Joint**	026-00112	2	2
29	Water Jacket Door **Nut**	027-00007	16	16
30	**Water Pipe Flange**	008-02024	1	1
31	Water Pipe Flange **Joint**	010-02059	1	1
32	Water Pipe Flange **Nut**	027-00006	2	2
33	**Cylinder Head Nut**	027-00026	3	3
34	**Grub Screw** for Cylinder Head	027-01730	4	4
35	**Locating Washer** for Cylinder Block	008-03024/001	2	2

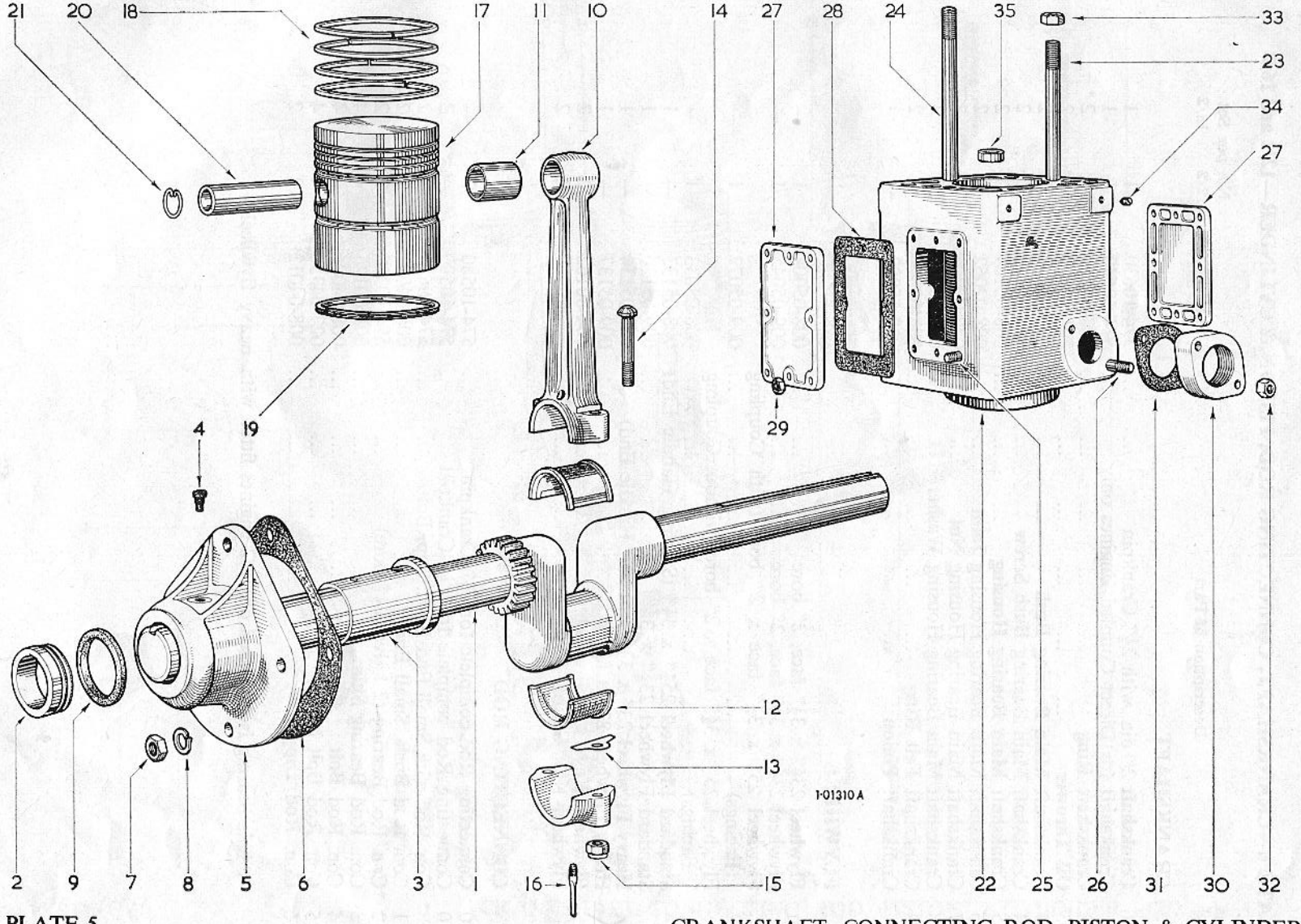


PLATE 5

CRANKSHAFT, CONNECTING ROD, PISTON & CYLINDER

PLATE 6—CRANKSHAFT, CONNECTING ROD, PISTON & CYLINDER—12/2 and 16/2

Illus. No.	Description of Part	Part No.	No. per Set 12/2	16/2
	CRANKSHAFT			
1	**Crankshaft** 2″ dia. with 2½″ Crankpin	574-10630	1	1
	Crankshaft for Direct Coupled Engines only	574-10640	1	1
2	**Crankshaft Ring**	003-30168	2	2
	Oil Thrower	201-12240	2	2
3	Crankshaft **Main Bearing Bush**	008-02004/019	2	2
4	Crankshaft Main Bearing Bush **Screw**	002-00129	2	2
5	Crankshaft Main Bearing **Housing**	008-02169	2	2
6	Crankshaft Main Bearing Housing **Joint**	008-02062	2	2
7	Crankshaft Main Bearing Housing **Nut**	027-00004	7	7
8	Crankshaft Main Bearing Housing **Washer**	027-00394	7	7
9	Crankshaft **Felt Ring**	003-00664	2	2
	Crankshaft **Pinion**	008-05002	—	1
	FLYWHEEL			
	Flywheel 23⅝″ x 3½″ face, 2″ bore	008-05004	1	—
	Flywheel 23⅝″ x 3½″ face, 2″ bore	009-05045	1	—
	Flywheel 25″ x 3¾″ face x 2″ bore (with Coupling Facings)	009-05072	1	—
	Flywheel 25″ x 3¾″ face x 2″ bore (without Coupling Facings)	008-05033	1	—
	Standard Flywheel 25⅝″ x 3½″ (Starting Handle End)	008-05133	—	1
	Standard Flywheel 23⅝″ x 3½″	009-05136	—	1
	Heavy Flywheel 23″ x 3½″ (Starting Handle End)	008-05134	—	1
	Heavy Flywheel 23″ x 3½″	009-05137	—	1
	Flywheel **Key**	004-00162	2	2
	Flywheel Key **Guard**	008-05010	2	2
	CONNECTING ROD			
10	**Connecting Rod** complete for 2½″ Crankpin	574-10580	2	—
10	Connecting Rod complete for 2½″ Crankpin	574-10590	—	2
	Con. Rod with Small End Bush, Cap, Bolts	574-10650	2	2
11	Con. Rod **Bush,** Small End	008-04007/001	2	2
12	*Con. Rod Bearing (2 halves 2½″ bore)	574-10320	2	2
13	Con. Rod Bearing **Shim**	003-00125/001	4	4
14	Con. Rod **Bolt**	008-04006	4	4
15	Con. Rod Bolt **Nut**	027-04356	4	4
16	Con. Rod **Dipper**	008-04012	2	2

*This bearing is also used on 12/2 engines fitted with heavy flywheels.

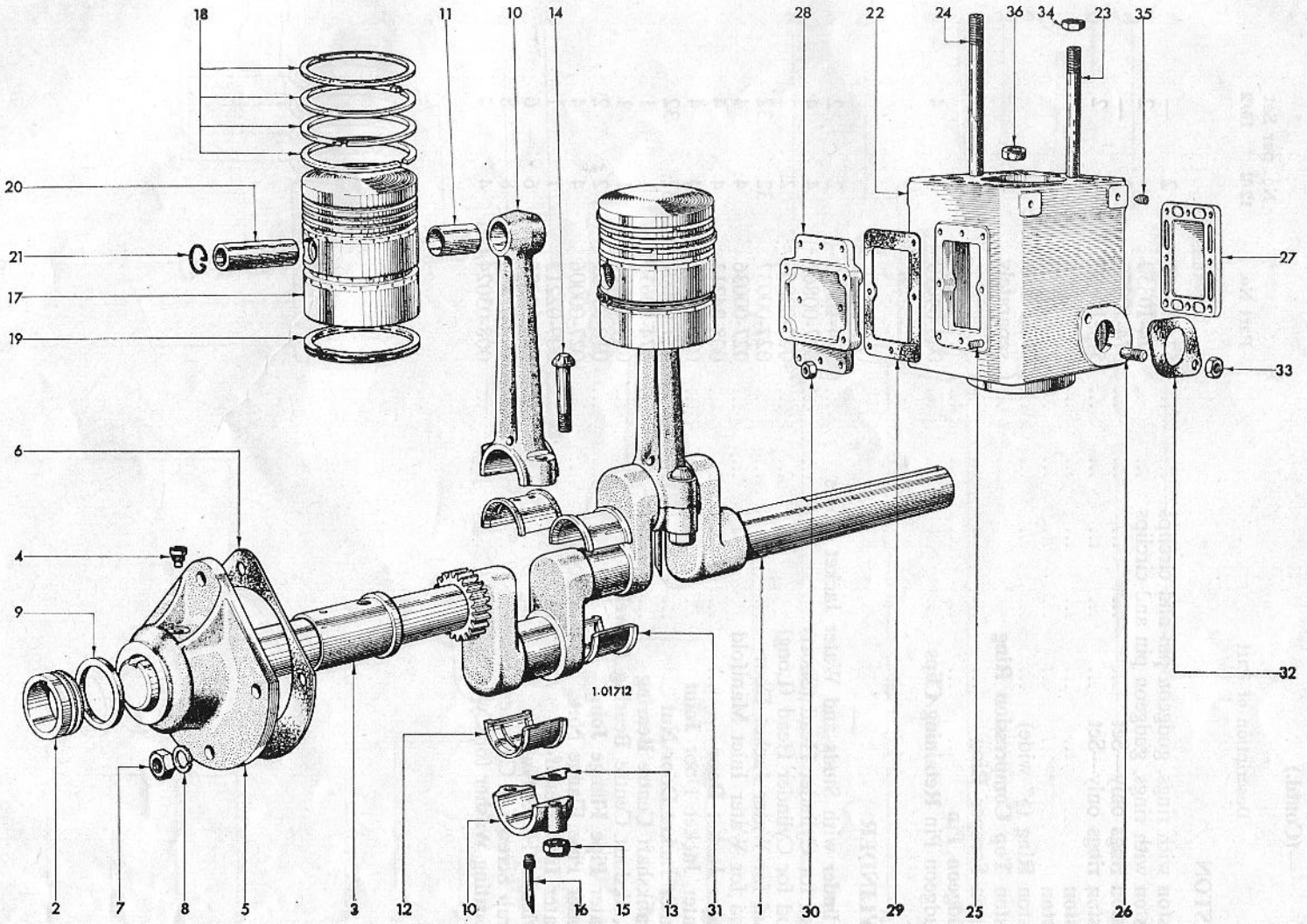


PLATE 6

CRANKSHAFT, CONNECTING ROD, PISTON & CYLINDER—12/2 and 16/2

PLATE 6—CRANKSHAFT, CONNECTING ROD, PISTON & CYLINDER—12/2 and 16/2 —(Contd.)

Illus. No.	Description of Part	Part No.	No. per Set 12/2	16/2
	PISTON			
—	**Piston** with rings, gudgeon pin and circlips	574-10340	2	—
—	**Piston** with rings, gudgeon pin and circlips	574-10350	—	2
	Piston rings only—Set	574-10970	2	—
	Piston rings only—Set	574-10980	—	2
17	**Piston**	NOT available separately		
	Piston			
18	Piston **Ring** ($\frac{1}{8}$" wide)			
	Piston **Top Compression Ring**			
19	Piston **Scraper Ring**			
20	**Gudgeon Pin**			
21	Gudgeon Pin **Retaining Clips**	008-04010	4	4
	CYLINDER			
22	**Cylinder** with Studs and Water Jacket Doors ...	574-10060	2	2
23	**Stud** for Cylinder Head (Short)	027-00862	4	4
24	Stud for Cylinder Head (Long)	027-00805	2	2
25	**Stud** for Water Jacket Door	027-00037	32	32
26	Stud for Water Inlet Manifold	027-00036	4	4
27	Water Jacket **Door**	008-24213	4	4
29	Water Jacket Door **Joint**	026-00112	4	4
30	Water Jacket Door **Nut**	027-00007	32	32
31	Crankshaft **Centre Bearing**	574-10610	1	1
	Crankshaft Centre Bearing **Dowel**	027-00032:	1	1
32	Water **Pipe Flange Joint**	010-02059	2	2
33	Water Pipe Flange **Nut**	027-00006	4	4
	Water **Inlet Manifold**	009-02213	1	1
34	Cylinder Head **Nut**	027-00026	6	6
35	**Grub Screw** for Cylinder Head	027-01730	8	8
36	**Locating Washer** for Cylinder Block	008-03024/001	4	4

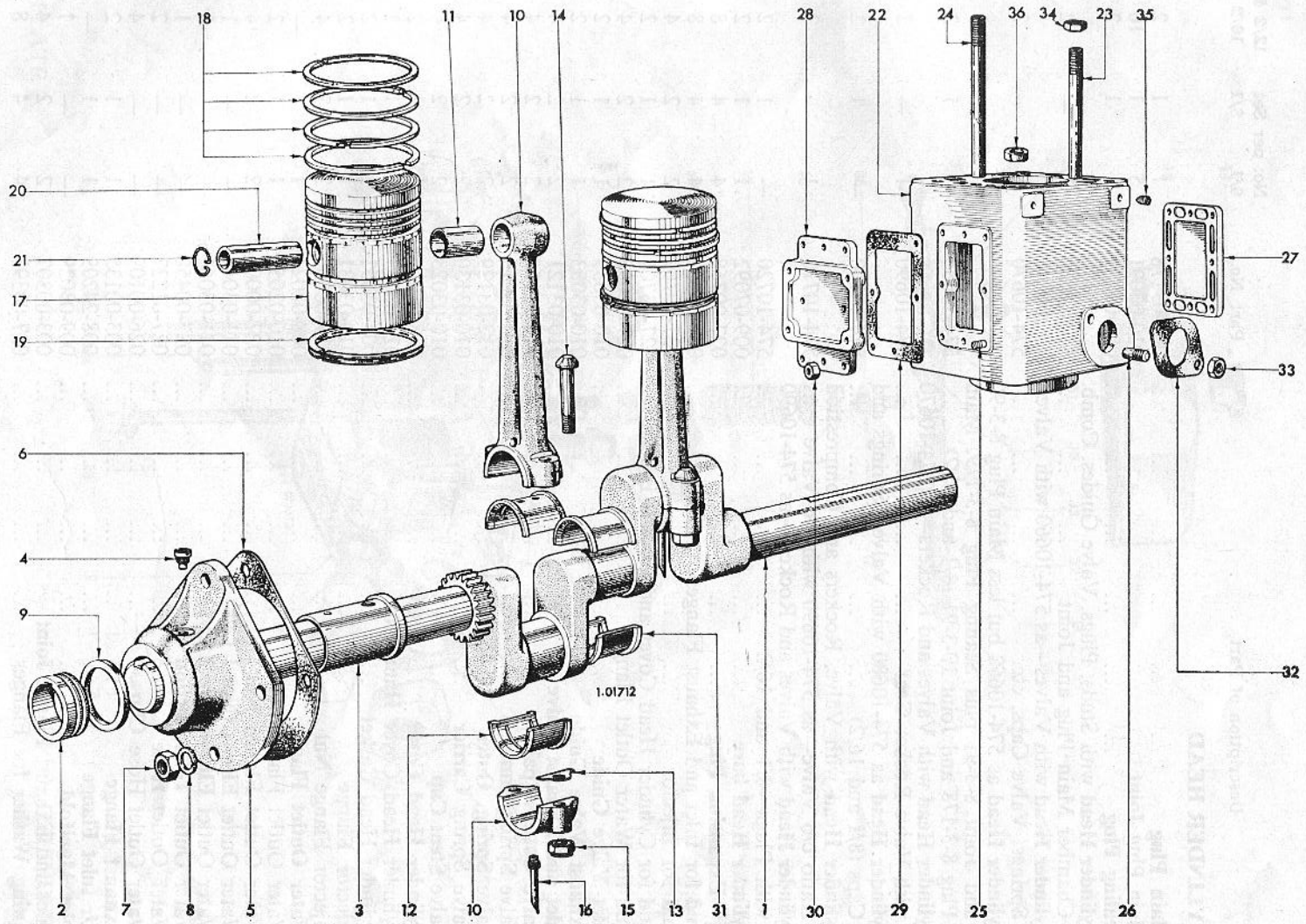


PLATE 6 CRANKSHAFT, CONNECTING ROD, PISTON & CYLINDER—12/2 and 16/2

PLATE 7—CYLINDER HEAD

Illus. No.	Description of Part	Part No.	No. per Set 6/1	8/1	12/2 & 16/2
	CYLINDER HEAD				
1	**Main Plug**	008-03178	1	1	2
2	Main Plug **Joint**	010-03091	5	1	10
3	**Sealing Plug**	008-03179	1	1	2
	***Cylinder Head** with Studs, Plugs, Valve Guides, Comb. Chamber Main Plug and Joint	574-10660	1	—	2
	***Cylinder Head** with Valves—as 574-10660 with Valves, Springs, Valve Caps, etc.	574-10670	1	—	2
	Cylinder Head as 574-10660 but less Main Plug 8-3-90 and Joint 8-3-91 plus Sealing Plug 8-3-179, Main Plug 8-3-178 and Joint 10-3-91 (8/1 and 16/2)	574-10680	—	1	2
	***Cylinder Head** with Valves and Rockers—as 574-10670 with Valve Rocker Gear	574-10690	1	—	2
	Cylinder Head as 574-10680 with Valves, Springs and Caps (8/1 and 16/2)	574-10700	—	1	2
	***Cylinder Head** with Valve, Rockers and Compression Ratio c/o Valve—as 574-10690 with c/o Valve	574-10710	1	—	2
	Cylinder Head with Valves and Rockers—as 574-10690 with Plugs—8/1 and 16/2	574-10720	—	1	2
4	**Cylinder Head bare**	009-07092	1	1	2
5	**1¼" Expansion Plug**	027-00768	4	4	8
6	**Stud** for Inlet and Exhaust Flanges	027-00220	4	4	8
7	**Stud** for Injector	027-00769	2	2	4
8	**Stud** for Cylinder Head Cover and Rocker Bracket	027-03701	1	1	2
9	**Stud** for Water Outlet Flange	027-00036	2	2	4
10	**Inlet Valve Guide**	010-03039	1	1	2
11	**Exhaust Valve Guide**	010-03083	1	1	2
12	**Inlet and Exhaust Valve**	010-03121	2	2	4
13	**Valve Cotters** (pairs)	010-03025	2	2	4
14	Valve **Spring, Inner**	012-03219	2	2	4
15	Valve **Spring, Outer**	012-03129	2	2	4
16	Valve Spring **Carrier**	010-03130	2	2	4
17	Valve **Stem Cap**	010-03023	2	2	4
18	**Cylinder Head Cover**	008-03026/001	1	1	2
19	Cylinder Head Cover **Hand Nut**	026-00081	1	1	2
20	Cylinder Head **Gasket**	008-03051	1	1	2
21	**Injector Flange**	010-03031	1	1	2
22	Injector Flange **Nut**	027-00005	2	2	4
23	**Water Outlet Flange**	008-02024	1	1	—
24	Water Outlet Flange **Joint**	010-02059	1	1	2
25	Water Outlet Flange **Nut**	027-00006	2	2	4
	Water Outlet **Elbow** (No. 1 Cyl.)	011-03042	—	—	1
	Water Outlet **Elbow** (No. 2 Cyl.)	011-03063	—	—	1
	Water Outlet **T-Connection**	027-00458	—	—	1
	Water Outlet **Hose**	027-01227	—	—	2
	Water Outlet Hose **Clip**	026-00109	—	—	4
	Exhaust Flange	003-00135	1	1	2
26	**Air Inlet Flange**	008-24209	1	1	—
	Inlet Manifold	009-03029	—	—	1
27	Inlet and Exhaust Flange **Joint**	003-00307	2	2	4
28	**Spring Washer** for Flanges	027-00393	4	4	8

*6/1 and 12/2 Engines only.

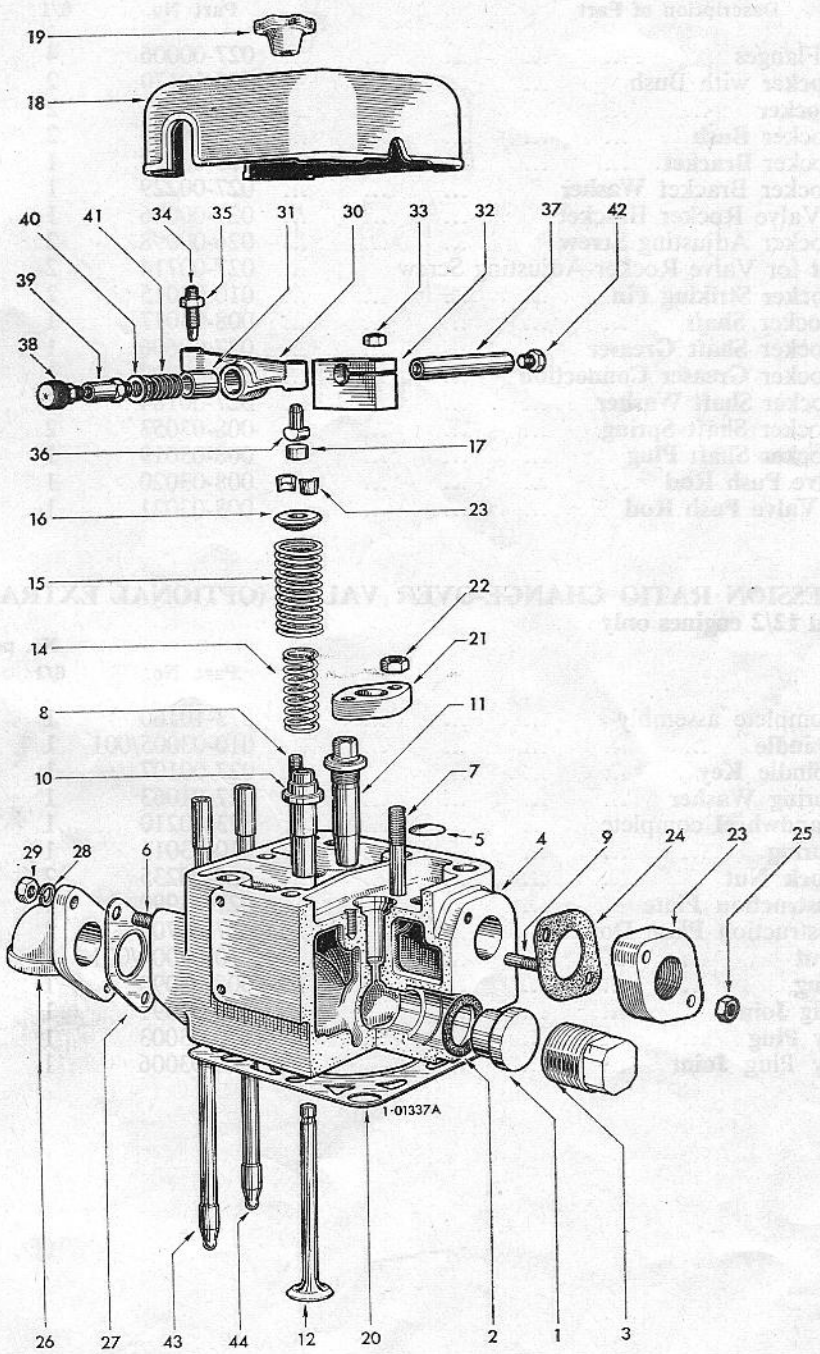


PLATE 7

CYLINDER HEAD

PLATE 7—CYLINDER HEAD (Contd.)

Illus. No.	Description of Part	Part No.	No. per Set 6/1	8/1	12/2 & 16/2
29	**Nut** for Flanges	027-00006	4	4	8
	Valve Rocker with Bush	574-10170	2	2	4
30	**Valve Rocker**	008-03013	2	2	4
31	Valve Rocker **Bush**	008-24165	2	2	4
32	Valve Rocker **Bracket**	008-03018	1	1	2
	Valve Rocker Bracket **Washer**	027-00229	1	1	2
33	**Nut** for Valve Rocker Bracket	027-00006	1	1	2
34	Valve Rocker Adjusting **Screw**	026-00098	2	2	4
35	**Lock Nut** for Valve Rocker Adjusting Screw	027-00714	2	2	4
36	**Valve Rocker Striking Pin**	010-03015	2	2	4
37	Valve Rocker **Shaft**	008-03017	1	1	2
38	Valve Rocker **Shaft Greaser**	027-00606	1	1	2
39	Valve Rocker **Greaser Connection**	008-03022	1	1	2
40	Valve Rocker **Shaft Washer**	027-00184	2	2	4
41	Valve Rocker Shaft **Spring**	008-03053	2	2	4
42	Valve Rocker Shaft **Plug**	008-03019	1	1	2
43	**Inlet Valve Push Rod**	008-03020	1	1	2
44	**Exhaust Valve Push Rod**	008-03021	1	1	2

COMPRESSION RATIO CHANGE-OVER VALVE (OPTIONAL EXTRA)
6/1 and 12/2 engines only

	Part No.	No. per Set 6/1	12/2
Valve, complete assembly	573-10160	1	2
Valve **Spindle**	010-03005/001	1	2
Valve Spindle **Key**	027-00107	1	2
Valve **Spring Washer**	027-01063	1	2
Valve **Handwheel** complete	573-10210	1	2
Valve **Spring**	010-03011	1	2
Valve **Lock Nut**	027-00235	2	4
Valve **Instruction Plate**	027-03990	1	2
Valve Instruction Plate **Dowel**	027-00707	2	4
Valve **Nut**	010-03004/001	1	2
Main Plug	008-03090	1	2
Main Plug **Joint**	010-03091	1	2
Auxiliary Plug	010-03003	1	2
Auxiliary Plug **Joint**	010-03006	1	2

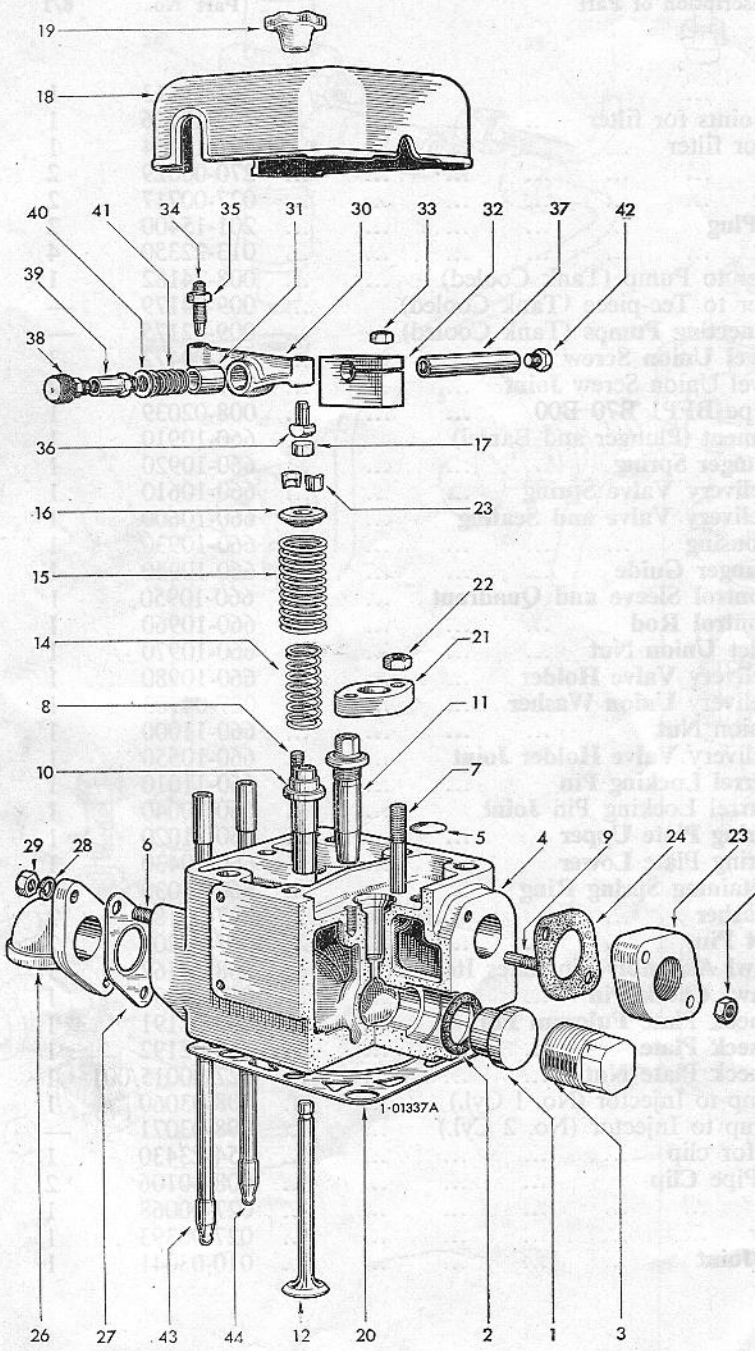


PLATE 7

CYLINDER HEAD

PLATE 8—FUEL SYSTEM

Illus. No.	Description of Part	Part No.	No. per Set 6/1	8/1	12/2 & 16/2
	FUEL PUMP				
1	**Fuel Filter**	201-11613	1	1	1
	Element and Joints for filter	201-13116	1	1	1
2	**Set of Joints** for filter	201-13114	1	1	1
3	**Setscrew**	270-00029	2	2	2
4	**Spring Washer**	027-00717	2	2	2
5	**Swivel Union Plug**	201-15400	2	2	2
6	**Joint**	013-22350	4	4	4
7	Fuel **Pipe** Filter to Pump (Tank Cooled)	008-24182	1	1	—
	Fuel Pipe Filter to Tee-piece (Tank Cooled)	009-24179	—	—	1
	Fuel Pipe **Connecting Pumps** (Tank Cooled)	009-02175	—	—	1
8	Fuel Pipe **Swivel Union Screw**	023-00472	3	3	4
9	Fuel Pipe Swivel Union Screw **Joint**	291-22650	2	2	4
10	**Fuel Pump** Type BFP1 B70 B00	008-02039	1	1	2
	Fuel Type **Element** (Plunger and Barrel)	660-10910	1	1	2
	Fuel Pump **Plunger Spring**	660-10920	1	1	2
	Fuel Pump **Delivery Valve Spring**	660-10610	1	1	2
	Fuel Pump **Delivery Valve and Seating**	660-10600	1	1	2
	Fuel Pump **Housing**	660-10930	1	1	2
	Fuel Pump **Plunger Guide**	660-10940	1	1	2
	Fuel Pump **Control Sleeve and Quadrant**	660-10950	1	1	2
	Fuel Pump **Control Rod**	660-10960	1	1	2
	Fuel Pump **Inlet Union Nut**	660-10970	1	1	2
	Fuel Pump **Delivery Valve Holder**	660-10980	1	1	2
	Fuel Pump Delivery **Union Washer**	027-04703	1	1	2
	Fuel Pump Union **Nut**	660-11000	1	1	2
	Fuel Pump Delivery **Valve Holder Joint**	660-10550	1	1	2
	Fuel Pump **Barrel Locking Pin**	660-11010	1	1	2
	Fuel Pump Barrel Locking Pin **Joint**	660-10040	1	1	2
	Fuel Pump **Spring Plate Upper**	660-11020	1	1	2
	Fuel Pump Spring Plate **Lower**	660-10430	1	1	2
	Fuel Pump **Retaining Spring Ring**	660-11030	1	1	2
11	Fuel Pump **Washer**	027-00184	2	2	4
12	Fuel Pump **Set Pin**	027-00203	2	2	4
13	Fuel Pump **Pawl Assembly**—includes Item 14	008-24162	1	1	2
14	Fuel Pump Pawl **Check Pin**	010-02190	1	1	2
15	Fuel Pump Check Plate **Fulcrum Pin**	008-02191	1	1	1
16	Fuel Pump **Check Plate**	010-02192	1	1	2
17	Fuel Pump Check Plate **Nut**	027-00015/001	1	1	2
18	Fuel **Pipe,** Pump to Injector (No. 1 Cyl.)	008-03060	1	1	1
	Fuel **Pipe,** Pump to Injector (No. 2 Cyl.)	008-03071	—	—	1
19	**Rubber Bush** for clip	354-23430	1	1	2
20	Injector Fuel Pipe **Clip**	008-30106	2	2	4
21	**Setscrew**	027-00068	1	1	2
22	**Spring Washer**	027-00393	1	1	2
23	**Fuel Injector Joint**	010-03041	1	1	2

8-30-60
8-30-71

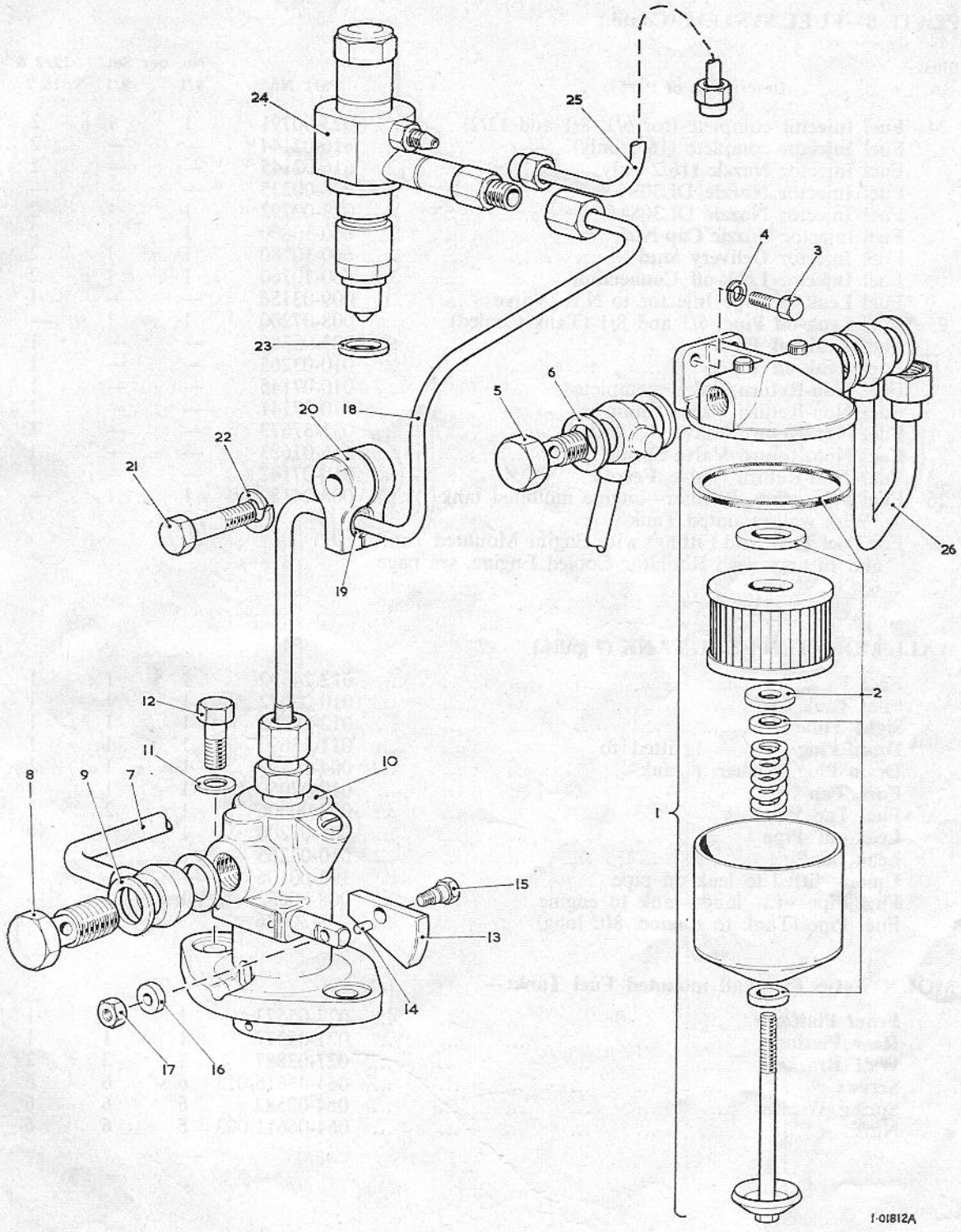


PLATE 8

FUEL SYSTEM

PLATE 8—FUEL SYSTEM (Contd.)

Illus. No.	Description of Part	Part No.	No. per Set 6/1	8/1	12/2 & 16/2
24	**Fuel Injector** complete (for 6/1, 8/1 and 12/2) ...	023-00791	1	1	2
	Fuel Injector complete (16/2 only)	616-02144	—	—	2
	Fuel Injector **Nozzle** (16/2 only)	616-02145	—	—	2
	Fuel Injector **Nozzle** DL30S406	208-00235	—	—	—
	Fuel Injector **Nozzle** DL30S46 ...	023-00792	1	1	2
	Fuel Injector Nozzle **Cap Nut**	660-10800	1	1	2
	Fuel Injector **Delivery Stud**	660-10780	1	1	2
	Fuel **Injector Leak-off Connection**	660-10760	1	1	2
	*Fuel **Leak-off Pipe** Injector to N.R. Valve	009-03156	—	—	1
25	*Fuel **Leak-off Pipe,** 6/1 and 8/1 (Tank Cooled) ...	008-07200	1	1	—
	*Fuel **Leak-off Pipe**	023-05386	—	—	1
	*Fuel **Leak-off Pipe**	010-03265	—	—	1
	Fuel **Non-Return Valve,** complete	010-07145	—	—	1
	Fuel Non-Return Valve **Union**	010-07141	—	—	1
	Fuel Non-Return Valve $\frac{3}{16}$" **Ball**	031-57673	—	—	1
	Fuel Non-Return Valve **Spring**	616-01623	—	—	1
	Fuel Non-Return Valve **Ferrule**	010-07142	—	—	1
26	Fuel **Pipe**—tank to filter—engine mounted tank ...	008-24180	1	1	—
	*With wall-mounted Tank				
	For **Fuel Tank** and Fittings with Engine Mounted Tank and Fittings with Radiator Cooled Engine, see page 63				

WALL MOUNTED FUEL TANK (7 galls.)

Fuel Tank	012-24392	1	1	1
Fuel Tank **Lid**	010-07072	1	1	1
Sight Tube	012-24398	1	1	1
Drain Plug } fitted to	011-13693	1	1	1
Drain Plug **Washer** } tank	004-00197	1	1	1
Fuel Tap	010-07050	1	1	1
Fuel Tap **Washers**	007-00406	1	2	2
Leak off Pipe	008-07200	1	1	—
Leak off Pipe	010-03265	—	—	1
Union—fitted to leak off pipe	103-00106	—	—	1
Fuel Pipe—42" long—tank to engine	008-30082	1	1	—
Fuel Pipe (Tank to Engine. 8ft. long)	008-30086			

MOUNTINGS for Wall mounted Fuel Tank:—

Front Platform	027-05573	1	1	1
Rear Platform	027-05577	1	1	1
Wall Brackets	027-03887	2	2	2
Screws	064-06616/013	6	6	6
Spring Washer	064-02582	6	6	6
Nuts	064-06611/003	6	6	6

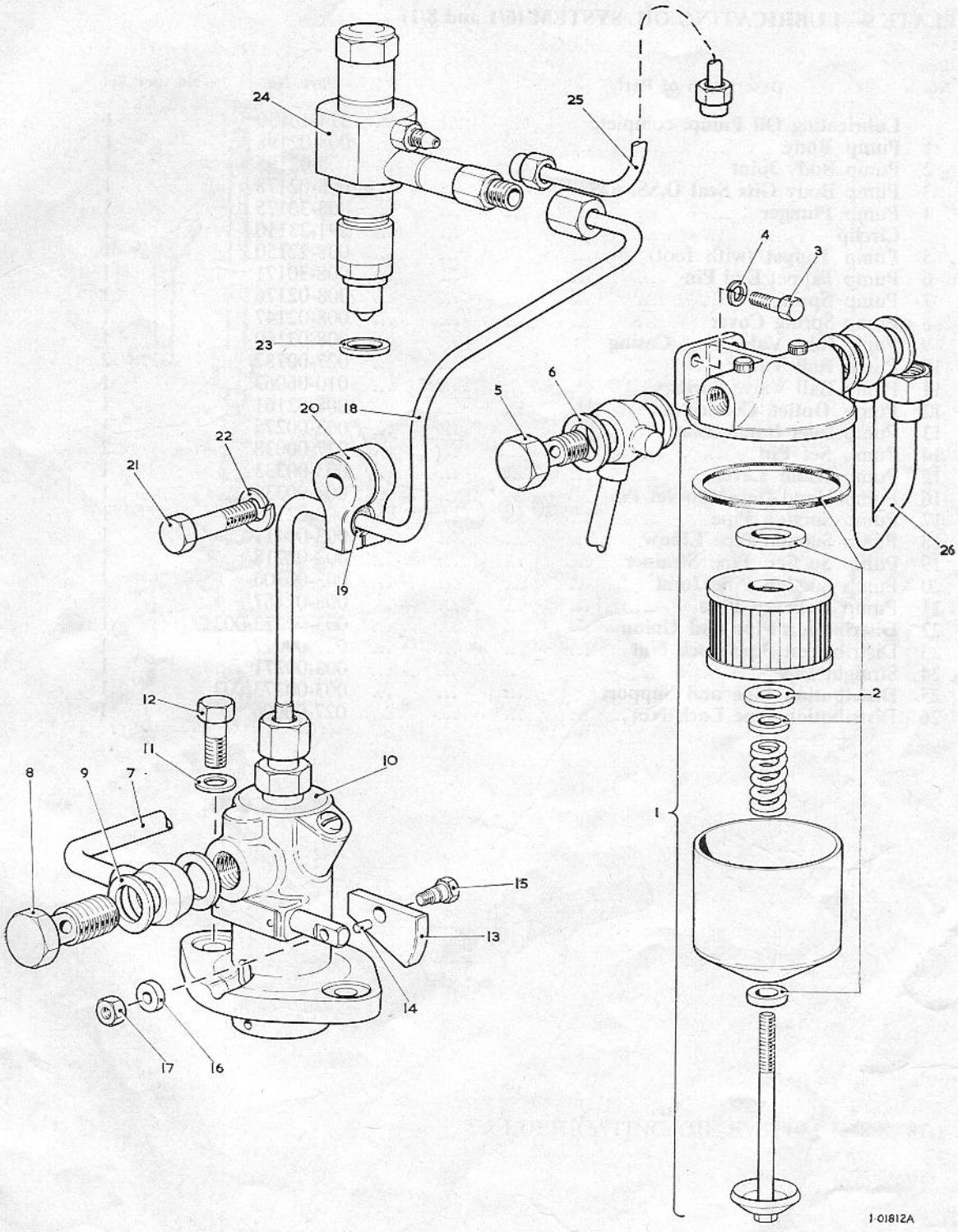


PLATE 8

FUEL SYSTEM

PLATE 9—LUBRICATING OIL SYSTEM (6/1 and 8/1)

Illus. No.	Description of Part	Part No.	No. per Set
	Lubricating Oil Pump, complete	574-10130	1
1	**Pump Body**	008-02198	1
2	Pump Body **Joint**	008-02195	1
3	Pump Body **Gits Seal O.SS. 625**	008-02178	1
4	Pump **Plunger**	008-30175	1
	Circlip	291-23110	1
5	**Pump Tappet** (with foot)	008-22150	1
6	Pump Tappet **End Pin**	008-30171	1
7	Pump **Spring**	008-02176	1
8	Pump Spring **Cover**	008-02147	1
9	Pump **Inlet Valve Stop Casing**	008-02160	1
10	Pump **Ball Valve**	027-00787	2
11	Pump Ball Valve **Spring**	010-06067	1
12	Pump **Outlet Connection**	008-02161	1
13	Pump **Inlet Connection**	003-00275	1
14	Pump **Set Pin**	027-00038	2
15	Pump **Hand Lever**	003-00333	1
16	Pump Hand Lever **Swivel Pin**	003-00334	1
17	Pump **Suction Pipe**	008-02168	1
18	Pump Suction Pipe **Elbow**	003-00411	1
19	Pump Suction Pipe **Strainer**	008-02218	1
20	Pump Suction Pipe **Joint**	003-00306	1
21	Pump **Delivery Pipe**	008-02187	1
22	**Distribution Pipe and Union**	003-00272/003	1
23	Distribution Pipe **Lock Nut**	027-00017	1
24	**Straight Pipe**	003-00271	1
25	**Distribution Pipe and Support**	003-00273/003	1
26	Distribution Pipe **Lock Nut**	027-00006	1

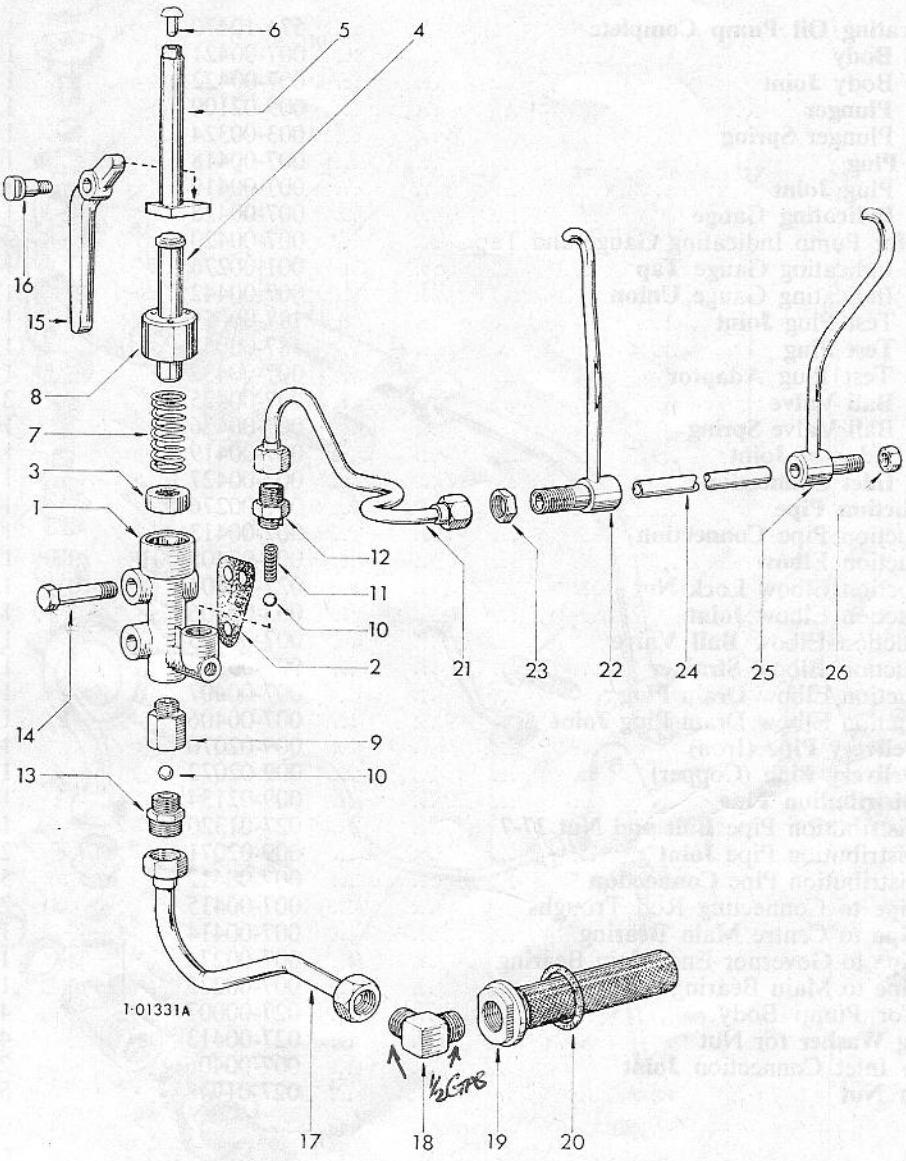


PLATE 9 LUBRICATING OIL SYSTEM (6/1 & 8/1)

PLATE 10—LUBRICATING OIL SYSTEM (12/2 and 16/2)

Illus. No.	Description of Part	Part No.	No. per Set
	Lubricating Oil Pump Complete	574-10470	1
1	**Pump Body**	007-00421	1
2	Pump Body **Joint**	007-00422	1
3	**Pump Plunger**	009-02100	1
4	Pump Plunger **Spring**	003-00324	1
5	**Pump Plug**	007-00418	1
6	Pump Plug **Joint**	007-00419	1
	Pump **Indicating Gauge**	007-00428	1
	Joint for Pump Indicating Gauge and Tap	007-00420	2
	Pump Indicating Gauge **Tap**	001-00276	1
	Pump Indicating Gauge **Union**	007-00442	1
7	Pump Test Plug **Joint**	187-00059	1
8	**Pump Test Plug**	187-00055	1
9	Pump Test Plug **Adaptor**	007-00432	1
10	**Pump Ball Valve**	007-00425	2
11	Pump Ball Valve **Spring**	007-00426	1
12	Pump Adaptor **Joint**	007-00419	1
13	Pump **Inlet Connection**	007-00427	1
14	**Oil Suction Pipe**	007-00276	1
15	Oil Suction Pipe **Connection**	007-00413	1
16	Oil Suction **Elbow**	007-00408/001	1
17	Oil Suction Elbow **Lock Nut**	027-00404	1
18	Oil Suction Elbow **Joint**	003-00306	1
19	Oil Suction Elbow **Ball Valve**	007-00425	1
20	Oil Suction Elbow **Strainer**	007-00270	1
21	Oil Suction Elbow **Drain Plug**	007-00407	1
22	Oil Suction Elbow Drain Plug **Joint**	007-00406	1
23	**Oil Delivery Pipe** (Iron)	009-02070	1
24	**Oil Delivery Pipe** (Copper)	009-02072	1
25	**Oil Distribution Pipe**	009-02134	1
26	Oil Distribution Pipe **Bolt and Nut 27-7**	027-01320	1
27	Oil Distribution Pipe **Joint**	009-02071	2
28	Oil Distribution Pipe **Connection**	007-00412	5
29	**Oil Pipe** to Connecting Rod Troughs	007-00415	2
30	**Oil Pipe** to Centre Main Bearing	007-00414	1
31	**Oil Pipe** to Governor End Main Bearing	007-00274	1
32	**Oil Pipe** to Main Bearing	007-00275	1
	Nut for Pump Body	027-00007	4
	Spring Washer for Nut	027-00413	4
	Pump Inlet Connection **Joint**	007-00406	2
	Union **Nut**	027-01948	5

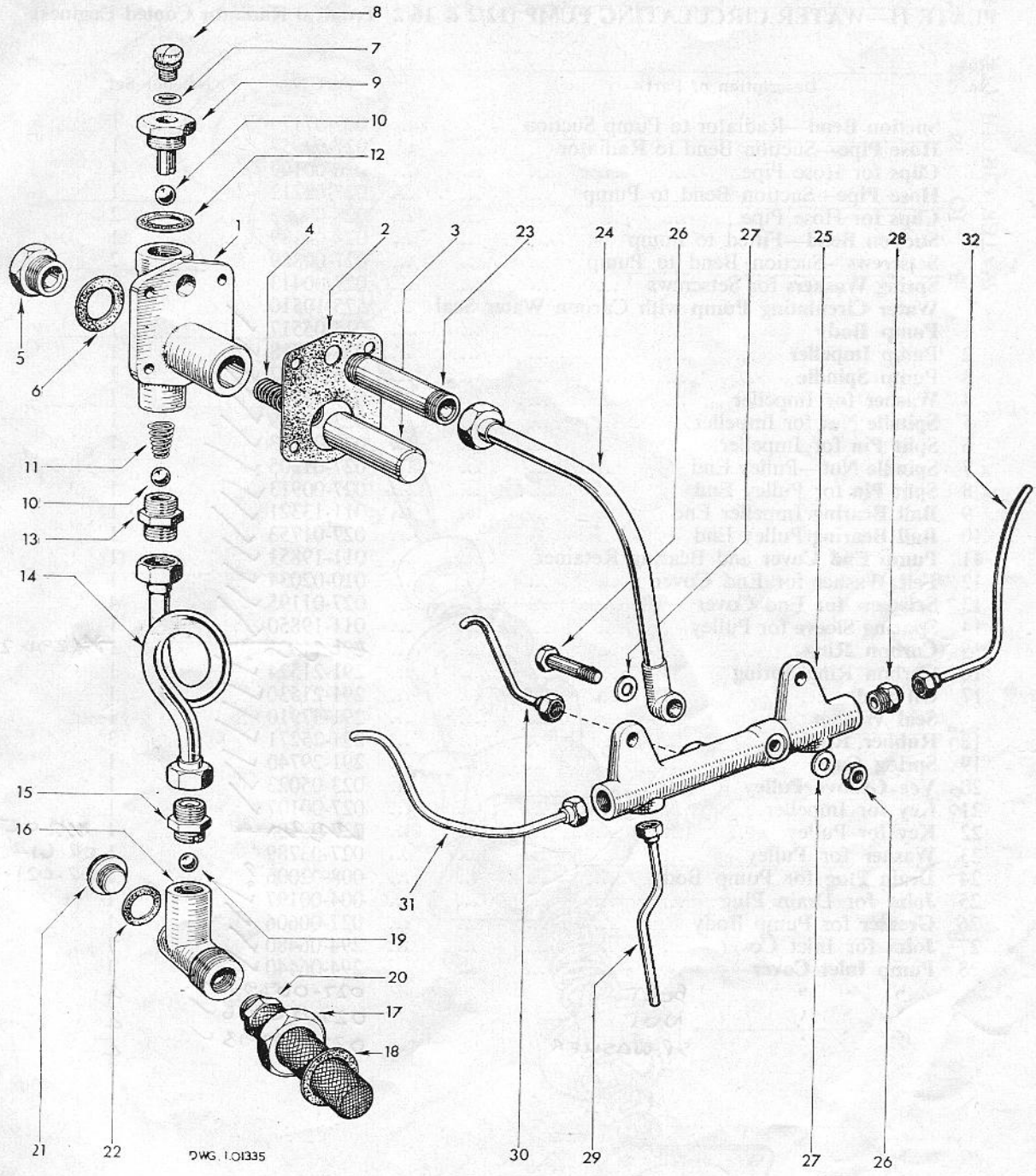


PLATE 10

LUBRICATING OIL SYSTEM (12/2 and 16/2)

PLATE 11—WATER CIRCULATING PUMP (12/2 & 16/2 Tropical Radiator Cooled Engines)

Illus. No.	Description of Part	Part No.	No. per Set	
	Suction Bend—Radiator to Pump Suction	009-07179	1	
	Hose Pipe—Suction Bend to Radiator	027-02357	1	
	Clips for Hose Pipe	026-00109	4	
	Hose Pipe—Suction Bend to Pump	027-02212	1	
	Clips for Hose Pipe	028-00095	2	
	Suction Bend—Fitted to Pump	024-04189	1	
	Setscrews—Suction Bend to Pump	027-00889	2	
	Spring Washers for Setscrews	027-00413	2	
	Water Circulating Pump with Carbon Water Seal	575-10510	1	
1	**Pump Body**	023-05517 ✓	1	
2	Pump **Impeller**	023-05518 ✓	1	
3	Pump **Spindle**	616-01757 ✓	1	
4	**Washer** for Impeller	027-03789 ✓	1	
5	**Spindle Nut** for Impeller	023-00619 ✓	1	
6	**Split Pin** for Impeller	027-03713 ✓	1	
7	**Spindle Nut**—Pulley End	027-01305 ✓	1	
8	**Split Pin** for Pulley End	027-00913 ✓	1	
9	**Ball Bearing** Impeller End	011-13321 ✓	1	
10	**Ball Bearing** Pulley End	027-01753 ✓	1	
11	**Pump End Cover** and Bearing Retainer	011-19851 ✓	1	
12	**Felt Washer** for End Cover	010-02034 ✓	1	
13	**Setscrew** for End Cover	027-01195 ✓	4	
14	**Spacing Sleeve** for Pulley	011-19850 ✓	1	
15	**Carbon Ring**	~~291-21501~~ ?	1	~~OR~~ 291-21502.
16	Carbon Ring **Spring**	291-21524 ✓	1	
17	**Oil Seal**	291-21530 ✓	1	
	Seal Washer	291-37910 ✓	1	
18	**Rubber Ring**	291-25271 ✓	3	
19	**Spring Cage**	291-29740 ✓	1	
20	**Vee Groove Pulley**	023-05023 ✓	1	
21	**Key** for Impeller	027-00107 ✓	1	
22	**Key** for Pulley	~~027-00506~~	1	~~OR~~ 027-00566
23	**Washer** for Pulley	027-03789	1	OR 614/00811
24	**Drain Plug** for Pump Body	008-02006 ?	1	OR 021-00153
25	**Joint** for Drain Plug	004-00197 ✓	1	
26	**Greaser** for Pump Body	027-00606 ✓	1	
27	**Joint** for Inlet Cover	294-06480 ✓	1	
28	**Pump Inlet Cover**	294-06440 ✓	1	
	" " "	BOLT 027-00895 ✓	4	
	" " "	NUT 027-00906 ✓	4	
	" " "	SP. WASHER 027-00393 ✓	4	

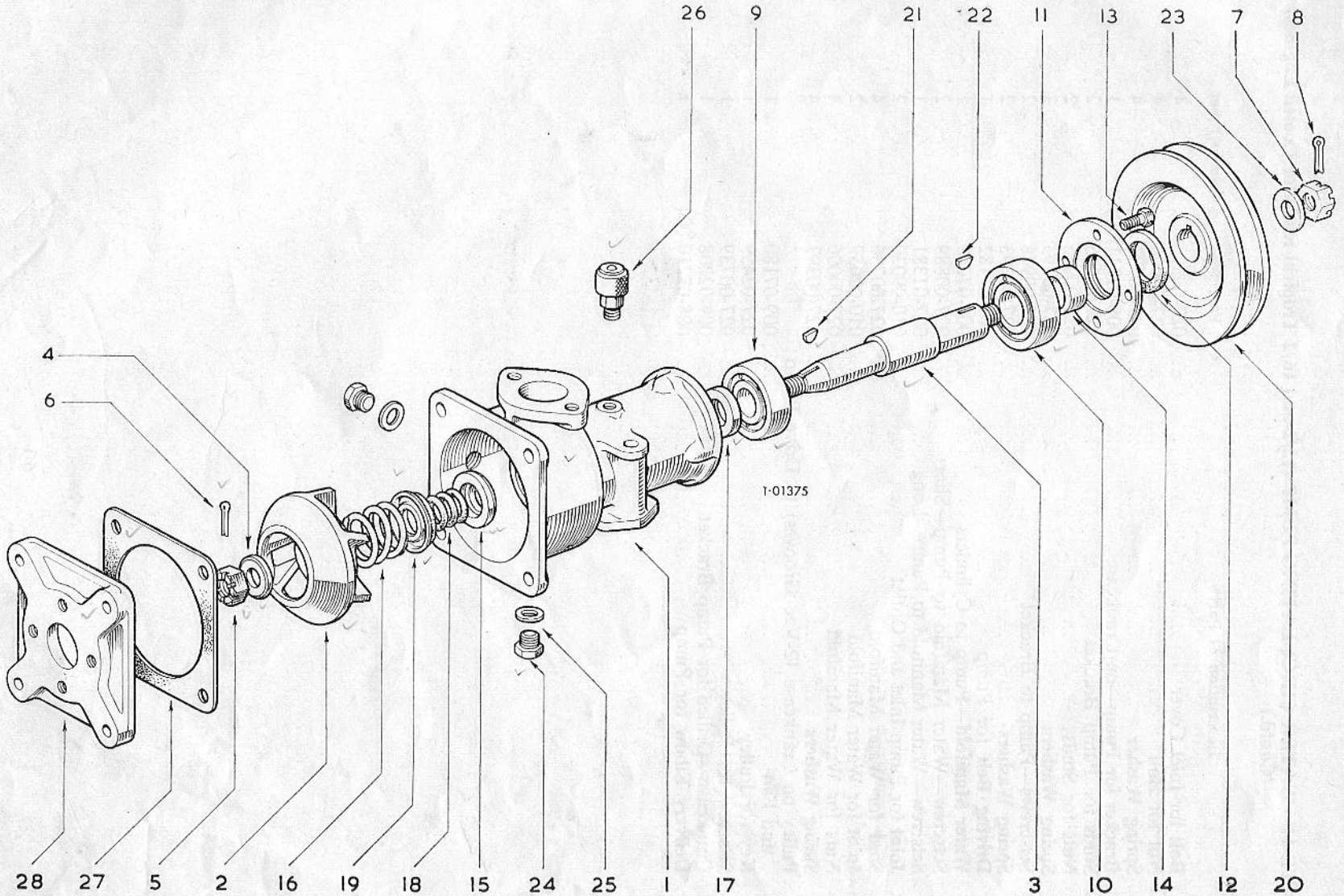


PLATE 11

WATER CIRCULATING PUMP

PLATE 11—WATER CIRCULATING PUMP (12/2 and 16/2 Tropical Radiator Cooled Engines) —(Contd.)

Illus. No.	Description of Part	Part No	No. per Set
26	**Bolt** for Inlet Cover	027-00895	4
27	**Nut** for Bolt	027-00906	4
28	**Spring Washer**	027-00393	4
	Bracket for Pump—on Crankcase	008-07211/001	1
	Studs for Pump Bracket	027-00045	2
	Nuts for Studs	027-00006	2
	Spring Washers	027-00393	2
	Setscrews—Pump to Bracket	027-00978	2
	Spring Washers	027-00393	2
	Driving Belt for Pump	009-07182	1
	Water Manifold—Pump to Cylinders	008-07029	1
	Setscrew—Water Manifold to Pump—Short ...	027-00889	2
	Setscrew—Water Manifold to Pump—Long	027-01381	1
	Joint for Pump Inlet and Outlet	010-09030	2
	Stud for Water Manifold	027-00736	4
	Joint for Water Manifold	010-02059	2
	Nuts for Water Manifold	027-00006	4
	Spring Washers	027-00393	4
	Pulley on Crankcase (2-Vee Grooves) to Drive Pump and Fan	009-07180	1
	Key for Pulley	027-02459	1
	Setscrew for Pulley	027-00739	1
	Crankcase—Drilled for Pump Bracket	009-02208	1
	Delivery Elbow for Pump	008-07210/001	1

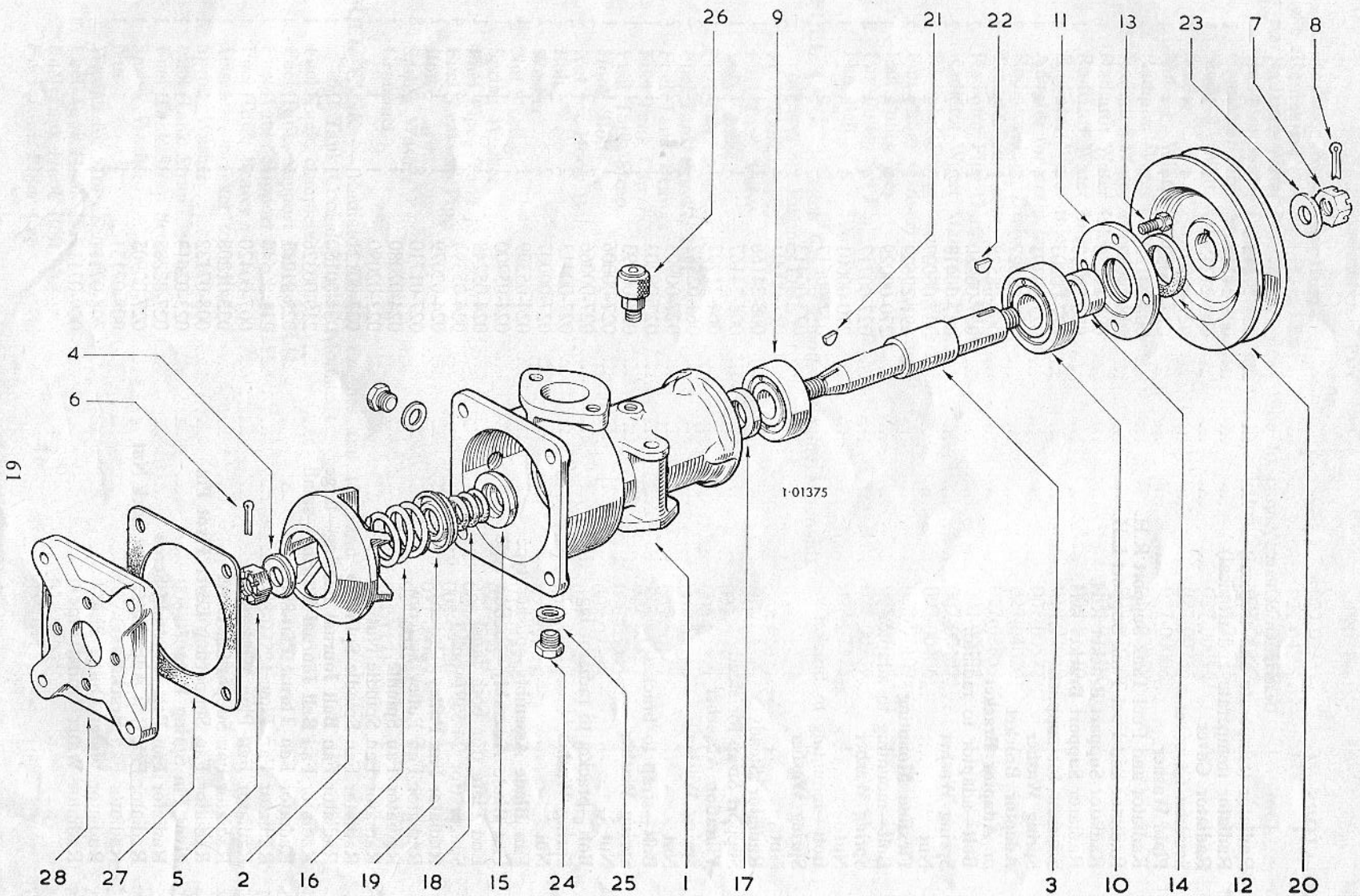


PLATE 11

WATER CIRCULATING PUMP

RADIATORS

Description of Part	Part No.	No. per Set 6/1	8/1	12/2 & 16/2
Radiator (temperate and tropical)	008-24243	1	1	—
Radiator (temperate and tropical)	008-24244	—	—	1
Radiator Cover	008-24245	1	1	1
Setscrew for cover	027-00901	4	4	4
Plain Washer	027-00082	4	4	4
Radiator and Fuel Tank **Support** R.H.	008-24155	1	1	—
Radiator and Fuel Tank **Support** L.H.	008-24157	1	1	—
Radiator **Support Bracket** R.H.	008-24150	—	—	1
Radiator **Support Bracket** L.H.	008-24153	—	—	1
Setscrew for supports	027-00203	4	4	4
Spring Washer	027-00393	4	4	4
Adaptor Bracket	008-08527	2	2	2
or **Adaptor Bracket**	008-08528	2	2	2
Bolt—adaptor to radiator	027-00360	2	2	2
Spring Washer	027-00413	2	2	2
Nut	027-00007	2	2	2
Flexible Mounting	291-29623	2	2	2
Bolt—mounting to adaptor	270-00029	4	4	4
Spring Washer	027-00717	4	4	4
Nut	270-00001	4	4	4
Bolt—mounting to bracket	027-00617	2	2	2
Spring Washer	027-00413	2	2	2
Nut	027-00007	2	2	2
Radiator Steady	008-24166	1	1	1
Support Strap for steady	008-24167	1	1	1
Vibration Absorber	064-21902	1	1	1
Spring Washer	064-02582/004	2	2	2
Nut	027-00905	2	2	2
Bolt—strap to bracket	027-00203	1	1	1
Spring Washer	027-00393	1	1	1
Nut	027-00006	1	1	1
Bolt—bracket to radiator lag	027-00066	2	2	2
Spring Washer	027-00413	2	2	2
Nut	027-00007	2	2	2
Fan Blade Assembly—pusher type	024-05399	1	1	1
Fan Blade Assembly—suction type	024-05400	1	1	1
End Plate (for both fans)	024-05248	1	1	1
Spacer (for 24-5391 only)	024-05394	4	4	4
Radiator Fan Pulley (Driven)	024-02079	1	1	1
Radiator Fan Pulley **Setscrew**	027-01710	8	8	8
Radiator Fan **Spindle**	024-02080	1	1	1
Radiator Fan Spindle **Nut**	023-02090	1	1	1
Radiator Fan Spindle **Split Pin**	027-00121	1	1	1
Radiator Fan **Ball Journal Bearing**—large	021-00150	1	1	1
Radiator Fan **Ball Journal Bearing**—small	210-00326	1	1	1
Radiator Fan **Thrust Plate**	023-01211	1	1	1
Radiator Fan **Plug**	211-00540	1	1	1
Radiator Fan Plug **Washer**	007-00420	1	1	1
Radiator Fan **Supporting Lever**	023-01208	1	1	1
Radiator Fan Supporting Lever **Pivot Pin**	008-07132	1	1	1
Pivot Pin Spring Ring	023-02613	1	1	1
Radiator Fan Belt Adjusting Screw	027-02285	1	1	1
Radiator Fan Belt Adjusting Screw **Lock Nut** ...	027-00905	1	1	1
Radiator Fan **Bracket**	008-07131	1	1	1
Radiator Water **Outlet Pipe**	008-07111	1	1	—
Radiator Water **Outlet Pipe**	009-07111	—	—	1

RADIATORS (Cont.) Description of Part	Part No.	No. per Set 6/1	8/1	12/2 & 16/2
Radiator Water **Pipe Hose**	027-02357	2	2	1
Radiator Water Pipe Hose **Clip**	027-04233	4	4	6
Radiator Water Pipe **Hose**—outlet pipe to connector	027-03554	1	1	1
Radiator Water Pipe **Hose**—connector to radiator ...	027-01227	1	1	1
Connector Pipe	008-24246	1	1	1
Stud—$\frac{3}{8}$" Whit. x $1\frac{1}{4}$"	027-00050	4	4	4
Stud	027-00736	—	—	8
Nut—$\frac{3}{8}$" Whit.	027-00006	4	4	12
Radiator Water **Outlet Pipe Joint**	010-02059	1	1	6
Radiator Water **Manifold Pipe**	009-07080	—	—	2
Radiator Water **Inlet Pipe**	008-07110	1	1	—
Radiator Water **Inlet Pipe**	009-07110	—	—	1
Radiator Water Inlet Pipe **Joint**	010-02059	1	1	—
Adaptor for drain tap	001-00572	1	1	1
Radiator Pipe **Drain Tap**	027-04020	1	1	1
Transfer on Cover	027-03859	1	1	1
Radiator Pipe Drain Tap **Joint**	004-00197	1	1	1
Radiator Water **Manifold Plug**	007-00407	—	—	1
Radiator Water Manifold Plug **Joint**	007-00406	—	—	2
Fan Pulley (Driver) on Crankshaft	008-07109	1	1	1
Fan Pulley **Key**	008-07098	1	1	1
Fan Pulley **Set Pin**	027-00739	1	1	1
Fan **Belt**	008-07125	1	1	1
FUEL TANK — Tank Cooled Engines (Engine Mounted) 6/1 and 8/1 Engines ONLY				
Fuel Tank	008-03037	1	1	—
Fuel Tank **Valve**	010-07050	1	1	—
Valve Joint	007-00406	1	1	—
Fuel Tank **Bracket R.H.**	008-07223	1	1	—
Fuel Tank **Bracket L.H.**	008-07224	1	1	—
Fuel Tank **Bearers**	008-30167	2	2	—
Fuel Tank **Cap**	027-03824	1	1	—
Fuel Tank **Strap**	008-03045	2	2	—
Hook Bolts	008-07103	2	2	—
Nut for Hook Bolt	027-00907	4	4	—
Bolt	027-00332	2	2	—
Washer	027-00618	2	2	—
Nut	027-00008	2	2	—
Spring Washer	027-00451	2	2	—
Fuel Pipe—Tank to Filter	008-24180	1	1	—
Fuel Leak-off Pipe	008-07230	1	1	—
Bolt	027-00739	4	4	—
Spring Washer	027-00393	4	4	—
Grommet	201-11710	1	1	—
FUEL TANK — Radiator Cooled Engines and 12/2 and 16/2 Tank Cooled (Engine Mounted)				
Fuel Tank, complete	008-03037	1	1	—
Fuel Tank, **Support Bracket, R.H.**	008-07223	—	—	1
Fuel Tank, **Support Bracket, L.H.**	008-07224	—	—	1
Fuel Tank **Bearer**	008-07163	2	2	2
Setscrew—bracket to cylinder	027-00739	4	4	4
Spring Washer	027-00393	4	4	4
Fuel Tank **Strap**	008-03045	2	2	2
Fuel Tank Strap **Setscrew**	027-00332	2	2	2
Spring Washer	027-00451	2	2	2
Nut	027-00008	2	2	2
Washer for Strap Setscrew	027-00618	2	2	2
Fuel Tank **Hook Bolt**	008-07103	2	2	2
Fuel Tank Hook Bolt **Nut**	027-00903	4	4	4
Fuel Tank **Filler Cap**	027-03824	1	1	1

FUEL TANKS (Cont.) Description of Part	Part No.	No. per Set 6/1	8/1	12/2 & 16/2
Fuel Tank **Valve**	010-00750	1	1	1
Fuel Tank Valve **Joint**	013-21778	1	1	1
Fuel Pipe (Tank to Filter)	008-24180	1	1	—
Fuel Pipe (Filter to Pump)	008-07173	1	1	1
Fuel Pipe (Filter to Tee-piece)	009-24179	—	—	1
Fuel Pipe (Connecting Pumps)	009-24175	—	—	1
Fuel Pipe **Fixing Plugs**	023-00472	2	2	2
Joint	291-22650	4	4	4
Grommet	201-11710	1	1	1
Fuel Tank Bearers	008-07163	2	2	2
Bolt	027-00739	4	4	4
Spring Washer	027-00393	4	4	4
Fuel Leak-off Pipe	009-07232	—	—	1
Fuel Leak-off Pipe	008-07230	1	1	—
Nut $\frac{1}{4}$″ Whit.	027-00008	2	2	2
Spring Washer	027-00451	2	2	2
SILENCER				
Silencer (Exhaust) complete with $1\frac{1}{2}$″ pipe connection	574-10950	1	1	2
Silencer **Bend** for Exhaust $1\frac{1}{2}$″ B.S.P.	027-00086	1	1	2
Exhaust Manifold } supplied to order only in place of 2 separate Silencers	009-03036	—	—	—
Exhaust **Flange** used with Manifold	028-00096	—	—	1
Exhaust Flange **Joint**	028-00089	—	—	1
Exhaust Flange **Bolt**	027-00426	—	—	2
Exhaust Flange Bolt **Nut**	027-00004	—	—	2
Exhaust Flange Bolt **Spring Washer**	027-00394	—	—	2
Exhaust **Pipe Bend** 2″ BSP	027-00262	—	—	1
Exhaust Silencer (Sheet Metal)	028-00176	—	—	1
SPANNERS				
Spanner $\frac{3}{16}$″ x $\frac{1}{4}$″	027-00323	1	1	1
Spanner $\frac{5}{16}$″ x $\frac{3}{8}$″	027-00151	1	1	1
Spanner $\frac{3}{8}$″ x $\frac{7}{16}$″ Union	027-00399	1	1	1
Spanner $\frac{7}{16}$″ x $\frac{1}{2}$″	027-00152	1	1	1
Spanner $\frac{9}{16}$″ x $\frac{5}{8}$″	027-00518	1	1	1
Spanner $\frac{3}{4}$″ x $\frac{7}{8}$″	027-00840	1	1	1
Spanner for Injector Nozzle Cap Nut	027-02494	1	1	1
STARTING HANDLE				
Starting Handle, complete, 6/1 and 8/1 only	574-10360	1	1	—
Starting Handle, complete	574-10620	—	—	1
Starting Handle **Crank**	009-05024	—	—	1
Starting Handle Crank	008-05024/001	1	1	—
Starting Handle **Clutch Pin**	003-00362	1	1	1
Starting Handle **Split Pin**	027-00120	1	1	1
Starting Handle **Spring**	003-00363	1	1	—
Starting Handle **Wood Grip,** 6/1 and 8/1 only	008-05121	1	1	—
Starting Handle **Wood Grip**	028-00078	—	—	1
Starting Handle Wood Grip **Pin, with Washer,** 6/1 and 8/1	008-24233	1	1	—
Starting Handle Wood Grip **Pin** with Washer	009-24234	—	—	1
Starting Handle Grip Pin **Lock Nut**	027-00904	1	1	1
SPEED CONTROL (Only supplied when specially ordered)				
Bowden Control Lever complete with 12″ length of cable and adjuster	008-06107	1	1	1
End Fork for Cable (fitted to cable)	008-02467	1	1	1
Support for Lever	008-02468	1	1	1

SPEED CONTROL (Continued) Description of Part	Part No.	No. per Set 6/1	8/1	12/2 & 16/2
Anchor Pin for Cable	009-02084	1	1	1
Locknut $\frac{5}{16}$″ Whit.	027-00007	1	1	1
Speed Indicator Plate	105-00447	1	1	1
Support Bracket	008-06108	1	1	1
Nut—$\frac{3}{8}$″ Whit.	027-00006	1	1	1
Spring Washer	027-00393	1	1	1
Bolt—$\frac{3}{8}$″ Whit. x $\frac{13}{16}$″	027-00739	1	1	1
Cable Stop	008-06109	1	1	1
Grub Screw	270-00050	1	1	1
Crankcase	008-02469	1	1	—
Crankcase	009-02469	—	—	1
PULLEY (Key-on Type)				
4″ Diam. x 7″ Face	008-05064	1	1	—
6″ Diam. x 7″ Face	008-05042	1	1	—
8″ Diam. x 7″ Face	008-05035	1	1	—
10″ Diam. x 7″ Face	008-05025	1	1	—
14″ Diam. x 7″ Face	008-05038	1	1	—
10″ Diam. x 9″ Face	009-05036	—	—	1
12″ Diam. x 9″ Face	009-05025	—	—	1
14″ Diam. x 9″ Face	009-05038	—	—	1
Key for Pulley	004-00312	1	1	—
Key for Pulley	027-00403	—	—	1
Setscrew for Pulley	027-00063	1	1	1
WATER TANK (6/1 and 8/1 only) Temperate and Tropical				
Water Tank, 50 gall., for Temperate Climate	003-00405	1	1	—
Water Tank, 70 gall., for Tropical Climate	004-00405	1	1	—
1″ **Hex. Nipple**	027-00171	1	1	—
1″ **3-Way Cock**	027-00170	1	1	—
1″ **Pipe,** $2\frac{1}{2}$″ long, screwed one end (Temp. and Trop.)	027-00255	2	2	—
1″ **Pipe,** 6″ long, screwed one end (Temp. and Trop.)	027-00173	2	2	—
1″ **Pipe,** 12″ long, screwed one end (Trop.)	027-00361	2	2	—
1″ **120° Bend** screwed one end (Temp. and Trop.)	027-02350	2	2	—
Hose Pipe $1\frac{1}{4}$″ bore x 20″ (Trop.)	008-24199	1	1	—
Hose Pipe, $1\frac{1}{4}$″ bore x 6″ (Trop.)—(Temp.—2)	027-01756	1	1	—
Hose Pipe **Clip**	003-00404	4	4	—
WATER TANK 12/2 and 16/2 (Temperate)				
Water Tank, 30″ dia. x 4′ 0″ high (120 galls.)	010-07001	—	—	1
3-Way Cock, $1\frac{1}{4}$″	027-00178	—	—	1
Hex. Nipple, $1\frac{1}{4}$″ tank outlet	027-00293	—	—	1
$1\frac{1}{4}$″ x 6″ **Pipes,** screwed one end, tank outlet and inlet	027-00166	—	—	4
$1\frac{1}{4}$″ x 135° **Bend**	027-02346	—	—	1
Hose Pipe $1\frac{5}{8}$″ bore x 18″ long tank inlet	009-24200	—	—	1
Hose Pipe, $1\frac{5}{8}$″ bore x 9″ long tank outlet	027-03913	—	—	1
Hose Pipe **Clips**	028-00095	—	—	4
Reducing Bush	027-01184	—	—	2
WATER TANK 12/2 and 16/2 (Tropical)				
Water Tank, 30″ dia. x 6′ 6″ high (170 galls.)	011-07095	—	—	1
3-Way Cock, $1\frac{1}{4}$″ tank outlet	027-00178	—	—	1
Hex. Nipple, $1\frac{1}{4}$″ tank outlet	027-00293	—	—	1
$1\frac{1}{4}$″ dia. **Pipe** 6″ long, screwed one end, tank outlet	027-00166	—	—	3
$1\frac{1}{4}$″ x 120° **Bend** tank inlet	027-02348	—	—	1
Hose Pipe, $1\frac{5}{8}$″ bore x 9″ long tank outlet	027-03913	—	—	1
Hose Pipe **Clips**	028-00095	—	—	4
$1\frac{1}{4}$″ x 21″ **Pipe** (screwed at one end) tank inlet	027-00492	—	—	1
Hose Pipe, $1\frac{5}{8}$″ bore x 18″ long	009-24200	—	—	1
Reducing Bush $1\frac{1}{3}$″-$1\frac{1}{4}$″ BSP	027-01184	—	—	2

Description of Part	Part No.	No. per Set 6/1	8/1	12/2 & 16/2
THERMOSTAT (Complete Assembly) Tank Cooled Engines ONLY				
To fit $1\frac{1}{4}$" bore hose	008-02181	1	1	—
To fit $1\frac{5}{8}$" bore hose	009-02181	—	—	1
THERMOSTAT ELEMENT Supplied to order only	008-02185	1	1	1
Hose Pipe Clips for Thermostat	003-00404	2	2	—
Hose Pipe **Clips** for Thermostat	028-00095	—	—	2

JOINTS FOR 6/1, 8/1, 12/2 & 16/2 DIESEL ENGINES

Description	Part No.	Material	No. per Set 6/1 & 8/1	12/2 & 16/2
Joint for Camshaft End Cover	003-00153	Paper	1	2
Joint for Crankcase Door	003-00301	Fibre	1	—
Joint for Plugs	007-00420	Fibre	2	3
Joint for Breather Body	003-00309	Fibre	1	1
Joint for Cylinder Flange	008-02094	Paper	*4	*8
Joint for Crankcase Door	007-00301	Fibre	—	1
Joint for Crankshaft Housing	008-02062	Paper	2	2
Joint for Water Jacket Door	026-00112	Fibre	2	2
Joint for Water Pipe Flange	010-02059	Fibre	*2	*4
Joint for Cylinder Head	008-03051	C & A	*1	*2
Joint for Exhaust Flange	003-00307	C & A	*2	*4
Joint for Main Plug C.O.V.	010-03091	Copper	1	2
Joint for Auxiliary Plug C.O.V.	010-03006	Copper	†*1	†*2
Joint for Filter Cover	023-02778	Fibre	1	1
Joint for Swivel Union Pipes	291-22650	Copper	6	6
Joint for Plugs, etc.	007-00406	Fibre	1	3
Joint for Drain Plug	004-00197	Fibre	1	1
Joint for Fuel Injector	010-03041	C & A	*1	*2
Joint for Plug	003-00306	Fibre	2	1
Joint for Pump Body	009-02071	Paper	—	1
Joint for Distribution	007-00422	Fibre	—	2
Felt Ring for Crankshaft	003-00664	Felt	2	2
Joint for Drain Plug Lub. Oil Pump	007-00419	Fibre	—	2
Joint for Pump Body	008-02195	Paper	1	—
Joint for Exhaust Manifold Flange	028-00089	C & A	—	*1
Valve Tappet Guide Joint	009-02227	C & A	—	4
Joint for Pump Inlet Connections	007-00406	Fibre	—	2

* For Decarbonising only.

† Not required for 8/1 or 16/2 engines.

	Decarbonising	Overhaul
6-1	657-10380	657-10390
8-1	657-10400	657-10410
12-2	657-10420	657-10430
16-2	657-10440	657-10450

MAINTENANCE

Date	Hours Run	Item	Work Carried Out

Waggonner Engine Works

Life time slow speed Lister type diesel engines

6hp Engine

Selling the best Indian Lister engines for over 5 years.

Starting at $1250

Waggonner Engine Works. is a small family owned and operated company dedicated to providing slow speed diesel engines and GenSets. I have been involved in Slow Speed gas engines engines for 12 years, and have been seling these slow speed diesel engines for 6 years. Each of my engines are thruoghly inspected, tourque spec's re-checked, and each unit is test ran for at least 6 hours in my shop to ensure a proper run in before they ever leave my shop. These engines have been built since the 1930's and are the longest continously produced engine in the world. We are always looking for stocking distributors who recieve exclusivity to sales in their area. The generator

E-mail me at WesternStar66@aol.com

1"X1" aux. water circulating pump for only $55!

Located in Catoosa, Oklahoma

heads are self exciting and self regulating, and controll panels are standard equipment on every unit. Each genset is a complete unit, equipped with a radiator w\ water pump, belt and flywheel guards, mounted on a steel frame. If you ever have any questions just ask! Thank you, Doug Waggonner CEO

24\2 15KW GenSet $3860

We build Gen Sets of every size! The smallest is the 6\1 3KW. The largest is the 24\2 15KW. Just let us know how many KW's your needing to generate, and I can give you a quote.

I do deliver to a few engine shows for the cost of gas. Pawnee, Oklahoma springfield, Mo. Winfield, Ks. and others within 100 miles of Tulsa, Oklahoma

All engines have replaceable cylinder liners!

I sell these engines quicker than I can get them shipped! So please keep in mind it sometimes takes as long as 8 to 12 weeks to recieve a shipment

12hp $1850

20 hp TWO cylinder $2350

24hp 1000 rpm $2800

oilfield engine oil field
engines pumpjack engine
ax fairbanks morse
cooper superior engine

cold start hand start crank
start hit miss antique gas
engines engine steam
traction

slow speed diesel engine
engines india lister listeroid
importer