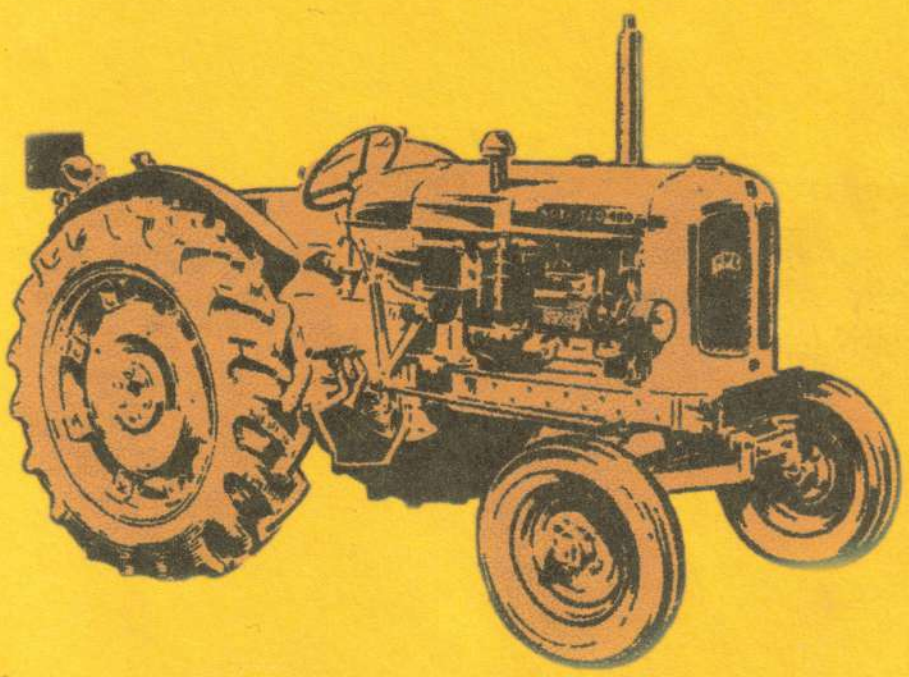
NUFFIELD

TRACTORS
Models
3DL 342 4M 4PM 4DM 460



WORKSHOP MANUAL

NUFFIELD

MODELS

4 M. 4 PM.

3 DL. 4 DM.

342. 460.

WORKSHOP MANUAL

NOTE

Refer to the end of the appropriate Section for the latest instructions when carrying out work on the tractor.

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The British Motor Corporation Limited
BMC Service division

Cowley Oxford England

Telephone – – – – – Oxford 77777
Telegrams – – – BMCSERV, Telex, Oxford
Telex – – BMCSERV, Oxford 83145 and 83146
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Nuffield Tractor. Issue 4

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INTRODUCTION

This Manual has been prepared to provide the service operator with the necessary information for the maintenance and repair of Nuffield tractors.

The Manual also serves as a ready-reference book for service supervision and covers items of procedure for the guidance of both the fully qualified and the less-experienced mechanic.

UNIT ARRANGEMENT

Included in the **'GENERAL DATA'** section in the following order are:

Three- and four-cylinder diesel engine data.
Petrol and vaporizing oil engine data.
Tractor data (all models).

The pages of **'GENERAL INFORMATION'** cover all models.

In the Manual the complete tractor is divided into sections, each of which deals with an assembly or major component and has a reference letter.

NUMBERING OF PAGES AND ILLUSTRATIONS

An index is given at the commencement of each section.

The pages and illustrations are numbered consecutively within each section, and the section title and letter are shown at the top of each page.

SERVICE TOOLS

Use of the correct tools contributes to an efficient, economic, and profitable repair. References have therefore been made to such tools throughout the Manual.

MODIFICATIONS

Refer to the end of the appropriate section for the latest instructions when carrying out any work on the tractor.

CONTENTS

GENERAL DATA

ENGINES

THREE- AND FOUR-CYLINDER DIESEL

ENGINE (2·55-litre)

Type	OEC/2 and OEC/2B. Serial codes 25T/B/D and 25TA/B/D.
Compression ratio	16·5 : 1.
Bore	3·7401 to 3·7409 in. (95·00 to 95·02 mm.).
Stroke	4·724 in. (120 mm.).
Capacity	155·6 cu. in. (2·55 litres).
Torque	108 lb. ft. (14·9 kg. m.) at 1,500 r.p.m.
Cylinder liner shim thickness	·003 and ·005 in. (·076 and ·127 mm.).
Maximum governed light running speed	2,100 r.p.m.
Maximum governed speed under load	2,000 r.p.m.

ENGINE (2·8-litre)

Type	OEG.
Compression ratio	16·5 : 1.
Bore	3·9370 to 3·9378 in. (100·00 to 100·02 mm.).
Stroke	4·724 in. (120 mm.).
Capacity	173 cu. in. (2·8 litres).
Torque	125 lb. ft. (17·3 kg. m.) at 1,500 r.p.m.
Cylinder liner shim thickness	·003 and ·005 in. (·076 and ·127 mm.).
Maximum governed light running speed	2,150 to 2,200 r.p.m.
Maximum governed speed under load	2,000 r.p.m.

ENGINE (3·4-litre)

Type	OEA/2D and OEA/2E. Serial codes 34T/B/D and 34TA/B/D.
Compression ratio	16·5 : 1.
Bore	3·7401 to 3·7409 in. (95·00 to 95·02 mm.).
Stroke	4·724 in. (120 mm.).
Capacity	207·5 cu. in. (3·4 litres).
Torque	131 lb. ft. (18 kg. m.) at 1,500 r.p.m.
Cylinder liner shim thickness	·003 and ·005 in. (·076 and ·127 mm.).
Maximum governed light running speed	2,150 to 2,240 r.p.m.
Maximum governed speed under load	2,000 r.p.m.

ENGINE (3·8-litre)

Type	OEE/2 and OEE/3. Serial codes 38T/BL/D and 38TA/BL/D.
Compression ratio	16·5 : 1.
Bore	3·9370 to 3·9378 in. (100·00 to 100·02 mm.).
Stroke	4·724 in. (120 mm.).
Capacity	231 cu. in. (3·77 litres).
Torque	170 lb. ft. (23·5 kg. m.) at 1,200 r.p.m.
Cylinder liner shim thickness	·003 and ·005 in. (·076 and ·127 mm.).
Maximum governed light running speed	2,120 to 2,160 r.p.m.
Maximum governed speed under load	2,000 r.p.m.

GENERAL DATA (ENGINES)—*continued*

Pistons and rings (2·55- and 3·4-litre)

Compression ring groove width	·096 to ·097 in. (2·438 to 2·463 mm.).
Compression ring width	·093 to ·094 in. (2·362 to 2·387 mm.).
Scraper ring groove width	·252 to ·253 in. (6·400 to 6·426 m.m.).
Scraper ring width	·249 to ·250 in. (6·324 to 6·350 in.).
Ring groove clearance	·002 to ·004 in. (·051 to ·102 mm).
Ring fitted gap	·011 to ·016 in. (·279 to ·406 mm.).
Bore clearance (on thrust face at bottom of skirt)	·0051 to ·0066 in. (·129 to ·168 mm.).

Pistons and rings (2·8- and 3·8-litre)

Compression ring groove clearance	
No. 1	·0095 to ·011 in. (·241 to ·279 mm.).
Nos. 2 and 3	·002 to ·004 in. (·051 to ·102 mm.).
Scraper ring groove clearance (Nos. 4 and 5)	·002 to ·004 in. (·051 to ·102 mm.).
Ring fitted gap	
No. 1 compression	·014 to ·020 in. (·356 to ·508 mm.).
Nos. 2 and 3 compression	·011 to ·016 in. (·279 to ·406 mm.).
Nos. 4 and 5 oil scraper	·011 to ·016 in. (·279 to ·406 mm.).
Bore clearance (on thrust face at bottom of skirt)	·0055 to ·0071 in. (·139 to ·180 mm.).

Gudgeon pins

Fit in piston	Hard hand press fit (room temp. 20 C. (68 F.).
Small-end bush inner diameter (reamed in position)	1·3755 to 1·37605 in. (34·938 to 34·952 mm.).

Connecting rods

Length between centres	8·18 to 8·19 in. (207·77 to 208·03 mm.).
Permissible out-of-parallel of big- and small-ends	·0001 in. per inch (·0001 cm. per cm.) effectual mandrel length.
Big-end bearing diameter	2·4395 to 2·4405 in. (61·963 to 61·988 mm.).
Big-end bearing to crankpin clearance	·002 to ·0035 in. (·051 to ·089 mm.).
Connecting rod to crankshaft side-clearance	·005 to ·007 in. (·127 to ·178 mm.).

Crankshaft and main bearing

Main bearing journal diameter	3·0610 to 3·0615 in. (77·749 to 77·762 mm.).
Crankpin diameter	2·4360 to 2·4365 in. (61·874 to 61·887 mm.).
Journal and crankpin undersize	Standard —·015 in., —·030 in., —·045 in. (—·381 mm. —·762 mm., —1·147 mm.).
Main bearing diameter	3·0645 to 3·0660 in. (77·838 to 77·876 mm.).
Bearing to crankshaft journal clearance	·003 to ·005 in. (·076 to ·127 mm.).
Rear oil seal cover to oil return thread clearance	·0070 to ·0085 in. (·178 to ·216 mm.) all round.
End-float (controlled by thrust washers)	·006 to ·010 in. (·152 to ·254 mm.).
Thickness of thrust washers	·091 to ·093 in. (2·31 to 2·36 mm.).

Camshaft (2·55- and 3·4-litre)

End-float (controlled by thrust plate)	·002 to ·012 in. (·051 to ·305 mm.).
Thrust plate thickness	·281 to ·285 in. (7·14 to 7·24 mm.).
Cam lift (early engines)	·258 in. (6·55 mm.).
Cam lift (later engines)	·270 in. (6·86 mm.).

Camshaft (2·8- and 3·8-litre)

End-float (controlled by thrust plate)	·002 to ·012 in. (·051 to ·305 mm.).
Thrust plate thickness	·281 to ·285 in. (7·14 to 7·24 mm.).
Cam lift	·270 in. (6·86 mm.).

Camshaft bearings

Journal diameters	
No. 1	1·997 to 1·998 in. (50·723 to 50·749 mm.).
Remainder	1·871 to 1·872 in. (47·5234 to 47·5488 mm.).
Bearing diameters	
No. 1 (bush)	1·9995 to 2·0010 in. (50·787 to 50·825 mm.).
Remainder	1·87475 to 1·87575 in. (47·6186 to 47·6440 mm.).
Bearing to camshaft clearance	
No. 1 (bush)	·0015 to ·0040 in. (·038 to ·102 mm.).
Remainder	·00275 to ·00475 in. (·0698 to ·1206 mm.).

Timing chain and wheels (2·55- and 3·4-litre)

Pitch	$\frac{3}{8}$ in. (9·525 mm.).
Number of pitches in length	112.
Number of pitches between 'bright' links	
Camshaft wheel to injection pump	30.
Camshaft wheel to crankshaft wheel	34.
Number of teeth	
Crankshaft wheel	21.
Camshaft wheel	42.
Tensioner wheel	25.
Injection pump wheel	42.
Timing chain guide pad thickness	$\frac{9}{32}$ in. (7·14 mm.).

Timing gears (2·55-, 2·8-, and 3·8-litre)

Backlash	·004 to ·006 in. (·102 to ·152 mm.).
Number of teeth on	
Crankshaft gear	25.
Camshaft gear	50.
Fuel injection pump gear	50.
Idler gear	58.
Idler gear bush inner diameter (reamed in position)	1·125 to 1·1255 in. (28·575 to 28·588 mm.).
Idler gear bush to shaft clearance	·001 to ·002 in. (·025 to ·051 mm.).
Thickness of idler gear thrust washer	·068 to ·070 in. (1·73 to 1·78 mm.).
Oil feed jet diameter	·062 in. (1·59 mm.).

Cylinder head and valve mechanism

	Inlet	*Exhaust*
Valve opens	5° B.T.D.C.	45° B.B.D.C.
Valve closes	40° A.B.D.C.	5° A.T.D.C.
Valve seat angle (cylinder head and valve)	45°	45°
Valve seat face width	·078 to ·099 in. (1·98 to 2·5 mm.)	·078 to ·099 in. (1·98 to 2·5 mm.)
Valve head diameter	1·558 to 1·563 in. (39·57 to 39·70 mm.)	1·401 to 1·406 in. (35·58 to 35·71 mm.)
Valve stem diameter	·3436 to ·3440 in. (8·727 to 8·737 mm.)	·3436 to ·3440 in. (8·727 to 8·737 mm.)
Valve guide bore diameter	·3460 to ·3465 in. (8·788 to 8·801 mm.)	·3460 to ·3465 in. (8·788 to 8·801 mm.)

GENERAL DATA (ENGINES)—*continued*

	Inlet	*Exhaust*
Valve stem to guide clearance:		
Early engines	·0020 to ·0029 in. (·051 to ·074 mm.)	·0020 to ·0029 in. (·051 to ·074 mm.)
Later engines	·001 to ·0025 in. (·025 to ·051 mm.)	·001 to ·0025 in. (·025 to ·051 mm.)
Valve stem to rocker clearance—hot or cold	·013 in. (·33 mm.)	·013 in. (·33 mm.)
Valve lift		
Early 2·55-, and 3·4-litre	·417 in. (10·59 mm.)	·417 in. (10·59 mm.)
2·8-, 3·8-, and later 2·55-, and 3·4-litre	·436 in. (11·08 mm.)	·436 in. (11·08 mm.)

	Inner	*Outer*
Valve springs		
Free length	1·8 in. (45·72 mm.)	2·25 in. (57·15 mm.)
Fitted length (valve closed)	1·594 in. (40·487 mm.)	1·875 in. (47·625 mm.)
Fitted length (valve open)	1·177 in. (29·896 mm.)	1·458 in. (37·033 mm.)
Load to compress to fitted length (valve open)	40 lb. (18·14 kg.)	90 lb. (40·82 kg.)

Rocker shaft diameter	·7177 to ·7182 in. (18·229 to 18·242 mm.).
Valve rocker bore diameter	·7192 to ·7202 in. (18·267 to 18·293 mm.).
Rocker to rocker shaft clearance	·0010 to ·0025 in. (·025 to ·064 mm.).
Rocker shaft distance collar thicknesses	
Front and rear ends of shaft, 2·55-litre	·243 to ·250 in. (6·17 to 6·35 mm.).
Each side of intermediate brackets, 2·55-litre	·290 to ·297 in. (7·37 to 7·54 mm.).
Between each rocker and bracket (2·8-litre)	·290 to ·297 in. (7·37 to 7·54 mm.).
Between each rocker and bracket (3·4- and 3·8-litre)	·243 to ·250 in. (6·17 to 6·35 mm.).
Between each pair of rockers	·8055 to ·8125 in. (20·46 to 20·64 mm.).
Tappet diameter	1·12350 to 1·12425 in. (28·536 to 28·556 mm.).
Tappet guide bore diameter	1·12475 to 1·12575 in. (28·569 to 28·594 mm.).
Tappet to guide clearance	·0005 to ·0023 in. (·013 to ·058 mm.).

Flywheel and starter ring

Maximum thickness of metal to be removed during 'skimming'	$\frac{3}{32}$ in. (2·38 mm.).
Run-out of flywheel on assembly	Zero to ·003 in. (·076 mm.).
Number of teeth on starter ring	126.
Starter ring to flywheel interference	·021 to ·029 in. (·533 to ·737 mm.).
To fit starter ring to flywheel heat to	275° C. (527° F.).

Oil pump

Driving shaft to pump body clearance	·0025 in. (·063 mm.) maximum.
End-float of pump rotors	·0020 to ·0045 in. (·051 to ·114 mm.).
Clearance between rotor lobes	·002 to ·004 in. (·051 to ·102 mm.).
Number of teeth on driving and driven gears	46.
Backlash between gears	·004 in. (·102 mm.).
Thickness of body shims	·002 and ·003 in. (·051 and ·076 mm.).

Main oil relief valve

Spring free length	$2\frac{1}{8}$ in. (53·98 mm.).
Spring fitted length	$1\frac{1}{16}$ in. (26·99 mm.).
Load to compress spring to fitted length	5 lb. (2·27 kg.).
Diameter of ball (early engines)	$\frac{7}{16}$ in. (11·11 mm.).

GENERAL DATA (ENGINES)—*continued*

Rocker gear oil relief valve	
Spring free length	¾ in. (19 mm.).
Spring fitted length	⅝ in. (15·9 mm.).
Load to compress to fitted length	3 oz. (85 gm.).
Diameter of ball	·236 in. (6 mm.).
Oil pressure	
Idling speed (3·4- and 3·8-litre)	10 to 15 lb./sq. in. (·7 to 1·05 kg./cm.²).
At 2,000 r.p.m. 94° C. (200° F.) (3·4- and 3·8-litre)	30 to 35 lb./sq. in. (2·11 to 2·46 kg./cm.²).
Idling (2·55-litre)	20 lb./sq. in. (1·4 kg./cm.²).
Normal (2·55-litre)	50 lb./sq. in. (3·5 kg./cm.²).
Idling (2·8-litre)	10 to 15 lb./sq. in. (·7 to 1·05 kg./cm².).
Normal (2·8-litre)	35 to 40 lb./sq. in. (2·46 to 2·81 kg./cm.²).
Oil filter	Purolator or Vokes.
Oil capacity of complete engine	15 pints (8·52 litres).

COOLING SYSTEM

Pump shaft to bush clearance	Running fit.
Pump end cover shim thicknesses	·008, ·015, and ·028 in. (·203, ·38, and ·71 mm.).
Number of fan blades	2.
Overall diameter of fan blades	16 in. (40·6 cm.).
Fan belt	
Depth	·406 to ·447 in. (10·31 to 11·35 mm.).
Width (outside)	·526 in. (13·36 mm.).
Angle of 'V'	40°.
Lateral movement (measured at the vertical run)	1 in. (25 mm.).
Thermostat	
Opening temperature	77 to 80° C. (170 to 176° F.).
Fully open temperature	94° C. (201° F.).
Valve lift	⅜ in. (9·5 mm.).

FUEL SYSTEM

Lift pump	A.C.
Main filter	Simms Type FF/111 or FH.23.
Fuel injection (2·55- and 3·4-litre)	
Injection pump	Simms.
Injection order (2·55-litre)	1, 3, 2.
Injection order (3·4-litre)	1, 3, 4, 2.
Injection timing	28° B.T.D.C.
Camshaft end-float (controlled by shims)	·002 to ·006 in. (·051 to ·152 mm.).
Shim sizes	·004 and ·008 in. (·1 and ·2 mm.).
Tappet spacer sizes	
No. 1 or 6A	·181 in. (4·6 mm.).
No. 2 or 7A	·185 in. (4·7 mm.).
No. 3 or 8A	·189 in. (4·8 mm.).
No. 4 or 9A	·193 in. (4·9 mm.).
No. 5 or 10A	·197 in. (5·0 mm.).
Injection pump drive coupling	Simms.
Venturi control unit	Simms.
Injectors	Simms.

Injection pressure	175 atmospheres.*
Plunger shim size	·015 in. (·375 mm.).

Fuel injection (2·8- and 3·8-litre)

Injection pump	Simms (Minimec).
Injection order (2·8-litre)	1, 3, 2.
Injection order (3·8-litre)	1, 3, 4, 2.
Injection timing	25° B.T.D.C.
Camshaft end-float (controlled by shims)	·002 to ·005 in. (·05 to ·126 mm.).
Shim sizes	·004 to ·008 in. (·1 to ·2 mm.).
Phase angle (controlled by tappet spacers)	
2·8-litre	120±½°.
3·8-litre	90±½°.

Tappet spacer sizes

Spacer thickness	*No. stamped on spacer*
·153 in. (3·9 mm.)	1
·157 in. (4·0 mm.)	2
·161 in. (4·1 mm.)	3
·165 in. (4·2 mm.)	4
·169 in. (4·3 mm.)	5
·173 in. (4·4 mm.)	6A
·177 in. (4·5 mm.)	7
·181 in. (4·6 mm.)	8
·185 in. (4·7 mm.)	9A
·189 in. (4·8 mm.)	10
·193 in. (4·9 mm.)	11
·197 in. (5·0 mm.)	12

Plunger vertical end-float (controlled by lower spring discs) ·002 to ·008 in. (·05 to ·2 mm.).

Effective thickness of disc	*No. stamped on disc*
·025 in. (·65 mm.)	1B
·029 in. (·75 mm.)	2B
·033 in. (·85 mm.)	3B
·037 in. (·95 mm.)	4B
·041 in. (1·05 mm.)	5B
·045 in. (1·15 mm.)	6B
·049 in. (1·25 mm.)	7B
·053 in. (1·35 mm.)	8B
·057 in. (1·45 mm.)	9B
·061 in. (1·55 mm.)	10B
·065 in. (1·65 mm.)	11B
·069 in. (1·75 mm.)	12B
·073 in. (1·85 mm.)	13B
·077 in. (1·95 mm.)	14B
·081 in. (2·05 mm.)	15B
·085 in. (2·15 mm.)	16B

* Add 5 atmospheres to the opening pressure when setting new injectors or after fitting new springs, to allow for settling of the components.

Plunger head clearance	·040 to ·060 in. (1·0 to 1·5 mm.).

Repair and general maintenance data

Test injectors (set at 175 atmospheres)	
Nozzle holder	BKB.50.SD.19b.
Nozzle	BDN.12.SD.12.
Calibration (2·55-litre)	
Control rod setting	16·5 mm.
Pump output for 200 shots	3±·2 c.c. at 225 r.p.m.
Maximum fuel setting (2·55-litre)	
Element output for 200 shots	10·2 to 11·0 c.c. at 600 r.p.m.
Average output for 200 shots	10·6±·2 c.c. at 600 r.p.m.
Calibration (2·8-litre)	
Maximum fuel setting	
Element output for 200 shots	11·3 to 12·1 c.c. at 600 r.p.m.
Average output for 200 shots	11·7±·2 c.c. at 600 r.p.m.
Idling	
Average output for 200 shots	3 c.c. at 250 r.p.m.
Calibration (3·4-litre)	
Control rod setting	7·0 mm.
Pump output for 200 shots	3±·2 c.c. at 225 r.p.m.
Maximum fuel setting (3·4-litre)	
Element output for 200 shots	10·2 to 11·0 c.c. at 600 r.p.m.
Average output for 200 shots	10·6±·2 c.c. at 600 r.p.m.
Calibration (3·8-litre)	
Maximum fuel setting	
Element output for 200 shots	10·8 to 11·6 c.c. at 600 r.p.m.
Average output for 200 shots	11·2±·2 c.c. at 600 r.p.m.
Idling	
Average output for 200 shots	3 c.c. at 250 r.p.m.

Test stations and National Institutes with dynamometer and fuel flow equipment

Engine speed, under maximum load	1,500 r.p.m.
Observed flow meter reading	
2·55-litre	½ pint (·284 litre) in 142±2 sec.
2·8-litre	½ pint (·284 litre) in 135±2 sec.
3·4-litre	½ pint (·284 litre) in 110±2 sec.
3·8-litre	½ pint (·284 litre) in 100±2 sec.

ELECTRICAL SYSTEM

Dynamo	
To Tractor No. 38241)	Lucas 12-volt, C39P2 (non-ventilated).
From Tractor No. 38242)	Lucas 12-volt, C40 (non-ventilated).
Starter motor	
To Engine Nos. 25T/B/D 5304 and 34T/B/D 47766	Lucas 12-volt, lever-engaged.
From Engine Nos. 25T/B/D 5305 and 34T/B/D 47767) and all 3·8-litre engines	Lucas 12-volt, solenoid-operated.
Solenoid switch	Lucas.

TORQUE WRENCH SETTINGS

Cylinder head nuts	100 lb. ft. (13·8 kg. m.).
Connecting rod big-end bolts	60 lb. ft. (8·3 kg. m.).
Main bearing nuts (slotted)	83 lb. ft. (11·5 kg. m.).
Main bearing nuts (Nyloc)	100 lb. ft. (13·8 kg. m.).
Flywheel bolts	100 lb. ft. (13·8 kg. m.).
Injector securing bolts	12 lb. ft. (1·6 kg. m.).
Delivery valve holder nuts	30 lb. ft. (4 kg. m.).
Starter motor drive clutch	65 to 80 lb. ft. (9 to 11 kg. m.).
Valve rocker bracket bolts	
$\frac{3}{8}$ in. (9·52 mm.)	30 lb. ft. (4 kg. m.).
$\frac{5}{16}$ in. (7·94 mm.)	15 lb. ft. (2 kg. m.).
Exhaust manifold bolts	30 lb. ft. (4 kg. m.).

PETROL AND VAPORIZING OIL

ENGINE

Serial code (vaporizing oil engine)	38T/V/T.
Serial code (petrol engine)	38T/V.
Engine type	4-cylinder side-valve.
Bore	3·937 in. (100 mm.).
Stroke	4·724 in. (120 mm.).
Capacity	230 cu. in. (3770 c.c.).

V.O.

Compression ratio .. 4·25 : 1.

	Engine speed (r.p.m.)					
	800	1,000	1,200	1,400	1,700	2,000
Brake M.E.P. (lb./sq. in.)	89·8	90·8	88·5	84·5	76·6	65·5
Brake M.E.P. (kg./cm.²)	6·3	6·38	6·2	5·94	5·39	4·6
Torque at flywheel (lb. ft.)	137	138·5	135	129	117	100
Torque at flywheel (kg. m.)	18·9	19·2	18·7	17·8	16·2	13·82
Brake-horse-power at flywheel	20·8	26·4	31	34·2	26·9	38
Horse-power at belt pulley	19·7	25	29·4	32·4	35·1	36

Petrol

Compression ratio .. 6·0 : 1.

	Engine speed (r.p.m.)					
	800	1,000	1,200	1,400	1,700	2,000
Brake M.E.P. (lb./sq. in.)	95·5	97·7	97·3	97	90·4	81·7
Brake M.E.P. (kg./cm.²)	6·7	6·86	6·83	6·8	6·35	5·75
Torque at flywheel (lb. ft.)	146	149	148·5	148	138	125
Torque at flywheel (kg. m.)	20·2	20·6	20·5	20·4	19·1	17·3
Brake-horse-power at flywheel (test-bed)	22	28·8	34·5	39·5	45	47·8
Horse-power at belt pulley	20·8	27·4	32·7	37·5	42·6	45·4

Pistons and rings	
Piston material	Light alloy.
Oversize bore	+·020 in. (·508 mm.).
Actual bore	3·957 in. (100·508 mm.).
Piston skirt clearance (on thrust side 90° to gudgeon pin)	·005 in. (·127 mm.).
Number of rings	
Compression	2.
Oil control	1.
Wide type	1.
Width of ring	
Compression	·0928 to ·0938 in. (2·36 to 2·38 mm.).
Oil control	·1865 to ·1875 in. (4·73 to 4·76 mm.).
Wide type	·1865 to ·1875 in. (4·73 to 4·76 mm.).
Ring groove clearance	·001 in. (·025 mm.).
Piston ring gap	
Compression	·011 to ·016 in. (·28 to ·41 mm.).
Oil control	·008 to ·012 in. (·2 to ·3 mm.).
Wide type	·011 to ·016 in. (·28 to ·41 mm.).
Gudgeon pins	
Diameter	1·062 in. (26·97 mm.).
Length	3·5 in. (89 mm.).
Method of location	Clamped in connecting rod.
Connecting rods	
Length between centres	8·545 in. (217·04 mm.).
Big-end bearing to crankpin clearance	·00075 to ·00275 in. (·019 to ·07 mm.).
Big-end bearing end-float	·0075 to ·0105 in. (·19 to ·267 mm.).
Crankshaft and main bearings	
Diameter of crankshaft main journals	
Standard	2·3745 to 2·375 in. (60·317 to 60·33 mm.).
1st regrind	Std.—·015 in. (·381 mm.).
2nd regrind, minimum	Std.—·030 in. (·762 mm.).
Crankpin diameter	
Standard	1·99725 to 1·99825 in. (50·72015 to 50·75555 mm.).
1st regrind	Std.—·015 in. (·381 mm.).
2nd regrind, minimum	Std.—·030 in. (·762 mm.).
Main bearing effective width	
Front	1·826 in. (46·38 mm.).
Rear	2·242 in. (56·95 mm.).
Rear	2·927 in. (74·35 mm.).
Bearing to crankshaft journal clearance	·002 to ·003 in. (·05 to ·076 mm.).
Crankshaft end-float	·004 to ·008 in. (·10 to ·20 mm.).
Camshaft and bearings	
Journal diameters	
Front	2·2465 to 2·2475 in. (57·058 to 57·083 mm.).
Centre	2·1840 to 2·1850 in. (55·472 to 55·497 mm.).
Rear	1·872 to 1·875 in. (47·551 to 47·672 mm.).
Bearing to journal clearance	·0025 in. (·063 mm.).
End-float	By spring-loaded plunger.
Timing chain and wheels	
Pitch	$\frac{3}{8}$ in. (9·52 mm.).
Number of pitches in length	80.

Timing markings	'T' marks on chain wheels and bright links in chain.
Number of pitches between 'bright' links (camshaft wheel to crankshaft wheel)	22.

	Inlet	*Exhaust*
Valve mechanism		
Valve opens	T.D.C.	45° B.B.D.C.
Valve closes	40° A.B.D.C.	8° A.T.D.C.
Valve seat angle	30°.	30°.
Valve head diameter	1·844 in. (46·8 mm.)	1·844 in. (46·8 mm.)
Valve lift	·375 in. (9·52 mm.)	·371 in. (9·42 mm.)
Valve stem to guide clearance	·0033 to ·0048 in. (·084 to ·122 mm.)	·0033 to ·0048 in. (·084 to ·122 mm.)
Valve guide internal diameter	·375 in. (9·52 mm.)	·375 in. (9·52 mm.)
Valve tappet type	Mushroom foot, adjustable head	Mushroom foot, adjustable head
Valve tappet clearance (cold)	·004 in. (·101 mm.)	·018 in. (·457 mm.)
Valve spring length	2·704 in. (68·7 mm.)	2·704 in. (68·7 mm.)
Valve spring poundage		
Shut	48 lb. (21·7 kg.)	48 lb. (21·7 kg.)
Open	82 lb. (37·2 kg.)	82 lb. (37·2 kg.)

Oil pump	
Gear end-float	·001 to ·0025 in. (·03 to ·06 mm.).
Diametrical clearance	·007 to ·0085 in. (·18 to ·22 mm.).
Oil pressure relief operates	60 lb./sq. in. (4·22 kg./m.^{2}).
Oil filter	Fram external, Type FHM801/1.
Oil filter element	B.M.C. Part No. 17H541.
COOLING SYSTEM	
Thermostat opening temperature	171 to 176° F. (77 to 80° C.).
Radiator top hose size	2 in. (I/D) × 2¼ in. (50·8 mm. × 57·1 mm.).
Radiator bottom hose size	1⅜ in. (I/D) × 2¼ in. (34·9 mm. × 57·1 mm.).

	V.O. engine	*Petrol engine*
IGNITION		
Distributor type	Lucas D3A4, Dispatch No. 40341A	Lucas D3A4, Dispatch No. 40344A
Distributor rotation	Counter-clockwise (viewed from above)	Counter-clockwise (viewed from above)
Distributor advance commences	125 to 275 r.p.m.	450 to 600 r.p.m.
Distributor maximum advance	18 to 20° at 1,150 r.p.m.	11 to 13° at 950 r.p.m.
Contact breaker gap	·014 to ·016 in. (·36 to ·41 mm.)	·014 to ·016 in. (·36 to ·41 mm.)
Coil	Lucas ER12V, Dispatch No. 45012A	Lucas ER12V, Dispatch No. 45012A
Ignition timing	T.D.C.	T.D.C.
Sparking plugs	Champion N21 (formerly N7) 14 mm. ¾ in. reach	Champion N21 (formerly N7) 14 mm. ¾ in. reach
Sparking plug gap	·030 in. (·76 mm.)	·030 in. (·76 mm.)
Firing order	1, 3, 4, 2	1, 3, 4, 2

ELECTRICAL SYSTEM

Dynamo	Lucas C39P2. Non-ventilated.
Starter	Lucas M45G, Type L5.
Number of teeth on starter pinion	11.

CARBURETTER

	V.O. engine	*Petrol engine*
Type	Solex 30 FV3	Solex 30 FV2
Needle valve	2·5 mm.	2·5 mm.
Main jet	110/51	105/54
Main jet cap	12/300	12/300
Pilot jet	60	55
Choke tube	30/24	30/23
Starter jet	100	—
Air jet	6·5 (2 off)	—

GENERAL DATA
TRACTORS

BRAKES		
Type	Lockheed internal expanding.	
Lining type	Capasco H.F. 32.	
Lining size	$8\frac{5}{8}$ in. × $2\frac{3}{16}$ in. × $\frac{5}{8}$ in. (219 mm. × 55·5 mm. × 4 mm.).	
Number of rivets	12 per shoe.	
Size of rivet	$\frac{9}{64}$ in. dia. × $\frac{9}{32}$ in. long (3 57 mm. × 7·14 mm.).	
Type of rivet	Hollow, with flat head.	
DIMENSIONS	*4 M, 4 PM, 4 DM, and* 460	*3 DL and* 342
Wheelbase	78 in. (198 cm.)	73 in. (185 cm.)
Track		
Front (minimum)—up to Tractor No. 30126	$52\frac{3}{4}$ in. (134 cm.)	$52\frac{3}{4}$ in. (134 cm.)
Front (maximum)—up to Tractor No. 30126	$71\frac{1}{4}$ in. (182 cm.)	$71\frac{1}{4}$ in. (182 cm.)
Front (minimum)—from Tractor No. 30127	52 in. (132 cm.)	52 in. (132 cm.)
Front (maximum)—from Tractor No. 30127	68 in. (173 cm.)	68 in. (173 cm.)
Rear (minimum)—flanged axle	53 in. (134 cm.)	52 in. (132 cm.)
Rear (maximum)—flanged axle	77 in. (195 cm.)	80 in. (203 cm.)
Rear (minimum)—sliding hub axle	53 in. (134 cm.)	—
Rear (maximum)—sliding hub axle	88 in. (224 cm.)	—
Overall length	$121\frac{1}{2}$ in. (309 cm.)	115 in. (292 cm.)
Overall width	69 in. (175 cm.)	68 in. (172 cm.)
Overall height (over exhaust pipe)	$80\frac{3}{4}$ in. (205 cm.)	76 in. (193 cm.)
Ground clearance		
Under front axle	*17 in. (43 cm.)	†$16\frac{3}{4}$ in. (42 cm.)
Under frame	*$24\frac{3}{4}$ in. (63 cm.)	†$18\frac{3}{8}$ in. (46 cm.)
Under final drive	*$18\frac{1}{4}$ in. (46 cm.)	†$13\frac{7}{8}$ in. (35 cm.)
Under rear axle	*23 in. (58 cm.)	†$18\frac{5}{8}$ in. (47 cm.)
WEIGHTS		
Fully equipped (tanks full)	*4,945 lb. (2243 kg.)	†4,330 lb. (1964 kg.)
Basic model (tanks full)	*4,545 lb. (2062 kg.)	†3,930 lb. (1783 kg.)
WHEEL SIZES		
Front wheels	4·50E × 16 3·62 × 19 5·50 × 16	4·50E × 16 3·62 × 19 5·50 × 16
Rear wheels	W10·00 × 32 W10·00 × 36 W10·00 × 38 DW11·00 × 30	W9·00 × 28 W10·00 × 32 W11·00 × 28
TYRE SIZES		
Front tyres	6·00—16 (4- and 6-ply) 6·00—19 (6-ply) 7·50—16 (6-ply)	5·50—16 (4-ply) 6·00—16 (4- and 6-ply) 6·00—19 (6-ply) 7·50—16 (6-ply)
Rear tyres	11·00—32 (6-ply) 11·00—36 (4- and 6-ply) 12·00—38 (6-ply) 13·00—30 (6-ply) 14·30—30 (6-ply)	10·00—28 (4-ply) 11·00—28 (4- and 6-ply) 13·00—28 (6-ply)

* With 11·00—36 tyres. † With 10·00—28 tyres.

TYRE PRESSURES

	Ply	Normal Pressure lb./sq. in.	Normal Pressure kg./cm.²	Maximum Pressure lb./sq. in.	Maximum Pressure kg./cm.²
Front					
5·50—16	4	28	2·0	32	2·25
6·00—16	4	28	2·0	32	2·25
6·00—16	6	28	2·0	48	3·5
6·00—19	6	28	2·0	48	3·5
7·50—16	6	—	—	36	2·5
Rear					
10·00—28	4	12	·9	16	1·1
11·00—28	4	12	·9	14	·98
11·00—28	6	12	·9	16	1·1
13·00—28	6	12	·9	18	1·27
13·00—30	6	12	·9	18	1·27
14·00—30	6	12	·9	16	1·1
11·00—32	6	12	·9	22	1·5
11·00—36	4	12	·9	14	·98
11·00—36	6	12	·9	22	1·5
12·00—38	6	12	·9	20	1·4

TRANSMISSION

	Ratio	Overall ratio
First gear	7·60 : 1	139 : 1
Second gear	4·81 : 1	88·2 : 1
Third gear	3·42 : 1	62·6 : 1
Fourth gear	2·32 : 1	42·5 : 1
Fifth gear	1·00 : 1	18·3 : 1
Reverse gear	4·36 : 1	80·0 : 1
Crown wheel drive ratio	8/35 (4·38 : 1)	
Final drive spur gear ratio	11/46 (4·18 : 1)	
Crown wheel and pinion backlash	·010 to ·013 in. (·254 to ·330 mm.)	

ROAD SPEEDS

Nuffield 342 with 10·00—28 tyres

		Engine speed (r.p.m.) 800	1,100	1,400	1,700	2,000
First gear	**(m.p.h.)**	**0·75**	**1·02**	**1·3**	**1·57**	**1·85**
	(km.p.h.)	1·21	1·70	2·1	2·54	2·98
Second gear	**(m.p.h.)**	**1·17**	**1·60**	**2·04**	**2·48**	**2·92**
	(km.p.h.)	1·98	2·58	3·24	4·0	4·70
Third gear	**(m.p.h.)**	**1·65**	**2·26**	**2·88**	**3·5**	**4·12**
	(km.p.h.)	2·61	3·65	4·7	5·63	6·6
Fourth gear	**(m.p.h.)**	**2·43**	**3·34**	**4·25**	**5·16**	**6·07**
	(km.p.h.)	3·9	5·38	6·82	8·31	9·75
Fifth gear	**(m.p.h.)**	**5·65**	**7·76**	**9·88**	**11·91**	**14·1**
	(km.p.h.)	9·10	12·5	15·3	19·3	22·5
Reverse gear	**(m.p.h.)**	**1·29**	**1·77**	**2·26**	**2·75**	**3·23**
	(km.p.h.)	2·08	2·86	3·6	4·42	5·21

Nuffield 460 with 11·00—36 tyres		*Engine speed (r.p.m.)*				
		800	1,100	1,400	1,700	2,000
First gear	**(m.p.h.)**	**0·91**	**1·25**	**1·59**	**1·92**	**2·26**
	(km.p.h.)	1·46	2·02	2·56	3·1	3·65
Second gear	**(m.p.h.)**	**1·43**	**1·98**	**2·52**	**3·03**	**3·60**
	(km.p.h.)	2·3	3·17	4·05	4·9	5·8
Third gear	**(m.p.h.)**	**2·02**	**2·75**	**3·53**	**4·30**	**5·05**
	(km.p.h.)	3·25	4·45	5·7	6·92	8·15
Fourth gear	**(m.p.h.)**	**2·97**	**4·10**	**5·20**	**6·30**	**7·45**
	(km.p.h.)	4·8	6·6	8·4	10·15	12·0
Fifth gear	**(m.p.h.)**	**6·9**	**9·5**	**12·1**	**14·7**	**17·3**
	(km.p.h.)	11·1	15·3	19·5	23·6	27·8
Reverse gear	**(m.p.h.)**	**1·58**	**2·18**	**2·77**	**3·36**	**3·96**
	(km.p.h.)	2·55	3·50	4·46	5·42	6·4

STEERING

Steering-wheel diameter	18 in. (45·7 cm.).
Revolutions of wheel (lock to lock)	4·75.
Turning circle without brakes	129 in. (3·28 m.).
Toe-in	$\frac{1}{8}$ in. (3·18 mm.).
Camber angle	1° 54′.
Castor angle	3° 50′.
King pin angle	0°.

CLUTCH

Type: Standard	Borg & Beck 11 in. (28 cm.) single dry plate.
Pressure springs	Colour Black.
Free length	2·798 in. (71·04 mm.).
Fitted length	1·688 in. (40·80 mm.).
Load (fitted)	150 to 160 lb. (65·76 to 72·57 kg.).
Type: With independent power take-off	Borg & Beck 11 in. (28 cm.) double clutch.
Pressure springs	Colour Light Blue.
Free length	1·93 in. (49·2 mm.).
Fitted length	1·41 in. (35·82 mm.).
Load (fitted)	145 to 155 lb. (65·76 to 70·29 kg.).
Pressure springs	Colour Cream.
Free length	2·68 in. (68·07 mm.).
Fitted length	1·68 in. (42·88 mm.).
Load (fitted)	120 to 130 lb. (54·4 to 59 kg.).
Type: Heavy duty	Borg & Beck 13 in. (33·02 cm.) single dry plate.
Pressure springs	Colour Yellow/Light Green.
Free length	2·68 in. (68·07 mm.).
Fitted length	1·688 in. (40·80 mm.).
Load (fitted)	135 to 145 lb. (54·42 to 65·76 kg.).

CAPACITIES

	4 *M and* 4 *PM*	3 *DL and* 342 4 *DM and* 460
Fuel tank	14 gal. (63·6 litres)	14 gal. (63·6 litres)
Engine sump (includes filter)	14 pints (8·0 litres)	15 pints (8·5 litres)
Gearbox and transmission	12 gal. (54·5 litres)	12 gal. (54·5 litres)
Steering-box	6 pints (3·4 litres)	3¼ pints (1·84 litres)
Air cleaner	1 pint (·57 litre)	1½ pints (·85 litre)
Cooling system	30 pints (17 litres)	—
Up to Tractor Nos. 771–7261 and 772–1999 (3 DL and 342)	—	21 pints (11·91 litres)
Up to Tractor Nos. 787–9854 and 792–4085 (4 DM and 460)	—	27 pints (15·3 litres)
From Tractor Nos. 771–7334 and 772–2031 (3 DL and 342)	—	18 pints (10·2 litres)
From Tractor Nos. 787–11721 and 792–10883 (4 DM and 460)	—	24 pints (13·6 litres)

Anti-freeze safe limit

	Absolute safe limit	*Commences freezing*
20 per cent. solution	−19° C.	−9° C.
25 per cent. solution	−26° C.	−13° C.
30 per cent. solution	−33° C.	−16° C.

Anti-freeze quantities

20 per cent.	*25 per cent.*	*30 per cent.*
30 pints (17 litres)	6 pints (3·4 litres)	7·5 pints (4·25 litres)	9 pints (5·11 litres)
27 pints (15·3 litres)	5·40 pints (3·06 litres)	6·75 pints (3·84 litres)	8·00 pints (4·54 litres)
24 pints (13·6 litres)	4·80 pints (2·72 litres)	6·00 pints (3·41 litres)	7·25 pints (4·14 litres)
21 pints (11·9 litres)	4·20 pints (2·38 litres)	5·25 pints (2·98 litres)	6·25 pints (3·55 litres)
18 pints (10·2 litres)	3·60 pints (2·05 litres)	4·50 pints (2·55 litres)	5·50 pints (3·12 litres)

BELT PULLEY

Location	Left-hand side of tractor.
Direction of rotation	Anti-clockwise viewed from left-hand side.
Direction of drive	Forward.
Diameter of pulley	10¼ in. (26 cm.).
Width of pulley	6½ in. (16·5 cm.) for 6-in. (15-cm.) belt.
Speed at rated r.p.m. (1,600)	1,232 r.p.m.
Speed at max. r.p.m. (2,000)	1,642 r.p.m.
Belt speed at rated r.p.m.	3,380 ft./min. (17·17 m./sec.).
Belt speed at max. r.p.m.	4,510 ft./min. (22·91 m./sec.).
Lubrication	Automatic.

POWER TAKE-OFF

	4 *M* and 4 *PM* 4 *DM and* 460	3 *DL and* 342
Location	Central—at rear of tractor	Central—at rear of tractor
Height above ground	29 in. (73·7 cm.)	24 in. (63 cm.)
Driving splines	1⅜ in. (34·92 mm.) S.A.E. standard	1⅜ in. (34·92 mm.) S.A.E. standard
Direction of rotation	Clockwise (viewed from rear)	Clockwise (viewed from rear)

	Engine speed (*r.p.m.*)				
	800	1,100	1,400	1,700	2,000
Power take-off shaft speed (r.p.m.)	302	415	528	642	755

HYDRAULIC POWER UNIT

Maximum pressure	1,900 to 2,200 lb./sq. in. (134 to 155 kg./cm.²)
Maximum lift at arms	4,500 lb. (2041 kg.).
Lift-rod lengths (without using screw adjustment)	
Lift-rod closed	22¼ in. (56·51 cm.).
Second position	24 1/16 in. (61·12 cm.).
Third position	25⅞ in. (65·72 cm.).
Fully extended	27 11/16 in. (70·33 cm.).
Rate of lift at 1,400 r.p.m.	1·5 sec.
Rate of drop (maximum rate)	1·25 sec.
High-pressure spring	
Fitted length	1·59 in. (40·4 mm.).
Fitted load	165 lb. (74·84 kg.).
Free length	2·38 in. (59·9 mm.).

ELECTRICAL

Battery	
4 M and 4 PM	2 Lucas 6-volt GTW9A.
4 DM and 460	2 Lucas 6-volt TR19E.
3 DL and 342	Lucas 12-volt MV15A.

TORQUE WRENCH SETTINGS (MAXIMUM)

Wheel nuts (front)	125 lb. ft. (17·28 kg. m.).
Wheel nuts (rear, flanged axle)	
3 DL and 342	125 lb. ft. (17·28 kg. m.).
4 DM and 460	250 lb. ft. (34·56 kg. m.).
Wheel nuts (rear, sliding hub axle) (4 M, 4 PM, 4 DM, and 460)	125 lb. ft. (17·28 kg. m.).

GENERAL INFORMATION

BRAKE PEDALS

The two brake pedals on the right-hand side of the tractor may be interlocked by a simple latch to give simultaneous brake operation provided the brakes are correctly adjusted. When the latch is raised each pedal can be operated separately, the left-hand pedal applying the left-hand wheel brake and the right-hand pedal applying the right-hand wheel brake.

Independent brake operation assists in making sharp turns and in reducing land wheel slip when ploughing.

PARKING LEVER

The parking lever operates a pawl which engages with a ratchet on the left-hand brake pedal. When the brake pedals are locked together by the latch the parking lever will hold both brakes in the 'On' position if it is moved forward to engage the ratchet while the pedals are depressed. If the latch is out of engagement the left-hand brake only is held by the ratchet.

HAND BRAKE (Optional Equipment)

A normal pawl-and-ratchet type hand brake is available as an optional item of equipment and when fitted operates directly on the foot brake cross-shaft. When the brake pedals are connected by the latch, operation of the hand brake lever will apply both brakes. When the latch is disengaged the hand brake will operate the right-hand brake only.

CLUTCH PEDAL

The clutch pedal is operated by the left foot. There must always be 1 in. (2·54 cm.) of free movement, measured at the pedal pad, before resistance is felt.

GEAR LEVER

The six gear positions are shown on the gear lever knob. Additional pressure to the left-hand side is necessary to overcome the safety spring resistance when engaging either first or reverse gear.

GOVERNOR CONTROL LEVER (Models 3 DL, 4 DM, 342, and 460)

This lever is situated to the left of the fuel tank. The speed of the engine increases as the lever is pulled to the rear and decreases as the lever is moved forward.

An intermediate stop on the control lever provides a ready means of setting the engine speed at 1,400 r.p.m. when running light. With the type of governor fitted to the engine it is necessary to open the throttle by hand when the load causes the engine speed to drop considerably below the preset 1,400 r.p.m.

GOVERNOR CONTROL LEVER (Model 4 M)

The four stops provided for the governor control lever are the starting stop, idling stop, normal running stop, and maximum speed stop. The stops are provided for convenience of working, and when the engine is warm the lever may be used in any position between the idling stop and maximum speed stop to suit the work in hand. With the lever pressed to the left and moved fully forward the starting position is reached. By moving the lever slightly to the rear until it engages behind the head of a bolt on the bracket it is located in the idling position. By moving the lever farther rearward the normal running stop is reached, and this is set at 1,400 r.p.m. but may be adjusted by the knurled knob within the range 1,000 to 1,600 r.p.m. to suit the work in hand. By pressing the lever to the left and moving it still farther rearward the maximum speed stop is reached.

GOVERNOR CONTROL LEVER (Model 4 PM)

The four stops provided for the governor control lever are the idling stop, starting stop, normal running stop, and maximum speed stop. The stops are provided for convenience of working, and when the engine is warm the lever may be used in any position to suit the work in hand. With the lever pressed to the left and moved fully forward the idling position is reached. By moving the lever slightly to the rear until it engages behind the head of the bolt on the bracket the most suitable position for starting is obtained. The normal running and maximum speed stops are attained in the manner described for Model 4 M, and adjustment of the normal running stop is also identical.

TEMPERATURE GAUGE (Optional Equipment on Models 4 PM, 3 DL, and 342)

The temperature gauge situated in the instrument panel indicates the temperature of the water in the engine cooling system. The gauge should be kept under frequent observation and an engine running temperature of 75 to 95° C. (167 to 203° F.) maintained. Keep the pointer within the green sector on the dial.

To assist in maintaining this temperature range it is recommended that the radiator shutters, available as an optional item, are fitted.

RADIATOR SHUTTER CONTROL (Optional Equipment on Models 4 PM, 3 DL, and 342)

The control lever is situated below the main fuel tank on the right-hand side. When the lever is in the upper position the shutters are closed, and are opened by pushing downwards on the lever. The shutters must be closed when starting the engine from cold to allow the correct working temperature to be reached as quickly as possible. Maintain the correct working temperature by adjusting the shutters to keep the needle of the gauge within the green sector on the dial.

OIL PRESSURE GAUGE

The oil pressure varies with the speed of the engine and the temperature of the oil, but as a general rule 15 to 20 lb./sq. in. (1·05 to 1·4 kg./cm.^{2}) when the engine is idling and not less than 30 lb./sq. in. (2·11 kg./cm.^{2}) when the engine is running at 2,000 r.p.m. should be shown on the dial of the gauge.

IGNITION SWITCH AND WARNING LIGHT (Models 4 M and 4 PM)

The switch is positioned below the oil pressure gauge on the instrument panel and is marked with an arrow. To switch on the ignition turn the switch until the arrow is pointing upwards to the 'on' position.

An ignition warning light positioned on the left of the instrument panel glows red when the ignition is on and the engine is not running. The light will go out once the engine is started and runs at a speed sufficient for the dynamo to charge the battery. Do not leave the ignition switched on with the engine at rest.

STARTER CONTROL (Early 3 DL and 4 DM Models)

Turn the key switch to the 'on' position. The starter switch lever is on the right-hand side below the fuel tank and must be pulled to the rear to engage the starter motor drive with the flywheel teeth. A firm, steady pull on the lever will ensure that the teeth are meshed as the starter motor begins to revolve.

STARTER SWITCH (Models Subsequent to Above)

The starter motor will not operate until the key switch on the instrument panel is in the 'on' position.

To operate the starter motor push in the knob marked 'S' on the right of the instrument panel. Release it immediately the engine fires. Should the engine fail to start first time, wait until it has come to rest before operating the starter switch again.

Take care not to operate the starter switch while the engine is running.

STARTER CONTROL (Early models 4 M and 4 PM)

The starter control knob is marked with an 'S' and is positioned on the instrument panel above the oil pressure gauge. Pull the control outwards to operate the starter motor and release it immediately the engine fires. Do not operate the starter until the engine is completely at rest.

CHOKE CONTROL (Model 4 PM)

This is the control marked 'C' on the instrument panel. When it is pulled out it closes the air intake to give a rich starting mixture. Push the control in to weaken the mixture as the engine warms up.

STARTING CARBURETTER CONTROL (Model 4 M)

The air and petrol passages in the starting carburetter are opened when this control, mounted on the instrument panel and marked 'C', is pulled fully out.

The control has four positions and must be pulled fully out when starting from cold. The control must be pushed inwards one position at a time as the engine temperature increases. See 'STARTING PROCEDURE (Model 4 M)' on page General Information 5.

MANIFOLD HOT-SPOT CONTROL (Model 4 M)

The control knob should be in the raised position when starting the engine from cold and should remain there until the temperature gauge needle approaches the green sector on the dial. The control should then be moved to the lower position. **Remember that it will be hot.**

STOP CONTROL (Models 3 DL and 4 DM)

This control is on the instrument panel and when pulled outwards it cuts off the fuel supply and stops the engine.

VOLTAGE REGULATOR

The voltage regulator unit is attached to the rear of the instrument panel. The regulator cut-out adjustments are sealed and should not be interfered with.

AMMETER

The ammeter indicates the flow of current into or out of the battery. When the battery is fully charged the charging rate will be low due to the functioning of the automatic voltage control, thus giving an indication of the condition of the battery. A discharge will be shown if the demand of the equipment switched on is greater than that of the dynamo output.

INSPECTION LAMP SOCKET

The two-pin plug socket provided on the instrument panel is for use with a 12-volt inspection lamp.

LIGHTING SWITCHES (Tractors Equipped with Lighting Equipment only)

Pull out the switch knob to switch on the sidelights and rear light. Rotate the knob clockwise and pull again to switch on the front floodlights.

After the sidelamps have been switched on the change-over switch on the rear lamp bracket should be pressed down to select the rear floodlight or tail lamp as required.

A headlamp beam dipping switch is incorporated in the horn-push of tractors fitted with dipping beam headlamps.

FUEL TAP

The fuel tap is integral with the sediment bowl fuel filter situated on the left-hand side of the tractor. The tap is open when the blade is vertical and closed when it is in a horizontal position.

STARTING PROCEDURE (MODELS 3 DL and 4 DM)

STARTING FROM COLD

Check the level of the oil, fuel, and water.

Make sure that the gear lever is in neutral, the brakes locked on, and that the belt pulley, power take-off, and hydraulic power units are all disengaged.

Close the radiator shutters (when fitted).

Ensure that the fuel tap at the sediment bowl on the left-hand side of the engine is turned on (blade vertical).

Move the governor control lever rearwards to the fully open position.

Turn the starter key switch on the instrument panel to the 'on' position.

Pull the starter switch lever firmly to the rear (later models have a 'push' starter switch on the instrument panel), release the switch when the engine starts, and move the throttle control lever forward to the required position. If the starter pinion fails to engage the flywheel teeth on tractors fitted with a lever-type starter control continue a steady pull on the starter lever until the pilot switch operates and the pinion slides into mesh as the starter revolves. Do not work the starter lever backwards and forwards.

It is not necessary for the tractor to remain stationary while the engine is warming up.

When fitted, radiator shutters must be opened as soon as the engine temperature reaches 75 to 95° C. (167 to 203° F.) (temperature gauge needle in green sector on the dial). Maintain this temperature by use of the radiator shutter control.

WARNING.—Avoid running the engine with the fuel turned off or running until the tank is empty as either practice will result in air entering the fuel system. To correct this slacken the air vent plug above the Simms fuel filter outlet boss and operate the priming lever on the fuel lift pump. Pump until fuel completely free of air issues from the top of the filter before retightening the air vent plug. Repeat with the air vent at the front of the fuel injection pump until air-free fuel issues from the air vent pipe. Give a few more strokes of the hand primer after tightening the air vents. The help of an assistant is required when air-venting the fuel system.

STARTING IN COLD WEATHER

Push in the excess fuel button on the stop control lever at the front of the fuel injection pump until it clicks into engagement. The engine will now start in the normal way. The excess fuel button will spring out to the normal position as soon as the engine starts.

At low temperatures the lubricating oil thickens and additional power is required to start the engine. To assist the starter motor under these conditions depress the clutch pedal whilst operating the starter.

STOPPING THE ENGINE

Stop the engine by moving the throttle control lever to the fully forward position and then pull out the stop control knob on the instrument panel. Return the starter key switch to the 'off' position.

PROLONGED IDLING

Since restarting is so easy it is wasteful to leave the engine idling for long periods merely to avoid restarting again. If, however, the engine must be left idling adjust the radiator shutters (when fitted) and the speed of the engine to keep the temperature gauge needle between 75 and 95° C. (167 and 203° F.). At normal air temperatures running the engine at idling speed is sufficient to keep the cooling water temperature within its correct range, but in winter a slight increase in engine speed may be necessary.

Prolonged idling can choke the atomizers and cause loss of power: it is therefore advisable to stop the engine.

STARTING PROCEDURE (Model 4 M)

Check the levels of the oil, fuel, and water.

Make sure that the gear lever is in neutral, the brakes are on, and the belt pulley, power take-off, and hydraulic power unit are disengaged.

Move the hot-spot control to the 'up' position.

Close the radiator shutters.

Turn on both **petrol (gasoline)** and **vaporizing oil** fuel taps.

Pull the starting carburetter control 'C' out fully.

Push the governor control lever forward to the starting position, pressing slightly to the left to pass the idling stop.

Switch on the ignition.

Pull the starter motor control 'S' and release it immediately the engine fires.

Pull the governor control lever back to the idling position and push in the starting carburetter control until it registers in the second pesition.

Set the governor control lever to give 1,400 r.p.m. and **start work.** This speed is extremely important and it is essential for a quick change-over to vaporizing oil fuel.

After approximately one minute push the starting carburetter control forward until it registers with the third position, still maintaining 1,400 r.p.m. When the temperature gauge needle is in the red sector and stands at about 11 o'clock (that is, after the engine has been running for about three minutes at 1,400 r.p.m.) push in the starting carburetter control.

Should the engine falter, return the starting carburetter control to the third position for a short period.

When the temperature gauge needle is just entering the green sector move the hot-spot control to the 'down' position (remember—it will be **hot**!) and maintain the normal temperature—needle just in the green sector—by use of the radiator shutter control.

STARTING A WARM ENGINE

When the engine has been stopped for a few minutes only it should start with the governor control lever approximately mid-way between the idling stop and the 1,400 r.p.m. position.

If not quite warm enough to start by this method place the governor control lever against the idling stop and pull out the starting carburetter control to the third position.

STOPPING THE ENGINE

Push the governor control lever right forward to the starting position and, when the engine has stopped, switch off the ignition and return the governor control lever to the idling position. Turn off the fuel taps if the tractor is to remain idle for a period. It is not necessary to consume the fuel in the float-chamber at the close of work.

STARTING PROCEDURE (Model 4 PM)

Check the levels of the oil, fuel, and water.

Make sure that the gear lever is in neutral, the brakes are locked on, and that the belt pulley, power take-off, and hydraulic power units are disengaged.

Turn on the fuel tap.

Place the governor control lever in the starting position by moving it slightly to the rear from the idling (minimum throttle) position.

Switch on the ignition.

Pull the choke control marked 'C' half-way out and hold it in this position.

Pull the starter control marked 'S' and release it immediately the engine starts.

Allow the choke control to return and push it fully home as soon as the engine will run with the control in the 'in' position. **Now start work.**

Should the engine falter, pull out the choke control momentarily.

STARTING A WARM ENGINE

When the engine has been stopped for a few minutes only it should start with the governor control lever in the starting position and the choke control right in.

STOPPING THE ENGINE

Push the governor control lever forward to the idling position, pressing slightly to the left to pass the starting

position, and switch off the ignition. Turn off the fuel tap if the tractor is to remain idle for a period. It is not necessary to consume the fuel in the float-chamber at the close of work.

STARTING IN COLD WEATHER (Models 4 M and 4 PM)

In cold weather it is advisable to turn the engine several times by the starting handle before attempting to use the starter motor. **Always keep the thumbs on the same side of the handle as the knuckles.**

This procedure is necessary at low temperatures as the lubricating oil is thick and additional power is required at the starter motor. To assist the starter motor under these conditions depress the clutch pedal while starting the engine by the use of the starter switch.

Allow the engine on PM models to be turned over a few times by the starter motor, with the choke control held out and with the ignition switched off, before attempting to start. Hold the choke control fully out when starting.

NOTE.—With V.O. engines, in very cold weather the valve that admits petrol to the starting carburetter may freeze. Free it by raising it with a finger-nail.

PROLONGED IDLING (Models 4 M and 4 PM)

Since restarting is so easy, it is wasteful to leave the engine idling for long periods merely to avoid starting again. If, however, the engine of a Model 4 M tractor must be left idling, adjust the radiator shutters and the speed of the engine to keep the needle of the temperature gauge just in the green sector of the dial. At normal air temperatures running the engine at idling speed is sufficient to maintain the water at the right temperature, but in winter a slight increase in speed may be necessary.

SAFETY PRECAUTIONS

ON CORNERS AND SLOPES

Do not use maximum speed when cornering, over rough surfaces, or when using the steering brakes.

Never use a higher gear than fourth on tractors fitted with 'V' twin front wheels or when fitted with special wheels without rubber tyres. Also on 'V' twin front wheel models take extra care on corners, when these vehicles are liable to be less stable. Ensure that the fifth speed stop is in position.

Avoid sudden braking on roads when hauling a trailer, particularly on bends or on slippery road surfaces.

When working across slopes avoid bumps and hollows which may cause the tractor to be tilted to a dangerous degree and use the widest permissible track setting.

When climbing steep gradients exercise the greatest care. Do not open the throttle rapidly. Do not engage the clutch violently.

When work on steep gradients is expected fit a front end weight. If there is any suspicion that the front wheels of the tractor are about to lift (indicated by loss of steering control) depress the clutch pedal. If this is necessary the tractor is being asked for more than its designed drawbar pull. Lighten the load and check that the hitch point is not higher than it should be (see pages O.2 and O.3 [3 DL] and OO.2 and OO.3 [4 DM]).

Move the governor control lever smoothly. Never snatch the lever back to accelerate, particularly when proceeding uphill.

When descending a steep hill with a load always use a low gear.

When using the brakes to assist in making sharp turns on a headland do not use full lock unless the speed is very low.

Only use the brakes to assist in steering when it is absolutely necessary.

GENERAL SAFETY PRECAUTIONS

DO NOT run the engine on 3 DL and early 4 DM models with the pipes between the venturi and the fuel pump disconnected or with the air cleaner removed.

Never dismount from the tractor while it is in motion.

Never start the engine from any position other than seated in the driving seat.

Never make any adjustments to P.T.O.-driven implements while the engine is running, even with the I.P.T.O. clutch disengaged.

Always keep the depth control lever in the forward position when depth control is not required.

Never drive the tractor close to the edges of ditches or banks, particularly so if the ground is loose or wet; it is better to make the headlands a bit wider.

Never consolidate a silage or manure heap with a tractor unless the sides of the heap are adequately supported.

Never make any adjustments to the tractor while it is in motion.

Never run the engine in a closed building or allow the exhaust pipe to come close to any inflammable material.

Never use the belt pulley as a foot-rest.

Never fill the fuel tank while the engine is running. Exercise caution when the engine is hot.

When using a tractor-mounted winch ensure that the tractor is in line with the direction of the pull.

Ensure that all guards are in position when operating the tractor.

Always keep the floor plates clean.

Fit a front end weight or ballast the front tyres (or both) when working on steep gradients or when using heavy rear-mounted equipment.

ECONOMY HINTS

Keep the pointer of the cooling system temperature gauge between 75 and 95° C. (167 and 203° F.).

Do not run the engine above 1,400 r.p.m. except when maximum power or maximum road speed is really necessary.

For light work run in a high gear with the throttle control lever set to give a low engine speed.

Do not leave the engine running when the tractor is idle for long periods.

When operating in very dusty conditions clean the air cleaner bowl daily (see pages General Information 15 or 16).

Always keep the tyres inflated to the correct pressures (see page General Data 12.)

FROST PRECAUTIONS

When the temperature approaches freezing-point precautions must be taken against damage by frost, either by adding an anti-freeze mixture to the cooling water or by draining the system at the close of work. It is not sufficient to cover the radiator with a muff.

In extreme cold check the water pump before starting the engine by attempting to rotate the water pump hub by hand. Restriction of movement will indicate that the vane is frozen in position and the system must then be filled with warm water and the tractor allowed to stand until the pump vane is freed.

USING ANTI-FREEZE IN THE COOLING SYSTEM

Care should be taken that anti-freeze mixture is used in the proportions recommended by the manufacturers. The strength of the mixture in the system should be maintained by topping up with water and anti-freeze mixture in the same proportion as that used initially to fill the system.

The capacities of the cooling systems are given on page General Data 13. The recommended quantity of Bluecol for protection down to 16° of frost (−9° C. or 16° F.) is 20 per cent. of the cooling capacity and for protection down to −18° C. (0° F.) a mixture of at least 25 per cent. anti-freeze must be used.

In addition to the brands quoted any anti-freeze which conforms to Specification B.S.3151 or B.S.3152 is approved.

The quantities required are given on page General Data 14.

Fill the system to a level 2 in. (5 cm.) from the top of the filler neck. Avoid overfilling to prevent unnecessary loss of anti-freeze on expansion.

Make sure that the cooling system is watertight and examine all joints, replacing any defective rubber hose with new.

Before introducing anti-freeze mixture to the radiator it is advisable to clean out the cooling system thoroughly by draining out the water and swilling out the water passages with a hose inserted in the water filler cap opening, keeping the drain taps open.

A label should be placed on the tractor to indicate that the cooling system contains anti-freeze and to prevent unnecessary draining.

If the cooling system is to be drained for attention to the engine run the anti-freeze mixture into a clean container and use it again.

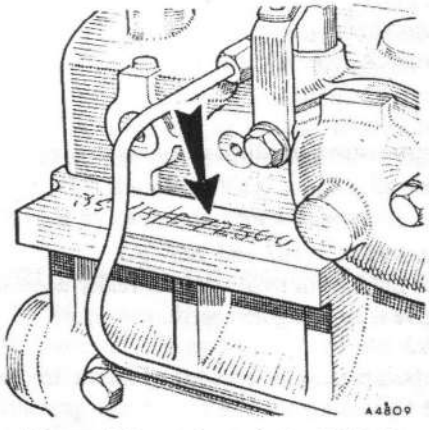
NOTE.—Do not use chloride solution in the radiator or anti-freeze mixture in the tyres.

Use rain-water in the cooling system when possible.

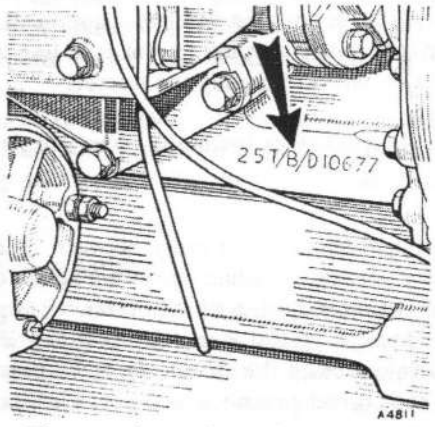
WARNING.—Anti-freeze mixtures with an alcohol base are not suitable for use in the cooling system owing to the relatively high temperatures attained in the top tank. Only anti-freeze mixtures of the ethylene glycol or glycerine type may be employed.

IDENTIFICATION

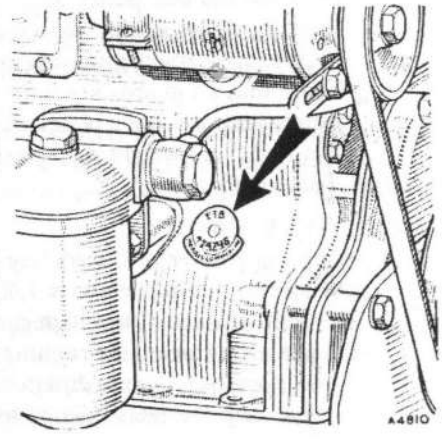
The major assemblies of the tractor each carry a serial number and their locations are detailed below. The numbers must always be quoted when communicating with your Distributor or Dealer. State also the number of hours the tractor has worked.



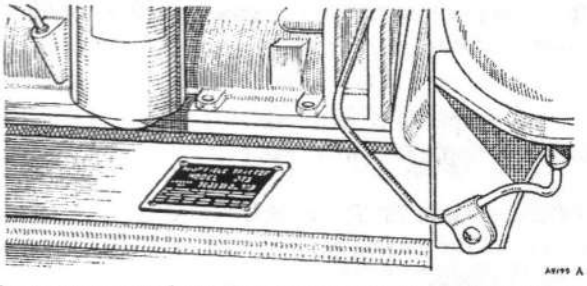
The serial number of the B.M.C. four-cylinder diesel engine is stamped in the rear top corner on the right-hand side of the cylinder block below No. 4 cylinder injector



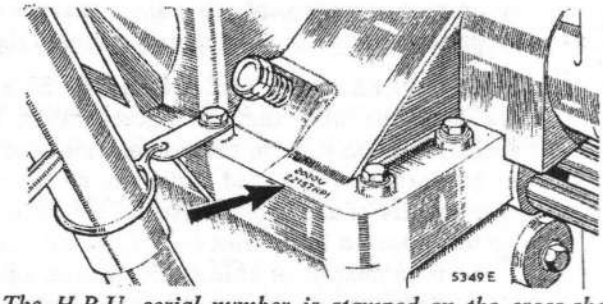
The serial number of the B.M.C. three-cylinder diesel engine is stamped on a machined face on the forward lower right-hand side of the cylinder block beneath the fuel injection pump coupling



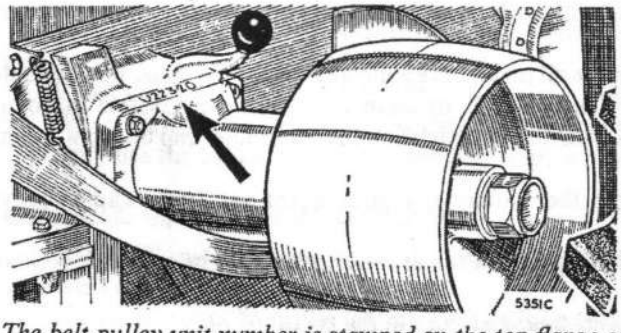
The serial number of all V.O. and petrol engines is stamped on a disc attached to the right-hand side of the cylinder block



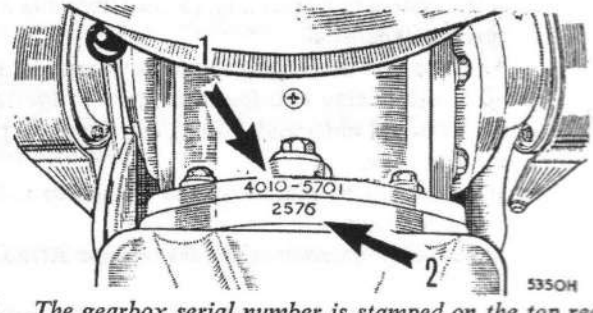
The tractor serial number is stamped on a plate attached to the right-hand side of the frame adjacent to the radiator



The H.P.U. serial number is stamped on the cross-shaft housing adjacent to the valve adjusting screw



The belt pulley unit number is stamped on the top flange of the unit



1. *The gearbox serial number is stamped on the top rear flange of the gearbox case immediately under the driver's seat*
2. *The P.T.O. unit serial number is stamped on the top flange of the unit housing*

UNIFIED SCREW THREADS

IDENTIFICATION OF UNIFIED SCREW THREADS

The general standardization of Unified screw threads makes it necessary to identify all nuts, bolts, and set screws with these threads in order to ensure their correct use with correspondingly threaded components and the fitting of correct replacements.

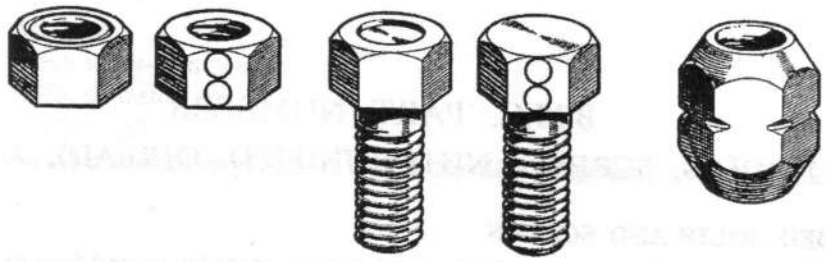
Identification has been standardized and is effected in the following manner:

Nuts. By a circular groove turned on the end face of the nut or by connected circles stamped on one flat of the hexagon.

Bolts and Set Screws. By a circular depression turned on the head or by connected circles stamped on one flat of the hexagon.

Wheel Stud Nuts. By a notch cut in all the corners of the hexagon.

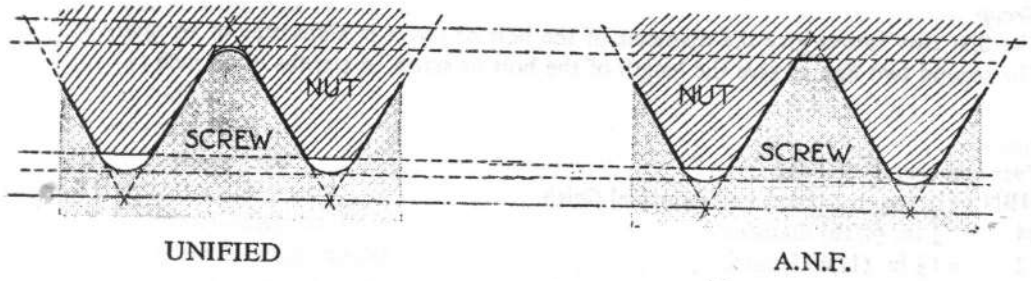
These identification marks are clearly shown in the illustration below, and it is obviously of the utmost importance that any nuts, bolts, or set screws so marked are used only in conjunction with their associated components having



The identification marks for components with Unified threads

Unified threads and that only replacement parts with Unified threads are used as these are **not** interchangeable with Whitworth, B.S.F., or Metric threads.

The Unified thread is, however, interchangeable with the American National Fine (A.N.F.) thread for all practical purposes.



This illustration of the Unified thread and A.N.F. thread to the same scale indicates their close relationship

Spanners. It is to be noted that all A.N.F.- and Unified-threaded nuts and hexagon-headed bolts are made to the standard American hexagon sizes and that spanners of the appropriate size must be used when tightening or loosening them.

KEY TO SPANNER SIZES (*Nominal widths between jaws*)

Nuffield standards	*Diameter of screw thread (inches)*									
	1/4"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	3/4"	7/8"	1"
For B.S.F. screws and nuts	·448	·529	·604	·705	·825	·925	1·016	1·207	1·309	1·489
For A.N.F. screws and nuts	·440	·504	·566	·629	·755	·880	·944	1·132	1·320	1·508
For Unified screws	·440	·504	·566	**·630**	·755	**·817**	·943	1·132	1·321	1·509
For Unified nuts (normal)	·440	·504	·566	**·692**	·755	**·880**	·943	1·132	1·321	1·509
For Unified nuts (heavy)	—	—	—	—	—	—	**1·069**	**1·258**	**1·446**	—

NOTE.—In the case of some Unified-threaded components the size of the hexagon for the nut is different from that of the bolt. Where this occurs the spanner size is shown in heavy type in the above table.

B.M.C. PART NUMBERS

STANDARD BOLTS, SCREWS, NUTS (UNIFIED THREAD), AND WASHERS

HEXAGON-HEADED BOLTS AND SCREWS

Part numbers are made up of two groups of letters and figures—three letters and four figures.

1st Group

The letters may be either HBN, HBZ, HNS, or HZS.
HBN indicates a hexagon-headed bolt—normal finish.
HBZ indicates a hexagon-headed bolt—zinc finish.
HNS indicates a hexagon-headed screw—normal finish.
HZS indicates a hexagon-headed screw—zinc finish.

2nd Group

The first two figures give the diameter of the bolt or screw in sixteenths of an inch (1/16).
The second two figures give the length of the bolt or screw in eighths of an inch (1/8).

Examples

Part number: HBN0412
HBN = hexagon-headed bolt—normal finish.
04 = 1/4 in. (4/16) diameter.
12 = 1 1/2 in. (12/8) length.

Part number: HZS1008
HZS = hexagon-headed screw—zinc finish.
10 = 5/8 in. (10/16) diameter.
08 = 1 in. (8/8) length.

NOTE.—Unified bolts or screws may be identified by either (1) a recess in the head or (2) circles indented on one or more flats.

PAN-HEAD AND COUNTERSUNK SCREWS

Part numbers are made up of two groups of letters and figures—three letters and four figures.

1st Group

The three letters may be either PMN, PMZ, CMN, or CMZ.
PMN indicates a pan-head screw—normal finish.
PMZ indicates a pan-head screw—zinc finish.
CMN indicates a countersunk screw—normal finish.
CMZ indicates a countersunk screw—zinc finish.

2nd Group

The first two figures give the diameter of the screw in sixteenths of an inch ($\frac{1}{16}$).
The second two figures give the length of the screw in sixteenths of an inch ($\frac{1}{16}$).

Examples

Part number: PMN0618
PMN = pan-head screw—normal finish.
06 = $\frac{3}{8}$ in. (6/16) diameter.
18 = $1\frac{1}{8}$ in. (18/16) length.

Part number: CMZ1016
CMZ = countersunk screw—zinc finish.
10 = $\frac{5}{8}$ in. (10/16) diameter.
16 = 1 in. (16/16) length.

NOTE.—Unified pan-head and countersunk screws may be identified by grooves cut in the head.

NUTS

Part numbers are made up of two groups of letters and figures—three letters and three figures.

1st Group

The letters may be either FNN or FNZ.
FNN indicates a hexagon nut—normal finish.
FNZ indicates a hexagon nut—zinc finish.

NOTE.—In the case of No. 6 size nuts the first letter becomes C, i.e. CNZ.

2nd Group

The first figure indicates the type of nut:
1 = standard nut.
2 = locknut.
3 = slotted nut (thick).
4 = slotted nut (normal).
5 = standard nut—high-tensile.
6 = locknut—high-tensile.
7 = slotted nut (thick)—high-tensile.
8 = slotted nut (normal)—high-tensile.

The last two figures indicate the size of the nut in sixteenths of an inch ($\frac{1}{16}$).

Examples

Part number: FNN106
FNN = hexagon nut—normal finish.
1 = standard nut.
06 = to fit $\frac{3}{8}$ in. (6/16) bolt.

Part number: FNZ408
FNZ = hexagon nut—zinc finish.
4 = slotted nut (normal).
08 = to fit $\frac{1}{2}$ in. (8/16) bolt.

STIFFNUTS (Self-locking)

Part numbers are made up of two groups of letters and figures—three letters and three figures.

1st Group

The letters may be either LNN or LNZ.
LNN = stiffnut—normal finish.
LNZ = stiffnut—zinc finish.

2nd Group

The first figure indicates the type of nut:
1 = aerotight.
2 = nyloc.
3 = turret.
The last two figures indicate the size of the nut in sixteenths of an inch ($\frac{1}{16}$).

Examples

Part number: LNN108
LNN = stiffnut—normal finish.
1 = aerotight.
08 = to fit $\frac{1}{2}$ in. (8/16) bolt.

Part number: LNZ304
LNZ = stiffnut—zinc finish.
3 = turret.
04 = to fit $\frac{1}{4}$ in. (4/16) bolt.

NOTE.—Unified nuts of all types may be identified by either (1) a groove cut in the upper face or (2) circles on one or more flats.

WASHERS

Plain

Part numbers are made up of two groups of letters and figures—three letters and three figures.

1st Group

The first two letters are the same for all plain washers—PW.
The third letter may be either N or Z, indicating respectively normal finish or zinc finish.

2nd Group

The first figure indicates the size:
1 = normal.
2 = large.
The last two figures give the size of the washer in sixteenths of an inch ($\frac{1}{16}$).

Examples

Part number: PWN112
PW = plain.
N = normal finish.
1 = normal size.
12 = diameter of hole to fit $\frac{3}{4}$ in. (12/16) bolt.

Part number: PWZ204
PW = plain.
Z = zinc finish.
2 = large size.
04 = diameter of hole to fit $\frac{1}{4}$ in. (4/16) bolt.

Spring

Part numbers are made up of two groups of letters and figures—three letters and three figures.

1st Group

The first two letters are the same for all spring washers—LW.
The third letter indicates the finish as for plain washers.

2nd Group

The first figure indicates the section:
1 = square.
2 = rectangular.

The last two figures give the size of the washer in sixteenths of an inch (1/16).

Examples

Part number: LWZ107
LW = spring washer.
Z = zinc finish.
1 = square section.
07 = diameter of hole to fit $\frac{7}{16}$ in. bolt.

Part number: LWN205
LW = spring washer.
N = normal finish.
2 = rectangular section.
05 = diameter of hole to fit $\frac{5}{16}$ in. bolt.

PART NAME ALTERNATIVES

Engine	Gudgeon pin.	Piston pin. Small-end pin. Wrist pin.
	Oil control ring.	Scraper ring.
	Core plug.	Core disc. Welch plug. Expansion plug.
	Oil sump.	Oil pan. Oil reservoir.
	Valve tappet.	Valve lifter.
	Starter ring.	Flywheel gear.
	Filter element.	Filter cartridge.
	Spring ring.	Snap ring. Circlip.
	Inlet valve.	Intake valve.
	Fuel.	Diesel oil.
	Petrol.	Gasoline.
	Paraffin.	Kerosene.
Cooling system	Drain tap.	Drain cock.
	Impeller.	Rotor. Vane.

Fuel system	Butterfly.	Throttle valve.
	Throttle unit.	Venturi.
Electrical system	Dynamo.	Generator.
	Control box.	Voltage regulator. Cut-out. Voltage control.
Controls	Mixture control.	Choke. Strangler.
Gearbox	Gear lever.	Shift lever.
	Change speed fork.	Shift fork. Selector fork.
	First motion shaft.	Clutch shaft. First reduction pinion. Main drive pinion. Drive gear.
	Layshaft.	Countershaft.
Transmission	Crown wheel.	Ring gear. Spiral drive gear.
	Bevel pinion.	Small pinion. Spiral drive pinion.
	Axle shaft.	Half-shaft. Hub driving shaft. Jack driving shaft.
	Differential gear.	Sun wheel.
	Differential pinion.	Planet wheel.
Steering	Stub axle.	Swivel axle.
	Track-rod.	Cross-tube.
	Draglink.	Side-tube. Steering connecting rod.
Exhaust	Silencer.	Muffler.
Body	Bonnet.	Hood.
	Wing.	Mudguard. Fender.

MAINTENANCE SCHEDULE (Models 3 DL, 4 DM, 342, and 460)

NOTE.—When carrying out service recommended in any section it is important that the preceding sections receive attention at the same time.

EVERY DAY OR EVERY 10 HOURS

Check the levels of oil, fuel, and water, and replenish if necessary. Check levels twice daily when working long hours. Avoid running the engine until the fuel tank is empty as this will allow air to enter the system.

Change the oil in the air cleaner oil bath when working in dusty conditions. (Change twice daily if working in extreme conditions.) Use engine oil to refill the bowl.

Check the tyre pressures.

Fill the gun with the appropriate grease recommended on page P.6, and give the following nipples two strokes with the gun (number of grease nipples shown in brackets):

Stub axles (2). Front axle trunnion pin (1). Brake pedal cross-shaft (1) (only when hand brake is fitted). Draglink (2). Radius rod pivot pin (when radius rods are fitted) (1).

EVERY 50 HOURS

Clean the tractor.

Clean the fuel tap filter, and the sediment bowl if necessary.

Clean the air cleaner and change the oil in the cleaner bowl.

Oil the working points on the brake and clutch mechanism and governor control.

Check that all exposed nuts, bolts, and drain plugs are tight.

The hydraulic power unit—operate a few times if it has not been in use during the week. Remove and clean the pump suction and magnetic filters. Grease the cross-shaft (2). Grease the right-hand lift-rod adjustment mechanism (1).

Fill the gun with grease to Ref. C and give two strokes to the nipples on the front wheel hubs.

If the tractor is fitted with a hand-operated clutch grease the withdrawal shaft (1) and lubricate all moving parts of the hand clutch and overload release mechanism.

EVERY 100 HOURS

Batteries—check the level of the electrolyte, and top up with distilled water if necessary. Check battery connections for tightness, clean the terminals, and smear with petroleum jelly.

EVERY 200 HOURS

Change the engine oil.

Change oil in fuel injection pump.

Clean the fuel lift pump filter gauze.

Remove the air cleaner and wash the gauze interior with paraffin (kerosene).

Check the level of the oil in the steering-box.

Check the front wheel alignment.

Flush out the radiator with clean water.

Check the brake and clutch adjustments.

Remove the drain plug from the Simms main fuel filter and allow fuel oil and accumulated sediment to drain off. Replace the drain plug, prime the filter with fuel oil, and vent the system.

Check the adjustment of the fan and dynamo belt tension.

EVERY 400 HOURS

Fit a new oil filter element.

Check the valve rocker clearances, and adjust if necessary.

Have the injectors cleaned and checked by your Dealer.

Renew the fuel filter element. Do not attempt to clean the element.

Remove and clean out the oil sump.

Give two strokes with the gun filled with transmission oil to the fan bearing (1).

EVERY 1,200 HOURS

Add two drops of engine oil to the dynamo lubricating hole.
Drain and flush out the main fuel tank. Clean the pencil filter.
Check the steering for wear in the joints, stub axles, and front hubs, and have bushings renewed when necessary.
Drain the transmission oil and refill. Clean the pump suction filter in the base of the hydraulic power unit.
Check all wiring, terminals, etc., and renew or tighten where necessary.
To preserve the tractor touch up the paintwork where necessary.
Have the starter and dynamo commutator and brush gear checked by your Dealer.

MAINTENANCE SCHEDULE (Models 4 M, 4 MV, 4 PM, and 4 PMV)

NOTE.—When carrying out service recommended in any section it is important that the preceding sections receive attention at the same time.

EVERY DAY OR EVERY 10 HOURS

Check the levels of oil, fuel, and water, and replenish as necessary. Check the levels twice daily when working long hours.

Examine the oil in the air cleaner oil bath when working in dusty conditions. (Examine twice daily and change oil if working in extreme conditions.)

Check tyre pressures.

Fill the grease gun with the appropriate grease recommended on page P.6 and give the following nipples two strokes with the gun (number of grease nipples shown in brackets):

Models 4 M and 4 PM

Front wheel hubs (2).
Stub axles (2).
Front axle trunnion pin (1).
Draglink (2).
Brake pedal cross-shaft (only when hand brake is fitted) (1).

Models 4 MV and 4 PMV

Front wheel hubs (2).
Steering shafts (3).
Draglink (2).

EVERY 50 HOURS

Thoroughly clean the tractor.
Give two strokes with the grease gun filled with grease to Ref. C to the nipple on the fan bearing.
Check the fan belt adjustment.
Clean the fuel filters and sediment bowls if necessary.
Check for even compression on all cylinders.
Wash the air cleaner bowl and change the oil.
Oil the working points on the clutch and brake mechanism and on the governor control.
Check that all exposed nuts, bolts, and drain plugs are tight.

The hydraulic power unit—operate a few times if it has not been in use during the week. Examine the magnetic filter and clean it as necessary. Grease the cross-shaft (2) and the right-hand lift-rod adjustment mechanism (1).

If the tractor is fitted with a hand-operated clutch grease the withdrawal shaft (1).

EVERY 100 HOURS

Remove the distributor cover, lift off the rotor arm, and drop a few spots of thin machine oil on the top of the spindle to lubricate the cam bearing. Lift off the dust-excluding plate and apply a little clean engine oil to the face of the cam. Drop a spot of oil onto the top of the moving contact pivot pin. Drop a few spots of thin machine oil through the hole in the contact breaker base plate to lubricate the automatic timing control mechanism. Clean the cover inside before replacing it.

Check the level of the electrolyte in the battery, and top up with distilled water if necessary.

4 M and 4 MV only

Change the engine oil and clean the oil filter element.

EVERY 200 HOURS

Clean the contact breaker points, and adjust if necessary.
Clean the carburetter float-chamber inlet filter.
Remove the air cleaner and wash the gauze interior with petrol or vaporizing oil.
Check the level of the oil in the steering box.
Flush out the radiator with clean water.
Check the brake and clutch adjustment.
Remove and clean the sparking plugs. Reset the points if necessary.
Remove the plug and add two drops of engine oil to the lubricating hole in the dynamo end cover.

4 PM and 4 PMV only

Change the engine oil and clean the oil filter element.

EVERY 500 HOURS

Fit a new oil filter element.
Renew the sparking plugs.
Check the tappet clearances, and adjust if necessary.

EVERY 1,000 HOURS

Decarbonize the engine if necessary.
Drain and flush out the main fuel tank. Clean the pencil filter.
Check the steering for wear in the joints, stub axles, and front hubs, and renew the bushes where necessary.
Drain the transmission oil and refill. Clean the pump suction filter in the base of the hydraulic power unit.
Check all wiring, terminals, etc., and renew or tighten where necessary.
Remove and clean out the oil sump.
Clean the oil pump floating filter.
Have the starter and dynamo commutator and brush gear checked by your Dealer.
To preserve the tractor touch up the paintwork where necessary.

CLAIMS UNDER WARRANTY

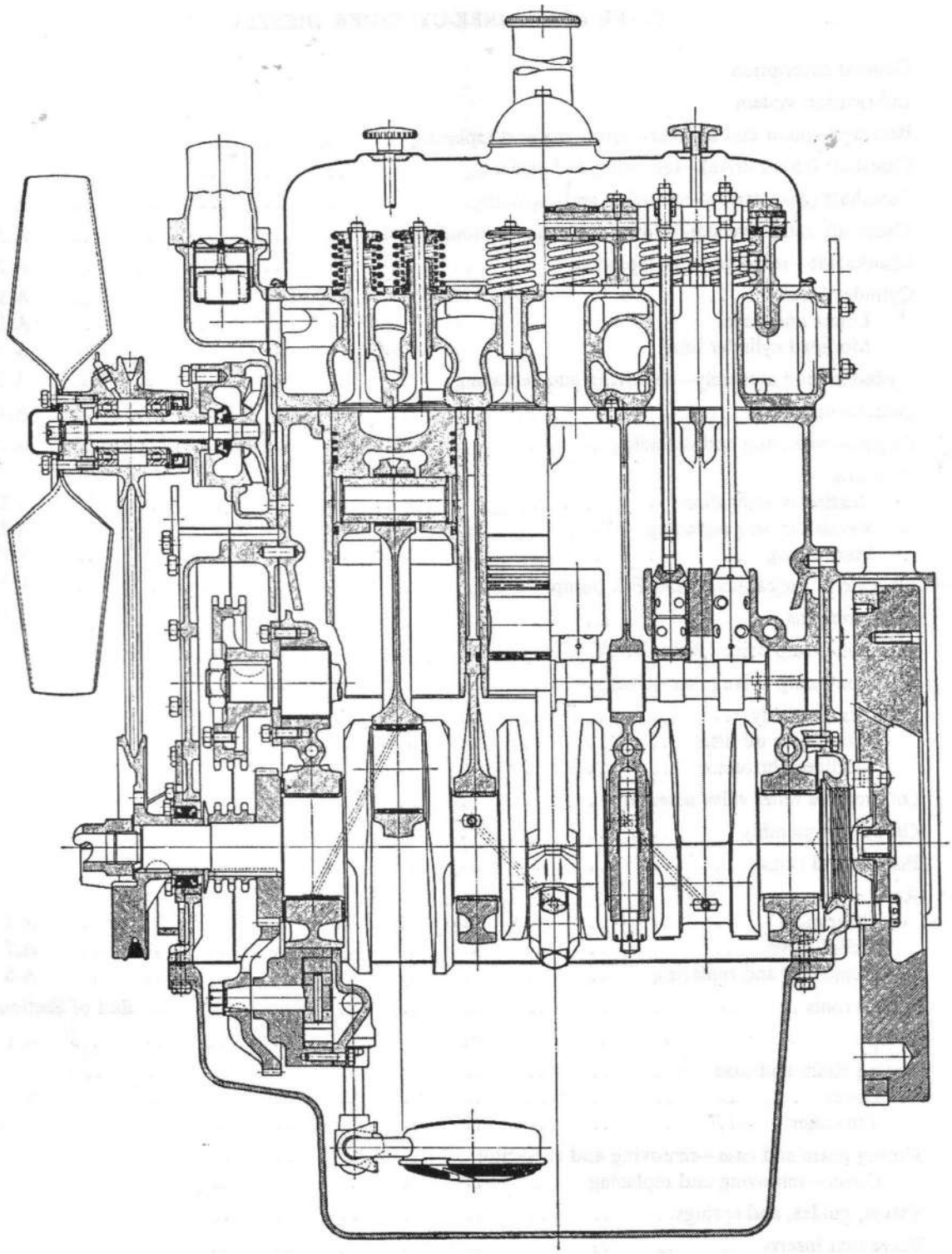
Claims for the replacement of material or parts under Warranty must always be submitted to the supplying Distributor or Dealer, or, when this is not possible, to the nearest Distributor or Dealer, informing them of the Vendor's name and address.

SECTION A

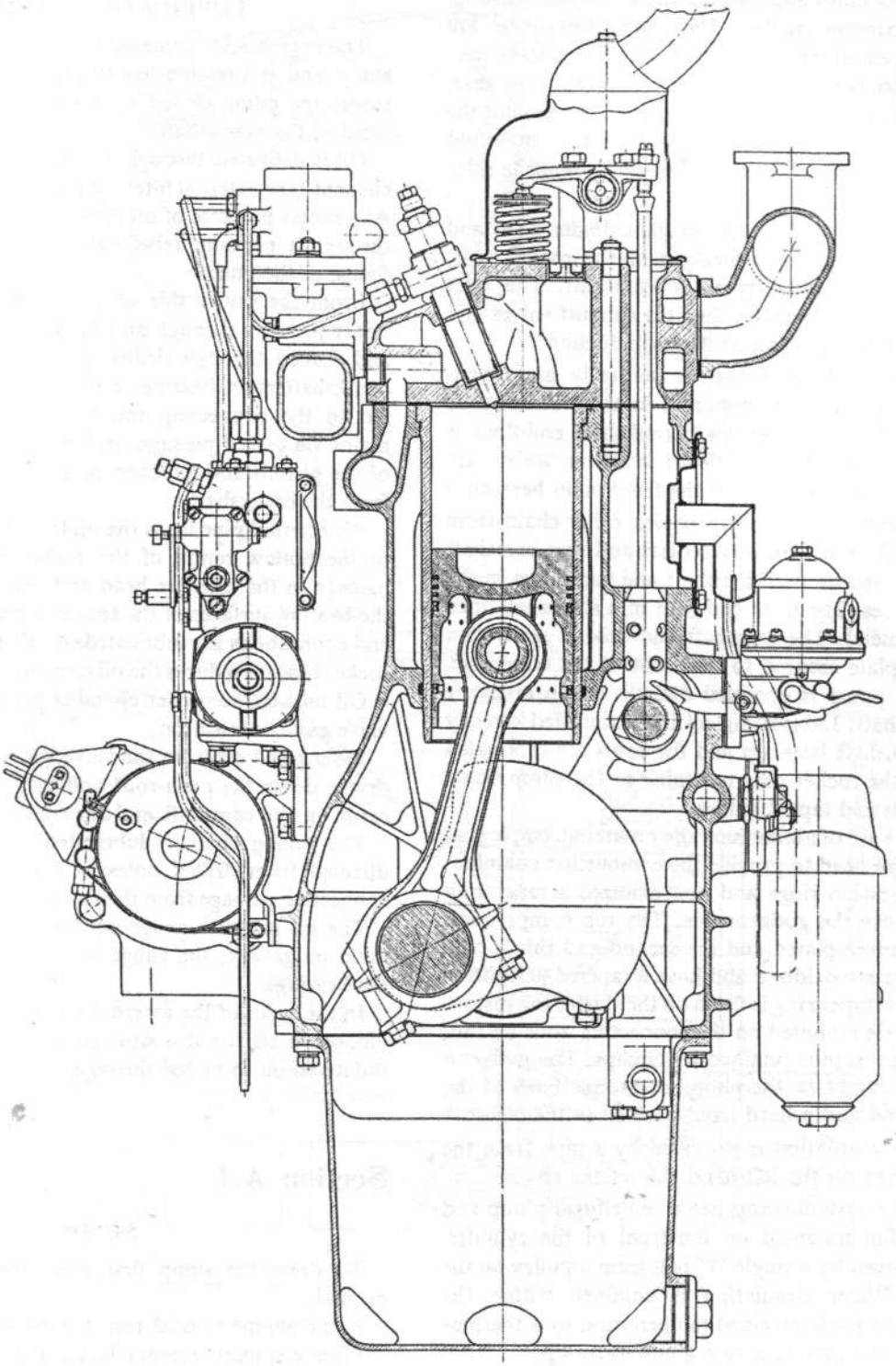
THE ENGINE

(TYPE OEC THREE-CYLINDER DIESEL)

THE NUFFIELD UNIVERSAL THREE ENGINE LONGITUDINAL SECTION



THE NUFFIELD UNIVERSAL THREE ENGINE
TRANSVERSE SECTION



GENERAL DESCRIPTION

The B.M.C. type OEC compression-ignition engine is a three-cylinder direct-injection type (capacity 2·55 litres).

The cylinder block and crankcase is a one-piece casting, ensuring maximum rigidity. Detachable wet liners are fitted, giving excellent cooling and ease of maintenance.

The cylinder head carries the valves, valve rocker gear, and injectors; it is completely water-jacketed around the ports and injector sleeves. The air induction manifold and the exhaust manifold are mounted on opposite sides of the cylinder head.

The valves are set vertically in the cylinder head and are operated through the medium of the rocker gear, push-rods, and tappets from the camshaft. The inlet valves are larger in diameter than the exhaust valves and are shrouded to assist air swirl on induction.

The forged-steel crankshaft is statically and dynamically balanced and is supported in the crankcase by four renewable main bearings. Crankshaft end-float is controlled by steel-backed thrust washers which are located in recesses each side of the front main bearing.

The camshaft is driven by a triplex roller chain from the crankshaft. The two intermediate and rear camshaft bearings are integral with the shaft and run direct in the crankcase bores. The front end runs in a steel shell lined with white metal. The camshaft end-float is controlled by a thrust plate secured to the front of the crankcase. The fuel lift pump is operated directly off an eccentric on the camshaft. Lubricating oil is pressure-fed directly onto the camshaft bearings and the cams are lubricated by oil from the rocker gear returning to the sump down the push-rods and tappet guides.

The pistons are of aluminium-alloy material, employing the cavity-type head to provide the combustion chamber. Three compression rings and one oxidized scraper ring are fitted above the gudgeon pin. The top compression ring is chromium-plated and the second and third com pression rings are oxidized and have a tapered periphery- An oxidized scraper ring is fitted on the skirtof the piston. The pistons are mounted on the connecting rods on full. floating gudgeon pins retained by circlips. The gudgeon pin is a running fit in the phosphor-bronze bush of the connecting rod and a hard hand-push fit in the piston.

Crankcase ventilation is provided by a pipe from the push-rod cover on the left-hand side of the engine.

The cooling system comprises a centrifugal pump and two-bladed fan mounted on the front of the cylinder block and driven by a single 'V' belt from a pulley on the crankshaft. Water circulation is confined within the engine, up to a predetermined temperature, by a thermostat in the outlet pipe to give a quick warm up.

A Lucas 12-volt dynamo is mounted on an adjustable bracket on the left-hand side of the engine and is driven by the fan 'V' belt. The starter motor is mounted to the right-hand side of the flywheel housing and is additionally supported by a metal strap and cradle.

LUBRICATION SYSTEM

The engine oil is contained in an aluminium-alloy cast sump and is pressure-fed throughout the engine by a rotor-type pump driven by a spur gear directly off the front of the crankshaft.

Oil is delivered through a feed pipe to the renewable-element-type external filter via a passage in the crankcase. Any excess pressure of oil is pumped back into the sump through a pressure relief valve mounted on the outlet flange of the pump.

From the outlet side of the external filter oil is fed under pressure through an internal horizontal oil gallery and forced through drilled passages directly into the crankshaft main bearings and camshaft bearings. Oil is fed to the connecting rod big-end bearings from the mains via drilled passages in the crankshaft. Lubrication of the pistons and gudgeon pins is effected by oil splash from the crankshaft.

An external pipe feeds the oil from the main oil gallery to the hollow centre of the rocker shaft via a drilled passage in the cylinder head and rear rocker post; thus the bearing surfaces of the rocker arms and the push-rod end connections are lubricated. A relief valve in the front rocker bracket reduces the oil pressure to this mechanism.

Oil mist in the rocker chamber provides the necessary valve guide lubrication.

Discharged oil from the valve rockers and relief valve drains down the push-rods and tappets to lubricate the cams on the camshaft and then back to the sump.

The timing chain is lubricated in two places by oil directed from drilled holes in a pipe mounted over a connecting passage from the front of the main oil gallery.

The oil pressure gauge connection is taken from the main oil gallery; the gauge indicates the oil pressure at the bearings.

In the event of the external oil filter element becoming blocked a relief valve situated in the filter head allows unfiltered oil to be fed through the engine.

Section A.1

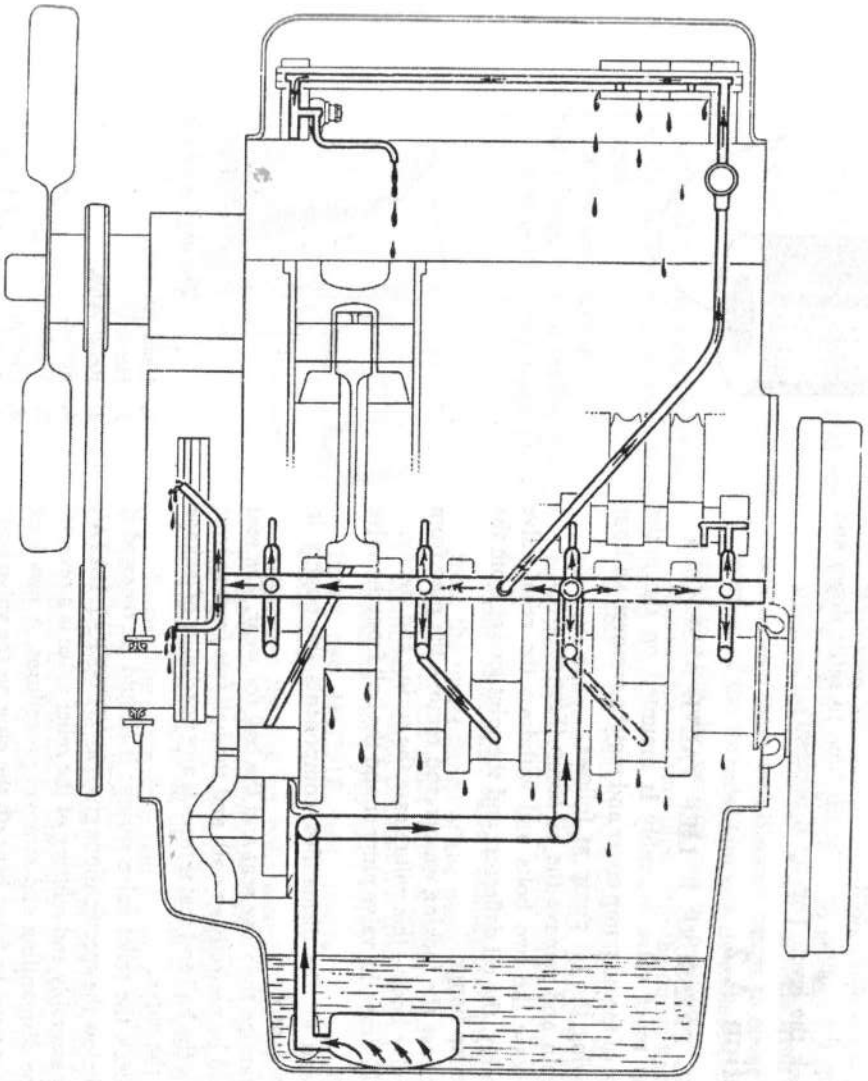
SUMP

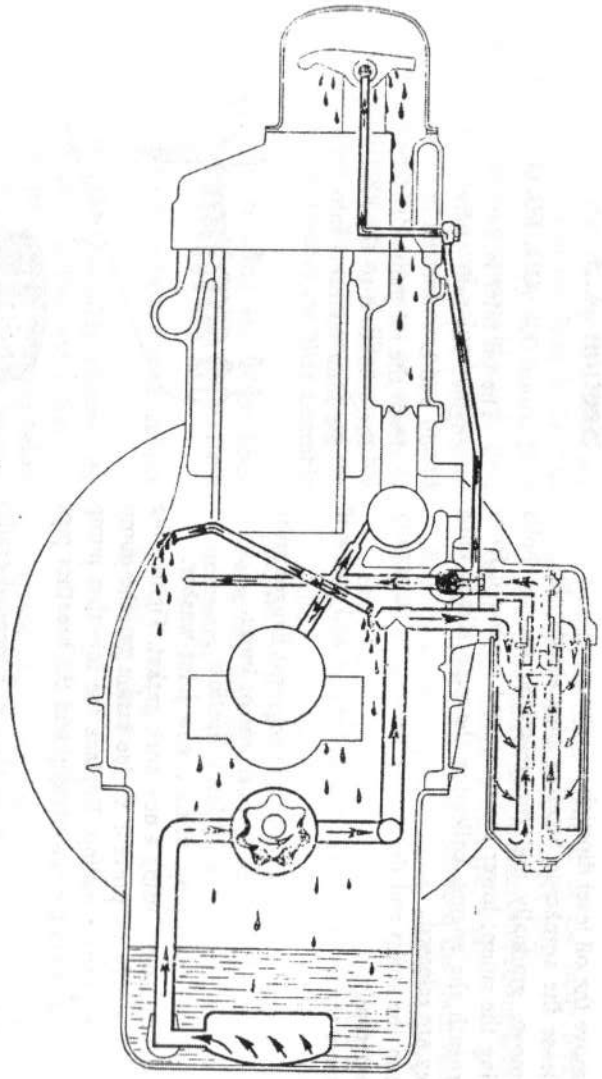
To drain the sump first place the tractor on level ground.

If the engine is cold run it until warm.

Place a suitable receptacle, capable of holding at least 2 gallons (9·1 litres) of oil, under the sump and remove the drain plug, which is on the left-hand side of the engine.

THE NUFFIELD UNIVERSAL THREE ENGINE—LUBRICATION SYSTEM





Remove the oil level dipstick.

Release the crankcase breather pipe steady clip.

Remove, gradually and progressively, the set bolts securing the sump; lower the sump and remove it from underneath the engine, collecting the pipe steady clips as they are released.

Clean the sump and drain plug thoroughly internally and externally.

Inspect the sump for cracks and damage and renew if necessary.

The sump and cylinder block attachment flanges must be wiped clean and freed from scores or burrs.

Clean and inspect the oil level dipstick.

Install the drain plug, using a new joint washer.

Install the sump, using a new cork gasket. Tighten the set bolts evenly to prevent undue strain on the sump but ensure positive sealing. Replace the injection pump oil level and drain pipe steady clip and the breather pipe steady clip.

Refill the engine with one of the recommended grades of oil (see **'RECOMMENDED LUBRICANTS'**, page P.6).

Install the dipstick.

Start the engine, check the oil pressure and check for leaks at the sump joint.

Stop the engine, give the oil time to settle down and recheck the level. Top up if necessary.

Section A.2

OIL PRESSURE RELIEF VALVE ASSEMBLY

The relief valve assembly is mounted on the outlet flange of the oil pump cover and may be removed without removing the oil pump as follows:

Drain and remove the oil sump (Section A.1).

Release the two bolts and withdraw the relief valve assembly, the oil deflector, and the joint gasket from the oil pump flange.

Release the locking washer and remove the plug from the valve body—this will release the spring and steady.

Withdraw the valve plunger and the ball from the valve body.

Clean all the dismantled components thoroughly in petrol (gasoline).

Examine the valve seat and the ball for wear. The seat should be perfectly smooth and the ball free from scores; renew the ball and seat if there is any possibility of leakage past the valve.

Check the relief valve spring; it should be renewed if it is below the specifications given in **'GENERAL DATA'.**

Reassembly and refitting of the relief valve is a reversal of the dismantling and removal procedures. A new lock washer must be fitted beneath the plug on the valve body and the plug locked when fully tightened.

Fit a new joint gasket between the joint faces.

Section A.3

OIL FILTER ASSEMBLY

The oil filter is mounted on the left-hand side of the engine. The unit operates to filter impurities out of the oil and is connected in the system by a passage running from the oil pump delivery pipe flange at the bottom of the crankcase to the filter inlet; an outlet passage from the filter connects into the main oil gallery.

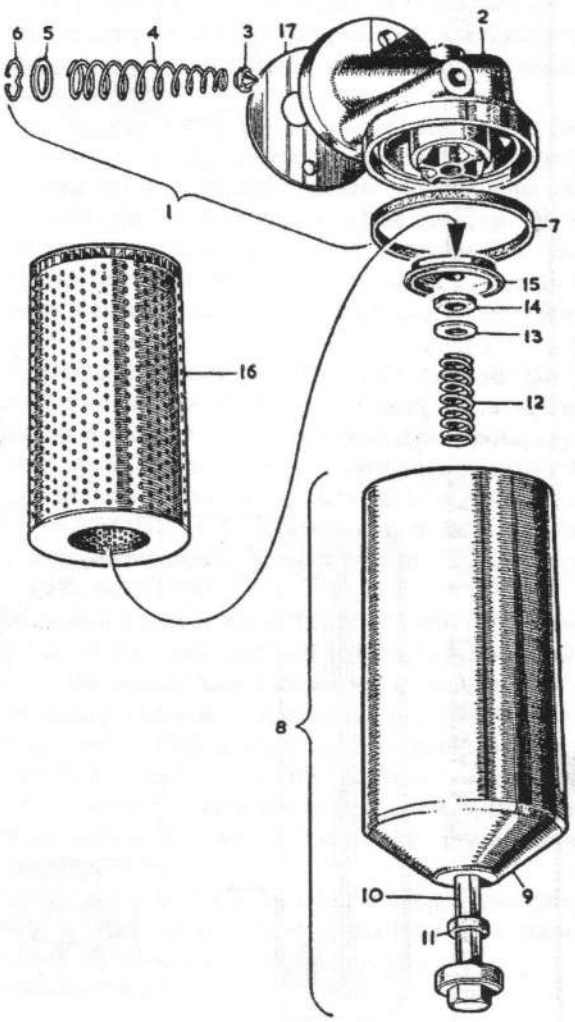


Fig. A.1

The engine oil filter components

1. Head assembly.
2. Head.
3. Relief valve.
4. Spring.
5. Washer.
6. Circlip.
7. Seal for sump—top.
8. Bolt—centre—and sump assembly.
9. Sump.
10. Bolt—centre.
11. Seal for sump—bottom.
12. Spring.
13. Washer.
14. Gasket.
15. Guide—element—bottom.
16. Element assembly.
17. Joint.

Impurities removed from the oil by the filter are collected by an element located in the filter body. The filter element should be renewed every 400 hours. If at any time the filtering element becomes blocked, thus preventing the passage of oil, a relief valve in the filter head comes into action, thus by-passing the element and allowing unfiltered oil to pass into the main oil gallery to lubricate the engine. To remove the oil filter assembly unscrew the two nuts securing the head casting of the filter to the cylinder block and remove the filter assembly and gasket.

Unscrew the centre bolt securing the filter body assembly to the filter head casting and drain the oil from the filter body.

Remove the filter element from the body and the rubber gasket from the head casting.

To dismantle the relief valve assembly remove the circlip and withdraw the washer, spring, and valve.

To remove the centre bolt file away the peening below the threads and withdraw the centre bolt. The bottom sealing plate, rubber seal, steel washer, and seal pressure spring are now loose in the filter body.

Thoroughly clean out the filter body and oil passages in the head casting.

Clean the gasket faces on the head casting and the cylinder block.

Examine the relief valve for correct seating and the spring for weakness.

Renew the filter element.

Renew the head to body gasket if necessary and also the sealing washers on the centre bolt if they have deteriorated or are damaged.

Install the head gasket in the head casting.

Replace the centre bolt, spring, bottom sealing plate, and seals and peen the centre bolt in two fresh places just below the threads.

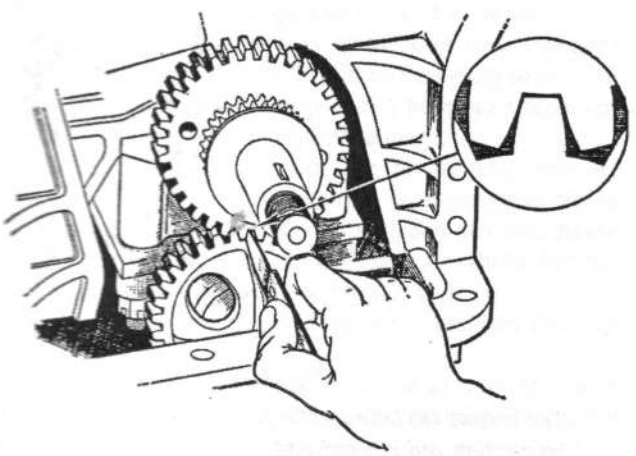


Fig. A.2

Checking the backlash between the oil pump driving gears with the aid of a feeler gauge

Install the filter element in the body and securely install the body assembly to the head.

Insert the relief valve, washer, and spring into the head casting and secure it with the circlip.

Fit a new joint gasket between the joint faces of the filter head and cylinder block and secure the filter in position.

Start the engine and check the oil pressure.

Check the filter for leaks.

Allow time for the oil to circulate and then stop the engine. After a short interval check the oil level in the sump and top up to the 'FULL' mark on the dipstick if necessary.

Section A.4

OIL PUMP ASSEMBLY

Drain and remove the sump (Section A.1).

Remove the two set bolts securing the oil delivery pipe flange to the cylinder block.

Remove the split pins and nuts securing the pump to the front main bearing cap.

Withdraw the pump from the studs complete with gear, delivery pipe, suction pipe, and oil strainer.

Remove the shims and hollow dowels from the studs and replace them with distance pieces to cover the plain portion of the threads; temporarily replace the securing nuts to keep the bearing cap in position.

Remove the delivery pipe from the outlet flange of the pump cover.

Remove the suction pipe complete with strainer from the inlet flange of the pump cover. Remove the split pin to enable the strainer to be withdrawn from the suction pipe.

Remove the relief valve assembly and the oil deflector from the outlet flange of the pump cover.

Dismantle the relief valve assembly (Section A.2).

Remove the split pin and nut from the pump spindle.

Withdraw the pump gear, using extractor 18G2 with thrust pad 18G231E, and remove the key from the pump shaft.

Remove the five set bolts securing the cover to the pump body and withdraw the cover, the outer rotor, and the inner rotor with the driving shaft pinned to it.

Thoroughly clean all the dismantled components.

Inspect the pump drive gear for worn or chipped teeth; renew the gear if necessary.

Inspect the relief valve components (Section A.2).

Check the spindle in the body for excessive wear.

Inspect the contacting surfaces of the rotor lobes for excessive wear. Should it be necessary to renew either the inner or outer rotor, it is advisable to renew both rotors complete with the spindle.

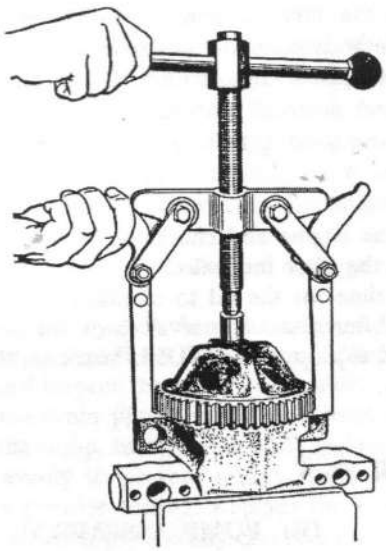


Fig. A.3
Using extractor 18G2 together with thrust pad 18G231E to withdraw the oil pump drive gear

Place a straight-edge across the end face of the pump body with the rotors in position and check the end-float. Any excessive end clearance can be remedied by lapping the pump body face, thus bringing the cover closer to the rotors.

Reassembly is a reversal of the dismantling procedure.

Use a new split pin to lock the nut securing the drive gear on the pump shaft and fit new joint gaskets between the mating surfaces of the suction pipe, delivery pipe, and relief valve body when refitting to the pump.

Fit a new split pin to locate the floating oil strainer to the suction pipe.

Reassemble the outer rotor of the pump with the chamfered end towards the bottom of the rotor pocket.

Before fitting the pump to the engine remove the nuts and distance pieces which temporarily secured the front main bearing cap.

Install the hollow dowels over the studs; ensure that they fit into the grooves in the bearing cap.

Using the original shims or new shims of the same thickness, replace the pump over the studs, engaging the pump gear with the driving gear on the crankshaft. Ensure that the pump and shims fit over the dowels so that they are flush against the bearing cap.

Tighten the nuts evenly to a torque of 84 lb. ft. (11·5 kg. m.). Check that a clearance of ·004 in. (·102 mm.) backlash exists between the driving gears (Fig. A.2), and re-shim if necessary. Lock the securing nuts in position with new split pins.

Secure the delivery pipe flange to the cylinder block face using a new gasket between the mating surfaces.

Replace the sump and refill with new oil (Section A.1).

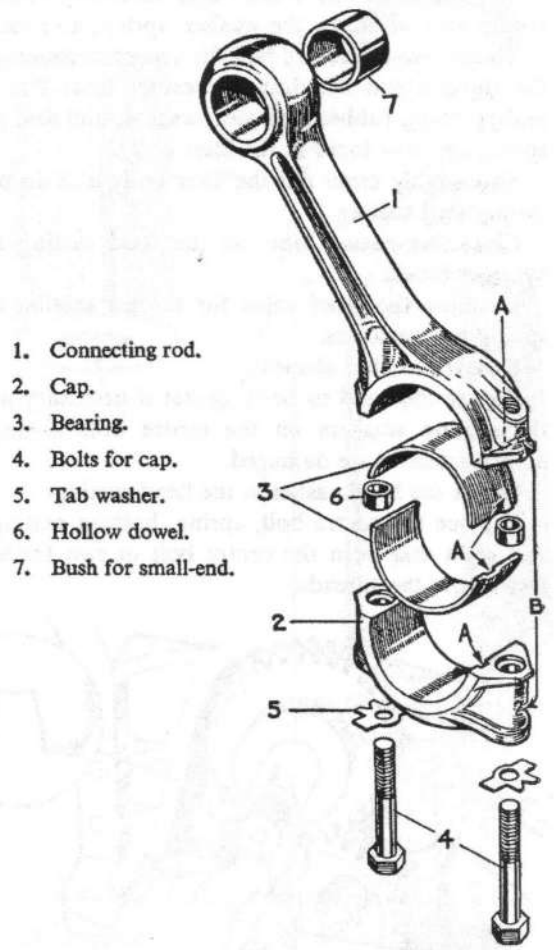
Section A.5

REMOVING AND REPLACING MAIN AND BIG-END BEARINGS

Unless the bearing journals are badly worn the big-end bearings may be renewed without removing the crankshaft. To renew the main bearings it is necessary to remove the engine (Section A.21) and withdraw the crankshaft as detailed in Section A.22. Shells are used both for the main and big-end bearings, which are of the shimless type and therefore non-adjustable.

Big-end bearings

It is possible to remove the pistons and connecting rods without removing the engine from the tractor.



1. Connecting rod.
2. Cap.
3. Bearing.
4. Bolts for cap.
5. Tab washer.
6. Hollow dowel.
7. Bush for small-end.

Fig. A.4
The arrows (A) indicate the positions of the lips on the connecting rod big-end and bearing shell. The arrows (B) indicate the markings on the rod and cap to facilitate their replacement in their original positions

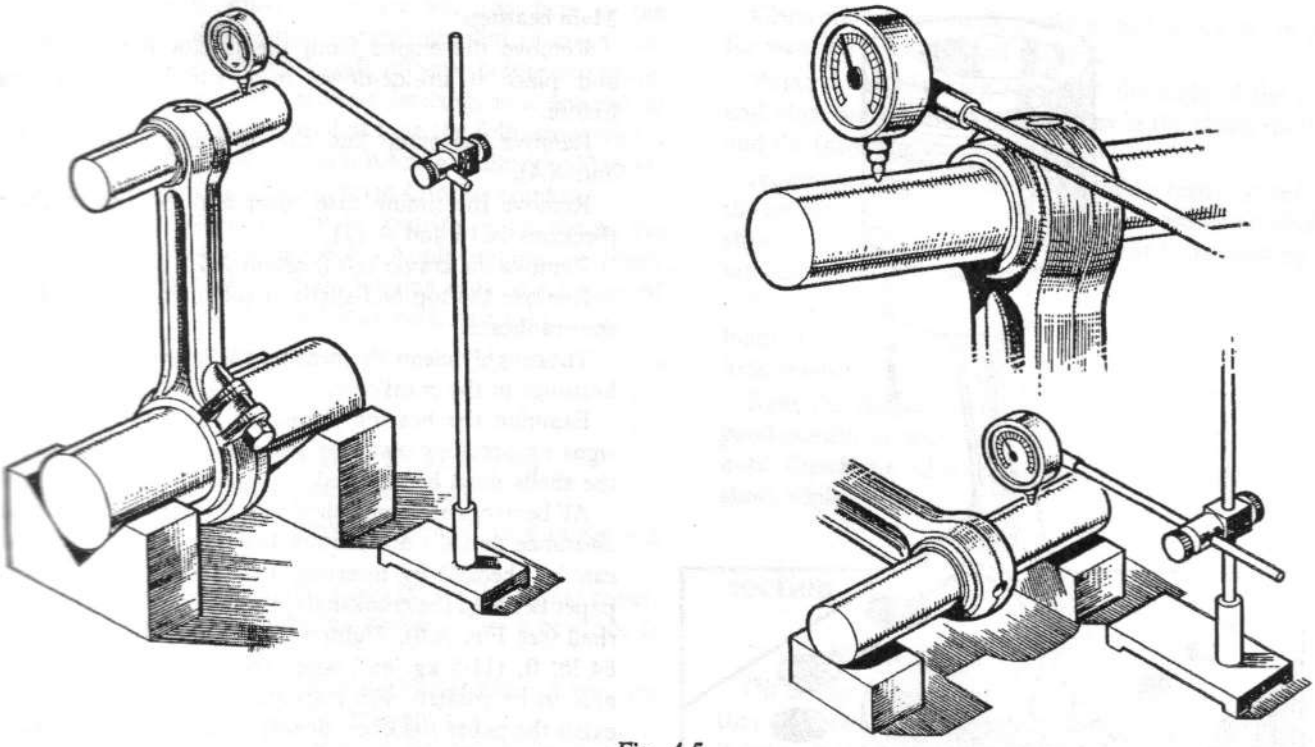


Fig. A.5

Checking the connecting rod alignment

Remove the cylinder head assembly (Section A.9).

Drain the engine oil and remove the sump (Section A.1).

Release the tab washers and remove the set bolts securing the caps and bearings to the connecting rods. Remove the caps with the bottom half of the bearings and the hollow dowels.

NOTE.—The suction pipe complete with strainer must be removed from the oil pump flange before the cap can be removed from the connecting rod in No. 1 cylinder.

Withdraw the pistons and connecting rods upwards through the cylinder bores. It will be necessary to remove the carbon deposit at the top of the bores to enable the pistons to pass through without damage.

Separate the pistons from the connecting rods by removing the two circlips securing each gudgeon pin in its piston and then pressing the gudgeon pin out. Mark the pistons, gudgeon pins, and bearing shells for re-assembly to their original connecting rods.

Thoroughly clean the bearing shells and the faces of the rods and caps.

Examine the bearing shells for wear and pits and renew if necessary. The bearings are prefinished with the correct diametrical clearance and do not require bedding in.

Each connecting rod and cap is marked with the number of the cylinder from which it was removed (Fig. A.4) and any new component should be suitably numbered before reassembly.

The alignment of the connecting rods should be checked, using an alignment fixture as shown in Fig. A.5. The centres of the little and big-ends must be parallel within ·0001 in. per in. (·0001 cm. per cm.) effective mandrel length. The test bars must be an accurate fit in the bores. If the alignment is not within that specified the connecting rods should be renewed. On no account must the connecting rods or caps be filed.

Before installing the connecting rods and bearings it is assumed that the gudgeon pins, pistons, and rings have been serviced as described in Sections A.10 and A.11. The pistons and connecting rods must be fitted in the same liner bores and the same way round as they were originally. Lubricate the bearing surfaces with engine oil.

Assemble the pistons to the connecting rods by inserting the gudgeon pins, which should be a hard hand-push fit at a room temperature of 68° F. (20° C.). Be sure to fit the pistons the correct way onto the connecting rods, i.e. the cavity in the piston top must be on the left-hand side of the engine, looking from the front (Fig. A.6). Lock the gudgeon pin in position with the two-circlips; ensure that they fit snugly into their grooves.

Space the compression ring gaps equally round the circumference of the piston and compress the piston rings, using tool 18G55.

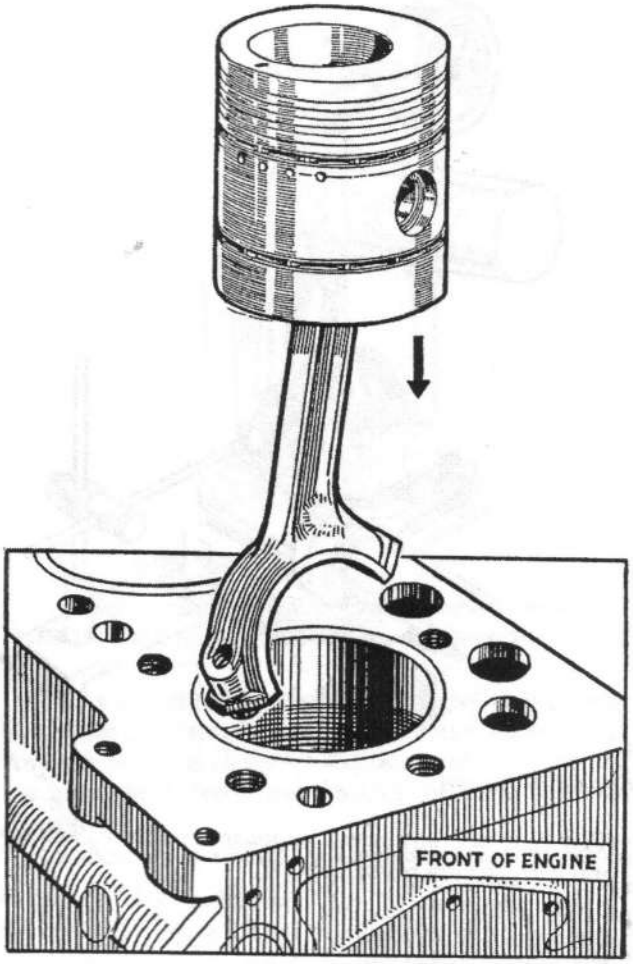


Fig. A.6

The correct assembly position for the connecting rod and piston

Insert the connecting rods and pistons downwards through their respective cylinder bores; the cavity in the piston top must be on the same side as the injection pump, i.e. the right-hand side of the cylinder block.

Fit the bearings, hollow dowels, and big-end caps. Each half of the bearings is notched to fit the connecting rod and cap so that they are correctly positioned and prevented from turning.

Fit new tab washers under the connecting rod cap bolts and tighten the bolts to a torque of 60 lb. ft. (8·1 kg. m.); lock in position with the tab washers.

Install the suction pipe, complete with strainer, to the oil pump body; a new gasket should be fitted between the joint faces.

Install the cylinder head assembly (Section A.9).

Install the sump and refill with the recommended grade of oil.

Main bearings

Remove the engine from the tractor (Section A.21) and place it upside-down in a suitable dismantling fixture.

Remove the sump and the oil pump (Sections A.1 and A.4).

Remove the timing case cover and the timing chain (Sections A.16 and A.17).

Remove the crankshaft (Section A.22).

Remove the top half-shells of the main bearings from the crankcase.

Thoroughly clean the bearing shells and caps and the housings in the crankcase.

Examine the bearing shells for wear and pitting; if signs of breaking away or picking up are evident then the shells must be renewed.

All bearings are prefinished with the correct diametrical clearance and do not require bedding in; the clearance can be checked by inserting a trial thickness of feeler paper between the crankshaft journal and the cap bearing shell (see Fig. A.8). Tighten the cap nuts to a torque of 84 lb. ft. (11·5 kg. m.), when the crankshaft should be able to be rotated with resistance. When this condition exists the paper thickness denotes the crankshaft running clearance.

New bearing shells should be marked to match up with the markings on the cap, **and on no account should the shells or caps be filed on their joint faces to take up wear or to reduce the running clearance.**

In the case of a 'run' bearing it is always essential to clean the crankshaft and cylinder block oilways thoroughly by applying a pressure gun containing paraffin (kerosene) or petrol (gasoline). Wash out the engine base and clean the oil pump and pump strainer to ensure that

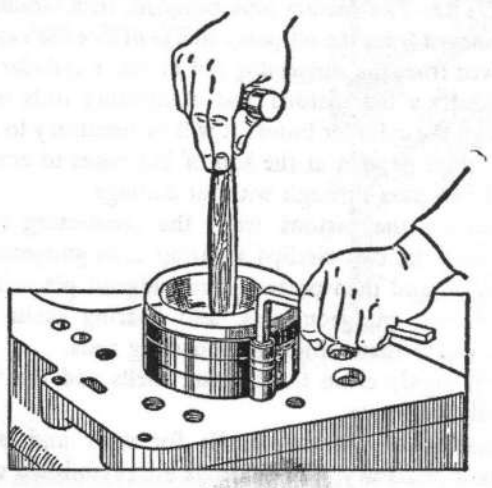


Fig. A.7

The use of piston ring compressor 18G55A is recommended when assembling the pistons into the cylinder bores