

Engine No.

MAINTENANCE

Attention	Date
Air Cleaner and Filter	
Cooling Fins	
Change Engine Lubricating Oil	
Decarbonise	
Fuel Injection	

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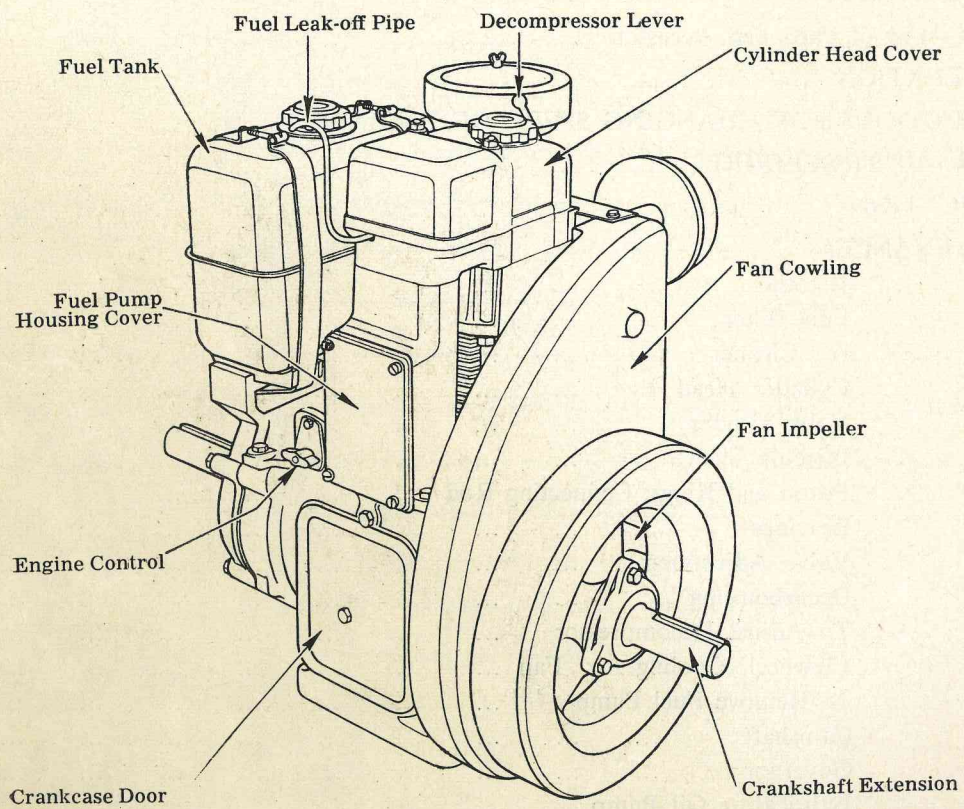


Fig. 1.—Type LD1 or SL1 Engine—Front View.

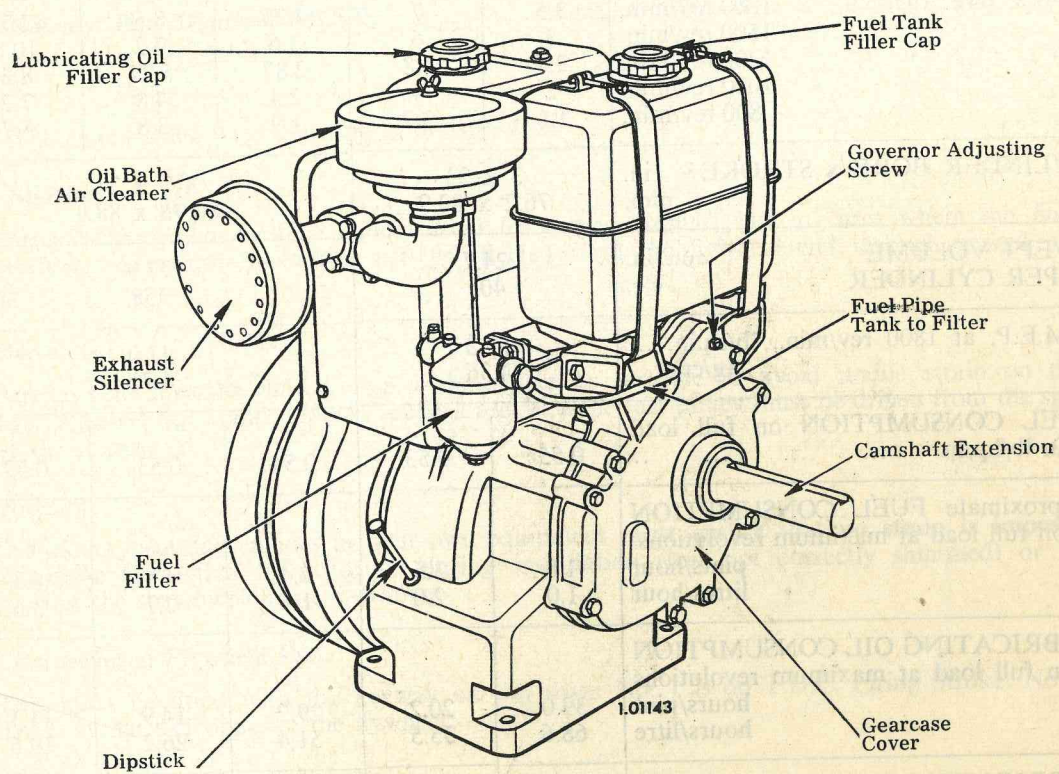


Fig. 2.—Type LD1 or SL1 Engine—Back View.

TECHNICAL DATA

	LD1	LD2	SL1	SL2	SL3
MAXIMUM GROSS BHP	5	10	6	12	18
RATED BHP	—	—	4.75	9.5	—
2000 rev/min.	3.5	7	4.25	8.5	12.75
B.S. 649 : 1958	3	6	3.6	7.2	10.8
1500 rev/min.	2.4	4.8	2.87	5.74	8.6
1200 rev/min.	2	4	2.4	4.8	7.2
1000 rev/min.	1.6	3.2	1.9	3.8	5.7
800 rev/min.					
CYLINDER BORE x STROKE in. mm.	3 x 3½ 76.2 x 88.9		3½ x 3½ 80.96 x 88.9		
SWEPT VOLUME cu. in. PER CYLINDER c.c.	24.7 405		27.9 458		
B.M.E.P. at 1800 rev/min., lb/sq.in. ... kg/cm² ...	62.3 4.36		67.0 4.71		
FUEL CONSUMPTION on full load in lb/hp/hr	0.55	0.53	0.54	0.53	0.52
Approximate FUEL CONSUMPTION on full load at maximum revolutions pints/hour litres/hour	1.8 1.0	3.5 2.0	2.4 1.4	4.8 2.7	6.3 3.6
LUBRICATING OIL CONSUMPTION on full load at maximum revolutions hours/pint hours/litre	39.0 68.6	20.2 35.5	29.2 51.4	14.9 26.2	11.1 19.5
LUBRICATING OIL SUMP (engine level) Capacity—pints litres See also page 13	3½ 2.0	9½ 5.4	3½ 2.0	9½ 5.4	13½ 7.7
EXHAUST CONNECTION B.S.P. ...	1"	1¼"	*1¼"	1¼"	1½"
NETT WEIGHT OF ENGINE lb kg.	261 118	416 187	261 118	416 187	513 233
STANDARD ROTATION CLOCKWISE LOOKING AT FLYWHEEL END On multi-cylinder engines No. 1 cylinder is at end opposite flywheel.					

*With reducing socket.

Engine Rating.

The engine is rated in accordance with BSS 649 : 1958, i.e., the engine will develop its rated H.P. continuously including 10% overload for a period not exceeding 1 hour in any period of 12 hours consecutive running.

AIR COOLED INDITION OF INSTALLAUSTRIAL ENGINES

The engine must be installed where a generous supply of fresh air is assured.
A portable electric light is recommended in addition to the fixed lighting.
Keep the exhaust pipe as short and straight as possible.

Exhaust Pipe Diameter—B.S.P.				LD1	LD2—SL1 & SL2	SL3
Up to 20ft.	...	...	...	1"	1½"	1½"
Over 20 ft.	...	...	...	1¼"	1½"	2"

The engine must be installed in a level position.

Hand Starting.

Normally the engine will be hand started from the camshaft but in cases where the final drive is from the camshaft, starting can be effected from the flywheel end through geared - up starting.

Belt Drive.

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

Distortion.

Customers installing engines in their own equipment must ensure that **no strain is imposed on the engine feet** either by distortion during installation (feet not correctly shimmed) or by deflection of the structure during operation.

Shaft Extension at Flywheel End.

This must be fitted with the keyway on top when No. 1 is on T.D.C. Firing Stroke. No. 1 cylinder is at the end opposite the flywheel.

Cooling.

The engine is cooled by air. A fan impeller is secured to the flywheel. Air is drawn into the impeller and discharged through trunking and shrouding to the fins of the cylinder and cylinder head.

Arrangements must be made to ensure the cooling air is not re-circulated or restricted (See Pages 6—12).

Temperatures.

- (1) The temperature rise from ambient to cooling air inlet and combustion air inlet must be kept as low as possible 11°F or 6°C.
- (2) The approximate temperature rise on full rated load across a run-in engine in good order is 81°F (45°C).
- (3) The Maximum permissible cooling air inlet and combustion air temperature is 125°F (52°C).
- (4) The British Standard rating for the engine applies for ambient temperatures not exceeding 85°F (30°C). Above this temperature the engine must be derated by 1% for every 5°F (2.78°C). It follows that it is most important to ensure that the cooling and combustion air inlet temperatures are kept as near ambient temperature as possible.

COOLING AIR CONSIDERATIONS

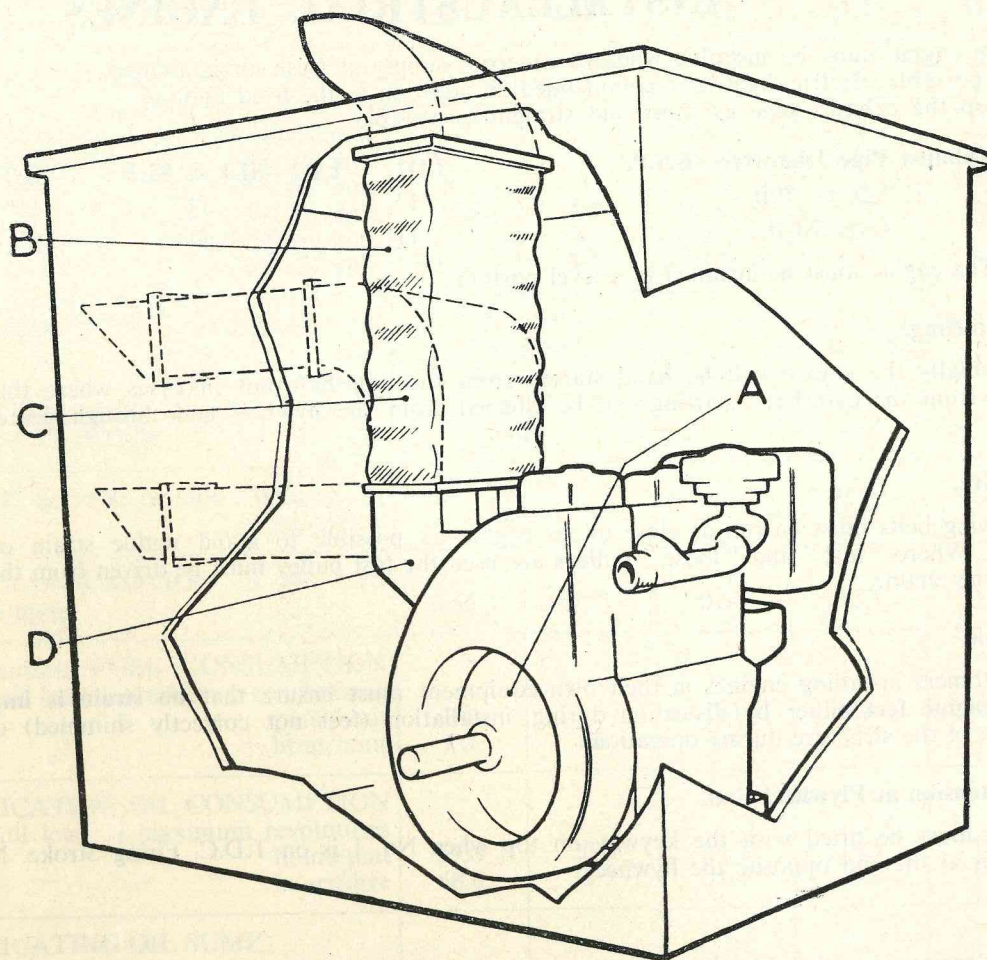


Fig. 3.—Method of leading out the hot cooling air in small enclosed compartments.

- A It is absolutely essential that the hot cooling air discharge does not find its way to the cooling air inlet and become recirculated.
 - B Flexible trunking of canvas, rubberized canvas or heat resisting rubber.
 - C One of these alternative methods must be used if the engine is flexibly mounted.
 - D Ducting as shown can be supplied if ordered. Ducting is fully detachable for servicing and priming fuel pumps and the trunking must be attached so that it does not impair the quick removal of the ducting.
- The extension of the ducting, the trunking and the cowl are to be supplied by the customer.
- For lengths of trunking up to 5 ft. (1.5 m.) the minimum inside area to be:—
- 30 sq. ins. (195 cm²) for SL1 & LD1.
 - 60 sq. ins. (390 cm²) for SL2 & LD2.
 - 90 sq. ins. (585 cm²) for SL3.
- For 5 to 10 ft. (1.5 to 3m.) multiply by 1.4.
- For 10 to 25 ft. (3 to 7.5 m.) multiply by 2.25.
- For 25 to 50 ft. (7.5 to 15 m.) multiply by 3.5.

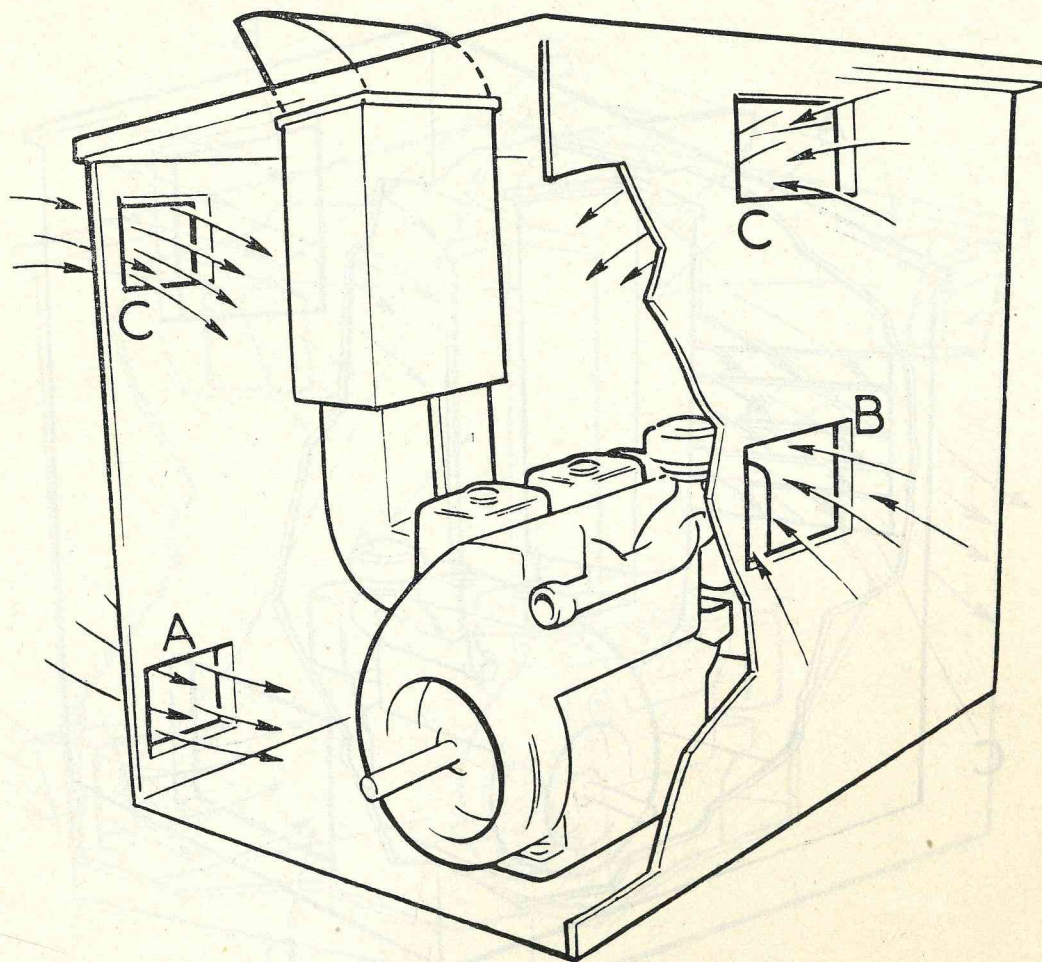


Fig. 4.—Notes on Air Intakes

- A** One of the cooling air intake holes must be near the bottom of engine room to bring cool air in and also to strike the engine sump to assist cooling the lubricating oil.
- B** Another intake hole must be opposite the air filter to ensure a good supply of cool combustion air.
- C** One or two cooling air intake holes must be near the top of the engine room to prevent an accumulation of hot air above the engine. Generally it is not desirable to place an air intake hole opposite the engine cooling fan, because the rest of the engine room will not be ventilated (except where the ambient temperature exceeds 120°F (49°C) when it is essential for the engine to be as cool as possible under these conditions).

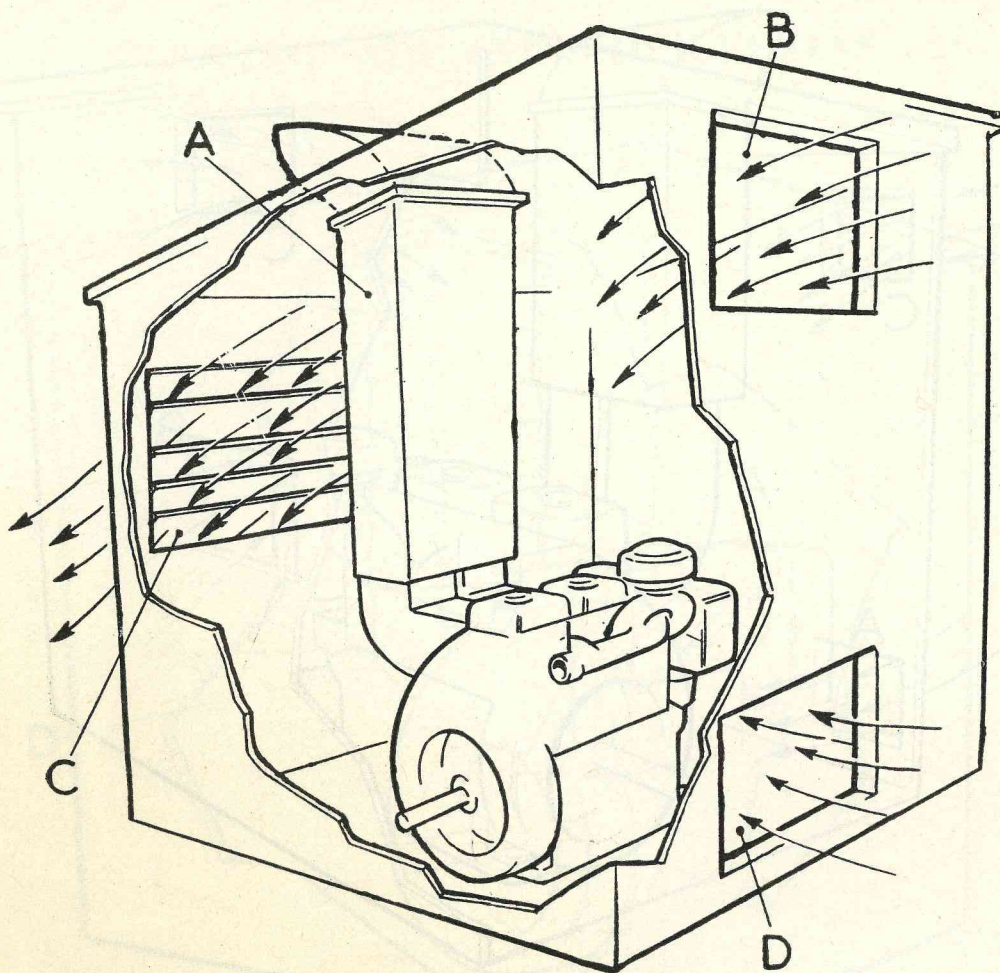


Fig. 5.—Installation in moderate size engine house (10 ft. x 6 ft. (3 m. x 1.8 m.)

- A Engine ducting, trunking and cowl to be used in tropical climates, and also in other climates when a cool engine house is required.
- B Window 2 ft. x 2 ft. (60 x 60 cm.) near the roof and opposite the main window. Capable of being fully opened.
- C Large window opposite the engine air outlet, capable of being fully opened (or if louvred, slots to be 4" (100 mm.) apart.
- D Window 2 ft. x 2 ft. (60 x 60 cm.) near the floor and opposite the main window, or in the wall nearest the engine fuel filter, capable of being fully opened.

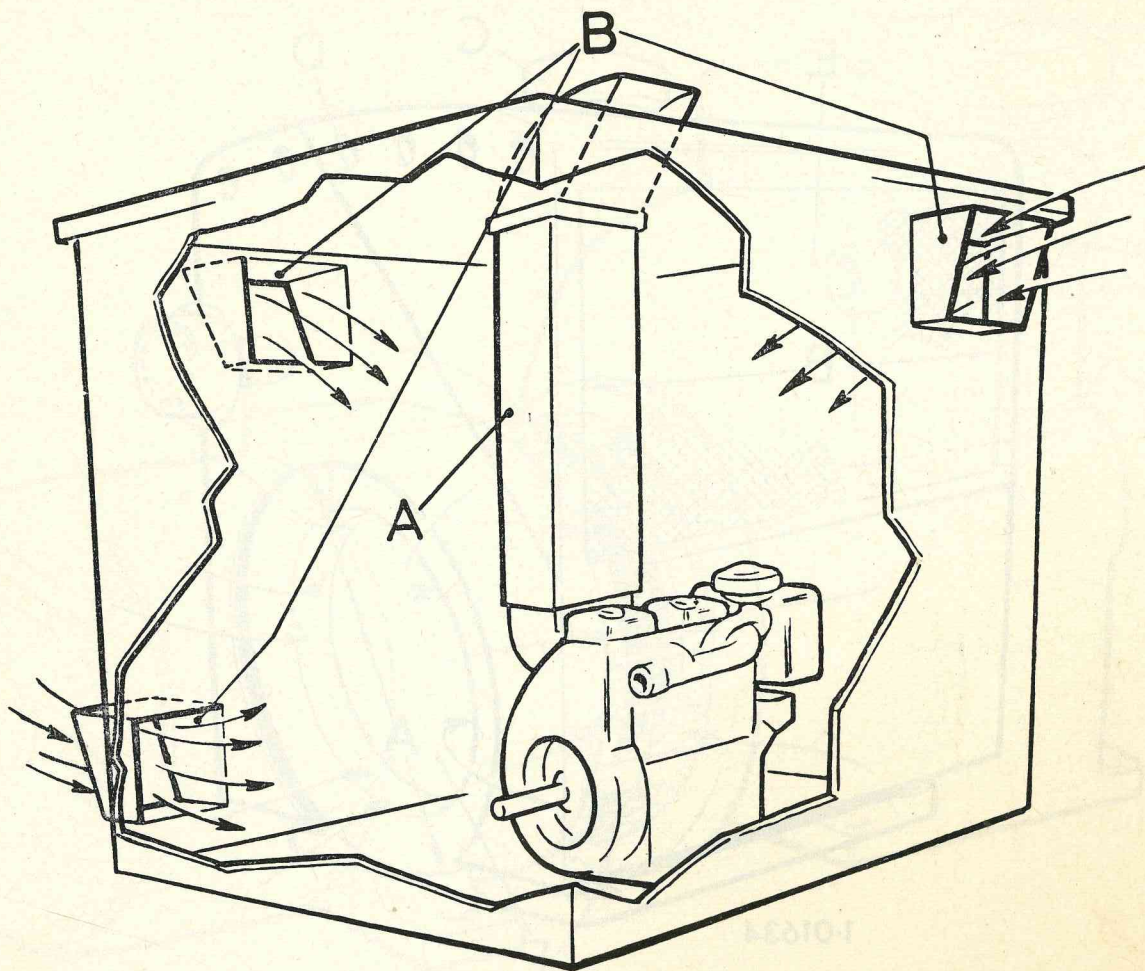


Fig 6.—Installation in confined space where air intake holes have to be as small as possible.

- A** Area of trunk and cowl to be as given in Fig. 3.
- B** Air intake holes to be in positions shown and all the same size to ensure even air distribution.

Minimum area of intakes:—

LD & SL1 3 holes each 13 sq. ins. (84 cm²).

LD & SL2 3 holes each 26 sq ins. (168 cm²).

SL3 3 holes each 40 sq. ins. (260 cm²).

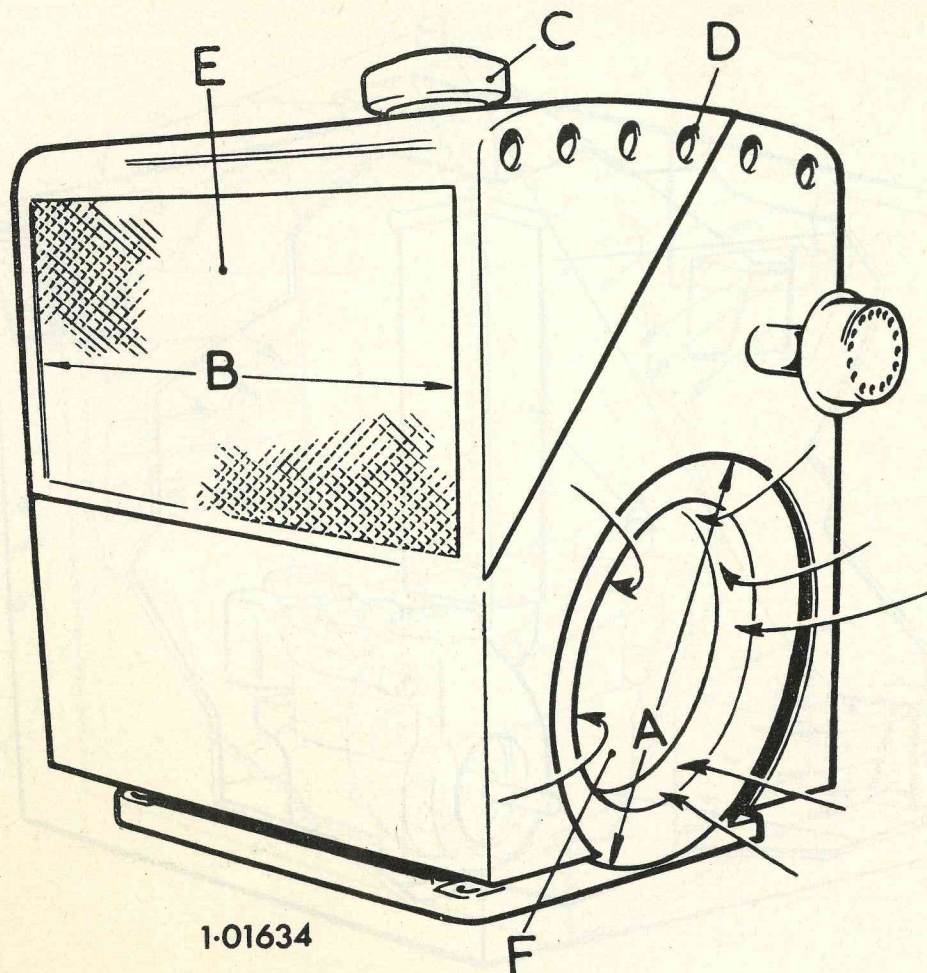


Fig. 7.— Engine installed in a housing which itself is in the open with unobstructed air all round.
(2 and 3 cylinder engines only)

- A** 15" (40 cm.) minimum diameter hole opposite flywheel air intake.
- B** 21" (533 mm.) for two cylinder engine; 26" (660 mm.) for three cylinder engine.
- C** Combustion air intake brought outside.
- D** At least 6 ventilating holes each end 1" (25.4 mm.) dia.
- E** Open mesh grille opposite hot air side of engine. Free area through grille 70 sq. ins. (450 cm²) (minimum) for two cylinder engine; 105 sq. ins. (680 cm²) minimum for three cylinder engines.
- F** Flywheel air intake to be against this end.

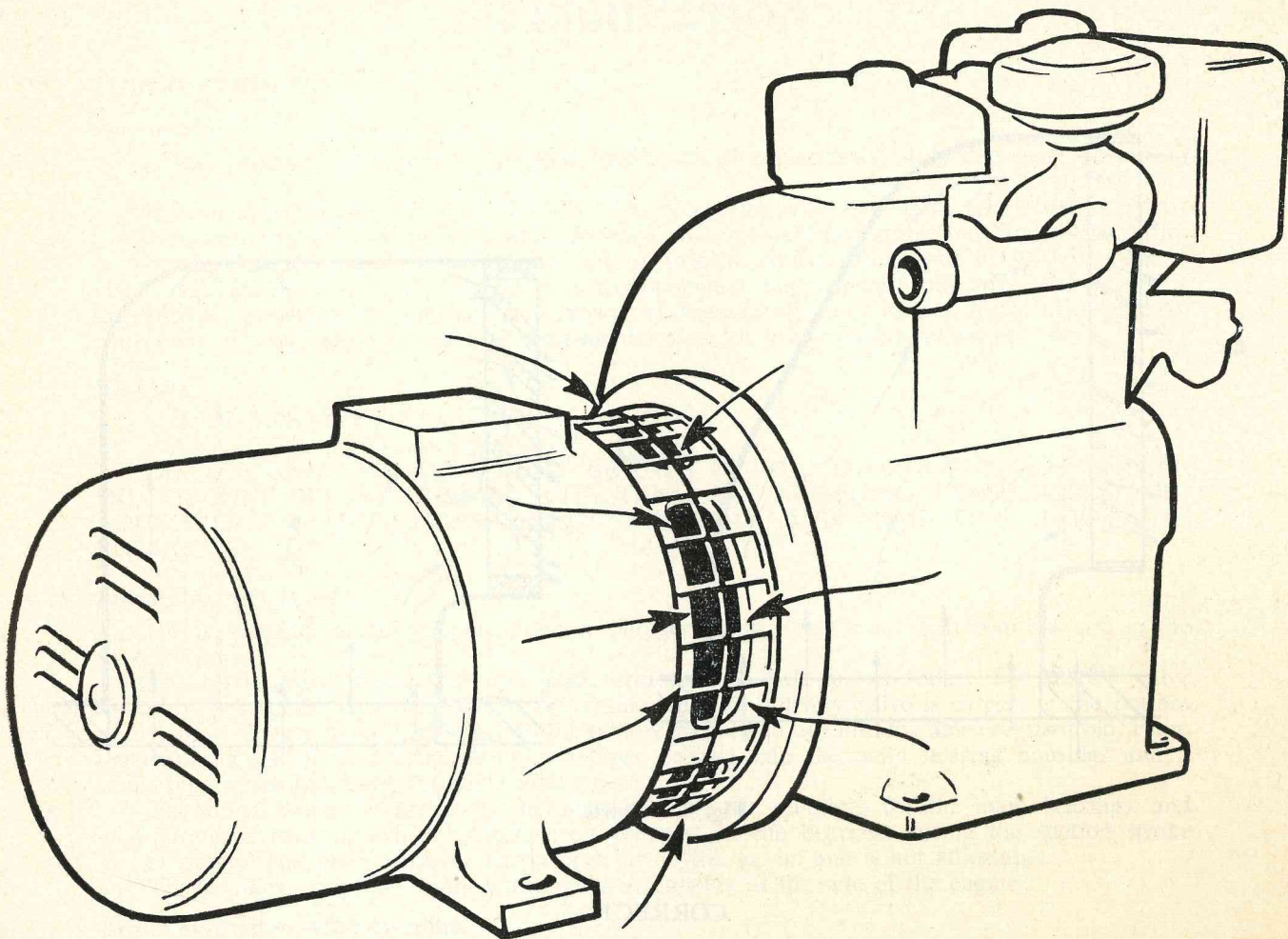


Fig. 8.—Engine close coupled to a driven machine.

Air intake holes in adaptor. The absolute minimum area of the intakes must be

30 sq. ins. (190 cm²) for SL & LD1.

60 sq. ins. (390 cm²) for SL & LD2.

90 sq. ins. (585 cm²) for SL 3.

Larger areas are preferred. The coupling or clutch driving member at the flywheel end must not obstruct the air flow to the fan, and the areas above must be maintained at this point and through to the fan.

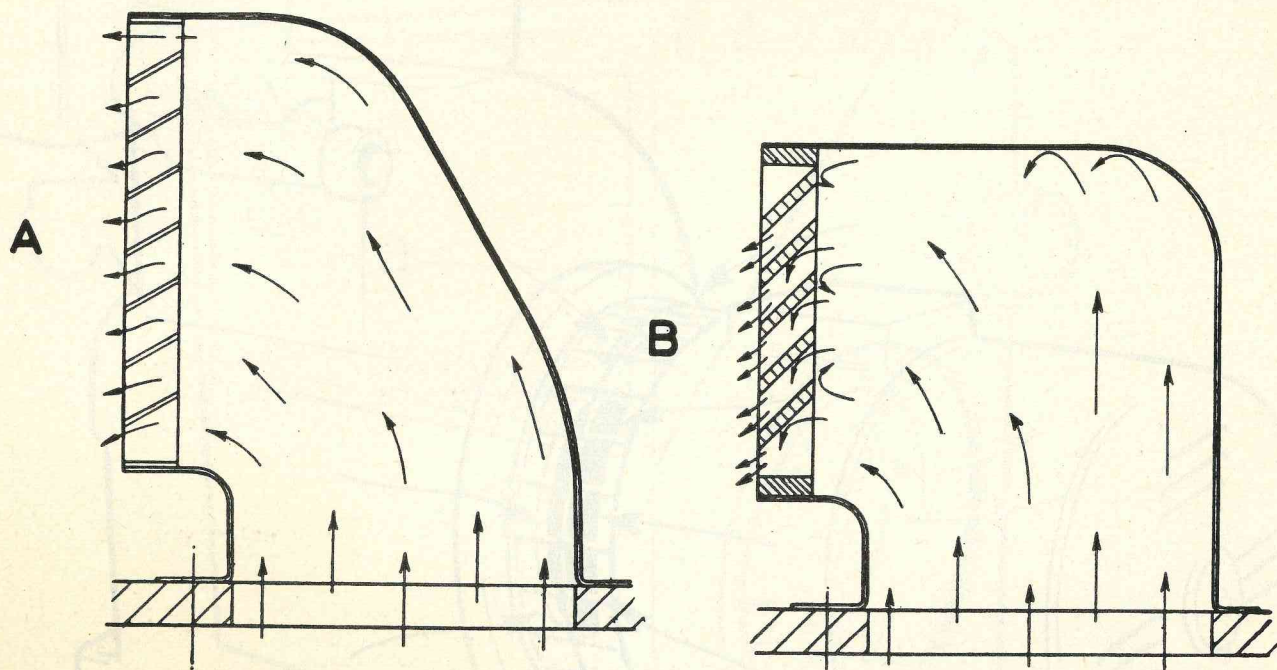


Fig. 9.—Cowls.

CORRECT—

- A** Area through louvres or grille is at least 25 per cent greater than area of ducting.

WRONG—

- B** Louvres or grille obstructs air flow. Area through louvres is smaller than area of ducting.

Grilles, wire mesh or louvres placed in the air stream are obstructions and allowances must be made for them. The free flow area of these must be calculated to ensure that it is at least 25% greater than that specified for the inlet and outlet passages.

LUBRICATION

LUBRICATING OIL

Specification

LD/SL engines must be run on good quality diesel engine heavy duty detergent lubricating oil.

In temperate climates (up to 85°F (30°C)) oils complying with BS1905 or DEF2101C or MIL-L-2104A must be used when load and servicing conditions are favourable but for arduous duties in temperate climates, and for all applications in tropical climates (above 85°F (30°C)) the use of oils to supplement 1 level of detergency is recommended. Supplement 1 oils must also be used if the sulphur content of the fuel is 1% or more. Multigrade oils must have a degree of detergency equivalent to Supplement 1 level and **must not** be used for heavy duty applications.

Viscosity

Below 85°F (30°C) use SAE10W

Above 85°F (30°C) use SAE20/20W

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

Lubricating Oil System

Oil is supplied under pressure from a plunger pump to all crankshaft bearings and to the valve rockers.

The oil is drawn through a wire gauze strainer and ball suction valve. The suction valve assembly is screwed into the base of the crankcase. The delivery valve is carried in the bottom of a hollow plunger, the oil passing into the hollow tappet and out into the delivery manifold. From the manifold the oil is distributed by two pipes pressed into the main bearing housings and a single pipe which lubricates the valve rocker gear.

The relief valve is carried in the plug securing the oil pipes for the main bearings, and incorporates a reservoir which maintains oil pressure on the bearings during the suction stroke of the pump. The relief valve is set to open at 50 lbs./sq. in. and is not adjustable.

The crankcase may be drained through a drain plug at the side of the engine.

Before Starting or After Overhaul

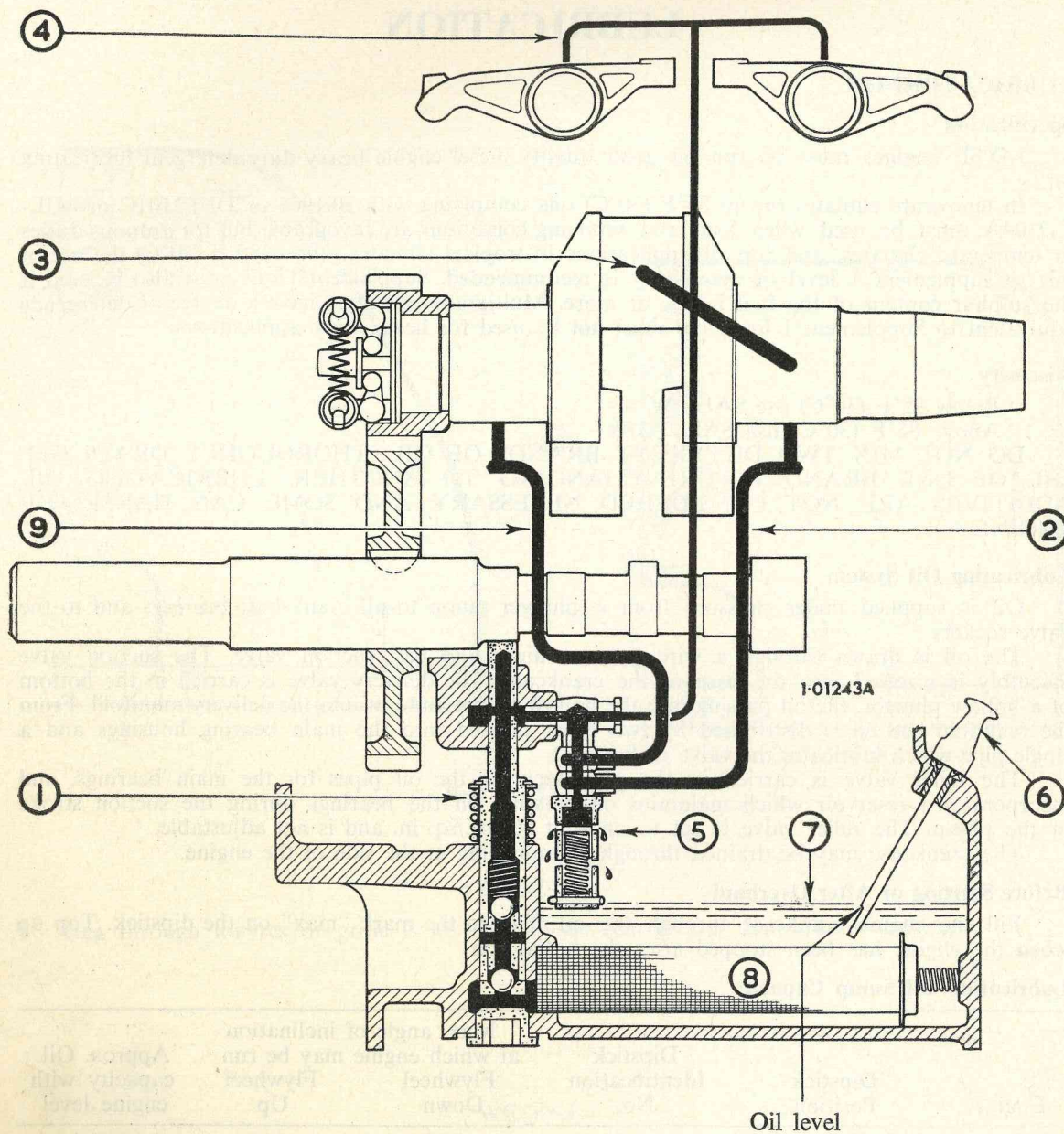
Fill the engine crankcase through the oil filler to the mark "max" on the dipstick. Top up when the engine has been stopped after the initial run.

Lubricating Oil Sump Capacity

Engine	Dipstick Position	Dipstick Identification No.	Max. angle of inclination at which engine may be run		Approx. Oil capacity with engine level
			Flywheel Down	Flywheel Up	
LD/SL1	Crankcase	1	10°	10°	3½ pints
	Crankcase Door	17	10°	10°	3½ pints
LD/SL2	Crankcase	16	15°	15°	9½ pints
	Crankcase Door	19	15°	15°	*9½ pints
	Crankcase Door	18	15°	13°	**11½ pints
SL3	Crankcase	4	10°	10°	13¾ pints
	Crankcase Door	8	15°	15°	**12 pints
	Crankcase Door	19	15°	10°	*13½ pints

*Door with lift pump, oil filter and filler.

**Door with dipstick only.



- | | |
|------------------------------------|--------------------------------------|
| 1. Lubricating oil pump. | 5. Lubricating oil relief valve. |
| 2. Oil pipe to main bearings. | 6. Lubricating oil dipstick. |
| 3. Oil passage to big end bearing. | 7. Lubricating oil level. |
| 4. Oil pipe to valve rockers. | 8. Lubricating oil suction strainer. |

Fig. 10.—Schematic diagram of Lubricating Oil System.

**LIST OF OILS COMPLYING WITH BSS. 1905 : 1952 MIN. OF DEF. SPECN. DEF. 2101C
AND U.S. ARMY SPEC. MIL-L-2104-A**

PROVENANCE	SAE 10W	SAT 20 or 20W	SAE 30
Castrol Ltd.	Agricastrol HD 10 Deusol CR 10	Agricastrol HD 20 Deusol CR 20	Agricastrol HD 30 Deusol CR 30
Esso Petroleum Co. Ltd.	Essolube HD 10 Estor HD 10	Essolube HD 20 Estor HD 20	Essolube HD 30 Estor HD 30
Germ Lubricants Ltd.	Duckhams HD 10/MIL	Duckhams HD 20/MIL	Duckham HD 30/MIL
A. Duckham & Co. Ltd.	Germil 101	—	Germil 303
Gulf Oil (Gt. Britain) Ltd.	Gulf Dieselube HD 10W (GB)	Gulf Dieselube HD 20/20W (GB)	Gulf Dieselube HD 30 (GB)
Filtrate Ltd.	Diesel "Filtrate" 10W	Diesel "Filtrate" 20	Diesel "Filtrate" 30
Mobil Oil Co. Ltd.	Delvac Oil 910 Mobiloil 10W (Overseas)	Delvac Oil 920 Mobiland Diesel 20	Delvac Oil 930 Mobiland Diesel 30
Petrofina Co. Ltd. (U.K.)	Motortonic SAE 10W Solna HD SAE 10W Solco HD SAE 10W	Motortonic SAE 20/20W Solna HD SAE 20/20W Solco HD SAE 20/20W	Motortonic SAE 30 Solna HD SAE 30 Solco HD SAE 30
Power Petroleum Co. Ltd. (U.K.) B.P. Companies(Overseas)	BP Energol DD 10W BP Energol IC-D 10	BP Energol DD 20W BP Energol IC-D 20	BP Energol DD 30 BP Energol IC-D 30
Regent Oil Co. Ltd.	RPM Delo Special SAE 10W	RPM Delo Special SAE 20/20W	RPM Delo Special SAE 30
Shell-Mex & B.P. Ltd.	Shell Rotella Oil 10W Shell Talona Oil 10W	Shell Rotella Oil 20/20W Shell Talona 20	Shell Rotella Oil 30 Shell Tolona Oil 30
Snowdrift Lubricants Ltd.	Apennine SAE 10	Apennine SAE 20	Apennine SAE 30
Valvoline Oil Co.	Super HPO 10	Super HPO 20	Super HPO 30
Vigzol Oil Co. Ltd.	New Ace 10	New Ace 20	New Ace 30

OILS COMPLYING WITH SPECIFICATIONS MIL-L-2104B SUPPLEMENT 1 AND DEF. 2101C SUPPLEMENT 1

PROVENANCE	SAE 10W	SAE 20 or 20W	SAE 30
Castrol Ltd.	Castrol CR 10 Deusol CR 10/1	Castrol CR 20 Deusol CR 20/1	Castrol CR 30 Deusol CR 30/1
Esso Petroleum Co. Ltd.	—	Estor HDX 20	Estor HDX 30
A. Duckham & Co. Ltd.	HD 10/1	HD. 20/1	HD. 30/1
Germ Lubricants Ltd.	Germol D10/S1	Germol D20/S1	Germol D30/S1
Gulf Oil (Gt. Britain) Ltd.	Gulflube Motor Oil HD 10W	Gulflube Motor Oil HD 20/20W	Gulflube Motor Oil HD 30
Filtrate Ltd.	Diesel "Filtrate" 10W	Diesel "Filtrate" 20	Diesel "Filtrate" 30
Mobil Oil Co. Ltd.	Delvac Oil 1 110	Delvac Oil 1 20	Delvac Oil 1 130
Petrofina Co. Ltd. (U.K.)	Motortonic Delta SAE 10W Solna S1. SAE 10W	Motortonic Delta SAE 20/20W	Motortonic Delta SAE 30 Solna S1 SAE 30
Power Petroleum Co. Ltd. (U.K.) B.P. Companies(Overseas)	BP Energol DS1-10W	BP Energol DS1-20W	BP Energol DS1-30
Regent Oil Co. Ltd.	Super RPM Delo Special SAE 10W	Super RPM Delo Special SAE 20/20W	Super Delo Special SAE 30
Shell-Mex & B.P. Ltd.	Shell Rotella T oil 10W	Shell Rotella T oil 20/20W	Shell Rotella T oil 30
Snowdrift Lubricants Ltd.	Alpine SAE 10	Alpine SAE 20	Alpine SAE 30
Valvoline Oil Co.	Super HPO S-1 10	Super HPO S-1 20	Super HPO S-1 30
Vigzol Oil Co. Ltd.	New Ace 10 Sup. 1	New Ace 20 Sup. 1	New Ace 30 Sup. 1

FUEL SUPPLY

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

Specification Limits.

ITEM	Min.	Max.
Cetane number	45	—
Viscosity: centistokes @ 100°F.	1.6	7.5
Redwood No. 1 @ 100°F.	31	45
Conradson carbon % by weight	—	0.1
Distillation % by volume recovered @ 357°C 675°F.	90	—
Flash Point (closed °F.)	130	—
Water % by volume	—	0.1
Ash % by weight	—	0.01
Sediment % by weight	—	0.01
Sulphur % by weight	—	1.3
Sulphur, corrosive	Not more than slight tarnish	
Strong acid number	Nil	Nil

The purchaser must satisfy himself that his engine is capable of dealing with the fuel at the lowest temperature to which it may be exposed.

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

Shell Gas Oil "C.I."

Regent Gas Oil

Esso Diesel Medium

Regent Derv.

Esso Marine Diesel Medium

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 dealer should be consulted.

Vaporising oils are unsuitable as fuel for Lister diesel engines.

In general, the fuel must be free from foreign matter or excessive wear will take place in the fuel injection system; some fuels are unsuitable owing to the excessive pressures resulting from their use or excessive carbon formation and chemical action on moving parts. 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.

Clean fuel is of the utmost importance in maintaining standard performance.

Fuel Tank

Always fill the fuel tank through a fine strainer, preferably at the end of a run. If any sediment is stirred up during the process this has time to settle before the engine is used again. If cans are used avoid tipping out the last few drops.

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

STARTING AND STOPPING

To Start Engine

- (a) Check fuel and lubricating oil levels.
- (b) If an oil bath air cleaner is fitted, fill the oil container with engine oil to the level marked on the air cleaner.
- (c) Ensure the fuel and lubricating oil systems are primed (See pages 33 and 13).
- (d) If the engine is fitted with fuel lift pump, prime the fuel filter by using the priming lever on the lift pump.
- (e) Move the decompressor lever(s) over towards the flywheel.
- (f) Pull the control lever outwards and allow it to rotate anticlockwise so that it abuts against the top stop and is in a vertical position. See illustrations below.
- (g) Lightly oil the end of the camshaft extension and fit the starting handle. It is recommended that this shaft always be used for starting the engine.
- (h) **Important.**—Turn the engine slowly from 3 to 20 turns on the camshaft according to the temperature and period of standing unused, in order to prime the combustion chamber(s) and the lubricating oil system.
- (i) Turn the handle smartly in a clockwise direction and whilst still turning, move the decompressor lever(s) towards the fuel tank. Slip off the starting handle when the engine fires.
- (k) As soon as the engine reaches normal speed, turn the control lever clockwise to the horizontal position so that it abuts against the horizontal stop—THIS IS MOST IMPORTANT.

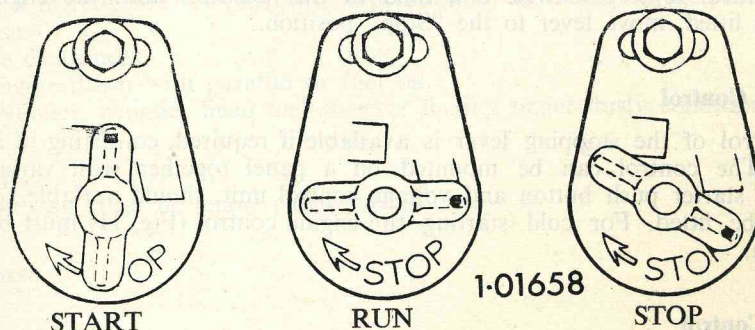


Fig 11—Engine Control

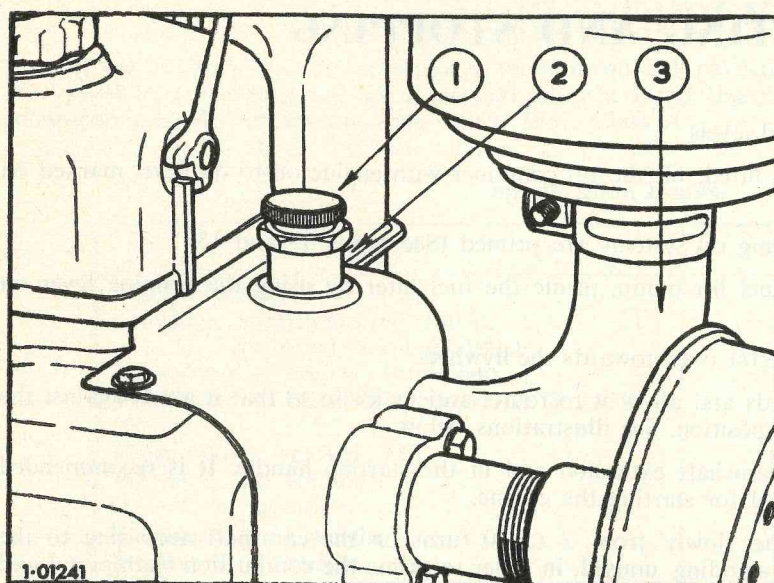
Starting Under Cold Conditions

An oil cup, mounted on the inlet valve port, is provided to assist starting under frosty conditions and should be used as follows:—

For starting under normal frosty conditions the cup should be half filled with SAE10W lubricating oil, the plunger pressed to the bottom of its stroke and the engine turned at least 5 complete revolutions with exhaust valve decompressed. The engine should then be started in the usual way.

For starting under extremely frosty conditions the cup should be completely filled with a mixture of 50% fuel oil and 50% SAE10W lubricating oil and the procedure then followed for normal frosty conditions.

The fuel and lubricating oil must be suitable for the temperature at which the engine has to be started—they must have a pour point lower than this temperature. For temperatures below 0°F it is permissible to dilute the SAE10W lubricating oil with up to 25% fuel oil, and to run and top up the sump with this mixture, or use SAE5W lubricating oil.



1. Plunger
2. Oil Cup
3. Air Inlet

Fig. 12.—Cold Starting Oil Injector Device.

To Stop Engine.

Turn the control lever clockwise and hold in this position until the engine stops. When remote control is fitted, move lever to the "Stop" position.

Remote Stopping Control

Remote control of the stopping lever is available if required, consisting of a hand lever and bowden cable. The control can be mounted on a panel together with variable speed lever, ammeter, electric starter push button and voltage control unit, should variable speed gear and/or electric starting be fitted. For cold starting the engine control (Fig. 11) must be set by hand to the start position.

Variable Speed Control

On all engines in place of the standard fixed speed control, a variable speed control can be fitted with a range of 800-1800 r.p.m. for LD engines or 800-2000 r.p.m. for SL1 and 2 engines. This arrangement is illustrated on page 38.

Electric Starting

Electric starting is available and can be operated by either direct or remote control; diagrams of the electric circuit for both these methods of control are shown on pages 46 and 47.

Speed Adjustment

A slight adjustment of speed may be made by turning the screwed rod which projects through the gear case. Turn anti-clockwise to increase speed, clockwise to decrease. Secure the locknut.

Do not increase speed more than 2½% without consulting R. A. Lister & Co. Ltd.

ROUTINE MAINTENANCE

When the engine is in daily use:—

Daily:

- Check supply of fuel oil.
- Check the level and condition of lubricating oil (also in gearbox if fitted).
- Clean the air cleaner under very dusty conditions.
- Drain the moisture trap in the exhaust pipe, if fitted.

Every 100 Hours:

- Clean the air cleaner under moderately dusty conditions. Renew the element if necessary.
- Check for oil and fuel leaks—tighten nuts and fittings if necessary.
- Wipe the engine and baseplate clean.
- Clean the cylinder, cylinder head and injector finning under very dusty conditions.

Every 250 Hours:

- Drain the lubricating oil and refill with the correct grade and type.
- Renew lubricating oil filter element—if fitted.
- Check injector sprays and clean if necessary. Do not clean at shorter periods unless absolutely necessary.

Every 500 Hours:

- Decarbonise if the engine shows loss of compression, or blow-by past the piston. Do not disturb otherwise.
- Adjust valve clearances.
- Wash the engine down with paraffin or fuel oil.
- Clean the cylinder, cylinder head and injector finning under dusty conditions.

Every 1000 Hours:

- Clean oil bath air filter or renew paper type filter.

Every 1500 Hours:

- Decarbonise.
- Clean the inlet manifold and exhaust system.
- Examine the fan blades and clean.
- Check for free working of the governor linkage.
- Drain and clean the fuel tank.
- Clean the fuel filter element. Renew if necessary.
- Adjust the injector pressure settings.
- Check the fuel pump timing and balancing.
- Clean the cylinder, cylinder head and injector finning under normal conditions.
- Check the lubricating oil pump valve assemblies.

Every 5000 Hours:

- Check the big end and main bearings.

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

MAINTENANCE

Note: Every effort must be made to maintain the engine in a clean condition and oil leaks must be dealt with as soon as they occur. With a new or overhauled engine the joints settle during the first few hours running and their tightness must subsequently be checked. This includes the following:

- Gear train end cover joint.
- Cylinder head cover joint.
- Lubricating oil pipe joints.
- Injector pipe nuts.
- Fuel pump housing cover joints.

Note: All joints, other than rubber, are to be coated on both sides with Wellseal or SQ32M jointing compound or an equivalent non-hardening engine jointing compound. Rubber joints are to be cemented to the covers with Bostik 772 compound or equivalent, no cement being used on the other side of the joint.

Note: For assembly use SAE10W heavy duty detergent lubricating oil with 5% concentrated colloidal graphite added. All bearing surfaces must be well lubricated including the cups of the push rods and the valve stems.

	Size	Torque lb. ft.	kg.m.	Component
$\frac{1}{4}$ "	UNF	10	1.38	—
$\frac{5}{16}$ "	UNF	15	2.07	Injector clamp nuts.
				Big end nuts
$\frac{3}{8}$ "	UNF	32	4.42	Balance weight setscrews.
$\frac{7}{16}$ "	UNF	50	6.91	Cylinder head holding down nuts.
$\frac{1}{2}$ "	UNF	68	9.4	
$\frac{3}{4}$ "	UNF	200	27.65	Flywheel crankshaft setscrew.

Oil Bath Air Cleaner

It is recommended that the element be cleaned at least every 1000 hours, even when operating in substantially dust-free conditions: under less favourable conditions more frequent cleaning will be necessary—even daily.

After dismantling the filter, the element should be thoroughly washed in paraffin or fuel oil and the filter bowl cleaned out. On re-assembly, the filter must be filled with oil up to the mark using the same grade of oil as for the engine.

Paper Type Air Cleaners

The element in this type of cleaner should not be cleaned but should be renewed.

Breather

A crankcase breather, in the form of a copper pipe, is screwed into the top of each cylinder head and connects with the inlet port. Vapour is drawn into the inlet manifold and a partial vacuum thus maintained in the crankcase which prevents oil leakage through joints and bearings.

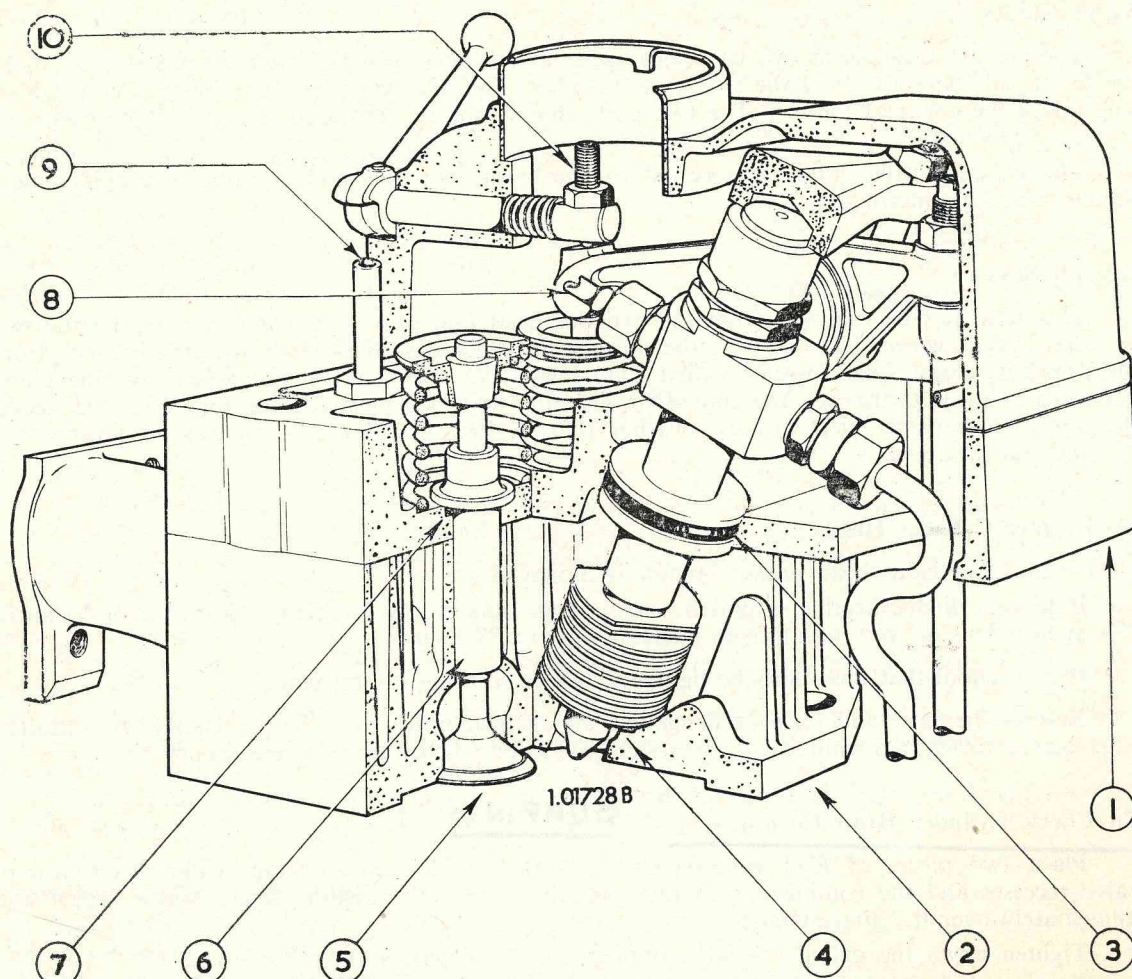
Fuel Filter

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

Clean or renew the filter element every 1500 hours—more frequently if the fuel is known to be dirty for any reason. The element may be washed in clean paraffin or fuel oil, taking care not to allow dirt to reach the inside of the element or delivery pipes. Clean the inside of the filter bowl.

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

See also page 33.



- | | |
|-----------------------------------|-------------------------------|
| 1. Cylinder head—top plate. | 6. Inlet valve guide. |
| 2. Cylinder head. | 7. Valve guide oil seal ring. |
| 3. Injector sleeve oil seal ring. | 8. Fuel leak-off pipe. |
| 4. Washer for injector sleeve. | 9. Breather. |
| 5. Inlet valve. | 10. Decompressor screw. |

Fig. 14.—Cylinder Head

To Remove Cylinder Head

Remove:—

- (a) Cylinder head cover.
- (b) Fuel pump housing door.
- (c) Lubricating oil pipe to valve rockers.
- (d) Fuel leak-off pipe.
- (e) Fuel pipe—fuel pump to injector.
- (f) Fuel injector.
- (g) Inlet and exhaust manifold.
- (h) Oil starting reservoir.
- (j) Air shroud at back of cylinder.
- (k) Four holding down nuts and washers and lift off head.

Valve Guides

The cylinder head is in two parts (an upper and lower). The valve guides are a press fit in the lower half only and hold the two parts together. The inlet valve guide is jointed on a rubber ring under the collar at the top. The two parts should not be separated unless it is necessary to replace components.

The exhaust valve guide is recessed at the lower end. Inlet and exhaust valve guides must therefore not be intermixed.

Injector Sleeve

This need not be removed from the cylinder head unless it is necessary to separate the two parts. It may, however, lift out with the injector, in which case the carbon must be brushed from the projecting part of the injector with a wire brush, care being taken not to damage the pintle valve which projects through the end of the injector, and then push the injector out of the sleeve. Be careful to replace injector sleeve washer (No. 4, Fig. 14). There is no washer between the injector and its sleeve.

To Replace Cylinder Head

Examine cylinder head gasket—renew if damaged.

Replace cylinder head and pull down the four nuts evenly. Tighten to a torque of 50 lb. ft. (6.9 kg.m.). This is "very tight" with a spanner about 7" long.

It is essential that these nuts be tightened before securing the injector.

Note:—The inlet and exhaust flanges of all cylinder heads must be lined up with a straight edge before finally tightening down to avoid distortion when fitting the manifolds.

To Check Cylinder Head Clearance.

BUMPING

Place two pieces of lead wire 0.048" x 1" (1.22 x 25.4 mm.) on top of the piston clear of valve recesses and the combustion chamber in the top of the piston. Space widely apart and immediately over the gudgeon pin.

Tighten down the cylinder head and turn the piston past T.D.C.

Remove the cylinder head and measure the thickness of lead. This should be between 0.030" (0.76 mm.) and 0.033" (0.84 mm.) and may be adjusted by steel shims 0.003" (0.075 mm.) thick placed between the cylinder head and the gasket. Only one joint must be used between the crankcase and the cylinder barrel.

To Remove Piston

- (a) Remove cylinder head.
- (b) Remove air guide plates at sides of cylinder.
- (c) Remove crankcase door.
- (d) Disconnect connecting rod big end bearing.
- (e) Lift off cylinder complete with piston and connecting rod, after having marked the camshaft side of the barrel with chalk.

Withdraw piston from cylinder.

To remove the gudgeon pin, immerse the piston in hot water, remove one spring circlip, and the gudgeon pin may then be pushed out.

Piston rings may be removed by inserting thin metal strips between the ring and the piston and easing off the ring, but it is recommended that a ring expanding tool, as made for car engines, be used when available.

To Replace Piston Rings

Clean piston ring grooves, oil holes and rings carefully.

Roll each ring (except the top one which is taper sided) round its own groove.

When fitting new rings, measure the gap between the ends when the ring is inserted squarely in the bottom of the cylinder. The gap should be between 0.012" and 0.016" (0.305-0.406 mm.) for the top ring and between 0.008" and 0.012" (0.203-0.305 mm.) for the compression and scraper rings.

The top ring is taper sided and chromium plated.

The second and third rings have tapered faces against the cylinder. These should be fitted with the larger diameter of the taper at the bottom. New rings are marked 'Top' on the top side.

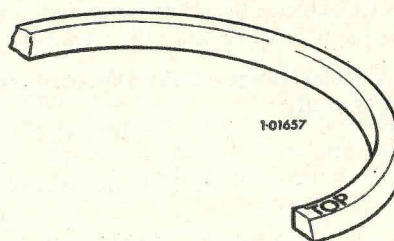


Fig. 15.—Piston Ring

To Replace Piston and Connecting Rod.

Always check the clearance between the piston skirt and the cylinder which must not be less than 0.005" (0.127 mm.) measured with a feeler pushed between the two.

Oil the piston and connecting rod and assemble into the cylinder block. Place one copper joint at the base of the cylinder block.

Turn the cylinder block so that the flats on the fins are towards the flywheel and fuel tank ends respectively, and the side marked with chalk is towards the camshaft.

Turn the piston so that the wording 'CAMSHAFT SIDE' is towards the camshaft (fuel pump housing).

Turn the crankshaft to T.D.C., lower into position the cylinder complete with piston and connecting rod, and when the connecting rod bolts have passed over the crankpin, turn the crank towards the door whilst the piston is being pressed down.

Assemble the big end bearing according to the identification marks and secure with the self locking nuts. Correct tightening torques is 15 lb. ft. (2.07 kg.m.).

Connecting Rod Big End Bearings

Big end bearings are copper-lead lined precision finished, and require no fitting; under no circumstances should they be scraped or touched up in any way.

If the big end has been dismantled because of failure of the metal, the oil passage in the crankshaft must also be examined for obstruction and fragments of metal. After cleaning out, it is advisable to crank the engine over by hand to see that oil reaches the bearing, and to flush out the oil passage.

Main Bearings (see also pages 29-30)

Engines are built with steel backed split bush main bearings with separate thrust washers. The top half is whitmetal lined and the bottom half copper-lead lined. When re-assembling an engine, care must be taken that the thrust washers are correctly positioned. The centre main bearing housing is located in the crankcase by means of a plain hollow dowel tapped at one end. Care should be taken to ensure that this is fitted with the tapped end outwards to assist removal. If new bearings are fitted, ensure that the oil holes are in line with the holes in the bearing housing, and that the bearing is pressed in so that the inner edge is $\frac{1}{16}$ " from the inner face of the bearing housing.

Valve Adjustment (TAPPET)

Above 1200 r.p.m. the valve clearance must be set to 0.002" (0.05 mm.) COLD for both inlet and exhaust valves. Below 1200 r.p.m., the clearances must be inlet 0.002" (0.05 mm.) and exhaust 0.006" (0.15 mm.) COLD.

To adjust, remove the cylinder head cover and turn the piston to the T.D.C. position firing stroke (both valves closed). Slacken the locknut on the adjusting screw and turn the screw until

the correct clearance has been obtained. Tighten the locknut whilst restraining the adjusting screw, and re-check to ensure that the clearance is correct.

NOTE: A feeler gauge of the thickness stated must pass easily but one 0.002" thicker must not pass at all.

Inlet Valve	Opens	10°	B.T.D.C.
	Closes	30°	A.B.D.C.
Exhaust Valve	Opens	30°	B.B.D.C.
	Closes	10°	A.T.D.C.

Valve heads must be between 0.015" and 0.020" (0.38—0.5 mm.) below the face of the cylinder head.

The width of valve seats must be 0.064"—0.083" (1.63—2.1 mm.). This width can be obtained by increasing the depth of the recess in the head using tool No. 317-85 for the exhaust valve and 317-189 for the inlet valve.

Decarbonising

Decarbonise after about 1500 hours.

(a) Recess in exhaust valve guide(s).

(b) Remove piston(s) and rings.

All parts must be thoroughly cleaned and washed in paraffin.

Special care must be taken with regard to:—

(a) Recess in exhaust valve guide(s).

(b) Valve ports.

(c) Piston rings and grooves.

(d) Combustion chamber(s) in top of the piston(s). (Do not remove).

(e) Fins must be cleaned on cylinder(s), cylinder head(s) and injector sleeve(s). **This is very important.**

(f) The inside of the piston(s).

(g) Regrind valve seats if not in perfect condition.

(h) Clean out exhaust piping and silencer.

To Adjust Decompressor

For engines provided with an oil filler hole in each cylinder head cover, access to the decompressors is through these holes.

Turn the piston to T.D.C., firing stroke.

Move the decompressor lever over towards the flywheel.

Slacken the locknut and turn the decompressor screw down until the exhaust valve touches the piston.

Turn the screw back $\frac{1}{2}$ turn and tighten the locknut.

For engines not fitted with removable oil filler caps in the cylinder head covers, the covers should be removed and the adjustment set so that, when the cover is secured in position the adjustment screw just touches the valve rocker lever when operated. The adjustment screw should then be screwed down a further $\frac{3}{4}$ turn and locked in position.

Flywheel

The flywheel is mounted on a taper. A withdrawing tool is required to remove it. Do not slacken the nut more than two turns before loosening the flywheel on the taper. On reassembling tighten the retaining setscrew to a final torque of 200 lb. ft. (27.65 kg.m.).

Cooling Air Fan

LD1 and SL1 engines with sheet metal fan shrouds: The fan shroud is secured by four set-screws which also retain the main bearing housing in position. To ensure correct crankshaft end float, metal shims are inserted between the main bearing housing and the crankcase. To ensure correct axial location of the cooling fan in the fan shroud, further shims may be inserted between the fan shroud and the main bearing housing so that there is between 0.040" and 0.090" (1.0—2.25 mm.) clearance between the side of the flywheel and the fan shroud.

All engines with cast fan shrouds: During initial assembly, the fan shroud is secured in position by means of the four centre setscrews, and the resultant gaps then gauged between the four bosses at the back of the fan shroud and the corresponding bosses on the end of the crankcase. The centre setscrews are then slackened, and long shims of corresponding gauged thickness are inserted transversely across the top bosses and across the bottom bosses. **Great care must be taken when stripping the engine down to note the position of all shims and to replace them as originally fitted.** This is particularly important when close coupled drive units are involved as incorrect shimming will cause distortion of the fan shroud and eccentric support of the driven unit in relation to the engine flywheel.

To Remove Fuel Pump

- (a) Drain fuel at fuel filter.
- (b) Remove fuel pipe to injector.
- (c) Disconnect fuel supply pipe.
- (d) Release governor adjusting spring.
- (e) Disconnect governor link.
- (f) Remove fuel pump clamp setscrew and clamp. Lift out pump, taking care of adjusting shims below pump body.

When refitting the fuel pump, use two spanners to tighten the fuel delivery connection to prevent the pump being twisted on its seating. The pump racks **must** move freely, otherwise erratic running or hunting will occur.

Camshaft (see also pages 31-32)

The camshaft is carried in porous bronze bushes. One bush is pressed into the end cover and the remainder into the crankcase.

The camshaft is extended beyond the cover and is the same diameter as the crankcase extension providing a second position for power take off at half the engine speed.

To Remove Camshaft

- (a) Remove fuel pump housing door.
- (b) Disconnect governor adjusting spring.
- (c) Disconnect fuel pipe(s)— filter to pump(s) and drain fuel.
- (d) Remove fuel pump(s) and tappet(s).
- (e) Remove set screws in gear and cover.
- (f) Turn camshaft keyway to bottom.
- (g) Remove crankcase door.
- (h) Slacken oil pump plug $\frac{1}{16}$ " (1.6 mm.), or remove from crankcase, in order to compress lubricating oil pump return spring until pump tappet is below level of camshaft bearing.
- (i) Remove gear end cover.
- (j) Hold up tappets and slide out camshaft—collect tappets.

To Replace End Cover

- (a) Clean joint faces, fit new joint with sealing compound both sides.
- (b) Fit end cover. **NOTE: Care must be taken not to damage oil seal.**
- (c) Hook speeder spring onto governor link.
- (d) Fit seven setscrews and copper washers in end cover.
- (e) Fit swivel union screw and joints to connect fuel pipe to filter.
- (f) Fill tank with fuel.
- (g) Bleed fuel system at all points.
- (h) Replace fuel pump housing door.
- (j) Start engine.
- (k) Adjust speeder spring screw to required speed and tighten lock-nut.

To Time Camshaft

The camshaft is timed by matching the letters 'O' on the camshaft gearwheel and the crankshaft pinion.

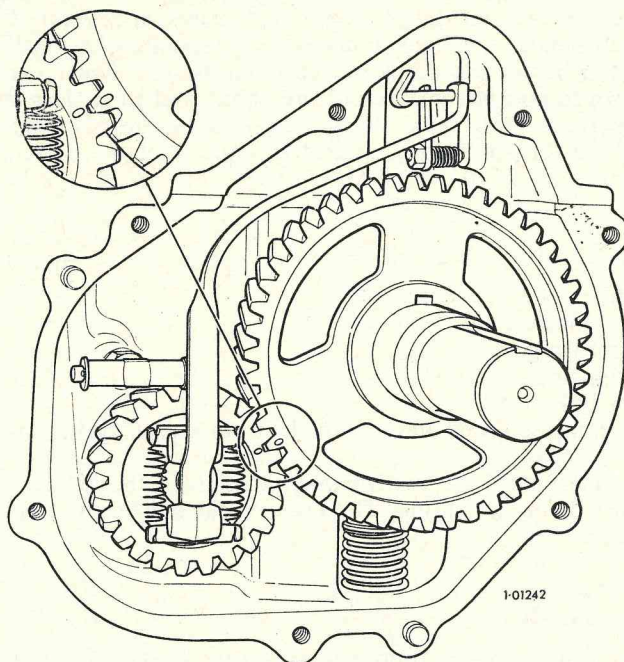


Fig 16.—Camshaft Timing

Governor

The engine governor is carried within the crankshaft pinion at the gearcase end of the engine.

The governor lever operating the fuel pump(s) is carried on a fulcrum bearing secured to the crankcase above the pinion. This bearing, fitted so that the centre line of the bearing is approximately $\frac{3}{4}$ " from the facing on the crankcase, is adjusted in accordance with the instructions given under "Setting Fuel Pump" (page 35), and secured with a lock nut.

The lever is curved to pass over the camshaft gearwheel and is joined to the fuel pump(s) by a link arm.

CARE MUST BE TAKEN AT ALL TIMES TO PREVENT ANY FOREIGN MATTER ENTERING THE CRANKCASE.

Lubricating Oil Pump

The plunger type pump is cam operated from the camshaft and the suction valve, being below the level of the oil, should require little attention.

At times of major overhaul, however, the pump should be dismantled for inspection.

Check that the sweated plugs retaining the suction and delivery ball valves are solidly locked in position.

Under no circumstances dismantle these valve assemblies.

When reassembling the pump ensure that the hollow end of the pump tappet is to the bottom.

To Remove Lubricating Oil Pump

- (a) Compress pump return spring to relieve pressure on the circlip.
- (b) Remove circlip.
- (c) Release pump spring.
- (d) Remove suction valve assembly from bottom of crankcase.

The pump plunger and tappet may now be pushed out.

Remove the spring and carrier ring from the crankcase.

The suction strainer is held in place by a spring end cap in front of the crankcase.

Main Bearing Housing

To remove:—

- (a) Remove flywheel.
- (b) Remove air and exhaust manifold(s).
- (c) Remove air shroud at back of cylinder(s).
- (d) Remove fan impeller trunking.
- (e) Remove crankcase door.
- (f) Remove lubricating oil relief valve and oil pipes to main bearings.

The housing may now be removed from the crankcase.

Before replacing, ensure that the main bearing bush is in its correct position—lubricating oil holes in line.

Crankshaft end play must be between 0.005" and 0.009" (0.12/0.21 mm.). This can be adjusted by metal shims of 0.005"/0.010" (0.127—0.254 mm.) thickness between the housing and crankcase. No paper joints must be used. The metal shims must be joined with clean jointing compound on both sides.

To Remove Crankshaft

- (a) Remove piston(s) and connecting rod(s).
- (b) Remove gear end cover.
- (c) Remove governor and control rod.
- (d) Remove crankshaft pinion (shrunk and keyed to crankshaft; to replace, heat in boiling water).
- (e) Remove main bearing housing and centre bearing locating dowel (using a $\frac{1}{4}$ " UNF bolt screwed into end).
- (f) Withdraw crankshaft through the housing bore.
Replace in the reverse order to removing.

Oil Seals

The crankcase is sealed at the crankshaft by screw type oil seals and felt rings, and the camshaft is sealed in the end cover with a Gits seal. Screw type seals must be concentric with the shaft, the maximum permissible variation of gap being 0.003" (0.075 mm.).

There is a ring type oil thrower on the flywheel end of the crankshaft and care must be taken to guide this ring over the end of the crankshaft when fitting the main bearing housing.

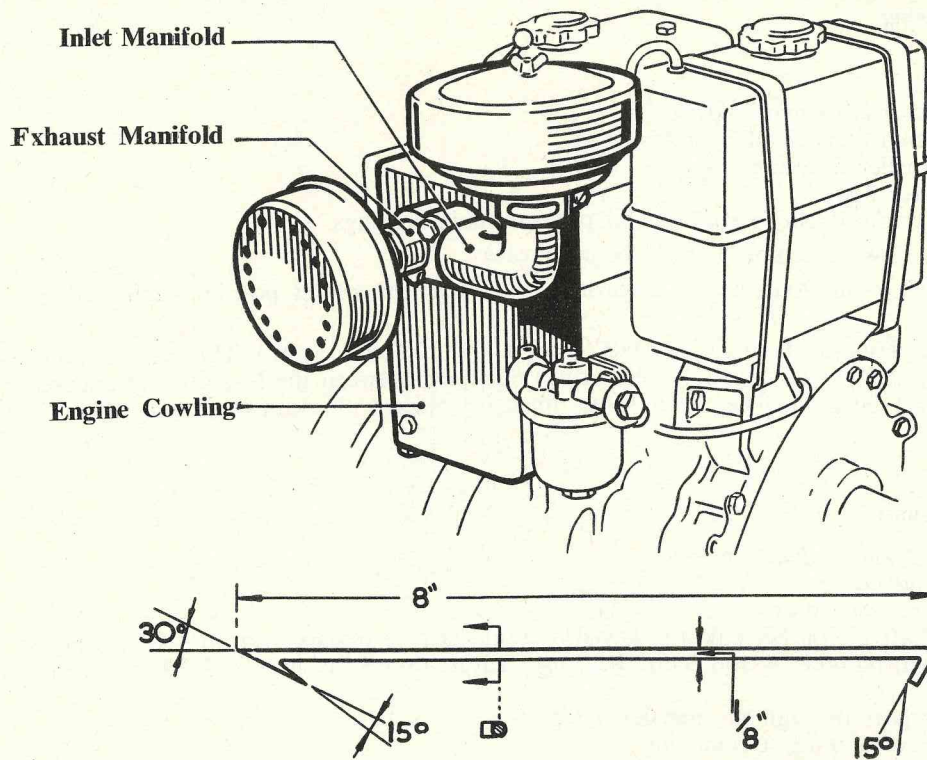
Cleaning of Cooling Fins

Under normal conditions the cylinder, cylinder head and injector cooling fins require cleaning at intervals of 1500 hours or even longer, but if the engine runs in a very dusty atmosphere, particularly if there is vegetable fibre, fluff, or similar matter in the air, cleaning may become necessary at 100 hours intervals. **Regular cleaning in exceptionally dusty conditions is essential if overheating is to be avoided.**

In dusty conditions it is also particularly important to **eliminate oil leaks**, so keeping the cooling fins dry and clean.

The engine has ample cooling capacity and therefore cleaning is not so important if the average load is light, but if the load is heavy, serious overheating can occur and this will damage the engine although the piston may not seize. Damage due to overheating may show itself as fuel injection trouble, stuck exhaust valves, with corresponding valve gear troubles, poor starting and scuffed piston rings and pistons.

To clean the fins it is necessary to remove the cooling air cowling (item 36, plate 1) and in order to do this the inlet and exhaust manifolds must be taken down. In many cases the inlet and exhaust manifold joint becomes damaged during this operation and a new joint must be fitted. The cleaning is effected with a special hooked wire tool, part no. 367-16170, the dimensional



Engine fin rake (Cleaning Tool 367/16170)

Fig. 17.—Cleaning Cooling Fins

illustration of which is shown above. This tool is of special design to draw the deposits between the fins towards the operator and makes the cleaning operation speedy and effective.

To clean the injector sleeve fins it is necessary to withdraw the injector sleeve from the cylinder head, after removing the injector.

Laying-up Procedure

The following routine should be carried out when it is known that the engine will not be required for some months:—

1. Replace fuel in tank with a small supply of Shell Fusus Oil A or equivalent.
2. Drain lubricating oil from sump and refill with Shell Ensis 453 oil or equivalent.
3. Run the engine for a period to circulate the Ensis oil through the system and to ensure the Fusus Oil is passed through the fuel pumps and injectors.
4. Stop the engine and drain off the Ensis lubricating oil from the sump, after which the crankshaft should NOT be turned until the engine is again required for service. The Fusus oil should be left in the fuel system.
5. Seal all openings on the engine with tape.
6. Remove batteries, when applicable, and store fully charged with the terminals coated with vaseline (petroleum jelly).
7. Grease all external bright parts and control linkage, etc.
8. Tie labels on the engine clearly stating what steps have been taken to inhibit the engine during storage, as above.

If the above is not carried out then the engine should be run about 15 minutes once a month.

SPECIAL TOOLS

Supplied to order only

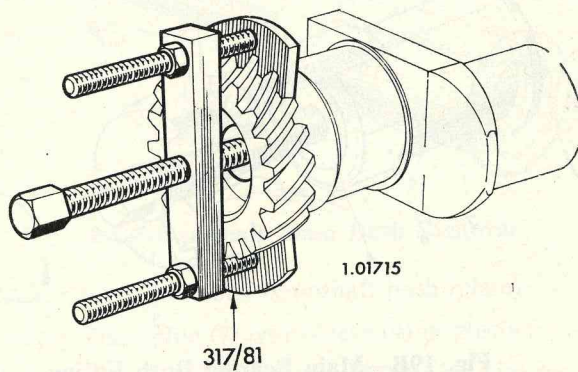


Fig. 18A.—Pinion Withdrawal Tool

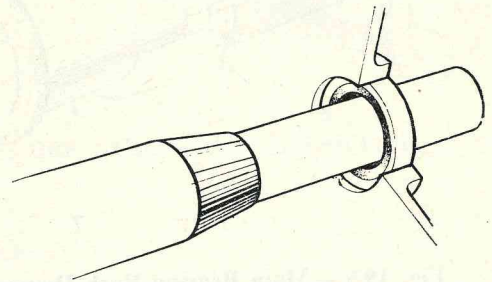


Fig. 18B.—Tapered Sleeve

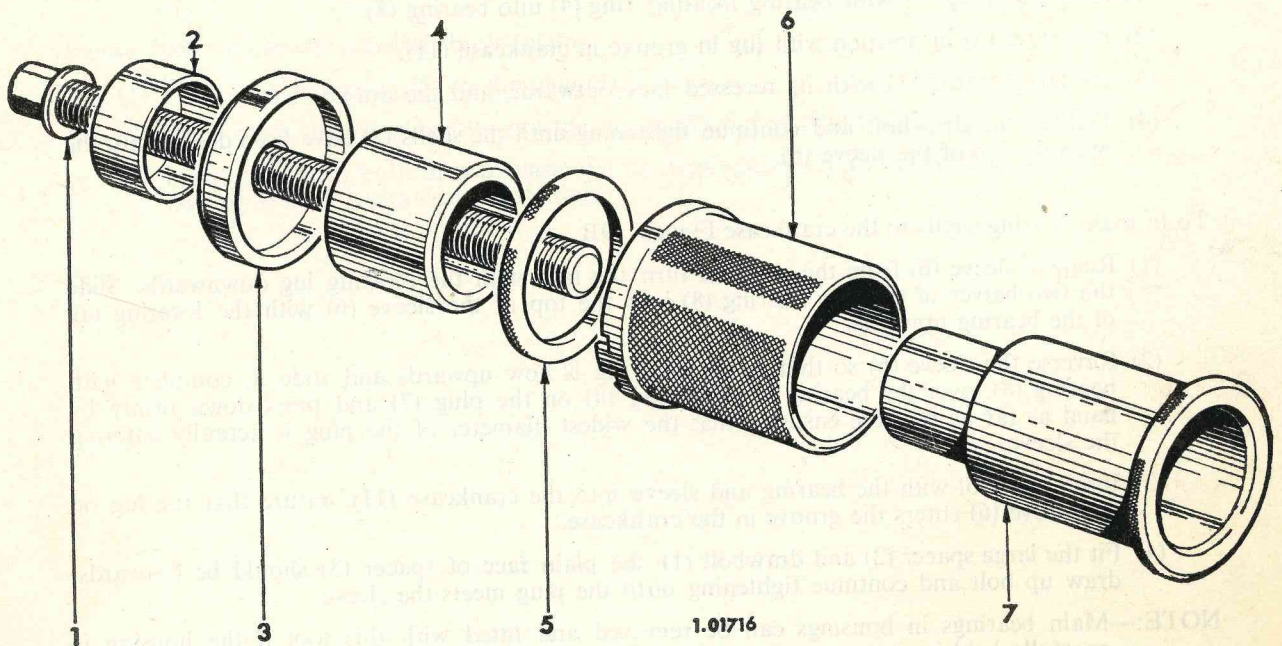


Fig. 18C.—Main Bearing Tool Complete—Part No. 317-84

KEY

- | | |
|-----------------|------------------|
| 1. Drawbolt | 4. Locating Ring |
| 2. Small Spacer | 5. Spacer Ring |
| 3. Large Spacer | 6. Sleeve |
| 7. Plug | |

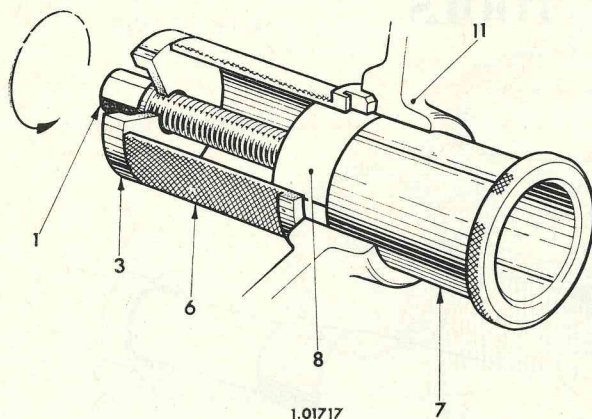


Fig. 19A.—Main Bearing Bush Removal

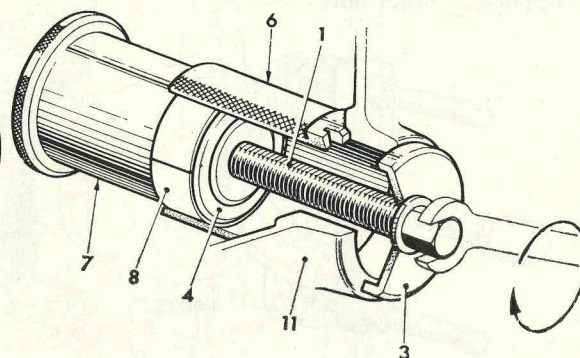


Fig. 19B.—Main Bearing Bush Fitting

To remove main bearing shells from the crankcases Figure 19A.

- (1) Enter the plug (7) with bearing locating ring (4) into bearing (8).
- (2) Fit sleeve (6) in position with lug in groove in crankcase (11).
- (3) Fit large spacer (3) with its recessed face outwards, and the drawbolt (1).
- (4) Tighten the drawbolt and continue tightening until the shells (8) have been drawn into the wide section of the sleeve (6).

To fit main bearing shells to the crankcase Figure 19B.

- (1) Remove sleeve (6) from the tool and turn the face with the locating lug downwards. Slide the two halves of the new bearing (8) into the top of the sleeve (6) with the locating tag of the bearing upwards.
- (2) Reverse the sleeve (6) so that its locating lug is now upwards and slide it, complete with bearing (8), over the bearing locating ring (4) on the plug (7) and press down firmly by hand as far as possible ensuring that the widest diameter of the plug is actually entering the sleeve.
- (3) Insert the tool with the bearing and sleeve into the crankcase (11), ensure that the lug on the sleeve (6) enters the groove in the crankcase.
- (4) Fit the large spacer (3) and drawbolt (1) the plain face of spacer (3) should be outwards, draw up bolt and continue tightening until the plug meets the sleeve.

NOTE:—Main bearings in housings can be removed and fitted with this tool if the housing is carefully held in a vice.

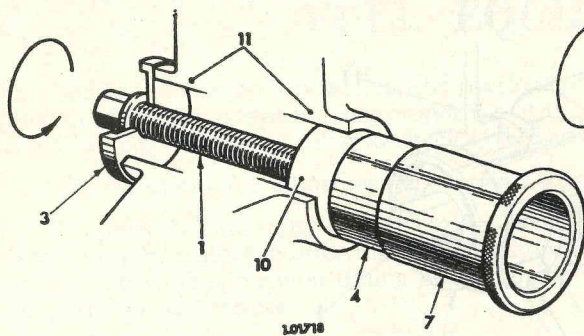


Fig. 20A.—Camshaft Plain Bush Removal

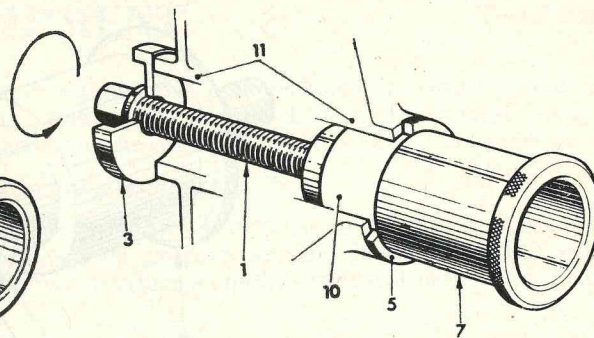


Fig. 20B.—Camshaft Plain Bush Fitting

Figure 20A—To remove camshaft bush (plain)

- (1) Place plug (7) with sleeve (4) in position as sketch.
- (2) Fit draw bolt (1) and spacer (3), with recessed face of spacer outwards, tighten draw bolt and continue tightening until bush (10) is withdrawn. Care must be taken to ensure that the plug (7) and sleeve (4) are accurately positioned and will not foul the crankcase when the draw bolt is tightened.

Figure 20B—To insert camshaft bush (plain)

- (1) Place the spacer ring (5) on the plug (7).
- (2) Place bush (10) on plug (7)—not the sleeve (4) is not required.
- (3) Insert plug with bush in crankcase and fit large spacer (3) and drawbolt (1). Tighten draw-bolt until bush is drawn into position.

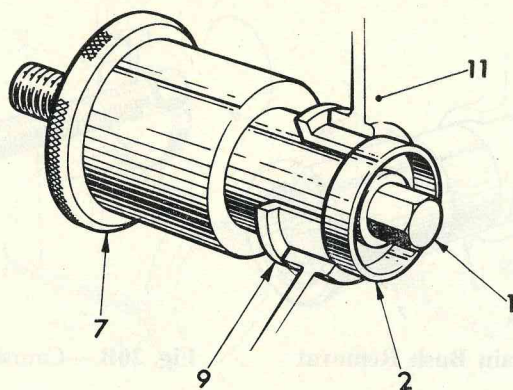


Fig. 21A.—Camshaft Flanged Bush Removal

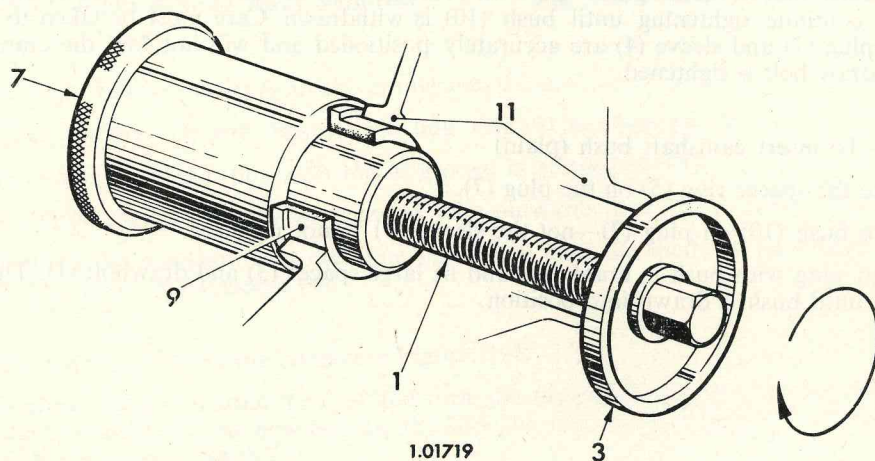


Fig. 21B.—Camshaft Flanged Bush Fitting

Figure 21A—To remove camshaft bush (flanged).

- (1) Insert plug (7) into bush (9).
- (2) Fit small spacer (2), with recessed face outwards, fit drawbolt (1) and tighten drawbolt until bush is withdrawn.

Figure 21B—To fit camshaft bush (flanged).

- (1) Place bush (9) on plug (7) as in sketch.
- (2) Fit large spacer (3)—with recessed face outwards—and drawbolt (1).
- (3) Tighten drawbolt and continue tightening until bush (9) is drawn into place.

FUEL EQUIPMENT

Engines of low horsepower can be overloaded without the user realising it, because even a fraction of a horse power is a big proportion of the total engine output. If a smoky exhaust is noticed in an engine the first thing to check is the setting of the overload stop.

The directions for adjusting the overload stop are given on page 35.

The injectors are most unlikely to be the cause of a smoky exhaust in LD/SL engines and should only be disturbed after the overload stop has been properly set and if the exhaust is still unsatisfactory. The injection timing of the engine may produce a smoky exhaust if more than $\frac{1}{4}$ " (6 mm.) out on the flywheel.

Overheating of the engine and of the combustion air reduces the weight of air available for combustion, produces a darker exhaust as well as a loss of power and can cause serious damage, so this matter must receive immediate attention. Full information on cooling problems arising from the installation of air cooled engines is given on pages 5 to 12.

IMPORTANT

When priming or checking the fuel pump timing, care must be taken to prevent the overflow of fuel passing into the crankcase.

Always fit a NEW joint washer when a joint has been broken.

Special care must be taken to see there is no leakage from the joints of the fuel pipe connection to the pump(s).

When tightening or loosening the fuel pump delivery connection, use two spanners to prevent the pump from twisting on its seating and causing misalignment and possibly jamming of the fuel pump rack.

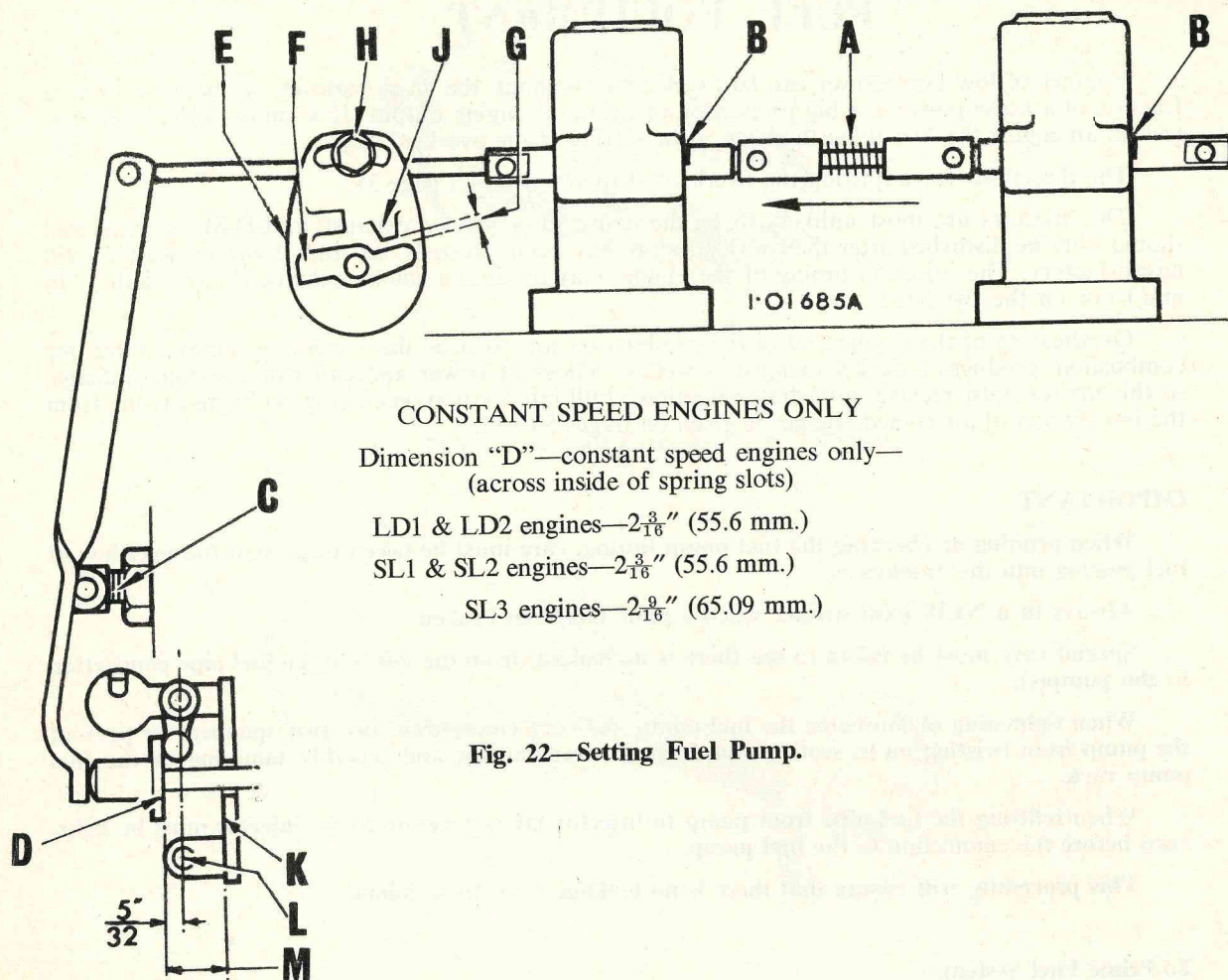
When refitting the fuel pipe from pump to injector the connection to the injector must be tightened before the connection to the fuel pump.

This procedure will ensure that there is no leakage from these joints.

To Prime Fuel System.

- (i) Fill fuel tank.
- (ii) Vent fuel filter (see Page 20).
- (iii) Vent fuel pipe at fuel pump(s). Turn engine as for starting i.e. 3 to 20 times until the injector(s) can be heard to inject and then attempt to start the engine. If the engine fails to start, prime the injection pipes as follows:—
 - (a) Remove cylinder head cover(s).
 - (b) Undo injection pipe at injector two turns only.
 - (c) Set control to start position.
 - (d) Turn engine until fuel free air flows from injector pipe(s). Retighten injector pipe nut and continue turning engine until injector(s) are heard to inject.

When self-venting pumps are fitted it should not be necessary to carry out the above procedure except when putting the engine into commission.



A—Fuel pump linkage.

B—Calibration mark.

C—Fulcrum.

D—Dimension across inside of spring seats.

E—Control lever locating plate.

KEY :

F—Control lever.

G—Setting clearance.

H—Locating plate setscrew.

J—Control lever stop.

K—Governor weights for variable speed engine.

SETTING OF FUEL PUMPS and GOVERNOR WEIGHTS (LD1 and 2 — SL1-2-3 engines.)

1. On multi-cylinder engines, adjust linkage "A" so that all the calibration marks "B" accurately coincide with the sides of the fuel pumps within 0.005" (0.127 mm.). The fuel pump racks must move freely after this adjustment.

Constant Speed Engines

2. Adjust fulcrum "C" so that when the calibration marks "B" are against the sides of the fuel pumps the distance "D" between the inside of the spring anchor slots is correct for the type of engine (see note re dimensions on page 34).

Variable Speed Engines

LD/SL1-2. Line up the faces of the weights as shown on opposite page and adjust fulcrum to bring pump calibration marks against the sides of the fuel pumps.

SL3. Centre line of arms behind the thrust cap should be in line and adjust to bring the calibrations to side of pump bodies.

3. LD engines only

Insert a shim 0.023" (0.585 mm.) to 0.027" (0.686 mm.) thick at "G" between the stop "J" and control lever "F". Rotate the locating plate "E" so that, with the shim in position, the calibration marks "B" are against the pump sides. The full width of each calibration mark must be visible. Lock locating plate "E" with screw "H" when this condition is satisfied.



This setting corresponds to a movement of the fuel rack of 0.074" (1.880 mm.)/0.086" (2.185 mm.) in the direction of the arrow. For LD1 engines at 750 r.p.m. the shims used at "G" should be between 0.032" and 0.036" (0.81-0.92 mm.) thick.

4. SL1-2-3 engines only

Proceed as 3 above but set to 0.028" (0.710 mm.) to 0.032" (0.813 mm.) instead of 0.023" (0.585 mm.) to 0.027" (0.686 mm.). The 0.074" (1.880 mm.)/0.086" (2.185 mm.) dimension becomes 0.090"/0.102" (2.286-2.590 mm.).

5. The lower settings are acceptable providing the engines carry the normal load but the higher ones **must not** be exceeded.

To Time Fuel Pump.

- Set the control lever to the "start" position.
- Turn the flywheel to the firing position. On  LD1 & SL1 engines, this is when the mark on the flywheel opposite the top centre mark on the fan shroud and both valves are closed. On the LD2, SL2 and SL3 engine the firing position is when the mark  is opposite the arrow at the back of the fan shroud near the fuel pumps, and both valves are closed (see illustration).

A table is given below showing the injection timing.

- Disconnect the fuel injector pipe at the pump and injector.
- Remove the delivery valve holder, delivery valve and spring. If fuel flows from the pump, turn the crankshaft forward until flow ceases.
- Replace the delivery valve holder without the valve and spring and lightly tighten.
- Turn the crankshaft backwards until fuel commences to flow and turn in direction of rotation until flow ceases. Blow fuel from the top of the holder to make sure flow has ceased. At this position the firing mark on the rim of the flywheel should be opposite the centre mark on the fan shroud. If it is not, the shims below the pump body must be adjusted.

Remove shims to advance.

Add shims to retard.

Shims 0.005" and 0.010" thick to a total of approximately 0.035" are normally inserted below the fuel pump.

One shim 0.005" (0.125 mm.) thick is equivalent to a timing adjustment of $\frac{3}{16}$ " (4.75 mm.) measured round the rim of a flywheel 14" diameter (35.6 cm.) diameter, or 13/64" (5.16 cm.) for a flywheel 15" (38 cm.) diameter.

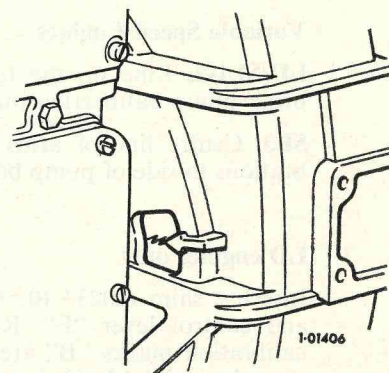



Fig. 23.—Fuel Pump Timing

FUEL INJECTION TIMING

Engine	B.T.D.C. Timing Degrees	Diameter of Flywheel	Distance Measured on Flywheel Rim
LD1 at 750 r.p.m.	26	14" (35.6 cm.)	3.18" (8.1 cm.)
LD1	28	14" (35.6 cm.)	3.42" (8.8 cm.)
		16" (40.6 cm.)	3.91" (9.9 cm.)
SL1	30	14" (35.6 cm.)	3.66" (9.3 cm.)
		16" (40.6 cm.)	4.2" (11.2 cm.)
LD2, SL2, & SL3	30	15" (38.1 cm.)	3.93" 10.0 cm.)*

*On SL2 and SL3 & LD2 engines the mark  is on the side of the flywheel; the above figures, which are measured on the flywheel rim or periphery, are given for guidance only.

Fuel Injector (Pintle Nozzle Type)

The fuel injector, located in the cylinder head, fits into a finned aluminium alloy sleeve. The sleeve is jointed at the bottom on an asbestos joint ring and at the top by a rubber ring which fits into a groove. See Fig. 14.

Each injector is secured by a clamp which fits over two studs screwed into the valve rocker bracket. The clamp nuts must be tightened evenly to 15 lb. ft. (2.07 kg.m.) torque ensuring that the clamp is level and bears evenly on the injector. The steel fuel pipe from the pump to the injector must not be tightened until the clamp is correctly secured.

There is no joint between the injector and the sleeve.

FUEL INJECTOR TESTING INSTRUCTIONS

Injectors—Testing Instructions

LD & SL engines are fitted with single hole, pintle type, injector nozzles, this being the most reliable type of nozzle known as it is almost impossible to block the hole completely.

The pintle nozzles used are of the delay type and this means that the profile of the pintle is such that on the first part of the needle lift, a relatively small proportion of finely atomised fuel is delivered, the bulk of the fuel going through after the needle has lifted a fixed amount. This feature gives good combustion and quiet operation.

It is strongly recommended that the nozzle should not be cleaned unless it is absolutely necessary. It is customary for a nozzle to run for 1,000 hours or more without cleaning, but under adverse conditions it should be inspected every 250 hours and the instructions given below must be followed.

Owing to the above mentioned features it is not possible to test these nozzles for spray in the ordinary hand pump as in most cases good nozzles will appear defective. The correct way to check nozzles is as follows:—

(a) Check the “bursting” pressure with an ordinary hand test pump and if necessary set the injector to 160 atmospheres (165.4 kg/cm²). This setting is higher than the normal one of 155/140 atmospheres (160/145 kg/cm²) and is to allow for the inevitable fall in pressure during running of the engine.

(b) While the injector is still connected to the hand pump check the tightness of the seating by drying the nozzle and applying a pressure of about 100 atmospheres (103.3 kg/cm²) when no leakage whatever should appear from the nozzle hole. At this stage the back leak past the lapped portion of the needle must be checked by bringing the pressure up to 150 atmospheres (155 kg/cm²) and noting the time the pressure takes to drop from 120 to 70 atmospheres (89-72 kg/cm²). This time must be between 15 secs. and 70 secs. (Alternatively measure the time between 150 and 100 atmospheres (155 and 103.3 kg/cm²) which must be 10 secs. to 45 secs.). When an injector is working in an engine the leak-off should be between 1% and 5% of the engine fuel consumption per cylinder.

(c) Check the spray by connecting the injector externally to the engine fuel pump by means of a special pipe* (Part Number 317/92). The nozzle must point **away** from the operator as the spray can easily penetrate the skin. Set the overload stop to the running position (external lever horizontal), turn the engine from the camshaft at about 60 r.p.m. camshaft speed and observe the spray in the usual way. A perfect spray is in the form of a fine mist and shows no signs of being “streaky” or “dribbling”.

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

Note.—*This can be made from a genuine spare pipe (correct length, bore and outside diameter) reversed and slightly set to allow the injector to be connected externally through the fuel pump housing door. After the pipe is bent, it **must never** be used for anything but test purposes, it is impossible to straighten it again to a sufficient degree of accuracy to give a satisfactory fit in the engine.

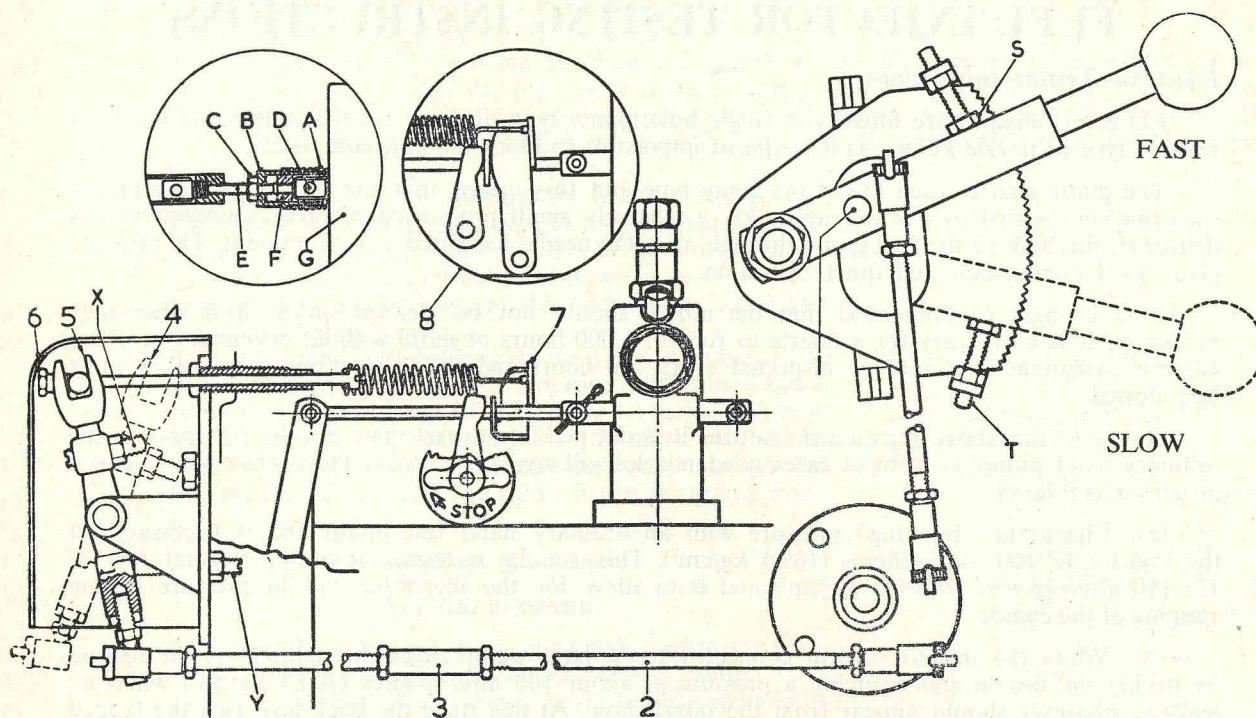


Fig. 24.—Arrangement of LD & SL Rod Operated Variable Speed Control

Cable operated arrangement is supplied as standard, rod operated as an alternative.

1. Alternative position for connecting rod.
2. For flexibly mounted engines this connecting rod must lie in a plane close to the horizontal and must not be less than 10" (254 mm.) long. Where it is necessary to carry the rod upwards fit universal rod coupling as above. Further rod couplings may be fitted as required.
3. Muff coupling for extending rods if required.
4. Idling position.
5. Full speed position.
6. Cover—not supplied with raised hand starting.
7. Fuel pump linkage for LD1/2 and SL1/2 engines.
8. Fuel pump linkage for SL3 engine.

Instructions for Adjusting Speed Control

LD/SL1 engines only. With the control lever in the "Slow" position—engine in neutral—adjust screw "X" until the idling speed is 650 r.p.m. and tighten nut.

LD/SL2 and SL3 engines. The idling device consists of a spring "A" which is mounted over the left hand shackle "F" of the flywheel end fuel pump and exerts a force on the fuel pump rack, by abutting against the pump body.

The fuel pump shackle "F" is fitted with a link stud "E" which has a long thread on which is screwed the idling spring adjusting sleeve "B". This sleeve when rotated controls the spring force and is locked in position by the lock nut "C".

To adjust the idling spring "A" the main speeder spring at the rear end of the engine is completely slackened and the adjusting sleeve "B" is rotated in the desired direction, until a steady idling of about one third of the rated engine speed is obtained, and then locked by the nut "C". Care must be taken that the shackle pin "D" is at least partially covered by the adjusting sleeve "B" as otherwise the pin is not located sideways and will fall out.

The speed control on the engine has an idling adjustment screw which should now be adjusted so that the main speeder spring just begins to increase the engine speed, and then screwed anti-clockwise one turn. The speeder spring must not exert any force when the engine is idling.

All engines. With control level still held in "Slow" position adjust screw "T" until it just touches the operating lever and lock the nut.

All engines. Push the control lever in the direction of "Fast" and adjust screw "Y" until full revolutions are obtained on load and tighten the locknut.

All engines. With control lever still held in "Fast" position adjust screw "S" until it just touches the operating lever and lock the nut.

N.B.—Ensure that the ratchet is engaged between two teeth in the "Fast" position. Adjust the length of the connecting rod or cable to suit.

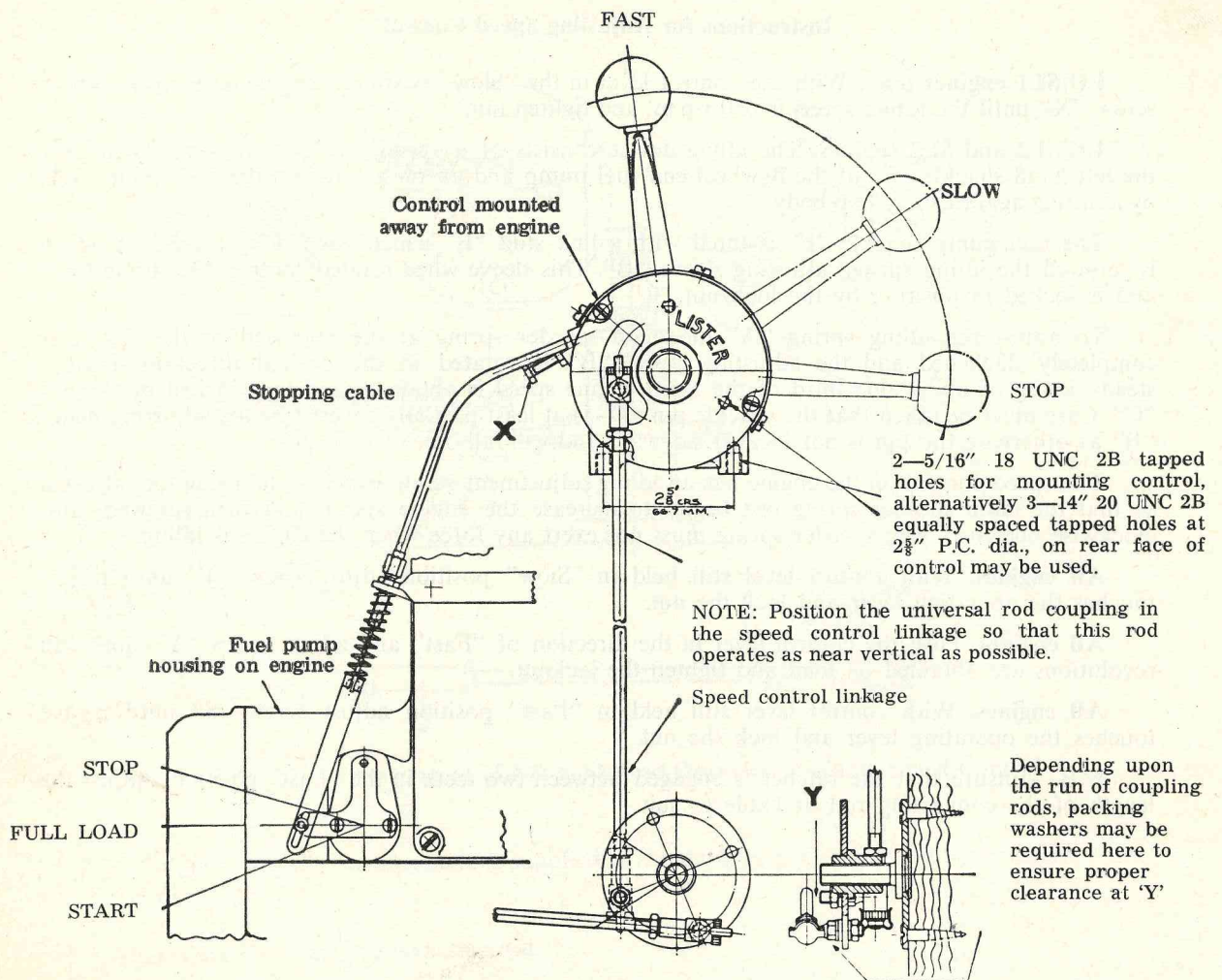


Fig. 25.—Arrangement of Single Lever Speed and Stop Control.

ADJUSTMENT

Engine idling at 650 r.p.m.: Adjust the connecting rod to the hand control so that the hand lever is in the bottom notch of the ratchet in the speed sector.

Engine at full speed: With the hand lever held in the full speed position (on load), set adjustable stop "X" so that it touches the hand lever. Tighten the lock nut.

Stopping control: Adjust cable so that the engine stops when the hand lever is at the limit of its travel in the stopping sector.

Speed Adjustment

A slight adjustment of speed may be made by turning the screwed rod which projects through the gear case. Turn anti-clockwise to increase speed, clockwise to decrease. Secure locknut.

Do not increase speed more than 2½% without consulting R. A. Lister & Co. Ltd.

GOVERNOR WEIGHTS & SPRINGS — CONSTANT SPEED

BSS 649 : 1958 Class A

SINGLE & TWIN CYLINDER ENGINES—

ENGINE Speed rev/min.	WEIGHTS 2 off		WEIGHT SPRING 2 off		SPEEDER SPRING 1 off	
	Part No.	Type	Part No.	Colour	Part No.	Colour
750-850	201-10730	Plain	201-10821	Green	201-10901	Blue
850-1000	201-10730	Plain	201-10821	Green	201-10903	Yellow
*1100-1300	201-10730	Plain	201-10821	Green	201-10900	Red
1400-1700	201-10730	Plain	201-10820	Red	201-10900	Red
1700-1800	201-12960	Drilled	201-10820	Red	201-10900	Red
2000	201-10735	Milled	201-10820	Red	201-10900	Red

THREE CYLINDER ENGINE—

1000	354-28351	Compo'nd	201-10820	Red	201-10903	Yellow
*1150-1300	354-11500	Plain	201-10820	Red	201-10903	Yellow
1500	354-11500	Plain	203-10822	Yellow	203-10901	Green
1800	354-11501	Drilled	203-10822	Yellow	203-10901	Green
2000	351-11502	Drilled	203-10822	Yellow	203-10901	Green

* See Page 23—Valve Adjustment.

GOVERNOR WEIGHTS & SPRINGS — VARIABLE SPEED

BSS 649 : 1958 Class B

Engine Type	Speed Range Rev/min.	Governor Weight			Speeder Spring		Idling Spring	
		Part No.	Type	No. per Set	Part No.	Colour	Part No.	No. per Set
LD2 & SL1	600-1800 700-2000	201-10733	Milled	2	201-10900	Red		
		201-10732	Milled	2	201-10900	Red		
LD1 & SL2	600-1800 700-2000	201-10733	Milled	2	201-10900	Red	204-21491	1
		201-10732	Milled	2	201-10900	Red	204-21491	1
SL3	600-1800	354-21561	Milled	2	203-10903	White	204-21491	1

Note:—There are no governor weight springs fitted to variable speed governors.

INSTRUCTIONS FOR CHANGING SPEEDS OF LD & SL ENGINES

FIXED SPEED

Note: Before starting consult the table on page 41 to check which of the governor weights and springs are to be changed.

Remove the fuel pump housing door.

Unhook the speeder spring from the governor link.

Disconnect fuel piping and drain the fuel tank.

Remove seven setscrews securing end cover.

Remove the end cover complete with tank and filter.

To Change Governor Weight Springs Only

Unhook the governor weight springs.

Fit new springs (consult table).

To Change Speeder Spring

Remove the speed adjusting screw from the end cover.

Remove the existing spring and fit the new speeder spring.

Re-fit the adjusting screw into the end cover and tighten the lock-nut after final adjustment of speed.

To Change Governor Weight

Remove split pins and washers from the governor lever fulcrum pin, and from the outer end only of the link to the governor.

Remove the governor lever.

IMPORTANT NOTE: DO NOT ALTER THE GOVERNOR LEVER FULCRUM SETTING.

Remove the governor thrust sleeve.

Remove the two setscrews securing the governor weight carrier.

Remove the carrier and weights.

Remove the governor weight fulcrum pins, fit new governor weights and replace the pins.

NOTE: Brass governor weights must be fitted with steel boots. If necessary use boots from the weights being removed.

Replace the governor sleeve, ensuring that it is perfectly clean. Refit the carrier complete with weights and pins and secure by means of the two setscrews.

Fit the correct governor weight springs (consult table).

Replace the governor lever and fit washers and split pins.

STARTING AND RUNNING FAULTS

Essential for Easy Starting

- (a) Engine to turn easily when decompressed; if not it may be due to:—
 - unsuitable lubricating oil (too heavy),
 - incorrect decompressor clearance,
 - tight bearing,
 - load not disconnected from engine.
- (b) Injector creak must be heard (or felt). If not, it may be due to:—
 - no fuel in tank,
 - air lock in system,
 - injector nozzle valve stuck open,
 - fuel pump delivery valve scored.
- (c) Good compression; if not, it may be due to:—
 - worn cylinder,
 - piston rings carboned in grooves,
 - leaking inlet or exhaust valve,
 - injector loose on seat.
- (d) Fuel pump rack(s) to be free.
- (e) Control must be vertical to give extra fuel for starting.

Knocking, this may be caused by:—

- (a) Valve, probably exhaust, sticking in guide and touching piston — clean stems and guides.
- (b) Slack bearing — fit new bearing, if crankshaft is not worn.
- (c) Insufficient clearance between the piston and cylinder head—check and adjust.
- (d) Injection too early—check and adjust.
- (e) Flywheel loose on shaft.
- (f) Excessive crankshaft end play.
- (g) Excessive carbon deposit on piston.

Carbon Deposit, excessive deposit may be due to:—

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

Smoky Exhaust.—Black smoke due to incomplete combustion of fuel caused by:—

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

Note.—Blue smoke, when faint, is generally the result of light load.

Heavy blue smoke is caused by lubricating oil passing the piston rings due to either stuck piston rings or a worn cylinder.

Engine Stops.—This may be due to:—

- (a) Lack of fuel—air or water in fuel system. Fuel system choked. (See Page 20).
- (b) Overload.
- (c) Overheating, due to shortage of lubricating oil or recirculation of cooling air.
- (d) Loss of compression.
- (e) Dirt in injector or fuel system.

Loss of Power.—This may be due to:—

- (a) Loss of compression.
- (b) Incorrect tappet clearance.
- (c) Choked exhaust pipe.
- (d) Fuel injection system. Fuel injector or fuel pump out of order. Air in the fuel system.
- (e) Choked fuel filter.

Failure to Obtain Normal Speed

- (a) Engine started under overload.
- (b) Fuel system not primed properly.
- (c) Insufficient fuel.
- (d) Injection retarded.

Loss of Oil Pressure

- (a) Oil level below mark on dipstick.
- (b) Strainer choked.
- (c) Fractured pipe or leaking joint.
- (d) Badly worn or run out bearing.
- (e) Relief valve not seating due to dirt, or worn out.
- (f) Oil pump plunger and valves, worn or dirty.

LISTER DIRECT DRIVE CLUTCH

Direct Drive Clutch (Lister)

The clutch fitted to either the crankshaft or camshaft is of the multi plate type running in oil. It is toggle operated and is therefore self locking in either the engaged or the disengaged position. Tension should be felt throughout the movement of the lever to engage the clutch and it should be released on completion of the movement.

The clutch housing is filled to the level of the side plug with light engine oil (SAE 10). The capacity is approximately $\frac{3}{8}$ imp. pint. An even lighter grade of oil may be used in cold weather to reduce oil drag of driven shaft.

Adjustment—see Fig. 26

The clutch plates are held between pressure plates when fully engaged. It is essential there should be no slip when fully engaged. If the full power is not being transmitted, the clutch should be adjusted as follows:—

- (1) Stop the engine.
- (2) Remove the inspection cover on top of the clutch casing.
- (3) With the lever in the “neutral” position, revolve the clutch until the adjusting plunger “C” is accessible.
- (4) Pull plunger “C” out of engagement and rotate adjusting ring clockwise 1 to 3 holes. Re-engage plunger “C”, and then check “feel” of the clutch operating lever. Alter the adjustment until the full power is transmitted without slip.
- (5) Do not adjust more tightly than is necessary to transmit the full power without slip.
- (6) Ensure the clutch runs freely in the “neutral” position.

Direct Drive Clutch—Rockford—Adjustment

The clutch plate is held between two pressure plates when fully engaged. It is essential there should be no slip when fully engaged. If the full power is not being transmitted the clutch should be adjusted as follows:—

- (1) Stop the engine.
- (2) Remove inspection cover on top of clutch casing.
- (3) With the level in the “neutral” position, revolve the clutch until the adjusting ring locking plate is accessible.
- (4) Slacken the locking plate screw with a screw driver and when dis-engaged from the serrations turn the adjusting ring clockwise. Re-secure the locking plate.
- (5) Do not adjust more tightly than is necessary to transmit the full power without slip.
- (6) Ensure the clutch runs freely in the “neutral” position.
All parts are lubricated on assembly (Shell Alvania Grease No. 2) or other equivalent high melting point grease and a grease nipple is provided for the clutch cross shaft.

Reduction Gear

Where reduction gears are fitted, fill the gear case to the maximum mark on the dipstick with the same grade of lubricating oil as used in the engine sump.

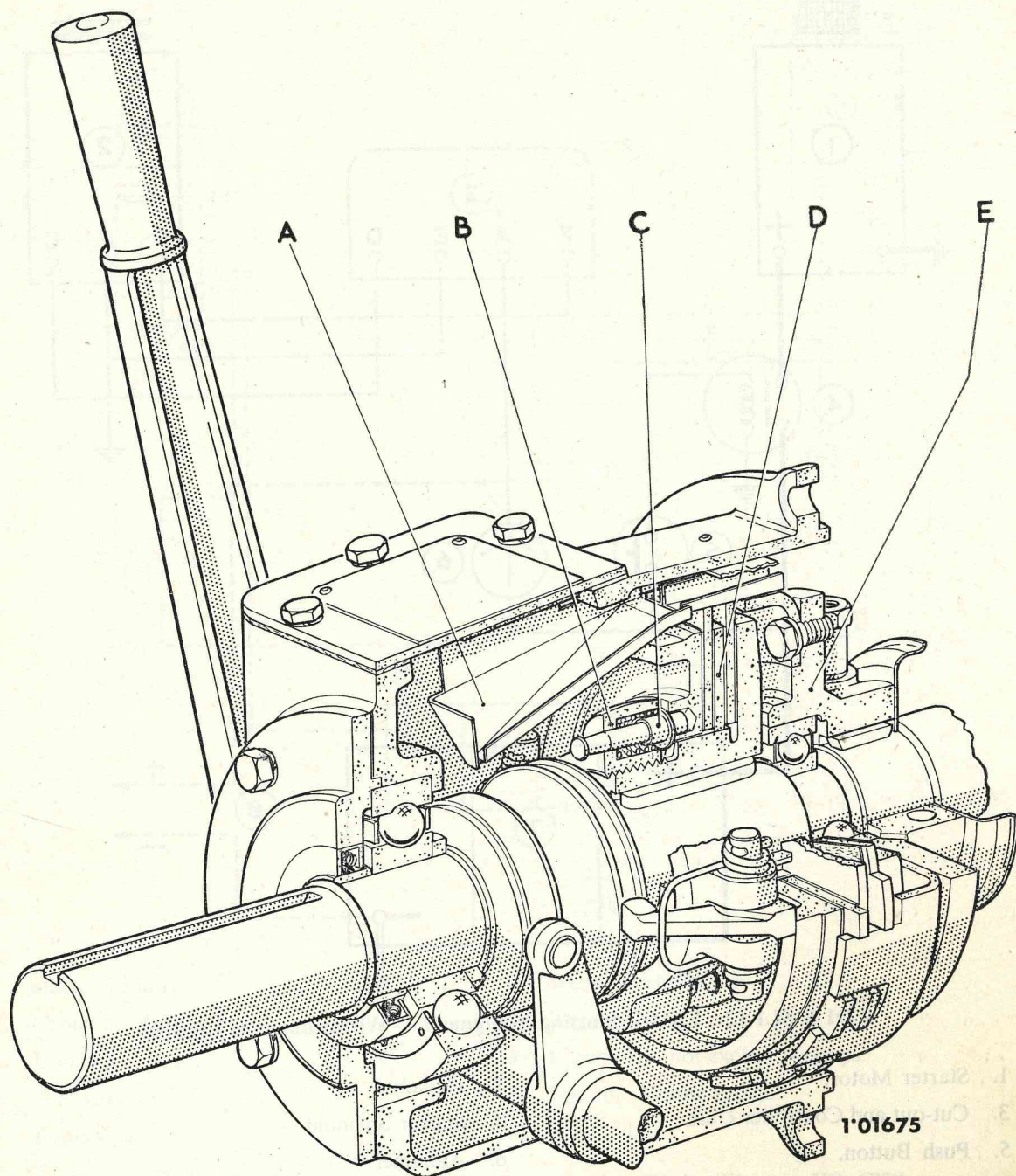
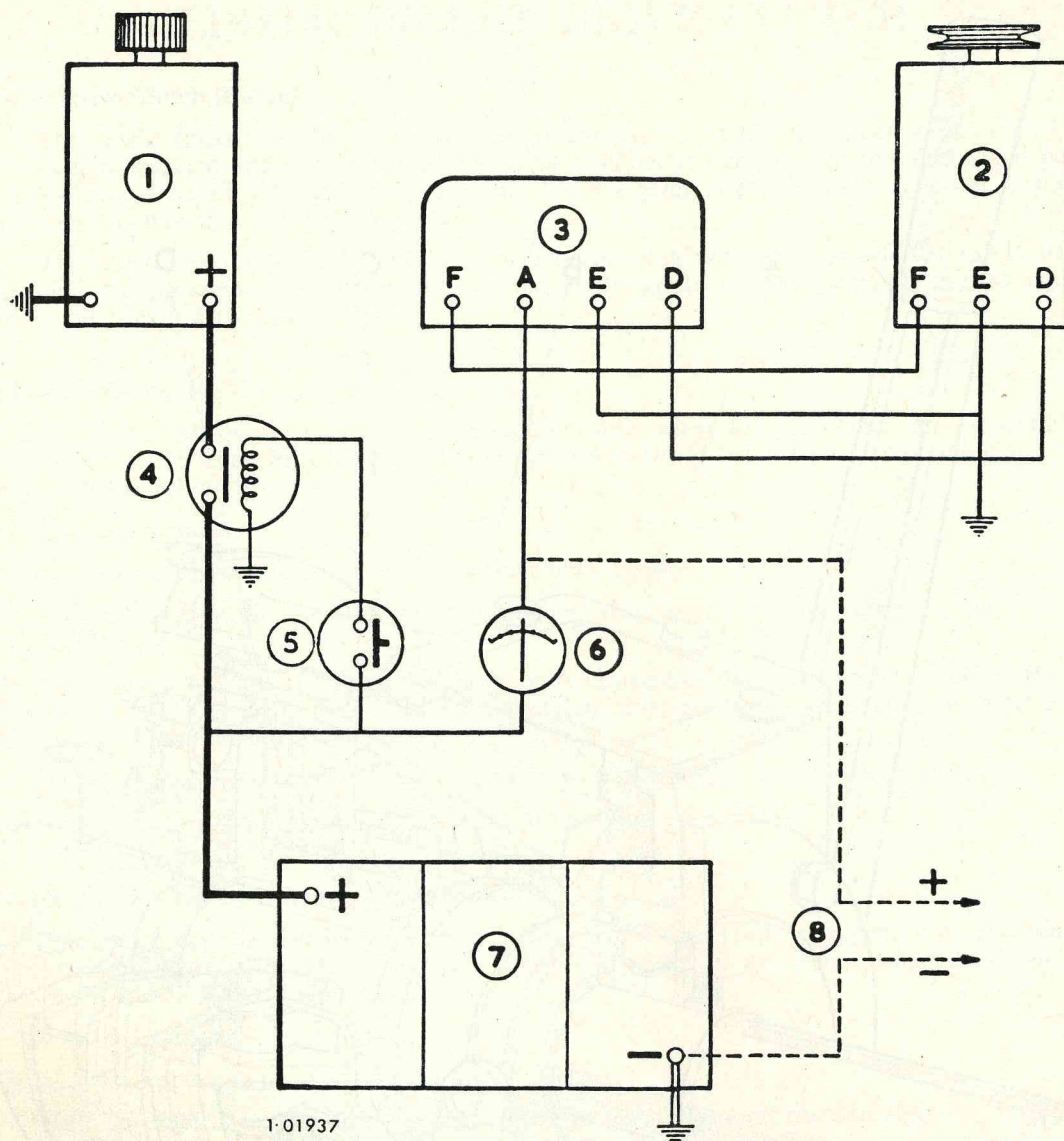


Fig. 26.—Lister Clutch

A Lubricating oil return trough.
B Clutch adjusting ring.

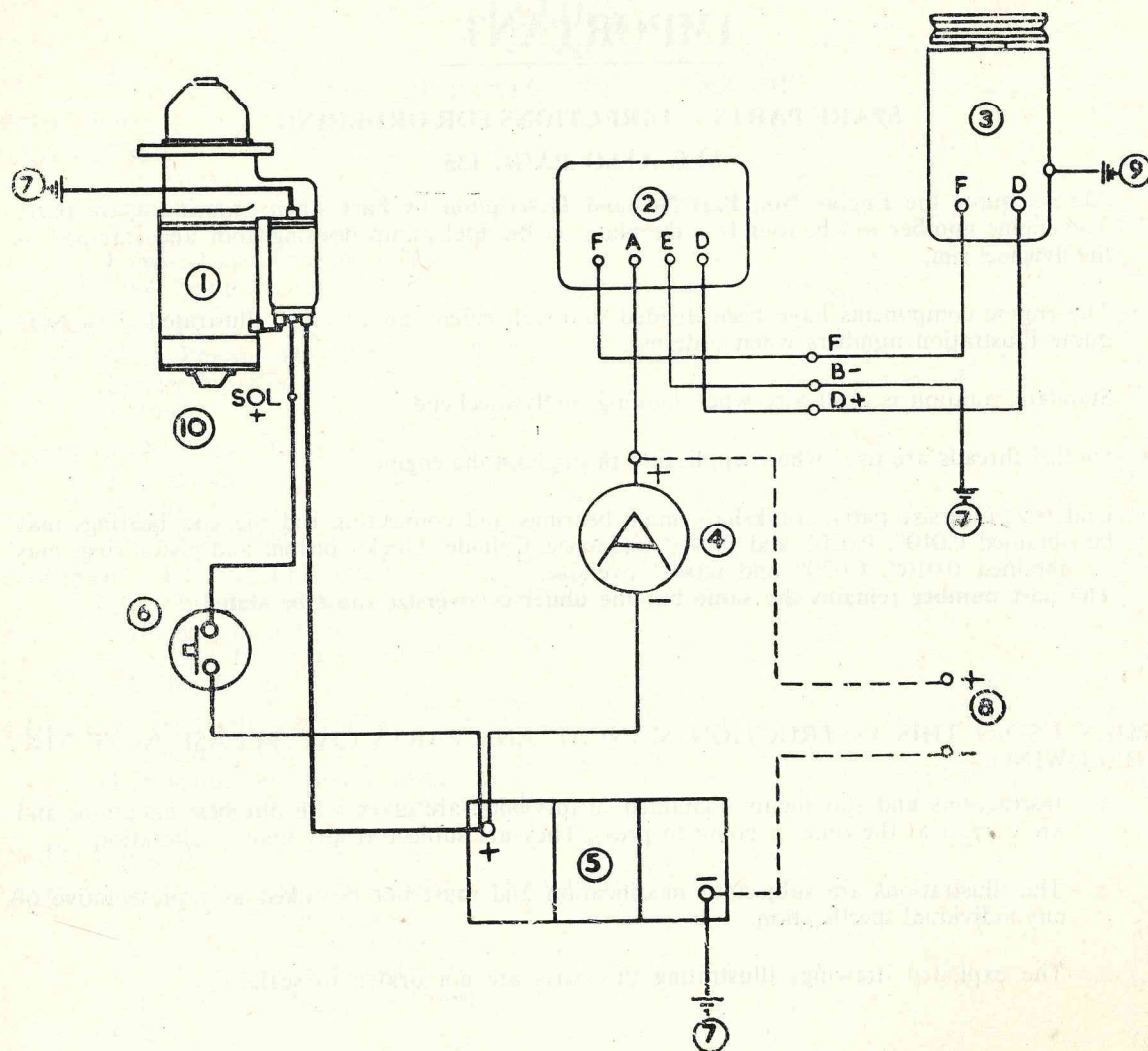
C Clutch adjusting plunger.
D Clutch plates.
E Clutch driving member.



1-01937

LD1 & SL1 12v. Electric Starting Equipment — Wiring diagram ED.6105

- | | |
|---------------------------------|----------------------|
| 1. Starter Motor. | 2. Dynamo. |
| 3. Cut-out and Controller Unit. | 4. Starter Solenoid. |
| 5. Push Button. | 6. Ammeter. |
| 7. Battery. | 8. Lighting Circuit. |



- | | |
|---------------------|------------------------------------|
| 1. Starter Motor. | 6. Starter Push Button. |
| 2. Controller Unit. | 7. Engine Earth. |
| 3. Dynamo. | 8. Light -- do not exceed 10 amps. |
| 4. Ammeter. | 9. Dynamo Frame Earth. |
| 5. Battery. | 10. Solenoid. |

LD2, SL2 & SL3 12v. Electric Starting Equipment — Wiring Diagram ED. 6838

IMPORTANT

SPARE PARTS — DIRECTIONS FOR ORDERING

SEE ALSO PAGE 135

1. Always quote the **Engine No., Part No. and Description of Part** when ordering spare parts. The engine number will be found on the plate on the fuel pump housing door and stamped on the flywheel rim.
2. The engine components have been divided into convenient groups and illustrated. **DO NOT** quote illustration numbers when ordering.
3. Standard rotation is clockwise when looking on flywheel end.
4. Unified threads are used where applicable throughout the engine.
5. Undersize/Oversize parts, crankshaft, main bearings and connecting rod big end bearings may be obtained 0.010", 0.020" and 0.040" undersize. Cylinder blocks, pistons and piston rings may be obtained 0.010", 0.020" and 0.040" oversize.
The part number remains the same but the undersize/oversize must be stated.

WHEN USING THIS INSTRUCTION MANUAL AND PARTS LIST, PLEASE NOTE THE FOLLOWING:—

1. Instructions and statements contained in this book are given with our best intentions and are correct at the time of going to press. They are subject at any time to alteration.
2. The illustrations are subject to modification and must not be taken as representative of any individual specification.
3. The exploded drawings illustrating the parts are not drawn to scale.

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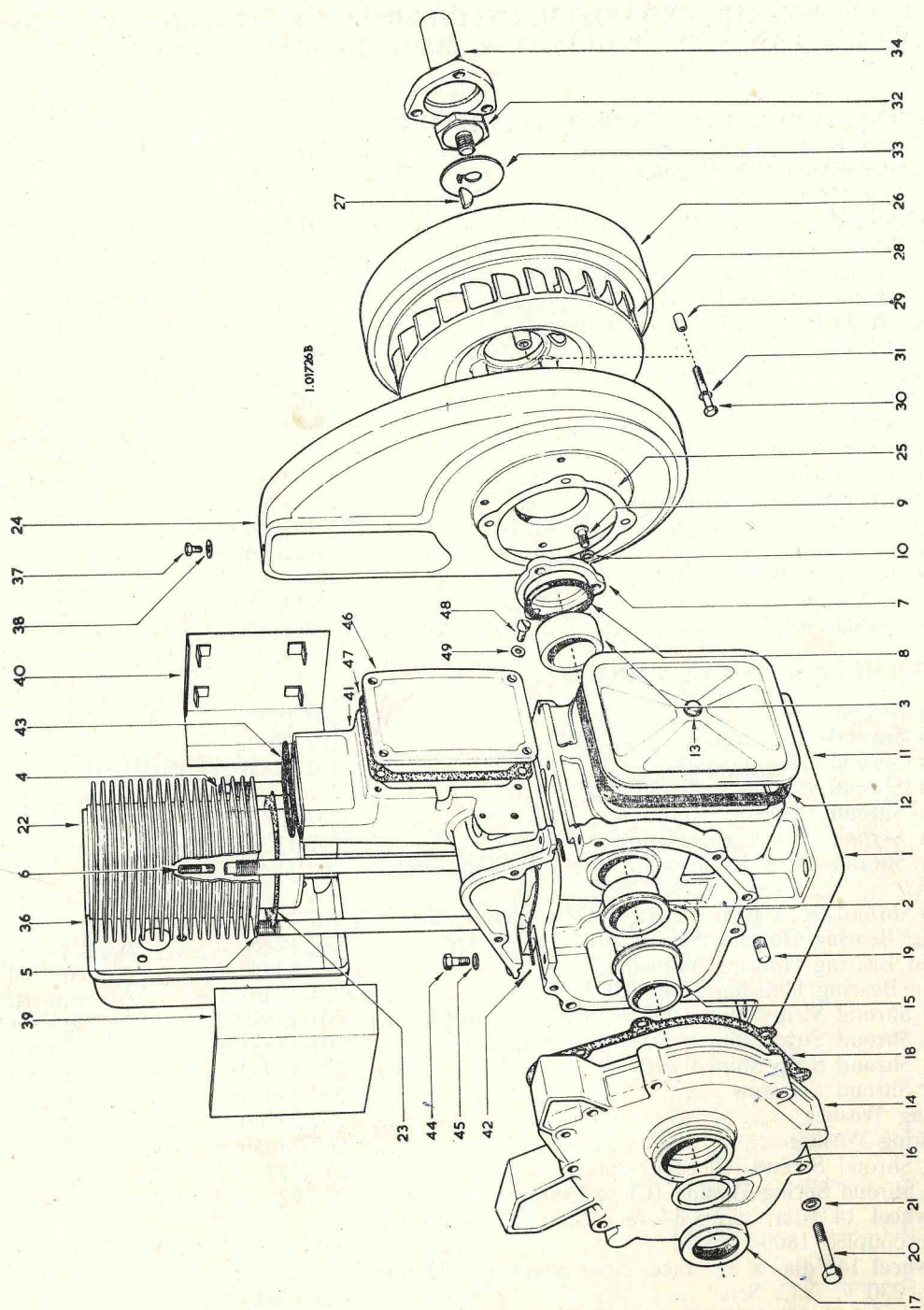
PARTS LIST

See Pages 48 and 135 for Ordering Procedure

PLATE 1—CRANKCASE, END COVER, CYLINDER BLOCK, SHIELD AND COWLING, FLYWHEEL FAN AND SHROUD, FUEL PUMP HOUSING

Illus. No.	Description	Part No.	No. off 1 Cyl.	per 2 Cyl.	Engine 3 Cyl.
CRANKCASE					
1	Crankcase Assembly comprising:— Crankcase 202-10014 fitted with Oil gallery plug 201-13570. Main Bearing 201-10063, Camshaft Bush 201-10181, Camshaft Bush 201-10190, Oil pipe support 201-11340.	570-10090	1	—	—
	Crankcase Assembly comprising Crankcase 202-10014 fitted with Oil gallery plug 201-13570. Main Bearing 201-10063, Camshaft Bush 201-10181, Camshaft Bush 201-10190, Oil pipe support 201-11340, Camshaft Bush 202-12030	570-10120	—	1	—
—	Crankcase Assembly comprising:— Crankcase 203-10010 fitted with Oil Gallery Plug 203-13570. Oil Pipe Support 203-11340, Main Bearing 201-10063, Camshaft Bush 201-10181, Camshaft Bush 201-10190 and Camshaft Bushes (2) 202-12030.	570-10970	—	—	1
2	Camshaft Bush—gear end	201-10181	1	1	1
—	Camshaft Bush Central Bearing	202-12030	—	1	2
3	Camshaft Bush Flywheel End	201-10190	1	1	1
4	Cylinder Head Stud—Long	201-11042	2	4	6
5	Cylinder Head Stud—Short	201-11052	2	4	6
6	Cylinder Head Cover Stud	270-120	2	4	6
—	Dowel for Plugging Oil Hole	201-13570	1	1	—
—	Dowel for Plugging Oil Hole	203-13570	—	—	1
—	Drain Plug	27-1815	1	1	1
7	Camshaft End Cover	201-12392	1	1	1
8	Camshaft End Cover Joint	201-18540	1	1	1
9	Camshaft End Cover Screw	270-208	3	3	3
10	Camshaft End Cover Washer	27-3988	3	3	3
—	Drain Plug Joint	291-3063	1	1	1
11	Crankcase Door	201-11180	1	—	—
—	Crankcase Door	202-12690	—	1	—
—	Crankcase Door	203-12692	—	—	1
—	Crankcase Door Dowel	201-13570	—	—	1
12	Crankcase Door Joint	291-22341	1	—	—
—	Crankcase Door Joint	202-12700	—	1	—
—	Crankcase Door Joint	203-12700	—	—	1
—	Crankcase Door Clamp Bar	291-2320	1	—	—
13	Crankcase Door Screw	201-11190	1	—	—
—	Crankcase Door Screw	270-53	—	9	11
—	Crankcase Door Washer	616-1608	1	—	—
—	Crankcase Door Washer	291-2609	—	9	11
—	Crankcase Door Screw Split Pin	27-2255	1	—	—
END COVER					
14	End Cover	201-11202	1	1	1
15	End Cover Bush	201-10171	1	1	1
—	Oil Thrower	201-13200	1	1	1
16	End Cover Oil Seal	201-13190	1	1	1
18	End Cover Joint	201-11211	1	1	1
19	End Cover Dowel	27-1430	2	2	2
20	End Cover Setscrew 5/16" UNF x 2 1/4"	270-66	7	7	7
21	End Cover Setscrew Washer	616-1608	7	7	7

Note: For special Crankcases see pages 97-98.



CRANKCASE

PLATE 1

**PLATE 1—CRANKCASE, END COVER, CYLINDER BLOCK, SHIELD AND COWLING,
FLYWHEEL FAN AND SHROUD, FUEL PUMP HOUSING (Contd.)**

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
CYLINDER BLOCK, SHIELDS AND COWLING					
†22	Cylinder Block—LD Engines	201-10273	1	2	—
—	Cylinder Block—SL Engines	201-17520	1	2	3
23	Cylinder Block Joint	201-10390	1	2	3
39	Side Shield (Governor End) complete	201-12410	—	1	—
—	Side Shield (Flywheel End) complete	203-12421	—	1	—
—	Side Shield (Flywheel End) complete	203-12420	—	—	1
40	Side Shield (Flywheel End)	203-12420	1	—	—
—	Side Shield (Governor End) complete	203-12410	—	1	1
—	Air Deflector Plate complete	203-18060	—	1	2
36	Cowling	201 10462	1	—	—
—	Cowling	570-10570	—	1	—
—	Cowling	570-10580	—	—	1
37	Cowling Setscrew	270-172	3	3	3
38	Cowling Washer	27-1698	3	3	3
—	Cowling Reverse Rotation	201-12601	1	—	—
—	Cowling Reverse Rotation	570-10600	—	1	—
—	Cowling Reverse Rotation	570-10590	—	—	1
—	Cowling Strap Bolt	270-286	—	2	2
—	Spring Washer	27-393	—	2	2
—	Spire Speed Nut	201-11590	—	3	3
FLYWHEEL AND FAN SHROUD					
24	Fan Shroud	201-10423	1	—	—
—	Fan Shroud—cast iron	202-10426	—	1	1
—	Fan Shroud—sheet metal	202-24880	—	1	1
—	Fan Shroud (for Close Coupling)	201 12581	1	—	—
—	Fan Shroud (Reverse Rotation)	201-12590	1	—	—
—	Fan Shroud (Reverse Rotation)	202-12592	—	1	1
—	Fan Shroud (Rev. Rotation—Close Coupling, electric start)	201-14951	1	—	—
—	Fan Shroud (Rev. Rot. Close Coupling—hand start)	201-14950	1	—	—
25	*Main Bearing Housing Shim 0.010"	201-12460	As required		
—	*Main Bearing Housing Shim 0.005"	201-12462	As required		
—	*Main Bearing Housing Shim 0.048"	201-12461	As required		
—	Fan Shroud Strip Shim 0.002" } Close Coupled	201-13580	As required		
—	Fan Shroud Strip Shim 0.005" } Engines	201-13581	As required		
—	Fan Shroud Strip Shim 0.010" } only	201-13582	As required		
—	Fan Shroud Setscrew	270-539	—	4	4
—	Spring Washer	202-24060	—	4	4
—	Locking Washer	202-24050	—	4	4
—	Fan Shroud Screws (Close Coupling)	270-177	4	—	—
—	Fan Shroud Spring Washer (Close Coupling)	27-3929	4	—	—
26	Flywheel 14" dia. x 2-5/8" face Std. all speeds and close coupled 1800 rpm	201-10203	1	—	—
—	Flywheel 14" dia. x 3 1/4" face, close coupled 1500 rpm only, 230 v. A.C. Sets	201-13640	1	—	—
—	Flywheel 16" x 2-3/8" (Crankshaft Hand Starting)	201-10204	1	—	—

* On engines with sheet metal fan shrouds these shims are fitted between the main bearing housing and the fan shroud to locate the shroud relative to the flywheel.
They are also fitted between the main bearing housing and the crankcase to locate the crankshaft on all engines.

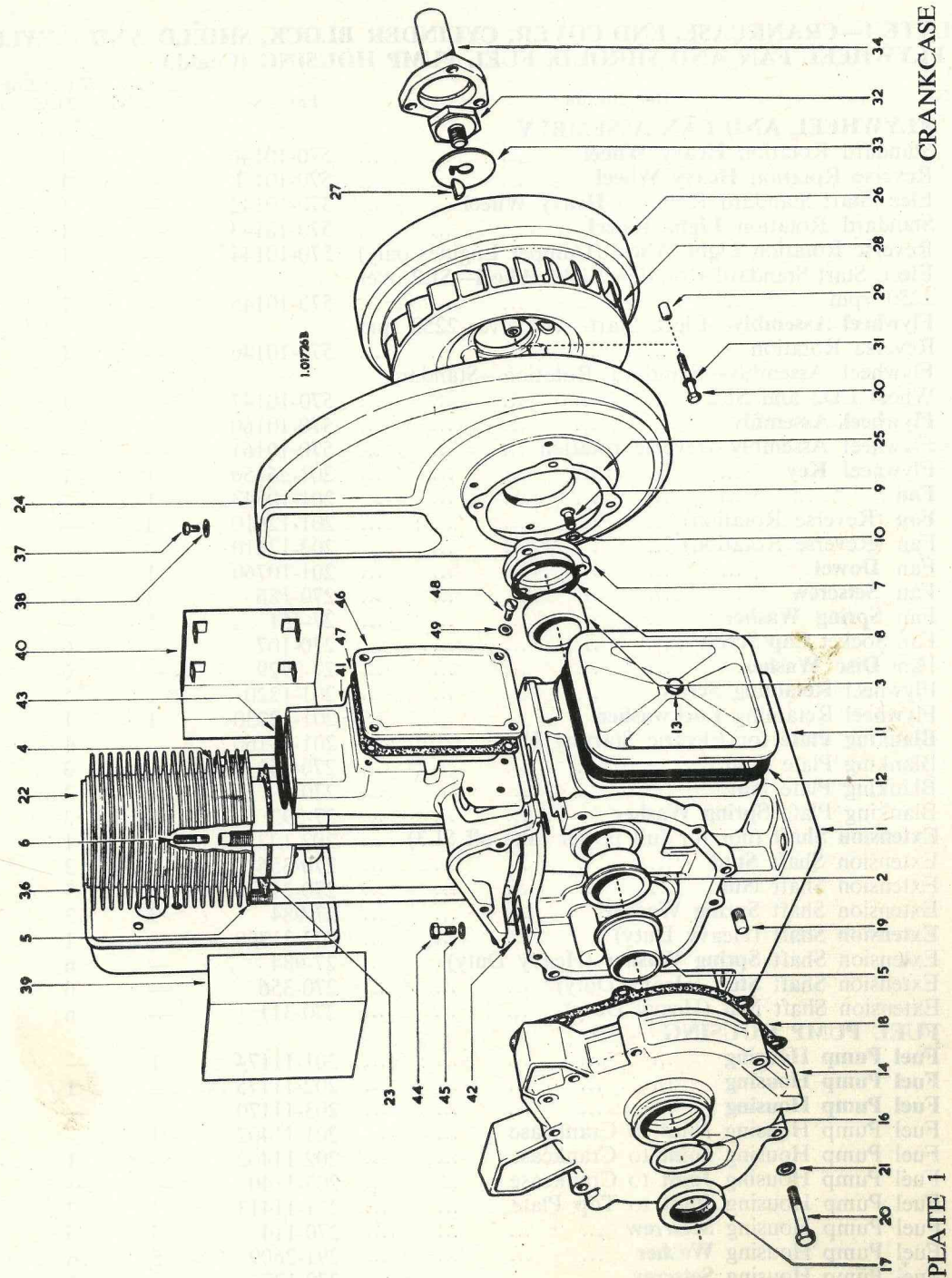
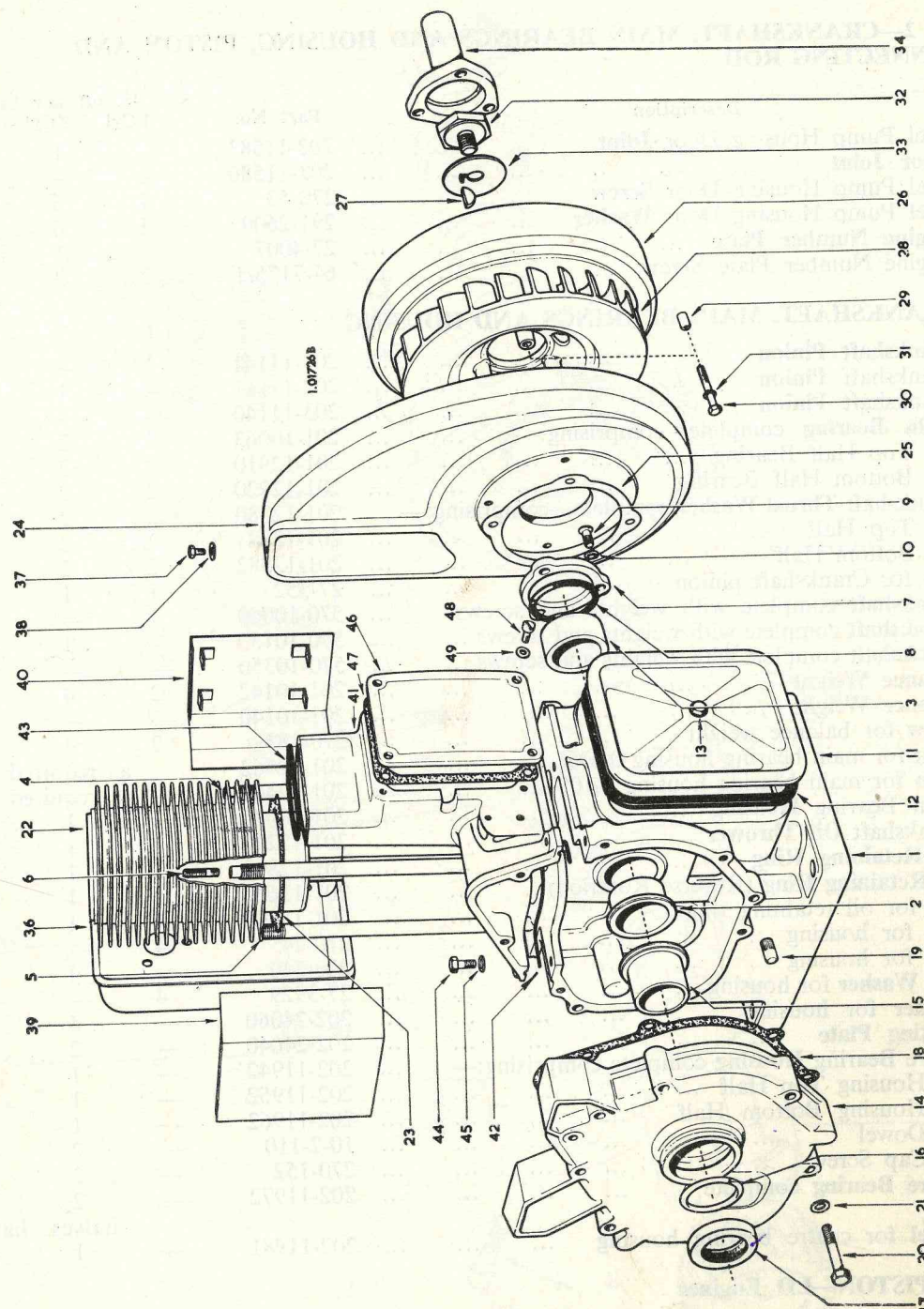


PLATE 1

CRANKCASE

**PLATE 1—CRANKCASE, END COVER, CYLINDER BLOCK, SHIELD AND COWLING,
FLYWHEEL FAN AND SHROUD, FUEL PUMP HOUSING (Contd.)**

Illus No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
FLYWHEEL AND FAN ASSEMBLY					
—	Standard Rotation Heavy Wheel	570-10140	—	1	—
—	Reverse Rotation Heavy Wheel	570-101/1	—	1	—
—	Elec. Start Standard Rotation Heavy Wheel	570-10142	—	1	—
—	Standard Rotation Light Wheel	570-10143	—	1	—
—	Reverse Rotation Light Wheel (Dumper Engines only)	570-10144	—	1	—
—	Elect. Start Standard Rotation Light Wheel —SL2 over 2250 rpm	570-10145	—	1	—
—	Flywheel Assembly —Elect. Start—SL2 over 2250 rpm Reverse Rotation	570-10146	—	1	—
—	Flywheel Assembly —Standard Rotation—Standard Wheel LD2 and SL2	570-10147	—	1	—
—	Flywheel Assembly	570-10160	—	—	1
—	Flywheel Assembly —reverse rotation	570-10161	—	—	1
27	Flywheel Key	201-26150	1	1	1
28	Fan	201-10543	1	—	—
—	Fan (Reverse Rotation)	201-12610	1	—	—
—	Fan (Reverse Rotation)	203-12610	—	—	1
29	Fan Dowel	201-10760	1	—	—
30	Fan Setscrew	270-186	3	—	—
31	Fan Spring Washer	27-451	3	—	—
—	Fan Socket Cap Screw	270-107	—	6	—
—	Fan Disc Washer	27-3929	—	6	—
32	Flywheel Retaining Screw	201-1220	1	1	1
33	Flywheel Retaining Lockwasher	201-12230	1	1	1
—	Blanking Plate for Electric Starting Hole	201-13160	—	1	1
—	Blanking Plate Stud	270-260	—	3	3
—	Blanking Plate Nut	270-4	—	3	3
—	Blanking Plate Spring Washer	27-393	—	3	3
34	Extension Shaft (not for full power take off SL3)	202-12210	1	1	1
—	Extension Shaft Stud	270-356	3	3	3
—	Extension Shaft Nut	270-311	3	3	3
—	Extension Shaft Spring Washer	27-984	3	3	3
—	Extension Shaft (Heavy Duty)	202-21700	—	1	1
—	Extension Shaft Spring Washer (Heavy Duty)	27-984	—	6	6
—	Extension Shaft Stud (Heavy Duty)	270-356	—	6	6
—	Extension Shaft Nut (Heavy Duty)	270-311	—	6	6
FUEL PUMP HOUSING					
41	Fuel Pump Housing	201-11174	1	—	—
—	Fuel Pump Housing	202-11175	—	1	—
—	Fuel Pump Housing	203-11170	—	—	1
42	Fuel Pump Housing Joint to Crankcase	201-11402	1	—	—
—	Fuel Pump Housing Joint to Crankcase	202-11402	—	1	—
—	Fuel Pump Housing Joint to Crankcase	203-1140	—	—	1
43	Fuel Pump Housing Joint to Top Plate	201-11413	1	2	3
44	Fuel Pump Housing Setscrew	270-114	5	5	5
45	Fuel Pump Housing Washer	291-2609	5	6	7
—	Fuel Pump Housing Setscrew	270-122	—	1	2
—	Spring Washer —used on Setscrew inside pump housing	27-451	—	1	2
46	Fuel Pump Housing Door	201-11571	1	—	—
—	Fuel Pump Housing Door	202-11573	—	1	—
—	Fuel Pump Housing Door	203-11570	—	—	1
47	Fuel Pump Housing Door Joint	201-11581	1	—	—



CRANKCASE

PLATE 1

PLATE 2—CRANKSHAFT, MAIN BEARINGS AND HOUSING, PISTON AND CONNECTING ROD

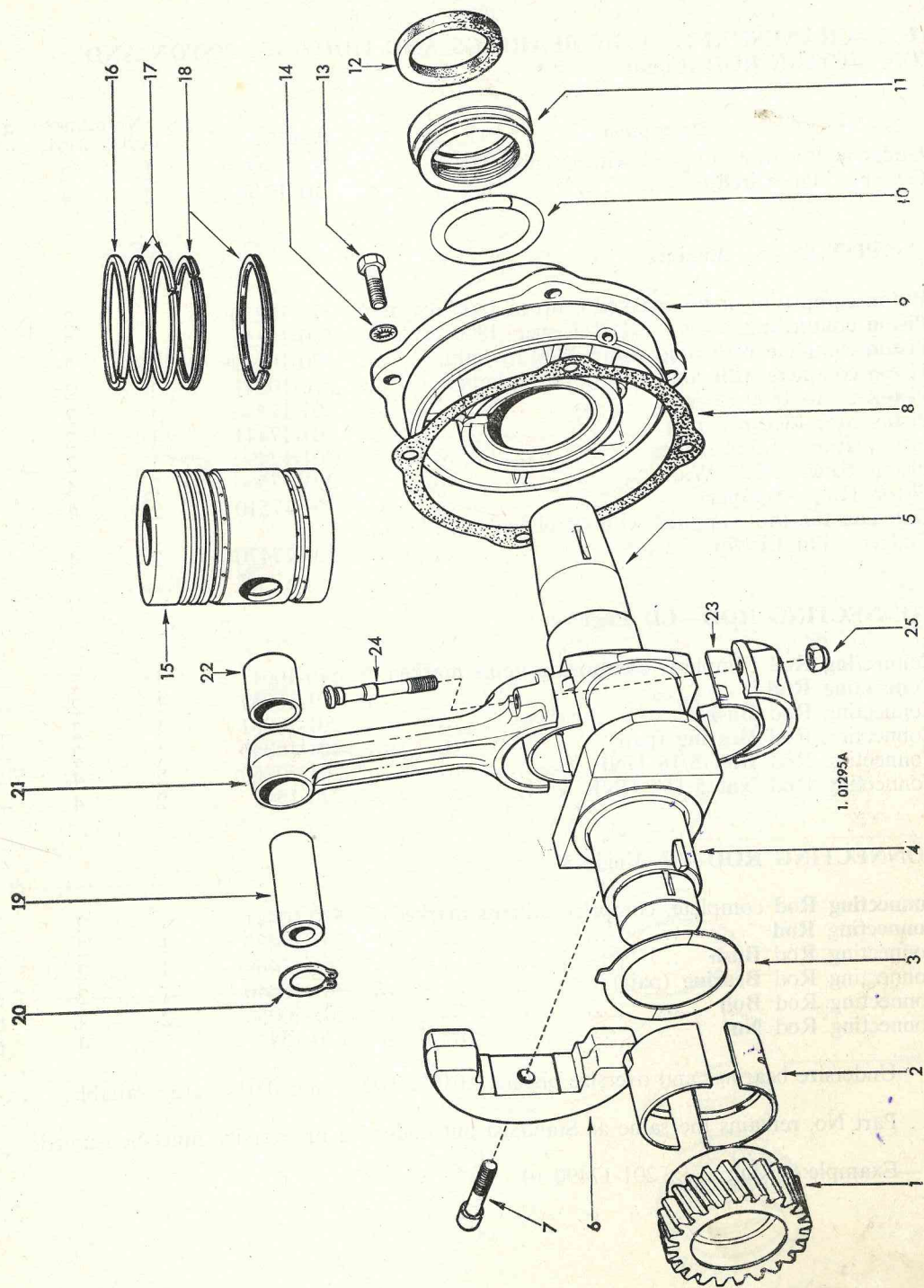
Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
—	Fuel Pump Housing Door Joint	202-11583	—	1	—
—	Door Joint	203-11580	—	—	1
48	Fuel Pump Housing Door Screw	270-53	4	6	9
49	Fuel Pump Housing Door Washer	291-2609	4	6	9
—	Engine Number Plate	27-4007	1	1	1
—	Engine Number Plate Screw	64-7175/1	2	2	2

CRANKSHAFT, MAIN BEARINGS AND HOUSING

1	Crankshaft Pinion	201-11141	1	—	—
—	Crankshaft Pinion	202-11141	—	1	—
—	Crankshaft Pinion	203-11140	—	—	1
2	Main Bearing complete—comprising:—	201-10063	2	2	2
	Top Half Bearing	201-12910	2	2	2
	Bottom Half Bearing	201-12920	2	2	2
3	Crankshaft Thrust Washer complete—comprising:—	201-12380	2	2	2
	Top Half	201-12381	2	2	2
	Bottom Half	201-12382	2	2	2
4	Key for Crankshaft pinion	27-352	1	1	1
5	Crankshaft complete with weights and screws	570-10000	1	—	—
—	Crankshaft complete with weights and screws	570-10130	—	1	—
—	Crankshaft complete with weights and screws	570-10350	—	—	1
6	Balance Weight	201-10142	2	4	—
—	Balance Weight	203-10140	—	—	4
7	Screw for balance weight	270-185	2	4	4
8	Shim for main bearing housing 0.005"	201-12462	as required as required		
—	Shim for main bearing housing 0.10"	201-12460			
9	Main Bearing Housing	201-10074	1	1	1
10	Crankshaft Oil Thrower	201-12240	1	1	1
11	Oil Retaining Ring	201-12890	1	1	1
—	Oil Retaining Ring (Reverse Rotation)	201-12630	1	1	1
12	Felt for oil retaining ring	201-12900	1	1	1
13	Bolt for housing	270-24	4	—	—
—	Bolt for housing	270-540	—	4	4
14	Disc Washer for housing	27-3929	4	—	—
—	Washer for housing	202-24060	—	4	4
—	Locking Plate	202-24040	—	2	2
—	Centre Bearing Housing complete comprising:—	202-11942	—	1	2
	Housing Top Half	202-11952	—	1	2
	Housing Bottom Half	202-11962	—	1	2
	Dowel	10-2-110	—	2	4
	Cap Screw	270-152	—	2	4
—	Centre Bearing complete	202-11972	—	2	4
—	Dowel for centre bearing housing	202-11981	—	halves 1	halves 2

PISTON—LD Engines

—	Piston complete with rings, gudgeon pin and circlips	570-10110	1	2	—
—	Piston comprising items marked *	570-10023	1	2	—
15	*Piston	201-10082	1	2	—
16	Piston Ring 5/32" Taper	201-12310	1	2	—
17	Piston Ring 3/32"	201-10121	2	4	—
18	Piston Scraper Ring	201-10130	2	4	—



CRANKSHAFT, CONNECTING ROD AND PISTON

PLATE 2

PLATE 2—CRANKSHAFT, MAIN BEARINGS AND HOUSING, PISTON AND CONNECTING ROD (Contd.)

Illus. No.	Description	Part No.	No. off per Engine		
			1 cyl.	2 cyl.	3 cyl.
19	*Gudgeon Pin (not supplied without piston)	201-10090	1	2	—
20	*Gudgeon Pin Circlip	201-10100	2	4	—

PISTON—SL Engines

—	Piston comprising items marked * up to 1800 rev/min.	570-10250	1	2	3
—	Piston comprising items marked † over 1800 rev/min.	570-10251	1	2	—
—	Piston complete with rings up to 1800 rev/min. ...	570-10240	1	2	3
—	Piston complete with rings over 1800 rev/min....	570-10241	1	2	—
15	*Piston up to 1800 rev/min.	201-17440	1	2	3
—	†Piston over 1800 rev. min.	201-17441	1	2	—
16	Piston Ring—5/32" Taper	201-17490	1	2	3
17	Piston Ring—3/32" Wide	201-17500	2	4	6
18	Piston Ring—Scraper	201-17510	2	4	6
19†	*Gudgeon Pin (not supplied without piston) ... ..	...	...	...	...
20†	*Gudgeon Pin Circlip	201-17470	2	4	6

CONNECTING ROD—LD Engines

—	Connecting Rod complete, comprising items marked *	570-10011	1	2	—
21	*Connecting Rod	201-10031	1	2	—
22	*Connecting Rod Bush	201-10031	1	2	—
23	*Connecting Rod Bearing (pair)	201-10040	1	2	—
24	*Connecting Rod Bolt 5/16 UNF	201-50050	2	4	—
25	*Connecting Rod Nut 5/16" UNF	270-154	2	4	—

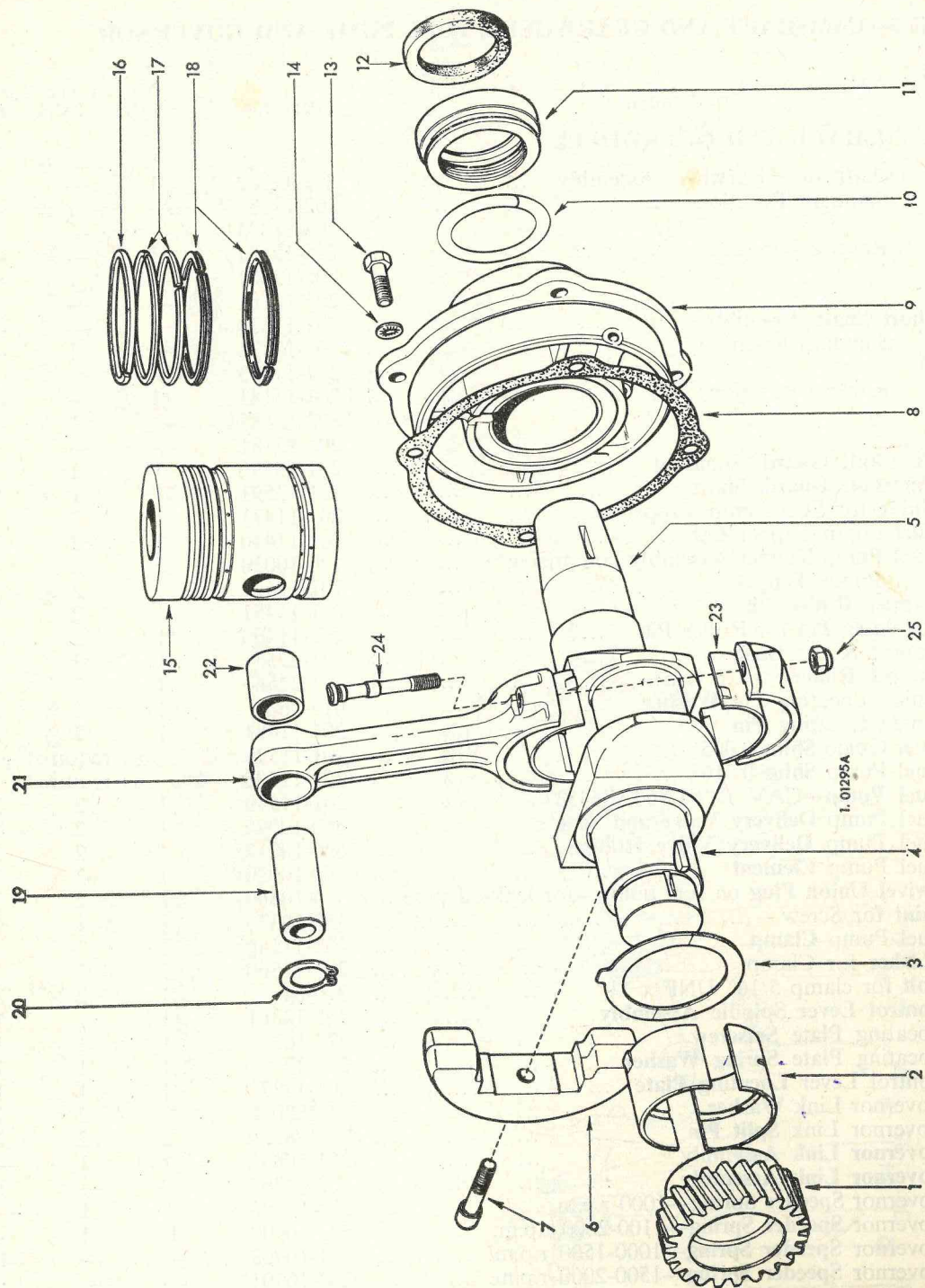
CONNECTING ROD—SL Engines

—	Connecting Rod complete, comprising items marked *	570-10411	1	2	3
21	*Connecting Rod	201-17480	1	2	3
22	*Connecting Rod Bush	201-17460	1	2	3
23	*Connecting Rod Bearing (pair)	201-10040	1	2	3
24	*Connecting Rod Bolt	201-50050	2	4	6
25	*Connecting Rod Nut	270-154	2	4	6

Undersize bearings and oversize pistons 0.010", 0.020" and 0.040" are available.

Part No. remains the same as Standard but undersize or oversize must be quoted.

Example:—Ring 201-17490/10.

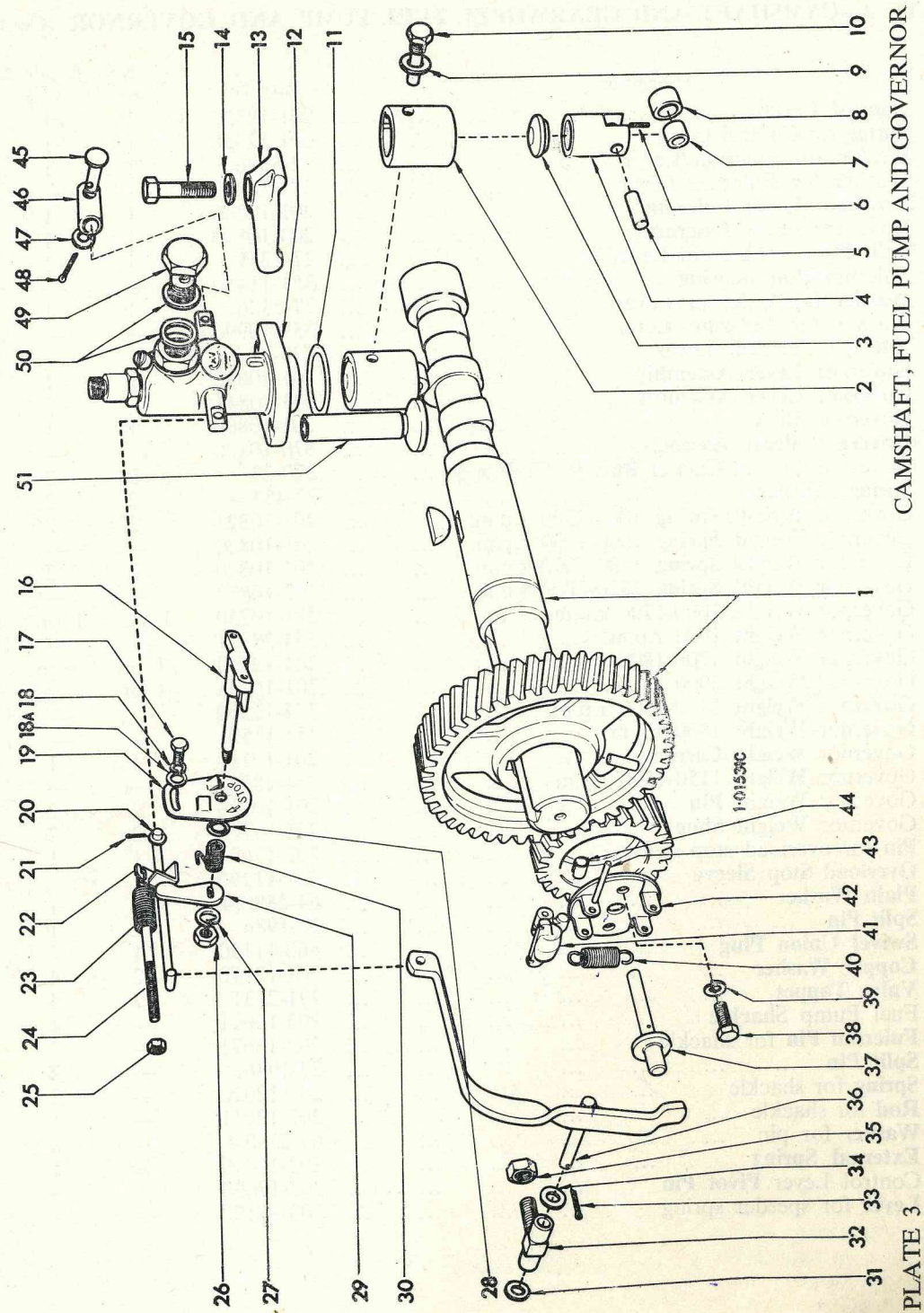


CRANKSHAFT, CONNECTING ROD AND PISTON

PLATE 2

PLATE 3—CAMSHAFT AND GEARWHEEL, FUEL PUMP AND GOVERNOR

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
CAMSHAFT AND GEARWHEEL					
1	Camshaft and Gearwheel Assembly	201-11333	1	—	—
—	Standard Rotation	202-11335	—	1	—
—	Reverse Rotation	203-11331	—	—	1
—	Short Shaft Assembly	201-12681	1	—	—
—	Standard Rotation	202-12681	—	1	—
—	Reverse Rotation	203-12681	—	—	1
—	Standard Rotation	201-11334	1	—	—
—	Reverse Rotation	202-11336	—	1	—
—	Reverse Rotation	203-11333	—	—	1
—	Camshaft Guard, Standard	201-15181	1	—	—
—	Camshaft Guard, Short	202-15181	—	1	—
—	Camshaft Guard, Short	203-15181	—	—	1
2	Guide for Fuel Pump Tappet	201-13590	1	1	1
3	Fuel Pump Tappet Cap	201-13591	1	1	1
—	Fuel Pump Tappet Assembly comprising*	201-11471	1	2	3
4	*Fuel Pump Tappet	201-11440	1	2	3
5	*Tappet Roller Pin	570-10030	1	2	3
6	*Tappet Roller Pin	201-11431	1	2	3
7	*Tappet Roller Pin	201-11451	1	2	3
8	*Tappet Roller Pin	201-11460	1	2	3
9	*Tappet Roller Bush	291-2255	1	2	3
10	*Tappet Roller	291-2256	1	2	3
11	Guide Locating Pin Washer	616-1608	1	2	3
12	Guide Locating Pin	201-11481	1	2	3
13	Fuel Guide Shim 0.005"	201-11520	as required	as required	as required
14	Fuel Pump Shim 0.010"	201-11530	as required	as required	as required
15	Fuel Pump—CAV BPF1A60AS6453	201-11510	1	2	3
16	Fuel Pump Delivery Valve and Seat	660-10000	1	2	3
17	Fuel Pump Delivery Valve Holder	660-10010	1	2	3
18	Fuel Pump Element	660-10020	1	2	3
19	Swivel Union Plug on fuel pump—for leak-off pipe	570-10660	1	2	3
20	Joint for Screw	352-29370	2	4	6
21	Fuel Pump Clamp	201-11540	1	2	3
22	Washer for Clamp	201-11560	1	2	3
23	Bolt for clamp 5/16" UNF x 1 1/2"	270-64	1	2	3
24	Control Lever Spindle Assembly	201-12361	1	1	1
25	Locating Plate Setscrew	270-103	1	1	1
26	Locating Plate Spring Washer	27-717	1	1	1
27	Control Lever Locating Plate	201-12371	1	1	1
28	Governor Link Washer	64-2580/4	2	2	2
29	Governor Link Split Pin	27-1986	2	2	2
30	Governor Link Assembly	201-10891	1	1	—
31	Governor Link Assembly	203-10890	—	—	1
32	Governor Speeder Spring—1000 r.p.m.	201-10903	1	1	—
33	Governor Speeder Spring—1100-2000 r.p.m.	201-10900	1	1	—
34	Governor Speeder Spring—1000-1500 r.p.m.	201-10903	—	—	1
35	Governor Speeder Spring—1500-2000 r.p.m.	203-10901	—	—	1
36	Governor Adjusting Lever	270-112	1	1	1
37	Nut for Adjusting Screw 3/16" UNF	270-1	1	1	1
38	Nut for Control Lever 1/4" UNF	270-2	1	1	1
39	Spring Washer for control lever	27-451	1	1	1
40	Plain Washer for control lever	27-1698	1	1	1

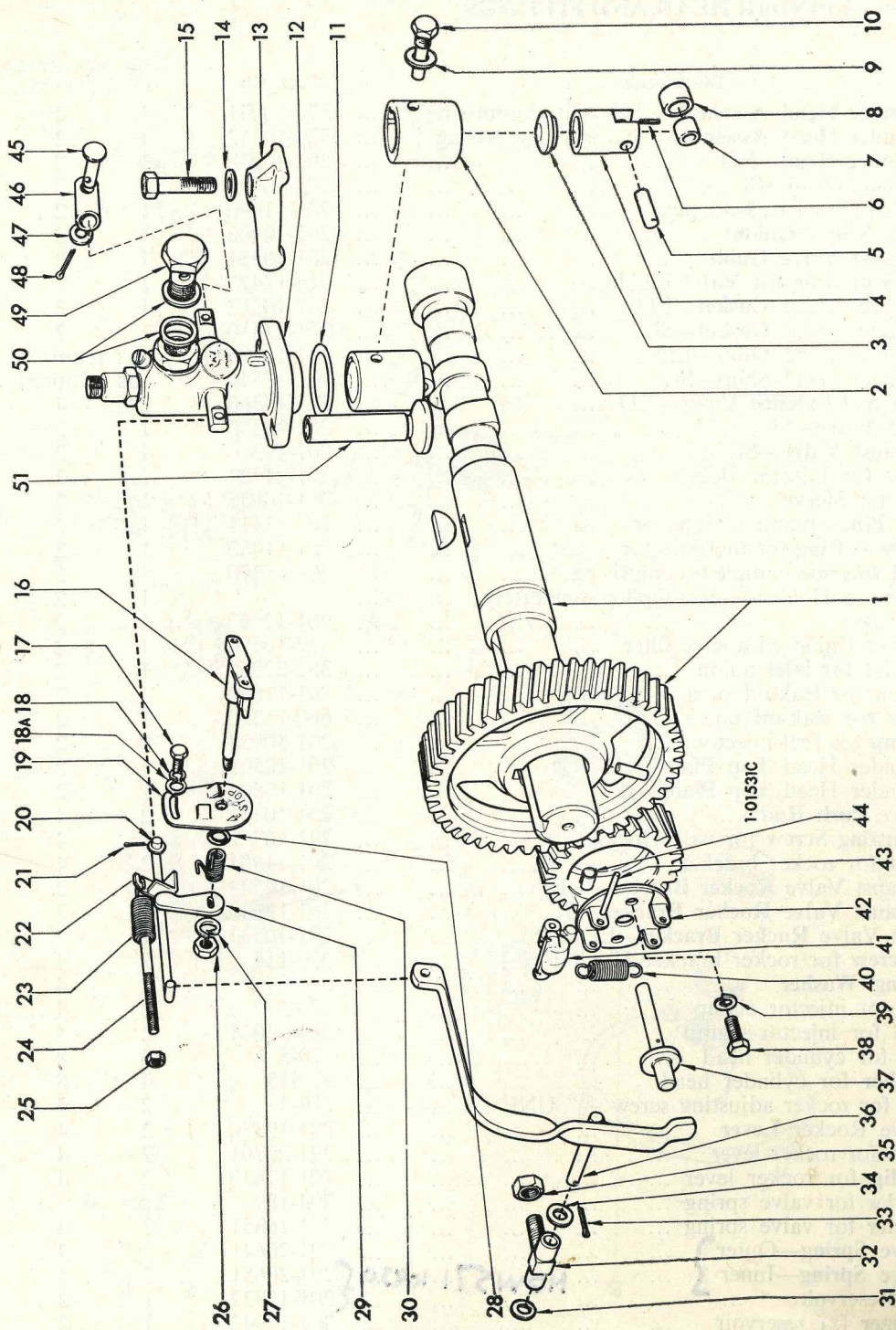


CAMSHAFT, FUEL PUMP AND GOVERNOR

PLATE 3

PLATE 3—CAMSHAFT AND GEARWHEEL FUEL PUMP AND GOVERNOR (Contd.)

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
29	Control Lever	201-12320	1	1	1
30	Spring for Control Lever	201-12330	1	1	1
31	Washer for Fulcrum Lever	27-5326	1	1	—
—	Washer for Fulcrum Lever	351-10990	—	—	1
32	Governor Lever Fulcrum	201-10830	1	1	—
—	Governor Lever Fulcrum	203-10830	1	1	—
33	Split Pin for Fulcrum Lever	27-2255	1	1	1
—	Fulcrum Ball Bearing	351-11480	—	—	2
34	Washer for Fulcrum Lever	27-5326	1	1	—
—	Washer for Fulcrum Lever	351-10990	—	—	1
35	Nut for Fulcrum Lever	270-4	1	1	1
36	Governor Lever Assembly	201-10842	1	1	—
—	Governor Lever Assembly	203-10841	—	—	1
37	Governor Sleeve	201-10800	1	1	—
—	Governor Sleeve Assembly	570-10190	—	—	1
38	Governor Weight Carrier Bolt $\frac{1}{4}$ " UNF x $\frac{3}{8}$ "	270-23	2	2	2
39	Spring Washer	27-451	2	2	2
—	Governor Weight Spring 1000-1300 r.p.m.	201-10821	2	2	—
40	Governor Weight Spring 1000-1300 r.p.m.	201-10820	—	—	2
—	Governor Weight Spring 1400-2000 r.p.m.	201-10820	2	2	—
—	Governor Weight Spring 1500-2000 r.p.m.	203-10822	—	—	2
41	Governor Weight 1000-1700 r.p.m.	201-10730	1 pr.	1 pr.	—
—	Governor Weight 1000 r.p.m.	354-28351	—	—	1 pr.
—	Governor Weight 1700-1800 r.p.m.	201-12960	1 pr.	1 pr.	—
—	Governor Weight 2000 r.p.m.	201-10735	1 pr.	1 pr.	—
—	Governor Weight 1150-1500 r.p.m.	354-11500	—	—	1 pr.
—	Governor Weight 1800 r.p.m.	354-11501	—	—	1 pr.
42	Governor Weight Carrier	201-10710	1	1	1
—	Governor Weight 1150-1500 r.p.m.	354-28341	—	—	1
43	Governor Weight Pin	201-10720	2	2	2
44	Governor Weight Shoe	201-10740	2	2	2
45	Pin for overload stop sleeve	202-13671	1	1	1
46	Overload Stop Sleeve	351-11290	1	1	1
47	Plain Washer	64-2580/4	1	1	1
48	Split Pin	27-1986	1	1	1
49	Swivel Union Plug	660-11150	1	2	3
50	Copper Washer	201-12970	2	4	6
51	Valve Tappet	291-2131	2	4	6
—	Fuel Pump Shackle	202-12001	—	2	4
—	Fulcrum Pin for shackle	202-13671	—	2	4
—	Split Pin	27-1986	—	2	4
—	Spring for shackle	202-12020	—	2	4
—	Rod for shackle	202-12011	—	1	2
—	Washer for pin	64-2580/4	—	2	4
—	External Spring	202-12710	—	1	2
—	Control Lever Pivot Pin	203-18090	—	—	1
—	Lever for speeder spring	203-18100	—	—	1

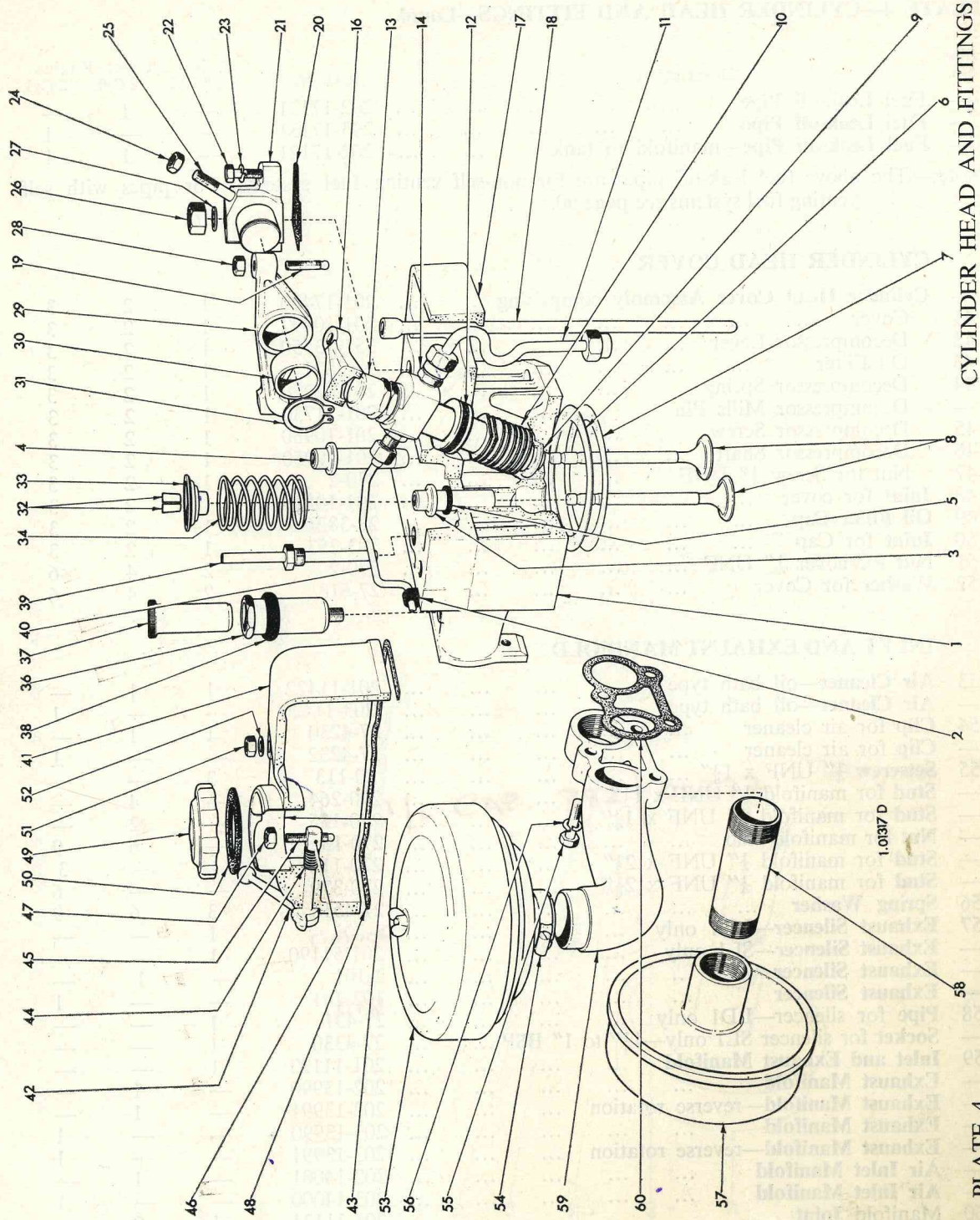


CAMSHAFT, FUEL PUMP AND GOVERNOR

PLATE 3

PLATE 4—CYLINDER HEAD AND FITTINGS

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
—	Cylinder Head Assembly—LD only comprising *	570-10041	1	2	3
—	Cylinder Head Assembly—SL only comprising †	570-10042	1	2	3
1	*Cylinder Head—LD	201-10028	1	2	—
—	†Cylinder Head—SL	201-10021	1	2	3
2	Bush for fuel leak-off pipe	201-11090	1	2	3
3*	Inlet Valve Guide	201-10400	1	2	3
4*	Exhaust Valve Guide	201-10321	1	2	3
5*	Oil Seal Ring for Valve Guide	616-1742	1	2	3
6	Cylinder Head Gasket—LD	201-10382	1	2	—
—	Cylinder Head Gasket—SL	201-17530	1	2	3
7	Cylinder Head Shim—LD	201-12300	as required		
—	Cylinder Head Shim—SL	201-17540	as required		
8	*Inlet and Exhaust Valve—LD	201-19360	2	4	—
—	†Inlet Valve—SL	201-19350	1	2	3
—	†Exhaust Valve—SL	201-19360	1	2	3
9	Joint for injector sleeve	201-11720	1	2	3
10	Injector Sleeve	201-10938	1	2	3
11	Fuel Pipe—pump to injector	201-11111	1	2	3
12	Oil Seal Ring for fuel injector	201-11080	1	2	3
13	Fuel Injector complete comprising	201-11770	1	2	3
—	Nozzle Holder—not supplied separately	...	1	2	3
—	Nozzle	201-12060	1	2	3
14	Inlet Union with edge filter	572-10590	1	2	3
—	Joint for inlet union	352-29960	1	2	3
15	Union for leak-off pipe	201-11690	1	2	3
—	Joint for leak-off union	660-11330	1	2	3
16	Clamp for fuel injector	201-10924	1	2	3
17	*Cylinder Head Top Plate—LD	201-10505	1	2	—
—	†Cylinder Head Top Plate—SL	201-10506	1	2	3
18	Valve Push Rod	201-10311	2	4	6
19	Adjusting Screw for valve rocker	292-167	2	4	6
20	Joint for rocker bracket	201-11901	2	4	6
21	Exhaust Valve Rocker Bracket—LD	201-10523	1	2	—
—	Exhaust Valve Rocker Bracket—SL	201-19630	1	2	3
—	Inlet Valve Rocker Bracket—LD & SL	201-10533	1	2	3
22	Setscrew for rocker bracket $\frac{1}{4}$ " UNF x $\frac{7}{8}$ "	270-114	2	4	6
23	Spring Washer	27-451	2	4	6
24	Nut for injector clamp $\frac{5}{16}$ "	270-3	2	4	6
25	Stud for injector clamp	201-11061	2	4	6
26	Nut for cylinder head	270-5	4	8	12
27	Washer for cylinder head	27-545	4	8	12
28	Nut for rocker adjusting screw $\frac{5}{16}$ " UNF	270-3	2	4	6
29	Valve Rocker Lever	201-19370	2	4	6
30	Bush for rocker lever	291-20701	2	4	6
31	Circlip for rocker lever	201-11630	2	4	6
32*	Carrier for valve spring	204-189	2 prs	4 prs.	6 prs.
33*	Carrier for valve spring	201-10351	2	4	6
34*	Valve Spring—Outer	291-20641	2	4	6
35*	Valve Spring—Inner	291-20651	2	4	6
36	Oil Reservoir	201-12932	1	2	3
37	Plunger for reservoir	201-12942	1	2	3
38	Grommet for reservoir	201-12951	1	2	3
39*	Breather Assembly	201-10982	1	2	3
40	Fuel Leak-off Pipe	201-11102	1	—	—



CYLINDER HEAD AND FITTINGS

PLATE 4

PLATE 4—CYLINDER HEAD AND FITTINGS—Contd.

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
—	Fuel Leak-off Pipe	202-17131	—	1	—
—	Fuel Leak-off Pipe	203-17131	—	—	1
—	Fuel Leak-off Pipe—manifold to tank	202-17121	—	1	1

Note:—The above fuel leak-off pipes are for non-self venting fuel systems. For pipes with self venting fuel systems see page 90.

CYLINDER HEAD COVER

—	Cylinder Head Cover Assembly comprising	201-17420	1	2	3
41	Cover	201-10492	1	2	3
42	Decompressor Lever	351-13550	1	2	3
43	Oil Filter	27-3821	1	2	3
44	Decompressor Spring	201-12270	1	2	3
—	Decompressor Mills Pin	201-11730	1	2	3
45	Decompressor Screw	201-10960	1	2	3
46	Decompressor Shaft	201-10950	1	2	3
47	Nut for Screw $\frac{1}{4}$ " UNF	270-2	1	2	3
48	Joint for cover	201-10510	1	2	3
49	Oil Filler Cap	28-3824	1	2	3
50	Joint for Cap	303-253	1	2	3
51	Nut for cover $\frac{1}{4}$ " UNF	270-2	2	4	6
52	Washer for Cover	27-618	2	4	6

INLET AND EXHAUST MANIFOLD

53	Air Cleaner—oil bath type	201-11422	1	1	—
—	Air Cleaner—oil bath type	203-11420	—	—	1
54	Clip for air cleaner	27-4230	1	1	—
—	Clip for air cleaner	27-4232	—	—	1
55	Setscrew $\frac{1}{4}$ " UNF x $1\frac{3}{8}$ "	20-113	3	—	—
—	Stud for manifold $\frac{1}{4}$ " UNF x $1\frac{1}{2}$ "	270-264	—	4	—
—	Stud for manifold $\frac{1}{4}$ " UNF x $1\frac{3}{4}$ "	270-155	—	2	—
—	Nut for manifold stud	270-13	—	6	9
—	Stud for manifold $\frac{1}{4}$ " UNF x $2\frac{1}{2}$ "	270-110	—	—	3
—	Stud for manifold $\frac{1}{4}$ " UNF x $2\frac{1}{8}$ "	270-379	—	—	6
56	Spring Washer	27-451	3	6	9
57	Exhaust Silencer—LD1 only	1-301	1	—	—
—	Exhaust Silencer—SL1 only	201-51190	1	—	—
—	Exhaust Silencer	2-101	—	1	—
—	Exhaust Silencer	102-101	—	—	1
58	Pipe for silencer—LD1 only	27-431	1	—	—
—	Socket for silencer SL1 only— $1\frac{1}{4}$ " to 1" BSP	27-4330	1	—	—
59	Inlet and Exhaust Manifold	201-11123	1	—	—
—	Exhaust Manifold	202-13990	—	1	—
—	Exhaust Manifold—reverse rotation	202-13991	—	1	—
—	Exhaust Manifold	203-13990	—	—	1
—	Exhaust Manifold—reverse rotation	203-13991	—	—	1
—	Air Inlet Manifold	202-14001	—	1	—
—	Air Inlet Manifold	203-14000	—	—	1
60	Manifold Joint	203-11131	1	2	—
—	Manifold Joint	203-11130	—	—	3
—	Manifold Joint	201-13017	1	1	1
—	Lubricating Oil Transfer (English)	201-13730	1	1	1

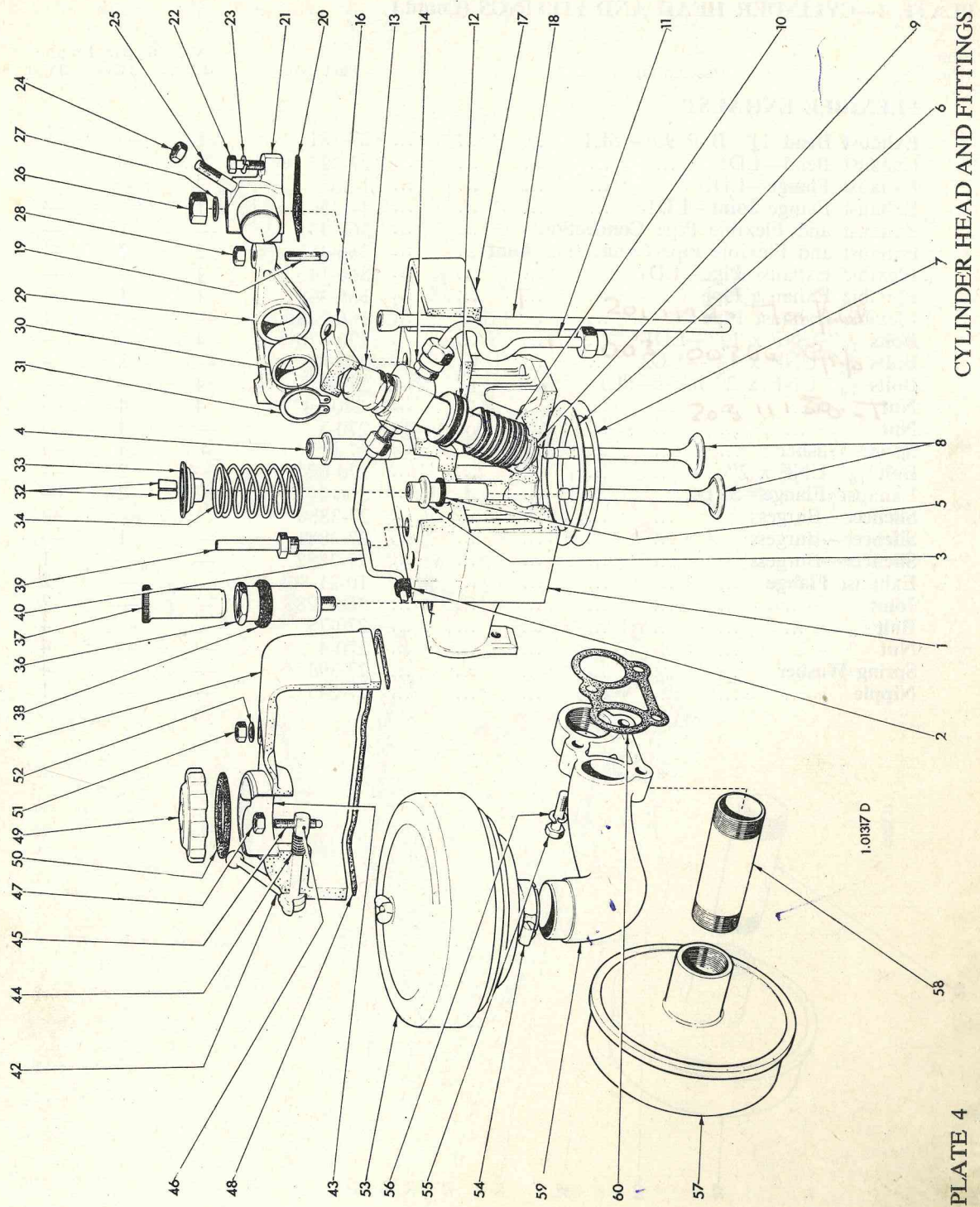
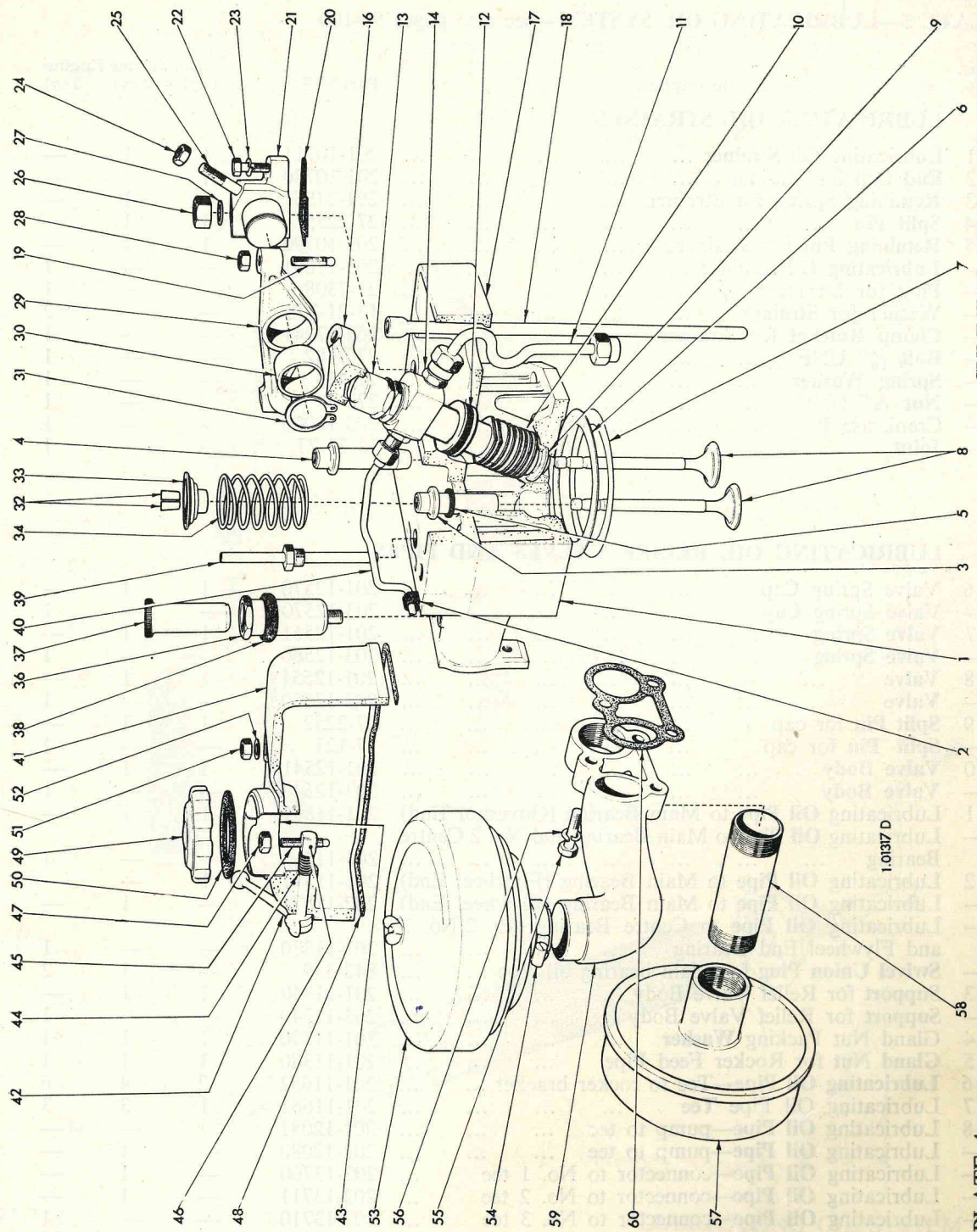


PLATE 4

PLATE 4—CYLINDER HEAD AND FITTINGS (Contd.)

Illus. No.	Description	Part No.	No. off per Engine	1 Cyl.	2 Cyl.	3 Cyl.
FLEXIBLE EXHAUST						
Exhaust Bend	1 1/4" BSP 90°—SL1	27-181	1	—	—	—
Exhaust Bend	—LD1	27-382	1	—	—	—
Exhaust Flange	—LD1	1-302	2	—	—	—
Exhaust Flange	Joint—LD1	1-1330	1	—	—	—
Exhaust and Flexible Pipe	Connection	366-451	—	1	—	—
Exhaust and Flexible Pipe	Connection Joint	366-453	2	2	—	—
Flexible Exhaust Pipe	—LD1	366-14	1	—	—	—
Flexible Exhaust Pipe		366-448	1	1	—	—
Flexible Exhaust Pipe		366-1286	—	—	—	1
Bolts	5/16" UNF x 1 3/4"—LD1	270-370	4	—	—	—
Bolts	5/16" UNF x 1 3/8"—LD2	270-62	—	2	—	—
Bolts	5/16" UNF x 2" brass—SL1	270-27	4	—	—	—
Nut		270-14	4	4	—	—
Nut		270-3	—	4	—	—
Spring Washer		27-413	4	4	—	—
Bolt	5/16" UNF x 2"	270-65	—	2	—	—
Exhaust Flange	—SL1-2	366-467	2	2	—	—
Silencer	—Burgess	27-3880	1	—	—	—
Silencer	—Burgess	27-3881	—	1	—	—
Silencer	—Burgess	27-3882	—	—	—	1
Exhaust Flange		10-21-801	—	—	—	2
Joint		366-1287	—	—	—	2
Bolt		270-75	—	—	—	4
Nut		270-4	—	—	—	4
Spring Washer		27-393	—	—	—	4
Nipple		27-245	—	—	—	1



CYLINDER HEAD AND FITTINGS

PLATE 4

PLATE 5—LUBRICATING OIL SYSTEM—See also pages 97-100

Illus. No.	Description	Part No.	No. off per Engine		
			1 cyl.	2 cyl.	3 cyl.
LUBRICATING OIL STRAINER					
1	Lubricating Oil Strainer	201-10711	1	1	—
2	End Cap for Strainer	201-10780	1	1	—
3	Retaining Spring for Strainer	291-2195	1	1	—
4	Split Pin	27-2255	1	1	—
5	Retaining Pin for Strainer	201-10790	1	1	—
—	Lubricating Oil Strainer	203-17881	—	—	1
—	Plug for Strainer	23-2308	—	—	1
—	Washer for Strainer	13-21-778	—	—	2
—	Clamp Bracket for Strainer	203-17941	—	—	1
—	Bolt $\frac{5}{16}$ " UNF	270-182	—	—	1
—	Spring Washer	27-413	—	—	1
—	Nut $\frac{5}{16}$ " UNF	270-3	—	—	1
—	Crankcase Plug	203-18000	—	—	1
—	Joint	13-21-77	—	—	1

LUBRICATING OIL RELIEF VALVES AND PIPES

6	Valve Spring Cap	201-12570	1	1	—
—	Valve Spring Cap	203-12570	—	—	1
7	Valve Spring	201-12561	1	1	—
—	Valve Spring	203-12560	—	—	1
8	Valve	201-12551	1	1	—
—	Valve	203-12550	—	—	1
9	Split Pin for cap	27-2252	1	1	—
—	Split Pin for cap	27-121	—	—	1
10	Valve Body	201-12541	1	1	—
—	Valve Body	203-12540	—	—	1
11	Lubricating Oil Pipe to Main Bearing (Governor End)	201-11861	1	1	—
—	Lubricating Oil Pipe to Main Bearing and No. 2 Centre Bearing	203-11860	—	—	1
12	Lubricating Oil Pipe to Main Bearing (Flywheel End)	201-11371	1	—	—
—	Lubricating Oil Pipe to Main Bearing (Flywheel End)	202-11371	—	1	—
—	Lubricating Oil Pipe to Centre Bearing No. 2/No. 3 and Flywheel End Bearing	203-11370	—	—	1
—	Swivel Union Plug for Main bearing oil pipe	842-359	—	1	2
13	Support for Relief Valve Body	201-11340	1	1	—
—	Support for Relief Valve Body	203-11340	—	—	1
14	Gland Nut Packing Washer	201-11390	1	1	1
15	Gland Nut for Rocker Feed Pipe	201-11380	1	1	1
16	Lubricating Oil Pipe—Tee to rocker bracket	201-11652	2	4	6
17	Lubricating Oil Pipe Tee	201-11662	1	3	3
18	Lubricating Oil Pipe—pump to tee	201-12081	1	—	—
—	Lubricating Oil Pipe—pump to tee	202-12080	—	1	—
—	Lubricating Oil Pipe—connector to No. 1 tee	202-13700	—	1	—
—	Lubricating Oil Pipe—connector to No. 2 tee	202-13711	—	1	—
—	Lubricating Oil Pipe—connector to No. 3 tee	202-13710	—	—	1
—	Lubricating Oil Pipe—pump to connector	203-12080	—	—	1
—	Lubricating Oil Pipe—connector to No. 1 tee	203-13700	—	—	1
—	Four Way Connector	203-17980	—	—	1
19	Lubricating Oil Pipe Bush	201-12280	1	1	1

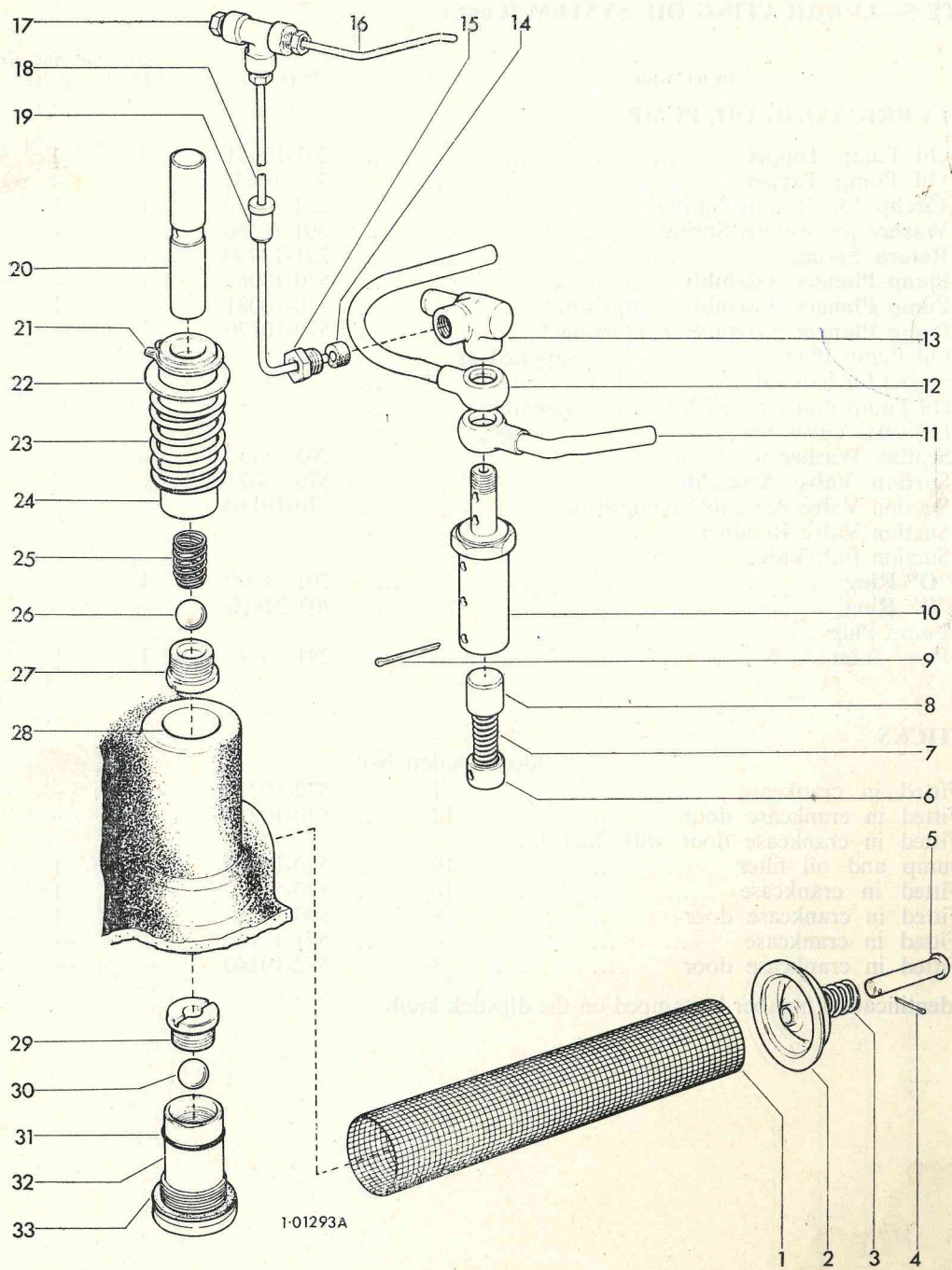


PLATE 5

LUBRICATING OIL SYSTEM

PLATE 5—LUBRICATING OIL SYSTEM (Cont.)

Illus. No.	Description	Part No.	No. off 1 Cyl.	per 2 Cyl.	Engine 3 Cyl.
LUBRICATING OIL PUMP					
20	Oil Pump Tappet	201-10651	1	1	—
—	Oil Pump Tappet	203-10651	—	—	1
21	Circlip for Return Spring	201-10670	1	1	1
22	Washer for Return Spring	201-10660	1	1	1
23	Return Spring	201-12450	1	1	1
—	Pump Plunger Assembly comprising*	570-10061	1	—	—
—	Pump Plunger Assembly comprising*	570-10081	—	1	—
—	Pump Plunger Assembly comprising*	570-10170	—	—	1
24	*Oil Pump Plunger	Supplied as an assembly only	—	—	1
25	*Spring for ball valve				
26	*Oil Pump Plunger Ball Valve				
27	*Delivery Valve Seat	203-18130	—	—	1
28	Seating Washer for Spring	570-10071	1	1	—
—	Suction Valve Assembly	570-10180	—	—	1
—	Suction Valve Assembly comprising				
29	†Suction Valve Retainer				
30	†Suction Ball Valve	201-24800	1	1	—
31	“O” Ring	203-24810	—	—	1
—	“O” Ring				
32	†Pump Plug	291-3064	1	1	—
33	Plug Joint				

DIPSTICKS

	Identification No.				
Fitted in crankcase	1	572-10210	1	—	—
Fitted in crankcase door	17	570-10211	1	—	—
Fitted in crankcase door with fuel lift pump and oil filter	19	570-10390	—	1	1
Fitted in crankcase	16	570-10370	—	1	—
Fitted in crankcase door	18	570-10380	—	1	—
Fitted in crankcase	4	571-10160	—	—	1
Fitted in crankcase door	8	572-10240	—	—	1

The identification number is stamped on the dipstick knob.

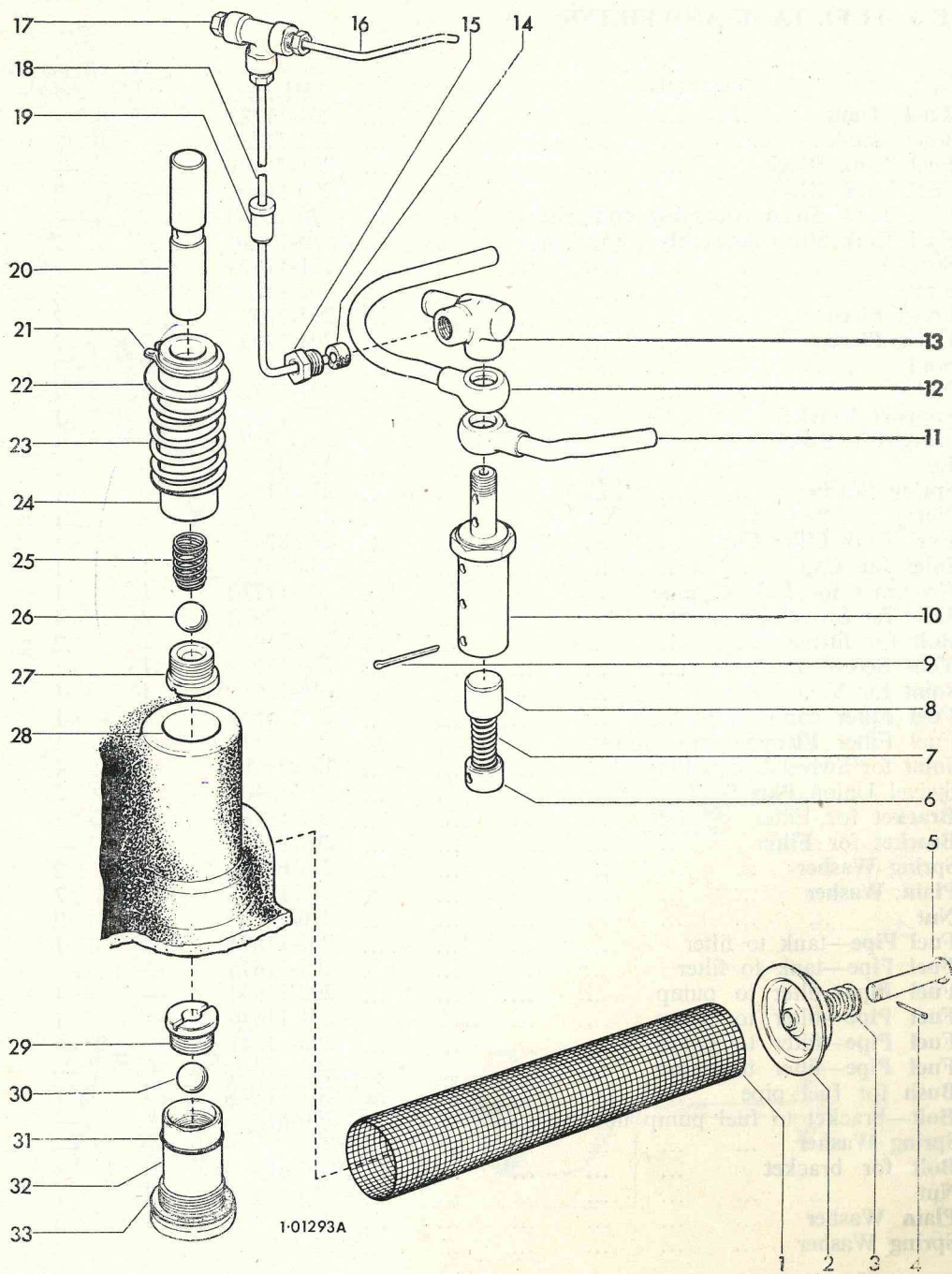


PLATE 5

LUBRICATING OIL SYSTEM

PLATE 6—FUEL TANK AND FILTER

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
1	Fuel Tank	201-11283	1	—	—
—	Fuel Tank	202-11280	—	1	1
2	Fuel Tank Block	201-11491	2	—	—
—	Fuel Tank Block	202-11490	—	2	2
3	Fuel Tank Strap Assembly comprising*	570-10630	2	—	—
—	Fuel Tank Strap Assembly comprising†	570-10640	—	2	2
—	*Strap	201-11503	2	—	—
—	†Strap	202-11501	—	2	2
4*	Cross Piece	294-2707	2	2	2
5*	Cross Piece	294-2708	2	2	2
6*	Stud	270-561	2	2	2
7*	Nut	201-18720	2	2	2
—	Support Bracket	367-19561	—	1	1
—	Strap for Bracket	367-19571	—	1	1
—	Bolt	270-54	—	1	1
—	Spring Washer	27-451	—	1	1
—	Nut	270-2	—	1	1
8	Fuel Tank Filler Cap	27-3824	1	1	1
9	Joint for Cap	303-253	1	1	1
10	Grommet for leak-off pipe	201-11710	1	1	1
11	Joint for Swivel Union Plug	201-12970	2	4	6
12	Bolt for filter	270-219	2	2	2
13	Vent Screw	270-172	1	1	1
14	Joint for Vent Screw	616-1601	1	1	1
15	Fuel Filter complete	201-11613	1	1	1
16	Fuel Filter Element with Joints	201-13116	1	1	1
17	Joint for Swivel Union Plug	13-22-350	4	4	4
18	Swivel Union Plug	201-15400	2	2	2
* 19	Bracket for Filter	201-11267	1	1	—
—	Bracket for Filter	203-11261	—	—	1
20	Spring Washer	27-1698	2	2	2
—	Plain Washer	27-717	2	2	2
21	Nut	270-1	2	2	2
22	Fuel Pipe—tank to filter	201-11674	1	1	—
—	Fuel Pipe—tank to filter	201-11675	—	—	1
23	Fuel Pipe—filter to pump	202-11644	—	1	—
—	Fuel Pipe—filter to pump	201-11644	—	1	—
—	Fuel Pipe—filter to pump	203-11641	—	—	1
—	Fuel Pipe—filter to pump	203-11640	—	—	1
24	Bush for fuel pipe	201-11271	1	1	1
—	Bolt—bracket to fuel pump housing	270-61	—	—	2
—	Spring Washer	27-413	—	—	2
—	Bolt for bracket	270-61	1	1	1
—	Nut	270-3	1	1	1
—	Plain Washer	27-82	2	2	2
—	Spring Washer	27-413	1	1	1

* NOW. 201 83200 .

PLATE 7—LISTER DIRECT DRIVE CLUTCH—CAMSHAFT DRIVE

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
1	Clutch Case	201-22900	1	1	1
2	Clutch Case Joint	203-19961	1	1	1
3	Clutch End Cover	201-22550	1	1	1
4	Clutch End Cover Joint	201 14741	1	1	1
5	Clutch End Cover Bolt 5/16" UNF x 1"	270-82	4	4	4
6	Clutch End Cover Bolt Spring Washer	27-413	4	4	4
—	Nut	270-3	4	4	4
7	Clutch Cover and Oil Return Trough Assembly	201 22721	1	1	1
comprising: —					
	Cover	201-22711	1	1	1
	Oil Trough	203-20010	1	1	1
	Breather Nut	201-24520	1	1	1
8	Clutch Cover Joint	203-20060	1	1	1
9	Clutch Cover Setscrew 1/4" UNF x 1/2"	270-54	6	6	6
10	Clutch Cover Setscrew Spring Washer	27-451	6	6	6
11	Oil Catcher Assembly—comprising:	203-20040	1	1	1
	Oil Catcher	203-20020	1	1	1
	Oil Catcher	203-20030	1	1	1
	Rivets for Oil Catcher	203-20840	2	2	2
12	Instruction Plate	203-20070	1	1	1
—	Rivets for instruction Plate	203-20830	4	4	4
13	Oil Breather Plug Assembly—comprising:	570-10460	1	1	1
	Plug	201-22570	1	1	1
	Element	201-18561	1	1	1
	Dowel	27-707	1	1	1
14	Joint	13-22-350	1	1	1
15	Plug, Oil Filler and Drain	11-13-693	2	2	2
16	Joint	4-197	2	2	2
17	Operating Lever—Outside	23-3134	1	1	1
18	Operating Lever Locking Bolt	27-890	1	1	1
19	Operating Lever Spring Washer	27-413	1	1	1
20	Sealing Ring for Operating Shaft	201-14640	2	2	2
21	Sealing Ring Retaining Collar	203-20080	2	2	2
—	Operating Shaft Assembly—comprising:	203-20111	1	1	1
22	Operating Shaft	203-20130	1	1	1
23	Operating Lever Inside	210-249	2	2	2
24	Taper Pin	27-822	2	2	2
25	Retaining Spring	210-259	1	1	1
26	Oil Seal	201-22960	1	1	1
27	Oil Seal Bush	201-22560	1	1	1
28	Ball Journal	210-154	1	1	1
29	Spacing Collar	201-22700	1	1	1
—	Clutch Shaft Assembly—comprising:	570-10470	1	1	1
30	Clutch Centre	201-22840	1	1	1
31	Clutch Shaft	201-22690	1	1	1
32	Key	27-785	1	1	1
33	Locating Pin	201-11160	1	1	1
—	Clutch Adjusting Ring Assembly—comprising:	570-10650	1	1	1
34	Adjusting Ring	210-250	1	1	1
35	Clutch Engaging Arms	210-261	2	2	2
36	Spring for Arms	201-24590	2	2	2
37	Pin for Arms	201-24581	2	2	2
—	Washer	27-4877	4	4	4
38	Split Pin	27-2274	4	4	4
39	Locating Pin	201-263	1	1	1
40	Locating Pin Spring	210-387	1	1	1

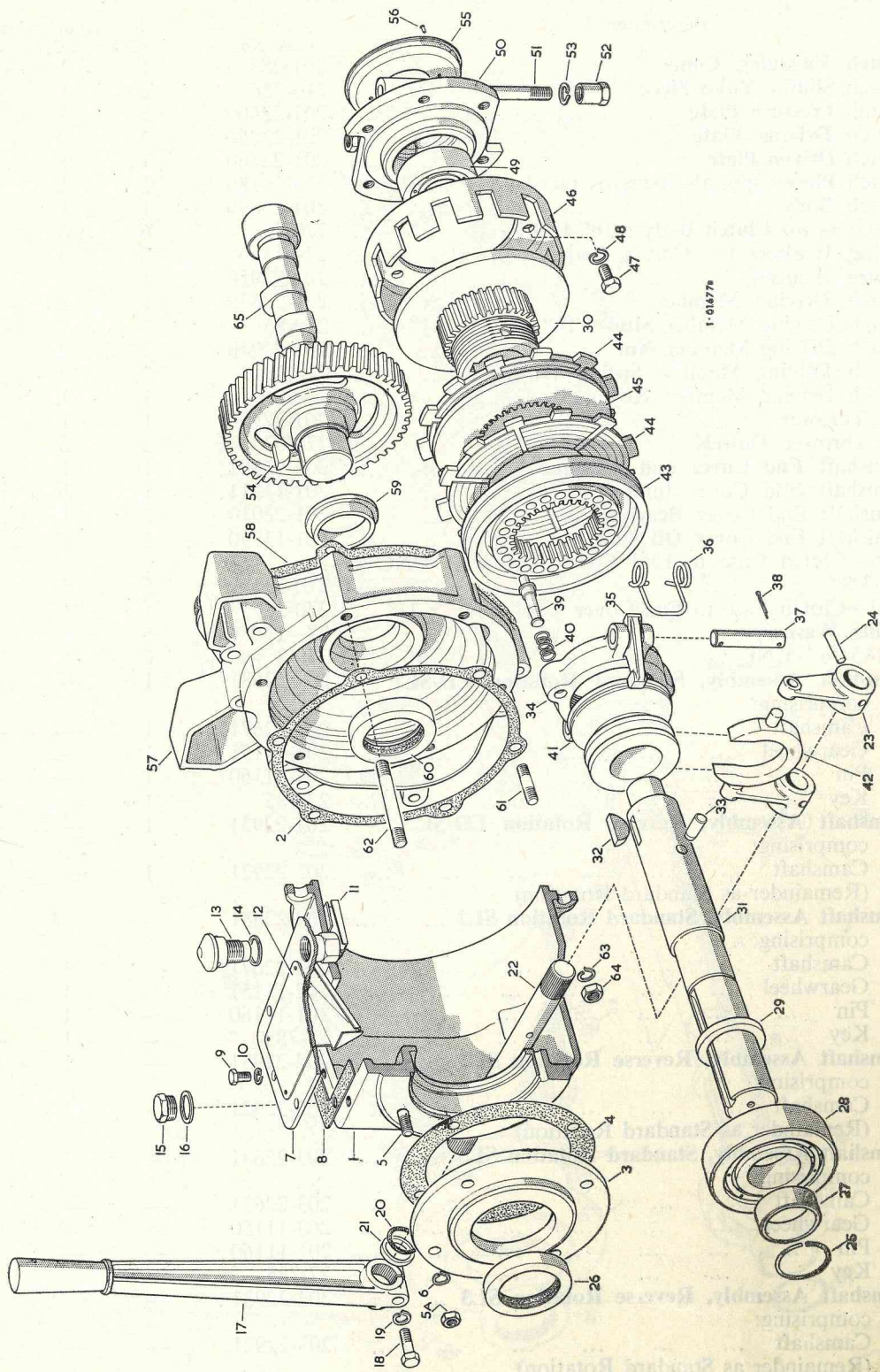
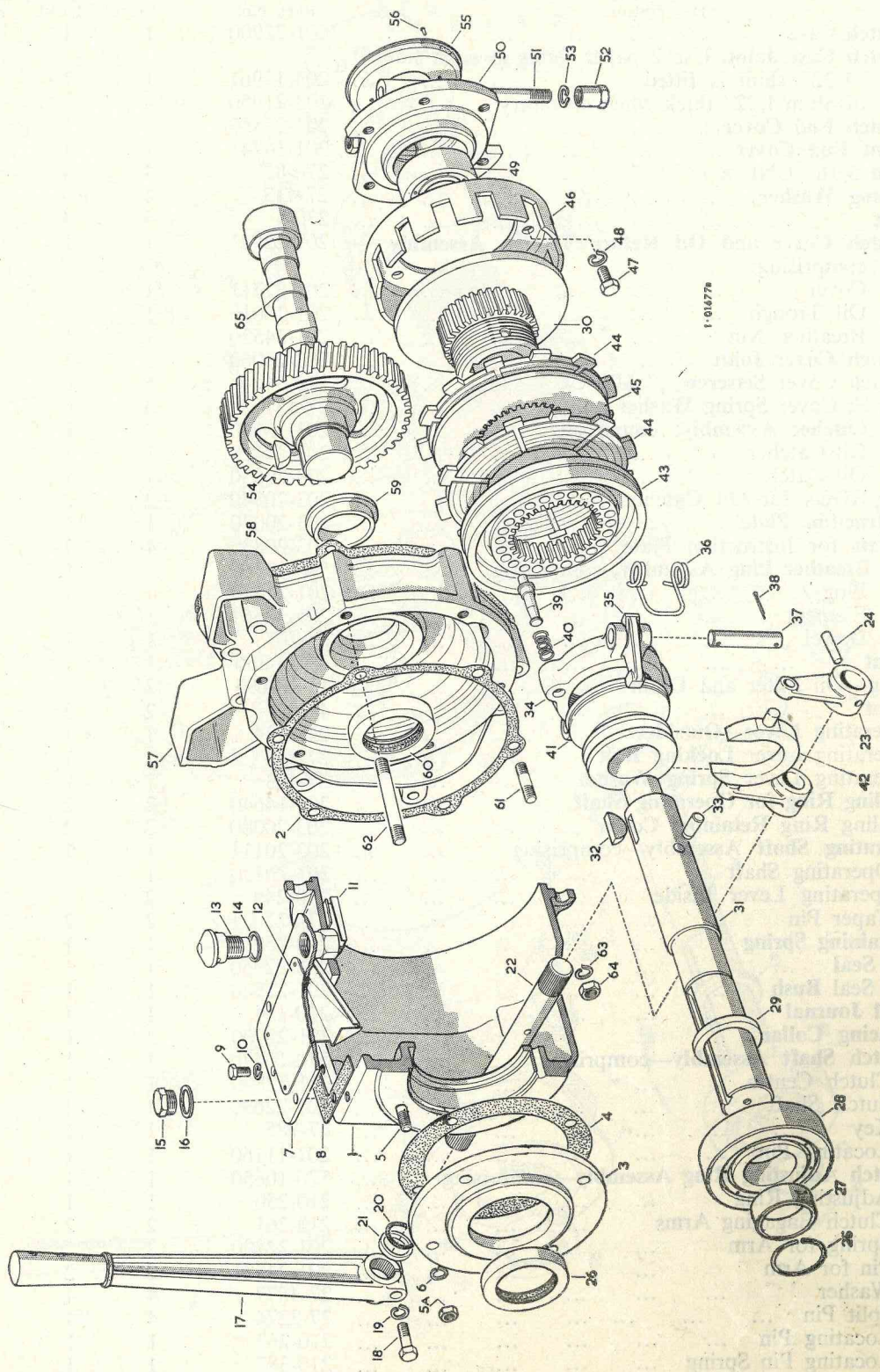


PLATE 7

CAMSHAFT CLUTCH

PLATE 7—LISTER DIRECT DRIVE CLUTCH—CAMSHAFT DRIVE (cont.)

No. Illus.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
		201-283	1	1	1
41	Clutch Engaging Cone	210-256	1	1	1
42	Clutch Sliding Yoke Piece	201-22600	1	1	1
43	Clutch Pressure Plate	201-22850	2	2	2
44	Clutch Driving Plate	201-22860	1	1	1
45	Clutch Driven Plate	579-10180	1	1	1
—	Clutch Plate—special—asbestos faced	201-22890	1	1	1
46	Clutch Body	270-59	6	6	6
47	Setscrews for Clutch Body 5/16" UNF x 5/8"	27-413	6	6	6
48	Spring Washers for Clutch Body	201-22950	1	1	1
49	Centre Bearing	201-22870	1	1	1
50	Clutch Driving Member	270-85	2	2	2
51	Clutch Driving Member Stud 5/16" UNF x 3 1/4"	201-22940	2	2	2
52	Clutch Driving Member Nut	27-413	2	2	2
53	Clutch Driving Member Spring Washer	27-785	1	1	1
54	Clutch Driving Member Key	201-22750	1	1	1
55	Oil Thrower	27-707	2	2	2
56	Oil Thrower Dowels	201-22881	1	1	1
57	Camshaft End Cover and Adaptor	201-11211	1	1	1
58	Camshaft End Cover Joint	201-22910	1	1	1
59	Camshaft End Cover Bearing	201-13190	1	1	1
60	Camshaft End Cover Oil Seal				
61	Stud—Clutch Case to End Cover 5/16" UNF-UNC x 1-3/8"	270-284	5	5	5
		270-237	1	1	1
62	Stud—Clutch Case to End Cover 5/16" UNF x 3 1/2"	27-413	6	6	6
63	Spring Washer	270-3	6	6	6
64	Nut 5/16" UNF	201-22681	1	—	—
65	Camshaft Assembly, Standard Rotation LD/SL1 —				
	comprising:				
	Camshaft	201-22671	1	—	—
	Gearwheel	201-11151	1	—	—
	Pin	201-11160	1	—	—
	Key	27-785	1	—	—
—	Camshaft Assembly, Reverse Rotation LD/SL	201-22931	1	—	—
	comprising:				
	Camshaft	201-22921	1	—	—
	(Remainder as Standard Rotation)				
—	Camshaft Assembly, Standard Rotation SL2 ...	202-22681	—	1	—
	comprising:				
	Camshaft	202-22671	—	1	—
	Gearwheel	202-11151	—	1	—
	Pin	201-11160	—	1	—
	Key	27-785	—	1	—
—	Camshaft Assembly, Reverse Rotation SL2 ...	202-22931	—	1	—
	comprising:				
	Camshaft	202-22921	—	1	—
	(Remainder as Standard Rotation)				
—	Camshaft Assembly, Standard Rotation SL3 ...	203-22681	—	—	1
	comprising:				
	Camshaft	203-22671	—	—	1
	Gearwheel	203-11150	—	—	1
	Pin	201-11160	—	—	1
	Key	27-785	—	—	1
—	Camshaft Assembly, Reverse Rotation SL3 ...	203-22931	—	—	1
	comprising:				
	Camshaft	203-22921	—	—	1
	(Remainder as Standard Rotation)				
—	Bolt End Cover to Crankcase 5/16" UNF x 2" ...	270-65	1	1	1

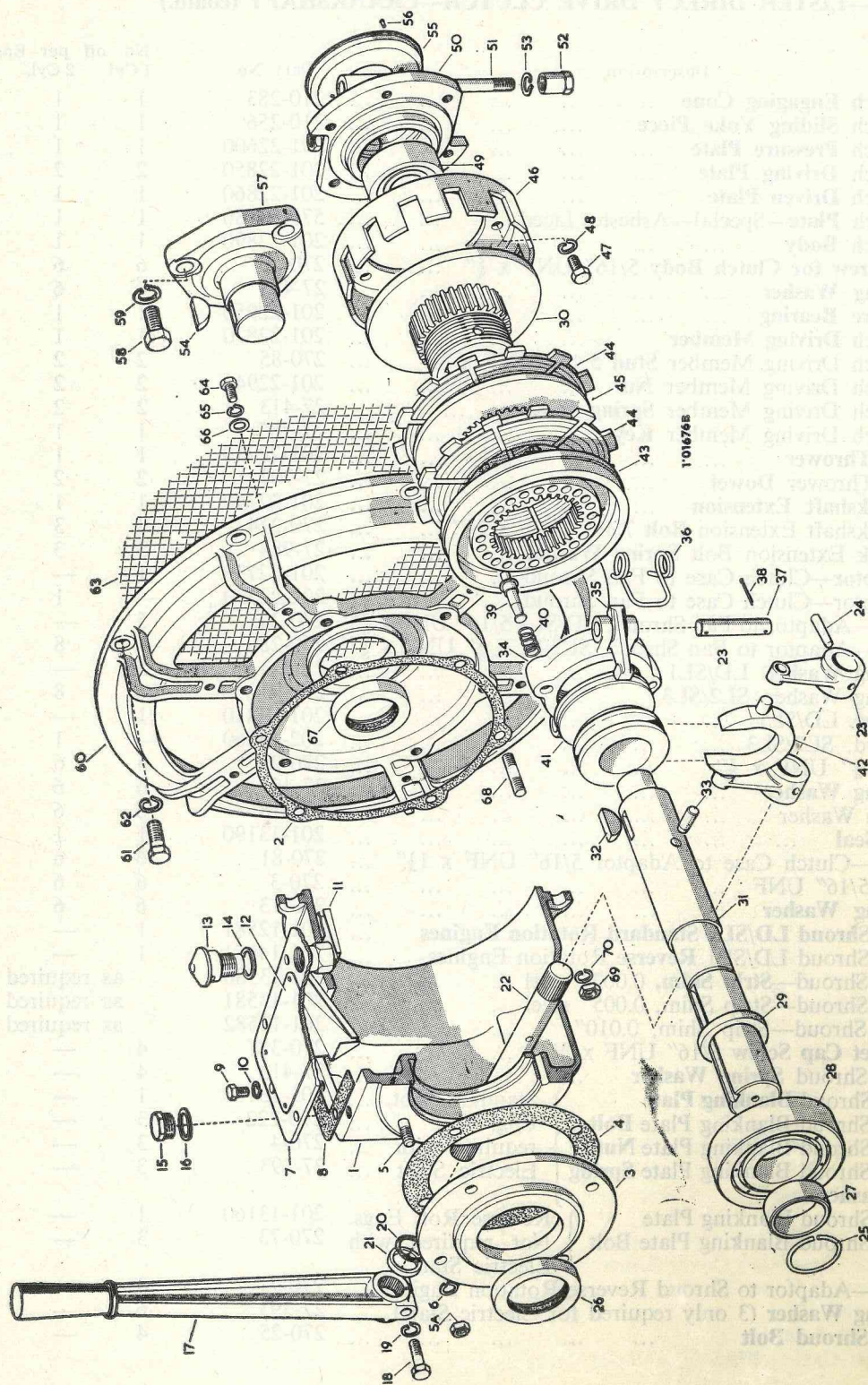


CAMSHAFT CLUTCH

PLATE 7

PLATE 8—LISTER DIRECT DRIVE CLUTCH—CRANKSHAFT

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
1	Clutch Case	201-22900	1	1	1
2	Clutch Case Joint. Use 2 paper joints (1 each side) if 1/32" shim is fitted	203-19961	1	1	1
	or Shim 1/32" thick when necessary	203-21950	—	—	—
3	Clutch End Cover	201-22550	1	1	1
4	Joint End Cover	201-14741	1	1	1
5	Bolt 5/16" UNF x 1"	270-82	4	4	4
6	Spring Washer	27-413	4	4	4
—	Nut	270-3	4	4	4
7	Clutch Cover and Oil Return Trough Assembly — comprising:	201-22721	1	1	1
	Cover	201-22711	1	1	1
	Oil Trough	203-20010	1	1	1
	Breather Nut	201-24520	1	1	1
8	Clutch Cover Joint	203-20060	1	1	1
9	Clutch Cover Setscrew 1/4" UNF x 1/2"	270-54	6	6	6
10	Clutch Cover Spring Washer	27-451	6	6	6
11	Oil Catcher Assembly—comprising:	203-20040	1	1	1
	Oil Catcher	203-20020	1	1	1
	Oil Catcher	203-20030	1	1	1
	Rivets for Oil Catcher	203-20840	2	2	2
12	Instruction Plate	203-20070	1	1	1
—	Rivets for Instruction Plate	203-20830	4	4	4
13	Oil Breather Plug Assembly, comprising	570-10460	1	1	1
	Plug	201-22570	1	1	1
	Element	201-18561	1	1	1
	Dowel	27-707	1	1	1
14	Joint	13-22-350	1	1	1
15	Plug—Oil Filter and Drain	11-13-693	2	2	2
16	Joint	4-197	2	2	2
17	Operating Lever—Outside	23-3134	1	1	1
18	Operating Lever Locking Bolt	27-890	1	1	1
19	Operating Lever Spring Washer	27-413	1	1	1
20	Sealing Ring for Operating Shaft	201-14640	2	2	2
21	Sealing Ring Retaining Collar	203-20080	2	2	2
—	Operating Shaft Assembly—comprising	203-20111	1	1	1
22	Operating Shaft	203-20130	1	1	1
23	Operating Lever Inside	210-249	2	2	2
24	Taper Pin	27-822	2	2	2
25	Retaining Spring	210-259	1	1	1
26	Oil Seal	201-22960	1	1	1
27	Oil Seal Bush	201-22560	1	1	1
28	Ball Journal	210-154	1	1	1
29	Spacing Collar	201-22700	1	1	1
—	Clutch Shaft Assembly—comprising:	570-10470	1	1	1
30	Clutch Centre	201-22840	1	1	1
31	Clutch Shaft	201-22690	1	1	1
32	Key	27-785	1	1	1
33	Locating Pin	201-11160	1	1	1
—	Clutch Adjusting Ring Assembly—comprising:	570-10650	1	1	1
34	Adjusting Ring	210-250	1	1	1
35	Clutch Engaging Arms	210-261	2	2	2
36	Spring for Arm	201-24590	2	2	2
37	Pin for Arm	201-24581	2	2	1
—	Washer	27-4877	4	4	4
—	Split Pin	27-2274	4	4	4
39	Locating Pin	210-263	1	1	1
40	Locating Pin Spring	210-387	1	1	1

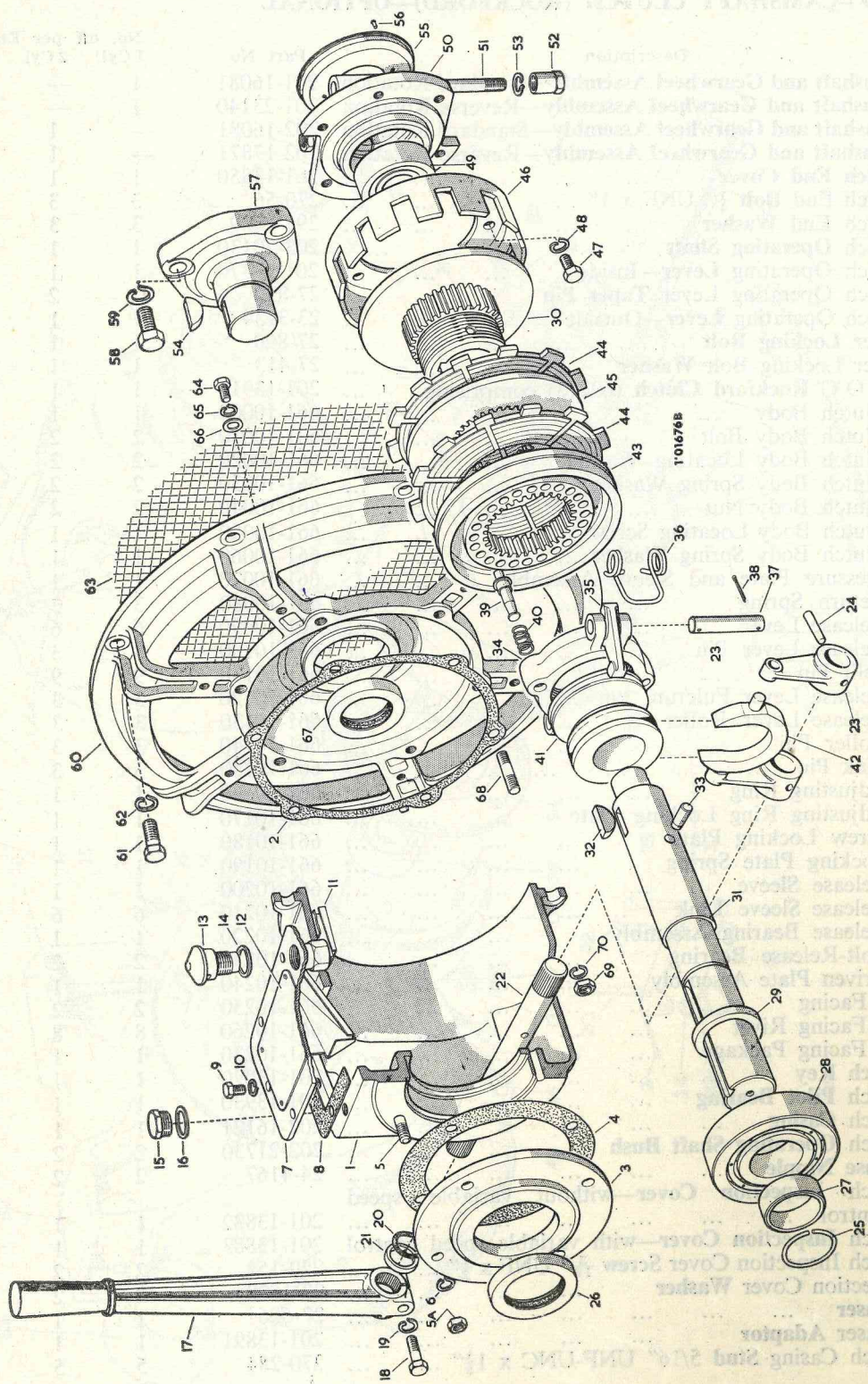


CRANKSHAFT CLUTCH

PLATE 8

PLATE 8—LISTER DIRECT DRIVE CLUTCH—CRANKSHAFT (contd.)

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
41	Clutch Engaging Cone	210-283	1	1	1
42	Clutch Sliding Yoke Piece	210-256	1	1	1
43	Clutch Pressure Plate	201-22600	1	1	1
44	Clutch Driving Plate	201-22850	2	2	2
45	Clutch Driven Plate	201-22860	1	1	1
—	Clutch Plate—Special—Asbestos faced	579-10180	1	1	1
46	Clutch Body	201-22890	1	1	1
47	Setscrew for Clutch Body 5/16" UNF x 5/8"	270-59	6	6	6
48	Spring Washer	27-413	6	6	6
49	Centre Bearing	201-22950	1	1	1
50	Clutch Driving Member	201-22870	1	1	1
51	Clutch Driving Member Stud 5/16" UNF x 3/4"	270-85	2	2	2
52	Clutch Driving Member Nut	201-22940	2	2	2
53	Clutch Driving Member Spring Washer	27-413	2	2	2
54	Clutch Driving Member Key	27-785	1	1	1
55	Oil Thrower	201-22750	1	1	1
56	Oil Thrower Dowel	27-707	2	2	2
57	Crankshaft Extension	201-22740	1	1	1
58	Crankshaft Extension Bolt 7/16" UNF x 1 1/4"	270-274	3	3	3
59	Crank Extension Bolt Spring Washer	27-984	3	3	3
60	Adaptor—Clutch Case to Fan Shroud	201-22730	1	—	—
—	Adaptor—Clutch Case to Fan Shroud	202-22730	—	1	1
61	Bolt—Adaptor to Fan Shroud, LD/SL1 5/16" UNF x 7/8"	270-24	5	—	—
—	Bolt—Adaptor to Fan Shroud, SL2/SL3, 3/8" UNC x 7/8"	270-286	—	8	8
62	Spring Washer, LD/SL1	27-413	5	—	—
—	Spring Washer, SL2/SL3	27-393	—	8	8
63	Guard, LD/SL1	201-13810	1	—	—
—	Guard, SL2/SL3	202-16060	—	1	1
64	Bolt 1/4" UNF x 5/8"	270-23	6	6	6
65	Spring Washer	27-451	6	6	6
66	Plain Washer	27-618	6	6	6
67	Oil Seal	201-13190	1	1	1
68	Stud—Clutch Case to Adaptor 5/16" UNF x 1 1/4"	270-81	6	6	6
69	Nut 5/16" UNF	270-3	6	6	6
70	Spring Washer	27-413	6	6	6
—	Fan Shroud LD/SL1 Standard Rotation Engines	201-12581	1	—	—
—	Fan Shroud LD/SL1 Reverse Rotation Engines	201-14951	1	—	—
—	Fan Shroud—Strip Shim, 0.002" steel	201-13580	as required		
—	Fan Shroud—Strip Shim, 0.005" steel	201-13581	as required		
—	Fan Shroud—Strip Shim, 0.010"	201-13582	as required		
—	Socket Cap Screw 5/16" UNF x 3/4"	270-327	4	—	—
—	Fan Shroud Spring Washer	27-413	4	—	—
—	Fan Shroud Blanking Plate	201-13160	1	—	—
—	Fan Shroud Blanking Plate Bolt	270-222	3	—	—
—	Fan Shroud Blanking Plate Nut	270-4	3	—	—
—	Fan Shroud Blanking Plate Spring Washer	27-393	3	—	—
—	Fan Shroud Blanking Plate	201-13160	1	—	—
—	Fan Shroud Blanking Plate Bolt	270-73	3	—	—
—	Bolt—Adaptor to Shroud Reverse Rotation Engines	270-71	3	—	—
—	Spring Washer (3 only required for Electric Start)	27-393	6	—	—
—	Fan Shroud Bolt	270-25	4	—	—

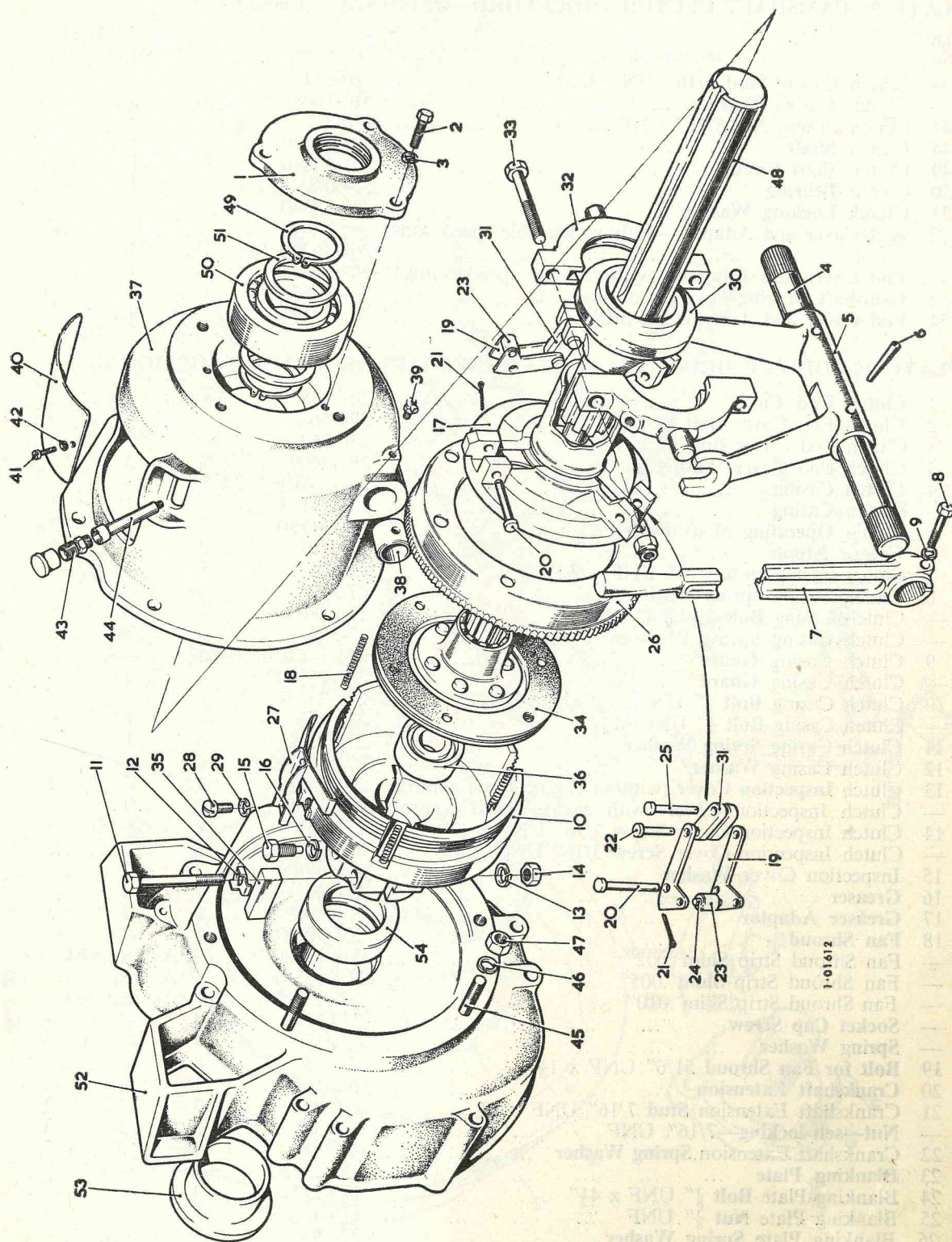


CRANKSHAFT CLUTCH

PLATE 8

PLATE 9—CAMSHAFT CLUTCH (ROCKFORD)—OPTIONAL

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
—	Camshaft and Gearwheel Assembly—Standard Rotation	201-16081	1	—	—
—	Camshaft and Gearwheel Assembly—Reverse Rotation	201-23140	1	—	—
—	Camshaft and Gearwheel Assembly—Standard Rotation	202-16081	—	1	—
—	Camshaft and Gearwheel Assembly—Reverse Rotation	202-17871	—	1	—
1	Clutch End Cover	201-13850	1	1	—
2	Clutch End Bolt $\frac{1}{4}$ " UNF x 1"	270-56	3	3	—
3	Clutch End Washer	291-2609	3	3	—
4	Clutch Operating Shaft	203-20130	1	1	—
5	Clutch Operating Lever—Inside	201-13870	1	1	—
6	Clutch Operating Lever Taper Pin	27-822	2	2	—
7	Clutch Operating Lever—Outside	23-3134	1	1	—
8	Lever Locking Bolt	27-890	1	1	—
9	Lever Locking Bolt Washer	27-413	1	1	—
—	$\frac{5}{16}$ " O/C Rockford Clutch (60213) comprising	201-13910	1	1	—
10	Clutch Body	661-10000	1	1	—
11	Clutch Body Bolt	601-10010	2	2	—
12	Clutch Body Locating Washer	661-10020	2	2	—
13	Clutch Body Spring Washer	661-10030	2	2	—
14	Clutch Body Nut	661-10040	2	2	—
15	Clutch Body Locating Screw	661-10050	1	1	—
16	Clutch Body Spring Washer	661-10060	1	1	—
17	Pressure Plate and Sleeve Assembly	661-10070	1	1	—
18	Return Spring	661-10080	3	3	—
19	Release Lever	661-10090	6	6	—
20	Release Lever Pin	661-10100	3	3	—
21	Split Pin	661-10110	9	9	—
22	Release Lever Fulcrum Pin	661-10120	3	3	—
23	Release Lever Roller	661-10130	3	3	—
24	Roller Pin	661-10140	3	3	—
25	Link Pin	661-10150	3	3	—
26	Adjusting Ring	661-10160	1	1	—
27	Adjusting Ring Locking Plate	661-10170	1	1	—
28	Screw Locking Plate	661-10180	1	1	—
29	Locking Plate Spring	661-10190	1	1	—
30	Release Sleeve	661-10200	1	1	—
31	Release Sleeve Link	661-10210	6	6	—
32	Release Bearing Assembly	661-10220	1	1	—
33	Bolt-Release Bearing	661-10230	2	2	—
34	Driven Plate Assembly	661-10240	1	1	—
	Facing	661-10250	2	2	—
	Facing Rivet	661-10260	8	8	—
	Facing Package	661-10270	1	1	—
35	Clutch Key	201-13920	1	1	—
36	Clutch Pilot Bearing	201-13930	1	1	—
37	Clutch Casing	202-16121	1	1	—
38	Clutch Operating Shaft Bush	202-21730	2	2	—
39	Grease Nipple	24-4167	2	2	—
40	Clutch Inspection Cover—without variable speed control	201-13882	1	1	—
—	Clutch Inspection Cover—with variable speed control	201-13883	1	1	—
41	Clutch Inspection Cover Screw $\frac{3}{16}$ " UNF x $\frac{1}{2}$ "	270-151	2	2	—
42	Inspection Cover Washer	27-1698	2	2	—
43	Greaser	27-606	1	1	—
44	Greaser Adaptor	201-13891	1	1	—
45	Clutch Casing Stud $\frac{5}{16}$ " UNF-UNC x $1\frac{3}{8}$ "	270-284	5	5	—



CAMSHAFT CLUTCH (ROCKFORD)

PLATE 9—CAMSHAFT CLUTCH—ROCKFORD—OPTIONAL—(Contd.)

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
—	Clutch Casing Stud 5/16" UNF x 3" ...	270-123	1	1	—
—	Clutch Casing Washer ...	616-1608	5	5	—
47	Clutch Casing Nut 5/16" UNF ...	270-3	6	6	—
48	Clutch Shaft ...	201-13820	1	1	—
49	Clutch Shaft Circlip ...	201-13830	1	1	—
50	Clutch Bearing ...	31-60	1	1	—
51	Clutch Locking Washer ...	201-13840	1	1	—
52	End Cover and Adaptor—without variable speed control ...	202-16370	1	1	—
—	End Cover and Adaptor—with variable speed control ...	202-16371	1	1	—
53	Camshaft Bearing—gear case outer ...	201-20670	1	1	—
54	End Cover and Adaptor Oil Seal ...	201-13190	1	1	—

PLATE 10—DIRECT DRIVE CLUTCH—CRANKSHAFT—ROCKFORD—OPTIONAL

1	Clutch End Cover ...	201-13850	1	1	1
2	Clutch End Cover Bolt 1/4" UNF x 1" ...	270-56	3	—	—
—	Clutch End Cover Bolt 1/4" UNC x 1" ...	270-262	—	3	3
3	Clutch End Cover Washer ...	291-2609	3	3	3
4	Clutch Casing ...	201-13801	1	—	—
—	Clutch Casing ...	202-16111	—	1	1
5	Clutch Operating Shaft Bush ...	201-21730	2	2	2
6	Grease Nipple ...	27-4167	2	2	2
7	Clutch Casing Bolt 5/16" UNF x 7/8" ...	270-24	5	—	—
8	Clutch Casing Spring Washer ...	27-413	5	—	—
—	Clutch Casing Bolt 3/8" UNC x 7/8" ...	270-286	—	8	8
—	Clutch Casing Spring Washers ...	27-393	—	8	8
9	Clutch Casing Guard ...	201-13810	1	—	—
—	Clutch Casing Guard ...	202-16060	—	1	1
10	Clutch Casing Bolt 1/4" UNF x 5/8" ...	270-23	6	—	—
—	Clutch Casing Bolt 1/4" UNC x 5/8" ...	270-285	—	6	6
11	Clutch Casing Spring Washer ...	27-451	6	6	6
12	Clutch Casing Washer ...	27-618	6	6	6
13	Clutch Inspection Cover (without engine speed control) ...	201-13882	1	1	1
—	Clutch Inspection Cover (with engine speed control) ...	201-13883	1	1	1
14	Clutch Inspection Cover Screw 3/16" UNF x 1/2" ...	270-151	2	—	—
—	Clutch Inspection Cover Screw 3/16" UNC x 1/2" ...	270-287	—	2	2
15	Inspection Cover Washer ...	27-1698	2	2	2
16	Greaser ...	27-606	1	1	1
17	Greaser Adaptor ...	201-13891	1	1	1
18	Fan Shroud ...	201-12581	1	—	—
—	Fan Shroud Strip Shim .002" ...	201-13580	As required		
—	Fan Shroud Strip Shim .005" ...	201-13581	As required		
—	Fan Shroud Strip Shim .010" ...	201-13582	As required		
—	Socket Cap Screw ...	270-327	4	—	—
—	Spring Washer ...	27-413	4	—	—
19	Bolt for Fan Shroud 5/16" UNF x 1 1/8" ...	270-25	4	—	—
20	Crankshaft Extension ...	202-16150	1	1	1
21	Crankshaft Extension Stud 7/16" UNF x 2" ...	270-356	3	3	3
—	Nut—self-locking—7/16" UNF ...	270-311	3	3	3
22	Crankshaft Extension Spring Washer ...	27-984	3	3	3
23	Blanking Plate ...	201-13160	1	—	—
24	Blanking Plate Bolt 3/8" UNF x 4 1/2" ...	270-222	3	—	—
25	Blanking Plate Nut 3/8" UNF ...	270-4	3	—	—
26	Blanking Plate Spring Washer ...	27-393	3	—	—

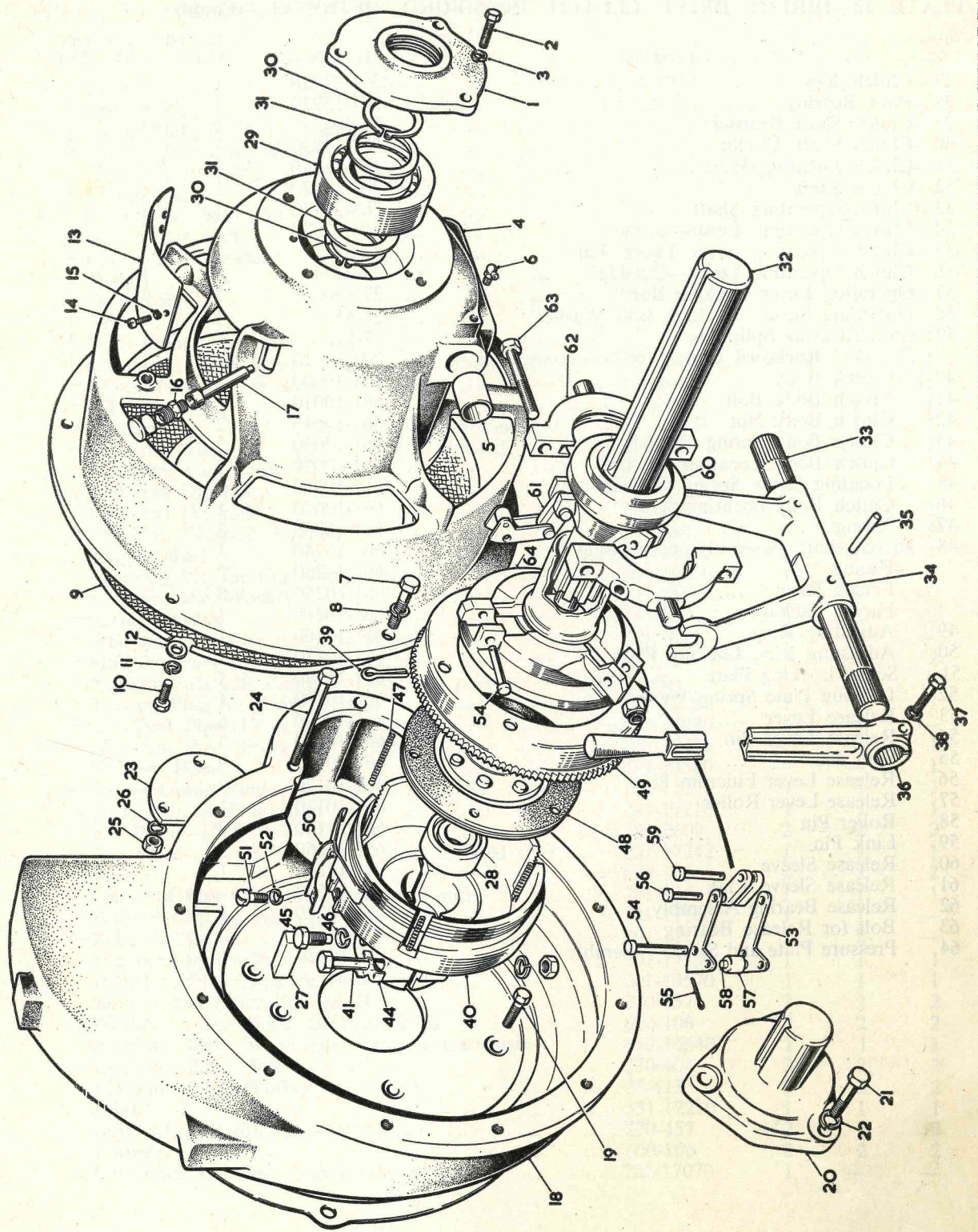


PLATE 10—DIRECT DRIVE CLUTCH—ROCKFORD—OPTIONAL—(Contd)

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
27	Clutch Key	201-13920	1	1	1
28	Pilot Bearing	201-13930	1	1	1
29	Clutch Shaft Bearing	31-60	1	1	1
30	Clutch Shaft Circlip	201-13830	2	2	2
31	Clutch Locating Washer	201-13840	2	2	2
32	Clutch Shaft	201-13820	1	1	1
33	Clutch Operating Shaft	203-20130	1	1	1
34	Clutch Operating Lever—Inside	201-13870	1	1	1
35	Clutch Operating Lever Taper Pin	27-822	2	2	2
36	Clutch Operating Lever—Outside	23-3134	1	1	1
37	Operating Lever Locking Bolt	27-890	1	1	1
38	Operating Lever Locking Bolt Washer	27-413	1	1	1
39	Clutch Casing Split Pin	27-912	1	1	1
	5 $\frac{1}{2}$ " O/C Rockford Clutch (60213) comprising:—	201-13910	1	1	1
40	Clutch Body	661-10000	1	—	—
41	Clutch Body Bolt	661-10010	2	—	—
42	Clutch Body Nut	661-10040	2	—	—
43	Clutch Body Spring Washer	661-10030	2	—	—
44	Clutch Body Locating Washer	661-10020	2	—	—
45	Locating Screw Spring Washer	661-10060	1	—	—
46	Clutch Body Locating Screw	661-10050	1	—	—
47	Spring	661-10080	3	—	—
48	Driven Plate Assembly—comprising:	661-10240	1	—	—
	Facing	661-10250	2	—	—
	Facing Rivet	661-10260	8	—	—
	Facing Package	661-10270	1	—	—
49	Adjusting Ring	661-10160	1	—	—
50	Adjusting Ring Locking Plate	661-10170	1	—	—
51	Screw Locking Plate	661-10180	1	—	—
52	Locking Plate Spring Washer	661-10190	1	—	—
53	Release Lever	661-10090	6	—	—
54	Release Lever Pin	661-10100	3	—	—
55	Split Pin	661-10110	9	—	—
56	Release Lever Fulcrum Pin	661-10120	3	—	—
57	Release Lever Roller	661-10130	3	—	—
58	Roller Pin	661-10140	3	—	—
59	Link Pin	661-10150	3	—	—
60	Release Sleeve	661-10200	1	—	—
61	Release Sleeve Link	204-23560	—	—	1
62	Release Bearing Assembly	661-10220	1	—	—
63	Bolt for Release Bearing	661-10230	2	—	—
64	Pressure Plate and Sleeve Assembly	661-10070	1	—	—

FUEL LIFT PUMP

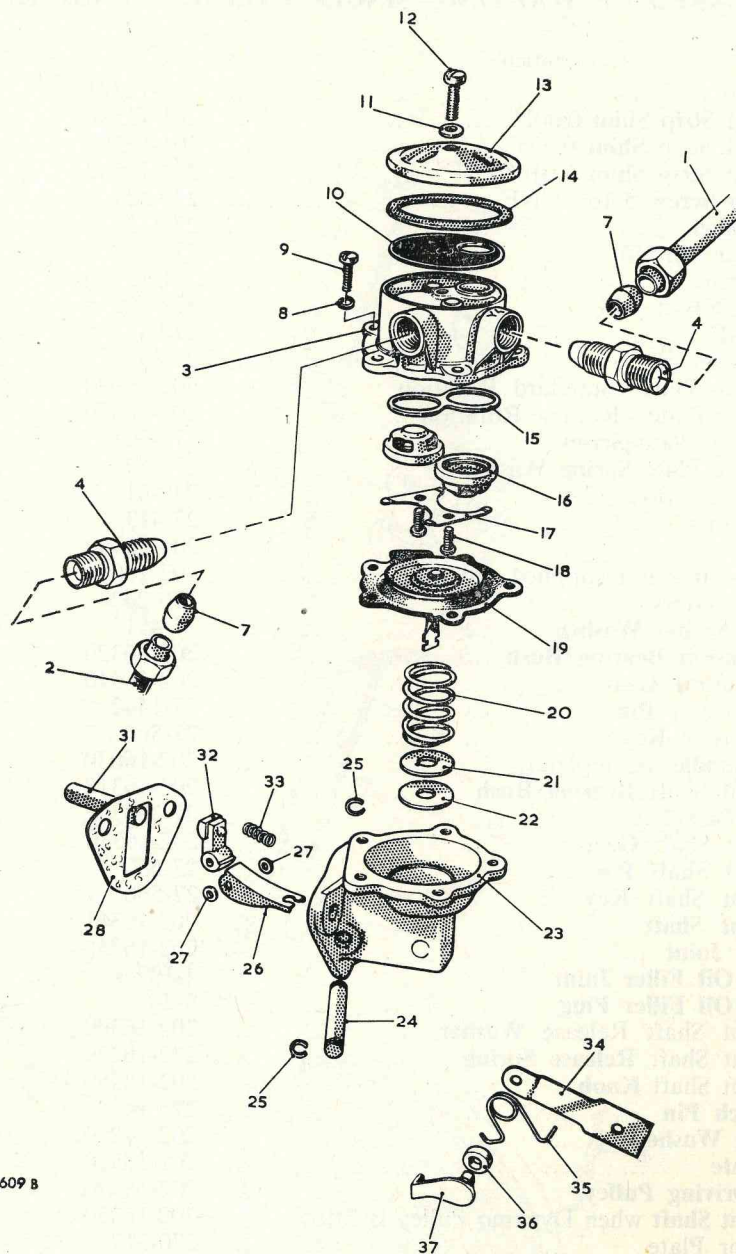
Description	Part No.	No. off per Engine		
		1 Cyl.	2 Cyl.	3 Cyl.
Door	201-17100	1	—	—
Door Joint	366-799	1	—	—
Guide Plate for Door Clamp	201-17180	1	—	—
Guide Plate Bolt Washer	270-54	1	—	—
Guide Plate Bolt	27-451	1	—	—
Clamp Bar	201-17310	1	—	—
Clamp Bar Split Pin	27-909	1	—	—
Clamp Bar Bolt	201-17190	1	—	—
Clamp Bar Washer	600-106	1	—	—
Door	202-17111	—	1	—
Door Joint	202-12700	—	1	—
Door	203-17111	—	—	1
Door Joint	203-12700	—	—	1
Crankcase Door Screw	270-53	—	9	11
Crankcase Door Washer	291-2609	—	9	11
Oil Filler	27-3821	—	1	1
Strainer } also when when Purolator	291-23751	—	1	1
Oil Filler Cap } Filter is fitted	27-3824	—	1	1
Oil Filler Cap Joint }	303-253	—	1	1
Lub. Oil Dipstick	570-10211	1	—	—
Lub. Oil Dipstick	570-10390	—	1	1
Lub. Oil Dipstick Adaptor	27-4344	1	1	1
Tappet Bush	201-17300	1	1	1
Locating Pin for Fuel Pump Tappet	201-17200	1	—	—
Locating Pin Washer	201-11890	1	—	—
Spring Washer	27-413	2	2	2
Stud for Fuel Lift Pump to Door	270-131	2	—	—
Stud for Fuel Lift Pump to Door	270-320	—	2	2
Nut for Fuel Lift Pump to Door	270-3	2	2	2
Tapped Plug for Swivel Union	201-17280	1	1	1
Air Vent Pipe (Filter to Tee Piece)	201-17080	1	1	—
Air Vent Pipe (Filter to Tee Piece)	203-17081	—	—	1
Rubber Hose	203-23560	—	—	1
Swivel Union Plug	201-17270	1	1	1
Swivel Union Plug Joint	291-17210	1	1	1
Tee Piece— $\frac{1}{8}$ " BSP 3/16" Tube	291-2609	2	2	2
Tee Piece— $\frac{1}{8}$ " BSP—when air duct is fitted	201-17212	1	1	1
Joint	600-106	2	2	2
Leak Off Pipe (Tee Piece to Fuel Tank)	291-366	1	1	1
Support Clip for Air Vent Pipe	201-17160	1	1	—
Felt for Clip	201-17170	2	2	—
Support Clip for Fuel Pipe	201-17150	1	1	1
Dowel to Plug Dipstick Hole	201-13570	1	1	1
Bolt to Seal Filter Bracket Holes	270-457	2	2	2
Washer to Seal Filter Bracket Holes	600-106	2	2	2
Blanking Plate (when Fuel Pump is not used)	352-16640	1	1	1
Blanking Plate Bolt	270-404	2	2	2
Blanking Plate Washer	27-413	2	2	2
Joint	351-12210	1	1	1
Bolt (when Purolator is not fitted)	270-457	2	2	2
Washer	600-106	2	2	2
Fuel Leak Off Pipe Injector to Connection	201-17070	1	—	—

PLATE 11—FUEL LIFT PUMP

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
—	Fuel Lift Pump complete	351-12150	1	1	1
1	Fuel Pipe —tank to lift pump (to suit installation) ...	...	1	1	1
2	Fuel Pipe—lift pump to filter	201-17093	1	1	—
—	Fuel Pipe—lift pump to filter	203-17091	—	—	1
3	Fuel Lift Pump Assembly— Upper Casting comprising*	662-10000	1	1	1
4	Swivel Union Plug	351-21610	2	2	2
5	Joint	351-21620	4	4	4
6	Swivel Union	351-21600	2	2	2
7	Olive Connection	351-21640	2	2	2
—	Nut	351-21630	2	2	2
8	Cover Screw Washer	662-10010	5	5	5
9	Cover Screw	662-10020	5	5	5
10	Filter Screen	662-10030	1	1	1
11	Head Screw Gasket	662-10040	1	1	1
12	Head Screw	662-10050	1	1	1
13	Filter Cover	662-10060	1	1	1
14	Filter Gasket	662-10070	1	1	1
15	* Valve Gasket				
16	* Valve Assembly				
17	* Valve Retaining Plate				
18	* Valve Retaining Screw				
19	Diaphragm Assembly includes items 21 and 22 ...	662-10120	1	1	1
20	Diaphragm Spring	662-10130	1	1	1
21	Oil Seal Washer —metal				
22	Oil Seal Washer —fabric				
23	Pump Body Assembly comprising †	662-10160	1	1	1
24	Rocker Arm Pin —circlip type	662-10170	1	1	1
25	Rocker Arm Pin Circlip	662-10180	2	2	2
26	Link and Leaf Spring Assembly	662-10190	1	1	1
27	Rocker Arm Pin Washer	662-10200	2	2	2
28	Joint	351-12190	1	1	1
31	Pump Tappet	201-17290	1	1	1
32	Rocker Arm	662-10210	1	1	1
33	Rocker Arm Spring	662-10220	1	1	1
34	† Primer Arm				
35	† Primer Return Spring	622-10230	1	1	1
36	† Distance Piece				
37	† Primer Lever				

FUEL PIPES—for self-venting fuel system

Fuel Leak-off Pipe	201-11103	1	—	—
Fuel Leak-off Pipe	202-17132	—	1	—
Fuel Leak-off Pipe	203-17132	—	—	1
Swivel Union Screw (non-return valve)—on fuel pump	570-10660	1	2	3
Copper Joint	352-29370	2	4	6



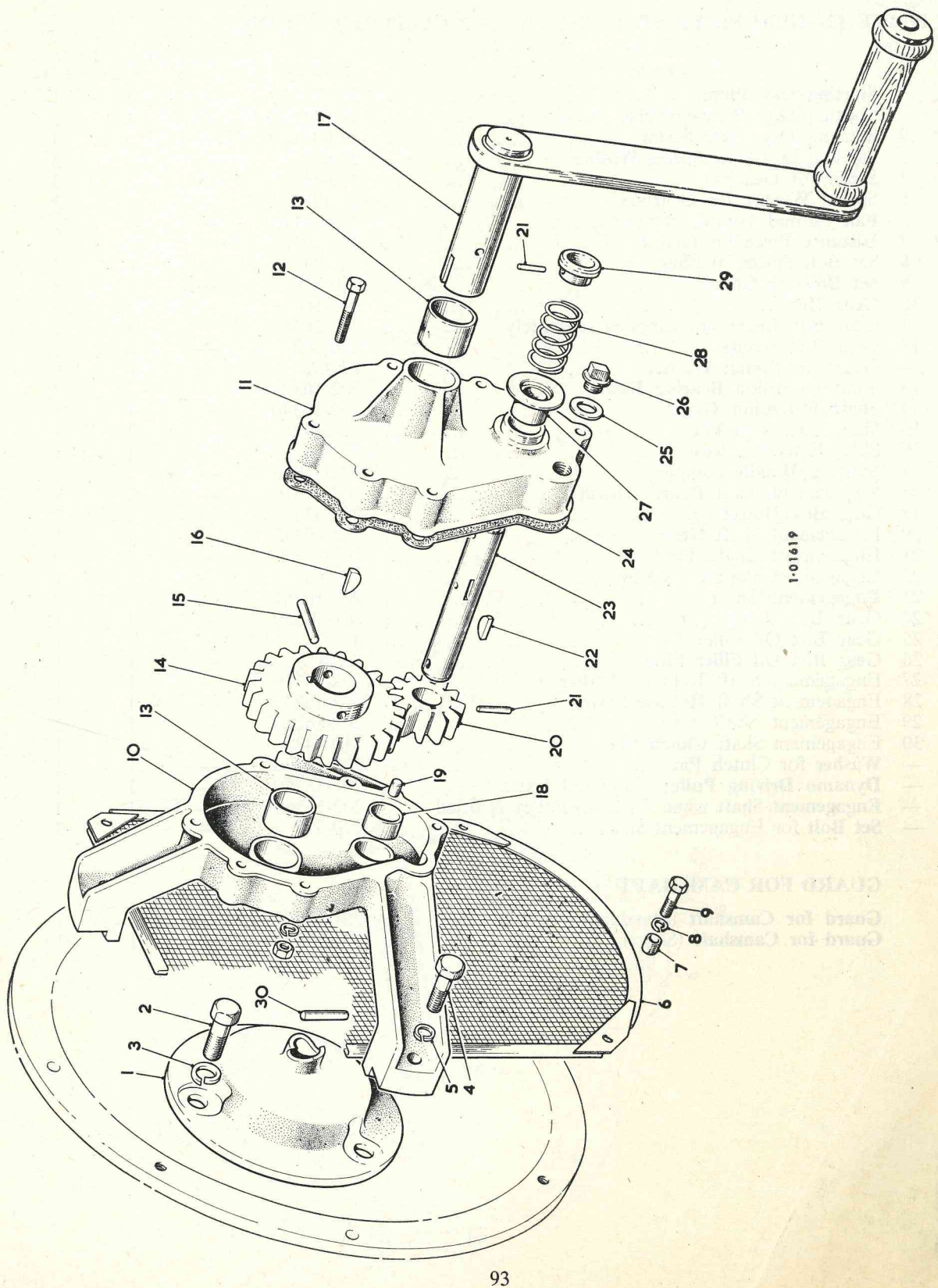
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PLATE 11

FUEL LIFT PUMP

PLATE 12—GEARED UP STARTING—SINGLE CYLINDER ENGINES

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
	Fan Shroud	201-12581	1	—	—
	Fan Shroud Strip Shim 0.002"	201-13580	As required	—	—
	Fan Shroud Strip Shim 0.005"	201-13581	As required	—	—
	Fan Shroud Strip Shim 0.010"	201-13582	As required	—	—
	Socket Cap Screw 5/16" UNF	270-327	4	—	—
	Spring Washer	27-413	4	—	—
	Bolt for Fan Shroud	270-25	4	—	—
	Blanking Plate	201-13160	1	—	—
	Bolt $\frac{3}{8}$ " UNF x $4\frac{1}{2}$ "	270-222	3	—	—
	Nut $\frac{3}{8}$ " UNF	270-4	3	—	—
	Spring Washer	27-393	3	—	—
1	Starting Dog Plate—Standard Rotation	202-16020	1	—	—
—	Starting Dog Plate—Reverse Rotation	202-16870	1	—	—
2	Starting Dog Plate Screw	270-301	3	—	—
3	Starting Dog Plate Spring Washer	27-984	3	—	—
4	Screw for Gear Box	270-61	4	—	—
5	Spring Washer	27-413	4	—	—
10	Gear Box	201-18530	1	—	—
11	Gear Box Cover not supplied separately	202-16050	1	—	—
12	Gear Box Screws	270-262	6	—	—
—	Gear Box Spring Washer	27-451	6	—	—
13	Shaft Extension Bearing Bush	202-16320	2	—	—
14	Shaft Extension Gear	202-16340	1	—	—
15	Shaft Extension Pin	27-1442	1	—	—
16	Shaft Extension Key	27-566	1	—	—
17	Starting Handle (Complete)	202-16030	1	—	—
18	Engagement Shaft Bearing Bush	202-16310	2	—	—
19	Gear Box Dowel	27-3677	2	—	—
20	Engagement Shaft Gear	202-16330	1	—	—
21	Engagement Shaft Pin	27-630	2	—	—
22	Engagement Shaft Key	27-566	1	—	—
23	Engagement Shaft	202-16361	1	—	—
24	Gear Box Joint	202-16350	1	—	—
25	Gear Box Oil Filler Joint	4-197	1	—	—
26	Gear Box Oil Filler Plug	8-2-6	1	—	—
27	Engagement Shaft Release Washer	202-16300	1	—	—
28	Engagement Shaft Release Spring	202-16270	1	—	—
29	Engagement Shaft Knob	202-16280	1	—	—
30	Shaft Clutch Pin	210-143	1	—	—
—	Clutch Pin Washer	202-16290	1	—	—
—	Sealing Plate	201-18520	1	—	—
—	Dynamo Driving Pulley	202-18240	1	—	—
—	Engagement Shaft when Dynamo Pulley is fitted	202-16360	1	—	—
—	Set Bolt for Plate	270-317	3	—	—



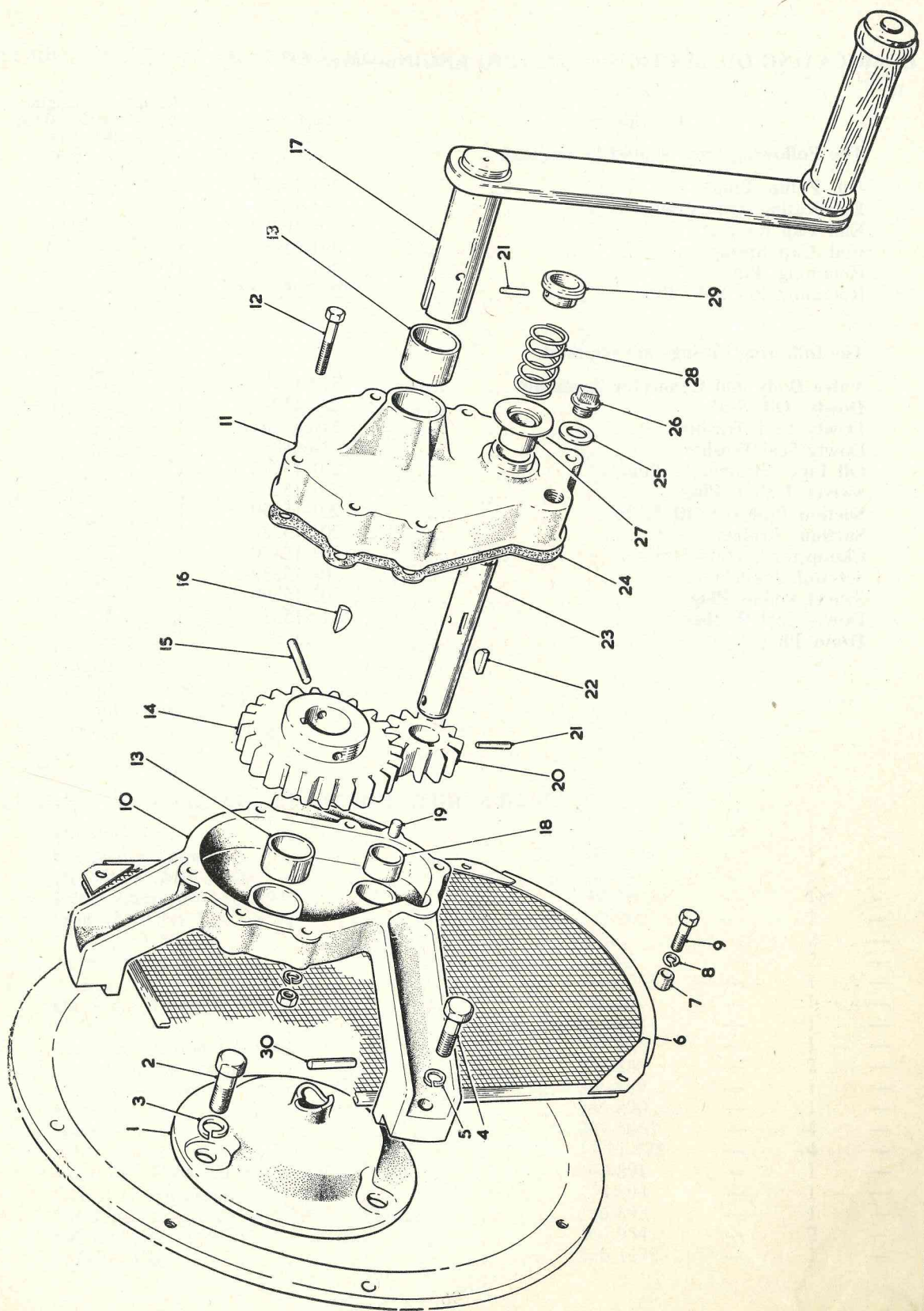
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PLATE 12—GEARED UP STARTING—2 and 3 CYLINDER ENGINES

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
1	Starting Dog Plate	202-16020	—	1	1
	Starting Dog Plate—reverse rotation	202-16870	—	1	1
2	Starting Dog Plate Screw	270-301	—	3	3
3	Starting Dog Plate Spring Washer	27-984	—	3	3
4	Screw for Gearbox	270-393	—	3	3
5	Spring Washer for Gearbox	27-393	—	3	3
6	Fan Shroud Guard , complete	202-18170	—	1	1
7	Distance Piece for Guard	390-1040	—	4	4
8	Set Bolt Spring Washer	27-393	—	4	4
9	Set Bolt for Guard	270-349	—	4	4
10	Gear Box	202-16091	—	1	1
11	Gear Box Cover not supplied separately	202-16050	—	1	1
12	Gear Box Screws	270-262	—	6	6
—	Gear Box Spring Washer	27-451	—	6	6
13	Shaft Extension Bearing Bush	202-16320	—	2	2
14	Shaft Extension Gear	202-16340	—	1	1
15	Shaft Extension Pin	27-1442	—	1	1
16	Shaft Extension Key	27-566	—	1	1
17	Starting Handle complete	202-16030	—	1	1
18	Engagement Shaft Bearing Bush	202-16310	—	2	2
19	Gear Box Dowel	27-3677	—	2	2
20	Engagement Shaft Gear	202-16330	—	1	1
21	Engagement Shaft Pin	27-630	—	2	2
22	Engagement Shaft Gear Key	27-566	—	1	1
23	Engagement Shaft	202-16361	—	1	1
24	Gear Box Joint	202-16350	—	1	1
25	Gear Box Oil Filler Joint	4-197	—	1	1
26	Gear Box Oil Filler Plug	8-2-6	—	1	1
27	Engagement Shaft Release Washer	202-16300	—	1	1
28	Engagement Shaft Release Spring	202-16270	—	1	1
29	Engagement Shaft Knob	202-16280	—	1	1
30	Engagement Shaft Clutch Pin	210-143	—	1	1
—	Washer for Clutch Pin	202-16290	—	1	1
—	Dynamo Driving Pulley —Optional Extra	202-18240	—	1	1
—	Engagement Shaft when Dynamo Pulley is fitted	202-16360	—	1	1
—	Set Bolt for Engagement Shaft	270-317	—	3	3

GUARD FOR CAMSHAFT

Guard for Camshaft (Standard)	201-13590	1	1	1
Guard for Camshaft (Short)	201-13591	1	1	1



GEARED UP STARTING

LUBRICATING OIL SUCTION on TILTING ENGINE—over 10°

Description	Part No.	No. off per Engine		
		1 Cyl.	2 Cyl.	3 Cyl.
The Following Parts should be omitted.				
Oil Pump Plug	201-10610	1	—	—
Lubricating Oil Strainer	201-10771	1	—	—
End Cap for do.	201-10780	1	—	—
End Cap Spring	291-2195	1	—	—
Retaining Pin	201-10790	1	—	—
Retaining Pin Split Pin	27-2255	1	—	—

The following Fittings are required.

Valve Body and Connector Assembly	570-10480	1	—	—
Dowty Oil Seal	201-15240	1	—	—
Dowty Seal Washer	31-66806	1	—	—
Dowty Seal Washer	31-66802	5	—	—
Oil Pipe (Strainer to Pump)	201-15270	1	—	—
Swivel Union Plug	201-15260	1	—	—
Suction Pipe for Oil Filter	201-15290	1	—	—
Suction Strainer	201-15280	1	—	—
Clamp for Suction Strainer	201-15320	1	—	—
Set Bolt for Clamp	201-15330	2	—	—
Swivel Union Plug	201-15300	1	—	—
Dowty Seal Washer	31-61533	1	—	—
Drain Plug	11-13-693	1	—	—

LUBRICATING OIL FILTER—PUROLATOR—LD1 - SL1

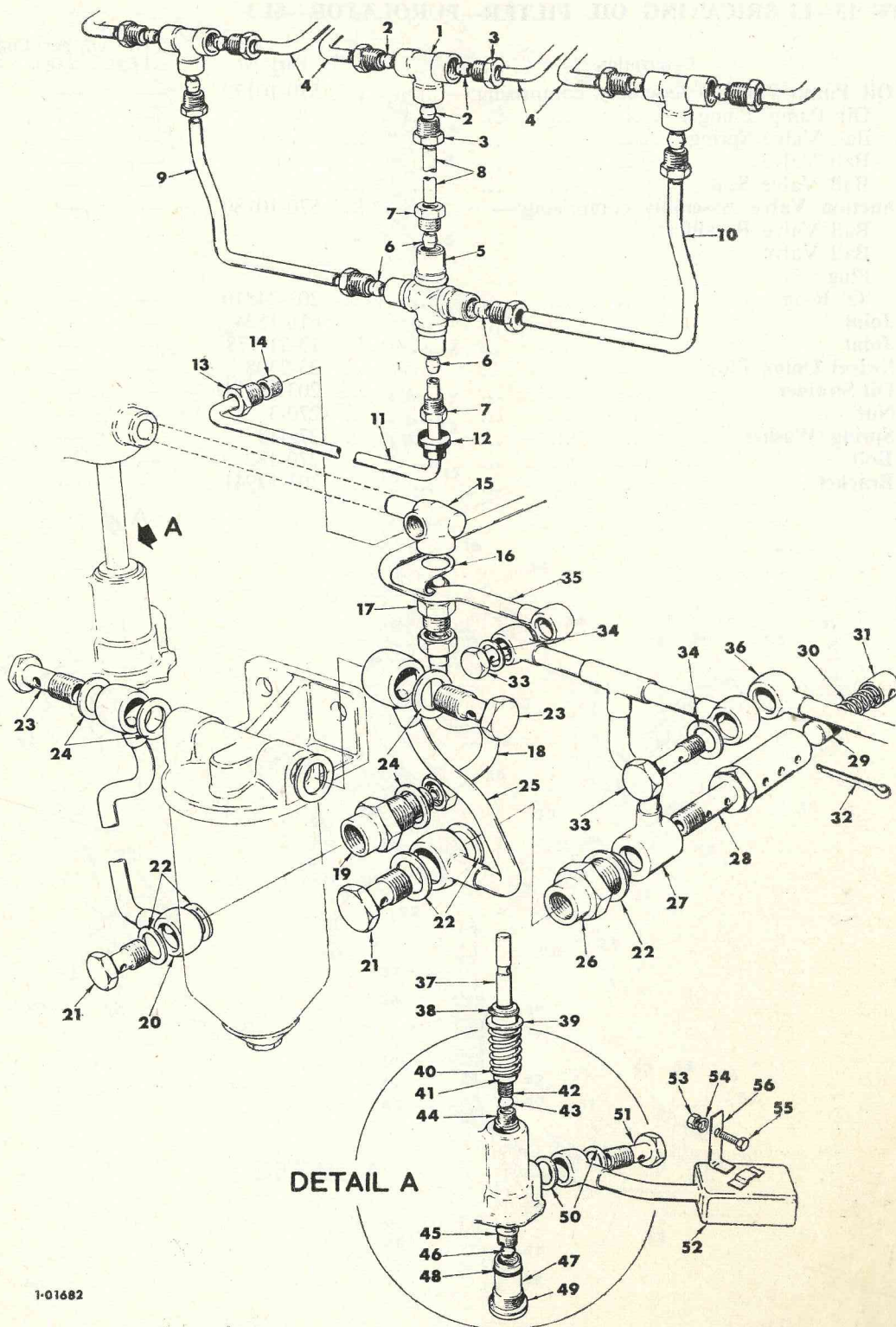
Description	Part No.	No. off per Engine		
		1 Cyl.	2 Cyl.	3 Cyl.
Crankcase ...	201-10015	1	—	—
Oil Filter—Purolator MF 3902 ...	366-896	1	—	—
Filter Element—MF 39A ...	201-26020	1	—	—
Bolt— $\frac{3}{8}$ " UNF x 1" ...	270-73	1	—	—
Nut— $\frac{3}{8}$ " UNF ...	270-4	2	—	—
Bolt— $\frac{3}{8}$ " UNF x $1\frac{1}{4}$ " ...	270-74	1	—	—
Spring Washer ...	27-393	4	—	—
Support Bracket ...	366-1300	1	—	—
Support Bracket Spacing Washer ...	27-82	2	—	—
Screw 5/16" UNF x $2\frac{1}{2}$ " ...	270-67	2	—	—
Union ...	31-85733	1	—	—
Oil Pipe ...	366-1277	1	—	—
Copper Joint ...	291-3063	1	—	—
Lock-nut ...	27-17	1	—	—
Oil Pipe—Governor End Main Bearing ...	366-1278	1	—	—
Oil Pipe—Flywheel End Main Bearing ...	366-1279	1	—	—
Adaptor Plug ...	366-1271	1	—	—
Copper Joint ...	616-1524	1	—	—
Union Screw ...	366-1272	1	—	—
Copper Joint ...	13-22-350	1	—	—
"O" Ring ...	616-1742	1	—	—
Copper Joint ...	291-3064	1	—	—
Oil Pipe—Union to Filter Inlet ...	366-2153	1	—	—
Oil Pipe—Filter Outlet to Union ...	366-2152	1	—	—
Swivel Union Screw ...	366-888	2	—	—
Copper Joint ...	13-21-778	4	—	—
Support Clip ...	366-2154	1	—	—
Support Clip Retainer ...	366-2155	1	—	—
Retainer Bolt—5/16" UNF x $\frac{7}{8}$ " ...	270-24	1	—	—
Nut—5/16" self locking ...	270-154	1	—	—
Felt ...	366-2156	1	—	—

LUBRICATING OIL FILTER—PUROLATOR—LD2-SL2

Crankcase ...	366-881	—	1	—
Crankcase Door ...	202-1711	—	1	—
Oil Filter (MF 3902) ...	366-896	—	1	—
Filter Element—MF 39A ...	201-26020	—	1	—
Stud— $\frac{3}{8}$ " UNF-UNC x $1\frac{1}{2}$ " ...	270-260	—	2	—
Nut— $\frac{3}{8}$ " UNF ...	270-4	—	2	—
Spring Washer ...	27-393	—	2	—
Union ...	31-85733	—	1	—
Oil Pipe—Pump to Union ...	366-883	—	1	—
Union ...	366-884	—	1	—
Oil Pipe—Union to Filter ...	366-886	—	1	—
Swivel Union Screw ...	366-888	—	2	—
Oil Pipe—Filter to Union ...	366-889	—	1	—
Union ...	366-890	—	1	—
Joint ...	291-3063	—	4	—
Joint ...	13-21-778	—	4	—
Oil Pipe—Flywheel end Main Bearing ...	366-891	—	1	—
Swivel Union Screw ...	355-894	—	1	—
Oil Pipe—Governor end Main Bearing ...	366-893	—	1	—
Swivel Union Screw ...	366-954	—	2	—
Support Clip ...	366-1678	—	1	—

PLATE 13—LUBRICATING OIL FILTER—PUROLATOR—SL3

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
—	Crankcase	366-1288	—	—	1
—	Crankcase Door	203-17111	—	—	1
—	Oil Filter (MF 39A)	366-896	—	—	1
—	Stud	201-26020	—	—	1
—	Spring Washer	270-260	—	—	2
—	Nut	27-393	—	—	2
—	Tee Piece comprising:—	270-4	—	—	2
1	Tee Piece	201-11662	—	—	2
2	Olive	201-12980	—	—	3
3	Nut	201-12990	—	—	9
4	Oil Pipe—tee to rockers	201-13000	—	—	9
—	Four Way Connector comprises	201-11652	—	—	6
5	Connector	203-17980	—	—	1
6	Olive	203-17990	—	—	1
7	Nut	201-12990	—	—	4
8	Oil Pipe—to No. 2 Tee	201-13000	—	—	4
9	Oil Pipe—to No. 1 Tee	203-13710	—	—	1
10	Oil Pipe—to No. 3 Tee	203-13700	—	—	1
11	Oil Pipe—pump to connector	202-13710	—	—	1
12	Oil Pipe Bush	203-12080	—	—	1
13	Gland Nut	201-12280	—	—	1
14	Packing Washer	201-11380	—	—	1
15	Connector	201-11390	—	—	1
16	Oil Pipe Support Clip	203-11340	—	—	1
17	Union	366-1746	—	—	1
18	Oil Pipe—union to crankcase	366-1100	—	—	1
19	Union in crankcase	366-1102	—	—	1
20	Oil Pipe—crankcase to filter	366-884	—	—	1
21	Swivel Union Plug	366-1103	—	—	1
22	Joint	366-954	—	—	2
23	Swivel Union Plug	291-3063	—	—	5
24	Joint	366-888	—	—	2
25	Oil Pipe—Filter to crankcase	13-21-778	—	—	5
26	Union—in crankcase	366-1104	—	—	1
27	Oil Pipe—between centre bearings and relief valve	366-1101	—	—	1
28	Relief Valve Body	366-1110	—	—	1
29	Relief Valve	203-12540	—	—	1
30	Relief Valve Spring	203-12550	—	—	1
31	Valve Spring Cap	203-12570	—	—	1
32	Split Pin	27-121	—	—	1
33	Swivel Union Plug	366-894	—	—	2
34	Joint	600-106	—	—	2
35	Oil Pipe—gear end main bearing	362-1111	—	—	1
36	Oil Pipe—flywheel end main bearing	366-1112	—	—	1
37	Oil Pump Tappet	201-10651	—	—	1
38	Oil Pump Return Spring Circlip	201-10670	—	—	1
39	Return Spring Washer	201-10660	—	—	1
—	Return Spring Seating Washer	203-18130	—	—	1
40	Return Spring	201-12450	—	—	1



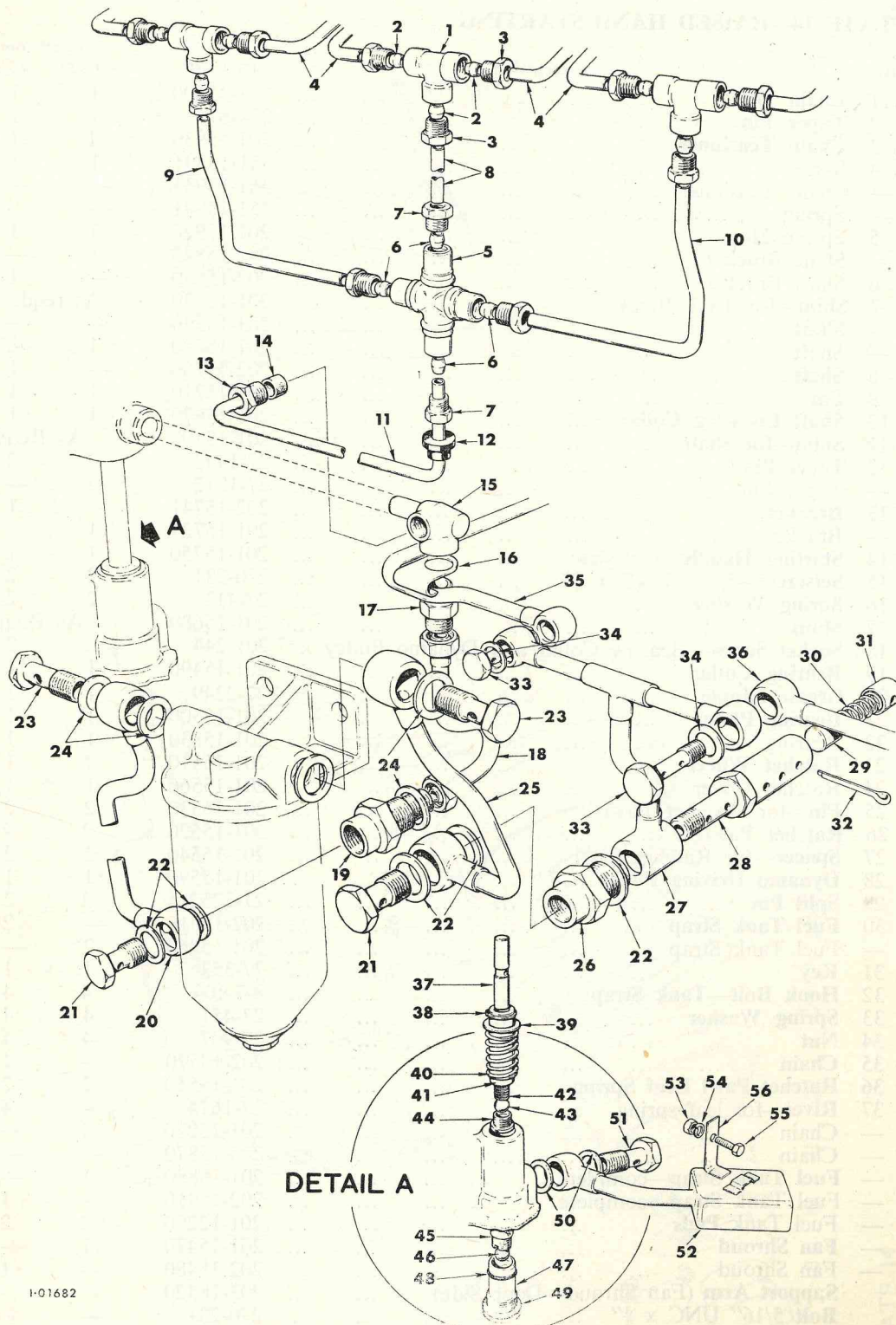
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PLATE 13

LUBRICATING OIL FILTER—PUROLATOR—SL3

PLATE 13—LUBRICATING OIL FILTER—PUROLATOR—SL3

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
—	Oil Pump Plunger Assembly comprising:— ...	570-10170	—	—	1
41	Oil Pump Plunger ...	...	—	—	1
42	Ball Valve Spring ...	...	—	—	1
43	Ball Valve ...	...	—	—	1
44	Ball Valve Seat ...	...	—	—	1
—	Suction Valve Assembly comprising:— ...	570-10180	—	—	1
45	Ball Valve Retainer				
46	Ball Valve				
47	Plug				
48	'O' Ring ...	203-24810	—	—	1
49	Joint ...	616-1524	—	—	1
50	Joint ...	13-21-778	—	—	2
51	Swivel Union Plug ...	23-2308	—	—	1
52	Oil Strainer ...	203-17881	—	—	1
53	Nut ...	270-3	—	—	1
54	Spring Washer ...	27-413	—	—	1
55	Bolt ...	270-182	—	—	1
56	Bracket ...	203-17941	—	—	1



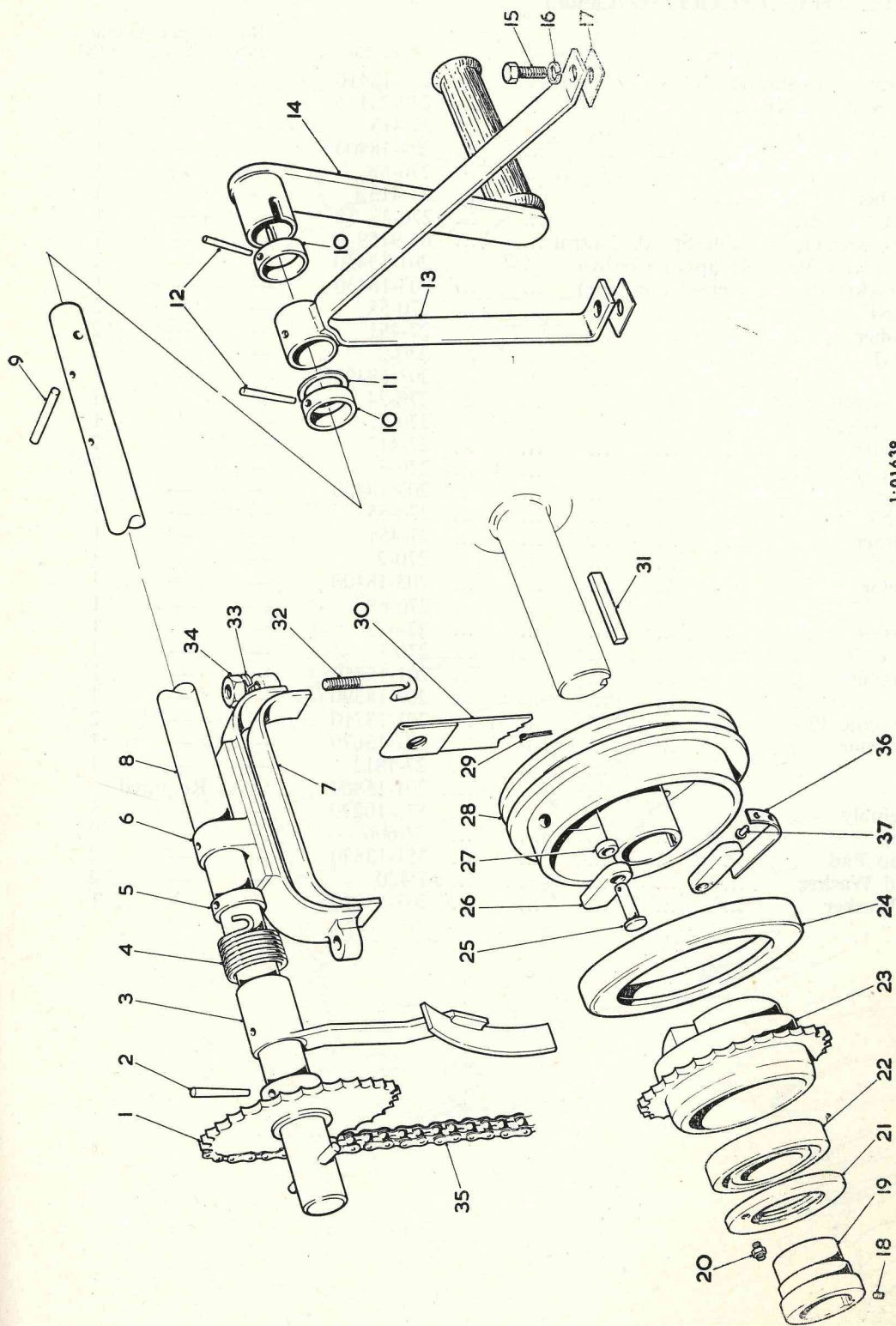
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PLATE 13

LUBRICATING OIL FILTER—PUROLATOR—SL3
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PLATE 14—RAISED HAND STARTING

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
1	Chain Wheel	201-15600	1	1	1
2	Taper Pin	27-367	1	1	1
3	Chain Tensioner	201-15930	1	1	—
4	Spring	351-13891	1	1	—
—	Chain Tensioner	351-13931	—	—	1
—	Spring	351-13891	1	1	—
5	Spring Hook	201-15970	1	—	—
—	Shaft Bracket	201-15840	1	—	—
6	Shaft Bracket	202-15630	—	1	—
7	Shim—for Tank Block	201-15620	As reqd.		
—	Shaft	203-18390	1	—	—
—	Shaft	201-15690	—	1	—
8	Shaft	202-15700	1	1	1
9	Pin	201-15710	1	1	1
10	Shaft Locating Collar	201-15670	As Required		
11	Shim—for Shaft	201-15800	2	2	—
12	Taper Pin	27-1442	—	—	1
—	Taper Pin	27-1812	—	1	—
13	Bracket	202-15741	1	—	—
—	Bracket	201-15721	1	—	—
14	Starting Handle—complete	201-15750	1	1	1
15	Setscrew—5/16 "UNC x 3/4"	270-231	2	2	—
16	Spring Washer	27-413	2	2	—
17	Shim	201-15680	As Required		
18	Socket Screw—Bearing Collar and Dynamo Pulley	201-244	2	2	2
19	Bearing Collar	201-15490	1	1	1
20	Grease Nipple	27-2249	1	1	1
21	Bearing Plate	201-15500	1	1	1
22	Bearing	201-15830	1	1	1
23	Ratchet Wheel	201-15510	1	1	1
24	Ratchet Cover	201-15560	2	2	—
25	Pin—for Ratchet Pawl	201-15530	2	2	—
26	Ratchet Pawl	201-15520	2	2	—
27	Spacer—for Ratchet Pawl	201-15540	2	2	—
28	Dynamo Driving Pulley	201-15590	1	1	—
29	Split Pin	27-2252	2	2	—
30	Fuel Tank Strap	202-15610	—	2	—
—	Fuel Tank Strap	201-15860	2	—	—
31	Key	27-353	1	1	—
32	Hook Bolt—Tank Strap	8-7-103	4	4	—
33	Spring Washer	27-451	4	4	—
34	Nut	27-907	4	4	—
35	Chain	202-15570	—	1	—
36	Ratchet Pawl Leaf Spring	201-15550	2	2	—
37	Rivet—for leaf spring	27-1674	4	4	—
—	Chain	201-15870	1	—	—
—	Chain	203-15870	—	—	—
—	Fuel Tank Strap—complete	201-15890	1	—	—
—	Fuel Tank Strap—complete	202-15910	—	1	—
—	Fuel Tank Pads	201-12290	2	2	—
—	Fan Shroud	201-15470	1	—	—
—	Fan Shroud	202-15480	—	1	—
—	Support Arm (Fan Shroud—Door Side)	203-18420	—	—	—
—	Bolt 5/16" UNC x 3/4"	270-231	—	—	—
—	Spring Washer	27-413	—	—	—



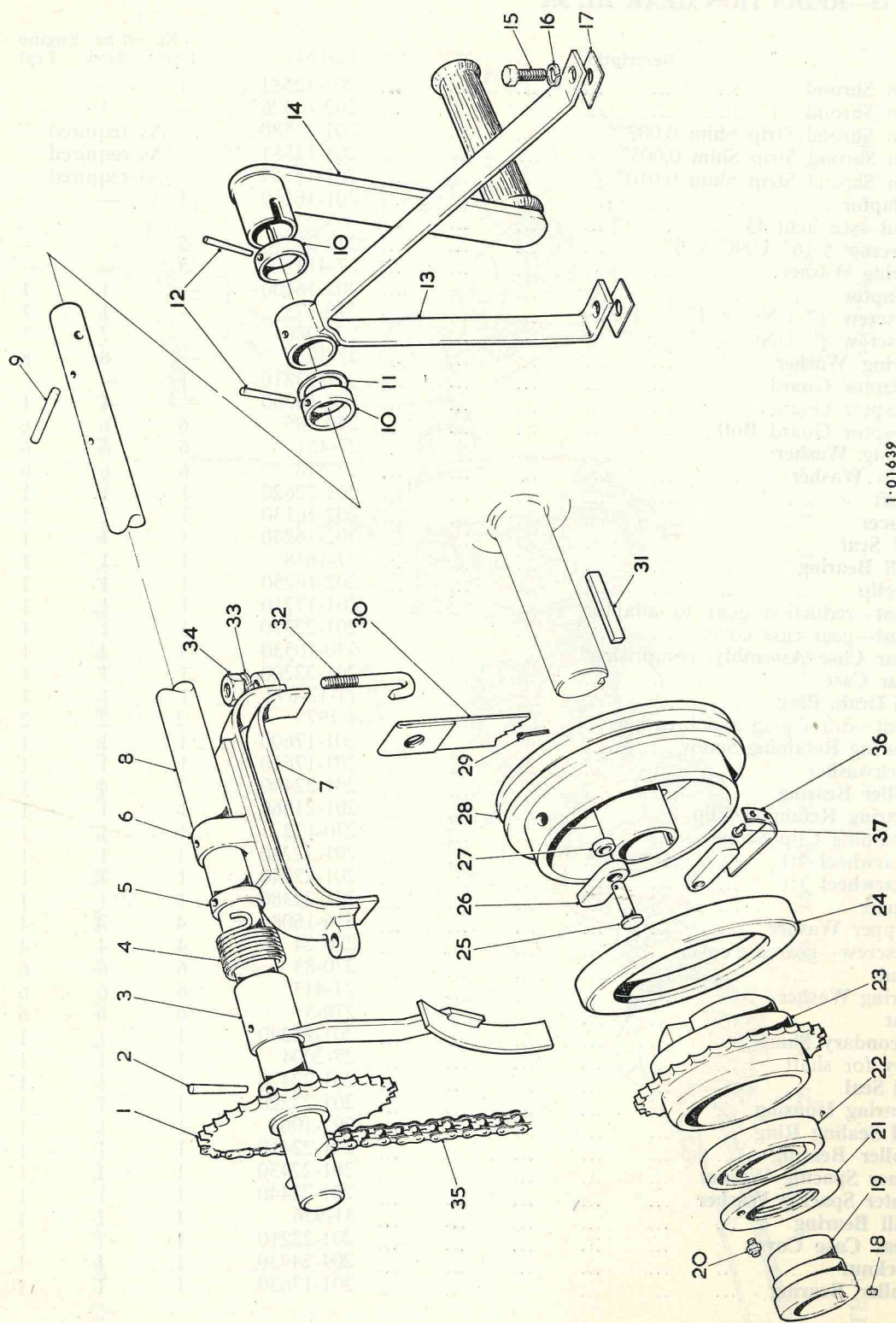
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PLATE 14

RAISED HAND STARTING

PLATE 14—RAISED HAND STARTING (Contd.)

Description	Part No.	No. off per Engine		
		1 Cyl.	2 Cyl.	3 Cyl.
Support Arm (Fan Shroud—Top)	203-18410	—	—	1
Bolt 5/16" x 2 3/4" UNF	270-231	—	—	1
Spring Washer	27-413	—	—	1
Clamp Collar	203-18400	—	—	1
Bolt 5/16" x 2 3/4"	270-68	—	—	1
Spring Washer	27-413	—	—	1
Nut 5/16" UNF	270-3	—	—	1
End Cover—without Variable Speed Control	64-9159	—	—	1
End Cover—with Variable Speed Control	201-13450	—	—	1
Support Bracket (End Cover—Door Side)	203-18430	—	—	2
Bolt 1/4" UNF x 1/4"	270-55	—	—	2
Spring Washer	27-451	—	—	2
Nut 1/4" UNF	270-2	—	—	1
Tee Bar	203-18490	—	—	1
Bolt 5/16" UNF x 7/8"	270-24	—	—	1
Bolt 5/16" UNF x 1"	270-61	—	—	2
Spring Washer	27-413	—	—	2
Nut 5/16" UNF	270-3	—	—	1
Support Arm	203-18480	—	—	1
Bolt 1/4" UNF x 3/4"	270-55	—	—	1
Spring Washer	27-451	—	—	1
Nut 1/4" UNF	270-2	—	—	1
Clamp Collar	203-18400	—	—	1
Bolt 5/16" x 2 3/4"	270-68	—	—	1
Spring Washer	27-413	—	—	1
Nut 5/16" UNF	270-3	—	—	1
Starting Handle	201-15750	—	—	1
Shaft	203-18390	—	—	2
Starting Handle Pin	201-15710	—	—	1
Locating Collar	201-15670	—	—	1
Taper Pin	27-1812	As Required		
Shim	201-15800	—	—	1
Tube Assembly	570-10220	—	—	2
Grease Cup	27-606	—	—	2
Grease Cup Pad	351-13880	—	—	2
Grease Pad Washer	7-420	—	—	1
Locating Washer	203-18510	—	—	1



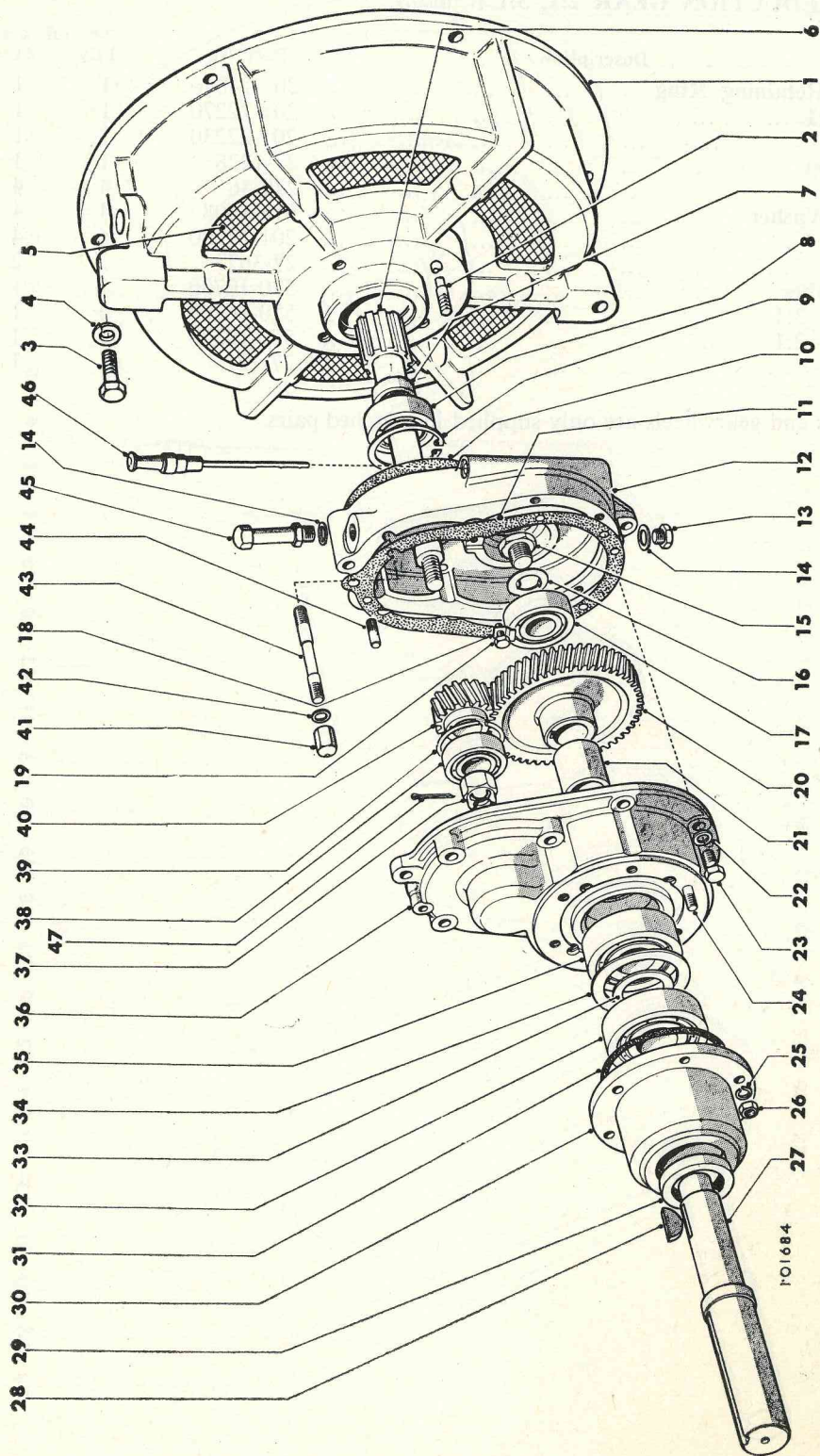
RAISED HAND STARTING

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PLATE 14

PLATE 15—REDUCTION GEAR 2:1, 3:1

Illus No.	Description	Part No.	No. off per Engine		
			1 cyl.	2 cyl.	3 cyl.
—	Fan Shroud	201-12581	1	—	—
—	Fan Shroud	202-10426	—	1	—
—	Fan Shroud Strip Shim 0.002"	201-13580	As required	As required	As required
—	Fan Shroud Strip Shim 0.005"	201-13581	As required	As required	As required
—	Fan Shroud Strip Shim 0.010"	201-13582	As required	As required	As required
—	Fan Shroud Strip Shim 0.010"	201-16100	1	—	—
1	Adaptor	270-24	5	—	—
2	Stud—see item 43	27-413	5	—	—
3	Setscrew 5/16" UNC x 7/8"	202-16100	—	1	1
4	Spring Washer	270-373	—	1	1
—	Adaptor	270-286	—	7	7
—	Setscrew 3/8" UNC x 3"	27-393	—	8	8
—	Setscrew 3/8" UNC x 7/8"	201-13810	1	—	—
—	Spring Washer	202-16060	—	1	1
5	Adaptor Guard	270-285	6	6	6
—	Adaptor Guard	27-451	6	6	6
—	Adaptor Guard Bolt	27-618	6	6	6
—	Spring Washer	201-22620	1	1	1
—	Plain Washer	202-16130	1	1	1
6	Shaft	202-16240	1	1	1
7	Spacer	27-1638	1	1	1
—	Oil Seal	202-16250	1	1	1
8	Ball Bearing	201-17710	1	1	1
9	Circlip	201-22370	1	1	1
10	Joint—reduction gear to adaptor	570-10530	1	1	1
11	Joint—gear case cover	201-22200	1	1	1
—	Gear Case Assembly, comprising*	11-13-693	1	1	1
12	*Gear Case	4-197	2	2	2
13	Oil Drain Plug	201-17600	1	1	1
14	Joint—drain plug and breather	201-17610	1	1	1
15	Bearing Retaining Screw	201-22400	1	1	1
16	Lockwasher	201-21060	1	1	1
17	Roller Bearing	270-172	1	1	1
18	Bearing Retaining Clip	201-22280	1	1	1
19	Retaining Clip Screw	201-22240	1	1	1
20	Gearwheel 2:1	201-22380	1	1	1
—	Gearwheel 3:1	616-1608	4	4	4
21	Spacer	270-24	4	4	4
22	*Copper Washer	270-83	6	6	6
23	*Setscrew—gearcase cover	27-413	6	6	6
24	Stud	270-3	6	6	6
25	Spring Washer	201-22290	1	1	1
26	Nut	27-2004	1	1	1
27	Secondary Shaft	201-22420	1	1	1
28	Key for shaft	201-22220	1	1	1
29	Oil Seal	292-1064	1	1	1
30	Bearing Housing	201-22410	1	1	1
31	Oil Sealing Ring	201-22430	1	1	1
32	Roller Bearing	201-22440	1	1	1
33	Inner Spacing Washer	31-936	1	1	1
34	Outer Spacing Washer	201-22210	1	1	1
35	Ball Bearing	204-24930	1	1	1
36	*Gear Case Cover	201-17630	1	1	1
37	Locknut				
38	Roller Bearing				



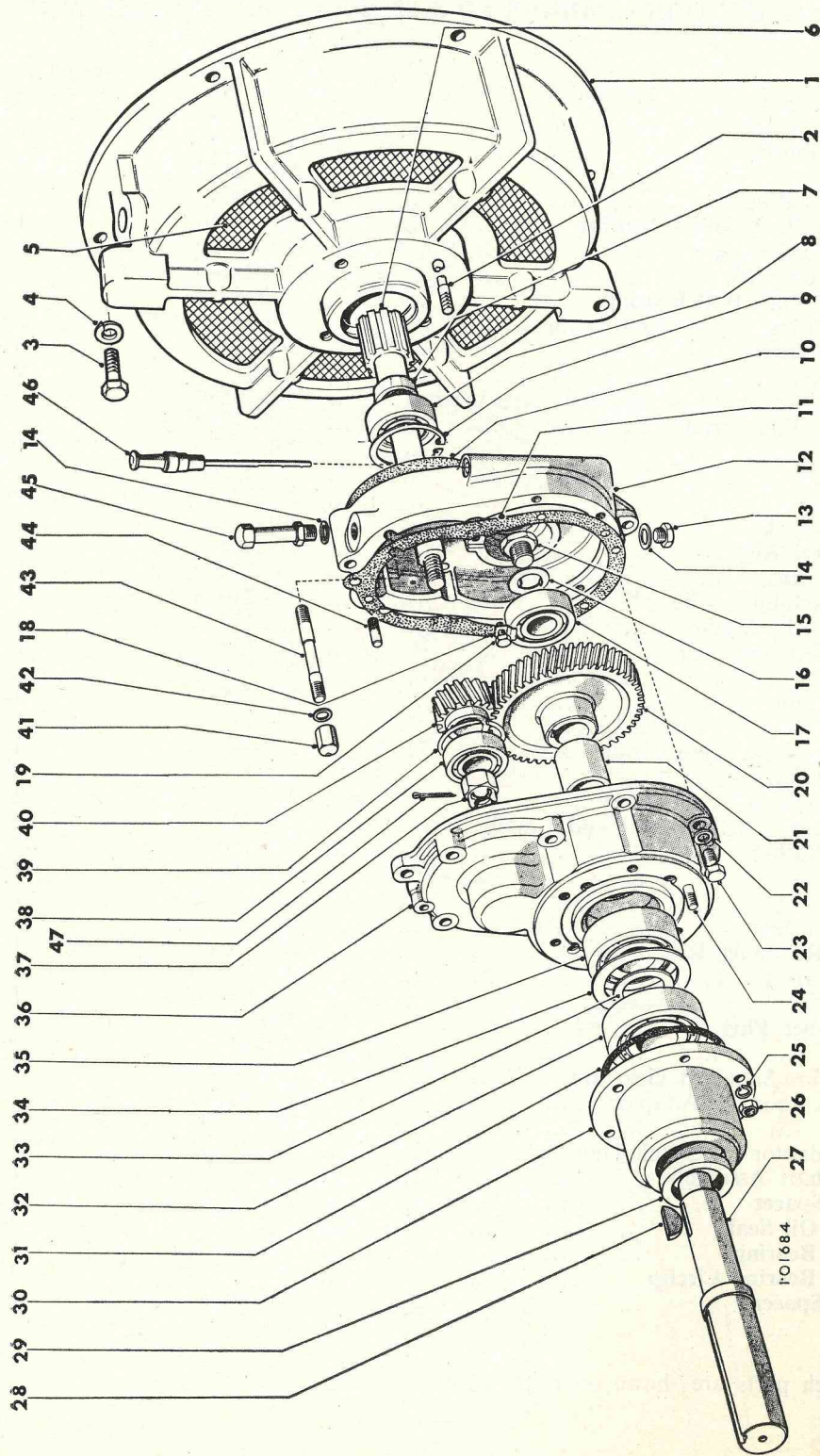
REDUCTION GEAR 2:1, 3:1

PLATE 15

PLATE 15—REDUCTION GEAR 2:1, 3:1 (Contd.)

illus No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
39	Bearing Retaining Ring	201-14840	1	1	1
40	Pinion 2:1	201-22270	1	1	1
—	Pinion 3:1	201-22230	1	1	1
—	Pinion Key	27-1228	1	1	1
41	Nut	270-46	4	4	4
42	Copper Washer	616-1608	4	4	4
43	Stud	201-17590	4	4	4
44	*Dowel	27-3677	2	2	2
45	Oil Breather	570-10780	1	1	1
46	Dipstick—3:1	570-10200	1	1	1
—	Dipstick—2:1	570-10370	1	1	1
47	Split Pin	27-121	1	1	1

Note:—Pinions and gearwheels are only supplied in matched pairs.



REDUCTION GEAR 2:1, 3:1

PLATE 15

PLATE 16—3:1 REDUCTION GEARBOX LD & SL, 2 AND SL3 ENGINES WITH LISTER CLUTCH

Illus No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
1	Secondary Shaft ...	201-22290		1	
2	Bearing Housing ...	201-22220		1	
3	Oil Seal ...	201-22420		1	
4	Oil Sealing Ring ...	292-1064		1	
5	Secondary Shaft Roller Bearing ...	201-22410		1	
6	Inner Spacing Washer ...	201-22430		1	
7	Outer Spacing Washer ...	201-22440		1	
8	Secondary Shaft Ball Bearing ...	31-936		1	
9	Stud—Housing to Gearcase Cover ...	270-83		6	
10	Spring Washer ...	27-413		6	
11	Nut ...	270-3		6	
	Gear Case Assembly—comprising parts marked *	570-10530			
12	*Gear Case End Cover ...	201-22210		1	
13	Joint ...	201-22370		1	
14	*Gear Case ...	201-22200		1	
15	Spacer ...	201-22380		1	
16	3:1 Gearwheel ...	201-22240		1	
17	Gear Wheel Key ...	27-2004		1	
18	Roller Bearing ...	201-22400		1	
19	Bearing Retaining Clip ...	201-21060		1	
20	Retaining Clip Screw ...	270-172		1	
21	Bearing Retaining Screw ...	201-17600		1	
22	Lockwasher ...	201-17610		1	
23	Oil Drain Plug ...	11-13-693		1	
24	Joint ...	4-197		1	
25	*Set Screw—Gear Case Cover ...	270-24		4	
26	*Copper Washer ...	616-1608		4	
27	*Dowel—Cover to Gear Case ...	27-3677		2	
28	Stud—Gearbox to Adaptor and Clutch ...	201-17590		4	
29	Copper Washer ...	616-1608		4	
30	Domed Nut ...	270-46		4	
31	3:1 Pinion ...	201-22230		1	
32	3:1 Pinion Key ...	27-1228		1	
33	Bearing Retaining Ring ...	201-14840		1	
34	Roller Bearing ...	201-17630		1	
35	Locknut ...	204-24930		1	
36	Oil Breather Plug ...	570-10780		1	
37	Joint ...	4-197		1	
38	Dipstick for Standard Gear Box ...	570-10200		1	
39	Joint—Gearbox to Adaptor ...	201-14740		1	
40	Adaptor ...	203-21800		1	
41	Joint—Adaptor to Clutch Housing ...	201-14741		1	
42	Clutch Shaft Assembly ...	201-22780		1	
43	Bearing Spacer ...	201-22810		1	
44	Adaptor Oil Seal ...	202-16240		1	
45	Adaptor Bearing ...	201-17430		1	
46	Adaptor Bearing Circlip ...	201-14110		1	
47	Bearing Spacer ...	202-16130		1	
48	Split Pin ...	27-121		1	

All other clutch parts are shown on pages 80-82.

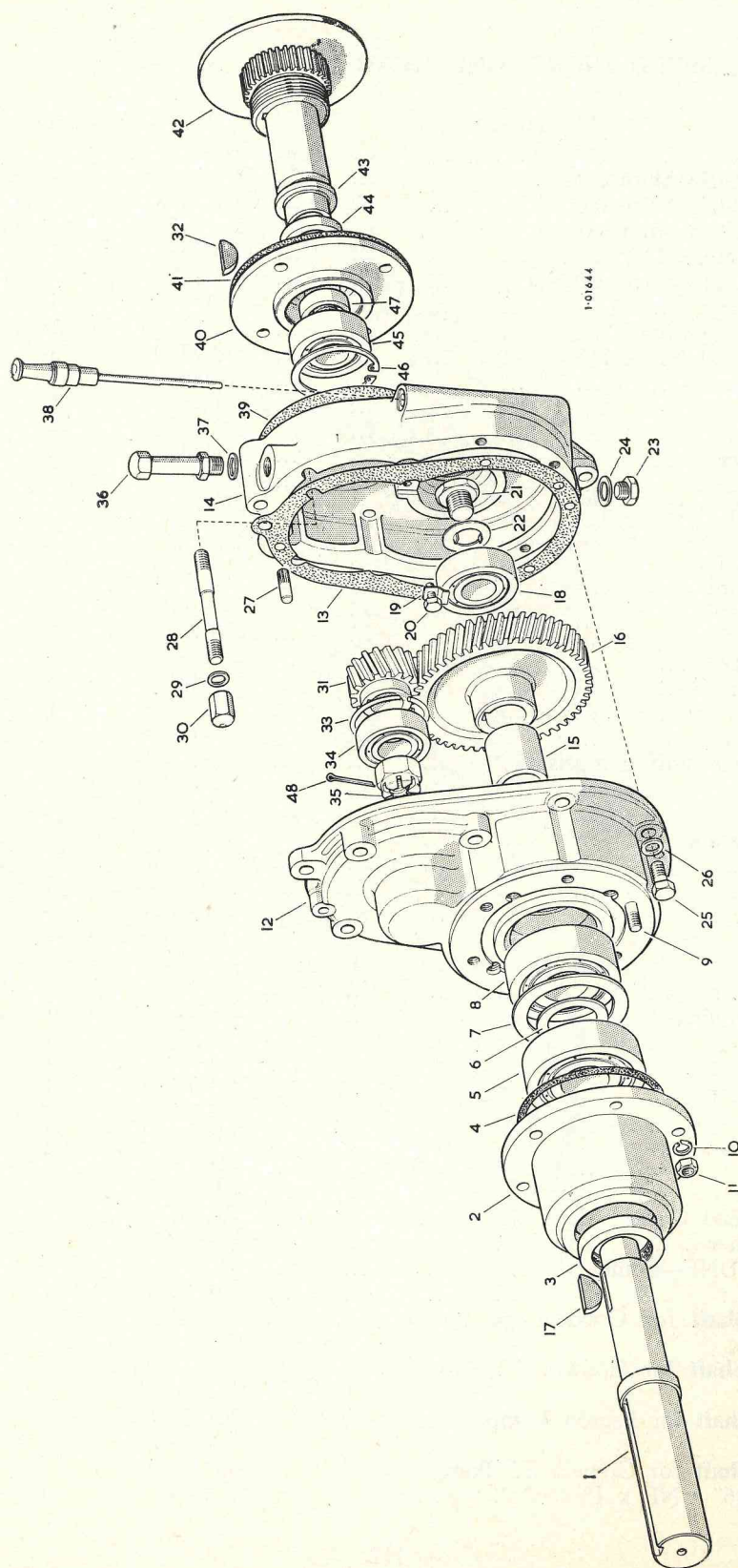
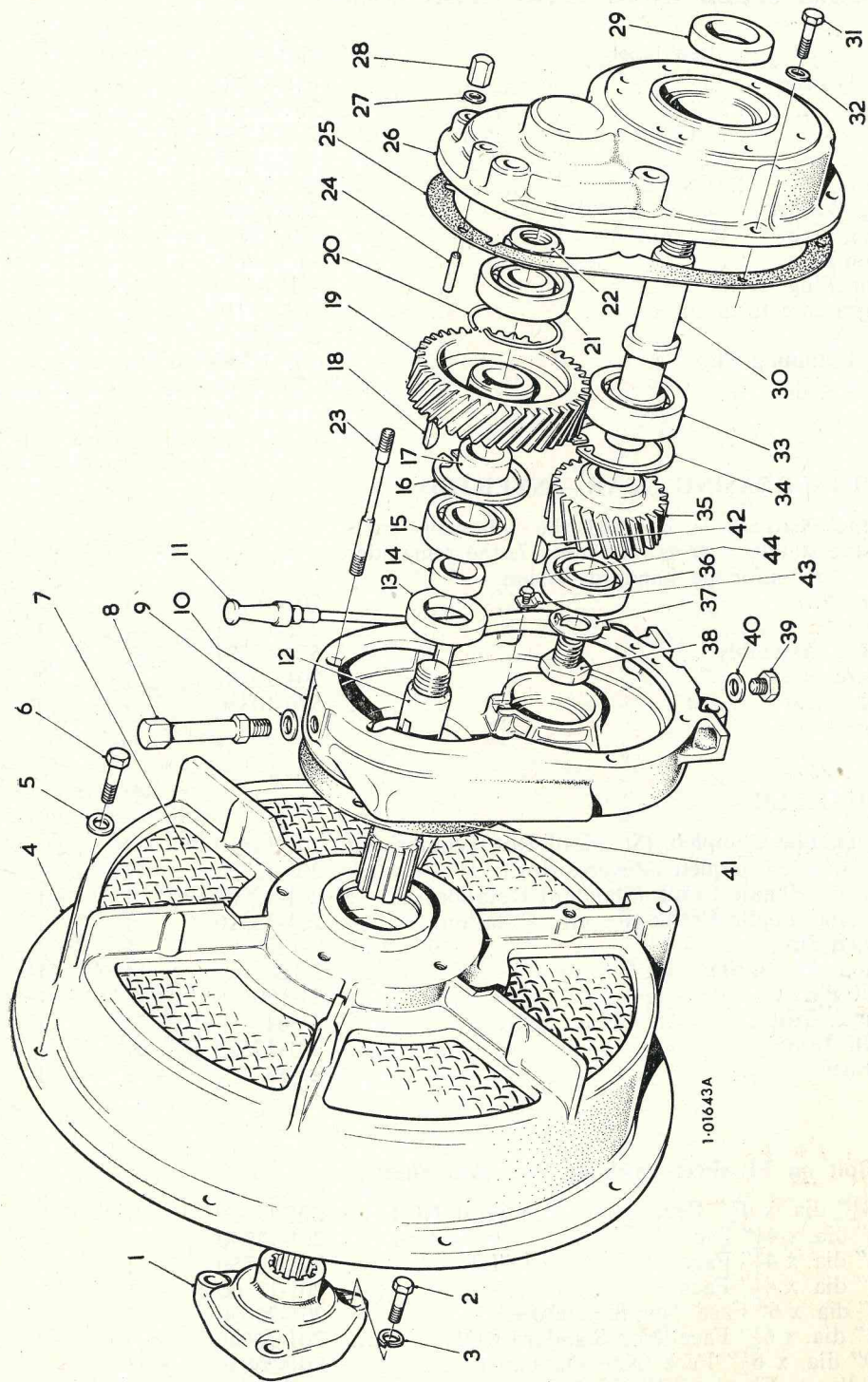


PLATE 16

CLUTCH AND 3:1 REDUCTION GEAR

PLATE 17—1:1.61 SPEED INCREASING GEAR

illus No.	Description	Part No.	1 Cyl. No. off	2 Cyl. per Engin	3 Cyl. per Engin
—	Fan Shroud	201-12581	1	—	—
—	Fan Shroud Strip Shim 0.002"	201-13580	As required		
—	Fan Shroud Strip Shim 0.005"	201-13581	As required		
—	Fan Shroud Strip Shim 0.010"	201-13582	As required		
—	Bolt 5/16" UNF x 1 1/8"	270-25	4	—	—
—	Socket Cap Screw 5/16" UNF x 3/4"	270-327	4	—	—
—	Spring Washer	27-413	4	—	—
1	Crankshaft Extension	202-16180	1	1	1
2	Setscrew 7/16" UNF x 1 1/4"	270-274	3	3	3
3	Spring Washer	27-984	3	3	3
—	Adaptor	201-16100	1	—	—
4	Adaptor	202-16100	—	1	1
—	Spring Washer	27-413	5	—	—
5	Spring Washer	27-393	—	8	8
—	Setscrew 5/16" UNF x 7/8"	270-24	5	—	—
6	Setscrew 3/8" UNC x 7/8"	270-286	—	7	7
—	Setscrew 3/8" UNC x 3"	270-373	—	1	1
—	Adaptor Guard	201-13810	1	—	—
7	Adaptor Guard	202-16060	—	1	1
—	Setscrew for Guard—1" UNC x 5/8"	270-285	6	6	6
—	Spring Washer	27-451	6	6	6
—	Plain Washer	27-618	6	6	6
8	Breather	570-10780	1	1	1
9	Joint for Breather	4-197	1	1	1
—	Gear Case Assembly comprising *	570-10530	1	1	1
10	*Gear Case	201-22200	1	1	1
11	Dipstick	570-10340	1	1	1
—	Dipstick Adaptor	27-4344	1	1	1
12	Shaft	201-22620	1	1	1
13	Oil Seal	202-16240	1	1	1
14	Bearing Spacer	202-16130	1	1	1
15	Bearing	27-1638	1	1	1
16	Circlip	202-16250	1	1	1
17	Bearing Spacer	202-16140	1	1	1
18	Key for Gearwheel	27-1228	1	1	1
19	Gearwheel	201-22260	1	1	1
20	Retaining Ring	201-14840	1	1	1
21	Bearing—roller	201-17630	1	1	1
22	Locknut	201-17620	1	1	1
23	Stud	201-17590	4	4	4
24	*Dowel	27-3677	2	2	2
25	Joint	201-22370	1	1	1
26	*Gear Case End Cover	201-22210	1	1	1
27	Copper Washer	616-1608	4	4	4
28	Nut—5/16" UNF—dome	270-46	4	4	4
29	Oil Seal	201-22420	1	1	1
30	Secondary Shaft for Goodenough Pump	201-22310	—	—	—
or					
30	Secondary Shaft for Godwin T2 Pump	201-22320	—	—	—
or					
30	Secondary Shaft for Pegson Pump	201-22360	—	—	—
or					
30	Secondary Shaft for Godwin T3 Pump	203-22330	—	—	—
31	*Setscrew 5/16" UNF x 7/8"	270-24	4	4	4



1:1.61 INCREASING GEAR

PLATE 17

PLATE 17—1:1.61 SPEED INCREASING GEAR—(contd.)

Illus. No.	Description	Part No.	No. off per Engine		
			1 cyl.	2 cyl.	3 cyl.
		616-1608	4	4	4
32	*Copper Washer	31-936	1	1	1
33	Bearing	201-22390	1	1	1
34	Circlip	201-22250	1	1	1
35	Pinion	201-22400	1	1	1
36	Bearing	201-17610	1	1	1
37	Locking Washer	201-17600	1	1	1
38	Retaining Screw	11-13-693	1	1	1
39	Oil Drain Plug	4-197	1	1	1
40	Joint for Plug	201-17710	1	1	1
41	Joint—gearcase to adaptor	27-2004	1	1	1
42	Pinion Key	201-21060	1	1	1
43	Bearing Retaining Clip	270-172	1	1	1
44	Screw for Clip				

1:1.61 SPEED INCREASING GEAR—INVERTED

When the gearcase is inverted the following parts replace the standard parts on Plate 17, the remainder are as for the standard version.

—	Adaptor	201-16101	1	—	—
4	Adaptor	202-16101	—	1	1
—	Gear Case Assembly	570-10531	1	1	1
10	Gear Case	201-22201	1	1	1
11	Dipstick	570-10330	1	1	1

STARTING HANDLE

STARTING HANDLE									
Starting Handle Complete (Standard Rot.)					} comprising	201-12510	1	1	1
Starting Handle Complete (Reverse Rot.)						201-13320	1	1	1
Starting Handle Crank (Standard Rotation)					...	201-12500	1	1	1
Starting Handle Crank (Reverse Rotation)					...	201-13310	1	1	1
Clutch Pin					...	2-125	1	1	1
Clutch Pin Spring					...	2-126	1	1	1
Split Pin					...	27-120	1	1	1
Wood Grip					...	3-364	1	1	1
Quill Iron					...	201-12520	1	1	1
Washer					...	27-85	1	1	1

PULLEYS (Bolt on Flywheel—without Extension Shaft)

Pulley 3 1/4" dia. x 4 1/2" Face (Non Std.)	} Must NOT be used on SL3	201-13330	1	—	—
Pulley 4" dia. x 4 1/2" Face		201-13340	1	—	—
Pulley 5" dia. x 4 1/2" Face		201-13350	1	—	—
Pulley 6" dia. x 4 1/2" Face		201-13360	1	1	1
Pulley 7" dia. x 6" Face (Non Standard LD1)	...	201-26030	1	1	1
Pulley 8" dia. x 6 1/2" Face (Non Standard LD1)	...	201-26040	1	1	1
Pulley 9" dia. x 6 1/2" Face (Non Standard)	...	201-26050	1	1	1
Stud—Pulley to Flywheel 7/16" UNF	...	270-298	3	3	3
Nut—Pulley to Flywheel 7/16" UNF	...	270-311	3	3	3
Spring Washer	...	27-984	3	3	3

PULLEYS—Key on Camshaft

Description	Part No.	No. off per Engine		
		1 cyl.	2 cyl.	3 cyl.
Pulley 5" dia. x 4½" Face	201-13390	1	—	—
Pulley 6" dia. x 4½" Face (Non St. LD2)	201-13400	1	1	—
Pulley 7" dia. x 4½" Face (Non St. LD1) } on SL3	201-13410	1	1	—
Pulley 8" dia. x 4½" Face (Non Standard LD1)	201-13420	1	1	1
Pulley 9" dia. x 4½" Face (Non Standard)	202-14970	1	1	1
Pulley Key	27-353	1	1	1
Pulley Key Setscrew 5/16" UNF x ¾"	270-60	1	1	1

SPANNERS—supplied with engine

Double Ended Spanner 7/16" x ½" AF	27-3838	1	1	1
Double Ended Spanner 9/16" BSF x 11/16" AF	27-4076	1	1	1
Double Ended Spanner ¾" x 7/16" Whit.	27-399	1	1	1
Double Ended Spanner 9/16" x ⅝" AF	27-3839	1	1	1
Special Flat Spanner	27-4075	1	1	1

FLEXIBLE COUPLING

Coupling Stud	202-12800	3	3	—
Tab Washer	202-13170	3	3	—
Hardy Coupling Disc	30-307	1	1	—
Distance Washer	201-13180	3	3	—
Coupling Rough Bored 11/16" dia.	201-23420	1	1	—
Coupling Bolt ¾" UNF	201-23430	3	3	—
Self Lock Nut ¾" UNF	270-159	3	3	—
Lock-Washer for Coupling Bolts	27-393	3	3	—
Coupling Plate	203-18150	—	—	1
Coupling Plate Stud	270-392	—	—	3
Coupling Plate Nut	270-311	—	—	3
Coupling Stud	203-12800	—	—	3
Coupling Tab Washer	202-13170	—	—	3
Coupling Disc	203-18160	—	—	1
Coupling Nut	270-159	—	—	3
Half Coupling	201-14320	—	—	1
Half Coupling Distance Washer	201-13180	—	—	3
Half Coupling Bolt	201-23430	—	—	3
Half Coupling Nut	270-159	—	—	3

ELECTRIC STARTING—LUCAS—12 volt
(See Drawings ED.6105 and ED.6838)

Description	Part No.	No. off per Engine		
		1 cyl.	2 cyl.	3 cyl.
Flywheel and Starter Ring Assembly 1800 r.p.m. ...	201-12880	1	—	—
Flywheel and Starter Ring Assembly 1500 r.p.m. ...	201-13660	1	—	—
Flywheel and Starter Ring Assembly ...	570-11130	—	1	—
Flywheel and Fan Assembly—reverse rotation ...	570-11140	—	1	—
Flywheel and Fan Assembly ...	570-10162	—	—	1
Starter Motor Distance Piece ...	202-13720	—	1	1
Starter Motor Stud ...	270-325	—	3	3
Dynamo Bracket ...	201-12760	1	1	1
Dynamo Bracket ...	201-12770	1	1	1
Dynamo Bracket Stud ...	270-98	2	2	2
Nut ...	270-3	4	4	4
Spring Washer ...	27-413	7	7	7
Setscrew $\frac{5}{16}$ " UNF x $2\frac{1}{2}$ " (not supplied with Marine Bearers) ...	270-67	1	1	1
Adjusting Link ...	201-12850	1	1	1
Adjusting Link Washer ...	27-85	1	1	1
Bolt $\frac{5}{16}$ " UNF x $1\frac{1}{8}$ " ...	270-25	1	1	1
Bolt $\frac{5}{16}$ " UNF x 1" ...	270-61	1	1	1
Setscrew ...	291-3694	1	1	1
Fan Shroud ...	201-12581	1	—	—
Fan Shroud Strip Shim 0.002" ...	201-13580	As req.	—	—
Fan Shroud Strip Shim 0.005" ...	201-13581	As req.	—	—
Fan Shroud Strip Shim 0.010" ...	201-13582	As req.	—	—
Socket Cap Screw $\frac{5}{16}$ " UNF ...	270-327	4	—	—
Fan Disc Washer $\frac{5}{16}$ " ...	27-413	4	—	—
Bolt for Fan Shroud ...	270-25	4	—	—
Sealing Plate ...	201-13430	1	—	—
Setscrew $\frac{5}{16}$ " UNF x $\frac{5}{8}$ " ...	270-59	10	—	—
Spring Washer $\frac{5}{16}$ " ...	27-413	10	—	—
Bolt $\frac{3}{8}$ " UNF x $4\frac{1}{2}$ " ...	270-222	3	—	—
Nut $\frac{3}{8}$ " UNF ...	270-4	3	—	—
Spring Washer $\frac{3}{8}$ " ...	27-393	3	—	—
Dynamo Driving Pulley ...	201-12840	1	1	1
Dynamo Driven Pulley ...	201-12830	1	1	1
Dynamo Driving Belt ...	201-12780	1	—	—
Dynamo Driving Belt ...	202-12780	—	1	1
Dynamo Driving Pulley Key ...	27-4057	1	1	1
Socket Setscrew ...	270-225	1	1	1
Starter Motor Type M35-G-1 ...	201-13270	1	—	—
Starter Motor—reverse rotation ...	201-13271	1	—	—
Starter Motor ...	202-17010	—	1	1
Starter Motor—reverse rotation ...	202-17011	—	1	1
Dynamo, Type C40A ...	291-36961	1	1	1
Dynamo, Type C40A—reverse rotation ...	291-36951	1	1	1
Controller ...	64-19099	1	1	1
Controller Bracket ...	64-12447	1	1	—
ST. 18 Starter Switch (not reqd. for Remote Control) ...	201-13290	1	—	—
Ammeter BM4 ...	291-3705	1	1	1
Battery Lug. Positive ...	64-6922	1	1	1
Battery Lug. Negative ...	64-6923	1	1	1
Battery Cable—2 ft. Positive } Supplied in pairs only ...	64-9254-1	1	1	1
Battery Cable—2 ft. Negative } Supplied in pairs only ...	64-9254-2	1	1	1
Battery Cable—3 ft. Positive } Supplied in pairs only ...	64-7172-1	1	1	1
Battery Cable—3 ft. Negative } Supplied in pairs only ...	64-7172-2	1	1	1
Battery Cable—6 ft. Positive } Supplied in pairs only ...	64-6604-1	1	1	1
Battery Cable—6 ft. Negative } Supplied in pairs only ...	64-6604-2	1	1	1
Battery Coupling Cable ...	64-12020	—	—	—
Battery ...	291-32331	1	1	1
Push Button—used with 351-31480 ...	64-9266	1	—	—
Starter Solenoid ...	351-31480	1	—	—
Push Button ...	64-22819	—	1	1

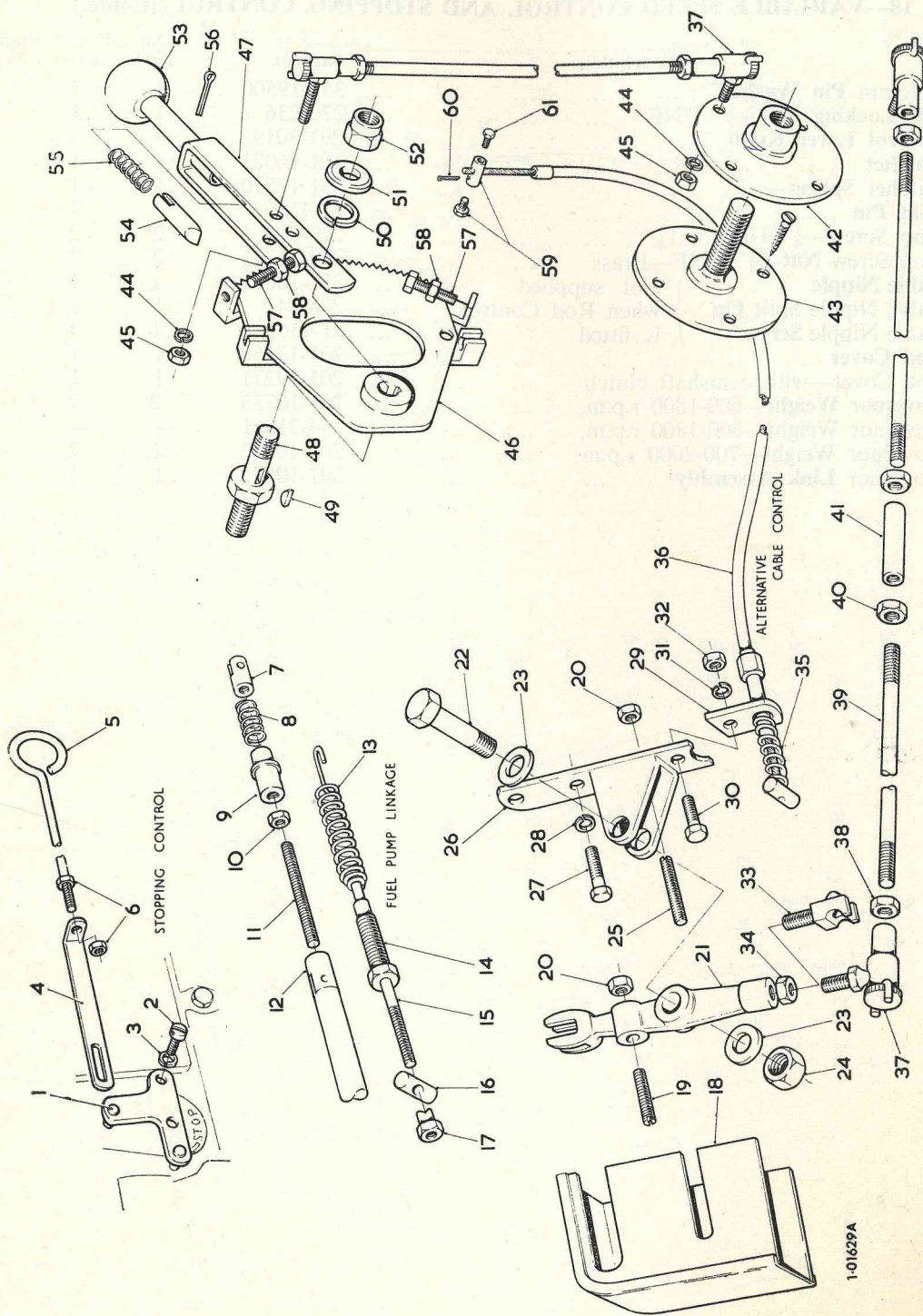
AUTO-LITE ELECTRIC STARTING SL3 (NORTH AMERICA ONLY)

Description	Part No.	No. off per Engine		
		1 Cyl.	2 Cyl.	3 Cyl.
Auto-Lite Dynamo (Not supplied by R. A. Lister & Co. Ltd.)	201-15110	1	1	1
Dynamo Driving Pulley	201-12840	1	1	1
Key	27-4057	1	1	1
Socket Setscrew	270-225	1	1	1
Belt	201-15050	1	1	1
Dynamo Pulley	201-15040	1	1	1
Auto-Lite Starter Motor	201-15120	1	—	—
Auto-Lite Starter Motor—reverse rotation	201-15121	1	—	—
Auto-Lite Starter Motor	202-15120	1	—	—
Auto-Lite Starter Motor—reverse rotation	202-15121	—	1	1
Distance Piece	202-15420	—	1	1
Push Button Starter Switch	202-15420	—	1	1
Ammeter (Optional Extra)	201-15100	1	1	1
Battery Lug. Positive (Optional Extra)	291-3705	1	1	1
Battery Lug. Negative (Optional Extra)	64-6922	1	1	1
Battery Cables (Optional Extra) as page 112	64-6923	1	1	1
Wiring Diagram	ED.6562	1	1	1
Arrangement Drawing	92321	—	1	1
Arrangement Drawing	91391	1	—	—
Flywheel and Fan Assembly	570-10162	1	1	1
Flywheel and Fan Assembly—reverse rotation	570-10163	1	1	1
Support Bracket for Dynamo	201-15070	1	—	—
Support Bracket for Dynamo	202-15430	—	1	1
Support Bracket Shim	201-15060	as required		
Support Bracket Stud	270-81	2	2	2
Support Bracket Spring Washer	27-413	2	2	2
Support Bracket Nut	270-3	2	2	2
Stud for Starter Motor	270-259	3	3	3
Bracing Stay	203-15460	1	1	1
Bracing Stay Setscrew	270-60	1	1	1
Bracing Stay Spring Washer	27-413	1	1	1
Bracing Stay Nut	270-3	1	1	—
Support Bracket for Dynamo	201-15000	1	—	—
Support Plate for Dynamo	202-15440	—	1	1
Support Plate Packing Washer	27-82	2	2	2
Support Plate Spring Washer	27-413	2	2	2
Support Plate Bolt	270-67	2	2	2
Adjusting Link for Dynamo	201-15020	1	1	1
Adjusting Link—reverse rotation	201-23770	1	1	1
Adjusting Link Distance Piece	201-15030	1	—	—
Adjusting Link Distance Piece	202-15451	—	1	1
Adjusting Link Spring Washer	27-413	2	2	2
Adjusting Link Nut	270-3	2	2	2
Adjusting Link Set Screw	270-231	1	1	1
Adjusting Link Plain Washer	27-82	1	1	1
Adjusting Link Spring Washer	27-413	2	2	2
Bolt (Dynamo to Bracket) with reverse rotation	270-61	2	2	2
Spring Washer	27-413	2	2	2
Nut	270-3	1	1	1
Spacer—dynamo to bracket—reverse rotation	202-20710	—	1	1
Bolt—for spacer—reverse rotation	270-63	—	1	1

Note:—Dynamos and starter motors are not supplied by R. A. Lister & Co. Ltd.

PLATE 18—VARIABLE SPEED CONTROL AND STOPPING CONTROL

Illus. No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
1	Stopping Control Lever	291-12361	1	1	—
2	Screw—No. 10 UNF x $\frac{3}{8}$ "	270-239	2	2	—
3	Washer	64-2582-2	2	2	—
4	Stopping Link	366-122	1	1	—
5	Stopping Control Rod	—	1	1	—
6	Nuts	—	2	2	—
7	Idling Control Shackle	204-12000	—	1	1
8	Idling Spring	204-21491	—	1	1
9	Idling Control Adjusting Sleeve	204-21480	—	1	1
10	Idling Control Nut	204-21500	—	1	1
11	Idling Control Connecting Rod	204-12010	—	1	1
12	Fuel Pump Shackle	202-12001	—	1	3
13	Speeder Spring—600-2000 r.p.m.	201-10900	1	1	—
	Speeder Spring—600-1800 r.p.m.	203-10903	—	—	1
14	Adjusting Screw	201-19210	1	1	1
15	Spindle	201-13510	1	1	1
16	Trunnion	572-10120	1	1	1
17	Nut	291-2231	1	1	1
18	End Cover—not with Raised Starting	201-19270	1	1	1
19	Adjusting Stud—short	201-17061	1	1	1
20	Nut— $\frac{1}{4}$ " UNF	270-2	2	2	2
21	Lever	201-19180	1	1	1
—	Distance Piece	201-19200	1	1	1
22	Bolt $\frac{5}{16}$ " UNF x $\frac{1}{4}$ "	270-416	1	1	1
23	Plain Washers	64-6612-8	2	2	2
24	Nut— $\frac{5}{16}$ " UNF—Brass	270-14	1	1	1
25	Adjusting Stud—long	201-15161	1	1	1
26	Bracket	201-19240	1	1	1
27	Setscrew	270-66	1	1	1
28	Copper Washer	616-1608	1	1	1
29	Bracket—for Control Cable	201-19280	1	1	1
30	Bolt— $\frac{1}{4}$ " UNF x $\frac{3}{4}$ "	270-55	1	1	1
31	Spring Washer	27-451	1	1	1
32	Nut— $\frac{1}{4}$ " UNF	270-2	1	1	1
33	Connection Screw—for Bowden Cable	201-19190	1	1	1
34	Locknut	64-2577-7	1	1	1
35	Return Spring	366-175	1	1	1
36	Cable and Wire Assembly—3 ft.	351-16370	1	1	1
—	Cable and Wire Assembly—6 ft.	351-16371	1	1	1
37	Ball Joint—Rod Control	351-16500	As required		
38	Locknut	64-2577-7	As required		
39	Control Rod	366-1200	As required		
40	Muff Coupling Locknut	64-2577-7	2	2	2
41	Muff Coupling	366-1201	1	1	1
42	Pivot Assembly	366-1202	1	1	1
43	Rod Coupling Plate Assembly	366-1205	1	1	1
44	Ball Joint Spring Washer	64-2582-3	2	2	2
45	Ball Joint Nut	64-2577-7	2	2	2
—	Operating Lever Assembly—items marked *	572-10360	1	1	1
46	*Detent Plate Assembly	351-15911	1	1	1
47	*Control Lever Assembly	351-15961	1	1	1
48	*Fulcrum Pin	351-15991	1	1	1
49	*Fulcrum Pin Key	351-19490	1	1	1
50	*Spring Washer	351-19530	2	2	2



1-01629A

PLATE 18

PLATE 18—VARIABLE SPEED CONTROL AND STOPPING CONTROL (Contd.)

Illus No.	Description	Part No.	No. off per Engine		
			1 cyl.	2 cyl.	3 cyl.
51	*Fulcrum Pin Washer ...	351-19500	1	1	1
25	*Self Locking Nut— $\frac{1}{2}$ " UNF ...	270-236	1	1	1
53	*Control Lever Knob ...	291-3019	1	1	1
54	*Ratchet ...	351-16021	1	1	1
55	*Ratchet Spring ...	351-19510	1	1	1
56	*Split Pin ...	27-4336	1	1	1
57	*Stop Screw— $\frac{1}{4}$ " UNF x $1\frac{1}{4}$ " ...	270-200	2	2	2
58	*Stop Screw Nut— $\frac{1}{4}$ " UNF—Brass ...	270-13	2	2	2
59	Cable Nipple ...	351-16001	1	1	1
60	Cable Nipple Split Pin ...	270-54	1	1	1
61	Cable Nipple Screw ...	27-4363	1	1	1
—	End Cover ...	201-13450	1	1	1
—	End Cover—with camshaft clutch ...	201-19271	1	1	1
—	Governor Weight—600-1800 r.p.m. ...	201-10733	2	2	—
—	Governor Weight—600-1800 r.p.m. ...	354-21561	—	—	2
—	Governor Weight—700-2000 r.p.m. ...	201-10732	2	2	—
—	Governor Link Assembly ...	201-10892	1	1	—

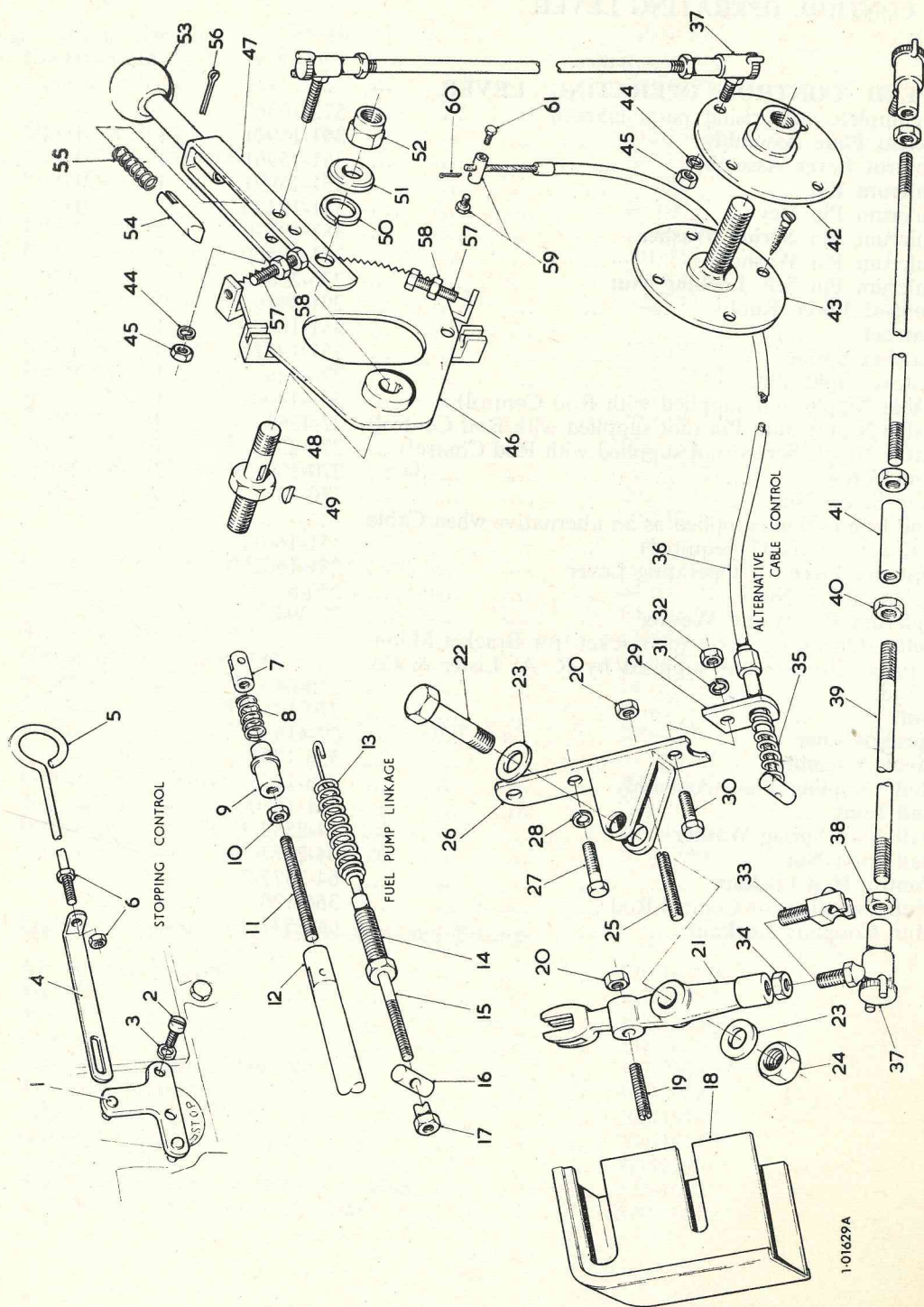


PLATE 18

SPEED CONTROL OPERATING LEVER

Description	Part No.	No. off per Engine		
		1 cyl.	2 cyl.	3 cyl.
SPEED CONTROL OPERATING LEVER	—			
complete comprising parts marked *	...	1	1	1
*Detent Plate Assembly ...	351-15911	1	1	1
*Control Lever Assembly ...	351-15961	1	1	1
*Fulcrum Pin ...	351-15991	1	1	1
*Fulcrum Pin Key ...	351-19490	1	1	1
*Fulcrum Pin Spring Washer ...	351-19530	2	2	2
*Fulcrum Pin Washer ...	351-19500	1	1	1
*Fulcrum Pin Self Locking Nut ...	270-236	1	1	1
*Control Lever Knob ...	291-3019	1	1	1
*Ratchet ...	351-16021	1	1	1
*Ratchet Spring ...	351-19510	1	1	1
*Ratchet Split Pin ...	27-4336	1	1	1
Cable Nipple (not supplied with Rod Control)	351-16001	1	1	1
Cable Nipple Split Pin (not supplied with Rod Control)	27-4363	1	1	1
Cable Nipple Screw (not supplied with Rod Control) ...	270-239	1	1	1
*Stop Screw ...	270-200	2	2	2
*Stop Screw Nut ...	270-13	2	2	2
*Rod Connection (supplied as an alternative when Cable Control is NOT required) ...	351-16011	1	1	1
*Distance Piece for Operating Lever ...	351-16620	—	—	2
*Fulcrum Pin Nut ...	270-6	—	—	2
*Fulcrum Pin Spring Washer ...	27-394	—	—	1
Bolts —Operating Lever to Bracket (for Bracket Mounting)—Bracket not supplied by R. A. Lister & Co. Ltd.) ...	270-64	—	—	2
Nut ...	270-14	—	—	2
Spring Washer ...	27-413	—	—	2
Pivot Assembly ...	366-1202	—	—	1
Rod Coupling Plate Assembly ...	366-1205	—	—	1
Ball Joint ...	351-16500	—	—	2
Ball Joint Spring Washer ...	64-2582-3	—	—	2
Ball Joint Nut ...	64-2577-7	—	—	2
Control Rod Locknut ...	64-2577-7	—	—	2
Muff Coupling for Control Rod ...	366-120	—	—	1
Muff Coupling Locknut ...	64-2577-7	—	—	2

COUPLED DECOMPRESSORS—LD2/SL2-SL3 IN HOUSING

Description	Part No.	No. off per Engine		
		1 Cyl.	2 Cyl.	3 Cyl.
Engine Stopping Lever	202-16720		1	
Operating Rod—flywheel end	203-16731		1	
or				
Operating Rod—fuel tank end	202-16740		1	
Instruction Transfer	367-22380		1	
Split Pin	27-591		1	
Spring	29-100		1	
Plain Washer	27-1698		1	
Rubber Grommet	201-11710		1	
Rubber Grommet	201-13960		1	
Slide Pad—fuel tank end	202-17371		1	
or				
Slide Pad—flywheel end	202-17370		1	
Retaining Plate	202-17380		1	
Bolt— $\frac{1}{4}$ " UNF x 1"	270-56		2	
Plain Washer	27-618		2	
Self Lock Nut— $\frac{1}{4}$ " UNF	270-153		2	
Control Rod Assembly—fuel tank end	202-17361		1	
Rod	202-17351			
Pivot Plate	202-17340			
or				
Control Rod Assembly—flywheel end	202-17360		1	
Screw—2BA x 1"	64-6772/5		1	
Plain Washer	64-6612/5		1	
Self Lock Nut—2BA	64-6649/3		1	
Coupling Rod Assembly	202-17330		2	
Screw } SL3 only 2BA x $\frac{3}{4}$ "	64-6772/4		1	
Screw } 2BA x 1"	64-6772/5		1	
Screw } LD/SL2 only 3/16" UNF x $\frac{3}{8}$ "	270-239		2	
Spring Washer }	64-2582/2		2	
Control Rod Knob	202-17390		1	
Nut— $\frac{1}{4}$ " UNF	270-2		1	
Instruction Transfer—flywheel end	202-17400		1	
Instruction Transfer—fuel tank end	202-17401		1	

AIR SILENCER AND FILTERS—Optional Fittings

		1 Cyl.	2 Cyl.	3 Cyl.
Air Silencer complete	570-10320	1	1	—
Air Filter	367-11780	1	—	—
Air Filter—dry type	203-18880	—	1	1
Element for 203-18880	201-26010	—	1	1
Inlet and Exhaust Manifold	367-28180	1	—	—
Air Inlet Manifold	366-3188	—	1	—
Adaptor for Air Filter	203-19140	—	—	1
Adaptor—used on dumper	204-19140	—	—	1
Adaptor Clip	27-4233	—	—	1
Air Silencer—for Oil Bath type filter	570-10321	—	—	1
Air Silencer—for Dry type filter	570-10322	—	—	1

PLATE 19—ENGINE HOUSING—LD/SL2-SL3 ENGINES, Standard Rotation

Illus No.	Description	Part No.	No. off per Engine		
			1 Cyl.	2 Cyl.	3 Cyl.
1	Bracket	202-16570		1	1
2	End Plate—fuel tank end—without speed control	202-16510		1	1
3	Endo Plate—fuel tank end—with speed control	366-2148		1	1
4	Cover—fuel filter hole	202-20720		1	1
5	Cover Bolt— $\frac{1}{4}$ " UNF x $\frac{1}{2}$ "	270-54		2	2
—	Locknut—bottom position	270-2		1	1
6	Spring Washer—top position	27-451		1	1
7	End Plate—flywheel end	202-16520		1	—
—	End Plate—flywheel end	203-16520		—	1
8	Back Plate	202-16480		1	—
—	Back Plate	203-16480		—	1
9	Front Plate	202-16560		—	1
—	Front Plate	203-16560		—	1
10	Top Plate Assembly—comprising:	202-16680		1	—
	Pressing	202-16531			
	Pressing	202-6671			
	Air Intake Pipe	203-16681			1
	Air Intake Pipe	203-16531			
—	Top Plate Assembly—comprising:	203-16670			
11	End Plate—for roof—fuel tank end	202-16550	1		1
12	End Plate—for roof—flywheel end	202-16540	1		1
13	Top Plate—for roof	202-16490	1		—
—	Top Plate—for roof	203-16490			1
14	Grid Assembly—comprising:	202-16580	1		—
	Grid	202-16790			
	Side Member	202-16780			
	Bottom Member	202-16690			
	Grid Assembly—comprising:—	203-16580			1
	Grid	203-16790			
	Side Member	202-16780			
	Bottom Member	203-16690			
15	Hinge Bracket Assembly—comprising	202-16600	2		2
	Bracket	202-16840			
	Bracket	202-16610			
	Bar	202-23640			
16	Packing Piece—thick	202-23650		as reqd.	
17	Packing Piece—thin	202-16640		as reqd.	
18	Hinge Stirrup Assembly—comprising:	202-16630	2		2
	Stirrup	202-16620			
19	Lifting Hook	202-16700	4		4
20	Locating Stay—for roof	202-16750	2		2
21	Spring—for locating stay	31-166	2		2
22	Fixing Hook—for roof	202-16710	2		2
23	Over centre Fastener—comprising:	202-20770	2		2
	Bracket	202-20780			
	Spring Clasp	202-20800			
	Lever	202-20790			
	Rivet	202-20810			
	Rivet	202-20820			
24	Fixing Bolt— $\frac{1}{4}$ " UNF x $\frac{1}{2}$ "	270-54	8		8
—	Nut— $\frac{1}{4}$ " UNF	270-2	8		8
25	Spring Washer	27-451	8		8
HOUSING WITH ELECTRIC STARTING—Standard Rotation					
The following parts differ from the parts fitted to hand start engines listed above.					
	Back Plate Assembly	202-21850	1		—
	Back Plate Assembly	203-21850			1
	Dynamo Bracket	201-12711	1		1

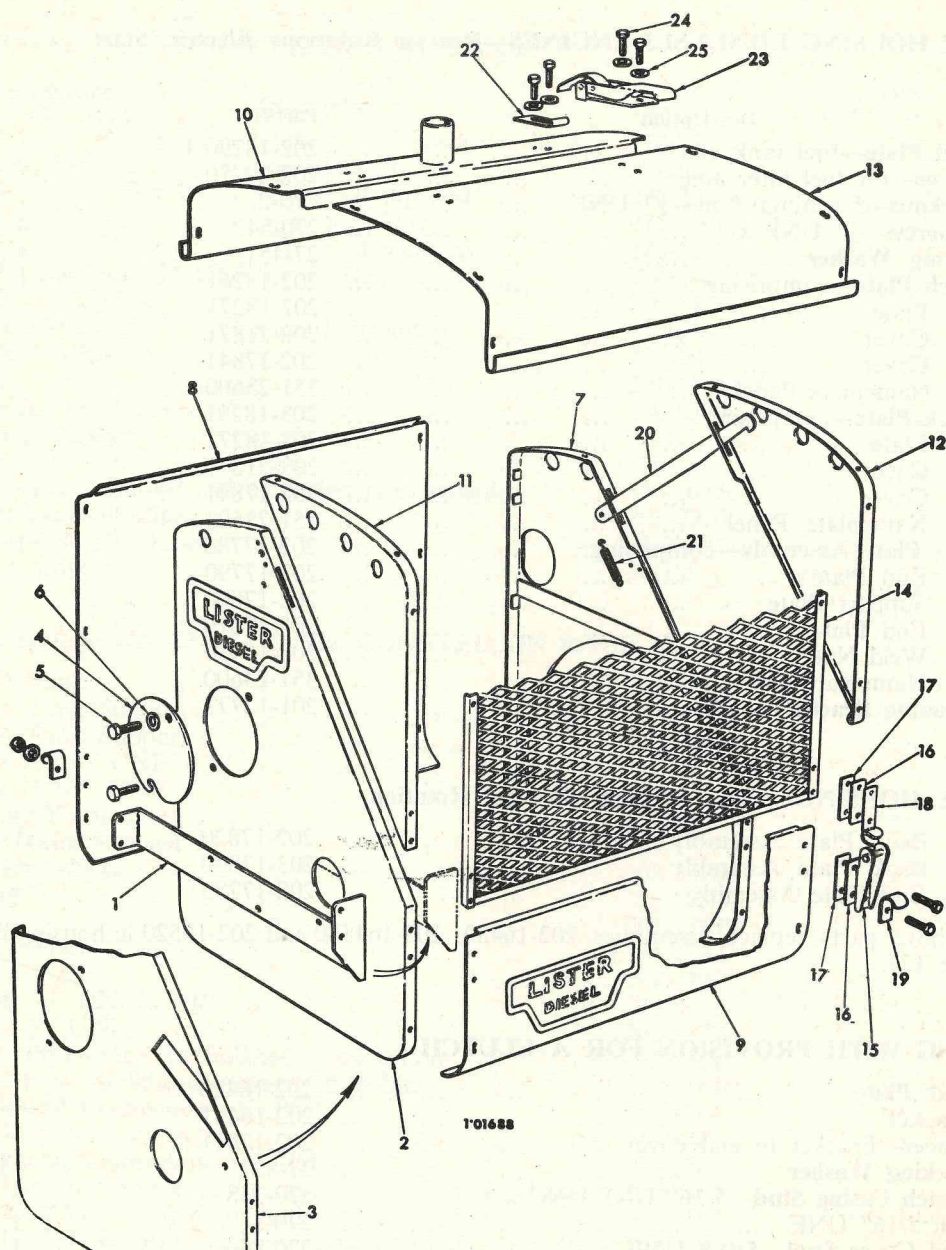


PLATE 19

ENGINE HOUSING

ENGINE HOUSING LD/SL2-SL3 ENGINES—Reverse Rotation—Electric Start

Description	Part No.	No. off per Engine		
		1 cyl.	2 cyl.	3 cyl.
End Plate—fuel tank end	202-18290	1	1	1
Cover—for fuel filter hole	202-20720	1	1	1
Locknut—for hinge bolt— $\frac{1}{4}$ " UNF	270-2	1	1	1
Setscrew— $\frac{1}{4}$ " UNF x $\frac{1}{2}$ "	270-54	4	4	4
Spring Washer	27-451	4	4	4
Back Plate—comprising	202-18261	1	—	—
Plate	202-18271	—	—	—
Cover	202-21871	—	—	—
Cover	202-17841	—	—	—
Nameplate Panel	351-23600	—	—	—
Back Plate—comprising	203-18251	—	—	1
Plate	203-18271	—	—	—
Cover	203-21871	—	—	—
Cover	202-17841	—	—	—
Nameplate Panel	351-23600	—	—	—
End Plate Assembly—comprising:	202-17780	1	—	1
End Plate	202-17790	—	—	—
Support Plate	202-17800	—	—	—
End Plate	202-17810	—	—	—
Weld Nut	202-16430	—	—	—
Nameplate Panel	351-23600	—	—	—
Dynamo Bracket	201-12777	—	—	—

ENGINE HOUSING—Hand Starting—Reverse Rotation

Back Plate Assembly	202-17820	1	—
Back Plate Assembly	203-17820	—	1
End Plate Assembly	202-17780	1	1

The above parts replace assemblies 202-16480, 203-164880 and 202-16520 in housing list—page 124.

HOUSING WITH PROVISION FOR A CLUTCH

*End Plate	202-16420	1	1
*Bracket	202-16441	1	1
Spacer—bracket to end cover	202-17411	1	1
Packing Washer	27-82	as reqd.	—
Clutch Casing Stud— $\frac{5}{16}$ " UNF-UNC x $1\frac{3}{4}$ "	270-348	3	3
Nut $\frac{5}{16}$ " UNF	270-3	1	1
End Cover Stud— $\frac{5}{16}$ " UNF x 4"	270-86	1	1

*These two items replace 202-16510 and 202-16570 on page 124.

HOUSING ON ENGINES with Fuel Lift Pump and Purolator Filter.

Front Plate Assembly	202-21280	1	—
Front Plate Assembly	203-21280	—	1
Grid Assembly	202-16581	1	—
Grid Assembly	203-16581	—	1

The above parts replace the following on page 124—202-16560, 203-16560, 202-16580, 203-16580

ADDITIONAL PARTS FOR FITTING HOUSING

Description	Part No.	No. off per Engine		
		1 cyl.	2 cyl.	3 cyl.
Bolt— $\frac{3}{8}$ " UNC x $\frac{7}{8}$ " } housing to bracket ...	270-286	8	8	8
Spring Washer } and fan shroud ...	27-393	8	8	8
Bolt— $\frac{1}{4}$ " UNF x $\frac{5}{8}$ " } hinge stirrup and ...	270-23	7	7	7
Nut— $\frac{1}{4}$ " UNF } grid assembly ...	270-2	7	7	7
Bolt— $\frac{1}{4}$ " UNF x $\frac{3}{4}$ " } roof locating ...	270-55	2	2	2
Self Lock Nut— $\frac{1}{4}$ " UNF } stay ...	270-153	2	2	2
Bolt— $\frac{1}{4}$ " UNF x $\frac{1}{2}$ " } general assembly ...	270-54	14	14	14
Spring Washer } ...	27-451	20	20	20
Plain Washer } ...	27-618	26	26	26
Stud ...	201-11061	3	3	3
Spacer—for bracket ...	240-5394	3	3	3
Spring Washer ...	27-413	3	3	3
Nut $\frac{5}{16}$ " UNF ...	270-3	3	3	3
Air Inlet Manifold and extension tube assembly ...	570-10430	—	1	1
Fuel Leak-off Pipe ...	203-20200	—	1	1
Hose—for air intake ...	27-2079	—	1	1
Hose Clips ...	26-109	—	2	2

ENGINE HOUSING—FUEL TANK MOUNTED ON ROOF—SL3

Fuel Tank ...	203-11280	1
Fuel Tank Support ...	203-18650	2
Fuel Tank Support ...	203-18660	2
Bolt— $\frac{5}{16}$ " UNF x $\frac{3}{4}$ " ...	270-60	12
Nut— $\frac{5}{16}$ " UNF ...	270-3	12
Spring Washer ...	27-413	12
Fuel Tank Support ...	203-18670	2
Packing Piece ...	203-18700	4
Strap ...	203-18680	2
Strap ...	203-18690	2
Cross Piece ...	294-2707	2
Cross Piece ...	294-2708	2
Stud— $\frac{1}{4}$ " UNF x $\frac{3}{4}$ " ...	270-80	2
Nut— $\frac{1}{4}$ " UNF ...	201-18720	2
Fuel Pipe—tank to bulkhead connection ...	203-21610	1
Fuel Pipe—bulkhead connection to filter ...	203-21620	1
Bulkhead Connection— $\frac{1}{4}$ " BSP ...	351-17440	1
Locknut for Connection ...	34-8342	1
Bulkhead Connection— $\frac{1}{8}$ " BSP ...	351-17450	1
Locknut for above connection ...	27-583	1
Leak-off Pipe—engine to bulkhead connection ...	203-21640	1
Leak-off Pipe—bulkhead connection to tank ...	203-21630	1

COOLING AIR OUTLET DUCT FOR LD1 AND SL1

Description	Part No.	No. off per Engine		
		1 Cyl.	2 Cyl.	3 Cyl.
Air Outlet Duct (Vertical Outlet)	366-864	1	—	—
Air Outlet Duct (Horizontal Outlet)	366-1195	1	—	—
Air Outlet Duct—reverse rotation	366-907	1	—	—
Felt—reverse rotation	366-2692	2	—	—
Support Plate for duct—reverse rotation	366-1704	1	—	—
Bracket—reverse rotation	366-1703	1	—	—
Fan Shroud	366-865	1	—	—
Fuel Pump Housing Door	366-866	1	—	—
Bracket for Outlet Duct	366-867	1	—	—
Set Bolt (Bracket to Fuel Pump Housing Door)	270-114	1	—	—
Copper Washer (Bracket to Fuel Pump Housing Door)	291-2609	2	—	—
Plain Washer (Bracket to Fuel Pump Housing Door)	27-618	1	—	—
Spring Washer (Bracket to Fuel Pump Housing Door)	27-451	1	—	—
Nut (Bracket to Fuel Pump Housing Door)	270-2	2	—	—
Set Bolt (Bracket to Outlet Duct)	270-54	2	—	—
Spring Washer (Bracket to Outlet Duct)	27-451	2	—	—
Distance Piece for Outlet Duct (Duct to Fan Shroud)	366-868	1	—	—
Nut (Duct to Fan Shroud)	270-3	1	—	—
Set Bolt (Duct to Fan Shroud)	270-231	1	—	—
Spring Washer (Duct to Fan Shroud)	27-413	2	—	—
Set Bolt (Duct to Fan Shroud)	270-54	1	—	—
Spring Washer (Duct to Fan Shroud)	27-451	1	—	—
Sealing Strip (for Standard Square Outlet Duct)	366-869	4	—	—
Backing Strip (for Standard Square Outlet Duct)	366-870	4	—	—
Wood Screw (for Standard Square Outlet Duct)	366-871	20	—	—

HOSE AND ADAPTOR FOR AIR OUTLET DUCT

Adaptor (for Standard Duct with Circular Adaptor)	366-932	1	—	—
Set Bolt (for Standard Duct with Circular Adaptor)	270-23	2	—	—
Spring Washer (for Standard Duct with Circular Adaptor)	27-451	2	—	—
Flexible Hose (for Standard Duct with Circular Adaptor)	366-873	1	—	—
Hose Clips (for Standard Duct with Circular Adaptors)	27-4312	2	—	—

COOLING AIR OUTLET DUCT—LD2-SL2-SL3—Standard and Reverse Rotation

Description	Part No.	No. off per Engine		
		1 Cyl.	2 Cyl.	3 Cyl.
Fan Shroud—Standard Rotation	202-15480	1	1	1
Fan Shroud—Reverse Rotation	202-18310	1	1	1
Fuel Pump Housing Door	366-3385	1	—	—
Fuel Pump Housing Door	366-1032	—	—	1
Air Outlet Duct Complete	366-3019	1	—	—
Air Outlet Duct Complete	366-3111	—	—	1
Jointing Felt	366-3029	1	—	—
Jointing Felt	366-3117	—	—	1
Stud for Duct	270-377	2	2	2
Spring Washer	27-451	2	2	2
Nut	270-2	2	2	2
Bracket for Duct—Standard Rotation	366-910	1	1	1
Plate for Bracket	366-1038	—	—	1
Bolt—Bracket to Fan Shroud—Standard Rotation	270-285	1	1	1
Bolt—Bracket to Air Duct—Standard Rotation	270-23	1	1	1
Spring Washer	27-451	2	2	2
Conversion Plate—Reverse Rotation	366-1712	1	1	1
Bolt for Plate—plate to duct—reverse rotation	270-54	1	1	1
Bolt for Plate—plate to shroud—reverse rotation	270-404	1	1	1
Spring Washer	27-451	2	2	2
Grommet—when air temp. gauge is not fitted	201-50950	1	1	1
Grommet—when air temp. gauge is fitted	354-31620	1	1	1
Sealing Strip	366-3040	2	2	2
Sealing Strip	366-3042	2	—	—
Sealing Strip	366-3130	—	—	2
Backing Strip	366-3039	2	2	2
Backing Strip	366-3041	2	—	—
Backing Strip	366-3129	—	—	2
Wood Screw	366-871	30	36	36
Air Deflector	366-908	1	1	1
Hook	366-3027	1	—	—
Plain Washer	27-618	1	—	—
Spring Washer	27-451	1	—	—
Nut	366-3025	1	—	—

Note:—Sealing strips and backing strips are used for joining trunking to the outlet duct.

SPECIAL TOOLS—Supplied to order only

Description	Part No.
Extractor for Crankshaft Pinion	317-81
Tapered Guide Sleeve	317-82
Flywheel Ret. Screw Insert for 10-7-194	317-6
Tool for Assembly and Extraction of Main and Cam- shaft Bearing	317-84
Recess Cutter for inlet valve	317-189
Valve Seat Recess Cutter for exhaust valve	317-85
Valve Seat Cutter 26433	317-86
Withdrawal Clamp for Flywheel	317-87
$\frac{3}{8}$ " UNF Bolts for use with 317-87	270-74
Reamer and Fixture for Small End Bushes (LD only)	317-88
Piston Ring Clamp	317-130
Valve Spring Compressor SK.201.42	317-91
Pipe for Injector Testing Set	317-92
Nozzle Cleaning Kit ET.140	317-117
Bent Nose Circlip Pliers	317-95
Shank for Valve Cutter 17230	317-96
Pliers for Gudgeon Pin Circlips	317-53
Pipe for Injector Timing	317-98
Spanner for Coupling Stud $\frac{3}{4}$ " A.F. King Dick	27-4197
NO.O.C.A. 2224	27-151
Spanner for Fuel Oil Union $5/16$ " x $\frac{3}{8}$ "	27-518
Spanner for Injector $\frac{5}{8}$ " B.S.F.	27-4175
Spanner for Cylinder Head $11/16$ " x $13/16$ "	367-16170
Cylinder Fin Cleaning Tool	

COMPLETE SET OF JOINTS FOR TYPE LD1 AND SL1 ENGINES

Description	Part No.	Material	LD1 Qty.	SL1 Qty.
Camshaft End Cover	201-18540	Rubber	1	1
Control Spindle	201-13120	Rubber	1	1
Crankcase Door	291-22341	Rubber	1	1
Cylinder Block	*201-10390	Copper	1	—
Cylinder Head Cover	*201-10510	Cork & Paper	1	1
Cylinder Head Gasket	*201-10382	Steel	1	—
Cylinder Head Gasket Shim	*201-12300	Steel	3	—
Cylinder Head Gasket	*201-17530	Steel	—	1
Cylinder Head Gasket Shim	*201-17540	Steel	—	3
Cylinder Head Nut Washer	*27-545	Soft Iron	4	4
End Cover	201-11211	Paper	1	1
Fuel Pump Inlet Washer	201-12970	Steel & Rubber	2	2
Fuel Pump Housing	201-11402	Fibre	1	1
Fuel Pump Housing	*201-11413	Rubber	1	1
Fuel Pump Housing Door	201-11581	Cork	1	1
Fuel Swivel Union Plug	13-22-350	Copper	4	4
Fuel Tank Cap and Oil Filler	303-253	Cork	2	2
Fuel Banjo Vent Screw	616-1601	Copper	1	1
Injector Sleeve	*201-11720	Fibre	1	1
Injector Sleeve Oil Seal	*201-11080	Rubber	1	1
Inlet and Exhaust Manifold	*201-11130	Fibre	1	1
Lubricating Oil Drain Plug	*291-3063	Copper	1	1
Lubricating Oil Drain Plug	291-3064	Copper	1	1
Oil Reservoir Grommet	*201-12951	Rubber	1	1
Valve Rocker Bracket	*201-11901	Paper	2	2
Valve Rocker Oil Pipe Gland Nut	201-11390	Rubber	1	1
Valve Guide Seal Ring	616-1742	Rubber	1	1
Leak-off Pipe Grommet	*201-11710	Rubber	1	1
Leak-off Pipe Bush	*201-11090	Rubber	1	1
Fuel Pipe Bush	201-11271	Rubber	1	1
Fuel Pump Housing Door Washer	291-2609	Copper	4	4
Fuel Pump Housing Washer	291-2609	Copper	5	5

*Joints for Decarbonising.

Ordering reference for complete set of joints—LD1—LIST 657-10010

Ordering reference for complete set of joints—SL1—LIST 657-10020

Decarbonising joints only—LD1—LIST 657-10000

Decarbonising joints only—SL1—LIST 657-10020

COMPLETE SET OF JOINTS FOR TYPE LD2 & SL2 ENGINE

Description	Part No.	Material	LD1 Qty.	SL1 Qty.
Camshaft End Cover	201-18540	Rubber	1	1
Oil Filler Cap	303-253	Cork	3	3
End Cover	201-11211	Paper	1	1
Crankcase Door	202-12700	Langite	1	1
Fuel Pump Housing to Crankcase	202-11402	Langite	1	1
Fuel Pump Housing to Top Plate	*201-11413	Rubber	2	2
Housing Door	202-11582	Langite	1	1
Swivel Union Plug Joint Washer	291-3062	Copper	4	4
Fuel Banjo Vent Screw	616-1601	Copper	4	4
Control Lever Spindle	201-13120	Rubber	1	1
Fuel Pump Inlet Washer (Dowty)	201-12970	Steel & Rubber	4	4
Lubricating Oil Pump Plug Washer	291-3064	Copper	1	1
Gland Nut Packing Washer	201-11390	Rubber	1	1
Cylinder Block	*201-10390	Copper	2	2
Cylinder Head Gasket	*201-10382	Steel	2	—
Cylinder Head Shim	*201-12300	Steel	8	—
Cylinder Head Gasket	*201-17530	Steel	—	2
Cylinder Head Shim	*201-17540	Steel	—	8
Rocker Bracket	*201-11901	Paper	4	4
Injector Sleeve Oil Seal Ring	*201-11080	Rubber	2	2
Cylinder Head Cover	*201-10510	Cork & Paper	2	2
Oil Reservoir Grommet	*201-12951	Rubber	2	2
Exhaust Manifold	*201-11130	Fibre	2	2
Cylinder Head Nut Washer	*27-545	Soft Iron	1	1
Injector Sleeve Washer	*201-11720	Fibre	2	2
Lubricating Oil Drain Plug	*291-3063	Copper	1	1
Oil Seal Ring for Valve Guides	616-1742	Rubber	2	2
Leak-off pipe Grommet	*201-11710	Rubber	2	2
Leak-off Pipe Bush	*201-11090	Rubber	2	2
Fuel Pipe Bush	201-11271	Rubber	1	1
Fuel Pump Housing Washer	291-2609	Copper	6	6
Fuel Pump Housing Door Washer	291-2609	Copper	6	6

*Joints for Decarbonising.

Ordering reference for complete set of joints—LD2—LIST 657-10050.

Ordering reference for complete set of joints—SL2—LIST 657-10070

Decarbonising joints only—LD2—LIST 657-10040

Decarbonising joints only—SL2—LIST 657-10060

COMPLETE SET OF JOINTS FOR TYPE SL3 ENGINE

Description	Part No.	Material	Quantity
Camshaft End Cover	201-18540	Rubber	1
Oil Filler Cap	303-253	Cork	3
End Cover	201-11211	Paper	1
Crankcase Door	203-12700	Langite	1
Fuel Pump Housing to Crankcase	203-11400	Langite	1
Fuel Pump Housing to Top Plate	*201-11413	Rubber	3
Housing Door	203-11580	Langite	1
Swivel Union Plug Joint Washer	13-22-350	Copper	4
Fuel Banjo Vent Screw	616-1601	Copper	1
Rubber Ring for Dipstick	201-13120	Rubber	1
Fuel Pump Inlet Washer (Dowty)	201-12970	Steel & Rubber	6
Lubricating Oil Pump Plug Washer	616-1524	Copper	1
Gland Nut Packing Washer	201-11390	Rubber	1
Cylinder Block	*201-10390	Copper	3
Cylinder Head Gasket	*201-17530	Steel	3
Cylinder Head Shim	*201-17540	Steel	12
Rocket Bracket	*201-11901	Paper	6
Injector Sleeve Oil Seal Ring	*201-11080	Rubber	3
Cylinder Head Cover	*201-10510	Cork and Paper	3
Oil Reservoir Grommet	*201-12951	Rubber	3
Exhaust Manifold	*203-11130	Fibre	3
Cylinder Head Nut Washer	*27-545	Soft Iron	12
Injector Sleeve Washer	*201-11720	Fibre	3
Lubricating Oil Drain Plug	*201-3063	Copper	1
Oil Seal Ring for Valve Guides	616-1742	Rubber	3
Leak-off Pipe Bush	*201-11090	Rubber	3
Fuel Pipe Bush	201-11271	Rubber	3
Fuel Pump Housing Washer	291-2609	Copper	7
Fuel Pump Housing Door Washer	291-2609	Copper	9

*Joints for Decarbonising.

Ordering reference for complete set of joints—LIST 657-10090

Decarbonising joints only—LIST 657-10080

INTERNAL FUEL SYSTEM JOINTS

Description	Part No.	Material	1 cyl. 2 cyl. 3 cyl.		
Fuel Pump—Barrel Locking Pin ...	660-10030	Aluminium	1	2	3
Fuel Pump—Air Vent Screw ...	660-10040	Fibre	1	2	3
Fuel Injector—Inlet Connection ...	660-10050	Iron	1	2	3
Fuel Pump—Delivery Valve ...	660-10060	Fibre	1	2	3
Fuel Pump—Inlet Connection ...	201-12970	Steel and Rubber	2	4	6

SPECIMEN ORDER FORM FOR SPARE PARTS

IMPORTANT — See Page 48

"SPARE PARTS"—DIRECTIONS FOR ORDERING

To

From

YOUR NORMAL SUPPLIER

Order No.

Date

Lister Engine Serial Number

[illegible]

Despatch Instructions

Engine No.

MAINTENANCE

Attention	Date
Air Cleaner and Filter	
Cooling Fins	
Change Engine Lubricating Oil	
Decarbonise	
Fuel Injection	

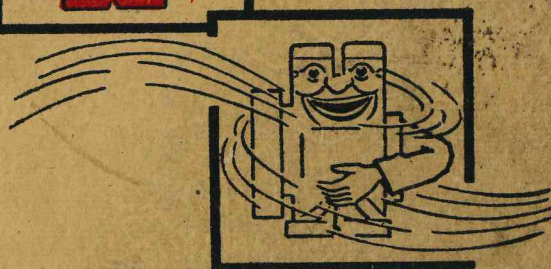
You want the best out of this engine, give
this handbook to the man who has to look
after it

BOOK 352

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TYPES LD & SL 1-2-3 CYLINDERS
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