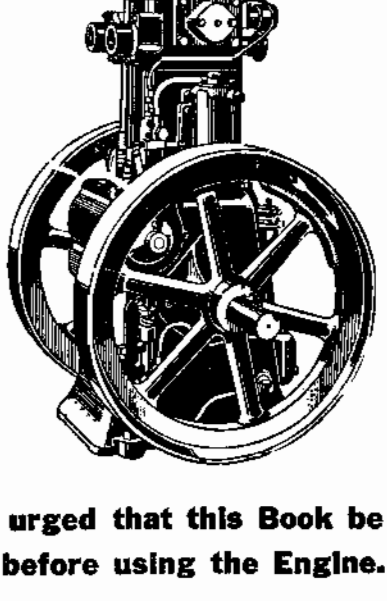
Lister

Stationary DIESEL ENGINES

MARKS 3-1, 5-1, 10-2

INSTRUCTION AND ILLUSTRATED SPARE PARTS BOOK



It is urged that this Book be read before using the Engine.

R. A. LISTER & CO. LTD.

ESTABLISHED 1867

DURSLEY, Glos., England.

LISTER

Stationary 'Diesel' Engine

Marks 3-1, 5-1, 10-2.

This book applies to the following Engines :—

							B.H.P. R.P.M.	B.H.P. R.P.M.
3/1	Single Cylinder	Bore	$3\frac{3}{4}''$	Stroke	$5\frac{1}{2}''$	giving	3 at 600	$3\frac{1}{2}$ at 650
5/1	,,	,,	$4\frac{1}{2}''$	,,	$5\frac{1}{2}''$	,,	5 ,, 600	6 ,, 650
10/2	Twin	,,	$4\frac{1}{2}''$	,,	$5\frac{1}{2}''$	,,	10 ,, 600	12 ,, 650

Fixing

The Engine should be securely fastened and be reasonably level.

Important Note. For belt drive always arrange the inside edge of driving belt as close to Engine bearing as possible. Where "Fast" and "Loose" pulleys are used, always arrange the pulleys so that the drive is taken on the side of the pulley nearest to the Engine bearing.

Attention to the above will prevent undue strain on the bearings due to overhang.

EXTRA HEAVY BELT DRIVES

If the machine which the engine is to drive makes the use of an exceptionally heavy or tight driving belt unavoidable, the driving pulley should be supported between two bearings on an extension shaft with a flexible coupling to connect it to the engine. Pulley shaft bearings and engine should be mounted on a substantial steel girder or concrete base.

Fuel Supply

FUEL TANK.

This should be fitted so that the bottom of the tank is approx. $1\frac{1}{2}$ feet above the Fuel Pump. In cases where the length of pipe between filter and fuel tank is abnormally long it may be desirable to increase this height in order to avoid too sluggish a flow of fuel.

Fuel Tanks supplied by us are fitted with a space in the bottom of tank to collect the sludge, etc., deposited by the fuel. The drain tap or plug should be used to flush out the sludge, and the tank cleaned out from time to time as found necessary.

The Tank should **never** be filled without using the strainer provided.

Clients providing their own Fuel Storage Tanks should arrange for the fuel outlet connection to be at least 2 ins. above the bottom of the fuel tank and the drain tap at the lowest point. This will prevent sludge entering the fuel pipe.

The Tank and piping must **not** be galvanised.

Never let Fuel Tank run dry.

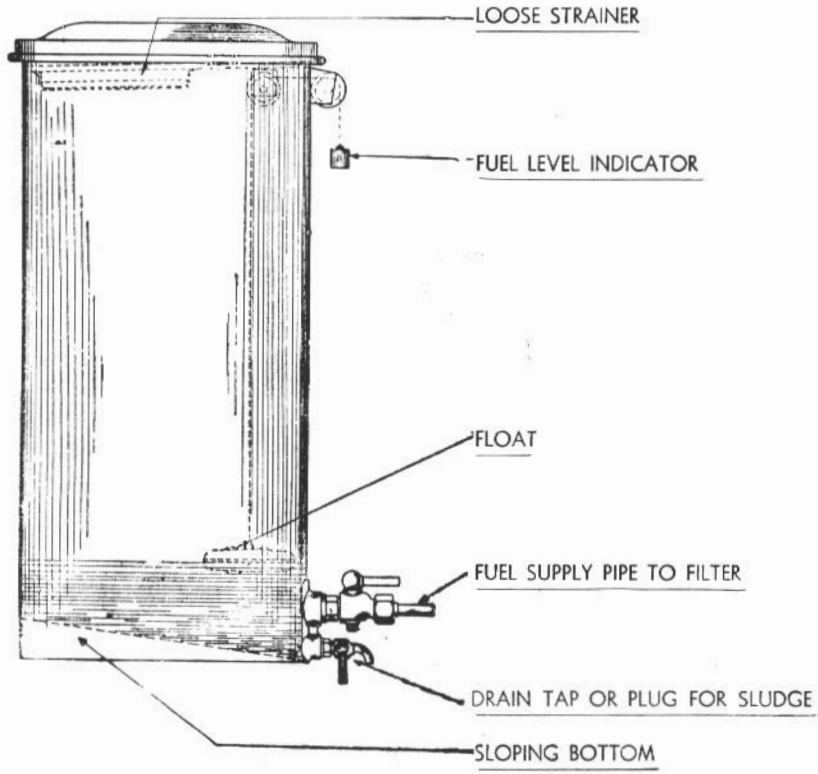


Fig 1.

Illustration of Fuel Tank showing drain tap, sloping bottom and level indicator.

Starting

Before starting the Engine, we strongly recommend the user to read through this instruction book, and thus become familiar with the principal features of the Engine.

Then proceed as follows :—

3-1 & 5-1

1. Remove Crankcase Door (Fig. 2) and pour Lubricating oil of the correct grade into the trough below the Crankshaft till it overflows into the sump.
2. Using engine oil in oil can, well oil connecting rod big end through the holes provided.
3. Open oil Filler Cover.
4. Fill sump with oil to within one inch of the top. About ¾ gal. is required
5. Work pump hand lever up and down and see that oil is delivered through the oil pipes inside the crankcase on to the main bearings.
6. Replace crankcase door.
7. Close oil Filler cover and screw wing nut tight. (Note—Do not open while engine is running as oil will be forced out.)

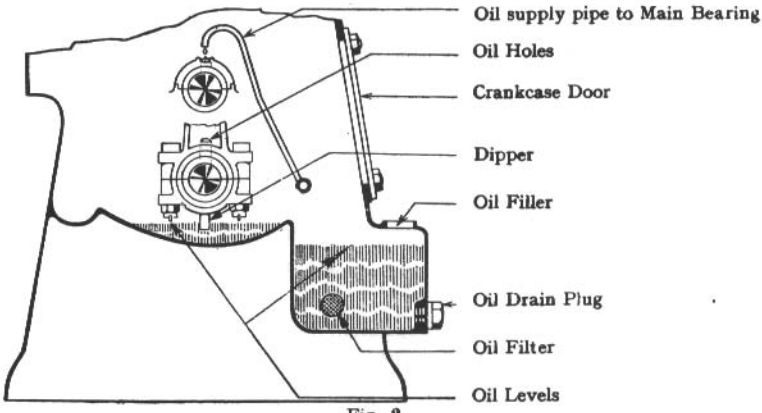


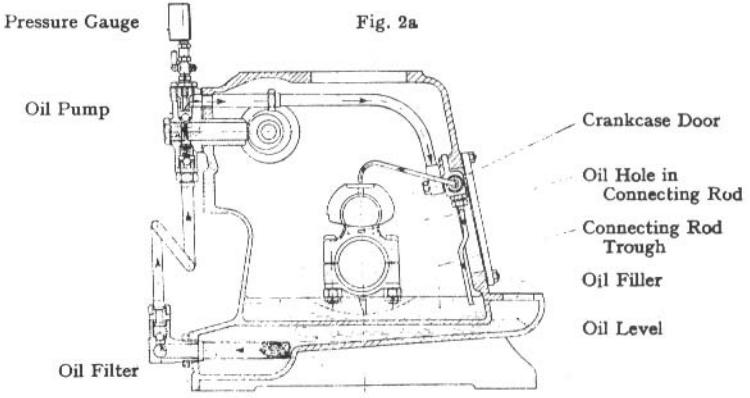
Fig. 2.

8. Fill recess in cylinder head round the valves with lubricating oil.
9. Fill tops of push-rods and tops of Tappets.
10. Fill small greaser on valve rocker shaft and screw down a turn.
11. Remove Screw labelled "Oil" near Valve Tappets and pour in about quarter pint of oil, replace screw. (3-1)
12. Fill water cooling system with water, avoiding "hard" water whenever possible. In case of tank cooling, open 3-way tap in bottom water tank connection so that the water can flow freely from tank into cylinder jacket. (Keep water above top connection in tank.) (5-1 & 10-2)
13. Fill fuel tank using fine gauze strainer.
14. Turn on fuel tap on fuel Tank.
15. Prime fuel system (see page 21).

See Note about changing oil on page 10.

Starting Instructions for 10-2 Diesel Engine

Fig. 2a



1. Remove Crankcase Door (Fig. 2a) and fill the connecting rod troughs with lubricating oil of the correct quality.
2. Using engine oil, in oil can, thoroughly oil connecting rod big end bearing through the holes provided.
3. Open Oil Filler Cover.
4. Fill sump with oil to within one inch of the top. About $1\frac{1}{4}$ gln. required
5. Turn Engine over by hand until oil is delivered through the three oil pipes inside the crankcase on to the main bearings.
6. Replace Crankcase Door.

To Start Engine

16. See that valve lifter stud is under the exhaust valve tappet (see Fig. 4).

17. Turn Governor Lever Handle downwards (see Fig. 4).

18. Lift Overload Pawl to allow governor lever to move to maximum position. This Pawl will return to Normal as soon as engine starts.

19. Screw the compression ratio changeover Valve(s) inwards tight on to seat.

20. Place the starting handle on the engine crankshaft (smear a little oil on the crankshaft first), and turn smartly. When a good speed has been attained on the flywheel, pull valve lifter stud from under exhaust valve tappet when the engine should immediately fire. **On multi-cylinder engines the other stud should be pulled out immediately after.**

21. As soon as the engine has attained its normal speed, open the compression ratio changeover valve by screwing the hand wheel(s) outwards until it (they) come(s) to a stop.

22. NOTE. When Changeover Valve is screwed in it beds against seating at A Fig. 3; when screwed out, against seating at B. These seatings should be kept free from carbon. This can be done by turning valve hand wheel backwards and forwards once or twice before leaving in final position, tight up.

23 After first starting twin cylinder engine, it is important to glance at Lub. Oil Pressure Gauge (Fig. 2a). If on turning on the small tap underneath the gauge, the gauge does not indicate that oil is circulating, stop the engine, unscrew the gauge, and pour oil into the pump to prime it. Replace gauge. Do not leave tap turned on, or gauge will quickly be worn out.

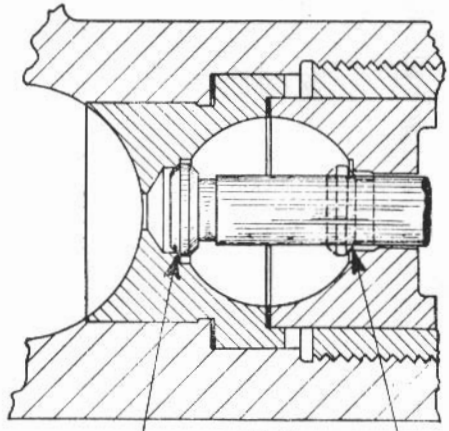


Fig 3
Illustration of
Change-over Valve.

To Stop

Push up Governor Lever Handle.

If frost is probable, drain cylinder jacket also water circulating pump if fitted.

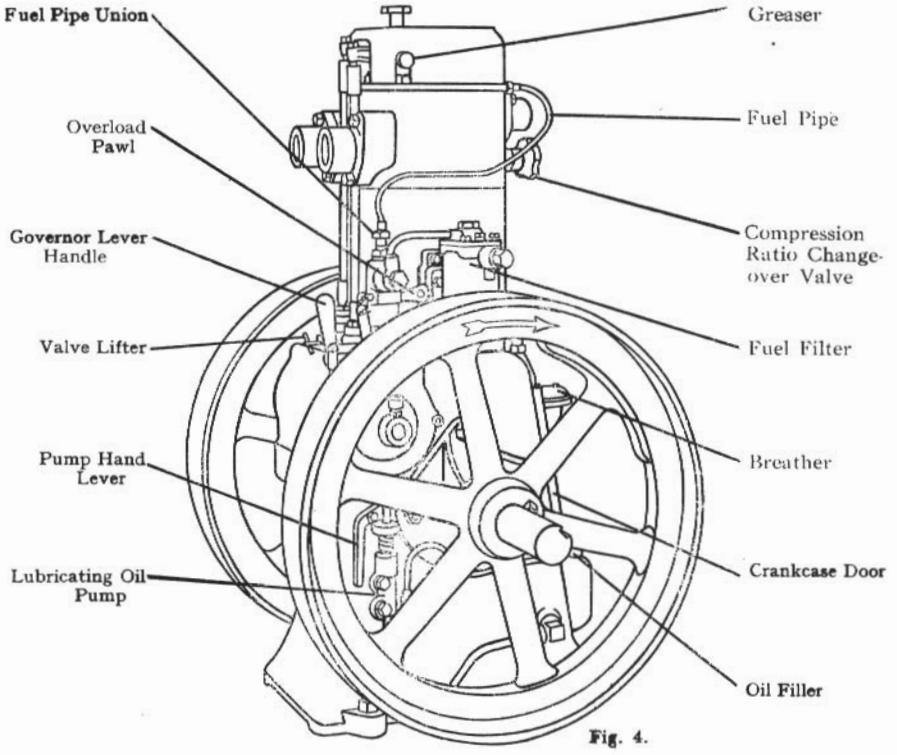


Fig. 4.

GENERAL

NOTE.—The working of a Diesel Engine is similar to that of a Petrol Engine in that it works on four strokes: 1, Suction; 2, Compression; 3, Power; 4, Exhaust. The following differences between Diesel Engines and Petrol Engines should be noted.

IN THE CASE OF THE DIESEL ENGINE

1. Air only is drawn in at the suction stroke.

2. The Fuel is sprayed into the cylinder at the top of the compression stroke where the heat caused by the compression of the air in the cylinder causes the Fuel to burn. There is no external method of igniting the fuel—i.e., no magneto, plug, or hot tube.
   From the above it will be realised that "Compression" becomes of vital importance, and valves, piston rings, and joints, must be kept in perfect condition. The fuel pump and injector should be left severely alone except for the treatment specified in the following pages.

THE FOUR STROKE CYCLE DIESEL ENGINE

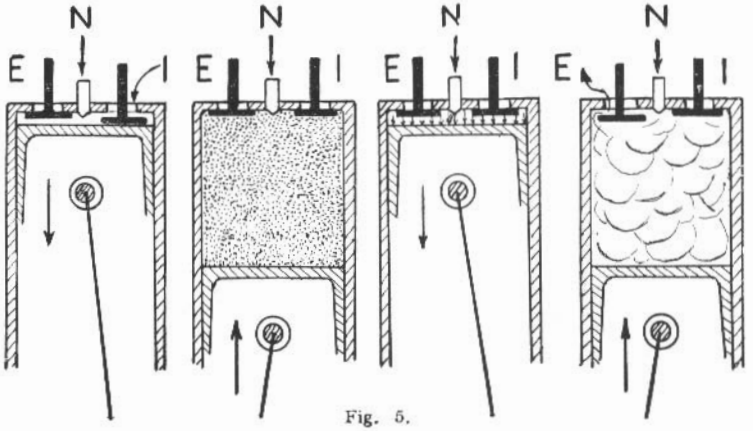


Fig. 5.

1st Stroke	2nd Stroke	3rd Stroke	4th Stroke
Inlet valve Open. Air Sucked in.	All valves closed. Air Trapped.	All valves closed. Air compressed, fuel injected.	Exhaust valve open. Gases forced out.
SUCTION.	**COMPRESSION.**	**POWER.**	**EXHAUST.**

N — Nozzle. E — Exhaust Valve. I — Inlet Valve

Fuel

As different Fuels are available in different parts of the World, it has not been found practicable to recommend any particular fuel oil 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 Table I (High Speed Diesel Fuel) British Standard Specification No. 209, 1937, as under :—

Flash Point (Closed)	Min.	150° F.
Hard Asphalt Content	Max.	0.1%
Ash Content	,,	0.01%
Viscosity (Redwood No. 1) at 100° F.	,,	45 Seconds
Water Content	,,	0.1%
† Pour Point	,,	20° F.
Conradson Carbon	,,	0.2%
Sulphur Content	,,	1.5%
Distillation—Vol. to 350°C.	Min.	85%
‡ Aniline Point	,,	60°C.
Gross Calorific Value	,,	19,000 B.Th. U/lb.

† This limit is intended for Temperate Climates only.

‡ Tentative test for ignition quality (for fuel of petroleum origin only) pending the development of an engine test.

In any case the purchaser shall satisfy himself that his whole equipment is capable of dealing with the oil of the lowest temperature to which the oil will be exposed.

The following fuel oils have been used with satisfaction in these Engines :

Pool Gas Oil

(if other oils are not obtainable)

Shell Diesoline	*Essodiesel
*Light Diesoleum	" Essostat "
Shell Gas Oil	" Essogasol "
Diesovap (Petroleum Importing Co. of Glasgow).	
Texaco 811 Diesel Gas Oil	Vacuum Diesillate
Atlantic Diesol	Shell Diesolite
‡Digboi Diesel Oil	

(*These fuels are normally used for vehicles.)

(‡Principally available in Assam. Used satisfactorily above 60°F)

It must be understood, however, that different Fuel Oils become available in different areas and that variations in a particular brand of fuel oil may occur.

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

Residual Oils or blends thereof are frequently contaminated with foreign or abrasive matter which is apt to cause wear to the components of engine. For the same reason Motor Car Sump oil cannot be recommended.

Burning or Illuminating Paraffin oil (Kerosene) **may** be used as a fuel but only if an admixture of ½ pint of lubricating oil per 2 gallons of paraffin is made.

Vaporising Oils are unsuitable as Fuel for Diesel Engines.

In general, the fuel must be free from foreign matter otherwise excessive wear may take place, particularly in the fuel Injection system ; certain fuels are unsuitable owing to the excessive temperatures and pressures 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.**

Lubrication

GENERAL.

It **must** be realised that the lubricating oil used in Diesel Engines requires different characteristics to that used for Petrol Engines.

The following is the outline specification of an oil that has proved satisfactory for use with Lister Diesel Engines :—

	Temperate	Tropical
Specific Gravity ...	0.93	.90
Open Flash Point	410° F. (210° C).	425° F.
Viscosity at 70° F. ...	1035 Redwood Seconds.	2000 Redwood Seconds.
,, ,, 140° F. ...	112 ,, ,,	175 ,, ,,
,, ,, 212° F. ...	46 ,, ,,	58 ,, ,,
(Or Viscosity at	20° C. 34° Engler).	65.7° Engler.
,, ,,	50° C. 5.5° ,,	8.6° ,,
,, ,,	100° C. 1.6° ,,	2° ,,
Pour Test A.S.T.M.		5° F.

In order to assist our users in the matter we are in a position to supply a suitable oil under the name of " Listrol L.I." which can be obtained from our accredited agents in Great Britain or direct from our Works at Dursley.

This oil is packed as follows :—

40 gallon steel barrels
10 gallon steel drums
5 gallon steel drums
12 one gallon cans in case
6 one gallon cans in case
Single gallon cans

The following lubricating oils have been used with satisfaction in LISTER DIESEL ENGINES :—

Temperate Climate	Tropical Climate
LISTROIL LI.	SHELL CY2.
SHELL CY1.	VACUUM MOBILOIL 'A.'
VACUUM GARGOYLE D.T.E. Heavy Medium.	VACUUM D.T.E. Extra Heavy.
TEXACO MOTOR OIL D.	GERM OIL, GRADE M.H.
GLICO DIESA MEDIUM	DUCKHAMS ADCOL R.J.
VALVOLINE DIESEL 306 Lubricating Oil.	TERESSO 60. (Standard and Esso products).
LISTER GERM OIL for Diesel Engines.	SILVERTOWN D3.
DUCKHAMS N.P.D.1.	TEXACO E.
PRICES DIESEL C.	WAKEFIELD DEUSOL 'O'
WELLSALINE G.18 No. 2 Engine Oil.	STERNOL DIESO 1404
WAKEFIELD DEUSOL 'G.'	GALENE MOTOR OIL S.A.E. 30
TYCOL GASOL 'B.'	
SILVERTOWN D2.	
STERNOL DIESO 4633.	
DIOL 55 (Standard and Esso products).	
THELSON Diesel Engine 'L'	

Most of the Lubricants used in Motor Car engines are too viscous for Diesel Engines and should not be used.

In **emergency** the following types of oil may be used, but their use should not be continued longer than is necessary :—

" Shell " Single or Vacuum " A," or any light grade of good quality motor car oil.

If for any reason it is desired to use an oil other than those mentioned on the previous page we would ask users to communicate with us, giving the name of the firm from whom it is desired to purchase supplies.

SYSTEM.

This is partly automatic and partly splash. The pump is of the plunger type operated by a special cam on the camshaft The suction valve of the pump is below oil level, thus giving positive action.

The Pump delivers a copious supply of oil to pockets which supply the main bearings. The overflow from these pockets flows into a trough in the crankcase from which oil is splashed over cylinder walls and connecting rod bearings, etc. by a dipper on the end of the connecting rod. The overflow from this trough returns to the oil reservoir in the base of the crankcase.

GENERAL ATTENTION.

Occasionally see that the oil level in the sump is maintained about one inch below the filler by adding fresh oil. See that recesses in cylinder head are kept filled for valve lubrication, and the tops of the push rods and tappets are filled with oil. With the exception of adding grease to the grease cup(s) for the valve rocker arms, no further attention to lubricatfon is necessary.

CHANGING OIL.

This will be necessary about every 2 or 3 months if the engine has been used every day. Customers should use their own discretion as to period between renewals of oil if engine has not been used so frequently. Remove Drain plug, and wipe out sump (through crankcase door) and refill engine as before.

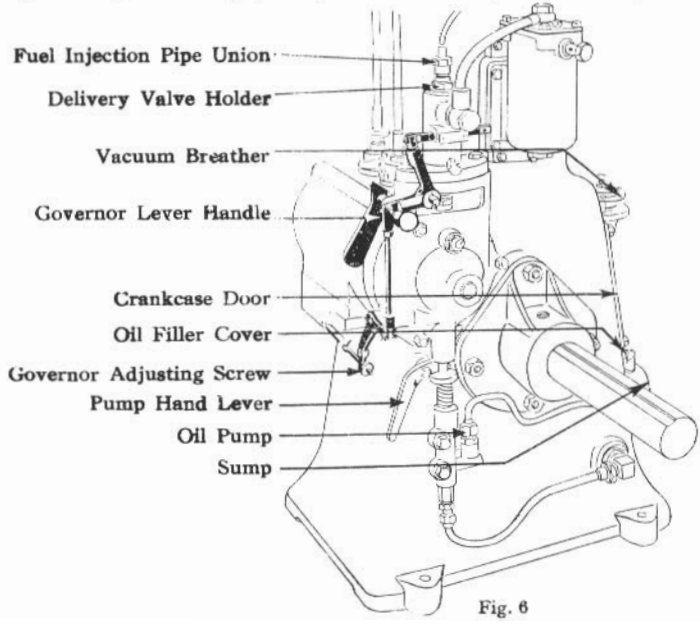


Fig. 6

OIL FILTER.

To clean filter, disconnect both ends of the copper pipe fixed to the lower part of the Lubrication oil pump.

Then unscrew the brass fitting to which the right hand end of the pipe was fixed. This will withdraw the filter.

The filter should be washed in paraffin (kerosene) and replaced by reversing the above process.

PRESSURE GAUGE (on 10·2 Engines). The cock should not be left turned on when engine is running otherwise the Gauge will become damaged, and useless.

Cooling

STANDARD RADIATOR.

If possible use rain or soft water, as hard water causes a deposit in cylinder and pipes.

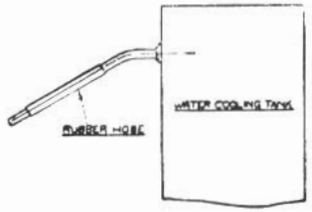
The object of the cooling system is to keep the temperature of the piston and cylinders below danger point, but at the same time to keep the engine hot to secure the maximum efficiency. The normal operating temperature is from 165° F. to 185° F. in the cylinder head

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

(a) Improper radiation, probably insufficient water in system.
(b) Fan Belt may be slipping.
(c) Water may be leaking from the radiator hose connections, etc.
(d) System may be clogged with sediment or scale
(e) Water pump (if fitted) may not be working properly.
(f) Radiator element clogged with dirt deposited by air passing through. The radiator should be inspected periodically to avoid this.

WATER TANK.

The tank should be so arranged that the outlet, about 3" from the bottom of the tank, is not lower than the inlet at the bottom of the engine cylinder, unless a circulating pump is fitted. The connection from the top of cylinder to the top of tank must slope upwards at every point, say 1 in 8, and on no account must there be any dip in this pipe.



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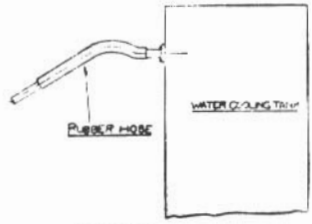


WRONG

It is essential that the water temperature at the engine be maintained between 165° and 185°F (75° and 85°C.) by checking over a reasonable period of normal running and adjusting the tap in the pipe connection, so that the amount of water circulating is restricted and the water temperature maintained as recommended. This should be carried out at the NORMAL load of the engine. This control can be effected automatically by fitting a thermostat in the pipe line which is a simple and inexpensive matter. (The temperature

of the water measured in the mouths of the pipe at the top of the Cooling Tank should be from 160° to 175° F. on the normal installation. This will vary in different cases.)

Keep water level above top connection in tank.

Before starting always see that there is no obstruction to water circulating, and that 3-way tap is on.

Turn on 3-way tap before refilling tank so as to avoid air locks.

In frosty weather drain cylinder jacket by turning 3-way tap so that cylinder and pipes are drained, but water remains in tank. Also open water jacket drain cocks.

REMEMBER THAT A DIESEL ENGINE IS A "HEAT" ENGINE AND THEREFORE IT SHOULD BE RUN HOT.

The water outlet pipe from the cylinders should be TOO HOT TO HOLD BUT—THE WATER SHOULD NOT BOIL.

WATER COOLING.

Hard water must not be used for cooling these engines. If only hard water is available it must be treated before use to a non-scalable degree by the use of a proprietary water softener or compound, such as D.M. Boiler Enamel, manufactured by Messrs. Houseman & Thompson, Ltd., Newcastle-on-Tyne. It is necessary to inspect the water spaces frequently and remove any scale or deposit; this is of particular importance if the water contains any trace of impurities, such as lime, chalk, and other vegetable matter. In all cases it is necessary to use clean rain water, or water which has been softened prior to use. With run-through circulation where the water runs to waste, the water must be softened prior to passing through the engine water jacket. It is of paramount importance to make frequent inspection of the engine water space, and precautions should be taken to prevent the ingress of foreign matter and to arrange for the appropriate method of cooling accordingly.

Exhaust

DIRTY EXHAUST.

It should be remembered that except on very light load, the exhaust should not be visible but if it is, **immediate investigation should be made** to ascertain the cause. Up to one third load, a clean exhaust can be attained by running the engine on high compression.

Black smoke in the exhaust is due to fuel and is usually caused by injection trouble, being consequent upon unsuitable fuel or poor spray due to faulty nozzle or indicates either excessive fuel or insufficient air. This may be due to overload and the absence of an overload stop, or a choked air cleaner.

(See separate instructions on page 19.)

Heavy blue smoke in the exhaust is due to lubricating oil getting past the piston and rings due to stuck rings, injection troubles, etc.

The engine should not be allowed to operate with a dirty exhaust.

LONG EXHAUST PIPES.

If a longer exhaust pipe than our standard bend must be fitted, this should at no point slope upward from the engine exhaust port unless a ground silencer is fitted close to the engine, or a suitable drain tap is fitted at the bottom of the pipe line, which tap should be opened before the engine is started up each time, otherwise moisture due to condensation in the cool pipe will drain back

into the cylinder head and cause damage. If more than 6 feet of pipe is fitted the bore must be increased to avoid risk of back pressure, and this increase will meet the case up to 10 feet of straight piping. For any length greater than 6 feet in which bends are included, and for any length above 10 feet, we recommend that an expansion chamber should be fitted in the pipe line close to the engine. This can be used with our standard bore of piping, unless the outlet from the expansion chamber is to be of any considerable length, in which case the bore should be increased.

If extra silencing is required two expansion chambers can be employed.

We can supply suitable expansion chambers, and additional information on request.

CLEANING EXHAUST SYSTEM.

It is important that exhaust pipes be cleaned out when the engine is decarbonised. It is essential that exhaust pipes should be easily accessible and not cemented in.

SIZES OF EXHAUST PIPES.

Up to 10 feet ...	... 2 in.
„ „ 20 „ ...	... 2½ in.
Above 20 „ ...	... 3 in.

Compression Changeover Valve

This is a device to give a very high compression for starting thus giving greater heat of compression for the ignition of the Fuel.

The handwheel screwed "in" gives High and "out" gives Low Compression.

DO NOT run on heavy load with High Compression.

For long runs at third load or lower use High Compression.

Always see that valve is either FULL SHUT or FULL OPEN.

Engines Working at an Altitude

Owing to the rarefied air at any considerable altitude, the cylinders of diesel engines receive a smaller charge of air and therefore develop a lowered power output.

The normal sea level rating of an engine should be reduced by 4% per 1000 feet of altitude over 330 feet above sea level.

The detrimental effect (apart from the loss of power) can be eliminated to some extent by slight adjustments to the Engine ; for instance, when running at over 8,000 ft. above sea level the Combustion Ratio Changeover Valve should be screwed right in.

Big End Bearings

They should be free but clearance must not exceed 3/1000 inch.

See that all oil holes are clean. This is very important, particularly after a big end failure, as frequently, portions of white metal are driven into the oilways in the big end.

Main Bearings

These are of the bush type and need no adjustment as long as the lubricating oil system does not fail through lack of oil.

See note above re cleaning of oilways.

TO TIME THE CAMSHAFT.

If for any reason the camshaft and timing wheels have been dismantled, the following method should be employed when re-assembling :—

Turn Crankshaft until the key-way is on the top.

Place camshaft so that tooth marked "I" on governor gear wheel meshes with tooth marked "I" on idler pinion "B."

Slip idler pinion into position and ensure that the nut on idler pinion spindle is fitted with a locking washer properly tightened after operation is completed (The "O" on crankshaft pinion "C" will then mesh with "O" on idler pinion "B").

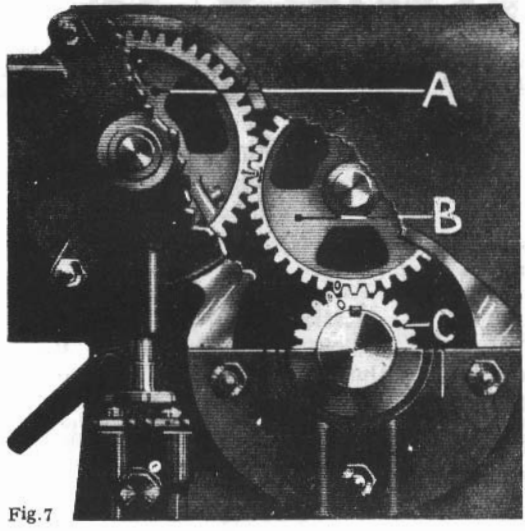


Fig.7

Cylinder Head

TO REMOVE.

1. Remove cylinder head Cover.
2. Remove Injector. See page 20.
3. Detach Inlet pipe. Exhaust pipe. Water pipe.
4. Remove Valve Rocker shaft and valve rockers by removing nuts and lifting off rocker gear.
5. Lift out Valve push rods.
6. Remove holding down nuts.

7. Lift off Cylinder Head. In obstinate cases, replace the injector (but **not** the fuel inlet pipes) and also valve rockers ; replace valve push rods and cylinder head holding down nuts, and slacken each of these H.D. Nuts about 2 turns each.

Next proceed as for starting, with the valve lifter stud under the exhaust valve tappet "in," turn the starting handle quickly to get a good speed and then smartly pull out valve lifter stud when the compression in the cylinder should cause loosening of the joint between cylinder head and crankcase.

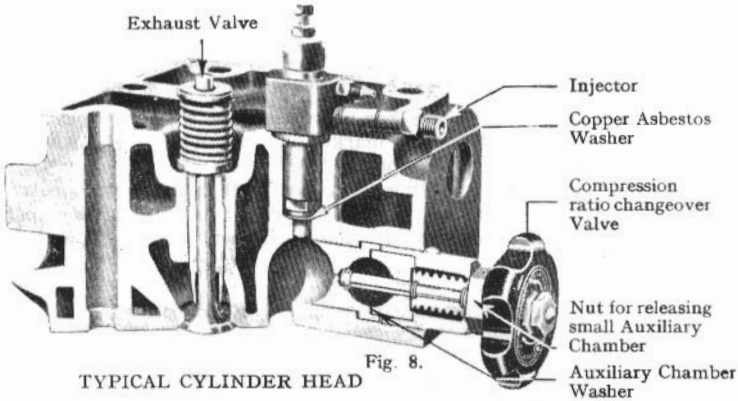


Fig. 8.
TYPICAL CYLINDER HEAD

The LISTARD Cylinder

(Van der Horst Patents)

The following points should be noted to get the best results from the "Listard" Processed Cylinder now included in the Lister Diesel Engines

Lubrication

Piston rings take longer to bed down in "Listard" Processed Cylinders than in softer cylinders. During this bedding down period the consumption of lubricating oil may be slightly higher than normal. Therefore, examine the lubricating oil level every 8 hours for the first 100 hours running with a new engine or after fitting new piston rings and replenish as described under the heading "Lubrication" Page 9.

Wear

Although the "Listard" surface is highly wear resisting it becomes polished with prolonged use. The greatest amount of wear will occur at the level of the top piston ring, when the piston is at the top of the stroke. Wear should not be allowed beyond a maximum of .0035 to .0040 (.1mm) in the diameter of the bore.

Overhauling

When the engine is dismantled for overhaul smear a coating of grease over the surface of the "Listard" cylinder liner bore. This can be wiped off when re-assembling. Use a good quality grease free from moisture.

TO REMOVE COMPRESSION CHANGEOVER VALVE.

1. Unscrew Large Boss.
2. This will withdraw the outer half of the outer combustion chamber.
3. The Main or inner combustion chamber plug must be loosened by compression in the manner described for cylinder head.

Drive a wooden plug hard into the $\frac{1}{4}$" dia. hole in the centre to prevent air leakage and then replace the outer portions just removed, with the hand-wheel in the "out" position, and with the outer combustion chamber nut screwed into the head with about 3 or 4 threads or turns which will be sufficient to prevent the inner combustion chamber from being ejected too violently when subjected to the force of compression.

NOTE.—Be careful of the copper washer between these two parts.

4. Unscrew small nuts in centre of hand wheel to extract valve.
5. Remove valve, taking care of spring and spring washer.

TO REMOVE VALVE GUIDES.

The inlet valve guide can be driven out.
The exhaust valve guide can be screwed out.

TO REPLACE CYLINDER HEAD.

1. Refit Valve Guides.
2. Refit Valves.
3. Refit Compression changeover Valve taking care that copper washer between two parts is in place.
4. See that Cylinder head gasket is in place and undamaged.

NOTE.—On 10-2 type Engines each Head must be replaced on its own Cylinder.

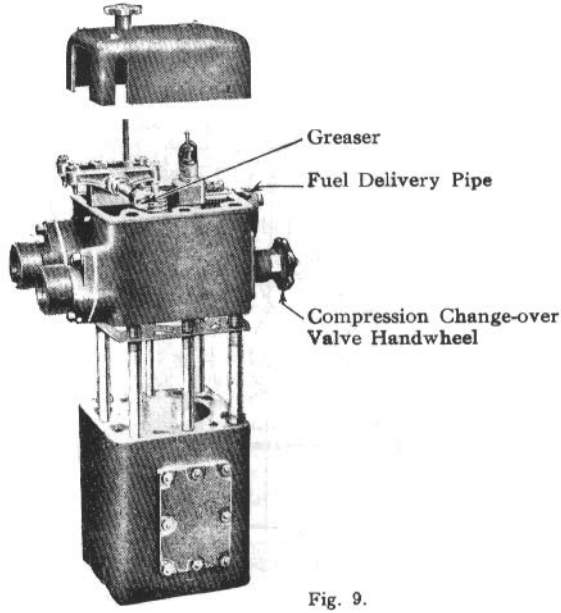


Fig. 9.

5. Replace Cylinder head on bolts, and tighten nuts finger tight.
6. (On 10-2 type engine only). Fit inlet manifold and exhaust manifold if supplied. This is necessary to ensure that all cylinder heads are in the correct position before tightening down the nuts. Failure to carry out this step will probably lead to cracked or broken manifolds.
7. Tighten down nuts by degrees, always diametrically opposite in succession—otherwise the head will be strained and the gasket will not seat properly.

TO REMOVE CYLINDER.

1. Remove Cylinder Head.
2. Detach water connection.
3. Lift off cylinder, taking care not to damage piston.

TO REPLACE CYLINDER.

1. See that paper washers are over bolts.
2. Slip cylinder over bolts taking care that Piston slides readily into the cylinder.
3. When home, cylinder and piston should be on level when piston is in its top position ; if not, adjust by removing or inserting paper washers below cylinder.

FUEL FILTER.

This should be cleaned out after every 500 hours running, as follows :—

1. Turn off fuel at tap in tank.
2. Disconnect the fuel outlet pipe from filter and plug the hole in cover.
3. Undo four nuts on top and remove cover together with the filter element.
4. Remove cage from filter element but do not remove the filter element from the cover.

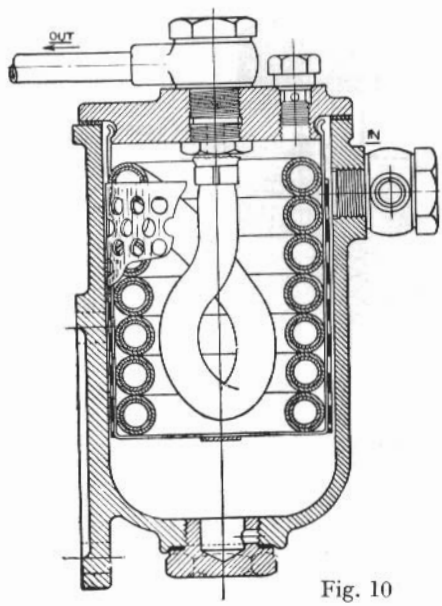


Fig. 10

5. Wash filter element in clean paraffin (kerosene) or fuel oil taking care that no dirt or dirty liquid gets to the inside of the filter element through the hole in the cover.
6. Remove drain plug from body and clean out body.
7. Re-assemble by reversing the above process.
8. Open vent screw on top of filter and prime fuel system (see page 21).
9. Should the element require replacing it is important that the cover is thoroughly cleaned before removing the old element. This will prevent fine particles of foreign matter entering threaded hole for the outlet connections.

Fuel Pump

Precaution to be observed when engine is to stand idle for lengthy periods.

When, after use, it is expected that the engine will not be used for a period of a month or longer it is recommended that the fuel oil is drained from the fuel pump and filter and that the latter is filled with a mixture of 75% White Oil, or medicinal paraffin, 25% illuminating paraffin (Kerosene) and that the engine is cranked over slowly until fuel pump is primed right through to the fuel injection pipe. When the engine is required to run again there is no need to drain the mixture from the filter as it will burn quite well as fuel. The reason for this is that it is found that ordinary diesel fuel may in time, especially in hot climates, dry on the fuel pump plunger causing it to stick very tightly in its barrel. When this occurs the fuel pump control rod is immovable. Should the control rod be found stuck in this manner it is most important that undue force is not used in an attempt to free it. The pump delivery union, delivery valve and spring should be removed and paraffin White Oil mixture should be injected down the fuel pump barrel. The control rod should be pushed backwards and forwards until it is working freely again. It must not be hammered free or internal damage to the fuel pump may result.

SETTING FUEL PUMP INJECTION.

With the governor handle in the RUNNING position place the crankshaft of the Engine in the firing position, which is approximately 20° before Top Dead Centre (T.D.C.). ($4\frac{1}{4}$ ins. on a 24" Flywheel.)

NOTE.—It is important that the correct T.D.C. be selected, i.e., at the end of the compression stroke, when both valves should be closed.

Disconnect the fuel injection pipe from the top of the pump and remove the delivery valve holder (See Fig. 6) and the delivery valve and spring. It is probable that fuel will immediately flow from the pump, in which case the flywheel should be rotated a few degrees forward or backward, as required, until the flow ceases. Replace the delivery valve holder without the valve and spring, tightening it up with a spanner. Now turn the engine backward slowly until the fuel recommences to flow, then turn the engine in the opposite direction, i.e., in the direction of rotation, until the fuel flow ceases. In checking this condition the fuel should be blown off the top of the delivery valve holder in order to make sure that the flow has definitely stopped. At this position the ⟋⟍ on the flywheel, which indicates injection, should be immediately opposite the centre of the cylinder Water Jacket coreplate, or of the fuel filter (if fitted). If not adjust the tappet underneath the pump until the condition is satisfied. Replace the delivery valve and spring, after washing them in paraffin (kerosene) or fuel oil, and reconnect the injection pipe. Prime the fuel injection pipe as instructed under "Before Starting Up."

This procedure must be adopted with both pumps of a twin cylinder engine.

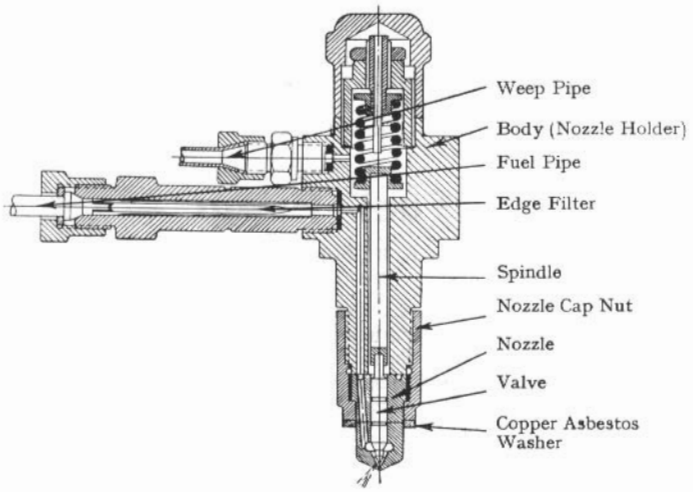


Fig. 11.

FUEL INJECTOR

FUEL INJECTOR.

To remove.

1. Remove cylinder Head Cover.
2. Disconnect fuel pipe and weep pipe.
3. Remove two nuts holding down Injector.
4. Withdraw injector.
5. Be careful not to lose copper asbestos washer round the nozzle. This sometimes remains in the cylinder head.

To Clean.

1. Grip injector upside down in vice by flats on the body.
2. Unscrew nozzle cap nut.
3. Remove nozzle together with its valve.
4. Remove valve and see that the jet is clean, if not, clean it with a piece of fine wire or pricker and clear all fuel channels in the nozzle.
5. Wash nozzle and valve in clean fuel oil thoroughly.
6. Test the nozzle valve by holding the nozzle upright, raise the valve about 1/16 in. and release it. The valve should drop back smoothly on to its seat.
7. If the valve doesn't do so rinse again using a piece of wood (not metal) to clean the inside of the nozzle.
8. If the valve cannot be freed fit a new nozzle, do not attempt to grind the valve in.
9. Refit nozzle—care being taken that the positioning pins fit their holes and screw nozzle cap nut down tight.

After Cleaning Injector.

1. With the fuel pump control in the starting position crank engine over by hand until fuel free from bubbles is pumped out of the uncoupled end of the fuel pipe—fuel pump to injector.
2. Connect injector to pipe, avoiding spilling of fuel from pipe, and leaving the union nut on the injector a few turns slack.
3. Again crank the engine until all air bubbles have been expelled from this loosely coupled connection.
4. Tighten union nut, and again crank the engine slowly. Within a dozen turns the spray should be delivered from the nozzle. This spray should be in the form of a fine mist.

To Adjust.

It is recommended that the injection pressure should be checked periodically and re-adjusted if necessary. This should be done by fitting the injector to an injection pressure measuring device of approved pattern We shall be pleased to give further information about such devices on request. The pressure at which the injector should be set is :—

100 atmospheres (1470 lbs. per sq. in.) for 3-1 Engines, or
75 atmospheres (1100 lbs. per sq. in.) for 5-1 & 10-2 Engines

To Replace.

1. See that the copper asbestos washer is either on the nozzle of injector or in the recess in Cylinder Head.
2. Insert Injector.
3. Screw on nuts, tightening both evenly.
4. Connect up pipes.

NOTE.—The Final test that injectors are working satisfactorily is as follows :—When crankshaft is rotated with controls set as for starting,

1. A creaking noise can be heard as the nozzle works.

TO PRIME THE FUEL SYSTEM.

Prime the filter by (using spanner) unscrewing vent screw on top of filter until the oil flows freely through, the union is then to be re-tightened.

Turn governor lever handle upwards to " Stop " position.

As it is HIGHLY IMPORTANT that all air should be removed from the fuel pump and fuel valve, in order to prime the fuel system, disconnect the fuel injection pipe from the delivery valve holder on the fuel pump by unscrewing the union.

Then remove the delivery valve holder and spring, and with the fingers slightly raise the delivery valve from its seating; as soon as this is done fuel should appear. The delivery valve should be held off its seat until all air bubbles are out of the system and until a solid column of fuel oil appears. Then replace the delivery valve holder and spring and tighten down the holder carefully and not too vigorously, so that the body of the fuel pump is not distorted.

The fuel injection pipe should now be connected again to the fuel pump, but in order to see that no air is present in the fuel pipe loosen the fuel pipe union at injector.

Then turn the governor lever handle downwards to the "Start" position.

Then put the starting handle on the crankshaft and put the compression release stud under the exhaust valve tappet in order to lift the exhaust valve. Then turn the crankshaft until fuel free from air bubbles appears at the fuel pipe injector union. Tighten fuel pipe union.

Finally, in order to make absolutely certain that a solid column of fuel is reaching the fuel valve, and that no air is present, if fuel is present without air a definite creak will be heard in the fuel valve.

On 10-2 type engines this procedure must be carried out on both pump elements.

Piston

TO REMOVE PISTON.

1. Remove Cylinder Head (See page 15).
2. Remove Cylinder (see page 18).
3. Remove spring clip from one end of Gudgeon Pin.
4. Remove Gudgeon Pin and lift off Piston.

TO REMOVE PISTON RINGS.

First work them loose; spring them open and push strips of thin metal between the rings and the piston at four different points and work the ring off along the strips of metal; repeat this process for each ring; care must be taken not to use force otherwise the rings will be distorted or broken.

TO REPLACE PISTON RINGS.

Clean Piston thoroughly paying particular attention to the ring grooves and oil holes. Reverse the above process. Rings should be replaced in their own grooves.

TO FIT NEW PISTON RINGS.

1. Clean Piston and Ring Grooves thoroughly.
2. Roll ring round groove to ensure that it does not bind.
3. Place ring in lower part of cylinder to see that the gap between these two ends of the ring is correct. (.012" to .016").
4. Wash ring and piston in Paraffin or Fuel Oil.
5. Place rings on Piston as above.

TO REPLACE PISTON.

See that all oil holes are clean.

Reverse the process of " To Remove Piston " (see above).

IMPORTANT. Piston and cylinder bore must have plenty of Oil on working surfaces when final assembly is made.

Valves

ADJUSTMENT.

Inlet Valves should be set to 17/1000 clearance when COLD.
Exhaust ,, ,, ,, ,, ,, 32/1000 ,, ,, COLD.

To do this, slack off the locknut on top of the Valve Rocker, turn the adjusting screw by means of a screw driver until the correct clearance is obtained between the valve and rocker and then tighten the locknut.

NOTE.—During this operation the valve tappet must be in its lowest position, and the rocker pressed firmly down on the tappet rod. See that compression release stud is clear of exhaust valve tappet.

To ensure that the tappet is in its lowest position, turn the Engine till the valve is fully open—then turn the crankshaft one complete revolution.

TO REMOVE VALVES.

1. Remove Cylinder Head. See page 15.
2. Remove valve stem caps.
3. Lay head upright on bench.
4. Depress valve spring carrier by pressing down with screw driver.
5. Remove valve stem cone (in two halves).
6. Remove valve spring carrier, and valve springs.
7. Turn Cylinder Head over, and remove valves.

TO REPLACE VALVES.

Reverse the above process.

TO GRIND IN VALVES.

Take out the valves and examine the contact on the seats, and if this is bright all round and the full width of the seat the valve is in good order and can be replaced after wiping the spindle clean ; but if blackened or rusted in places, or pitted with small black holes on the line where the seat should be the valve must be re-ground. To do this, apply some flour emery powder or fine valve grinding paste to the face of the valve, then twist the valve backwards and forwards smartly upon its seat for two or three minutes, exerting a little pressure, lifting occasionally, and turning around to different positions. Take out the valve ; wipe the face and seat clean and dry and then replace valve and turn it round on its seat a few times ; then withdraw, and see if both valve and seat show a bright line all round ; if not, repeat the grinding until this is obtained. An accurate way of testing the bedding of the seat is to put broad chalk lines at intervals of about $\frac{1}{2}$" all round across the seat of the valve, down the centre of each chalk line put a pencil mark and replace the valve carefully, giving it a turn of a $\frac{1}{4}$" under gentle pressure ; if the seat is good each of the pencil lines will be cut across on the line of the face and if any are not so cut the valves require further grinding.

Valve Tappets must be adjusted after Grinding in Valves.

Vacuum Breather

The purpose of the vacuum breather on the crankcase is to maintain a vacuum in the crankcase so that the lubricating oil will not work out through the bearings. This valve should not be tampered with The screw holding it on should be kept tight.

Speed Regulation

Should a slight adjustment in speed be required, this can be made by screwing inwards the adjusting screw to increase the tension on the governor spring. This increases the speed, and by screwing out the adjusting screw the tension on spring is eased and so the speed is dropped slightly.

N.B.—THE NORMAL SPEEDS MUST NOT BE ALTERED ABOVE 2½% WITHOUT FIRST CONSULTING US.

Decarbonising

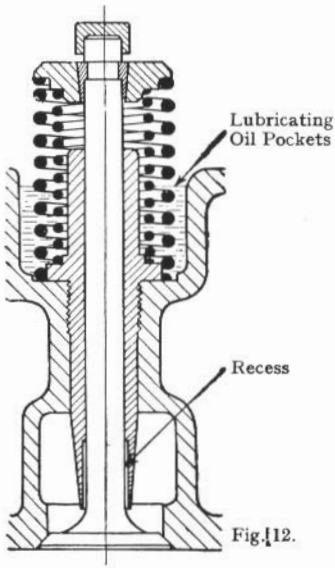


Fig. 12.

ENGINE SHOULD NOT BE RUN MORE THAN 500 HOURS WITHOUT DECARBONISING.

1. Remove Cylinder Head (see page 15)
2. Remove Compression-change-over Valve (see page 17).
3. Remove Valves (see page 23).
4. Withdraw Piston (see page 18).
5. Remove Piston Rings (see page 22).

ALL PARTS must be scraped clean of carbon and dirt and washed in Paraffin before re-assembly.

Special care must be taken with regard to :—

(a) Valve Guide (Recess in bore of guide). (See drawing).
(b) Valve Ports.
(c) Piston Ring Grooves.

Valves should be inspected and ground in, if not in perfect condition. This applies also to the change-over-Valve.

Clean out all exhaust piping, expansion chambers, silencers, etc.
Re-assemble by reversing the above process.
Every part must be scrupulously clean before being placed in position.

Fuel Storage

These notes are prepared to assist users of Lister Diesel Engines in supplying their engines with a clean fuel, thus ensuring conditions most favourable for trouble-free operation.

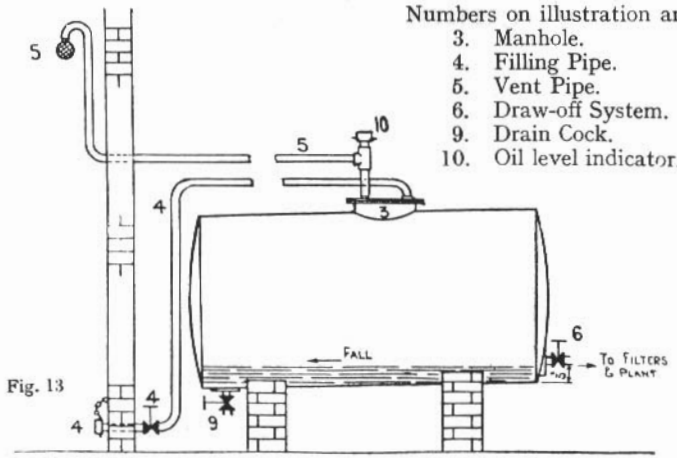


Fig. 13

Numbers on illustration are :

3. Manhole.
4. Filling Pipe.
5. Vent Pipe.
6. Draw-off System.
9. Drain Cock.
10. Oil level indicator.

1. Buying Fuel. The user should first be certain that the fuel he is buying is of a grade suitable for his engine, and that it is supplied to him as clean as is commercially possible. It is preferable to take delivery of a large quantity of fuel at infrequent intervals rather than taking frequent deliveries of small quantities of fuel oil.

2. Storing Fuel. Fig. 16. Fuel is best stored in a tank mounted on a brick or concrete cradle, allowing sufficient room underneath for the drawing off of any sediment or condensation water. Storage tanks should preferably be of welded construction, thoroughly cleaned inside and out before putting into service, and should be painted on the outside with a protective coating. They should preferably be installed under cover, and in a sheltered position. The fuel outlet should be located at one end of the tank, about three inches above the bottom, and an ample size of drain cock should be located underneath the tank at the opposite end. The tank should slope downwards from the fuel outlet end to the drain cock end with an inclination of between $\frac{1}{4}$" and $\frac{1}{2}$" per foot. The filler connection should be arranged on the top of the tank, and should consist of as short a pipe as possible, threaded to suit the hose pipe of the oil supplier. When not in use it should be closed by means of a dust cap which is retained by a chain. Fig. 14. The English size for oil storage tank filler pipe is $2\frac{1}{2}$" diameter screwed with a British standard gas thread. A vent pipe should also be mounted on the top of the tank, terminating in a goose-neck protected by a wire cage. The filler and vent pipe can, with advantage be mounted on a manhole cover which should be provided for cleaning purposes, and should not be less than 24" diameter. For checking the oil depth a dipstick hole with a protective cover is effective.

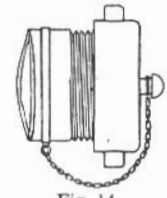


Fig. 14

A filter of large capacity should be provided in the draw-off system.

IMPORTANT.—See that the service tank is full before a new supply of fuel is put in storage tank. This gives the fuel in storage tank time to settle down after replenishing.

Before taking fresh supplies of oil into the tank the drain cock should be opened to draw off the accumulated water of condensation, together with any dirt and dust which has deposited.

In some cases, where only a small quantity of fuel is consumed, it may not be feasible to install a storage tank. In these instances fuel is usually delivered in drums of approximately 40 gallon capacity. In such cases the drums should be mounted in a horizontal position on blocks or trestles, Fig. 15, sufficiently high above the ground to permit the fuel being drawn off into a receptacle of ample capacity without the necessity of rocking or tipping the drum. It is most important that the fuel in the drums should have the best possible chance of settling o that any foreign matter which may be in the oil can sink to the bottom. For this same reason it is not advisable to use the last dregs out of a fuel oil drum, since these dregs are almost certain to contain a certain amount of foreign matter which may harm the fuel pump and fuel injector. Attention should be paid to the cleanliness of the receptacle in which the fuel oil is carried from the storage tank to the service tank on the engine. If these are not cleaned out after use and before use, a certain amount of dirt is bound to get into the fuel oil from this source, since the very sticky nature of fuel oil invites all sorts of grit and dust to stick to the sides of the receptacle and thus find its way into the fuel oil. It is a good plan to have a second drum mounted ready for use. The fuel in this drum then has ample time to settle down before any is drawn off.

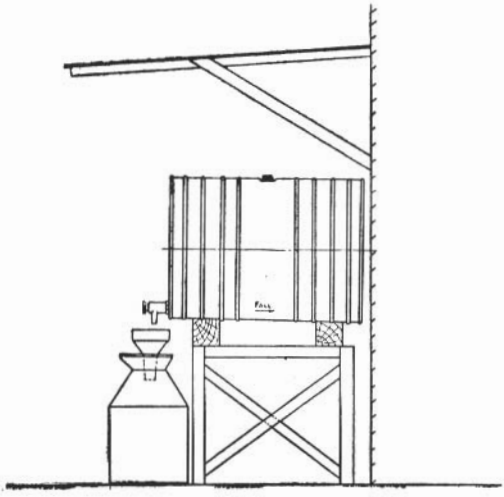


Fig. 15

Advice about the attention necessary for the service tank will be found on page 1 and the engine fuel filter on page 18 and 19.

How to Deal with Possible Trouble

DIFFICULT STARTING

This may be due to :—

1. Injector not acting properly.

2. Loss of Compression.

Piston or Rings faulty

Cylinder badly worn—see page 16

KNOCKING.

This may be caused by :—

1. Valve, probably exhaust, sticking in guide and touching Piston—Clean Valves ... ... Page 22
2. Injection too early—Check Setting ... ... Page 20
3. Big end or main bearing Slack—Fit new Bushes

CARBON DEPOSIT.

Excessive deposit may be due to :—

1. Late injection of Fuel—check setting ... ... Page 19
2. Injector not acting correctly—clean it ... ... Page 20
3. Too long, too small or choked Exhaust Pipe ... Page 12
4. Unsuitable lubricating oil ... ... Page 9
5. Unsuitable Fuel ... ... Page 8

DIRTY EXHAUST.

This may be caused by :—

1. Engine overloaded
2. Injector not working properly ... ... Pages 20 & 21
3. Choked Exhaust Pipe ... ... Page 12
4. Unsuitable Fuel or water in Fuel ... ... Page 8
5. Compression Changeover Valve left in Starting position
6. Lubrication oil passing piston Rings

STICKY PISTON.

This may be caused by :—

1. Unsuitable lubricating oil ... ... Page 9
2. Too much lubricating oil ... ... Page 9
3. Unsuitable Fuel ... ... Page 8
4. Incorrect timing of Fuel Injection ... ... Page 19
5. Engine too cool ... ... Page 11
6. Restricted Exhaust ... ... Page 12

ENGINE STOPS.

This may be due to :—

1. Overload
2. Lack of Fuel—Choked Injector or Pipe Line, Tank empty, Air in Pipe Line ... ... Pages 19 & 20
3. Water in Fuel ... ... Page 8
4. Overheating—
   No Water
   No Lubrication

LOSS OF POWER.

This may be due to :—

1. Loss of Compression, vide " Difficult Starting "
2. Incorrect Tappet clearance ... ... Page 22
3. Compression Changeover Valve left in Starting position
4. Choked Exhaust Pipe ... ... Page 13
5. Fuel Injection incorrect due to :—
   Injector out of order ... ... Pages 20 & 21
   Pump timing incorrect ... ... Page 19

IMPORTANT

SPARE PARTS.—Directions for Ordering.

Always state **Engine type, No., Specification No., Part No.,** and **Description of Part,** for which spares are required. The No. and Specification No. will be found on brass plate attached to Crankcase. The Engine No. is also stamped on Flywheel rim.

EXAMPLE:— Part No. 10-3-130.
Description of Part, Valve Spring Carrier.

The above information is necessary for us to identify the parts you require and failure to observe these directions will inevitably cause delay due to correspondence or disappointment in receiving parts which you do not require, and which will not suit your engine.

FOR SERVICE—Phone DURSLEY 2371 (9 lines)

ENGINE SPARE PARTS 3-1, 5-1 AND 10-2 RANGE

3-1 Engine Specification No.	Commencing at Engine No.
5-1 Engine Specification No.	Commencing at Engine No.
10-2 Engine Specification No.	Commencing at Engine No.

1. List is arranged with each assembly in alphabetical order.

2. The following sections are listed but not illustrated:—Flywheel, Fuel Tank, Pulley, Radiator, Silencer, Spanners, Starting Handle, Water Tanks and Fittings.

3. When ordering spares, please state, Engine Specification No., Engine No., Name of Part and Part No.

4. Prices and Figures in this list are subject to revision without notice, and previous issues are hereby cancelled.

5. Alteration slips will be issued when a change is made, and it is essential that these are stuck on the page where the alteration is to apply.

6. Example in making use of the list. Part required—**Lubricating Oil Pump Plunger for 3-1 Engine.**

   Follow in alphabetical order to "Lubricating" and see illustration. Against the required part, the illustration No. **367** is given. Opposite **367** in the spares list, a part No. 8-2-137 is listed together with the price.

N.B.—Do **not** quote Illustration No., always quote Part Nos. **when ordering.**

CAMSHAFT 3-1, 5-1 ENGINES

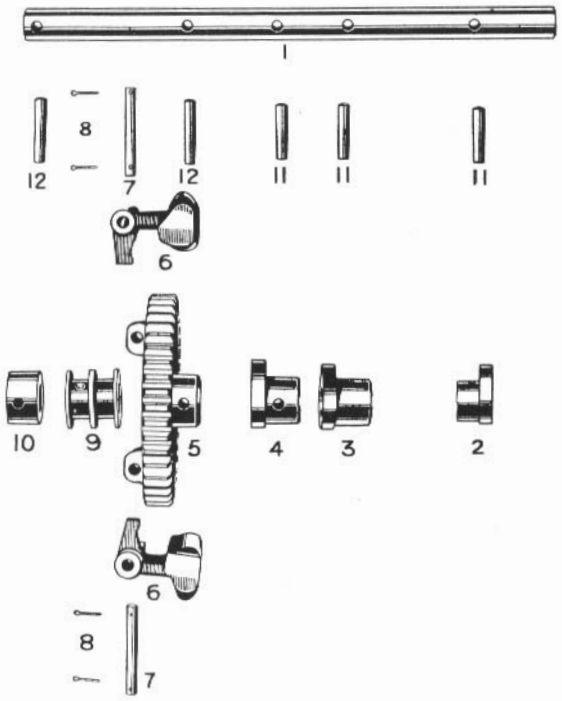


Illustration No.	Description of Part.	Order Part No.	No. per Set. 3-1	5-1	Price each £ s. d.
	CAMSHAFT complete ... ... comprising the following parts :	3151DC	1	1	
1	**Camshaft**	3151	1	1	
2	**Cam** (for Fuel and Lub Oil Pump) ...	5-1/B124A	1	1	
3	**Cam** (for Exhaust Valve)	3192	1	1	
4	**Cam** (for Inlet Valve)	3191	1	1	
5	**Governor Gear Wheel**	3166	1	1	
6	Governor **Weight**	3167	2	2	
7	Governor Weight **Spindle**	3168	2	2	
8	Governor Weight Spindle **Split Pin** ...	S909	4	4	
9	Governor **Sleeve**	3165	1	1	
10	**Collar**	5-1/F54	1	1	
11	**Taper Pin** No. 6 1½" long for Cams ...	S367	3	3	
12	**Taper Pin** No. 6 1¾" long for Gear Wheel	S130	2	2	

CAMSHAFT IDLER 3-1, 5-1, 10-2 ENGINES

Illustration No.	Description of Part.	Order Part No.	No. per Set. 3-1	5-1	10-2	Price each £ s. d.
13	**Idler Spindle**	5-1/B29	1	1	1	
14	Idler **Pinion**	3185	1	1	1	
15	Idler Pinion **Washer**	S394	1	1	1	
16	Idler Pinion **Nut** ¼ Whit.	S4	1	1	1	

CAMSHAFT 10-2 ENGINE

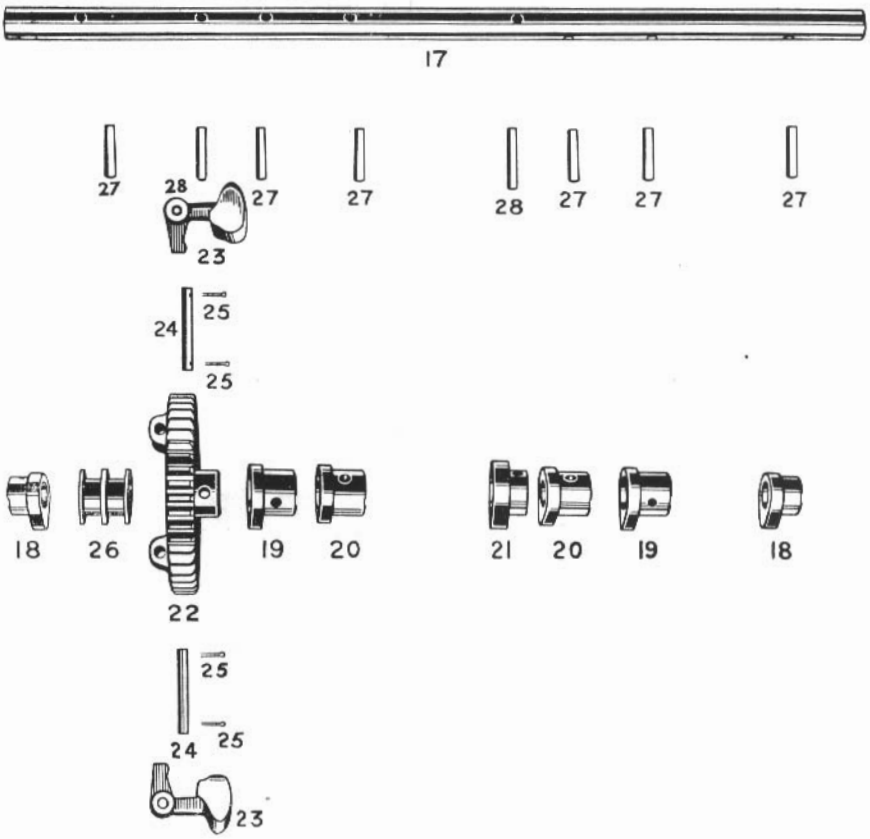
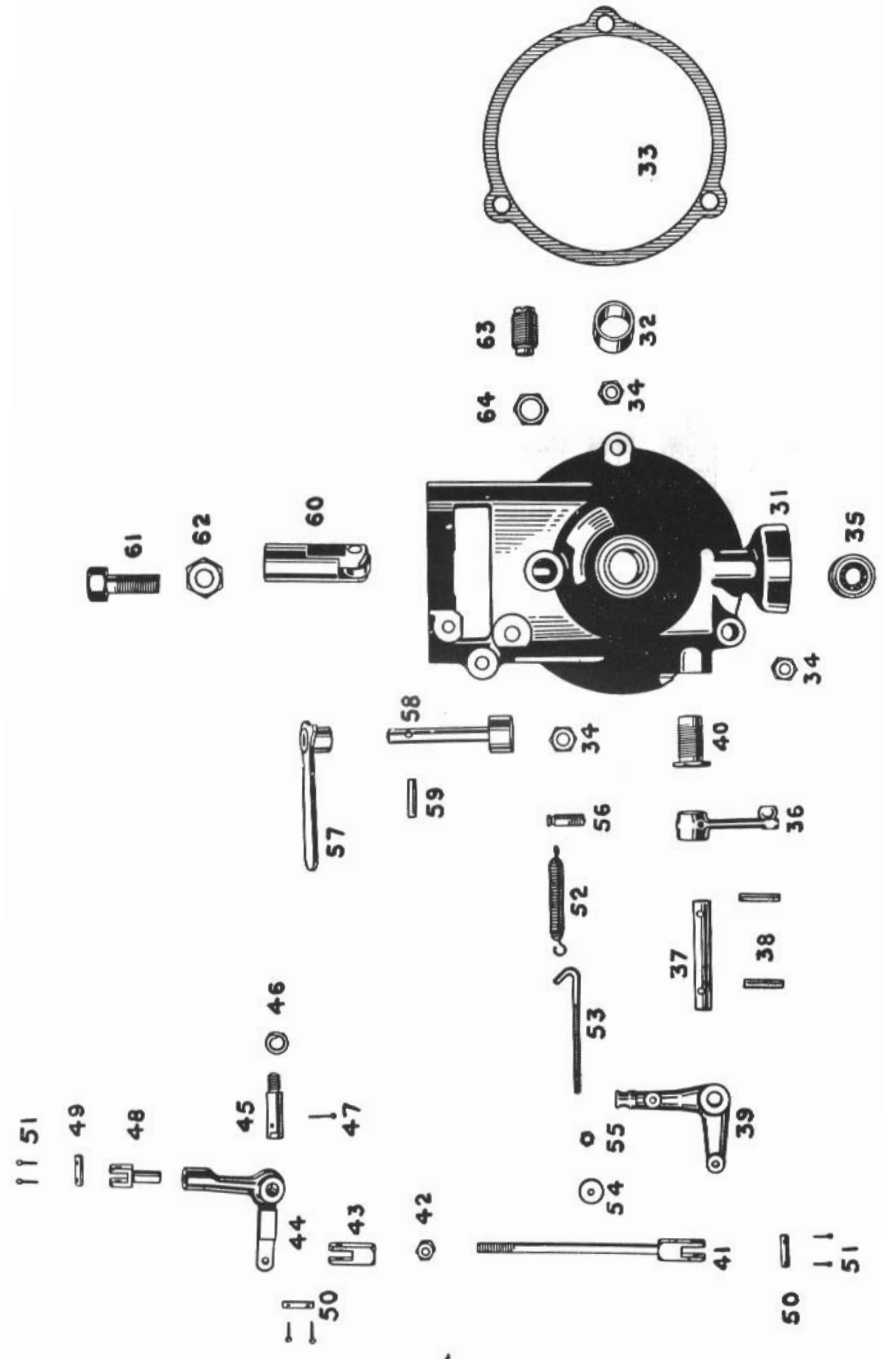


Illustration No.	Description of Part.	Order Part No.	No. per Set.	Price each. £ s. d.
	CAMSHAFT complete ... ... comprising the following parts :	10-2/F1C	1	
17	**Camshaft**	10-2/F1	1	
18	**Cam** (for Fuel Pump)	5-1/B124A	2	
19	**Cam** (for Exhaust Valve)	3192	2	
20	**Cam** (for Inlet Valve)	3191	2	
21	**Cam** (for Lubricating Oil Pump)	3329	1	
22	**Governor Gear Wheel**	3166	1	
23	Governor **Weight**	3167	2	
24	Governor Weight **Spindle**	3168	2	
25	Governor Weight Spindle **Split Pin** ...	S909	4	
26	Governor **Sleeve**	3165	1	
27	**Taper Pin** No. 6 1¼" long for Cams ...	S367	7	
28	**Taper Pin** No. 6 1¼" long for Gear Wheel	S130	1	
	Camshaft **Centre Bearing**	12157	1	

CAMSHAFT END COVER AND OUTSIDE GOVERNOR FITTINGS
3-1, 5-1 ENGINES

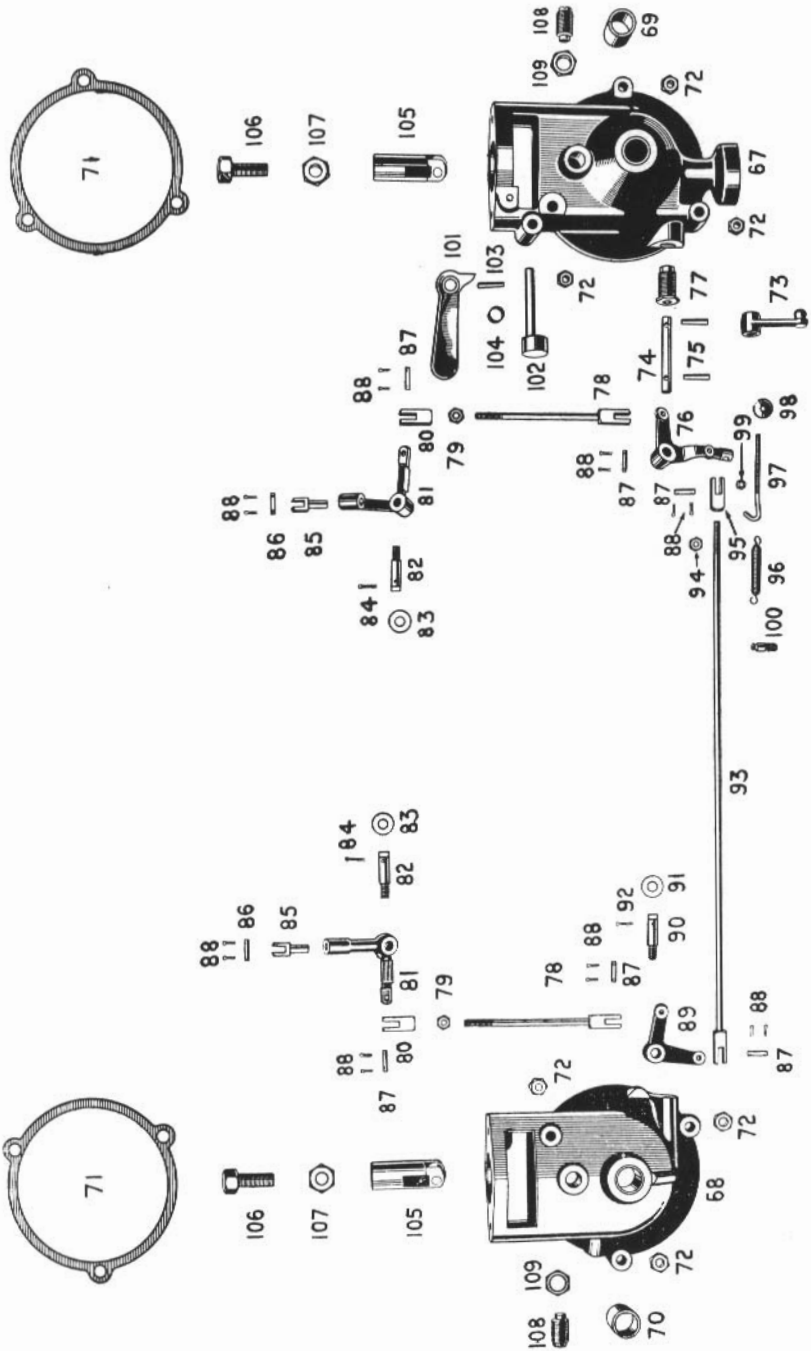


CAMSHAFT END COVER AND OUTSIDE GOVERNOR FITTINGS

3-1, 5-1 ENGINES

Illustration No.	Description of Part.	Order Part No.	No. per Set. 3-1	5-1	Price each £ s. d.
31	**Camshaft End Cover** with **Bush** 5-1/F2...	8-2-138B	1	1	
32	Camshaft End Cover **Bush**	5-1/F2	1	1	
33	Camshaft End Cover **Joint**	3153	1	1	
34	Camshaft End Cover **Nut** $\frac{3}{8}$ Whit.... ...	S6	3	3	
35	Camshaft End Cover **Gits Oil Seal** ...	8-2-177	1	1	
36	**Governor Inside Lever** with Roller 3172 and Pin 3173	5-1/F12AC	1	1	
37	Governor Inside Lever **Spindle**	5-1/F76	1	1	
38	Governor Inside Lever Spindle **Taper Pin**	S132	2	2	
39	Governor **Bottom Lever**	5-1/F78	1	1	
40	Governor Bottom Lever **Bush**	5-1/F77	1	1	
41	Governor **Connecting Rod** with Fork 3375 and Rivet 27/1529	5-1/F80C	1	1	
42	Governor Connecting Rod **Lock Nut** $\frac{1}{4}$ Wh.	S8	1	1	
43	Governor Connecting Rod **Fork**	12380	1	1	
44	Governor **Upper Lever**	5-1/F56	1	1	
45	Governor Upper Lever **Fulcrum Pin** ...	12381	1	1	
46	Governor Upper Lever Fulcrum Pin **Washer**	S184	1	1	
47	Governor Upper Lever Fulcrum Pin **Split Pin**	S122	1	1	
48	Governor Upper Lever **Eye End**	5-1/F83	1	1	
49	Governor Upper Lever Eye End **Joint Pin**	5-1/F33	1	1	
50	**Joint Pin** (for Forks)	3376	2	2	
51	**Split Pin**	S122	6	6	
52	**Governor Spring**	T192	1	1	
53	Governor Spring **Hook**	3176	1	1	
54	Governor Spring Hook **Adjusting Nut** ...	3177	1	1	
55	Governor Spring Hook **Lock Nut** $\frac{3}{16}$ Whit.	S15	1	1	
56	Governor Spring **Anchor Pin**	3175	1	1	
57	**Cut Off Hand Lever**	5-1/F85	1	1	
58	Cut Off **Spindle and Eccentric**	5-1/F84	1	1	
59	Cut Off Spindle **Taper Pin**	S132	1	1	
60	**Tappet** (for Fuel Pump with Roller (5-1/B127) and Pin 5-1/B126)	5-1/B120C	1	1	
61	Tappet **Adjusting Screw**	5-1/B123	1	1	
62	Tappet Adjusting Screw **Lock Nut** ...	S864	1	1	
63	Tappet **Fixing Screw**	5-1/B129	1	1	
64	Tappet Fixing Screw **Lock Nut**	S17	1	1	
	Double Coil Spring Washer for cut off spindle	S699	1	1	

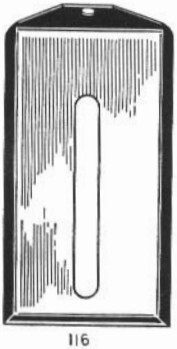
CAMSHAFT END COVER AND OUTSIDE GOVERNOR FITTINGS
10-2 ENGINE

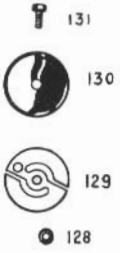


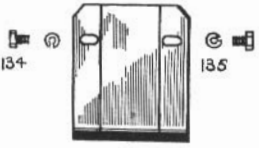
10-2 ENGINE

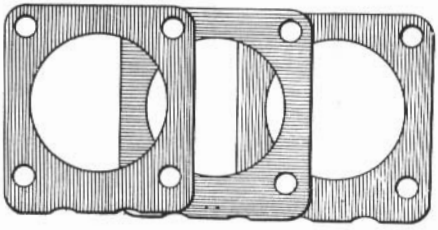
Illustration No.	Description of Part.	Order Part No.	No. per Set.	Price each £ s. d.
67	**Camshaft End Cover** (with Bush 5-1/F2)	9-2-138B	1	
68	**Camshaft End Cover** (with Bush 10-2/F3)	10-2/B165B	1	
69	Camshaft End Cover **Bush**	5-1/F2	1	
70	Camshaft End Cover **Bush**	10-2/F3	1	
71	Camshaft End Cover **Joint**	3153	2	
72	Camshaft End Cover **Nut** $\frac{3}{8}$ Whit. (Gov. end)	S6	3	
73	**Governor Inside Lever** (with Roller 3172 and Pin 3173)	5-1/F12AC	1	
74	Governor Inside Lever **Spindle**	5-1/F76	1	
75	Governor Inside Lever Spindle **Taper Pin**	S132	2	
76	Governor **Bottom Lever** R. H. side ...	5-1/F78	1	
77	Governor Bottom Lever **Bush**	5-1/F77	1	
78	Governor **Connecting Rod** (with Fork 3375 and Rivet 27/1529)	5-1/F80C	2	
79	Governor Connecting Rod **Lock Nut** $\frac{1}{4}$ Wh.	S8	2	
80	Governor Connecting Rod **Fork**	12380	2	
81	Governor **Upper Lever**	5-1/F56	2	
82	Governor Upper Lever **Fulcrum Pin** ...	12381	2	
83	Governor Upper Lever Fulcrum Pin **Washer**	S184	2	
84	Governor Upper Lever Fulcrum Pin **Split Pin**	S122	2*	
85	Governor Upper Lever **Eye End**	5-1/F83	2	
86	Governor Upper Lever Eye End **Joint Pin**	5-1/F33	2	
87	**Joint Pin** (for Forks)	3376	6	
88	**Split Pin**	S122	16	
89	**Governor Bottom Lever** (L.H. side) ...	10-2/F87	1	
90	Governor Bottom Lever **Fulcrum Pin** ...	12381	1	
91	Governor Bottom Lever Fulcrum Pin **Washer**	S184	1	
92	Governor Bottom Lever Fulcrum Pin **Split Pin**	S122	1	
93	**Connecting Rod** (for Bottom Levers) ...	10-2/F86	1	
94	Connecting Rod **Lock Nut** $\frac{1}{4}$ Whit ...	S8	1	
95	Connecting Rod **Fork**	12380	1	
96	**Governor Spring**	T192	1	
97	Governor Spring **Hook**	3176	1	
98	Governor Spring Hook **Adjusting Nut** ...	3177	1	
99	Governor Spring Hook **Lock Nut** $\frac{3}{16}$ Whit.	S15	1	
100	Governor Spring **Anchor Pin**	3175	1	
101	**Cut Off Hand Lever**	5-1/F85	1	
102	Cut Off **Spindle and Eccentric** ...	5-1/F84	1	
103	Cut Off Spindle **Taper Pin**	S132	1	
104	Cut Off Spindle **Spring Washer**	S699	1	
105	**Tappet** (for Fuel Pump, with Roller 5-1/B127 and Pin 5-1/B126)	5-1/B120C	2	
106	Tappet **Adjusting Screw**	5-1/B123	2	
107	Tappet Adjusting Screw **Lock Nut** ...	S864	2	
108	Tappet **Fixing Screw**	5-1/B129	2	
109	Tappet Fixing Screw **Lock Nut**	S17	2	
	Double Coil Spring Washer for fuel cut off spindle	S699	1	
	Camshaft End Cover Nut (Rear end) ...	S7	3	

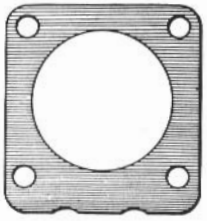
CRANKCASE FITTINGS 3-1, 5-1 ENGINES





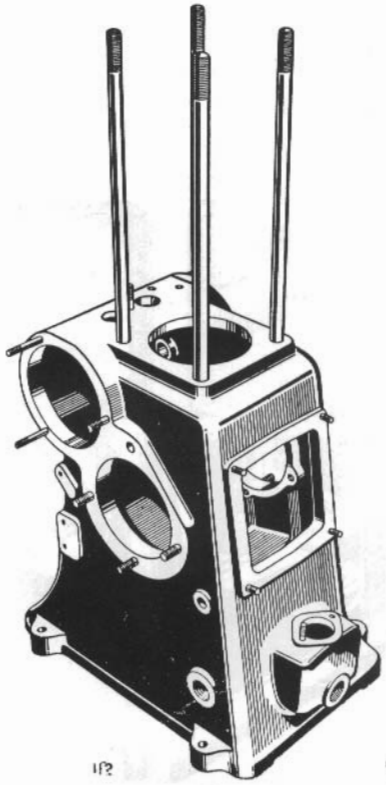


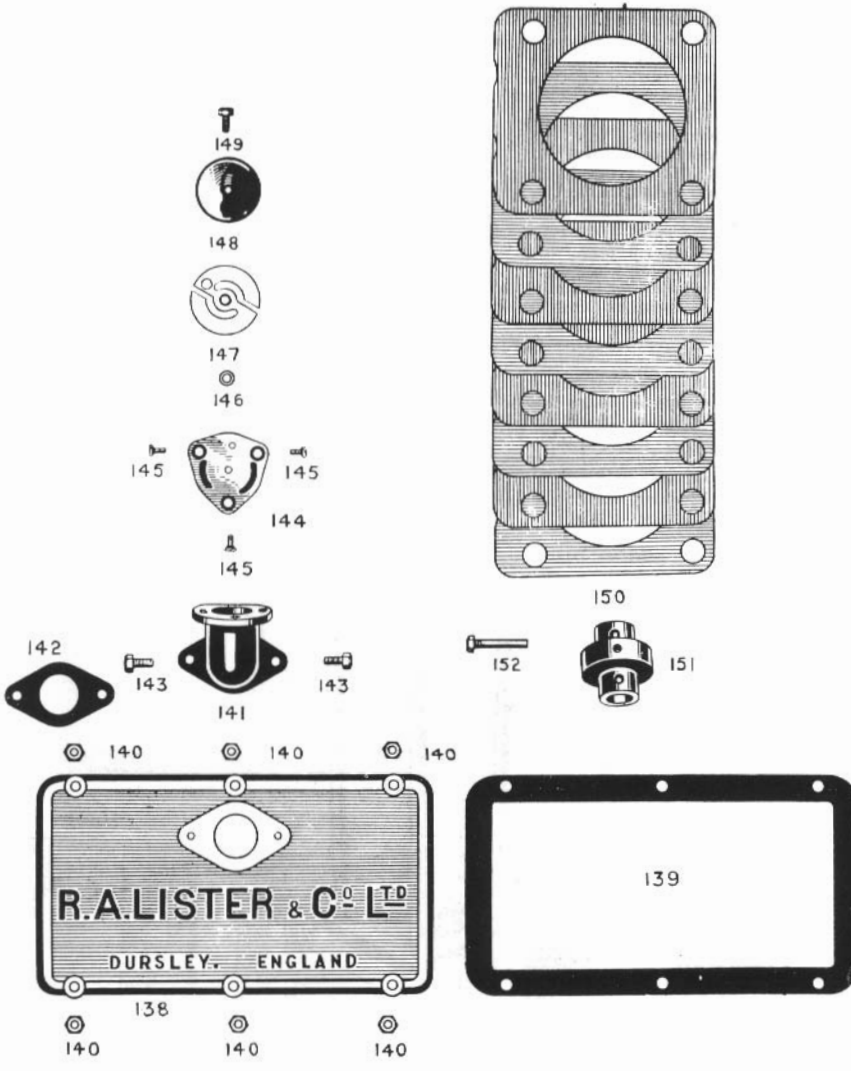




CRANKCASE FITTINGS 3-1, 5-1 ENGINES

Illustration No.	Description of Part.	Order Part No.	No. per Set. 3-1	5-1	Price each £ s. d.
112	**Crankcase** (with Studs and Camshaft Bush)	8-2-101S	1	1	
	Crankcase Stud for Cylinder and Cylinder Head	S861	4	4	
	Crankcase **Stud** for Main Bearing Housing	S35	7	7	
	Crankcase **Stud** for Oil Filler Lid	S33	1	1	
	Crankcase **Stud** for Tappet Guide Clamp...	S36	1	1	
	Crankcase **Stud** for Crankcase Door ...	S65	4	4	
	Crankcase **Stud** for Camshaft End Cover...	S57 Gear	1	1	
	Crankcase **Stud** for Camshaft End Cover...	S60 End	2	2	
	Stud for Camshaft End Cover	S217 Drive	3	3	
	Nut for Camshaft End Cover	S7 End	3	3	
113	Crankcase **Door**	8-2-199C	1	1	
114	Crankcase Door **Joint**	3301	1	1	
115	Crankcase Door **Nut** $\frac{1}{16}$ Whit.	S7	4	4	
116	Crankcase **Splash Tray**	8-2-102	1	1	
117	Crankcase **Splash Tray Bolt**	S203	1	1	
118	Crankcase **Splash Tray Joint**	12420	1	1	
119	Crankcase Splash Tray **Nut** $\frac{3}{8}$ Whit. ...	S6	1	1	
120	Crankcase Splash **Guard**	8-2-201	1	1	
128	Crankcase Breather **Spacing Bush** ...	21/114	1	1	
129	Crankcase Breather **Disc**	21/112	1	1	
130	Crankcase Breather **Cover**	21/113	1	1	
131	Crankcase Breather Cover **Screw** ...	27/1285	1	1	
132	Crankcase **Joint** to Cylinder	5-1/B94	4	4	
133	Crankcase **Cover** (for Camshaft)	5-1/B174	1	1	
134	Crankcase Splash Guard **Set Screw** ...	S46A	2	2	
135	Crankcase Splash Guard **Spring Washer**	S451	2	2	
	Crankcase **Oil Drain Plug**	3140	1	1	
	Crankcase Oil Drain Plug **Joint**	3306	1	1	
	Bush for Camshaft	3155	1	1	
	Nut for Cylinder Studs	S2	4	4	
	Engine Number Plate	S666	1	1	
	Dowel for Number Plate	S707	2	2	
	Dowel for Breather Disc	S655	1	1	

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R.A.LISTER & Co LTD
DURSLEY. ENGLAND
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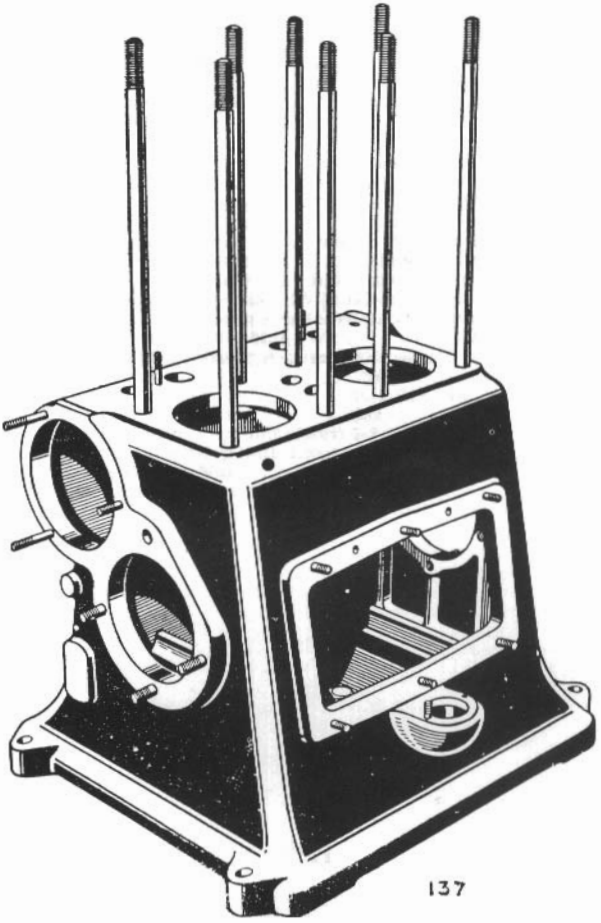
CRANKCASE FITTINGS 10-2 ENGINE

Illustration No.	Description of Part.	Order Part No.	No. per Set.	Price each £ s. d.
137	**Crankcase** (with Studs and Camshaft Bush 3155	9-2-101S	1	
	Crankcase Stud for Cylinder and Cylinder Head	S861	8	
	Crankcase Stud for Main Bearing Housing	S35	7	
	Crankcase **Stud** for Oil Filler Lid	S37	1	
	Crankcase **Stud** for Tappet Guide Clamp ...	S36	2	
	Crankcase **Stud** for Crankcase Door ...	S65	6	
	Crankcase **Stud** for Camshaft End Cover ...	S57 Gear	1	
	Crankcase **Stud** for Camshaft End Cover ...	S60 End	2	
	Crankcase Stud for Camshaft End Cover...	S668 Drive	1	
	Crankcase **Stud** for Camshaft End Cover...	S71 End	2	
138	Crankcase **Door**	10-2/B19	1	
139	Crankcase Door **Joint**	12301	1	
140	Crankcase Door **Nut** ⅜ Whit.	S7	6	
141	Crankcase **Breather Body**	5-1/B25	1	
142	Crankcase Breather Body **Joint**	3309	1	
143	Crankcase Breather Body **Set Pin** ...	S150	2	
144	Crankcase Breather Body **Plate**	10-2-245	1	
145	Crankcase Breather Body Plate **Screw** ...	27/1552	3	
146	Crankcase Breather **Spacing Bush** ...	21/114	1	
147	Crankcase Breather **Disc**	21/112	1	
	Dowel for Breather Disc	S655	1	
148	Crankcase Breather **Cover**	21/113	1	
149	Crankcase Breather Cover **Screw** ...	27/1285	1	
150	Crankcase **Joint** to Cylinder	5-1/B94	8	
151	Crankcase **Bearing** for Camshaft	3155	1	
152	Crankcase Bearing **Pin**	S519	1	



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CRANKSHAFT 3-1, 5-1 ENGINE

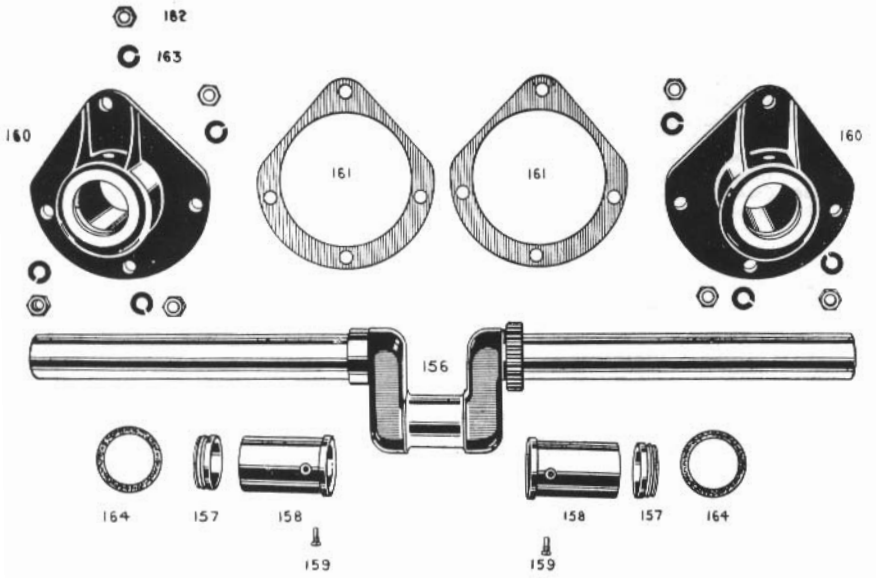


Illustration No.	Description of Part.	Order Part No.	No. per Set. 3-1	5-1	Price each £ s. d.
156	**Crankshaft** (for 3-1, with Pinion) ...	8-5/102C	1	–	
156	**Crankshaft** (for 5-1, with Pinion) ...	8-5-102C	–	1	
157	Crankshaft **Oil Thrower Ring**	5-1/B170	2	2	
158	Crankshaft **Main Bearing Bush**	5-1/B4A	2	2	
159	Crankshaft Main Bearing Bush **Screw** ...	A129	2	2	
160	Crankshaft Main Bearing **Housing** ...	5-1/B169	2	2	
161	Crankshaft Main Bearing Housing **Joint** ...	5-1/B62	2	2	
162	Crankshaft Main Bearing Housing **Nut** $\frac{1}{2}$ Wh.	S4	7	7	
163	Crankshaft Main Bearing Housing **Washer**	S394	7	7	
164	Crankshaft **Felt Ring**	3664	2	2	
	Crankshaft for Direct Coupled Engines ...	8-5-103	1	1	

CRANKSHAFT 10-2 ENGINE

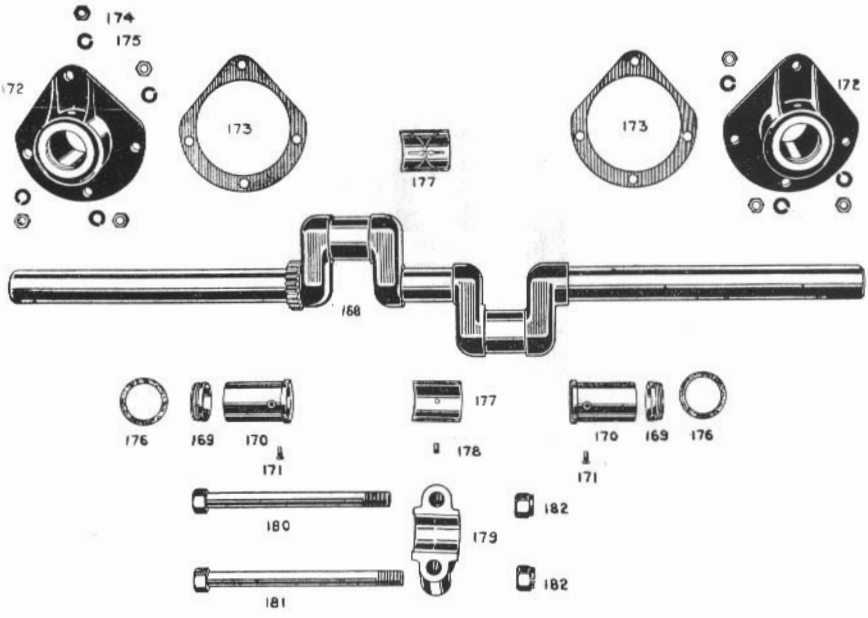


Illustration No.	Description of Part.	Order Part No.	No. per Set.	Price each. £ s. d.
168	**Crankshaft** (with Pinion) ...	9-5-102C	1	
169	Crankshaft **Oil Thrower Ring**	5-1/B170	2	
170	Crankshaft **Main Bearing Bush**	5-1/B4A	2	
171	Crankshaft Main Bearing Bush **Screw** ...	A129	2	
172	Crankshaft Main Bearing **Housing** ...	5-1/B169	2	
173	Crankshaft Main Bearing Housing **Joint** ...	5-1/B62	2	
174	Crankshaft MainBearing Housing **Nut** ¼ Wh.	S4	7	
175	Crankshaft Main Bearing Housing **Washer**	S394	7	
176	Crankshaft **Felt Ring**	3664	2	
177	Crankshaft **Centre Bearing**	10-2/E13/14A	1	
178	Crankshaft Centre Bearing **Dowel** ...	S32	1	
180	Crankshaft Centre Bearing Cap **Bolt** (Short)	9-2-179	1	
181	Crankshaft Centre Bearing Cap **Bolt** (Long)	9-2-180	1	
182	Crankshaft Centre Bearing **Nut**	27/1316	2	
	Crankshaft for Direct Coupled Engines ..	9–5–103C	1	

CONNECTING ROD, PISTON 3-1, 5-1, 10-2 ENGINES

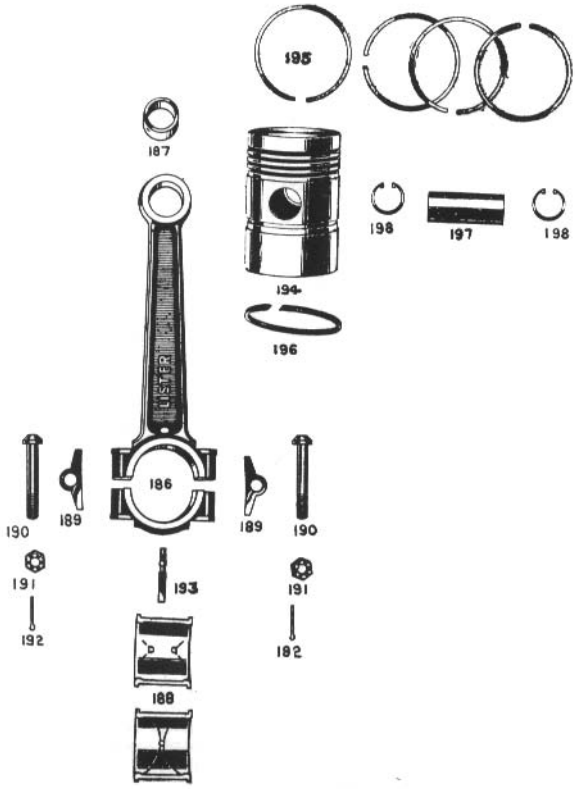


Illustration No.	Description of Part.	Order Part No.	No. per Set. 3-1	5-1	10-2	Price each. £ s. d.
	CONNECTING ROD complete (for 3-1)	208/18C	1	–	–	
	Connecting Rod complete (for 5-1)	5-1/D5C2½	–	1	–	
	Connecting Rod complete (for 10-2)	10-2/D5C2½	–	–	2	
186	Connecting Rod with small end bush, cap, bolts, nuts and split pins (for 3-1) ...	208/18	1	–	–	
186	Connecting Rod with small end bush, cap, bolts, nuts and split pins (for 5-1 and 10-2)	5-1/D5	–	1	2	
187	Connecting Rod **Bush** (for 3-1)	208/19	1	–	–	
187	Connecting Rod **Bush** (for 5-1 and 10-2) ...	5-1/D7A	–	1	2	
188	Connecting Rod **Bearing**	5-1/D18/19	1	1	2	
189	Connecting Rod **Shim**	3125	2	2	4	
190	Connecting Rod **Bolt**	5-1/D6	2	2	4	
191	Connecting Rod Bolt **Nut** ¼ Whit. ...	S16	2	2	4	
192	Connecting Rod **Split Pin**	S121	2	2	4	
193	Connecting Rod **Dipper** (for 3-1 and 5-1)	8-4-13C	1	1	–	
193	Connecting Rod **Dipper** (for 10-2)	5-1/D12	–	–	2	
194	**Piston** (for 3-1)	208/16	1	–	–	
194	**Piston** (for 5-1 and 10-2)	8-4-24	–	1	2	
195	Piston **Ring** (for 3-1)	208/14	4	–	–	
195	Piston **Ring** (for 5-1 and 10-2)	10-4-18	–	4	8	
196	Piston **Scraper Ring** (for 3-1)	208/22	1	–	–	
196	Piston **Scraper Ring** (for 5-1 and 10-2) ...	23/2299	–	1	2	
197	**Gudgeon Pin** (for 3-1)	208/15	1	–	–	
197	**Gudgeon Pin** (for 5-1 and 10-2)	5-1/D3A	–	1	2	
198	Gudgeon Pin **Retaining Spring** (for 3-1) ...	208/216	2	–		
198	Gudgeon Pin **Retaining Spring** (for 5-1 and 10-2)	5-1/D10	–	2	4	

CYLINDER FITTINGS 3-1, 5-1, 10-2 ENGINES

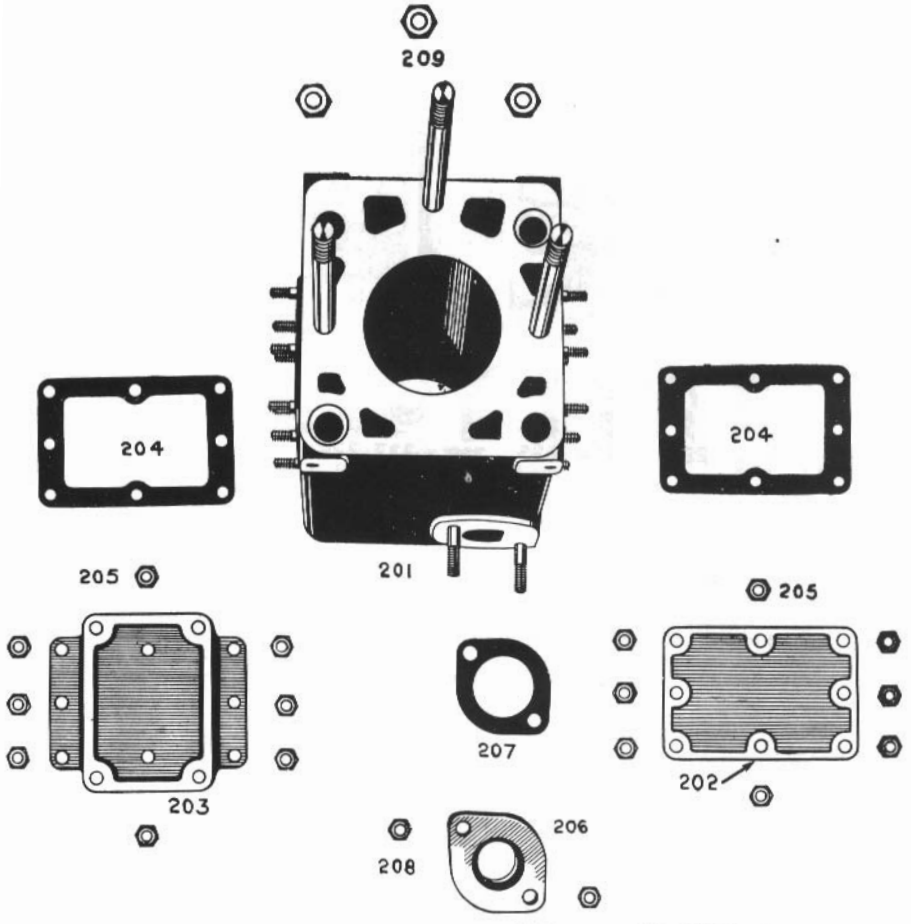


Illustration No	Description of Part.	Order Part No.	No. per Set. 3-1	5-1	10-2	Price each. £ s. d
201	**Cylinder** with Studs (for 3-1)	208/42S	1	–	–	
201	**Cylinder** with Studs (for 5-1 and 10-2) ...	8-2-44S	–	1	2	
	Stud for Cylinder Head (Short)	S862	3	2	4	
	Stud for Cylinder Head (Long)	S805	–	1	2	
	Stud for Water Jacket Door	S37	16	16	32	
	Stud for Water Pipe Flange	S36	2	2	4	
202	Cylinder **Water Jacket Door**	5-1/B20	1	1	3	
203	Cylinder **Water Jacket Door** (for Fuel Filter)	8-2-21	1	1	1	
204	Cylinder Water Jacket Door **Joint** ...	X16112	2	2	4	
205	Cylinder Water Jacket Door **Nut** $\frac{5}{16}$ Whit.	S7	16	16	32	
206	Cylinder Water **Pipe Flange**	5-1/B24	1	1	2	
207	Cylinder Water Pipe Flange **Joint** ...	8-1/B59	1	1	2	
208	Cylinder Water Pipe Flange **Nut** $\frac{3}{8}$ Whit.	S6	2	2	4	
209	**Nut** (for Cylinder Head) $\frac{9}{16}$ Whit. ...	S26	3	3	6	
	Grub Screw for Cylinder Head	27/1730	4	4	8	
	Locating Washer for Cylinder Block ...	5-1/C24A	2	2	4	
	Dripcan Bracket	10-19-751	1	1	–	
	Listard Plate	27/2227	1	1	2	
	Dowel for Listard Plate	S707	2	2	4	
	Drip Can **Bracket**	10-19-751	1	1	–	

CYLINDER HEAD FITTINGS 3-1, 5-1, 10-2 ENGINES

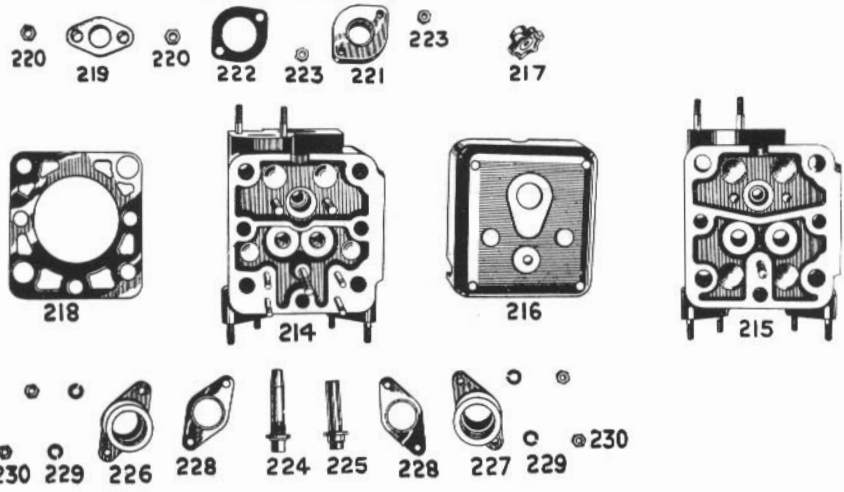


Illustration No	Description of Part.	Order Part No	No. per Set. 3–1	5–1	10–2	Price each £ s. d.
214	**Cylinder Head** with Studs (for 3-1) ...	208/112S	1	–	–	
215	**Cylinder Head** with Studs (for 5-1 and 10-2)	9-7-92S	–	1	2	
	Stud for Inlet and Exhaust Flange ...	S220	4	4	8	
	Stud for Injector	S769	2	2	4	
	Stud for Cylinder Head Cover and Rocker Bracket	S649	1	1	2	
	Stud for Rocker Bracket	S674	4	–	–	
	Stud for Water Flange	S36	2	2	4	
216	Cylinder Head **Cover**	5-1/C26A	1	1	2	
217	Cylinder Head Cover **Nut**	5-1/C28	1	1	2	
218	Cylinder Head **Joint** (for 3-1)	208/91	1	–	–	
218	Cylinder Head **Joint** (for 5-1 and 10-2) ...	5-1/C51	–	1	2	
219	**Injector Flange**	8-1/C31	1	1	2	
220	Injector Flange **Nut** $\frac{7}{16}$ Whit.	S5	2	2	4	
221	**Water Outlet Flange**	5-1/B24	1	1	–	
222	Water Outlet Flange **Joint**	8-1/B59	1	1	-	
223	Water Outlet Flange **Nut** $\frac{3}{8}$ Whit.	S6	2	2	-	
224	**Exhaust Valve Guide**	10-3-83	1	1	2	
225	**Inlet Valve Guide**	8-1/C39	1	1	2	
226	**Exhaust Flange**	3135	1	1	2	
227	**Inlet Flange**	3135	1	1	–	
228	**Joint** (for Flange)	3307	2	2	2	
229	**Spring Washer**	S393	4	4	4	
230	**Nut** $\frac{3}{8}$ Whit.	S6	4	4	4	
	Nut for Cylinder Head $\frac{1}{2}$ Whit.	S2	4	4	8	
	1" Expansion Plug for Cylinder Head ...	S757	2	2	4	
	1¼" Expansion Plug for Cylinder Head ...	S768	2	2	4	
	Air Inlet Manifold	10-2/C29	–	–	1	
	†Lister Felt Type **Air Filter**	10-3-139C	1	1	1	
	‡Air Filter **Felt Pad**	10-3-143	1	1	1	
	‡**Air Inlet Pipe** (Tank Cooled)	8-3-149	1	1	–	
	‡**Nipple** for Filter (Rad. Cooled)	S245	1	1	1	also for 10-2
	‡**Elbow** for Filter (Rad. Cooled)	S456	1	1	1	tank cooled

‡ Supplied with all Lighting Plant Engines but only to order with other Engines.

COMPRESSION RATIO CHANGE OVER VALVE 3-1 ENGINE

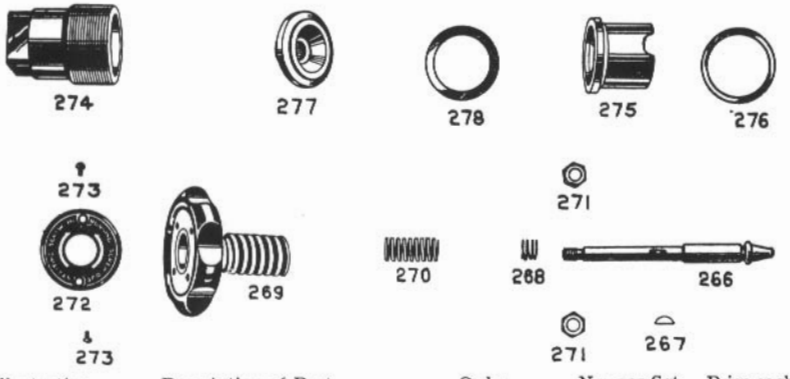


Illustration No.	Description of Part.	Order Part No.	No. per Set. 3-1	Price each £ s. d.
	VALVE complete assembly	208/364C	1	
266	Valve **Spindle**	208/364	1	
267	Valve Spindle **Key**	S107	1	
268	Valve **Spring Washer**	S1063	1	
269	Valve **Handwheel complete** ...	8-1/C68bC	1	
270	Valve **Spring**	8-1/C11	1	
271	Valve **Lock Nut**	S235	2	
272	Valve **Instruction Plate**	S1037	1	
273	Valve Instruction Plate **Screw** ...	S48	2	
274	Valve **Nut**	8-1/C4A	1	
275	**Main Plug**	208/361	1	
276	Main Plug **Joint**	23/361	1	
277	**Auxiliary** Plug	208/365	1	
278	Auxiliary Plug **Joint**	23/362	1	

COMPRESSION RATIO CHANGE OVER VALVE 5-1, 10-2 ENGINES

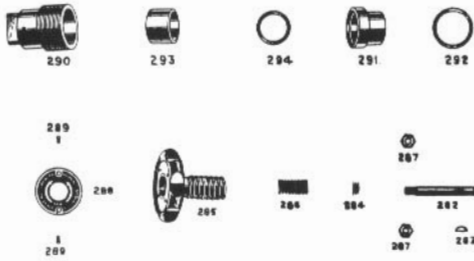
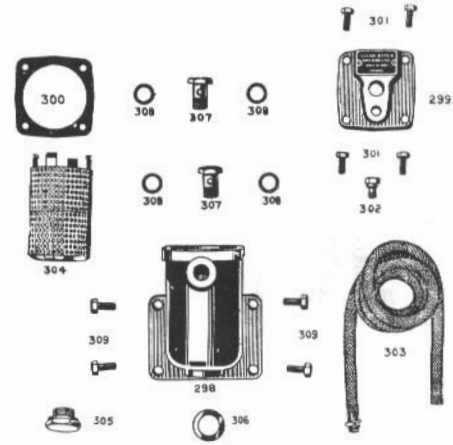


Illustration No.	Description of Part.	Order Part No.	No. per Set. 5-1	No. per Set. 10-2	Price each £ s. d.
	VALVE complete assembly ...	8-1/C5BC	1	2	
282	Valve **Spindle**	8-1/C5A	1	2	
283	Valve Spindle **Key**	S107	1	2	
284	Valve **Spring Washer**	S1063	1	2	
285	Valve **Handwheel complete** ...	8-1/C68BC	1	2	
286	**Valve Spring**	8-1/C11	1	2	
287	Valve **Lock Nut**	S235	2	4	
288	Valve **Instruction Plate**	S1037	1	2	
289	Valve Instruction Plate **Screw** ...	S48	2	4	
290	Valve **Nut**	8-1/C4A	1	2	
291	**Main Plug**	5-1/C90	1	2	
292	Main Plug **Joint**	8-1/C91	1	2	
293	**Auxiliary** Plug	8-1/C3	1	2	
294	**Auxiliary** Plug **Joint**	8-1/C6	1	2	

FLYWHEEL 3-1, 5-1, 10-2, ENGINES

Illustration No.	Description of Part.	Order Part No.	No. per Set. 3-1	5-1	10-2	Price each £ s. d.
	Flywheel 24″ x 3½″ (Timing Gear Side) ...	5-1/E4	2	2	1	
	Flywheel 24″ x 3½″ 10-2 only ...	9/5/45	–	–	1	
	Flywheel 25″ x 3¾″ with coupling facings, 3-1 and 5-1 only	5-1/E32	1	1	–	
	Flywheel 25″ x 3¾″ with coupling facings, 10-2 only	9-5-72	–	–	1	
	Flywheel 25″ x 3¾″ without coupling facings	5-1/E33	1	1	1	
	Flywheel **Key**	5162	2	2	2	
	Flywheel Key **Guard**	5-1/E10	1	1	1	

FUEL FILTER 3-1, 5-1, 10-2 ENGINES



	FUEL FILTER complete	23/2283C	1	1	1	
298	**Filter Body**	23/2283	1	1	1	
299	Filter Body **Cover**	23/2282	1	1	1	
300	Filter Body Cover **Joint**	23/2278	1	1	1	
301	Filter Body Cover **Set Pin**	S888	4	4	4	
302	Filter **Vent**	10-2-89	1	1	1	
303	Filter **Wick** with nipple and clip	23/2288C	1	1	1	
304	Filter Wick **Container**	23/2279	1	1	1	
305	Filter **Drain Plug**	H137	1	1	1	
306	Filter Drain Plug **Joint**	H91	1	1	1	
307	Filter **Swivel Union Screw**	23/472	2	2	2	
308	Filter Swivel Union **Joint**	29/169	4	4	4	
309	Filter **Set Screws**	S739	4	4	4	
	FUEL TANK and Fittings for Tank Cooled Engine. (For Tank and Fittings with Radiator cooled Engines see pages 27 and 28)					
	Fuel Tank, complete, 9″ dia. x 21″ vertical fixing, 3-1 & 5-1 only	8-7-18C	1	1	–	
	Fuel Tank, complete, 10-2 only	10-7-61C	–	–	1	
	Fuel Tank **Gauze Strainer**	10-7-80	1	1	1	
	Spring Clip for Strainer	151/3	1	1	1	
	Fuel **Valve**	8-1/G50	1	1	1	
	Fuel Valve **Joint**	12406	1	1	1	
	Drain Plug	5-1/B6	1	1	1	
	Drain Cock **Joint**	5197	1	1	1	
	Fuel Tank **Support Hook,** 3-1 & 5-1 only	8-7-25	1	1	–	
	Fuel Tank **Support Hook,** 10-2 only ...	10-7-86	–	–	1	
	Fuel Tank **Strap,** 3-1 and 5-1 only ...	8-7-23	1	1	–	
	Fuel Tank **Strap,** 10-2 only	8-1/G15	–	–	1	
	Fuel Tank Fixing **Bolt**	S231	1	1	1	
	Fuel Tank Fixing **Nut** ¼ Whit.	S8	1	1	1	
	Fuel Pipe (Tank to Filter) 3-1 also 5-1 Temp	5-1/G7	1	1	–	
	Fuel **Pipe** (Tank to Filter) 5-1 Trop. ...	5-1/G8	–	1	–	
	Fuel Pipe (Tank to Filter) Temp.	10-2/G7	–	–	1	
	Fuel Pipe (Tank to Filter) Trop.	18-2/G34	–	–	1	
	Tank **Float**	10-7-79	1	1	1	
	Tank Float **Balance Weight**	10-7-77	1	1	1	
	Chain for Balance Weight	8-7-14	1	1	1	
	Fuel Tank **Lid**	8-7-19C	1	1	1	

FUEL SYSTEM 3-1, 5-1 ENGINES

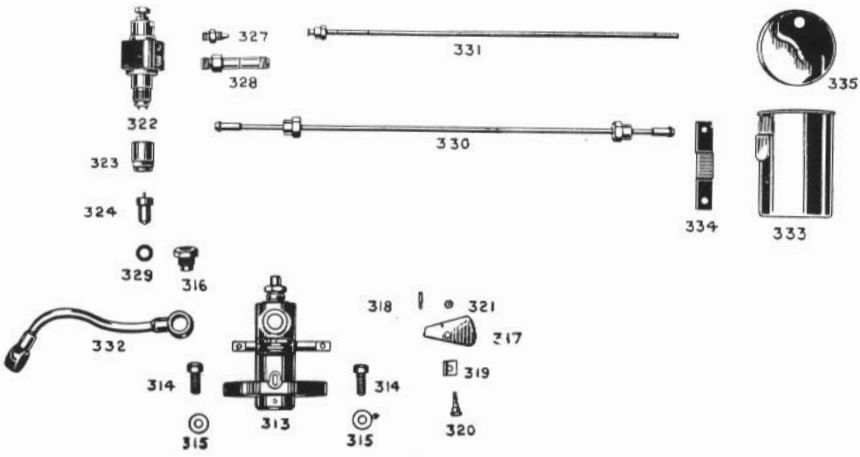


Illustration No.	Description of Part.		Order Part No.	No. per Set. 3-1	No. per Set. 5-1	Price each. £ s. d.
313	**Fuel Pump** (for 3-1) Type BPF1B60B00		208-39	1	–	
313	Fuel **Pump** (for 5-1) Type BPF1B70B00		5-1 B39	–	1	
	3-1 Fuel Pump **Element** (Plunger & Barrel)		7009/41	1		
	5-1 Fuel Pump **Element** (Plunger & Barrel)		7009/43	–	1	
	Fuel Pump **Delivery Valve Spring** ...		7032/7	1	1	
	Fuel Pump Delivery Valve and Seating		7010/188	1	1	
314	Fuel Pump **Set Pin**		S203	2	2	
315	Fuel Pump **Washer**		S184	2	2	
316	Fuel Pump **Delivery Union Nut**		5557/1	1	1	
317	Fuel Pump **Pawl**		10-2-189	1	1	
318	Fuel Pump Pawl **Check Pin**		10-2-190	1	1	
319	Fuel Pump **Check Plate**		10-2-192	1	1	
320	Fuel Pump Check Plate **Fulcrum Pin** ...		8-2-191	1	1	
321	Fuel Pump Check Plate **Nut**		S15A	1	1	
322	Fuel **Injector complete**	3-1 ...	208-135	1	–	
322	Fuel **Injector complete**	5-1 ...	8-1C35	–	1	
324	Fuel Injector Nozzle DL30S406	3-1 ...	208-235	1	–	
324	Fuel Injector Nozzle DL30S46	5-1 ...	23-792	1	1	
323	Fuel Injector **Nozzle Cap Nut**		7008/14	1	1	
327	Fuel Injector **Leak-off connection** ...		7008/3	1	1	
328	Fuel Injector **Delivery Stud**		7008/31	1	1	
329	Fuel Injector **Joint**		8-1/C41	1	1	
330	Fuel **Pipe** (Pump to Injector)		5-1/C73A	1	1	
331	Fuel **Pipe** (Injector to Drip Can)		5-1/C79	1	1	
332	Fuel **Pipe** (Filter to Pump) Tank Cooled		8-2-175	1	1	
	Fuel Pipe **Fixing Plug**		23/472	1	1	
	Fuel Pipe Fixing Plug **Joint**		29/169	2	2	
333	**Fuel Drip Can**		10-19-767	1	1	
334	**Fuel Drip Can Bracket**		10-19-751	1	1	
335	**Fuel Drip Can Lid**		10-19-768	1	1	

FUEL SYSTEM 10-2 ENGINE

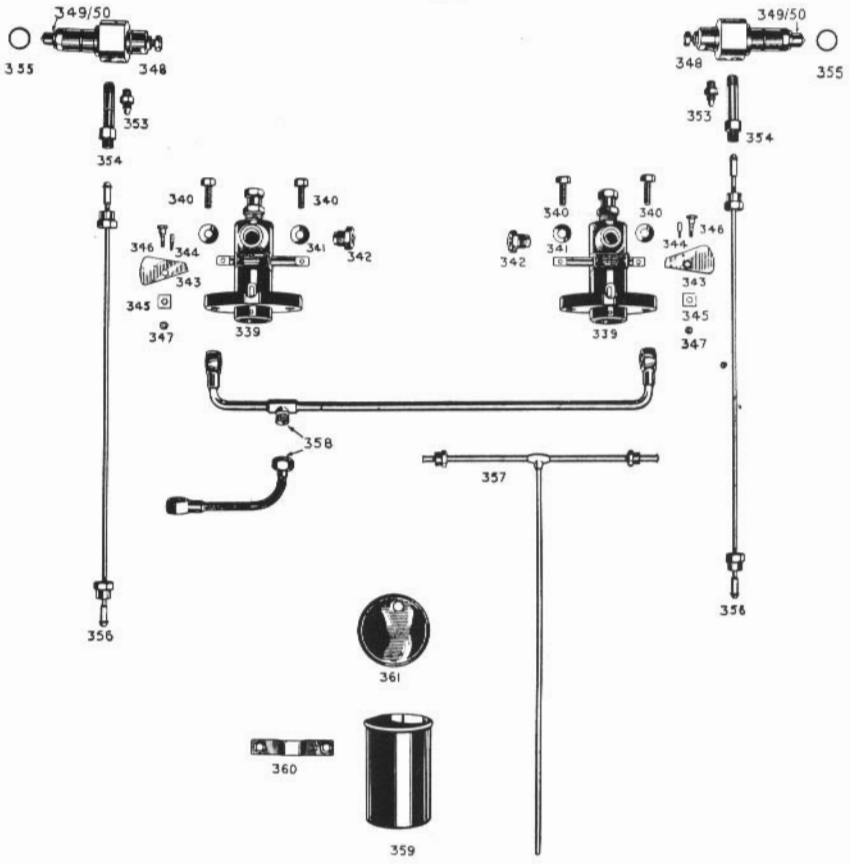
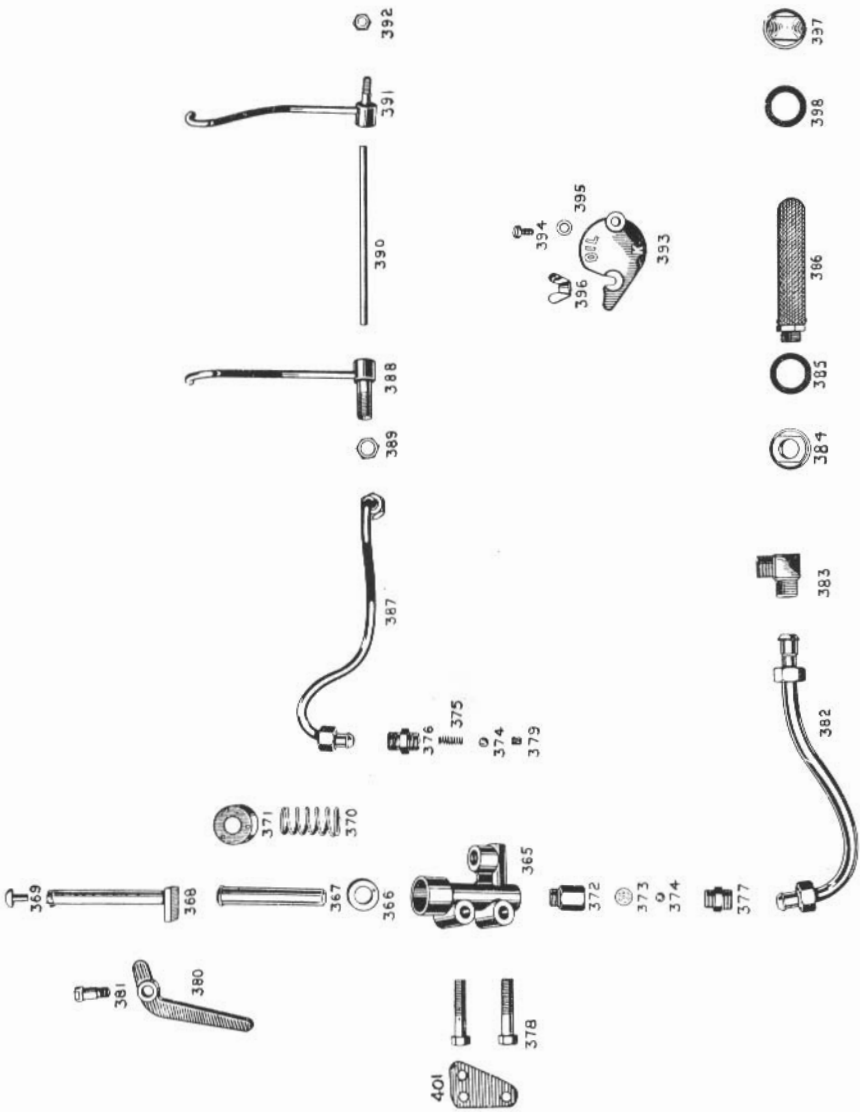


Illustration No.	Description of Part	Order Part No.	No per Set	Price each £ s. d.
339	**Fuel Pump** Type BPF1B70B00	5-1/B39	2	
	Fuel Pump **Delivery Valve and Seating**	7010/188	2	
	Fuel Pump Delivery Valve **Spring**... ...	7032/7	2	
340	Fuel Pump **Set Pin**	S203	4	
341	Fuel Pump **Washer**	S184	4	
342	Fuel Pump **Delivery Union Nut** ...	5557/1	2	
343	Fuel Pump **Pawl**	10-2-189	2	
344	Fuel Pump Pawl **Check Pin**	10-2-190	2	
345	Fuel Pump **Check Plate**	10-2-192	2	
346	Fuel Pump Check Plate **Fulcrum Pin** ...	8-2-191	2	
347	Fuel Pump Check Plate **Nut**	S15A	2	
348	**Fuel Injector, complete**	8-1/C35	2	
349	Fuel Injector **Nozzle** DL30S46	23/792	2	
	Fuel Injector Nozzle **Cap Nut**	7008 14	2	
353	Fuel Injector **Leak-off connection** ...	7008/3	2	
354	Fuel Injector **Delivery Stud**	7008/31	2	
355	**Fuel Injector, Joint**	8-1/C41	2	
356	Fuel **Pipe** (Pump to Injector)	5-1/C73A	2	
357	Fuel **Pipe** (Injector to Drip Can)	9-3-156	1	
358	Fuel **Pipe** (Filter to Tee Piece) Tank Cooled	9-2-192	1	
358	Fuel **Pipe** (Connecting Pumps) Tank Cooled	9-2-175	1	
	Fuel Pipe **Fixing Plug**	23/472	2	
	Fuel Pipe Fixing Plug **Joint**	29/169	2	
359	Fuel **Drip Can**	10-19-767	1	
360	Fuel Drip Can **Bracket**	10-19-751	1	
361	Fuel Drip Can **Lid**	10-19-768	1	
	Fuel Drip Can Bracket **Set Screw** ...	27/1631	2	

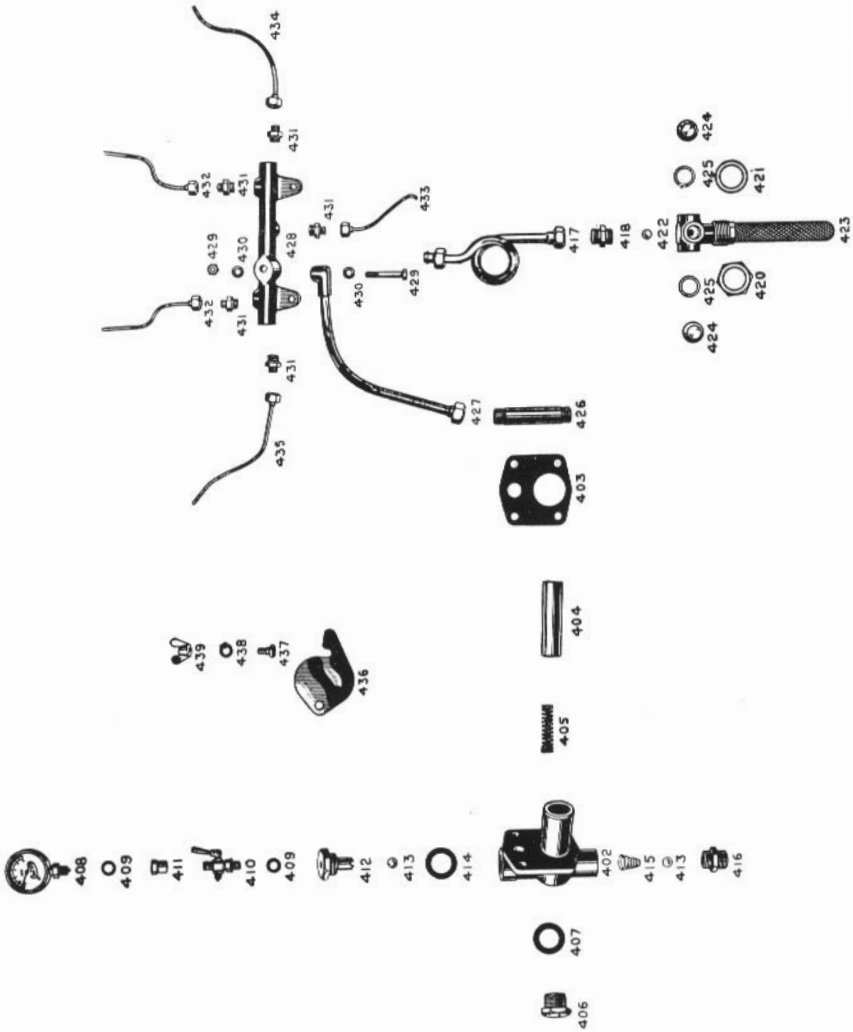
LUBRICATING OIL SYSTEM 3-1, 5-1 ENGINES



LUBRICATING OIL SYSTEM 3-1, 5-1 ENGINES

Illustration No.	Description of Part.	Order Part No.	No. per Set. 3-1	5-1	Price each £ s. d.
	LUBRICATING OIL PUMP complete	8-2-198C	1	1	
365	**Pump Body**	8-2-198	1	1	
366	Pump Body **Gits Seal** OS.625	8-2-178	1	1	
367	Pump **Plunger**	8-2-137	1	1	
368	Pump **Tappet** (with foot)	8-2-150	1	1	
369	Pump Tappet **End Pin**	5-1/B130	1	1	
370	Pump **Spring**	8-2-176	1	1	
371	Pump Spring **Cover**	8-2-147	1	1	
372	Pump **Inlet Valve Stop Casing**	5-1/B160	1	1	
373	Pump **Inlet Valve Stop**	5-1/B159	1	1	
374	Pump **Ball Valve**	3327	2	2	
375	Pump Ball Valve **Spring**	8-1/F67	1	1	
376	Pump **Outlet Connection**	5-1/B161	1	1	
377	Pump **Inlet** Connection	3275	1	1	
378	Pump **Set Pin**	S38	2	2	
380	Pump **Hand Lever**	3333	1	1	
381	Pump Hand Lever **Swivel Pin**	3334	1	1	
382	Pump **Suction Pipe**	5-1/B168	1	1	
383	Pump Suction **Elbow**	3411	1	1	
384	Pump **Strainer Plug**	3128	1	1	
385	Pump Strainer Plug **Joint**	3306	1	1	
386	Pump **Strainer**	12270C	1	1	
387	Pump **Delivery Pipe**	8-2-187	1	1	
388	**Distribution Pipe and Union**	3272C	1	1	
389	Distribution Pipe **Lock Nut**	S17	1	1	
390	**Straight Pipe**	3271	1	1	
391	**Distribution Pipe and Support**	3273C	1	1	
392	Distribution Pipe **Lock Nut** $\frac{3}{8}$ Whit. ...	S6	1	1	
393	**Oil Filler Lid**	3431	1	1	
394	Oil Filler Lid **Screw**	3439	1	1	
395	Oil Filler **Spring Washer**	S699	1	1	
396	Oil Filler **Wing Nut**	S687	1	1	
397	Oil **Drain Plug**	3140	1	1	
398	Oil Drain Plug **Joint**	3306	1	1	
401	Pump **Joint**	8-2-195	1	1	

LUBRICATING OIL SYSTEM 10-2 ENGINE



LUBRICATING OIL SYSTEM 10-2 ENGINE

Illustration No.	Description of Part.	Order Part No.	No. per Set.	Price each £ s. d.
	LUBRICATING OIL PUMP complete			
402	**Pump Body**	12421	1	
403	Pump Body **Joint**	12422	1	
404	Pump **Plunger**	9-2-100	1	
405	Pump Plunger **Spring**	3324	1	
406	Pump **Plug**	12418	1	
407	Pump Plug **Joint**	12419	1	
408	Pump **Pressure Gauge**	12428	1	
409	Pump Pressure Gauge **Joint**	12420	2	
410	Pump Pressure Gauge **Tap**	D276	1	
411	Pump Pressure Gauge Tap **Union** ...	12442	1	
412	Pump Pressure Gauge **Adaptor**	12432	1	
413	Pump **Ball**	12425	2	
414	Pump **Adaptor Joint**	12419	1	
415	Pump **Ball Spring**	12426	1	
416	Pump **Inlet Connection**	12427	1	
417	**Oil Suction Pipe**	12276	1	
418	Oil Suction Pipe **Connection**	12413	1	
419	Oil Suction **Elbow**	12408	1	
420	Oil Suction Elbow **Lock Nut**	S404	1	
421	Oil Suction Elbow Joint	3306	1	
422	Oil Suction Elbow **Ball**	12425	1	
423	Oil Suction Elbow **Strainer**	12270C	1	
424	Oil Suction Elbow **Drain Plug**	12407	2	
425	Oil Suction Elbow **Joint**	12406	2	
426	Oil **Delivery Pipe** (Straight) Wrot Iron ...	10-2/B70	1	
427	Oil **Delivery Pipe** (Copper)	9-2-72	1	
428	Oil **Distribution Pipe**	9-2-134	1	
429	Oil Distribution Pipe **Bolt and Nut** ...	27/1320	1	
430	Oil Distribution Pipe **Joint**	10-2/B71	2	
431	Oil Distribution Pipe **Connection** ...	12412	5	
432	Oil **Pipe** (to Con Rod Troughs)	12415	2	
433	Oil **Pipe** (to Centre Main Bearing) ...	12414	1	
434	Oil **Pipe** (to Gov. End Main Bearing) ...	12274	1	
435	Oil **Pipe** (to Fuel Pump Brk. Bearing) ...	12275	1	
436	Oil **Filler Lid**	3435	1	
437	Oil Filler Lid **Screw**	3433	1	
438	Oil Filler **Spring Washer**	S699	1	
439	Oil Filler **Wing Nut**	S687	1	

DRY SUMP SYSTEM—Particulars of Parts for Special Equipment may be obtained on application to us, quoting Engine Number.

Description of Part.	Order Part No.	No. per Set. 3-1	5-1	Price each £ s. d.
PULLEY 3-1 and 5-1 only				
Pulley 10 × 7 with Key and Set Screw	5-1/E25C	1	1	
Pulley **Key**	5312	1	1	
Pulley **Set Pin**	S63	1	1	
PULLEY 10-2 only.				
Pulley 12 × 9 with Key and Set Screw	10-2/E25C	–	–	
Pulley **Key**	S403	–	–	
Pulley **Set Pin**	S63	–	–	
RADIATOR				
Radiator Block (Temperate & Tropical) for 3-1 only	8-7-107	1	–	
Radiator Block (Temperate) for 5-1 only	8-7-107	–	1	
Radiator Block (Tropical) for 5-1 only	8-7-126	–	1	
Radiator **Filler Cap**	27/2452	1	1	
Radiator **Cover**	8-7-108	1	1	
Radiator Cover **Set Screws**	S901	4	4	
Radiator and **Fuel Tank Support** R.H.	8-7-134	1	1	
Radiator and **Fuel Tank Support** L.H.	8-7-176	1	1	
Bolts (Fuel Filter to Bracket)	S68	4	4	
Nuts for Fuel Filter Bolts	S6	4	4	
Spring Washers for Filter Bolts	S393	4	4	
Radiator **Front Support**	8-7-133	1	1	
Radiator **Top Cross Stay**	8-7-115	1	1	
Set Screw for Supports	S203	12	12	
Set Screw for Supports	S739	4	4	
Spring Washers $\frac{5}{16}$"	S413	8	8	
Spring Washers $\frac{3}{8}$"	S393	15	15	
Radiator Fan (Clockwise Rot. Engine) 3-1 Temperate and Tropical, 5-1 Temp.	23/2097	1	1	
Radiator Fan (Clockwise Rot. Engine) 5-1 Tropical	23/2600	–	1	
Radiator Fan (Anti-Clockwise Rot. Engine) 3-1 Temperate and Tropical, 5-1 Temp.	210/345	1	1	
Radiator Fan Anti-Clockwise Rot. Engine) 5-1 Tropical	24/2600	–	1	
Radiator Fan **Pulley** (Driven)	24/2079	1	1	
Radiator Fan Pulley **Set Screw**	27/1710	8	8	
Radiator Fan **Spindle**	24/2080	1	1	
Radiator Fan Spindle **Nut**	23/2090	1	1	
Radiator Fan Spindle **Split Pin**	S121	1	1	
Radiator Fan Pulley **Ball Journal Bearing**	21/150	1	1	
Radiator Fan Pulley **Ball Journal Bearing**	210/326	1	1	
Radiator Fan **Thrust Plate**	23/1211	1	1	
Radiator Fan $\frac{1}{4}$" B.S.P. **Plug**	211/540	1	1	
Radiator Fan **Fibre Washer**	12420	1	1	
Radiator Fan **Supporting Lever**	23/1208	1	1	
Radiator Fan Supporting Lever **Pivot Pin**	8/7/132	1	1	
Pivot Pin Spring Ring	23/2613	1	1	
Radiator Fan **Belt Adjusting Screw**	27/2285	1	1	
Radiator Fan Belt Adj. Screw **Lock Nut**	S905	1	1	
Radiator Fan **Nut** $\frac{5}{16}$ B.S.F.	S905	1	1	
Radiator Fan **Bracket**	8-7-131	1	1	
Radiator **Water Outlet Pipe**	8-7-111	1	1	
Radiator Water Pipe **Hose**	S1205	2	2	
Radiator Water Outlet Pipe Hose **Clip**	X16109	4	4	
Radiator Water Outlet Pipe **Joint**	8-1/B59	1	1	
Radiator Water Outlet Pipe **Stud**	S50	2	2	
Radiator Water Outlet Pipe **Nut** $\frac{3}{8}$ Whit.	S6	2	2	
Radiator Water Inlet Pipe	8-7-110	1	1	
Radiator Water Inlet Pipe **Joint**	8-1/B59	1	1	
Slotted Nut for Pivot Pin	23/2090	1	1	
Split Pin for ditto	S121	1	1	
Radiator Water Inlet Pipe **Stud**	S50	2	2	

‡ Not Plus 15 %

Description of Part.	Order Part No.	No. per Set. 3-1	5-1	10-2	Price each. £ s. d.
Radiator Water Inlet Pipe **Nut** ⅜ Whit. ...	S6	2	2	–	
Radiator Water **Drain Tap**	D610	1	1	–	
Radiator Water Drain Tap **Joint**	5197	1	1	–	
Fan Pulley (Driver) on Crankshaft ...	8-7-109	1	1	–	
Fan Pulley **Key**	8-7-98	1	1	–	
Fan Pulley **Set Pin**, ⅜" x 1 1/16"	S739	1	1	–	
Fan Pulley **Belt**, ½" Wide (Whittle) 63 Links	8-7-125	1	1	–	
FUEL TANK (Radiator Cooled Engines) 3-1 and 5-1					
Fuel Tank complete	8-7-171	1	1	–	
Fuel Tank **Wood Bearer**	8-7-163	2	2	–	
Fuel Tank **Strap**	8-7-175	2	2	–	
Fuel Tank **Tightening Bar**	8-7-150	1	1	–	
Fuel Tank **Strap Set Screw**	S332	2	2	–	
Fuel Tank Strap **Washer**	S618	2	2	–	
Fuel Tank **Hook Bolt**	8-7-103	2	2	–	
Fuel Tank Hook Bolt **Nut** ¼ B.S.F. ...	S907	4	4	–	
Fuel Tank **Drain Plug**	211/540	1	1	–	
Fuel Tank Drain Plug **Joint**	12420	1	1	–	
Fuel Tank **Filler Cap**	303/208c	1	1	–	
Fuel Tank **Cock**	8-1/G50	1	1	–	
Fuel Tank Cock **Joint**	12406	1	1	–	
Fuel **Pipe** (Tank to Filter)	8-7-172	1	1	–	
Fuel **Pipe** (Filter to Pump)...	8-7-173	1	1	–	
Fuel Pipe Fixing Plug C. & A. **Washer** ...	29/169	1	1	–	
RADIATOR. For 10-2 Engines only.					
Radiator Block (Temp.) 52 m/m Block ...	8-7-106	–	–	1	
Radiator Block (Tropical) 84 m/m Block	9-7-127	–	–	1	
Radiator **Filler Cap**	27/2452	–	–	1	
Radiator **Cover**	8-7-108	–	–	1	
Radiator Cover **Set Screws**	S901	–	–	4	
Radiator **Support Bracket** (R.H.) ...	9-7-134	–	–	1	
Radiator **Support Bracket** (L.H.) ...	9-7-135	–	–	1	
Radiator Support **Cross Stay**	8-7-115	–	–	1	
Radiator Support **Main Front Stay** ...	8-7-133	–	–	1	
Radiator Support **Set Screws** ⅜" Whit. x 1" long	S203	–	–	12	
Radiator Support **Set Screws** ⅜" Whit. x 1 1/16" long	S739	–	–	4	
Radiator Support **Spring Washer**, 5/16" ...	S413	–	–	8	
Radiator Support **Spring Washer**, ⅜" ...	S393	–	–	15	
Radiator **Fan** (Temperate Clockwise Rot. Engine) ...	23/2097	–	–	1	
Radiator Fan (Temperate Anti-Clockwise Rot. Engine) ...	210/345	–	–	1	
Radiator Fan (Tropical Clockwise Rot. Engine) ...	23/2600	–	–	1	
Radiator Fan (Tropical Anti-Clockwise Rot. Engine) ...	24/2600	–	–	1	
Radiator Fan **Pulley** (Driven)	24/2079	–	–	1	
Radiator Fan Pulley **Set Screw**	210/433	–	–	4	
Radiator Fan **Spindle**	24/2080	–	–	1	
Radiator Fan Spindle **Nut**	23/2090	–	–	2	
Radiator Fan Spindle **Split Pin**	S121	–	–	2	
Radiator Fan **Ball Journal Bearing** ...	21/150	–	–	1	
Radiator Fan **Ball Journal Bearing** ...	210/326	–	–	1	
Radiator Fan **Thrust Plate**	23/1211	–	–	1	
Radiator Fan ¼" B.S. **Pipe Plug**	211/540	–	–	1	
Radiator Fan **Plug Fibre Washer** ...	12420	–	–	1	
Radiator Fan **Supporting Lever**	23/1208	–	–	1	
Radiator Fan Supporting Lever **Pivot Pin**	8-7-132	–	–	1	
Pivot Pin Spring Ring	23/2613	–	–	1	

Description of Part.	Order Part No.	No. per Set. 3–1	5-1	10-2	Price each £ s. d	
Radiator **Fan Belt Adjusting Screw** ...	27/2285	–	–	1		
Radiator Fan Belt Adjusting Screw **Lock Nut**	S905	–	–	1		
Radiator Fan **Bracket**	8-7-131	–	–	1		
Radiator **Water Outlet Pipe**	9-7-111	–	–	1		
Radiator Water Inlet and Outlet Pipe **Hose**, 6″ long x 1⅞″ bore	S1205	–	–	2		
Radiator Water Inlet and Outlet Hose **Clip**	X16109	–	–	4		
Radiator Water **Pipe Joint**	8-1/B59	–	–	6		
Radiator Water **Manifold Pipe**	9-7-80	–	–	2		
Radiator Water Manifold Pipe **Nuts** ⅜ Whit.	S6	–	–	12		
Radiator Water **Inlet Pipe**	9-7-110	–	–	1		
Radiator Pipe **Drain Tap**	D610	–	–	1		
Radiator Water Drain Tap **Joint**	5197	–	–	1		
Radiator Water Drain Tap **Plug**	1/572	–	–	1		
Radiator Water **Manifold Plug**	12407	–	–	1		
Radiator Water Manifold Plug **Joint** ...	12406	–	–	2		
Radiator Water Manifold **Stud**	S736	–	–	4		
Radiator Water **Pipe Stud**	S50	–	–	8		
Radiator **Fan Pulley Driver**	8-7-109	–	–	1		
Radiator Fan Pulley **Key**	8-7-98	–	–	1		
Radiator Fan Pulley **Set Screw**	S739	–	–	1		
Radiator Fan **Belt**, ½″ wide 63 Links ...	8-7-125	–	–	1		
FUEL TANK (Radiator Cooled Engines)						
Fuel Tank complete	8-7-171	–	–	1		
Fuel Tank **Support Bracket** R.H. ...	9-7-148	–	–	1		
Fuel Tank **Support Bracket** L.H. ...	9-7-176	–	–	1		
Bolts (Fuel Filter to Bracket)	S68	–	–	4		
Nuts for Fuel Filter Balts	S6	–	–	4		
Spring Washers for Filter Bolts	S393	–	–	4		
Fuel Tank **Tightening Bar**	8-7-150	–	–	1		
Fuel Tank **Wood Bearer**	8-7-163	–	–	2		
Fuel Tank **Strap**	8-7-175	–	–	2		
Fuel Tank **Hook Bolt**	8-7-103	–	–	2		
Fuel Tank Hook Bolt **Nut** ¼ B.S.F. ...	S907	–	–	4		
Fuel Tank **Set Screw** for Strap	S332	–	–	2		
Fuel Tank **Washer** for Strap	S618	–	–	2		
Fuel Tank **Drain Plug**	211/540	–	–	1		
Fuel Tank Drain Plug **Joint**	12420	–	–	1		
Fuel Tank **Washer** for Strap and Set Screw	S618	–	–	2		
Fuel Tank **Filler Cap**	302/208c	–	–	1		
Fuel Tank **Cock**	8-1/G50	–	–	1		
Fuel Tank Cock **Joint Washer**	12406	–	–	1		
Fuel **Pipe** (Tank to Filter)	8-7-172	–	–	1		
Fuel **Pipe** (Filter to Tee Piece)	9-7-173	–	–	1		
Fuel **Pipe** (Connecting Pumps)	9-7-174	–	–	1		
Fuel Pipe **Fixing Plug**	23/472	–	–	2		
Fuel Pipe Fixing Plug C. & A. **Washer** ...	29/169	–	–	4		
SILENCERS (Air and Exhaust)						
Silencer (Air)	B101	1	1	1		
Silencer (Exhaust), complete with 1½″ gas pipe connection	3341C	1	1	2		
Silencer **Bend** for Exhaust 1½″ B.S.P. ...	S86	1	1	2		
Exhaust Manifold	10-2/C36	–	–	1		
Exhaust **Flange** used with Manifold ...	R96	–	–	1	Supplied to order only in place of 2 separate Silencers. For 10–2 only.	
Exhaust Flange **Joint**	R89	–	–	1		
Exhaust Flange **Bolt**	S426	–	–	2		
Exhaust Flange Bolt **Nut**	S4	–	–	2		
Exhaust Flange Bolt **Spring Washer** ...	S394	–	–	2		
Exhaust Pipe **Bend** 2″ B.S.P.	S262	–	–	1		
Exhaust **Silencer** (Sheet Metal)	R176/C	–	–	1		

Description of Part.	Order Part No.	No. per Set. 3–1	5–1	10–2	Price each. £ s. d.
SPANNERS					
Spanners 3/16″ x 1/4″	S323	1	1	1	
5/16″ x 3/8″	S151	1	1	1	
3/8″ x 7/16″ Union	S399	1	1	1	
7/16″ x 1/2″	S152	1	1	1	
9/16″ x 5/8″	S518	1	1	1	
3/4″ x 7/8″	S840	1	1	1	
STARTING HANDLE					
Starting Handle, complete, 3-1 & 5-1 only	5-1/E24/1C	1	1	–	
Starting Handle, complete, 10-2 only ...	10-2/E24C	–	–	1	
Starting Handle **Crank**, 3-1, 5-1 & 10-2 ...	10-2/E24	1	1	1	
Starting Handle **Clutch Pin**	3362	1	1	1	
Starting Handle **Split Pin**	S120	1	1	1	
Starting Handle **Spring**	3363	1	1	1	
Starting Handle **Wood Grip**, 3-1 & 5-1 only	8-5-121	1	1	–	
Starting Handle **Wood Grip**, 10-2 only ...	R78	–	–	1	
Starting Handle Wood Grip **Pin**, with Washer, 3-1 and 5-1 only	8-5-120	1	1	–	
Starting Handle Wood Grip **Pin**, with Washer, 10-2 only	13–21–771	–	–	1	
Starting Handle Grip Pin **Lock Nut** ...	S14	1	1	–	
Starting Handle Grip Pin **Lock Nut** ...	S904	–	–	1	
SPEED CONTROL (10-2) (only supplied when specially ordered)					
Bowden Control Lever complete with 12″ length of cable and adjuster	23/4216	–	–	1	
End Fork for Cable (fitted to cable) ...	9-20-274	–	–	1	
Support for Lever	9-20-273	–	–	1	
Anchor Pin for Cable	9-20-84	–	–	1	
Locknut 5/16 Whit.	S7	–	–	1	
Speed Indicator Plate	105/447	–	–	1	

VALVES AND VALVE TAPPET 3-1, 5-1, 10-2 ENGINES

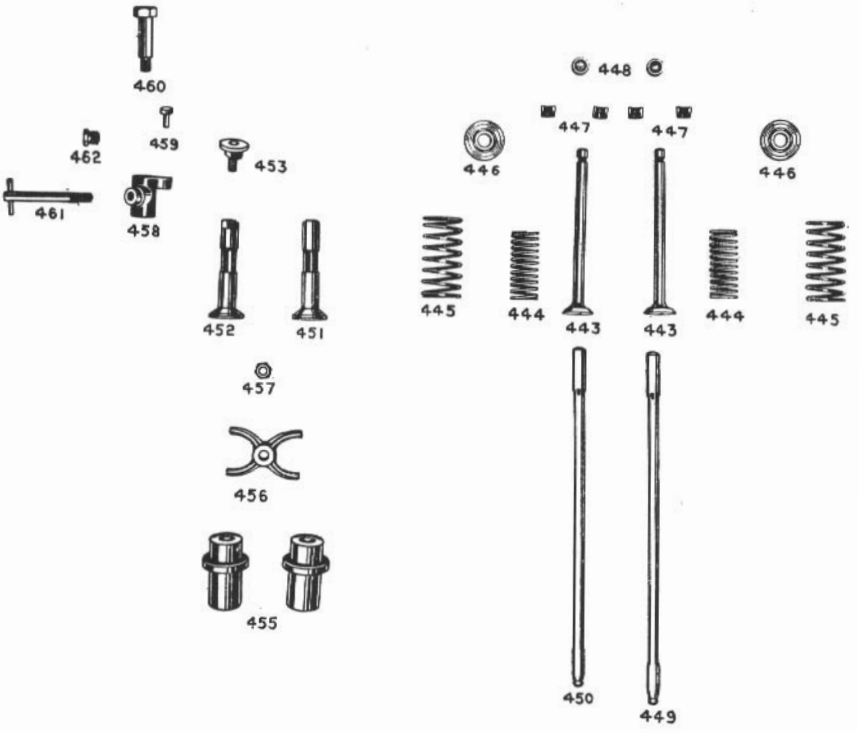


Illustration No.	Description of Part.	Order Part No.	No. per Set 3-1	5-1	10-2	Price each £ s. d.
443	**Valve Inlet and Exhaust** (for 3-1) ...	208/55	2	–	–	
443	**Valve Inlet and Exhaust** (for 5-1 and 10-2)	8-1/C121	–	2	4	
444	Valve **Spring** (Small)	10-3-129	2	2	4	
445	Valve **Spring** (Large)	11-3-220	2	2	4	
446	Valve Spring **Carrier**	10-3-130	2	2	4	
447	Valve **Stem Cone** (in pairs)	8-1-C25	2	2	4	
448	Valve **Cap**	8-1/C23	2	2	4	
449	Valve **Push Rod** (Inlet)	5-1/C20C	1	1	2	
450	Valve **Push Rod** (Exhaust)	5-1/C21C	1	1	2	
451	Valve **Tappet** (Inlet)	X16128	1	1	2	
452	Valve **Tappet** (Exhaust)	3493	1	1	2	
453	Valve Tappet **Head**	X16379	1	1	2	
455	Valve Tappet **Guide**	3194	2	2	4	
456	Valve Tappet Guide **Clamp**	3389	1	1	2	
457	Valve Tappet Guide Clamp **Nut** $\frac{3}{8}$ Whit. ...	S6	1	1	2	
458	Valve **Lifter**	5-1/B13A	1	1	1	
458	Valve **Lifter**	10-2/B15A	–	–	1	
459	Valve Lifter **Pin**	5-1/F41	1	1	2	
460	Valve Lifter **Swivel Pin**	5-1/B11	1	1	2	
461	Valve Lifter **Operating Handle**	5-1/B12C	1	1	2	
462	**Oil Plug**	5-1/B6	1	1	1	
	Valve Tappet **Clearance Gauge**	27/1419	1	1	1	

WATER AND AIR INLET MANIFOLDS 10-2 ENGINE

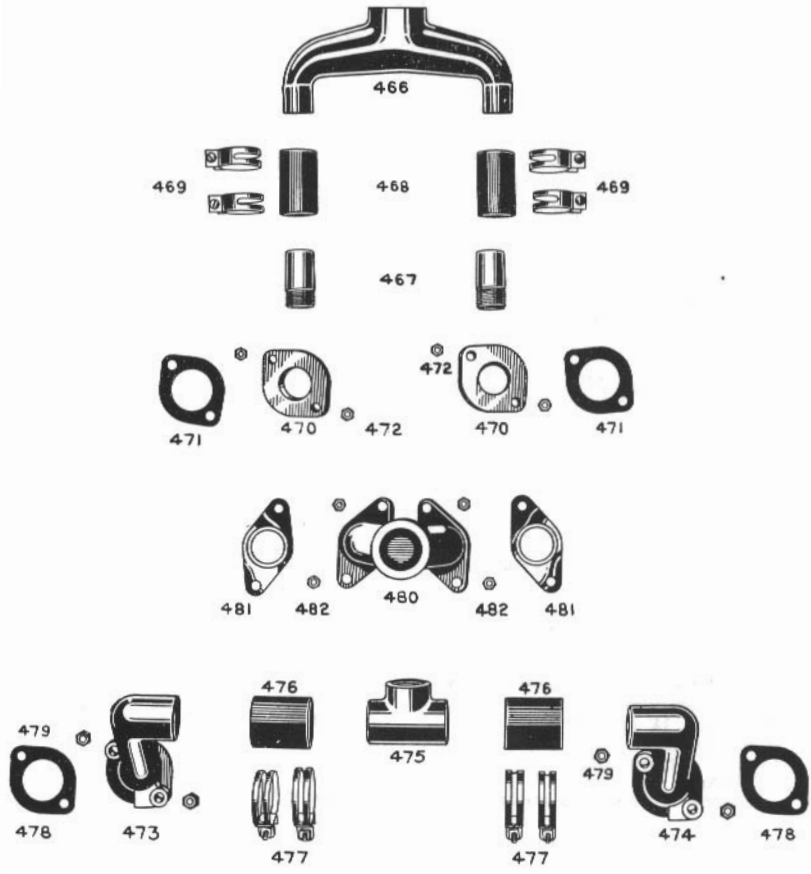


Illustration No.	Description of Part.	Order Part No.	No. per Set.	Price each. £ s. d.
	WATER INLET BRANCH complete ...	12480C	1	
466	Water Inlet **Branch**	12480	1	
467	Water Inlet **Pipe**	S255	2	
468	Water Inlet **Hose**	S733	2	
469	Water Inlet Hose **Clip**	3404	4	
470	Water Inlet **Flange**	5-1/B24	2	
471	Water Inlet Flange **Joint**	8-1/B59	2	
472	Water Inlet Flange **Nut** ⅜ Whit. ...	S6	4	
473	Water **Outlet Elbow** (No. 1 Cyl. End)	18-2/C42	1	
474	Water **Outlet Elbow** (No. 2 Cyl. End)	18-2/C63	1	
475	Water Outlet **T Connection** ...	S458	1	
476	Water Outlet **Hose**	S1227	2	
477	Water Outlet Hose **Clip**	X16109	4	
478	Water Outlet **Joint**	8-1/B59	2	
479	Water Outlet **Nut** ⅜ Whit.	S6	4	
480	**Air Inlet Manifold**	10-2/C29	1	
481	Air Inlet Manifold **Joint**	3307	2	
482	Air Inlet Manifold **Nut** ⅜ Whit. ...	S6	4	

WATER TANKS AND FITTINGS

3-1, 5-1, 10-2 ENGINES

Description of Part	Order Part No.	No per Set. 3-1	5-1	10-2	Price each £ s. d.
WATER TANK 3-1 and 5-1 only					
Water Tank, 50 Gall. for Temperate Climate	3405	1	1	–	
Water Tank, 70 Gall. for Tropical Climate	5405	–	1	–	
1″ Hex. Nipple	S171	1	1	–	
1″ 3-Way Cock	S170	1	1	–	
1″ Pipe, 2½″ long, screwed one end	S255	2	2	–	
1″ Pipe, 6″ long, screwed one end. Temp.	S173	1	1	–	
1″ Pipe, 12″ long, screwed one end. Trop.	S361	2	2	–	
1″ 120 deg. Bend. Temp.	27/2350	2	2	–	
1″ 120° Bend, screwed one end. Trop. ...	27/2350	1	1	–	
1″ 120° Bend, screwed both ends. Trop. ...	S174	1	1	–	
1″ Socket. Trop.	S172	1	1	–	
Hose Pipe, 1¼″ Bore x 6″	27/1756	2	2	–	
Hose pipe **Clip**	3404	4	4	–	
WATER TANK (Temperate) 10-2 only					
Water Tank 30″ dia. x 4′ 0″ High (120 gal.)	AR93	–	–	1	
3-way Cock, 1¼″	S178	–	–	1	
Hex. Nipple, 1¼″	S293	–	–	1	
1¼″ x 6″ Pipes, screwed one end	S166	–	–	2	
1¼″ x 150° Bend, screwed both ends	S270	–	–	1	
Hose Pipe, 1⅜″ bore x 6″ long	S685	–	–	2	
Hose Pipe **Clip**	R95	–	–	4	
1¼″ Pipe, 4″ long, screwed one end	S190	–	–	2	
1¼″ Socket	S192	–	–	1	
1¼″ 120° Bend, screwed one end	27/2348	–	–	1	
WATER TANK (Tropical) 10-2 only					
Water Tank, 30″ dia. x 66″ high (170 galls.)	R93	–	–	1	
3-way Cock, 1¼″	S178	–	–	1	
Hex. Nipple, 1¼″	S293	–	–	1	
1¼″ dia. Pipe, 6″ long, screwed one end ...	S166	–	–	1	
1¼″ 120 deg. Bend	S269	–	–	1	
Hose Pipe, 1⅜″ bore x 6″ long	S685	–	–	2	
Hose Pipe Clips	R95	–	–	4	
1¼″ x 21″ Pipe (screwed at one end)	S492	–	–	1	
1¼″ Socket	S192	–	–	1	
1¼″ Pipe 4″ long, screwed one end	S190	–	–	2	
THERMOSTAT. Complete Assembly. To fit 1¼″ bore hose	8-2-181	1	1	–	Supplied to order only
THERMOSTAT ELEMENT	8-2-185	1	1	1	Supplied to order only
THERMOSTAT. Complete Assembly. To fit 1⅜″ bore hose	9-2-185	–	–	1	Supplied to order only
Hose Pipe **Clips** for Thermostat	3404	2	2	–	Supplied to order only
Hose Pipe **Clips** for Thermostat	R95	–	–	2	Supplied to order only

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