Ferguson

SERVICE MANUAL

SPECIFICATION AND DATA
TRACTORS TYPE TE—A20 and TE—D20

This specification initially gives data of the basic normal-width tractor, less engine ; specifications of engines then follow.

Details applicable to tractors which deviate from this standard, e.g. narrow-width models, are given in Section T, under the title of ' Special Type Tractors.'

TRACTOR, LESS ENGINE

Overall Dimensions.

Wheel Base 70" (1778 mm.) Track : Front adjustable in 4" steps (102 mm) from 4ft. to 6ft. 8 ins. (1219 to 2032 mm.)
,, Rear ,, ,, ,, ,, ,, 4ft. to 6ft. 4 ins. (1219 to 1930 mm.)

Turning circle : with brakes 16 ft. (4876 mm) without brakes 20 ft. (6095 mm).

Ground clearance 13" (330 mm.) Overall length 9 ft. 7 ins. (2921 mm.) Overall width 5 ft. 4 ins. (1625 mm.)
Overall height 4 ft. 8 ins. (1320 mm.) Weight (dry) 2500 lb. (1134 kg). Tyres front 4.00 × 19. Tyres rear 10.00 × 28.

Fill-Up Data.

Engine Sump 12 pints (6.8 litres)
Air Cleaner ¾ pint (.45 litres)
Cooling System 20 pints (11.3 litres)
Transmission casing 5 gallons (22.8 litres)
Belt Pulley ½ pint (.28 litres)
Fuel tank-TE-A20 : 8 gallons (36 litres)
-TE-D20 : 7 gallons (31.5 litres) and 1 gallon (4.5 litres)
Steering Box 5 pints. (2.9 litres)
Front Hubs (each) ⅜ pint (.30 litres)
Tyre pressures : Front 26 lb. per sq. inch
Rear 12 lb. per sq. inch

Component Details	Dimensions New		Clearance New		Permissible Worn Clearance or Dimension		Remarks
	Ins.	mms.	Ins.	mms.	Ins.	mms.	
Hydraulic Pump.							
Housing Bore for Control Valve Bush	.999 1.000	25.375 25.400					
			—.001 —.0025	—.025 —.064			
Control Valve Bush Ext. Dia.	1.001 1.0015	25.425 25.438					
Control Valve Bush Int. Dia.	.5925 .5030	15.959 15.062					
			.0005 .0012	.013 .031			
Control Valve Dia.	.5918 .5920	15.032 15.037					
Hydraulic Lift Assy.							
Hydraulic Cylinder Bore	2.4995 2.5010	63.487 63.525					
			.0015 .0040	.038 .102	.006	.152	
Hydraulic Cylinder Piston Dia.	2.497 2.498	63.424 63.449					
Piston Ring Groove Width	.1255 .1265	3.188 3.213					
			.0015 .0035	.038 .089	.005	.126	
Piston Ring Width	.124 .123	3.150 3.124					
Piston Ring Gap (Closed)	.007 .013	.178 .330			.018	.457	
Linkage Check Chain Length.	8.015 7.980	203.581 202.692					Length of check chain taken between inside faces of end links.

Torque Loadings—Valve Chamber Clamp Bolts 70 lbs. ft. (9.675 kg.m). Pump Assembly Securing Bolts 45 lbs. ft. (6.25 kg.m).

Fork retraction spring—Free length inside hooks 4.88" (123.952 mm). Length under 12 lbs. (5.443 kg) load 6.94" (176.276 mm).

Component Details	Dimensions New		Clearance New		Permissible Worn Clearance or Dimension		Remarks
	Ins.	mms.	Ins.	mms.	Ins.	mms.	
Check Chain Shackle Length	1.189 1.205	30.201 30.607					This dimension taken from pin hole centre to inside face.
Check Chain Assy. Total Length	10.358 10.425	263.093 264.795			10.7	271.76	This length between pin hole centres.
Transmission.							
Shifter Mechanism.							
Shifter Rail Dia.	.7465 .7475	18.961 18.987					
			.0015 .0035	.038 .089	.006	.152	
Shifter Rail Bore in Casing	.749 .750	19.025 19.050					
Plunger Spring Details.	Axial load 12 ± 1 lb. Load may be increased in increments of 3 lbs. (1.361 kg) by fitting 1/16″ (1.588 mm) shims up to a maximum of 5/16″ (7.938 mm) giving max. load of 27 lbs. (12.247 kg). Free length 1.571″ (39.903 mm). Solid length .832″ (21.133 mm). Nominal fitted length 1.32″ (33.528 mm).						
Thickness of Shifter Forks at Pressure Faces.	.372 .368	9.449 9.347					
			.008 .016	.203 .406	.025	.634	
Width of Groove in Coupling Connectors	.380 .384	9.652 9.754					
Mainshaft.							
First Gear Bushing Bore.	2.0620 2.0635	52.375 52.413					
			.0015 .0052	.038 .132	.007	.177	
Mainshaft Dia. at Position of 1st Gear	2.0605 2.0583	52.337 52.281					
2nd Gear Bushing Bore.	2.0620 2.0635	52.375 52.413					
			.0015 .0052	.038 .132	.007	.177	
External Dia. of Bearing Connector	2.0605 2.0683	52.337 52.281					
Countershaft.							
3rd. Gear Bushing Bore.	2.0620 2.0635	52.375 52.413					
			.0015 .0052	.038 .132	.008	.203	
Ext. Dia. of Counter-shaft 3rd. Gear Bush	2.0605 2.0583	52.337 52.281					
4th. Gear Bushing Bore	2.0635 2.0620	52.413 52.375					
			.0052 .0015	.132 .038	.007	.177	
Ext Dia. of Connector Bearing.	2.0605 2.0583	52.377 52.281					
Reverse Gear Bushing Bore	1.1250 1.1256	28.575 28.590					
			.002 .003	.051 .076	.008	.203	
Reverse Shaft Dia.	1.123 1.122	28.524 28.499					
End Float—Main & Countershaft.			See Remarks				Fit shims behind mainshaft bearing retainer and P.T.O. Shaft bearing support to give preload of 7 to 12 lbs. ins. (.081—.138 kg.m). on main and countershafts.

Component Details	Dimensions New		Clearance New		Permissible Worn Clearance or Dimension		Remarks
	Ins.	mms.	Ins.	mms.	Ins.	mms.	
Backlash(A)—Sliding Coupling and Mating Teeth on Gear Wheels .008″ .203 mm .010″ .254 mm			**(B)**—Sliding coupling and mating teeth on connectors— .0005″ .013 mm. .0015″ .038 mm.		**(C)**— Gear teeth— .004″ .102 mm. .008″ .203 mm.		

Power Take-off Shaft.

Rear splines 6 × 1.92″ (48.77 mm) long × 1.121″ (28.47 mm) dia. × .922″ (23.42 mm) dia. × .275″ (6.99 mm) wide.
1.123″ (28.52 mm) .932″ (23.67 mm) .277″ (7.04 mm)
21/64″ (8.33 mm) dia. hole at distance of ½″ (12.7 mm) from shaft end.
End Cover Int. Dia. 2½″ (63.5 mm).

Clutch.

Release Shaft Dia.	.997 .996	25.324 25.298					
			.004 .0065	.102 .165	.010	.254	
Bush Bore.	1.001 1.0025	25.425 25.464					
Clutch Springs.	9 green springs each of 105 lb. (47.627 kg) to 115 lb. (52.199 kg). 9 orange springs each of 90 lb. (40.823 kg) to 100 lb. (45.358 kg).						Orange springs superseded green springs after Tractor Serial No. 32872.

Free movement of pedal should be ⅜″ (9.5 mm). This dimension taken between upper side of pedal and underside of footrest bracket. Movement of release lever ends ½″ (13 mm). Variation in release lever height should not exceed .015″ (.381 mm).

Rear Axle.

Backlash — Crown wheel and pinion .004″ (.102 mm). Half shaft end float .008″ (.203 mm).
.025″ (.634 mm). .020″ (.508 mm).
Clearance between crown wheel and thrust pads .013″ (.033 mm).
.020″ (.508 mm).

Front Axle.

Centre Trunnion Bushing Int. Dia. Fitted.	1.756 1.764	44.602 44.806					
			.008 .017	.203 .432	.035	.088	
Centre Pin Dia.	1.747 1.748	44.347 44.399					
Bore of Outer Axle for Spindle Bushes	1.3735 1.3745	34.887 34.912					
			±.001	±.025			
Ext. Dia. Spindle Bushes.	1.3735 1.3745	34.887 34.912					
Int. Dia. Spindle Bushes	1.249 1.250	31.725 31.750					
			.003 .005	.076 .127	.010	.254	
Spindle Dia.	1.246 1.245	31.648 31.623					

Steering.

Backlash—Screw adjustment against rear faces of segments to give minimum backlash without binding.

Distances between ball centres and vertical plane through drop arm crankshaft centre 2.17″ (55.12 mm) with steering wheel in straight ahead position.

Pulley Attachment.

Pulley width 6½″ (165 mm) Dia. 9″ (229 mm). Gear Ratio to P.T.O. Shaft 1.86 to 1. Backlash between driving gears .004″ (.102 mm) .020″ (.508 mm)

PETROL ENGINE, PART No. 57963

(Manufactured by the Standard Motor Co.)

ENGINE—80 mm bore, fitted to tractors Type TE-A20, TE-C20.

Stroke 92 mm. Piston Displacement 112.9 cu. ins. (1850 c.c.) Compression ratio 5.77 to 1.

Maximum belt horse power—23.9.

Tightening Torque—Cylinder Head Nuts 60 to 65 lbs. ft. (8.25—8.95 kg. metres).
Big End Nuts 42 to 46 lbs. ft. (5.8—6.4 kg. metres).
Main Bearing Nuts 90 to 100 lbs. ft. (12.4—13.8 kg. metres).
Flywheel Cap Screws 42 to 46 lbs. ft. (5.8—6.4 kg. metres).

Component Details	Dimensions New		Clearance New		Permissible Worn Clearance or Dimension		Remarks
	Ins.	mms.	Ins.	mms.	Ins.	mms.	
Crankshaft.							
Journal Diameter	2.4795 2.4790	62.979 62.967					
			.0025 .0010	.064 .025	.006 dry	.152	Similar tolerances for re-ground crankshaft to .020", .030", .040" (.508, .762, 1.016 mm) undersize.
Bearing Diameter (Fitted)	2.4815 2.4805	63.030 63.015					
Crankshaft End Float.							
Centre Journal Length.	1.7507 1.7498	44.468 44.445					
			.0117 .0048	.297 .122	.010 dry	.254	Crankshaft end float controlled by thickness of thrust washers.
Centre Bearing Cap width + 2 thrust washers.	1.7450 1.7390	44.323 44.171					
Big End.							
Crankpin Diameter	2.0861 2.0866	52.987 53.000					
			.0024 .0006	.061 .015	.006	.152	Similar tolerances for re-ground crankshaft to .020", .030", .040" (.408, .762, 1.016 mm) undersize.
Bearing Diameter	2.0985 2.0872	53.302 52.015					
Connecting Rod End Float.							
Crankpin Length	1.1890 1.1870	30.201 30.150					
			.0115 .0075	.292 .191			
Con-Rod Width	1.1795 1.1775	29.959 29.909					
Ovality—Journals & Crankpins.					0.002	.051	Minimum diameter to be such that the permissible worn clearance for bearings is not exceeded.
Taper—Journals & Crankpins.					0.002	.051	
Small End.							
Bore for Bush	1.0000 .9995	25.4 25.387					
			—.0035 —.0050	+.09 —.13			Heat piston in boiling water for removal and fitting of gudgeon pin.
Bush, Ext. Dia.	1.0045 1.0035	25.514 25.489					
Bush, Int. Dia.	.8752 .8738	22.230 22.220					
			—.00035 —.00030	+.009 —.008			These clearance figures taken at 68°F.
Gudgeon Pin, Dia.	.87510 .87485	22.228 22.221					
			+.00045 —.00005	+.011 —.001			
Gudgeon Pin Holes in Piston	.8853 .87505	22.233 22.226					

Component Details	Dimensions New		Clearance New		Permissible Worn Clearance or Dimension		Remarks
	Ins.	mms.	Ins.	mms.	Ins.	mms.	
Pistons & Sleeves.							
Piston Dia.—(Thrust Side Top Skirt)	3.1461 3.1472	79.908 79.939					Sleeves and pistons graded F.G.H. in steps of .0004" (.010 mm).
			.0028 .0034	.071 .086			
Sleeve Bore (Parallel)	3.1492 3.1503	79.99 80.018					
			.0013 .0019	.033 .048			
Piston Dia. (Thrust Side Bottom Skirt)	3.1476 3.1487	79.949 79.977					
Top Land Diameter	3.133 3.131	79.578 79.527	.0162 .0193	.412 .490			Piston fitted with three rings above gudgeon pin, one ring below.
Ring Groove Width Top and 2nd.	.0957 .0947	2.431 2.405					On engines S101E to S56962E a plain bottom scraper ring fitted below gudgeon pin.
			.0030 .0010	.076 .025	.005	.127	
Compression Ring Width Top & 2nd.	.0937 .0927	2.380 2.355					
Ring Groove Width (3rd.)	.1895 .1885	4.813 4.788					Similar tolerances for oversize pistons +.020" (.508 mm).
			.0030 .0010	.076 .025	.005	.127	
Scraper Ring Width (3rd.)	.1875 .1865	4.763 4.737					Oversize rings + .010" (.245 mm) + .020" (.508 mm) + .030" (.762 mm).
Ring Groove Width (4th.)	.1580 .1570	4.013 3.987					Replacement sleeves available as standard size, and rebored + .020" (.508 mm).
			.0030 .0010	.076 .025	.005	.127	
Scraper Ring Width (4th.)	.1560 .1550	3.962 3.937					
Ring Gap (Closed)			.010 .006	.25 .15			
Clearance Between :							
Sleeve & Upper Block			.045 .015	1.143 .381			Dimensions taken respectively at top flange and spigot of sleeve.
Sleeve & Lower Block			.003 .0005	.076 .013			
Stand-out of Sleeve			.003 .0055	.076 .140			Desired clearance when assembled.
Water Pump & Thermostat.							
Housing Bore for Bearing	1.1813 1.1807	30.005 29.990					
			+.0007 —.0004	+.018 —.010			
Bearing Case, Ext. Dia.	1.1811 1.1806	30.000 29.987					
Oil Pump.							
Approximate capacity at 50 lbs. per square inch (3.52 kg/sq. cm.) is 3.95 gallons (16.94 litres) per minute at 2,000 r.p.m. (Engine)							
Outer Rotor, outside dia.	1.598 1.599	40.589 40.615					
			.001 .003	.025 .075			
Housing, internal dia.	1.601 1.600	40.665 40.640					
Rotor depth—outer and inner :	0.9995 0.9985	25.387 25.362					
			.0005 .0015	.013 .038			A combined worn clearance of .004" (.101mm) indicates need of cover and housing face lapping.
Housing depth	1.001 1.000	25.403 25.400					

Component Details	Dimensions New		Clearance New		Permissible Worn Clearance or Dimension		Remarks
	Ins.	mms.	Ins.	mms.	Ins.	mms.	
Inner rotor, major dia.	1.171 1.172	29.743 29.769					
Inner rotor, minor dia.	.729 .731	18.517 18.567					
Clearance on rotors			.004 .0005	.102 .013			Where clearance exceeds .010" (.253 mm) new parts should be fitted.
Camshaft.							
Front Journal Dia.	2.0590 2.0595	52.299 52.311					
			.0045 .0025	.114 .051	.0065	.164	Max. wear on camshaft journals .003" (.076 mm) and .0035 (.088 mm) in cylinder block.
Bore in Block	2.0635 2.0620	52.413 52.375					
2nd Journal Dia. 3rd. " " Rear " "	1.71575 1.71525	43.580 43.567					
			.0045 .0025	.114 .051	.0065	.164	
Bore in Block	1.71975 1.71825	43.683 43.645					
Locating Groove	.1885 .1865	4.788 4.737					
			.0065 .003	.165 .076			This clearance determines camshaft end float.
Locating Plate	.1835 .1820	4.661 4.623					
Tappets & Valves.							
Tappet Bore in Block	.9380 .9373	23.825 23.807					
			.0013 .0002	.033 .005			
Tappet Dia.	.9371 .9367	23.802 23.792					
Valve Tip Clearance Inlet Exhaust			.010 .012	.254 .305			
Valve Guide Bore Dia.	.313 .312	7.950 7.925					
Inlet Valve Stem Dia.	.311 .310	7.899 7.874	.001 .003	.025 .076			
Exhaust Valve Stem Dia.	.309 .308	7.849 7.823	.003 .005	.076 .127			
Guide projection above spring seat.	9/16"	14.3					

Valve seating angle on valve head 45°. Valve seat angle in cylinder head 44½°.

Valve Springs.

Free length 1.716" (43.586 mm). Fitted load 38 lbs + 2 lb. (17.237 kg ± .907 kg).
Fitted length 1.25 (31.75 mm). Full lift load 60 lb. (27 kg) approx.

Flywheel.

Spigot dia. (for Starter Gear Ring)	13.406 13.403	340.512 340.436			Flywheels balanced individually. Held to crankshaft by 4 set screws locked in pairs. Single dowel. Locating holes in flywheel 90° apart, in crankshaft 180° apart.
			—.031 —.023	—.787 —.584	
Starter Gear Ring Inside Dia.	13.380 13.375	339.852 339.725			

Run-out of clutch contact face at outer dia. should not exceed .003" (.076 mm),

Clearance between starter pinion and ring gear, Engine Serial No.SIE—S67028E, .156" (3.962 mm).
Engine Serial No. S67029E onwards .114" (2.896 mm).
Face-up starter mounting flange or fit shims to suit.

Component Details	Dimensions New		Clearance New		Permissible Worn Clearance or Dimension		Remarks
	Ins.	mms.	Ins.	mms.	Ins.	mms.	
Carburettor.							
Zenith Type 24 T—2.							
Choke Tube	17						
Main Jet	120						
Adj. Needle	12						
S.R. Jet	50						
Progression	120						
Needle Seating	1.5 mm						
Air Jet	2.0						
S.R. Bottom Feed	1.5						
Zenith Type 24T—2 (Min./Max. Adj. Jet)							
Choke Tube	17						
Main Jet	100						
Adj. Needle	1.00 drilled						
S.R. Jet	50						
Progression	120						
Needle Seating	1.5 mm						
Petrol level at 4′ 6″ Head	15 mm						
Inter-con	1mm drilled						
Air Jet	2.0						
Petrol Inlet Boss	Stamped M-M						
Holley.							
Discharge Nozzle.							.104″ (2.642 mm) with 4 holes .040″ (1.016 mm) dia.
Float Needle Seat							.081″ (2.057 mm). dia. .083″ (2.108 mm) dia.
Main Jet							.035″ (.889 mm) dia.
High Speed Bleed							.0293″ (.744 mm) dia.
Upper Idle Restriction							.046″ (1.168 mm) dia.
Idle Discharge Hole							.052″ (1.321 mm) dia.
Second Idle Discharge Hole							.046″ (1.168 mm) dia.
Venturi							21/32″ (16.669 mm) dia.
Fuel Level at 3/4 (.341 kgm) fuel pressure							9/16″ ± 1/32″ (14.274 ± .787 mm) to top face of fuel bowl.
Float cut-off position							7/16″ (11.13 mm) measured between upper casting face and outer float top.

Governor.

Governor lever spring: Free length: inside hooks 3.8″ (96.5 mm). End Play .005″ (.127 mm) Rate: 18 lbs/in + 5%. No of coils: 26. .010″ (.254 mm)

Load at 1″ (25.4 mm) deflection: 25 lbs. (11.34 kg) + 1 lb. (.454 kg.) Initial wound-in load: 7 lbs. (3.175 kg).

Control Rod: Free length: inside hooks 2.687″ (68.25 mm). Rate: 64 lbs./in ± 5%. No of coils: 11½.

Compensating Spring: Load at ½″ (12.7 mm) deflection: 38 lbs. (17.237 kg) ± 1½ lbs. (.681 kg). Initial wound-in load: 6 lbs. (2.722 kg).

VAPORISING OIL ENGINE, PART No. 500038

(Manufactured by the Standard Motor Co.)

ENGINE—85 mm bore, fitted to tractors Type TE-D20, TE-E20.

Stroke 92 mm. Piston Displacement 127 cu. ins. (2088 c.c.) Compression ratio 4.8 to 1.

Maximum belt horse power—23.9.

Tightening Torque—Cylinder Head Nuts 60 to 65 lbs. ft. (8.25—8.95 kg. metres).
Big End Nuts 42 to 46 lbs. ft. (5.8—6.4 kg. metres).
Main Bearing Nuts 90 to 100 lbs. ft. (12.4—13.8 kg. metres).
Flywheel Cap Screws 42 to 46 lbs. ft. (5.8—6.4 kg. metres).

Component Details	Dimensions New		Clearance New		Permissible Worn Clearance or Dimension		Remarks
	Ins.	mms.	Ins.	mms.	Ins.	mms.	
Crankshaft.							
Journal Diameter	2.4795 2.4790	62.979 62.967	.0025 .0010	.064 .025	.006 dry	.152	Similar tolerances for re-ground crankshaft to .020", .030", .040" (.508, .762, 1.016 mm) undersize.
Bearing Diameter (Fitted)	2.4815 2.4805	63.030 63.015					
Crankshaft End Float.							
Centre Journal Length.	1.7507 1.7498	44.468 44.445	.0117 .0048	.297 .122	.010 dry	.254	Crankshaft end float controlled by thickness of thrust washers.
Centre Bearing Cap width + 2 thrust washers.	1.7450 1.7390	44.323 44.171					
Big End.							
Crankpin Diameter	2.0861 2.0866	52.987 53.000	.0024 .0006	.061 .015	.006	.152	Similar tolerances for re-ground crankshaft to .020", .030", .040" (.508, .762, 1.016 mm) undersize.
Bearing Diameter	2.0985 2.0872	53.302 52.015					
Connecting Rod End Float.							
Crankpin Length	1.1890 1.1870	30.201 30.150	.0115 .0075	.292 .191			
Con-Rod Width	1.1795 1.1775	29.959 29.909					
Ovality—Journals & Crankpins.					0.002	.051	Minimum diameter to be such that the permissible worn clearance for bearings is not exceeded.
Taper—Journals & Crankpins.					0.002	.051	
Small End.							
Bore for Bush	1.0000 .9995	25.4 25.387	—.0035 +.0050	+.09 —.13			Heat piston in boiling water for removal and fitting of gudgeon pin.
Bush, Ext. Dia.	1.0045 1.0035	25.514 25.489					
Bush, Int. Dia.	.8752 .8738	22.230 22.220	+.00035 —.00030	+.009 —.008			These clearance figures taken at 68° F.
Gudgeon Pin, Dia.	.87510 .87485	22.228 22.221	+.00045 —.00005	+.011 —.001			
Gudgeon Pin Holes in Piston	.8853 .87505	22.233 22.226					

Component Details	Dimensions New		Clearance New		Permissible Worn Clearance or Dimension		Remarks
	Ins.	mms.	Ins.	mms.	Ins.	mms.	
Pistons & Sleeves.							
Piston Dia.—(Thrust Side Top Skirt)	3.3429 3.3438	84.905 84.933					Sleeves and pistons graded F.G.H. in steps of .0004" (.010 mm).
Sleeve Bore (Parallel)	3.3460 3.3471	84.988 85.016					
Piston Dia. (Thrust Side Bottom Skirt)	3.3442 3.3453	84.943 84.971					
Top Land Clearance			.017 .019	.432 .483			
Ring Groove Width Top 2nd and 3rd.	.0797 .0807	2.024 2.050					
			.0030 .0010	.076 .025	.005	.127	
Compression Ring Width Top 2nd & 3rd.	.0787 .0777	1.999 1.974					
Ring Groove Width (4th.)	.1895 .1885	4.813 4.788					Similar tolerances for oversize pistons +.020" (.508 mm). Oversize rings + .010" (.245 mm) + .020" (.508 mm) + .030" (.762 mm). Replacement sleeves available as standard size, and rebored + .020" (.508 mm).
			.0030 .0010	.076 .025	.005	.127	
Scraper Ring Width (4th.)	.1875 .1865	4.763 4.737					
Ring Groove Width (5th.)	.1580 .1570	4.013 3.987					
			.0030 .0010	.076 .025	.005	.127	
Slotted Scraper RingWidth (5th.)	.1560 .1550	3.962 3.937					
Ring Gap (Closed)			.010 .006	.25 .15			
Clearance Between :							
Sleeve & Upper Block			.045 .015	1.143 .381			Dimensions taken respectively at top flange and spigot of sleeve.
Sleeve & Lower Block			.003 .0005	.076 .013			
Stand-out of Sleeve			.003 .0055	.076 .140			Desired clearance when assembled.
Water Pump & Thermostat.							
Housing Bore for Bearing	1.1813 1.1807	30.005 29.990					
			+.0007 —.0004	+.018 —.010			
Bearing Case, Ext. Dia.	1.1811 1.1806	30.000 29.987					
Oil Pump.							
Approximate capacity at 50 lbs. per square inch (3.52 kg/sq. cm.) is 3.95 gallons (16.94 litres) per minute at 2.000 r.p.m. (Engine)							
Outer Rotor, outside dia.	1.598 1.599	40.589 40.615					
			.001 .003	.025 .075			
Housing, internal dia.	1.601 1.600	40.665 40.640					
Rotor depth—outer and inner :	0.9995 0.9985	25.387 25.362					
			.0005 .0015	.013 .038			A combined worn clearance of .004" (.101mm) indicates need of cover and housing face lapping.
Housing depth	1.001 1.000	25.403 25.400					

Component Details	Dimensions New		Clearance New		Permissible Worn Clearance or Dimension		Remarks
	Ins.	mms.	Ins.	mms.	Ins.	mms.	
Inner rotor, major dia.	1.171 1.172	29.743 29.769					
Inner rotor, minor dia.	.729 .731	18.517 18.567					
Clearance on rotors			.004 .0005	.102 .013			Where clearance exceeds .010" (.253 mm) new parts should be fitted.
Camshaft.							
Front Journal Dia.	2.0590 2.0595	52.299 52.311					
			.0045 .0025	.114 .051	.0065	.164	Max. wear on camshaft journals .003" (.076 mm) and .0035 (.088 mm) in cylinder block.
Bore in Block	2.0635 2.0620	52.413 52.375					
2nd Journal Dia. 3rd. " " Rear " "	1.71575 1.71525	43.580 43.567					
			.0045 .0025	.114 .051	.0065	.164	
Bore in Block	1.71975 1.71825	43.683 43.645					
Locating Groove	.1885 .1865	4.788 4.737					
			.0065 .003	.165 .076			This clearance determines camshaft end float.
Locating Plate	.1835 .1820	4.661 4.623					
Tappets & Valves.							
Tappet Bore in Block	.9380 .9373	23.825 23.807					
			.0013 .0002	.033 .005			
Tappet Dia.	.9371 .9367	23.802 23.792					
Valve Tip Clearance Inlet Exhaust			.010 .012	.254 .305			
Valve Guide Bore Dia.	.313 .312	7.950 7.925					
Inlet Valve Stem Dia.	.311 .310	7.899 7.874	.001 .003	.025 .076			
Exhaust Valve Stem Dia.	.309 .308	7.849 7.823	.003 .005	.076 .127			
Valve Head Diameter : Inlet	1.176 1.172	29.570 29.769					
Exhaust	1.051 1.047	26.695 26.594					
Guide projection above spring seat.	9/16"	14.3					

Valve seating angle on valve head 45°. Valve seat angle in cylinder head 44½°.

Valve Springs.

Free length 1.716" (43.586 mm). Fitted load 38 lbs ± 2 lb. (17.237 kg ± .907 kg).
Fitted length 1.25 (31.75 mm). Full lift load 60 lb. (27 kg) approx.

Flywheel.

Spigot dia. (for Starter Gear Ring)	13.406 13.403	340.512 340.436			Flywheels balanced individually. Held to crankshaft by 4 set screws locked in pairs. Single dowel. Locating holes in flywheel 90° apart, in crankshaft 180° apart.
			—.031 —.023	—.787 —.584	
Starter Gear Ring Inside Dia.	13.380 13.375	339.852 339.725			

Run-out of clutch contact face at outer dia. should not exceed .003" (.076 mm).

Clearance between starter pinion and ring gear, Engine Serial No.S1E—S67028E, .156" (3.962 mm).
Engine Serial No. S67029E onwards .114" (2.896 mm).
Face-up starter mounting flange or fit shims to suit.

Carburettor.

Zenith Type 24T—2 (Min./Max. Adj. Jet) Choke Tube : 17. Main Jet : 105. Adj. Needle : 1.25 drilled. S.R. Jet : 60. Progression : 120. Needle Seating : 1.5 mm. Petrol level at 4′ 6″ Head : 15 mm. Inter-con : 1mm drilled. Air Jet : 2.0. Petrol Inlet Boss and adjusting needle head Stamped V.O.

Governor.

Governor lever spring: Free length: inside hooks 3.8″ (96.5 mm). End Play .005″ (.127 mm) .010″ (.254 mm) Rate: 18 lbs/in ± 5%. No of coils: 26.

Load at 1″ (25.4 mm) deflection: 25 lbs. (11.34 kg) ± 1 lb. (.454 kg.) Initial wound-in load: 7 lbs. (3.175 kg).

Control Rod: Free length: inside hooks 2.687″ (68.25 mm). Rate: 64 lbs./in ± 5%. No of coils: 11½.

Compensating Spring: Load at ½″ (12.7 mm) deflection: 38 lbs. (17.237 kg) ± 1½ lbs. (.681 kg). Initial wound-in load: 6 lbs. (2.722 kg).

DIESEL ENGINE

(Manufactured by the Standard Motor Co.)

ENGINE—3 3/16" (80.96 mm) bore × 4" (101.6 mm) stroke, 4 cylinders, fitted to Tractors Type TE-F20.

Displacement 127.68 cu. ins. (2092 cc.) Compression Ratio 17 : 1 Firing Order 1, 3, 4, 2.

Maximum Belt Horse Power—26 at 2,000 r.p.m.

Tightening Torques :—
- Cylinder Head Nuts 75 to 80 lb. ft. (10.4—11.1 kg.m)
- Big End Nuts 65 to 70 lb. ft. (9—9.7 kg.m)
- Oil Pump Attachment 16 to 18 lb. ft. (2.2—2.5 kg.m)
- Flywheel Set Screws 90 to 100 lb. ft. (12.4—13.8 kg.m)
- Main Bearing Socket Screws 25 to 30 lb. ft. (3.5—4.1 kg.m)
- Centre Bearing Housing to Block 39 to 42 lb. ft. (5.4—5.8 kg.m)
- Clutch Fixing Screws 26 to 28 lb. ft. (3.6—3.9 kg.m)
- Injector Attachment 12 to 14 lb. ft. (1.6—1.9 kg.m)

Component Details	Dimensions New ins.	Dimensions New mms.	Clearance New ins.	Clearance New mms.	Remarks
Main Bearing Housings :					
Front					For checking external dia. of all Housings—break housing and assemble on a mandrell 2.9180"/2.9183" (74.117/74.125 mm.) dia. without bearings. Tighten Socket Screws 29—31 lb. ft. (4—4.3 kg.m).
Housing Spigot Ext. Dia.	5.0615 5.0605	128.562 128.537			
			.0030 .0005	.076 .013	
Bore in Cylinder Block	5.0635 5.0620	128.613 128.575			
Centre					
Housing Ext. Dia.	6.8115 6.8105	173.012 172.987			
			.0035 .0005	.089 .013	
Bore in Cylinder Block	6.8140 6.8120	173.076 173.025			
Rear					
Housing Spigot Ext. Dia.	6.8735 6.8725	174.587 174.562			
			.004 .001	.102 .025	
Bore in Cylinder Block	6.8765 6.8745	174.663 174.613			
Main Bearings.					For checking bore dia. assemble both halves with ring dowels fitted and tighten screws to 29—31 lb. ft. (4—4.3 kg.m).
Housing Bores, Front, Centre and Rear.	2.9165 2.9170	74.079 74.092			
Radial thickness of Bearings, Front, Centre and Rear	.08250 .08225	2.096 2.089			Front and rear Main Bearing Liners are identical but centre is .100" (2.54 mm.) wider.
Bearing Bore Dia. Front, Centre and Rear	2.7540 2.7530	69.952 69.926			With Bearings fitted into Housings tighten to specified torque setting.
			.0040 .0025	.102 .064	Desired clearance when assembled.
Crankshaft.					Similar tolerances for reground Crankshaft to .010", .020", .030", .040" (.254, .508, .762, 1.016 mm.) undersize.
Journal Dia.	2.7505 2.7500	69.863 69.850			
Crankshaft End Float					
Rear Journal Length	1.7507 1.7498	44.468 44.445			
			.0117 .0048	.297 .122	
Rear Bearing Housing width	1.559 1.557	39.599 39.548			
Thrust Washer thickness	.093 .091	2.362 2.311			

Component Details	Dimensions New ins.	mms.	Clearance New ins.	mms.	Remarks
Big End.					
Crankpin Dia.	2.3115 2.3110	58.712 58.699	 .0035 .0020	 .089 .051	Similar tolerances for reground crankshaft to .010", .020", .030", 040", .060" (.254, .508, .762, 1.016, 1.524 mm.) undersize.
Bearing Bore Dia.	2.3145 2.3135	58.789 58.763			
Con. Rod Bore Dia.	2.4575 2.4570	62.421 62.408			For checking bearing bores—assemble Con. Rod and tighten to specified setting.
Bearing Shell thickness	.07175 .07150	1.822 1.816			
Connecting Rod End Float.					
Crankpin Length	1.4390 1.4370	36.551 36.500	 .0105 .0065	 .267 .165	For service purposes :— Max. permissible variation in Con. Rod total weights 1½ ozs. (42.52 gms.). Metal may be removed from web on bearing cap for fine weight adjustment.
Con. Rod Width	1.4305 1.4285	36.335 36.284			Con. Rod assembly weight graded—N, P, Q, S, T, U—in 1½ oz. stages.
Small End.					
Bore for Bush	1.126 1.125	28.600 28.575	 —.0050 —.0025	 —.127 —.064	
Bush External Dia.	1.1300 1.1285	28.702 28.664			
Bush Internal Dia.	1.0002 .9998	25.405 25.395	 +.00035 —.00035	 +.009 —.009	Specified clearance using drawing sizes, but bore of Bush machined to suit Gudgeon Pin for the required fit.
Gudgeon Pin Dia.	1.00015 .99985	25.404 25.396	 +.0003 —.0003	 +.008 —.008	Specified clearance using drawing sizes but desired fit of gudgeon pin in Piston obtained by selective assembly.
Gudgeon Pin Holes in Piston.	1.00015 .99985	25.404 25.396			Heat piston in hot oil for fitting.
Pistons, Sleeves and Inserts.					
Wellworthy Type Pistons.					
Original Piston Skirt Dia. (Round and Parallel).	3.183 3.182	80.848 80.823	 .0070 .0050	 .178 .127	Ungraded up to Engine No. SA.7739E.
Sleeve Bore (Parallel).	3.1890 3.1880	81.001 80.975			Replacement sleeves available as standard size only, (i.e. no provision made for reboring and fitting oversizes).
1st Modification—Engine No. SA.774OE — SA.9205E.					
Piston Skirt Dia. —F. Grade (Round and Parallel).	3.1834 3.1829	80.858 80.846			Pistons and Sleeves graded F & G.
—G. Grade	3.1838 3.1834	80.868 80.858	 .0056 .0047	 .142 .120	
Sleeve Bore —F. Grade (Parallel).	3.1885 3.1880	80.988 80.975			Replacement Pistons and Sleeves available at standard size only (i.e. no provision for oversizes).
—G. Grade	3.1890 3.1885	81.001 80.988	 .0056 .0047	 .142 .120	

Component Details	Dimensions New ins.	mms.	Clearance New ins.	mms.	Remarks
Wellworthy Type Pistons—*continued.*					
2nd Modification—Engine No. SA.9206E—SA.23082E.					
Piston Skirt Dia.—Top —F. Grade	3.1833	80.856			Alternative to B.H.B. type Pistons.
(Oval ground tapered skirt)	3.1829	80.846			
—G. Grade	3.1838	80.868			Grade to be measured at top of skirt thrust side.
	3.1834	80.858			
3rd Modification—Engine No. SA.23083E and future.					
Piston Skirt Dia.—Top —F. Grade	3.1837	80.866			
(Oval ground tapered skirt)	3.1833	80.856			
—G. Grade	3.1842	80.879			
	3.1838	80.868			
			.0052	.132	
			.0043	.110	
Sleeve Bore —F. Grade	See 1st Modification.				
(Parallel) —G. Grade					
Ovality—Top of Skirt	.005	.127			
	.004	.102			
—Bottom of Skirt	.001	.025			
	.000	.000			
Piston Head Dia.	3.158	80.213			Piston Head Dia. up to SA.15104E — 3.1625"/3.1595" (80.328/80.252 mm.)
(Parallel).	3.155	80.137			
			.02300	.584	
			.01925	.489	
Cylinder Insert	3.17800	80.721			
Lower Internal Dia.	3.17725	80.702			
B.H.B. Type Pistons (Introduced as an alternative at Engine No. SA.21735E).					
Original					
Piston Skirt Dia.—Top —F. Grade	3.1838	80.868			Grade to be measured at top of Skirt Thrust side.
(Oval ground tapered skirt)	3.1834	80.858			
—G. Grade	3.1843	80.882			
	3.1839	80.871			
			.0051	.129	
			.0042	.107	
Sleeve Bore —F. Grade	See under Wellworthy type Piston—1st Modificaton.				
(Parallel). —G. Grade					
1st Modification—Engine No. SA.21914E—SA.29605E.					
Piston Skirt Dia.—Top —F. Grade	3.1842	80.879			
(Oval ground tapered Skirt).	3.1838	80.868			
—G. Grade	3.1847	80.892			
	3.1843	80.882			
			.0047	.120	
			.0038	.096	
Sleeve Bore —F. Grade	As above.				
(Parallel) —G. Grade					
2nd Modification—Engine No.			.0052	.135	
SA.29606E and future.			.0043	.110	
Piston Skirt Dia.—Top —F. Grade	3.1837	80.866			
(Oval ground tapered skirt).	3.1833	80.856			
—G. Grade	3.1842	80.879			
	3.1838	80.868			
Ovality—Top of Skirt	.0122	.310			
	.0098	.249			
—Bottom of Skirt	.0024	.061			
	.0008	.020			
Piston Head Dia.	3.1583	80.221			
(Parallel)	3.1543	80.120			
			.0237	.602	
			.01895	.481	
Cylinder Insert	3.17800	80.721			
Lower Internal Dia.	3.17725	80.702			

Component Details	Dimensions New ins.	Dimensions New mms.	Clearance New ins.	Clearance New mms.	Remarks
Ring Groove Width (Top, 2nd & 3rd).	.0832 .0822	2.113 2.088			Piston Rings :— Three Compression Rings and one slotted Scraper Ring all above Gudgeon Pin. Chromium plated top Compression Ring—deleted on the Wellworthy Piston at Engine No. SA8309E and re-introduced at Engine No. SA.28867E.
			.0055 .0035	.140 .089	
Compression Ring Width (Top, 2nd & 3rd)	.0787 .0777	1.999 1.974			
Ring Groove Width (4th).	.1602 .1592	4.069 4.044			
			.005 .003	.127 .076	2nd and 3rd Compression Rings; tapered periphery rings introduced at Engine No. SA. 28867E, marked "T" denoting the taper and must be fitted with "T" upwards.
Slotted Scraper Ring Width (4th).	.1562 .1552	3.967 3.942			
All rings—fitted gap			.014 .009	.356 .229	
Lower Block Dia. for Sleeve.	3.4073 3.4068	86.546 86.532			For service purposes, oversize Piston Rings, +.010" (.254 mm.) only, available for fitting in existing worn Cylinder Sleeve bores.
			.0021 .0008	.053 .020	
Sleeve External Dia.	3.4060 3.4052	86.512 86.492			
Upper Block Recess Dia. for Inserts and Sleeve Flange.	3.65725 3.65625	92.894 92.868			
			.00245 .00045	.062 .011	
Cylinder Insert Lower External Dia.	3.6558 3.6548	92.857 92.832			
Cylinder Insert Upper— Width of Slot. (See Remarks).	1.265 1.255	32.131 31.877			When upper insert is fitted in bore 3.6565" (92.875 mm.) dia. When in free state, gap increases by .03" (.762 mm.) nominally.
Cylinder Insert Upper— Radial Thickness.	.2335 .2325	5.931 5.906			
Gasket Cylinder Sleeve—Thickness.	.012	.305			
Sleeve Flange Thickness (Up to Engine No. SA.23082E).	.12575 .12475	3.194 3.169			Slot in bottom of Sleeve.
Sleeve Flange Thickness (Engine No. SA.23083E and future).	.21575 .21475	5.480 5.455			Without slot in bottom of Sleeve.
Depth of recess for Cylinder Inserts in Cylinder Block.	.9072 .9057	23.043 23.005			
Depth of Cylinder Inserts Lower Insert	.2390 .2380	6.071 6.045			Specified Insert depths are over flats. As the mating surfaces are cones, these dimensions cannot be used directly for calculating the 'nip.' Use original Upper Insert only with Sleeve Incorporating Slot; later type only with slotless Sleeve, which has the thicker flange.
Upper Insert (Up to Engine No. SA.23082E).	.5510 .5500	13.995 13.970			
Upper Insert (Engine No. SA.23083E and future).	.461 .460	11.709 11.684			
Stand out of upper insert above block (with new Sleeve gasket).			.0045 .0010	.115 .025	
Stand out of Piston at T.D.C. above top face of Cylinder Block (not insert)			+.010 —.003	+.254 —.076	
Water Pump					
Housing Bore for Bearing	1.5749 1.5744	40.003 39.990			
			+.00061 —.00040	+.015 —.010	
Bearing Case External Dia.	1.57480 1.57429	40.000 39.987			
Spindle Dia.	.6264 .6256	15.905 15.893			Drive to impellor imparted through interference fit of impellor on spindle. Incorporated at Engine No. SA. 14655E.
			—.0022 —.0012	—.056 —.030	
Impellor Bore	.6245 .6240	15.863 15.850			

Component Details	Dimensions New ins.	mms.	Clearance New ins.	mms.	Remarks
Thermostat. Up to Engine No. SA.17122E.					
Valve begins to open	167 — 176 F.	(75 — 80 C.)			Stamped No. X43570/11
Valve fully open	203 F.	(95 C.)			
Valve Lift	.312	7 94			
Engine No. SA.17123E and future.					
Valve begins to open	154 — 163 F.	(68 — 73 C.)			Stamped No. X43570/16
Valve fully open	185 F.	(85 C.)			
Valve Lift	.312	7.94			
Oil Pump					
Approximate capacity at 50 lb/sq. in. (3.52 kg/sq. cm.) is 3.95 galls. (16.94 litres) per minute at 2000 engine r.p.m. (Oil pump runs at engine speed).					
Oil Pressure 40-60 lb/sq. in. (2.8—4.2 kg/sq. cm.).					
Bore Inner Rotor	.4987	12.667			
	.4993	12.683			
			.0012	.030	
			.0002	.005	
Pump Shaft Dia.	.4985	12.662			
	.4981	12.651			
			.0014	.036	
			.0005	.013	
Bush Internal Dia.	.4995	12.688			
	.4990	12.675			
Outer Rotor	1.599	40.615			
Outside Dia.	1.598	40.589			
			.006	.152	
			.004	.102	
Housing Internal Dia.	1.604	40.742			
	1.603	40.716			
Rotor Depth—Inner and Outer	.9995	25.388			
	.9985	25.362			
Pump Housing Depth from flange face to bottom of bore	.8410	21.361			
	.8400	21.336			
Depth of Recess in Front Main Bearing Housing	.157	3.988			
	.156	3.962			
Gasket Thickness (Uncompressed).	.006	.152			
End Clearance			.0035	.089	End clearance allowing for .002" (.051 mm.) compression of gasket. A combined worn clearance of .005" (.127 mm.) indicates need of facing bearing housing recess and facing.
			.0005	.013	
Inner Rotor Major Dia.	1.172	29.769			
	1.171	29.743			
Inner Rotor Minor Dia.	.731	18.567			
	.729	18.517			
Clearance on Rotors			.004	.102	Measured when major dia. of inner rotor and minor dia. of outer rotor are in line; when this clearance exceeds .010" (.254 mm.) new parts should be fitted.
			.001	.025	
Camshaft					
Journal Dias.	1.5595	39.612			
	1.5590	39.599			
			.0045	.115	
			.0025	.064	Provision made for vernier setting of the valve timing with camshaft chainwheel on centre.
Bore in Block and Front Bush Internal Dia.	1.5635	39.713			
	1.5620	39.675			
Camshaft End Float					
Front Bearing Length	1.373	34.874			
	1.370	34.798			
			.0075	.191	
			.0020	.051	
Front Journal Length	1.3775	34.988			
	1.3750	34.925			

Component Details	Dimensions New ins.	mms.	Clearance New ins.	mms.	Remarks
Tappets and Valves					
Bore in Block.	.5630	14.300			
	.5623	14.282			
			.0012	.030	
			.0003	.008	
Tappet Stem Dia.	.5620	14.275			
	.5618	14.270			
Valve Tip Clearance Inlet & Exhaust (Cold).			.012	.305	
Valve Guide Bore Dia.	.3130	7.950			Valve Guides not interchangeable; except between Engine No. SA.17677E and SA.29403E when the inlet guide was common.
Inlet & Exhaust.	.3120	7.925			
			.0023	.058	
			.0008	.020	
Inlet Valve Stem Dia.	.3112	7.904			
	.3107	7.892			
			.005	.127	
			.003	.076	
Exhaust Valve Stem Dia.	.309	7.849			
	.308	7.823			
Valve Head Dia.					
Inlet	1.252	31.801			
	1.248	31.699			
Exhaust	1.127	28.626			
	1.123	28.524			
Valve Lift :					
Inlet	.3075	7.810			
Exhaust	.342	8.687			
Valve Seating Angle on Valve Head 45°. Valve Seat Angle in New Cylinder Head 89° included.					When seats in Cylinder Head are re-cut for servicing, utilize a 90° (incl.) cutter.
Valve Springs.					
Rate : Inner 56.8 lb/in. (1014.3 kg/m) Outer 106 lb/in. (1892.9 kg/m)					
Fitted Length : Inner 1.125" (28.575 mm.) Outer 1.219" (30.963 mm.)			Free Length : Inner 1.51" (38.354 mm.) approx. Outer 1.600" (40.64 mm.) approx.		
Fitted Load + 2 lb./—1 lb. (.908—.454 kg.) : Inner 22 lb. (10 kg.) Outer 40 lb. (18.1 kg.)			Full Lift Load : Inlet Inner 39.5 lb. (17.9 kg.) Outer 72.5 lb. (32.9 kg.)	Exhaust 41.5 lb. (18.8 kg.) 76.5 lb. (34.7 kg.)	
Valve Timing (Crankshaft Degrees).					
Exhaust opens 45° before B.D.C. closes 5° after T.D.C.					
Inlet opens 5° before T.D.C. closes 25° after B.D.C.					
Decompression Cam Clearances.					
Cylinder Nos. 1, 2 and 4			.030	.762	Set with slot in shaft end vertical, located, on all except very early models, by fitting a dowel ($\frac{3}{16}$" dia.) through 3rd pedestal extension.
Cylinder No. 3			.045	1.143	
Flywheel.					Flywheels balanced individually. Held to Crankshaft by 6 set screws locked in pairs. Single dowel locating flywheel on Crankshaft.
Spigot Dia. (for starter gear ring)	13.094	332.588			
	13.091	332.511			
			—.031	—.787	
			—.023	—.584	
Gear Ring Inside Dia.	13.068	331.927			
	13.063	331.800			
Crankshaft Spigot Dia.	4.0002	101.605			
	3.9995	101.588			
			+.0012	+.030	
			—.0004	—.010	
Flywheel Dia. for Spigot.	4.0007	101.778			
	3.9998	101.595			
Run-out of clutch contact face at outer dia. should not exceed .003" (.076 mm.).					

Component Details	Dimensions New ins.	mms.	Clearance New ins.	mms.	Remarks
Jockey Chainwheel Assembly					
Spigot Dia.	.749	19.025			
Wheel Carrier	.748	18.999			
			.0025	.064	
			.0008	.020	
Chainwheel Bush	.7505	19.063			
Internal Bore	.7498	19.045			
Front Pivot Dia.	.499	12.675			
	.498	12.649			
			.0025	.064	
			.0008	.020	
Bore in Timing Cover	.5005	12.713			
	.4998	12.695			
Rear Pivot Dia.	.4998	12.695			
	.4993	12.683			
			.0012	.030	
			.0000	.000	
Bore in Cylinder Block	.5005	12.713			
	.4998	12.695			
Injector Pump Drive.					
Pump Drive	.8748	22.220			Drive Bush for chainwheel gives vernier adjustment for pump timing in $1\frac{1}{2}$° stages up to 6°.
Shaft Minor Dia.	.8743	22.207			
			.0012	.030	
			.0000	.000	
Locating Bush Int. Dia.	.8755	22.238			
	.8748	22.220			
Locating Bush Ext. Dia.	1.28105	32.538			
	1.28055	32.526			
			.0014	.035	
			.0000	.000	
Chainwheel Bore	1.28195	32.561			
	1.28105	32.538			
Pump Drive Shaft Major Dia.	1.1233	28.532			
	1.1215	28.486			
			.0042	.107	
			.0015	.038	
Bearing Housing	1.1257	28.593			
Internal Dia.	1.1248	28.570			
Drive Shaft End Float.					
Length of Shaft	2.1900	55.626			
	2.1875	55.563			
			.0075	.191	
			.0030	.076	
Length of Housing	2.1845	55.487			
	2.1825	55.436			

Injector Pump and Injectors.

Injection Spill Cut-off 30° (Crankshaft) before T.D.C.

Timing hole in flywheel and Cylinder Block when aligned with $\frac{1}{4}$" (6.35 mm.) dia. tommy bar locates Nos. 1 and 4 spill cut-off timing.

Slots in Pump Mounting Flange allows for the following movement.
Pumps Pt. Nos. 300342 and 300781—total 10° (Crankshaft).
Pumps Pt. Nos. 300964 and 300972—total 16° (Crankshaft).

Injector Breaking Pressure.	120 ats. (123.5 kg/sq. cm.). (1764 lb/sq. in.).	
Spray Angle.	4°	
Valve Lift.	.0276	.700

Electrical Equipment.

Dynamo :

Runs at 1.72 engine speed.

Component Details	Dimensions New ins.	mms.	Clearance New ins.	mms.	Remarks

Starter Motor.

Number of Teeth in Flywheel Gear Ring and Starter Pinion 113 and 11 respectively.

End Clearance between disengaged starter pinion and Flywheel Gear Ring .090″ (2.29 mm.)—Distance from mounting flange to front face of Flywheel Gear Ring 1.090″ (27.69 mm.).

Starter Pilot Switch should make electrical contact when the leading face of the starter pinion is 1⅝″ (41.28 mm.) from the starter motor mounting flange face.

Batteries.

Specific Gravity 1.28 — 1.30 at 60°F. (15°C.).

Up to Tractor Serial No. 207705.	120 ampere hour capacity at 10 hour discharge rate 2 — 6 volt 17 plate units connected in series. Recharge rate 13 amps.
Tractor Serial No. 207706 and future.	115 ampere hour capacity at 10 hour discharge rate. 2 — 6 volt 19 plate units connected in series. Recharge rate 12 amps.

Clutch.

Clutch Dia.	10 254
Clutch Springs :	12 green springs each of 105 lb. (47.627 kg.) to 115 lb. (52.199 kg.).

Fill-up Data.

Fuel Tanks.	Main. 7 Imp. Gallons (31.85 litres). Auxiliary Tank. ¾ Imp. Gallon (3.4 litres). Ki-gass Tank. ¾ pint (.43 litres).
Engine Sump.	12 pints (6.8 litres).
Air Cleaner Bowl.	¾ pint (.43 litres).
Cooling System.	15 pints (8.5 litres).

Tractor Weight Approx. :

Up to Tractor Serial No. 325000	2700 lb. (1225 kg.)
Tractor Serial No. 325001 and future.	2770 lb. (1256 kg.)

PETROL ENGINE

(Manufactured by the Standard Motor Co.)

ENGINE : 85 m/m bore × 92 m/m. stroke as fitted to Tractors Type TE-A20.

Displacement : 2088 cc. (127.4 cu. ins.) Compression Ratio : 6 : 1. Firing Order : 1, 3, 4, 2.

Maximum Belt Horse Power — 28.2.

Tightening Torques : — Cylinder Head Nuts 60 — 65 lbs. ft. (8.29 — 8.98 kg.m). Main Bearing Nuts 80 — 85 lbs. ft. (11.05 — 11.75 kg.m).

Big End Nuts 50 — 55 lbs. ft. (6.91 — 7.60 kg.m) Flywheel Cap Screws 42 — 46 lbs. ft. (5.8 — 6.4 kg.m).

Component Details	Dimensions New		Clearance New		Remarks
	ins.	mm.	ins.	mm.	
Main Bearings.					
Housing Bore	2.6255 2.6250	66.688 66.675			For checking housing or bearing bores fit bearing cap and tighten to specified torque.
Radial thickness of Bearings.	.07225 .07200	1.8351 1.8288			
Bearing Bore diameter (fitted).	2.4815 2.4805	63.030 63.005			
			.0025 .0010	.064 .025	Similar tolerances for reground crankshaft to .010", .020", .030", .040" (.254, .508, .762, 1.016 mm) undersize.
Crankshaft.					
Journal diameter.	2.4795 2.4790	62.979 62.967			
Crankshaft End Float.					
Centre Journal length	1.7507 1.7498	44.468 44.445			
			.0117 .0048	.297 .122	
Centre Bearing Cap Width	1.559 1.557	39.599 38.548			
Thrust Washer thickness (2 off)	.093 .091	2.362 2.311			
Big End.					
Crankpin diameter	2.0866 2.0861	53.000 52.987			Similar tolerances for reground crankshaft to .010", .020", .030", .040" (.254, .408, .762, 1.016 mm) undersize.
			.0024 .0006	.061 .015	
Bearing Bore diameter (fitted).	2.0885 2.0872	53.048 52.015			For checking big-end or bearing bores assemble connecting rod and tighten to specified setting.
Connecting Rod Bore diameter	2.2335 2.2327	56.731 56.710			
Radial thickness of Bearings	.07275 .07250	1.8479 1.8415			
Connecting Rod End Float					
Crankpin length	1.1915 1.1865	30.264 30.137			
			.014 .007	.356 .178	
Connecting Rod width	1.1795 1.1775	29.959 29.909			

Component Details	Dimensions New		Clearance New		Remarks
	ins.	mm.	ins.	mm.	
Small End.					
Bore for Bush	1.0000 .9995	25.400 25.387			
			—.0035 —.0050	—.09 —.13	Heat piston in boiling oil for removal and fitting of gudgeon pin.
Bush, external diameter	1.0045 1.0035	25.514 25.489			
Bush internal diameter	.8752 .8748	22.230 22.220			
			*—.00035 —.00030	+.009 —.008	*Specified clearances using drawing sizes but desired fit of gudgeon pin — hand push fit at 68°F — obtained by selective assembly.
Gudgeon Pin diameter	.87510 .87485	22.228 22.221			
			*—.00045 —.00005	+.011 —.001	
Gudgeon Pin Holes in Piston.	.8753 .87505	22.233 22.226			
Pistons and Sleeves.					
Piston diameter F. Grade (Thrust side top skirt).	3.3430 3.3427	84.912 84.905			
G. ,,	3.3434 3.3430	84.922 84.912			
H. ,,	3.3438 3.3434	84.932 84.922			
			.0037 .0030	.094 .076	
Sleeve Bore F. ,, (Parallel).	3.3463 3.3460	84.996 84.983			
G. ,,	3.3467 3.3464	85.006 84.993			Replacement sleeves available as standard size, and rebored +.020" (.508 mm). Oversize pistons available to suit rebored sleeves. See below.
H. ,,	3.3471 3.3468	85.016 85.009			
Clearance, Bottom of Piston Skirt (Thrust side)			.0022 .0015	.056 .038	Thrust side Piston Skirt tapered .0015" (.038 mm) on diameter.
Top Land diameter.	3.329 3.327	84.557 84.506	.0201 .0170	.510 .432	
Ring Groove width Top and 2nd.	.0807 .0797	2.050 2.024			Piston fitted with three rings above gudgeon pin, one ring below.
			.0030 .0010	.076 .025	
Compression Ring width Top and 2nd.	.0787 .0777	1.999 1.974			
Ring Groove width 3rd.	.1895 .1885	4.813 4.788			
			.0030 .0010	.076 .025	
Slotted Scraper Ring width 3rd.	.1875 .1865	4.763 4.737			Similar tolerances for: oversize rings +.010" (.254 mm), +.020" (.508 mm), +.030" (.762 mm).
Ring Groove width 4th.	.158 .157	4.013 3.989			
			.0030 .0010	.076 .025	
Slotted Scraper Ring width 4th.	.156 .155	3.962 3.937			
Ring Gap (closed)			.015 .010	.381 .254	
Clearance between :— Top Flange of Sleeve and Upper Block— Upper Block diameter	4.140 4.125	105.156 104.775			
			.045 .015	1.143 .381	
Top Flange of Sleeve diameter	4.110 4.095	104.394 104.013			

Component Details	Dimensions New		Clearance New		Remarks
	ins.	mm.	ins.	mm.	
Clearance between :—					
Sleeve Spigot and Lower Block					
Lower Block diameter	3.6260	92.100			
	3.6245	92.062			
			.003	.076	
			.0005	.013	
Sleeve Spigot diameter	3.6240	92.049			
	3.6230	92.024			
Cylinder Block	4.501	114.325			
(Top face to seating face for Sleeve)	4.499	114.274			
Gasket thickness	.019	.483			
(uncompressed)	.016	.406			
Cylinder Sleeve	4.488	113.995			
(Top face to seating face).	4.487	113.970			
Stand out of Sleeve above Cylinder			.002	.051	
Block.			.008	.203	
Oversize Sleeves & Pistons					
Piston Diameter	3.3632	85.425			
+.020" (.508 mm).	3.3627	85.413			
			.0043	.110	
			.0030	.076	
Sleeve Bore (Parallel)	3.36700	85.522			
+.020" (.508 mm).	3.36625	85.503			
Water Pump.					
Housing Bore for Bearings	1.5749	40.002			
	1.5744	39.990			
			+.00061	+.015	
			—.00040	—.010	
Bearing Case external diameter	1.57480	40.000			
	1.57429	39.987			
Spindle diameter	.6262	15.905			
	.6257	15.893			
			—.0032	—.081	Drive to impellor imparted through
			—.0022	—.056	interference fit of impellor on spindle.
Impellor Bore diameter	.6235	15.837			Incorporated at Engine No. SC.41539E.
	.6230	15.824			
Thermostat.					
Valve begins to open	133° — 147° F.		56° — 64° C.		
Valve fully open	171° F.		77 C.		
Valve lift	$\frac{1}{4}$" — $\frac{3}{8}$"		6.3 — 9.5 mm.		
Oil Pump.					
Approximate capacity at 50 lbs. sq. in. (3.52 kg. sq. cm.) is 3.95 gallons (17.95 litres) per minute at 2,000 r.p.m. Oil Pump (Oil Pump runs at half engine speed).					
Oil pressure 40 — 60 lbs./sq. in. (2.8 — 4.2 kg. sq. cm.).					
Outer Rotor, outside diameter	1.599	40.615			
	1.598	40.589			
			.006	.152	
			.004	.101	
Housing Internal diameter	1.604	40.741			
	1.603	40.716			
Bore, Inner Rotor	.4987	12.667			
	.4993	12.682			
			.0002	.005	
			.0013	.033	
Pump Shaft diameter	.4980	12.649			
	.4985	12.661			
			.003	.076	
			.001	.025	
Housing Bore internal diameter	.5010	12.725			
	.4995	12.687			
End Clearance of Rotors.					
Rotor depth — outer and inner	0.9995	25.387			
	0.9985	25.362			
			.0005	.013	A combined worn clearance of .005"
			.0025	.064	(.127 mm) indicates need of cover and
Housing depth	1.001	25.425			housing face lapping.
	1.000	25.400			

Component Details	Dimensions New		Clearance New		Remarks
	ins.	mm.	ins.	mm.	
Inner rotor, major diameter	1.171 1.172	29.743 29.769			
Inner rotor, minor diameter	.729 .731	18.517 18.567			
Clearance on rotors			.004 .001	.102 .025	Measured when major diameter of inner rotor and minor diameter of outer rotor are in line. Where clearance exceeds .010" (.254 mm) new parts should be fitted.
Camshaft.					
Front Journal diameter	2.0595 2.0590	52.311 52.299			
			.0045 .0025	.114 .063	Max. wear on camshaft journals .003" (.076 mm) and .0035" (.089 mm) in cylinder block.
Bore in Block.	2.0635 2.0620	52.413 52.375			
2nd Journal diameter 3rd " " Rear " "	1.71575 1.71525	43.580 43.567			
			.00445 .00245	.113 .062	
Bore in Block	1.7197 1.7182	43.680 43.642			
Camshaft End Float.					
Locating Groove	.1885 .1865	4.788 4.737			
			.0065 .0030	.165 .076	
Locating Plate	.1835 .1820	4.661 4.623			
Tappets and Valves					
Tappet Bore in Block	.9380 .9373	23·825 23·807			
			.0013 .0002	.033 .005	
Tappet diameter	.9371 .9367	23.802 23.792			
Valve Tip clearances (cold) Inlet			.010	.254	
Exhaust			.012	.305	
Inlet valve stem diameter	.311 .310	7.899 7.874			
			.001 .003	.025 .076	
Valve Guide Bore diameter (Inlet and Exhaust)	.313 .312	7.950 7.925			
			.003 .005	.076 .127	
Exhaust Valve Stem diameter	.309 .308	7.849 7.823			
Valve Head diameter : Inlet	1.113 1.109	28.27 28.17			
Exhaust	1.051 1.047	26.695 26.594			
Guide projection above spring seat	.59	15.0			
Valve lift	.2985	7.582			

Valve seating angle on valve head 45 . Valve seat angle in new cylinder head 44½°, but serviced at 45°
Exhaust Valve inserts available for service purposes.

Valve Springs.

Free length 1.787" (45.390 mm). Fitted load 38 lbs. $\frac{+2 \text{ lbs.}}{-1 \text{ lbs.}}$ (17.237 kg. $\frac{+.907 \text{ kg.}}{-.454 \text{ kg.}}$)
Fitted length 1.321" (33.553 mm). Full lift load 60 lb. (27 kg.) approx.

Component Details	Dimensions New		Clearance New		Remarks
	ins.	mm.	ins.	mm.	
Valve Timing (Crankshaft Degrees).					
	Exhaust opens 40° before B.D.C. closes at T.D.C.				Timing hole in the flywheel and crankcase when aligned with tommy bar locate No. 1 and No. 4 T.D.C.
	Inlet opens at T.D.C. closes 40° after B.D.C.				
Flywheel.					
Spigot diameter (for Starter Gear Ring).	13.406 13.403	340.512 340.436			
			—.031 —.023	—.787 —.584	
Starter Gear Ring (inside diameter)	13.380 13.375	339.852 339.725			
Crankshaft Spigot diameter	4.0007 4.0002	101.617 101.605			
			+.0012 —.0004	+.0305 —.0102	
Flywheel diameter for Spigot.	3.9998 3.9995	101.595 101.587			

Run out of Clutch contact face at outer diameter should not exceed .003" (.076 mm).

Carburetter.

Zenith type 24 T — 2 (fully variable main jet).

Choke tube	17	Inter Con.	1 mm. drilled.
Main jet	100	Air jet	2.0
Slow running jet	60	Carburetter bowl stamped "P".	
Progression	120 (2 holes)		
Needle seating	2.0 mm.		
Petrol level at 4' 6" head	15 mm.		

Battery : Tractor Serial No. 200,001 and future — 12 volt 38 amp. hour capacity at 10 hour discharge rate. Specific Gravity 1.28 — 1.30 fully charged at 60°F. (16°C.)

Distributor : Static Setting 1° (Crankshaft) before T.D.C. Contact Breaker Gap .014" — .016" (.36 — .41 mm.)

Spark Plug.

Reach	.5	12.7
Thread diameter	14 mm.	
Gap	.032	.81
	.030	.76

Starter Motor : No. of Teeth : Flywheel Gear Ring and Starter Pinion, 145 and 10 respectively.
Distance of front mounting flange to rear face of flywheel gear ring. 1.563" (39.7 mm.)

Dynamo : Runs at 1.9 × engine speed.

Governor : Range 400 — 2000 r.p.m. (Engine).

Governor Lever Spring :

Free Length — inside hook 3.8" (96.5 mm). End Play .005" (.127 mm). .010" (.254 mm) Rate 20 lbs/in. ± 5%.
No. of Coils 24¾. Load at 1" (25.4 mm) deflection : 20 lbs (9.07 kg.) ± 2 lb. (.907 kg.).
Initial wound-in load : Nil.

Control Rod Compensating Spring :

Free Length : inside hooks 2.187" (55.55 mm). Rate 64 lbs/in. ± 5%. No. of coils 11½.
Load at ½" (12.7 mm) deflection : 38 lbs. (17.237 kg.) ± 1½ lbs. (.681 kg.).
Initial wound-in load : 6 lbs. (2.722 kg.).

Fill-up Data :

Fuel Tank	8 Imperial gallons (36 litres), including 1 Imperial gallon (4.5 litres) reserve.
Engine Sump	12 pints (6.8 litres)
Air Cleaner Bowl	¾ pint (0.43 litres)
Transmission	5 Imperial gallons (22.8 litres)
Steering Gear-box	5 pints (2.9 litres)
Front Hubs	⅝ pint (0.35 litres)
P.T.O. Pulley	½ pint (0.28 litres)
Cooling System	15 pints (8.5 litres)

VAPORISING OIL ENGINE

(Manufactured by the Standard Motor Co.)

This information supersedes that originally issued on Pages B.9 to B.12.

Engine : 85 mm bore × 92 mm stroke as fitted to Tractors Type TE-D 20.

Displacement : 2088 CC (127.4 cu. ins.) Firing Order : 1, 3, 4, 2.

There are several types of the V.O. Engine, namely :—

Engine Nos. S120,510E to S170,173E covering versions 1 & 2.
Compression Ratio : 4.8 to 1.
Max. Belt H.P.: 23.9

Engine Nos. S170,174E onwards, covering versions 3 & 4.
Compression Ratio : 5.1 : 1.
Max. Belt H.P. : 25.4

Component Details		Dimensions New ins.	Dimensions New mm.	Clearance New ins.	Clearance New mm.	Remarks
Pistons & Sleeves.						
Piston Dia. (Thrust Side Top Skirt)	F. Grade	3.3430 3.3427	84.912 84.905			
	G. ,,	3.3434 3.3430	84.922 84.912			Piston fitted with four rings above gudgeon pin, one ring below. These grades are identical with those of 85 m/m bore petrol engine.
	H. ,,	3.3438 3.3434	84.932 84.922			Oversize pistons available to suit rebored sleeves.
				.0037 .0030	.094 .076	
Sleeve Bore (Parallel)	F. ,,	3.3463 3.3460	84.996 84.988			Sleeves identical with those of 85 mm bore petrol engine.
	G. ,,	3.3467 3.3464	85.006 84.998			Replacement sleeves available as standard size, and rebored + .020″ (.508 mm).
	H. ,,	3.3471 3.3468	85.016 85.009			
Clearance, Bottom of Piston Skirt (Thrust Side).				.0022 .0015	.056 .038	Thrust side Piston Skirt tapered .0015″ (.038 mm) on diameter.
Top Land Diameter		3.329 3.327	84.557 84.506	.0190 .0170	.483 .432	
Ring Groove Width Top, 2nd, and 3rd.		.0807 .0797	2.050 2.024			
				.003 .001	.076 .025	
Compression Ring Width. Top, 2nd, and 3rd.		.0787 .0777	1.999 1.974			
Ring Groove Width 4th		.1895 .1885	4.813 4.788			
				.003 .001	.076 .025	Similar tolerances for oversize rings + .010″ (.245 mm), + .020″ (.508 mm) + .030″ (.762 mm).
Slotted Scraper Ring Width 4th		.1875 .1865	4.763 4.737			
Ring Groove Width 5th		.158 .157	4.013 3.987			
				.003 .001	.076 .025	
Slotted Scraper Ring Width 5th		.156 .155	3.962 3.937			
Ring Gap (closed)				.015 .010	.381 .254	

Component Details	Dimensions New		Clearance New		Remarks
	ins.	mm.	ins.	mm.	
Oversize Sleeves & Pistons					
Piston Diameter	3.3632	85.425			
.020" (.508 mm).	3.3627	85.413			
			.0043	.110	
			.0030	.076	
Sleeve Bore (Parallel)	3.36700	85.522			
+.020" (.508 mm)	3.36625	85.503			
Valve Head Diameters.					
Version 1. Engine Nos. S120,510E — S121,954E.					
Inlet	1.252	31.800			
	1.248	31.699			
Exhaust	1.252	31.800			
	1.248	31.699			
Version 2. Engine Nos. S121,955E — S170,173E.					
Inlet	1.176	29.870			
	1.172	29.769			
Exhaust	1.051	26.695			
	1.047	26.594			
Version 3. Engine Nos. S170,174E — S225,311E.					
Inlet	1.113	28.270			
	1.109	28.169			
Exhaust	1.051	26.695			
	1.047	26.594			
Version 4. Engine Nos. S225,312E onwards.					
Inlet	1.238	31.445			
	1.234	31.344			
Exhaust	1.051	26.695			
	1.047	26.594			

Thermostat.

Valve begins to open	167° F—176° F	75°C—80°C.
Valve fully open	203° F.	95°C.
Valve lift	.312	7.94

Carburettor.

Zenith Type 24 T-2 (fully variable main jet).

Choke Tube	17
Main Jet	105
Slow Running Jet	60
Progression	120 (2 holes)
Needle Seating	2.0 mm.
Fuel level at 4' 6" head	15 mm.
Inter-con	1 mm drilled.
Air Jet	2.0 mm.
Carburettor Bowl Stamped	"V.O."

Distributor. Static Setting 4 (crankshaft), before T.D.C. (Versions 1 & 2 and early editions of version 3, 6° (Crankshaft).

Spark Plug

Reach	.75	19.05
Thread diameter	14 mm.	
Gap	.035	.89
	.030	.76

Fill-up Data.

Fuel Tank. Vaporising Oil : 7 Imperial Gallons (31.5 litres) Petrol : 1 Imperial Gallon (4.5 litres).

For other details and data — refer to 85 mm. bore petrol engine, Pages B21 to B25

LAMP OIL ENGINE

(Manufactured by the Standard Motor Co.)

ENGINE : 85 mm bore × 92 mm stroke as fitted to Tractors Type TE-H 20.

Displacement : 2088 CC (127.4 cu. ins.)
Compression Ratio : 4.5 : 1.
Firing Order : 1, 3, 4, 2.
Maximum Belt H.P. : 22.9

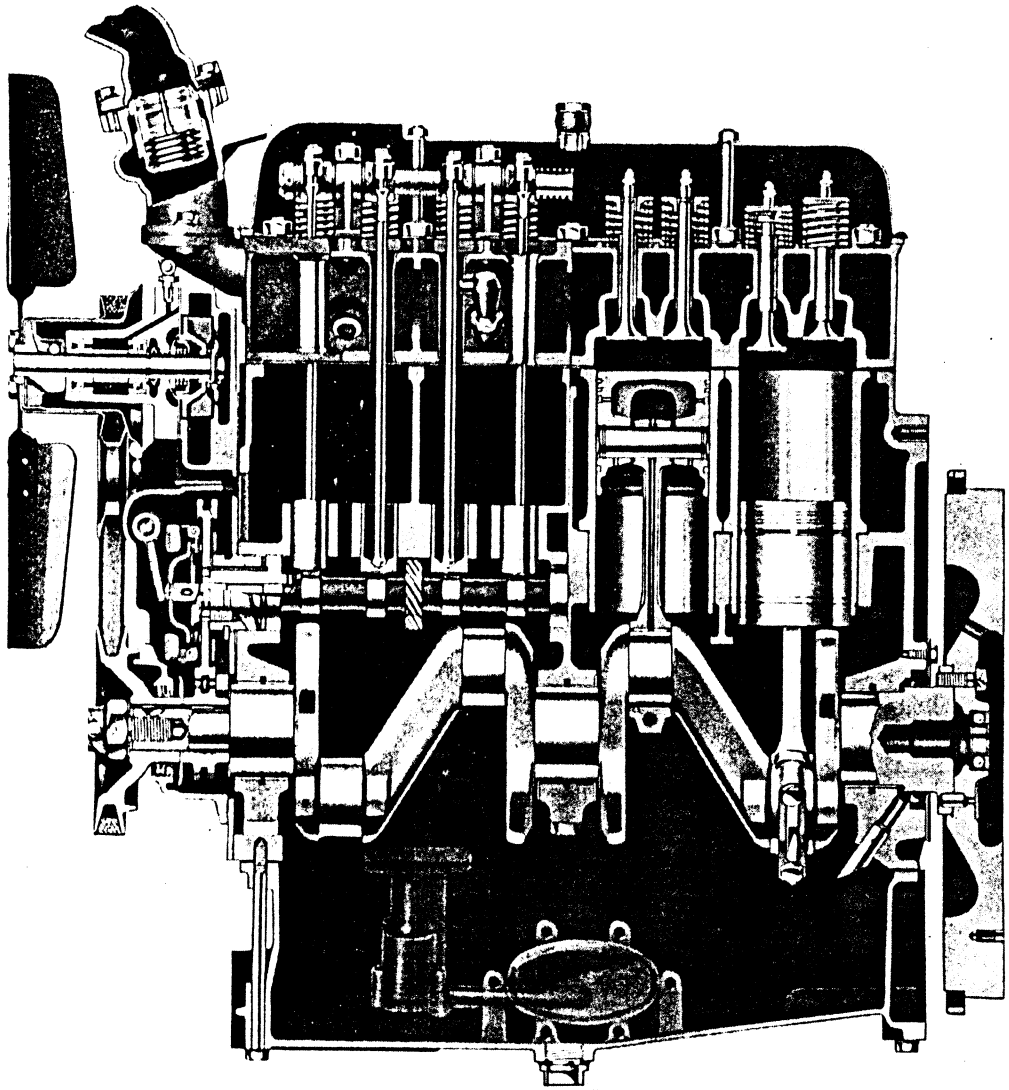
Component Details		Dimensions New ins.	Dimensions New mm.	Clearance New ins.	Clearance New mm.	Remarks
Pistons and Sleeves.						
Piston Diameter. (Thrust Side Top Skirt)	F. Grade	3.3435 3.3432	84.925 84.917			Piston fitted with four rings above gudgeon pin, one ring below.
	G. ,,	3.3439 3.3436	84.935 84.917			Oversize pistons available to suit rebored sleeves.
	H. ,,	3.3443 3.3440	84.945 84.938			
				.0031 .0025	.079 .064	
Sleeve Bore (Parallel)	F. ,,	3.3463 3.3460	84.996 84.988			Sleeves identical with those of 85 m/m bore petrol engine.
	G. ,,	3.3467 3.3464	85.006 84.998			Replacement sleeves available as standard size, and rebored — .020″ (.508 mm).
	H. ,,	3.3471 3.3468	85.016 85.009			
Clearance, Bottom of Piston Skirt (Thrust side)				.0016 .0010	.041 .025	Thrust side Piston Skirt tapered .0015″ (.038 mm) on diameter.
Top Land Dia.		3.328 3.325	84.531 84.455	.0221 .0180	.561 .457	
Ring Groove Width Top, 2nd and 3rd		.0817 .0807	2.075 2.050			
				.004 .002	.102 .051	Similar tolerances for oversize rings — .010″ (.245 mm) — .020″ (.508 mm) — .030″ (.762 mm).
Compression Ring Width Top, 2nd and 3rd		.0787 .0777	1.999 1.974			
Ring Groove Width 4th and 5th		.1905 .1895	4.839 4.813			
				.0040 .0020	.102 .051	
Slotted Scraper Ring Width 4th and 5th		.1875 .1865	4.763 4.737			
Ring Gap—closed				.015 .010	.381 .254	
Oversize Sleeves & Pistons						
Piston Diameter .020″ (.508 mm).		3.3637 3.3632	85.438 85.425			
				.0038 .0025	.096 .064	
Sleeve Bore (Parallel) .020″ (.508 mm).		3.36700 3.36625	85.522 85.503			
Spark Plug						
Reach		.75	19.05			
Thread diameter			14 mm.			
Gap		.032 .028	.81 .71			

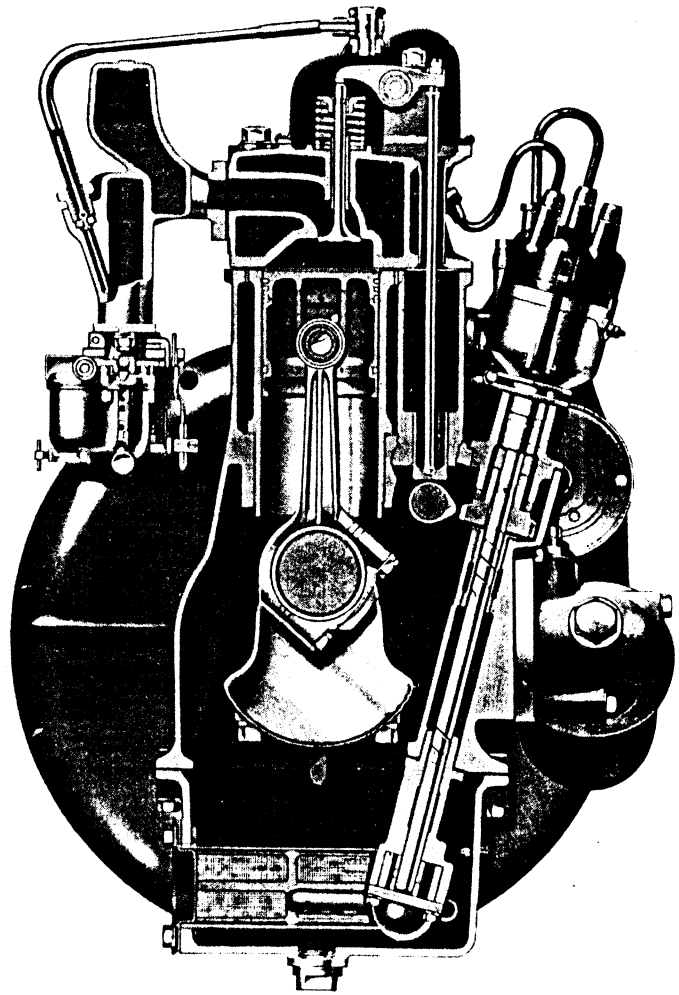
The Thermostat and Carburettor are identical to the vaporising oil engine. See page B28.

Fill-up Data.

Fuel Tank. Lamp Oil. 7 Imperial Gallons (31.5 litres). Petrol 1 Imperial Gallon (4.5 litres).
Cooling System : 17 pints (9.6 litres.)

For other details and data — Refer to 85 mm bore petrol engine. Pages B21 to B25.





SECTIONAL VIEWS OF PETROL ENGINE

ENGINE SECTION

The following instructions assume the use of the specially designed dismantling stand and range of tools and equipment listed in Section U of this Manual.

Separate dismantling and assembly instructions have been prepared for the removal and replacement of all main components, but those covering replacement of the crankshaft assume a complete engine overhaul.

The comprehensive dimensional specification, presented in Section B, should be referred to when inspecting components for wear. Screw threads should always be lubricated before tightening.

PETROL ENGINE AS FITTED TO TRACTORS TYPE TE-A20 AND TE-C20

Lubrication System

It is proposed under this heading to describe the passage of oil through the engine, and to explain the function and dismantling procedure for the various components connected with oil distribution (i.e. oil filter and oil pump).

Oil Distribution (Fig. 1).

Oil is pumped from a wire mesh screen through an annular space around the pump drive shaft to the filter, from which it passes to the oil gallery for distribution as indicated in the table overleaf. Oil leakage between shaft and upper bush is prevented by a reverse spiral groove on the upper portion of the shaft.

Front, centre and rear journals of both crankshaft and camshaft are connected by drillings directly to the oil gallery, whilst oil arrested by rear crankshaft seal drains through rear main bearing cap to sump. Lubrication of connecting rod big-end bearings is provided through drillings in crankshaft connecting front journal and No. 1 crankpin, centre journal and Nos. 2 and 3 crankpins and rear journal and No. 4 crankpin. The clearance between connecting rod bearing and crankpin provides sufficient flow of oil under pressure to pass along a central drilling in connecting rod to gudgeon pin, with a further surge when the connecting rod drilling aligns the supply drilling at the crankpin. Cylinder walls are lubricated by intermittent splash feed through a bleed hole drilled in the connecting rod.

A spiral oil groove connects two flats which are machined on the camshaft rear journal in such positions that as the shaft revolves,

one approaches the oil inlet drilling from the gallery, while the other approaches a second drilling through the cylinder block and head to the rear rocker shaft pedestal. Momentarily, during each revolution of the camshaft, both holes are uncovered by the flats and oil under gallery pressure passes along the spiral groove and up to the hollow rocker shaft where it is distributed through drillings to internally grooved rocker bushes. Oil is directed through relief holes from rockers on to adjusters and push rods, returning by gravity through tappet chambers to sump. This drip feed also helps to lubricate the intermediate camshaft journal, while excess oil from rocker gear is drained from cylinder head through crankcase to sump.

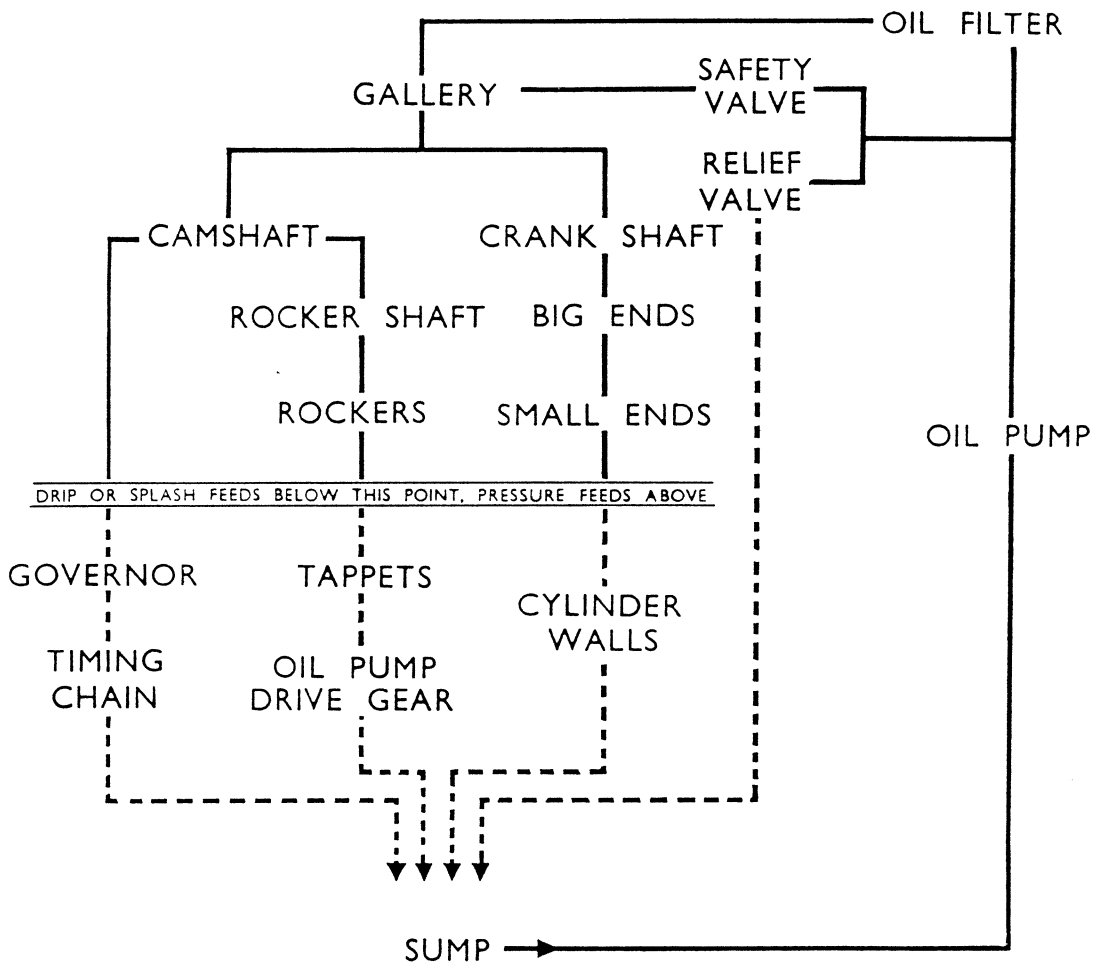


FIG. 1

NOTE : Valve guide tops stand proud of cylinder head to avoid possibility of oil drainage to combustion chambers.

Lubrication of timing chain and governor mechanism is provided through a drilling from the circular groove in the front camshaft journal to a slot on the timing sprocket mounting face, from which oil is dispersed by centrifugal force, to drain to sump through a recess on forward face of front main bearing cap.

The Oil Pump (Fig. 2)

After detachment, the oil pump can be dismantled by removal of 4 set screws securing cover assembly to pump body, revealing the spindle and inner rotor as-

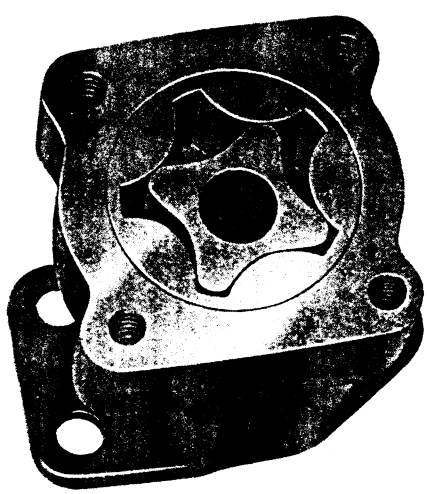


FIG. 2.

sembly which drives the outer rotor. It will be seen from Fig. 2 that the outer rotor has 5 lobes while the eccentrically mounted inner rotor has four. Thus, as the spindle turns, oil from the vacant space over the inlet port is transferred to the outer port, from which it is expelled as the lobes engage. The pump requires no attention other than washing in paraffin during a major engine overhaul.

The Oil Filter : (Fig. 3)

Vertical type X—fitted to tractors type TE-A20 before Serial No. 56340 :

Inclined type Y—fitted to tractors type TE-A20 after Serial No. 56339 :

Although the above oil filters are different in appearance, they have the same principle of operation and both house a pressure relief and safety valve. Oil is pumped from the sump through port A to the outside of the filter element. Particles of dirt are removed as the oil passes through to the inside of the element and escapes to the gallery through diagonal port B. If tightness of bearings or low viscocity of oil causes the pressure in the system to rise above 40—60 lbs. sq. inch (2.8—4.2 kg. per sq. cm.), unfiltered oil passes back to the sump as pressure relief valve C opens. Should the element become clogged and the passage of oil severely restricted, oil in the diagonal port B and gallery will be at lower pressure

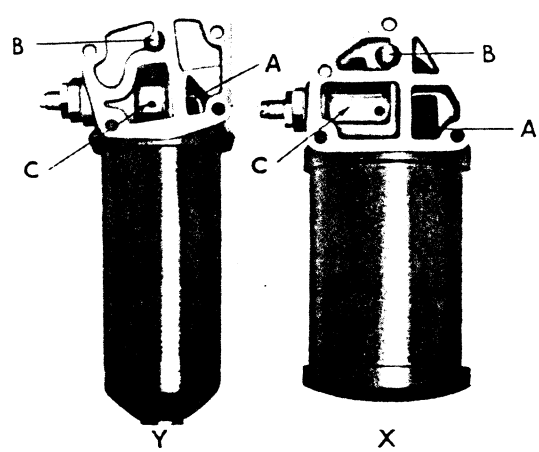


FIG. 3.

than that on the outside of the element, opening a safety valve at the lower end of port B and allowing unfiltered oil to pass into gallery.

To Dismantle Vertical Type (see Fig. 4)

1. Remove long bolt 12 which screws into boss filter base.
2. Tap head assembly 3 free from barrel 2, withdraw element 21 and remove 'C' spring 20 from boss.
3. Remove top pressure plate 19, felt washer 18, plain washer 17, and element locating spring 16.
7. Tap base assembly off barrel 2.
8. From base assembly remove 'C' spring 22. Detach pressure plate 23 and felt washer 24 from boss and rubber jointing 25 from its groove.
9. Wash all parts in paraffin and rebuild base assembly.

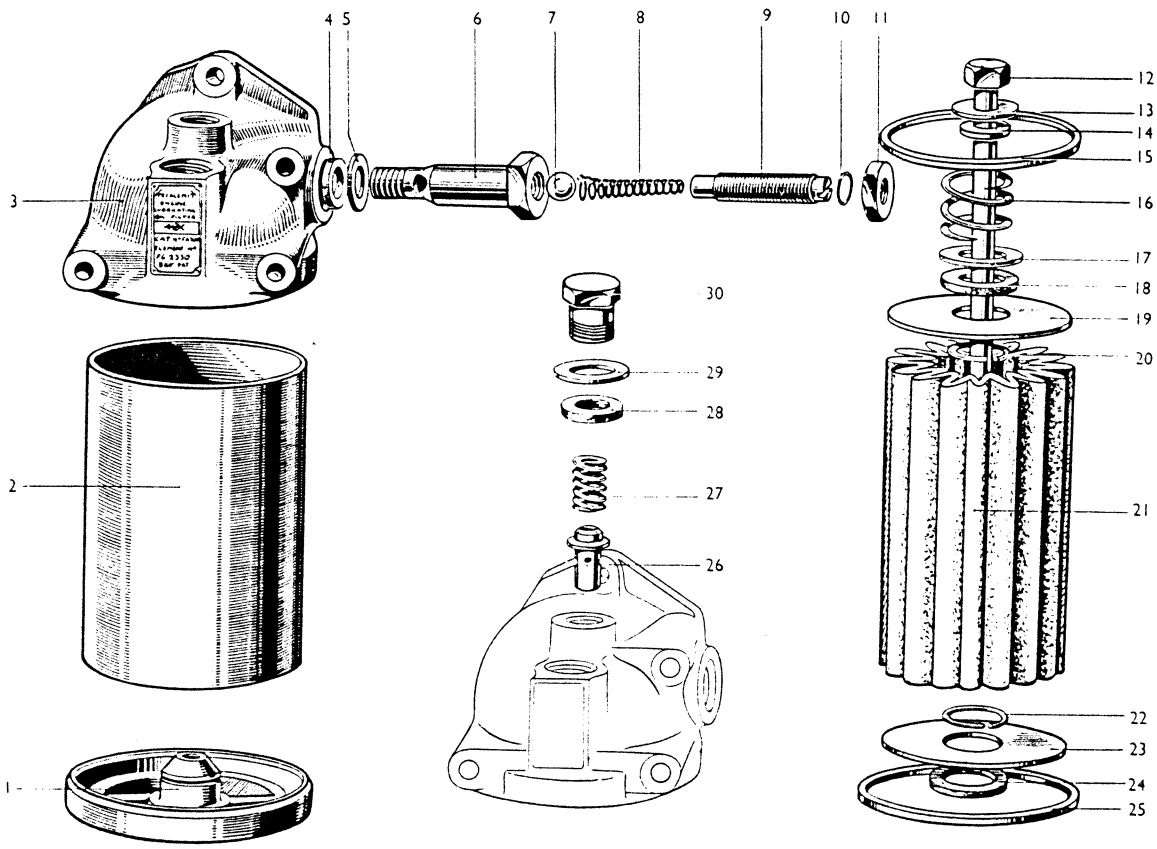


FIG. 4

4. Unscrew and remove safety valve plug 30, spring 27, and valve 26. Remove plug washer 29, and rubber sealing washer 28 from recess in plug boss.
5. Withdraw pressure relief valve assembly with washer 5 and seal 4 after unscrewing the larger hexagon on body 6.
6. Dismantle pressure relief valve assembly by unscrewing locknut 11 and plug 9 and withdrawing spring 8 and ball 7.

Re-Assembly of vertical type

Before re-assembly, carefully scrape all paint and dirt from machined faces and bosses, wash all parts in paraffin and blow out with compressed air. Re-new any defective part, paying particular attention to rubber and felt sealing washers.

1. Insert ball 7 in pressure relief valve body 6 and locate spring 8 with its

wide end on ball. Screw adjustment plug 9 into body and place over its slotted end a new lead packing ring 10 before screwing down locknut 11. As a preliminary setting, the plug should be screwed in so that about 6 — 7 threads are exposed above lock nut.

2. Place rubber sealing washer 4 into recess and screw down the valve assembly on to washer 5.

3. Place safety valve 26 in its bore and locate spring 27 on valve shoulder.

4. Locate rubber sealing washer 28 in its recess and tighten plug 30 on to its washer.

5. Place spring 16, steel washer 17, felt sealing washer 18, and pressure plate 19 over central boss inside filter head, and secure by fitting 'C' spring 20 in groove.

6. Replace joint ring 25 in groove of base, and secure felt washer 24 and pressure plate 23 by 'C' spring 22.

7. Assemble base, head and barrel with new filter element 21 and secure by screwing down long bolt 12 on to washer 13, having inserted rubber seal 14.

Inclined Type—General (Fig. 5)

This filter can be mounted in place of the vertical type without the necessity of drilling and tapping further bolt holes in the engine crank case. The filter further differs in that the barrel and base are cast in one unit to form the container. The safety valve also is of different design. Although instructions are given for removal and replacement of bottom pressure plate 21, the operations are awkward, and not usually necessary.

To Dismantle inclined type.

1. Remove long bolt 11 which screws into a boss in the base of container 1. Tap off head 2 and remove sealing washer 13, plain washer 12, and ring 14.

2. From filter head remove "C" spring 18, clamping plate 17, felt washer 16, and steel dished washer 15.

3. The safety valve assembly 25 can now be unscrewed and removed for cleaning, but not further dismantled.

4. Instructions relative to pressure relief valve are identical with those for vertical type filters as these valves are interchangeable.

5. From screwed boss in the base of container, remove "C" spring 20 to release pressure plate 21, felt washer 22, steel washer 23, and pressure plate spring 24.

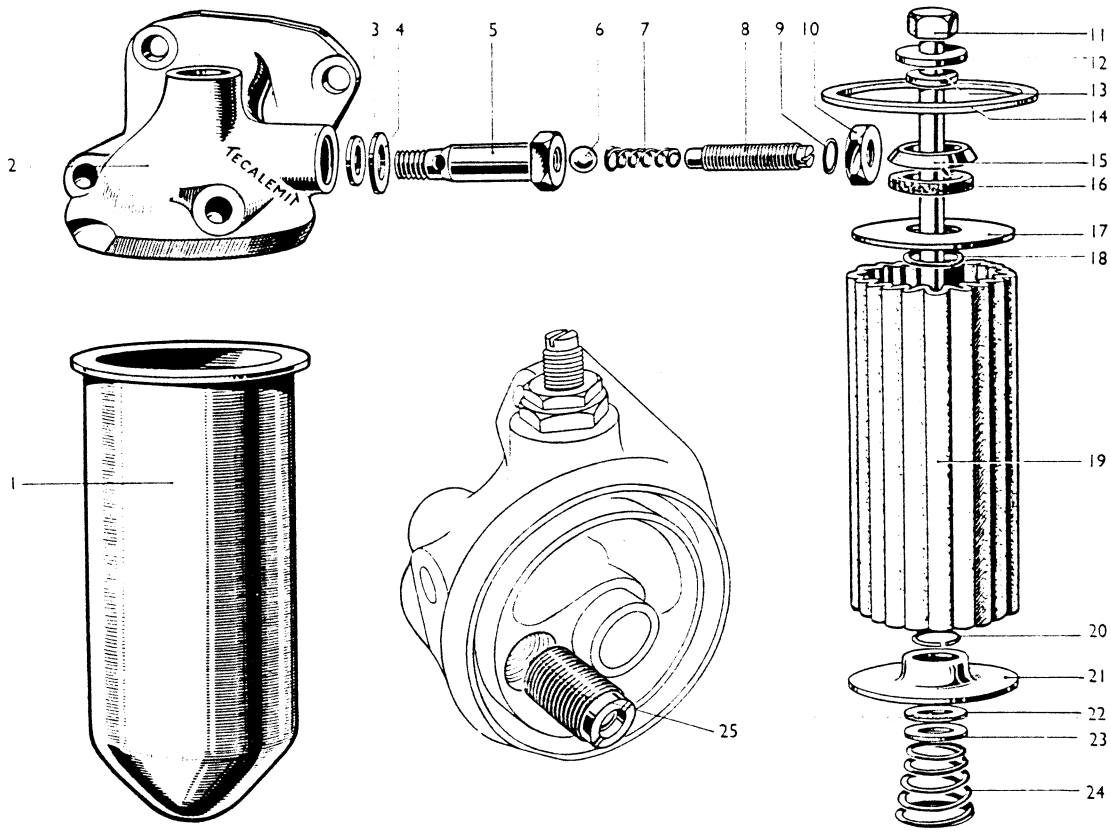


FIG. 5.

Re-Assembly of inclined type.

Clean all parts as recommended for vertical type filters, then proceed as follows :—

1. Insert ball 6 in pressure relief valve body 5 and locate spring 7 with its wide end on ball. Screw adjustment plug 8 into body and place over its slotted end a new lead packing ring 9 before screwing down lock nut 10. As a preliminary setting, the plug should be screwed in so that about 6—7 threads are exposed above lock nut. Place rubber sealing washer 3 into its recess and screw down the valve assembly on to washer 4.

2. Replace safety valve assembly 25.

3. On filter head 2, replace steel dished washer 15, felt washer 16 and clamping plate 17. Secure by fitting "C" spring 18 in its groove.

4. In base of container, replace pressure plate spring 24, steel washer 23, felt washer 22, and pressure plate 21. Secure by fitting "C" spring in its groove.

5. Replace joint ring 14 in its recess in head, locate head on container and replace sealing washer 13. Secure by tightening long bolt 11 on to its washer 12.

OVERHAUL OF CYLINDER HEAD ASSEMBLY

Necessity for Decarbonisation and Valve Grinding.

The combustion of the fuel-air mixture supplied to an engine cylinder should spread rapidly and evenly from the spark plug points through the charge. The heat of combustion should rapidly expand the gases produced by the combustion, and exert a steady sustained pressure on the piston.

The gradual build up of carbon deposits from the burnt gases inside the combustion chamber eventually adversely affects combustion because the deposits become incandescent from the heat of combustion, and prematurely ignite the incoming gas charge. Also, they cause areas of irregular combustion, giving sharp, violent increases of pressure on the piston.

The actual increase in compression ratio and poor heat dissipation due to layers of carbon can be sufficient to cause the very high pressure and temperature necessary for spontaneous combustion of fuel well before the piston has reached the top of its stroke.

This inefficient combustion is usually made evident by a characteristic metallic knocking or 'pinking,' or by a tendency for the engine to 'run on' after the ignition is switched off.

Loss of Compression.

Starting difficulty, loss of power, or increased fuel consumption will often indicate that cylinder compression is being impaired by carbon deposits in the valve guides which prevent valves from closing properly, or valve seating faces having become pitted or burnt and which need regrinding, re-cutting or even replacing.

Testing Cylinder Head Compression.

Cylinder compression can be tested by either of the following methods :—

(*a*) By turning crankshaft two complete turns with starting handle, a comparison can be made of the compression resistance of the four cylinders and thus the condition of the four pairs of valves.

(*b*) By connecting a pressure gauge with suitable adaptor to each of the spark plug holes in turn and operating the starter with ignition switched off. It is important for this test that the battery is fully charged. At cranking speed the cylinder-head pressure of an engine in good condition should be 90 to 100 lbs. per square inch. (6.33—7.03 kg. per sq. cm.)

The important point to note during both these tests is any deficiency in compression for one particular cylinder compared with the average for the other three.

Visual Indication of Need for Decarbonisation.

Decarbonisation is usually necessary after about 300 hours work. An indication of the condition of combustion chamber can be obtained from that of the spark plugs. If, on removal for examination, the plugs have acquired a considerable amount of carbon around the base of the electrodes, a similar state can be assumed to exist in the combustion chambers.

The following instructions are necessary for the complete reconditioning of the cylinder head. It is unlikely that the complete overhaul will be necessary until the engine has done many hundreds of hours work, but removal of carbon deposits and lapping of valves should be carried out at regular intervals.

Preparations for Lifting Cylinder Head (Fig. 6).

1. Remove radiator filler cap and drain water from radiator and cylinder block by opening the two drain taps, one of which is located at the base of the radiator, and the other on cylinder block behind dynamo.

2. Detach hood. This entails removal of two support attachment bolts from forward end of fuel tank, and two shoulder screws from radiator support bracket.

3. Remove hood.

4. Turn off fuel, disconnect fuel pipe at sediment bowl, and remove tank, which is secured by four bolts.

5. Remove crankcase breather pipe by unscrewing the banjo connection at rocker cover and screwed adaptor at manifold.

6. Remove cotter pin from governor spring link lever 1 at forward end of throttle rod 2. Pull off link and allow to remain suspended on spring 3.

7. Disconnect radiator stay and hose 4 at water outlet elbow 5.

8. Disconnect by-pass hose 6 at thermostat body 7 or water pump 8 and remove the two set screws securing thermostat body to flange at forward end of cylinder head.

9. Swing clear the assembly comprising thermostat body and water outlet elbow, pivoting on throttle rod, as shown in Fig. 6.

10. Disconnect exhaust pipe clip at engine mounting flange.

11. Using service wrench FTB2, remove manifold nuts. Pull manifold off its studs and leave suspended clear of cylinder head as shown in Fig. 6. Remove gaskets.

12. Remove rocker cover with gasket.

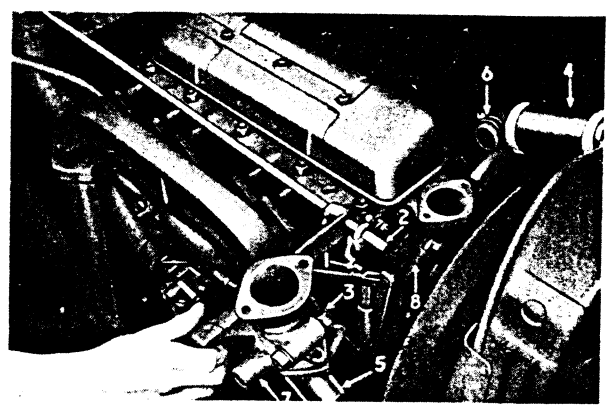


FIG. 6

13. Lift rocker shaft assembly after removing the four pedestal securing nuts from their studs.

14. Lift out push rods ensuring that tappets are not disturbed.

15. Remove spark plugs and immerse in petrol.

To Remove and Dismantle Cylinder Head Assembly.

1. Remove the ten cylinder head securing nuts from their studs.

2. Pulling at thermostat flange at forward end, and rocker cover flange at rear, remove cylinder head and gasket.

Note :-

Do not break the seal between head and block by turning engine. This may disturb sleeves.

3. On to the second and fourth cylinder head studs on manifold side, screw sleeve retainers—FT.3, Fig. 7.

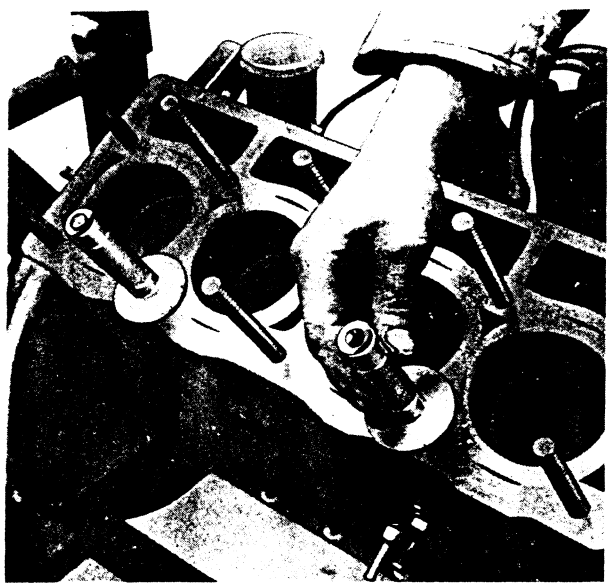


FIG. 7

4. Mount cylinder head assembly on service fixture FTB9, with pegs located in end stud holes. Adjust the position of the strut to obtain a vertical pull on collar. Compress valve springs and remove split cones. Valves and springs should be placed in order of removal on stand as shown in Fig. 8.

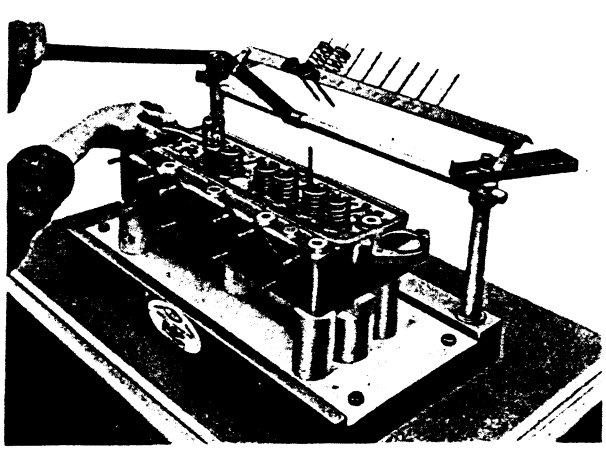


FIG. 8

Note :-

If oil retaining cups and seals are fitted above valve guides, they should be discarded.

Replacement of Push Rod Tubes :-

Damaged push rod tubes can easily be replaced using service tool FT.53, Fig. 9.

To Remove Tube.

1. Cut through the tube with a hack-saw. Fig. 10 inset.
2. Knock out each half of the tube from its location in cylinder head.

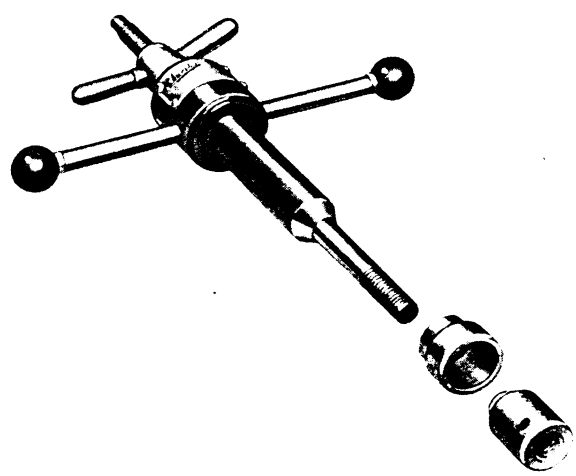


FIG. 9

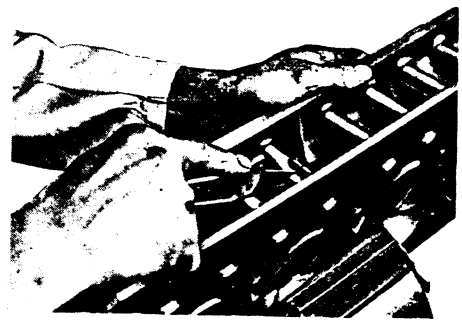
To Fit New Tube.

Place collar A on tool shank as shown in Fig. 10.

2. Locate new tube in cylinder head flange.
3. Insert tool shank through tube and tighten tapered collar B.
4. Turn handle C to pull tube into position.

5. Unscrew and remove tool.

6. Replace tool without collar A, secure tapered collar B. and tighten by turning handle C. to locate taper of tool body in tube.



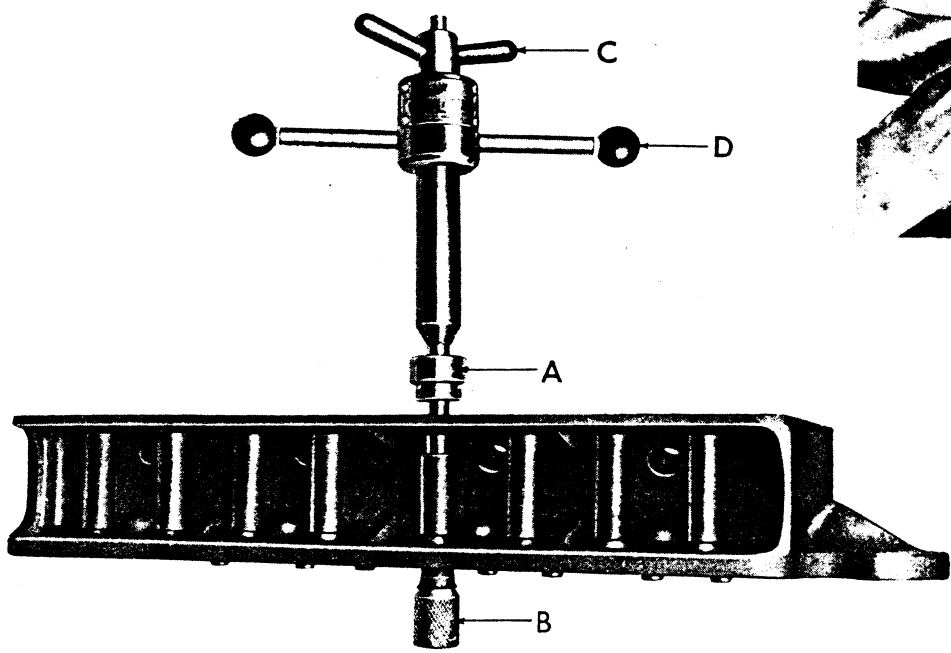


FIG. 10

7. Turn handle lever D to spin out edge of tube.

8. Continue tightening and spinning until edge of tube is spread into recess to give firm location.

Rocker Assembly (Fig. 11)

Pedestals 1, rockers 2 and 3, and springs 4 can be slid off the rocker shaft 5 after removal of one of the end collars 6 and the shaft locating plug 7 from No. 4 pedestal. Prior to tapping off the end collar, it is necessary to tap out its locating pin 8.

Should any of the rocker bushes 9 have worn, the assembly comprising rocker and bush must be renewed. However, adjusting pins and locknuts 10 are available as spare parts.

After blowing out all oil drillings with compressed air, re-assemble as follows :—

1. Assemble rockers and springs on shaft as shown in Fig. 11 with pairs of rockers converging towards valve pad ends and with the rear pedestal, which has the oil feed drilling, located at the radially drilled and tapped shaft end.

2. Tap on end collar, insert pin and peen over.

3. Position shaft in the drilled pedestal so that locating plug can be inserted and tightened over its shake-proof washer.

Tappets and Pushrods.

Examine each tappet in turn. Face markings illustrated in Fig. 12A., indicate that the tappet has not been turning in its bore, while those illustrated in Fig. 12B indicate satisfactory turning, thus ensuring even wear and satisfactory rocker adjustment. Tappets which have not been turned should either be replaced or relocated in another bore where satisfactory rotation has taken place. If a push rod is bent or has worn seating, it should be replaced.

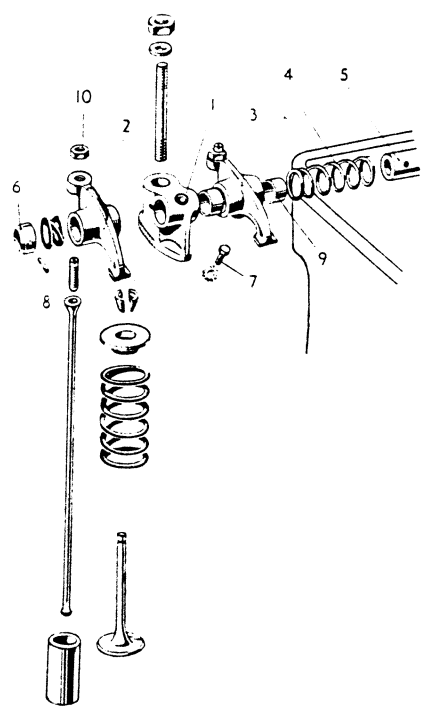


FIG. 11

Removal of Carbon Deposits.

An examination of carbon deposits on the cylinder head, combustion chambers and piston crowns will indicate the general mechanical conditions of the engine. A hard dry deposit shows that the piston rings etc., are not unduly worn. The reverse is indicated if the carbon is soft and oily.

Pistons and Sleeves.

1. Turn crankshaft until two pistons are about $\frac{1}{4}$" (6.35 mm) before the top of their stroke and insert an old piston ring in the bore on top of one of them.

2. Place sufficient clean rag in remaining cylinders to ensure that carbon scrapings do not enter the bores.

3. Using a suitable scraper, carefully remove from the piston crowns all carbon inside the old piston ring, leaving a ridge around the piston edge and at the top of the sleeve bore. This helps to retain compression.

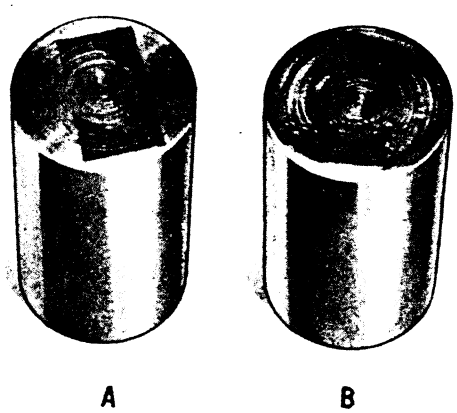


FIG. 12

4. Repeat this procedure for the remaining three pistons, taking care that no scrapings or chips drop between the sleeves into the cylinder block water jacket. Wipe off piston crowns with petrol-moistened rag.

5. Scrape any particles of dirt or grit from the upper machined surface of cylinder block and wipe off with a petrol-moistened rag.

Note :-

To ensure that no loose carbon particles remain around piston edges, thin oil can be squirted on to the edges of piston crowns, and the crankshaft rotated. Any loose particles will be left on the bores, and can easily be wiped away.

Cylinder Head.

1. Examine water jacket. Immerse head in caustic soda solution if necessary to clear scale. Dismantle and clean thermostat assembly—see Section D.
2. Remove all carbon deposits from combustion chambers, valve ports and guide shrouds by means of suitable scrapers, or pneumatic hand tool, as shown in Fig. 13.

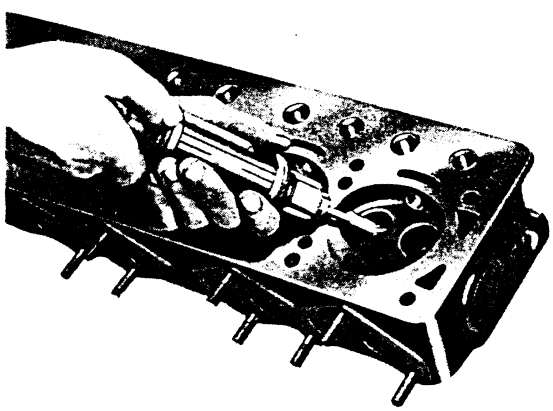


FIG. 13

3. Thoroughly clean all machined faces and wash in petrol or paraffin.

Valves, Seats and Guides.

1. Thoroughly scrape all carbon from each valve head, wash valve in petrol, afterwards polishing head and stem, preferably using a rotating wire buffer similar to that illustrated in Fig. 14.

   Be careful to replace each valve in its correct position on the Service Fixture so that it can be subsequently fitted in its correct guide.

2. When each valve is thoroughly cleaned, examine the fit in its guide bore.

   The clearance between stem and guide should be :—

   Exhaust
   0.003″ — 0.005″ (.0762 — .1270 mm)

   Inlet
   0.003″ — 0.001″ (.0762 — .0254 mm)

3. If the clearance appears excessive, the valve stem diameter should be measured. The diameter of unworn stems should be :—

   Exhaust
   0.309″ — 0.308″ (7.8486 — 7.8232 mm)

   Inlet
   0.311″ — 0.310″ (7.8994 — 7.8740 mm)

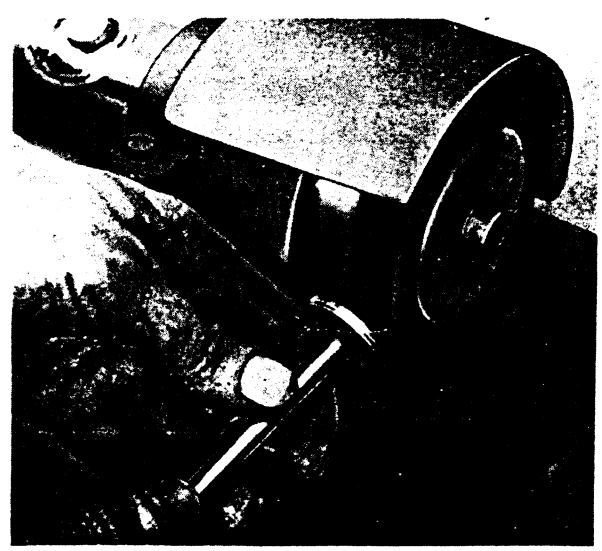


FIG. 14

After this examination, and before further treatment, it should be decided whether wear on valve stems and guides warrants replacement.

Spark Plugs.

After plugs have been washed in petrol and allowed to dry, the insulators and electrodes should be cleaned with a wire brush, or, preferably, with one of the proprietary spark plug service units. Remove all traces of grit or carbon from screw threads. Examine the insulators for cracks and the electrodes for signs of excessive burning ; if damage of this nature is suspected, plugs should be renewed. If it is decided that a plug is worthy of further use, the centre and side electrodes should be dressed with a small smooth file, and the gap set to $^{0.028}/_{0.082}$ ins. $\left(^{.701}/_{.813}\text{ mm}\right)$ by bending the side electrode.

Valve Grinding and Cutting.

The operations detailed below are necessary for the purpose of ensuring a gas-tight seal between valve and seat in cylinder head.

Grinding-in is necessary whenever a new, refaced, or very slightly pitted valve is to be used in a cylinder head where the valve seat is in a similar condition. Valves and seats which have become more extensively worn should be replaced or re-cut before regrinding. The necessary cutting treatment depends entirely on the condition and previous treatment of the valve or seat, which should be examined and compared with the examples shown in Fig. 17.

Grinding-In.

It is most important that each valve is ground into its correct seat in the cylinder head, and for this reason it has been emphasised that care should be taken, after removal, to assemble valves in their correct order on the cylinder head Service Fixture. The valve grinding tool used can be either of the hand type or the pneumatic type as shown in Fig. 15, and the treatment for each valve is as follows :—

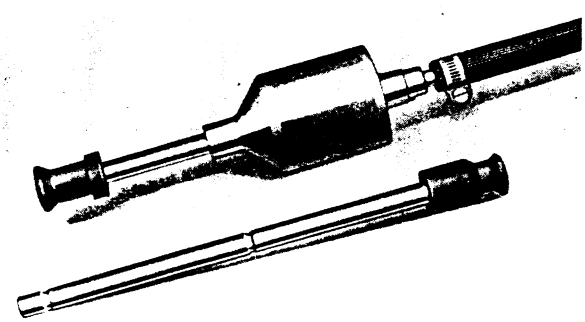


FIG. 15

1. Mount the cylinder head on the the service stand with combustion chambers uppermost.

2. Coat the bevelled face of the valve with grinding paste. If the seats are in fairly good condition, it will only be necessary to use fine paste, but if this is not sufficient to produce a clean surface, a little coarse paste must be used, finishing off with fine grade.

3. Exerting an even pressure on the grinding tool, rotate the valve backwards and forwards as shown in Fig. 16. After a few oscillations, lift the valve and press down in another position. This ensures even grinding.

4. Examine the valve as the work proceeds until a smooth dull ring is formed round its seating face cor-

FIG. 16

responding with the seat cut in the cylinder head.

5. Test if seat is true. Carefully clean all grinding paste from both valve and seat, mark seat in at least 4 positions with a soft lead pencil, then rotate the dry valve as if continuing grinding process. The correctly ground-in valve will then make a bright ring concentric with the smooth matt band first observed. If this ring is unbroken and all pencil marks broken, the valve will be gas-tight on assembly.

Cutting Valves and Seats.

Typical conditions of valves and seats which require re-cutting are illustrated in Fig. 17.

Fig. 17A. shows a new, correctly seated valve providing a centrally located seating area of approximately half that of the inclined face. In Fig. 17B grinding has been carried out to such an extent that the valve head has sunk into the cylinder head, giving such a large seating area that its efficiency has been impaired.

Fig. 17C shows an extreme condition in which the valve is shrouded by a step formed on the seat due to excessive grinding. Engine performance will suffer because of the consequent later opening and early closing of the valve, and the loss of seating efficiency described above. In Fig. 17D the step illustrated in detail C has been removed, using the $44\frac{1}{2}°$ cutter but the seating face still remains too large. Fig. 17E illustrates the use of the 70° narrowing cutter to reduce the seating area to the correct size. It will be seen that the lower part of the $44\frac{1}{2}$ seat has been cut away, leaving the correct valve contact area of approximately half of the inclined face.

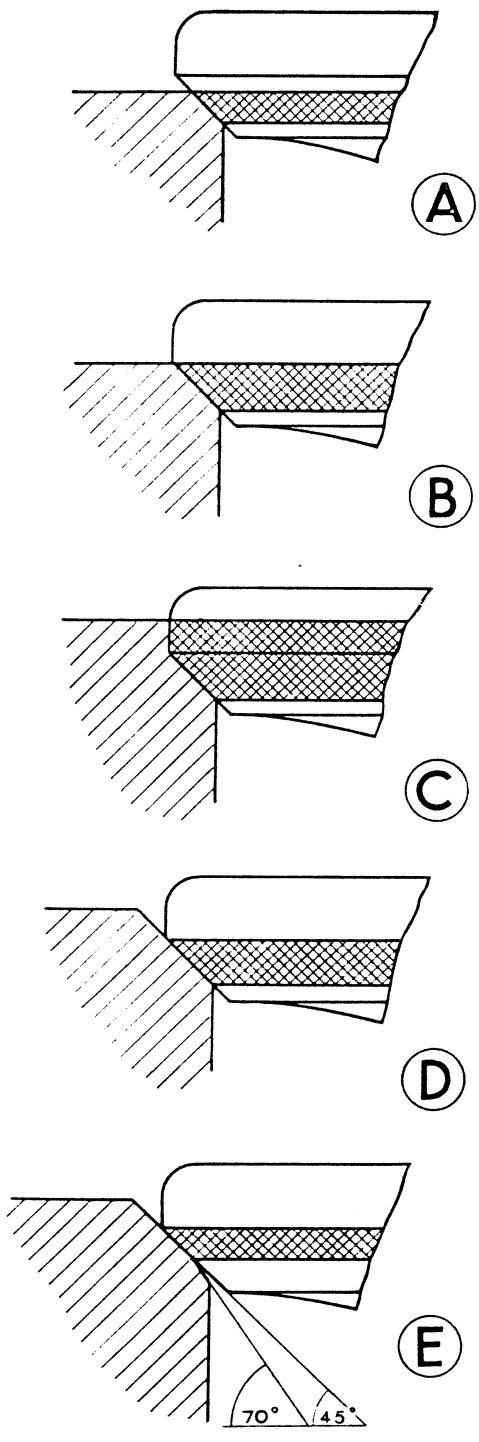


FIG. 17

Refacing Valves.

Valve head seating angle is 90° included.

Valves are manufactured from a much harder steel than that of their seats in the cylinder head. Consequently, if a valve is badly burnt or pitted, the grinding operation previously described would remove an excessive amount of material from cylinder head seats before restoration of the sealing face of the valve heads. Therefore, badly pitted valves should always have their sealing faces re-ground at the correct angle before lapping-in. It is strongly recommended that grinding is carried out using the specialised machine illustrated in Fig. 18. The least possible amount of steel should be ground away, consistent with

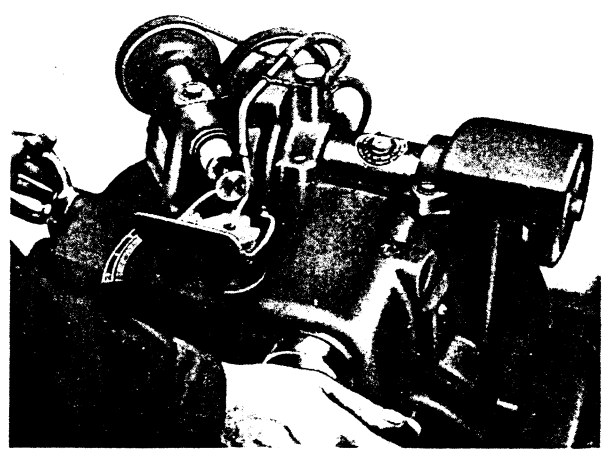


FIG. 18

the removal of the pittings. A valve should be discarded if re-facing treatment reduces its head thickness above the seating edge below $\frac{1}{32}$" (1 mm). If the head is too thin the edges are apt to curl up when the valve becomes hot.

Re-cutting Valve Seats.

Valve seat angle is 89° included.

It will not usually be necessary to recut seats with the 44½ cutter unless they are badly pitted, or if a step has formed as shown in Fig. 17C use the cutter to remove the absolute minimum of metal necessary to form the profile shown in Fig. 17D. The narrowing cutter should be used as necessary to provide the correct sealing area shown in Fig. 17E.

FIG. 19

The use of the valve seat cutter and pilot, service tool FT.316, is illustrated in Fig. 19. The cutter is a push fit over the tapered shank of the tool, while the pilot is a sliding fit in the valve guide bore. After locating the pilot with the cutter teeth bearing lightly on the seat requiring treatment, a few revolutions of the tool will suffice to clean up the seating face. This procedure applies to either cutter.

Note—Valves and seats **must** be lapped-in after refacing. Valves should be mounted on the cylinder head service fixture in their correct order for assembly.

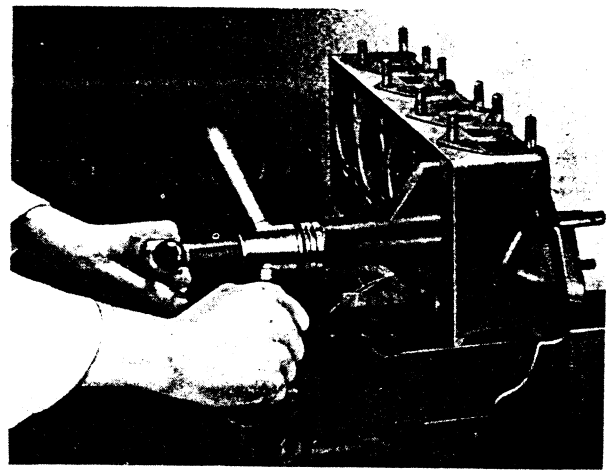


FIG. 20

Precautions before Re-Assembly.

Before re-assembling the eight ground-in valves, all traces of paste should be removed from valve head, stems, and seats in the cylinder head. Ensure that no paste remains in the valve guide bores by dipping valve stems in petrol and passing up and down in guides. Ensure that all valve guides protrude 9/16" (14.3 mm) above valve spring seats in cylinder head. If the protrusion is less than 9/16" (14.3 mm) the guide will have to be removed, cleaned, and re-located, using service tool FT.60—Fig. 20 and 21. Examine all valve springs. If a spring compresses to a length less than 1¼" (31.75 mm) under a load of 38 lbs. (17.237 kg.) it should be renewed.

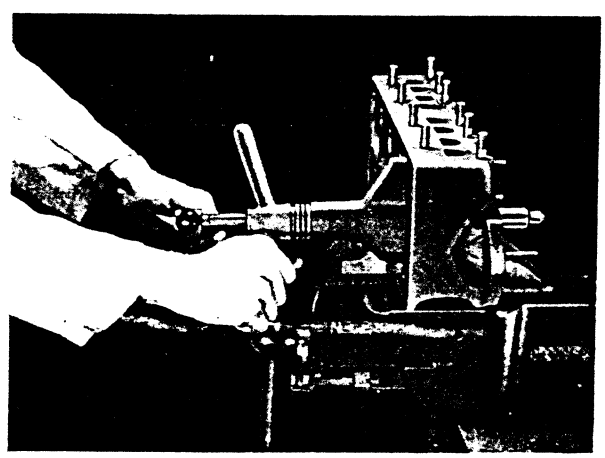


FIG. 21

Assembly of Valves and Springs.

Locate each valve in its correct guide and mount the cylinder head on the service stand with valve spring seats uppermost. Oil retaining cups and seals are not to be fitted.

Assemble each valve spring as follows :—

1. Place spring over the valve stem with close wound coils to spring seat shown in Fig. 23 inset.
2. Mount collar and compress spring.
3. Insert split cones, and allow the spring to expand.

To replace Cylinder Head Assembly.

1. Remove all rag from cylinder bores.
2. Ensure that none of the tappets has become displaced in its bore.
3. Remove cylinder sleeve retainers.
4. Carefully place a new cylinder head gasket over studs on to face of block.

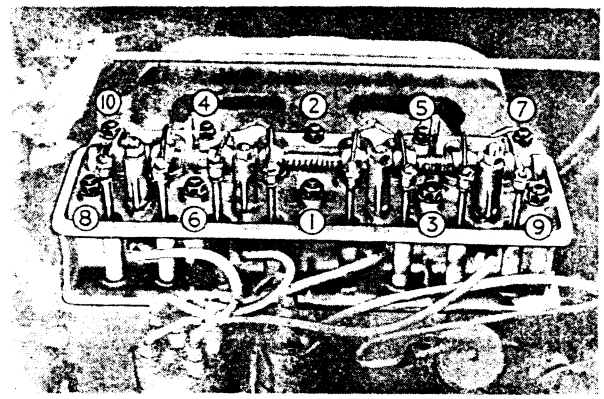


FIG. 22

5. Mount cylinder head over studs and tighten nuts over washers gradually in order shown in Fig. 22 to a torque wrench reading of 60—65 ft. lbs. (8.25—8.95 m.kg.)
6. Insert push rods in their tubes.

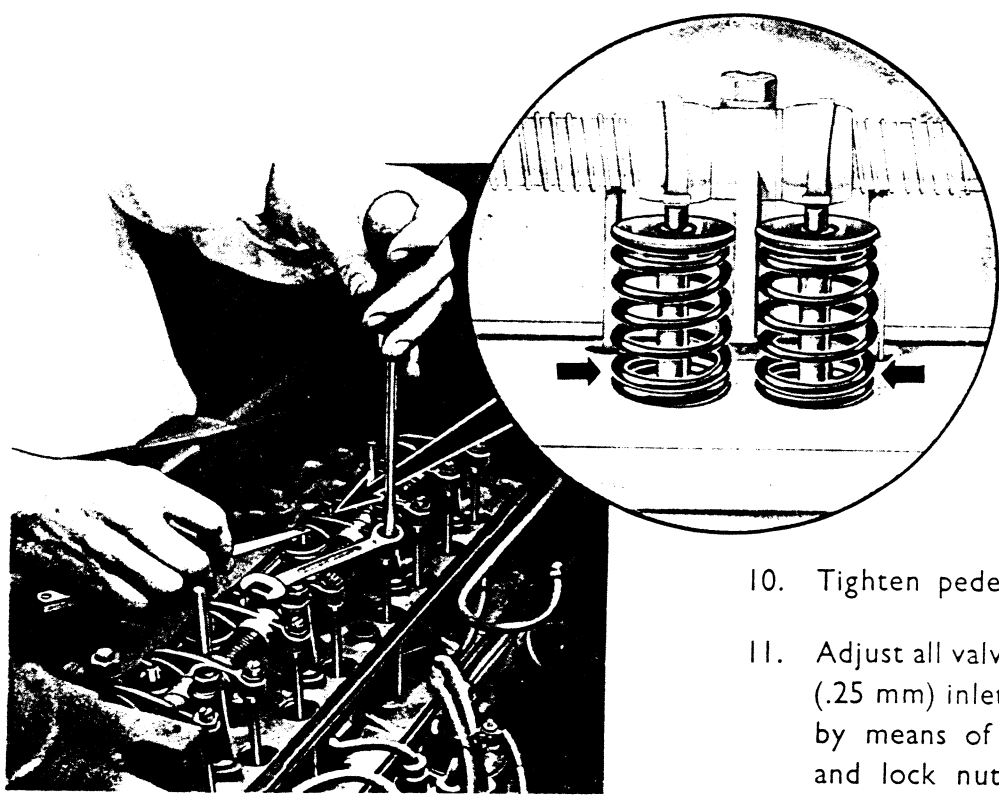


FIG. 23

7. Slacken off all rocker adjusters.
8. Mount rocker shaft assembly, locating pedestals over the four long studs on left side of head.
9. Locate rocker ends over valve tips, and adjusters in push rod cups.
10. Tighten pedestal securing nuts.
11. Adjust all valve tip clearances to 0.010" (.25 mm) inlet, 0.012 (.3 mm) exhaust by means of rocker adjuster screws and lock nuts as shown in Fig. 23.

12. Replace rocker cover with gasket.
13. Replace spark plugs and leads.

To Complete Re-Assembly.

1. Renew manifold gasket if showing signs of "blowing."
2. Mount manifold on studs over gaskets, and secure by tightening nuts on to lock washers. Tighten gradually in the order shown in Fig. 24.

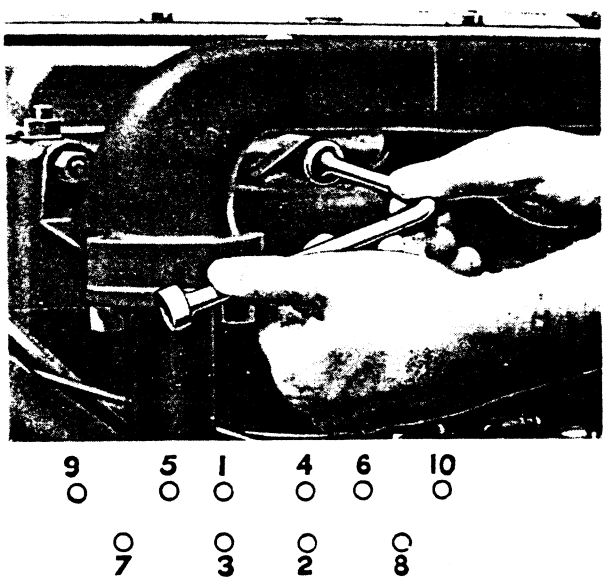


FIG. 24

3. Attach exhaust pipe clip to engine mounting flange by tightening set screws.
4. Secure thermostat body to flange at forward end of cylinder head by tightening two set screws on to lock washers.
5. Re-connect thermostat by-pass hose at thermostat body and radiator hose and stay at water outlet elbow.
6. Replace governor spring link and secure with cotter pin.
7. Replace crankcase breather pipe with fibre washers at screwed adaptor in manifold and banjo connection on rocker cover.
8. Replace fuel tank and re-connect fuel pipe at sediment bowl.
9. Replace hood.
10. Replace battery.
11. Re-fill radiator.
12. Turn on petrol.

After the engine has been run for a few hours, re-adjustment of valve tip clearances may be necessary, due to bedding-in of valves.

CAMSHAFT AND TIMING MECHANISM

Removal of Timing Cover.

1. Support engine forward of sump plug and remove hood together with front axle and radiator assembly.
2. Remove fan belt and fan which is secured to pulley by 4 set screws with lock washers.

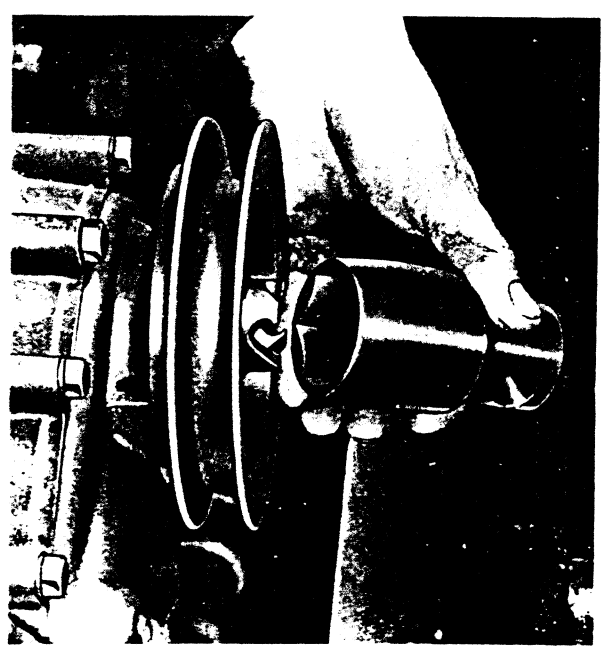


FIG. 25

3. Remove starting handle jaw, using service tool FTB.16, Fig. 25, with long lever. Bend back tabs of starting handle jaw lock washer, then select 4th gear and apply parking brake before striking lever to unscrew jaw.

4. Remove pulley from crankshaft key.

5. Disconnect throttle tie rod from governor lever by removal of clevis.

6. Disconnect governor lever rod from ball connection on lever at forward end of throttle rod.

7. Pull timing cover with gasket free from the two locating dowels, after removal of 3 bolts, 8 set screws, and one nut from stud.

Removal of Camshaft.

1. Withdraw governor cup and shaft assembly from its hole in the camshaft Then remove governor plate for examination. See Section F.

2. Bend back corners of locking plate and remove the two set screws securing camshaft timing sprocket.

3. Remove crankshaft sprocket oil thrower, and lever crankshaft sprocket about $\frac{1}{8}$" forward.

4. Remove camshaft sprocket with chain.

5. Remove camshaft locating plate which is secured to engine plate by 3 set screws on lock washers.

6. Remove rocker assembly, cylinder head, pushrod and tappets. (See page C7—11).

7. Withdraw camshaft.

Re-assembly—Valve Timing.

1. Replace camshaft, tappets, cylinder head, push rods and rocker mechanism. (See page C17), for cylinder head replacement carry out instruction 1—10 only.

2. Locate crankshaft sprocket.

3. Replace camshaft sprocket. (See "Valve Timing").

4. Before adjusting valve timing, check sprocket alignment by placing a straight-edge across front faces of sprockets and shim as necessary behind crankshaft sprocket. This check should always be made if it is suspected that the engine has had treatment which has affected crankshaft or camshaft end float.

5. Replace crankshaft sprocket oil thrower with dished edge forward and timing cover with new gasket.

6. Replace pulley and fan, locating any balancer weights with the stamped "BALANCER" to front and with drilled holes in line. Note that fan blades should be to rear of central mounting plate. Should stud have screwed out when removing timing cover, it should be replaced directly below water pump.

Valve Timing.

The following procedure assumes that adjacent teeth of camshaft and crankshaft timing sprockets have been scribe marked when No. 1 inlet and exhaust valves are fully closed with No. 4 inlet valve just opening and exhaust valve just closing.

1. Set No. 1 piston at T.D.C. See Section G Pages 17-19.
2. Locate camshaft sprocket by set screws through any two convenient holes.
3. Turn sprocket and camshaft until scribe marks are adjacent.
4. Lightly press No. 4 cylinder rocker adjusting screw into push rod cups, and rock camshaft sprocket gently backwards and forwards as shown in Fig. 26 to check whether the introductory condition applies.

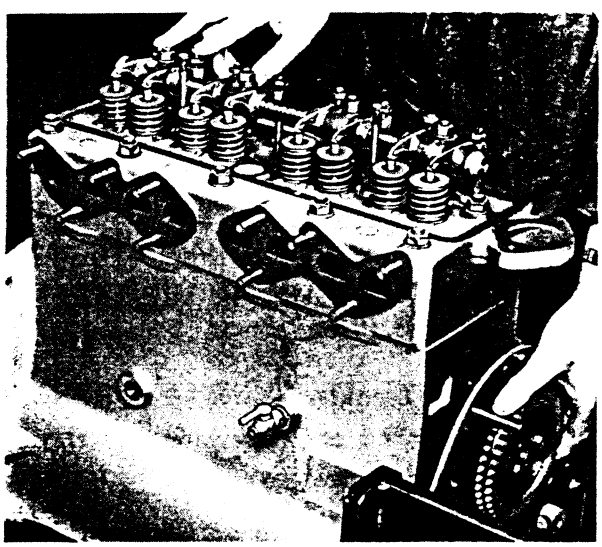


FIG. 26

5. If instruction (4) gives a positive result, mount chain and secure camshaft sprocket in position chosen.
6. If instruction (4) gives a negative result, repeat instructions (2) to (5) having located camshaft sprocket 90° clockwise from previous position. There are four alternative positions.
7. Adjust all rocker clearances to—
   0.010" (.254 mm) inlet.
   0.012" (.305 mm) exhaust.
   replace cover with new gasket before continuing re-assembly.

The following procedure assumes that no components are marked, in which case it is necessary to remove starter for access to flywheel. The operations can, of course, be more conveniently carried out if engine is removed and flywheel completely exposed.

1. Mount and locate camshaft sprocket and chain by inserting set screws through any two convenient holes.
2. Turn flywheel by means of a suitable lever through starter hole in crankshaft flange, until No. 4 inlet and exhaust valves are closed, then adjust their rocker clearances to :
   0.020" (.508 mm) inlet.
   0.022" (.559 mm) exhaust.
3. Insert a 0.010" (.254 mm) feeler gauge between rocker and No. 4 inlet valve tip and turn flywheel in direction of normal rotation, until feeler is just beginning to be gripped (i.e. valve beginning to open).
4. Chalk mark flywheel and adjacent spot on crankcase.
5. Insert 0.010" (.254 mm) feeler gauge between rocker and No. 4 exhaust valve tip and turn flywheel in same direction until grip on feeler is just beginning to relax (i.e. valve just closing).
6. Chalk mark flywheel adjacent to previous mark on crankcase.
7. Return flywheel to original position and, approaching in direction of normal rotation, position it so that its two chalk marks are equidistant from the one on the crankcase. This positions the camshaft so that No. 4 inlet valve

has just begun to open and No. 4 exhaust valve is just about to close, with No. 1 inlet and exhaust valves fully closed.

8. Without altering position of camshaft, remove sprocket and chain and turn flywheel until No. 1 piston is at T.D.C. (See Section G. Pages 17-19)

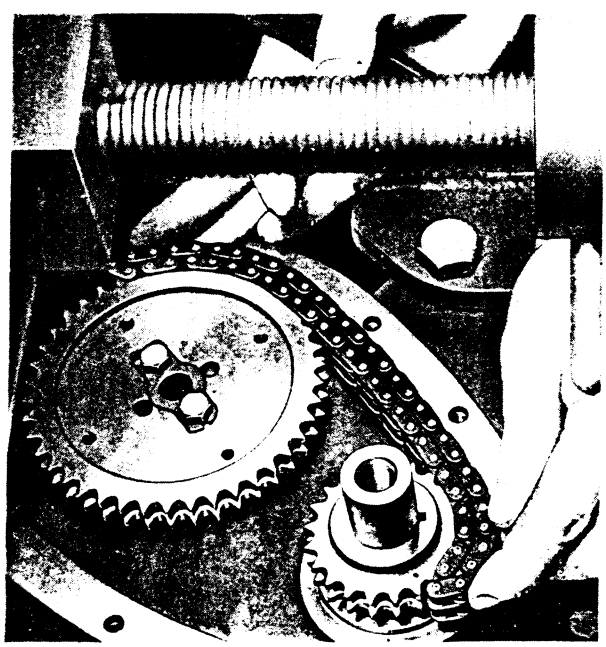


FIG. 27

9. Still without altering position of camshaft, mount sprocket with set screws finger tight and apply chain as shown in Fig. 27. The chain, located on crankshaft sprocket, should engage at least 4 teeth on camshaft sprocket with no slackness. Reversal of sprocket provides four alternative positions on camshaft, giving a location variable by $\frac{1}{4}$ tooth. The drillings in camshaft sprocket are located so that 90° movement will give $\frac{1}{2}$ tooth adjustment, while reversal of sprocket will give a further $\frac{1}{4}$ tooth adjustment in either direction.

10. Having found the correct position for camshaft sprocket, mount chain, adjust all rocker clearances to :—

    0.010" (.254 mm) inlet.

    0.012" (.305 mm) exhaust.

    replace cover with new gasket before continuing re-assembly.

Thank you very much for your reading.

Please Click Here Then Get More Information.