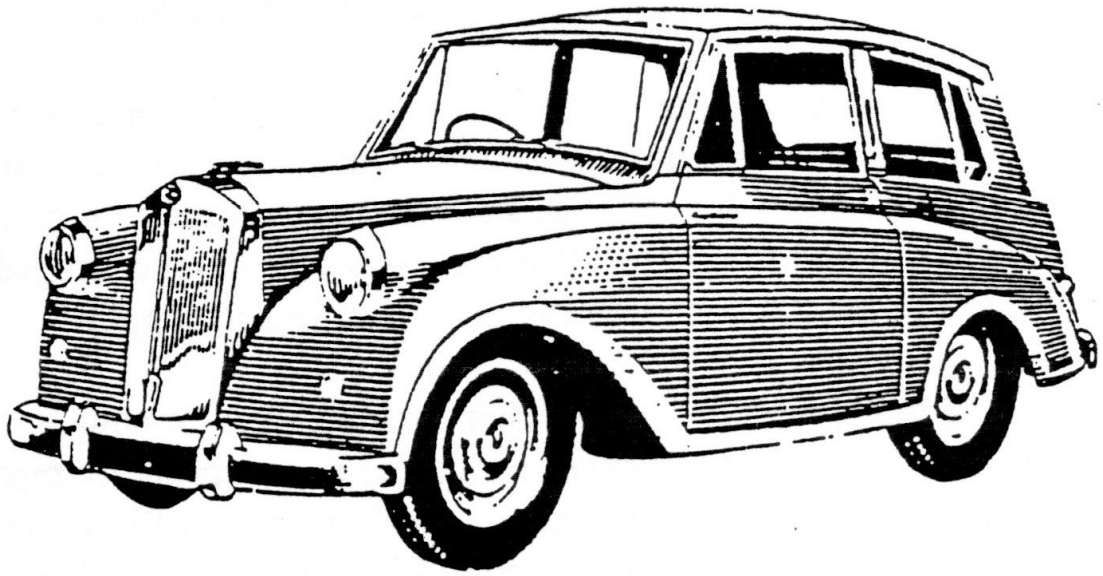
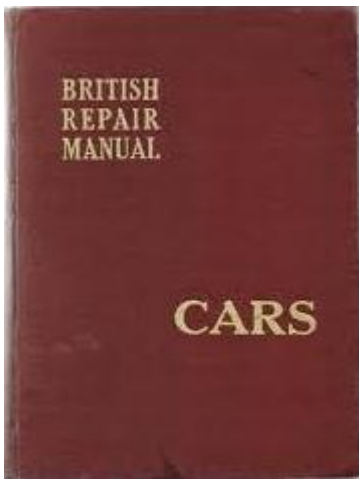
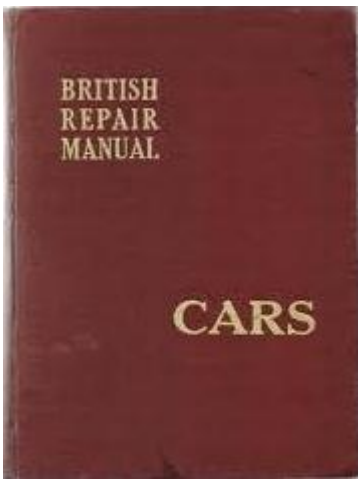


TRIUMPH MAYFLOWER CLUB

BRITISH REPAIR MANUAL: THE TRIUMPH MAYFLOWER





Published 1952 | Paul Burgess

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TRIUMPH MAYFLOWER

GENERAL DATA, DIMENSI0NS AND SPECIFICATIONS

NOTE.-All dimensions are in inches unless otherwise stated.

Make	Triumph.
Model	Mayflower.
Year of manufacture	1950 to 1952.
Turning circle	34' 0".
Location of serial number	On bulkhead.
Track, front	3' 9" (3' 10" from chassis number TT 5553).
Track rear	4' 0" (4' 1 " from chassis number TT 5553).
Wheelbase	7' 0".
Ground clearance	7.00.
Height	5' 2".
Width	5' 2".
Length	13' 0".
Weight	2142 lbs.
Fuel consumption	35 M.P.G.

Torque Poundage, Bolts and Studs

Cylinder head	35 to 38 lbs./ft.
Connecting rod	35 to 38 lbs./ft.
Main bearing	90 to 100 lbs./ft.
Manifold	18 to 20 lbs./ft.
Sump	16 to 18 lbs./ft.
Water pump housing	12 to 14 lbs./ft.
Flywheel securing	42 to 46 lbs./ft.
Clutch to flywheel	20 to 22 lbs./ft.
Bell housing	18 to 20 lbs./ft.

Capacities

LUBRICANTS	QUANTITY	S.A.E. No.
Engine	6 pints	Over 70° F. S.A.E. 40.
		40° F. to 70° F. S.A.E. 30
		10° F. to 40° F. S.A.B. 20
		10° F. to 10° F. S.A.E. 10
Gearbox	1¼ pints	Over 10° F. S.A.E. 30
		Below 10° F. S.A.E. 20
Rear axle	1½ pints	Over 10° F. S.A.E. 90 EP.
		Under 10° F. S.A.E. 80 EP.
Fuel tank	9 gallons	
Cooling system	12 pints.	

Engine

Type	Side valve.
Bore	2.48 (63m.m.).
Stroke	3.94 (100m.m.).
Number of cylinders	4.
Firing order	1, 3, 4, 2.
Nominal H.P.	9.84.
Capacity	76.1 cu. in, (1247c.c.).
Compression ratio	6 to 1.

B.H.P	38 at 4200 R.P.M.
Maximum torque	700 lbs./ft at 2500 R.P.M.
Maximum B.M.E.P	116 lbs./sq. in. at 2500 R.P.M.
Ignition setting	2° before T.D.C. (Full retard).
Location of engine number	Adjacent to oil filler.

Crankshaft

Journal diameter	1.9995 to 2.0000.
Permissible wear	1.9975.
Bearing internal diameter	2.0015 to 2.0020.
Permissible wear	2.003.
New clearance	0015 to .0025.
Worn clearance	.005 dry.
Internal diameter of main bearing housing	2.1460 to 2.1465.
Bearing undersizes	—.020, —.030, —.040.
Rear journal length	1.59475 to 1.59375.
Rear bearing cap width (Plus thickness of two thrust washers)	1.584 to 1.590.
New clearance (End float)	.004 to .006.
Main bearing width	1.380 to 1.370.
Crankpin diameter	1.750 to 1.7495.
Permissible wear	1.748.
Bearing internal diameter (Big end)	1.7510 to 1.7515.
Permissible wear	1.753.
New clearance	.001 to .002.
Permissible worn clearance	.006 dry.
Internal diameter of big end bearing housing	1.856 to 1.855.
Bearing width (Big end)	.939 to .929.
Big end bearing undersizes	—020, —.030, —.040.
Crankpin width	1.1257 to 1.1348.
Worn dimension	1.127.
Connecting rod width	1.117 to 1.115.
Worn dimension	1.113.
New clearance	.008 to .010.
Journals and crankpins (Ovality and taper)	.002 maximum.

Little End

Bore for bush	.8755 to .8745.
External diameter of bush	.8780 (go) to .877 (no go).
Internal diameter of bush	.7498 to .7502.
Permissible wear	.750.
New clearance	.0002 at 68° F.
Gudgeon pin diameter	.7501 to .74985.
Permissible wear	.749.
Worn clearance	.002.

Piston Rings

Type	Plain compression. Slotted oil control.
Number of compression	2.
Number of oil control	1.

DIMENSIONS	TOP RING	2nd RING	OIL CONTROL RING
Nominal diameter	2.480	2.480	2.480
Width	.0787 to .0777	.0787 to .0777	.156 to .155
Wear limit (width)	.075	.075	.154
Groove clearance	.001 to .003	.001 to .003	.001 to .003
Ring gap (fitted):			
Minimum	.004	.004	.004
Maximum	.008	.008	.008

Pistons and Cylinders

Size F:	Bore diameter	2.4799 to 2.4802 minimum.
Size G:	Bore diameter	2.4802 to 2.4806 minimum.
Size H:	Bore diameter	2.4807 to 2.4810.
Size F:	Top diameter of piston	Over 2.4774 to 2.4777.
Size G:	Top diameter of piston	Over 2.4777 to 2.4781.
Size H:	Top diameter of piston	Over 2.4781 to 2.4785.
	New clearance	.002 to .003.
Size F:	Bottom diameter of piston	Over 2.47865 to 2.47895.
Size G:	Bottom diameter of piston	Over 2.47895 to 2.47935.
Size H:	Bottom diameter of piston	Over 2.47935 to 2.47975.
	New clearance	.001 to .0015.

Valves

Type	Poppet.
Material:	
Inlet	Silichrome steel E.N.52
Exhaust	E.N.59
Position	Side
Timing:	
Inlet opens	10°' B.T.D.C.
Inlet closes	50° A.B.D.C.
Exhaust opens	50° B.B.D.C.
Exhaust closes	10° A.T.D.C.
Tappet clearances	.015 cold, inlet and exhaust.
Clearance for timing	.020 cold.

Valve and Valve Guides

DIMENSIONS	INLET	EXHAUST
Stem diameter	.2475 to .2465	.2475 to .2465
New clearance in guide	.002 to .004	.002 to .004
Guide diameter	.2495 to .2505	.2495 to .2505
Angle of face (included)	90°	90°
Top of valve guide to cylinder		
Block upper face	.97	.97
External diameter of valve guide	.4385 to .4395	.4385 to .4395

Valve Springs

Fitted length	1 9/32
Fitted load at fitted length	22 lbs. (+2 lbs. — 1 lb).
Valve lift (nominal)	25 + .010.
Load at full lift	37 lbs.
Number of free coils	7.

Camshaft

Front journal diameter	1.6845 to 1.684.
Permissible wear	1.681.
First journal bearing bore	1.6882 to 1.6873.
Permissible wear	1.691.
New clearance between journal and bearing	.003 to .004.
Maximum worn clearance	.010.
Intermediate and rear journal diameters	1.497 to 1.4965.
Permissible wear	1.494.
Intermediate and rear journal bearing bores	1.5010 to 1.499.5.
Permissible wear	1.504.
New clearance	.0025 to .0045.
Maximum worn clearance	.010.
End float	.003 to .0065 (new) .012 (maximum permissible).

Lubrication System

Type	Forced feed.
Type of pump	Hoburn-Eaton double rotor.
Pump drive	Gear from camshaft.
Outer rotor:	
Outside diameter	1.598 to 1.599.
Housing internal diameter	1.600 (+.001 —.000).
New clearance	.002 to .003.
Depth of rotor	1.0 (—.0005—.0015).
Housing depth	1.0 (+.001 —.000).
New clearance	.005 to .0025,

Note.—A combined worn clearance of .004 indicates the necessity for cover and housing face lapping.

Inner rotor:	
Major diameter	1.171 to 1.172.
Minor diameter	.729 to .731.
Clearance on rotors:	
Maximum clearance, new	.001 to .004,
Minimum clearance, new	.0025 to .0005.

Note.—Where clearance in excess of .010 exists, new parts should be fitted.

Cooling System

Type	Fan, pump and thermo-syphon.
Water pump, type	Centrifugal.
Water pump drive	V-belt from crankshaft.
Water pump, type of bearing	Ball.
Number of fan blades	4.

Sparking Plugs

Make	Champion.
Model	NA8.
Reach	¾ inch.
Size	14 mm.
Gap at electrodes	.025.

Distributor

Make	Lucas.
Model	DKYH4A.
Contact point gap	.012.

Condenser capacity	.23 m.f.d.
Distributor rotation	Counter-clockwise at the top.

Carburettor

Make	Solex.
Type	32 FAIO.
Settings:	
Choke	21.
Main jet	105.
Correction jet	220.
Pilot jet	45.
Air bleed	210.
Needle valve	2.0.
Starter air jet	4.5.
Starter petrol jet	120.

Fuel Pump

Make	A.C.
Type	Y.
Service number	1524712.
Operation	Mechanical.
Pressure	1 ½ to 2 ½ lbs./sq. in.

Clutch

Make	Borg and Beck,
Type of hub	Sprung.
Model	7 ¼ A6-G.
Clutch pedal free travel	1.00.
Clearance between toggle levers and release bearing	1/16
Type of release bearing	Graphite.
Number of springs	6.

Gearbox

Type	Synchromesh.
Ratios:	
Top	1 to 1.
Second	1.67 to 1.
First	3.54 to 1.
Reverse	4.11 to 1.
Selector mechanism:	
Selector rod diameter	9/16 (—.001 —.002).
Bore for selector rod in casing and bush, spring fitted	9/16 ±.000.5.
New clearance	.0025 to .00225.
Plunger spring, fitted load	10 lbs.
Width of grooves in "Second" and "Top" synchro sleeve and "Reverse" gear for change speed forks	9/32 (+.004 -f.OOO).
New clearance	.010 to .016.
Width of selector fork sides	9/32 (—.006 —.010).
Mainshaft:	
Constant pinion shaft bore	.9245 to .9250.
Constant pinion bush outside diameter	.9240 to .9235.
New clearance	.0005 to .0015.
Constant pinion bush bore	.6887 to .6880.

Mainshaft spigot	.6875 to .6870.
New clearance	.0005 to .00175.
"Second" and "Top" bush external diameter	1 ½ (—.0017 -.0029).
"Second" and "Top" bush bore	1 ½ ±.0005,
New clearance	.00125 to .00275.
"Flrst" gear bush external diameter	1.5675 (—.001 —.0017).
"First" gear bush bore	1.5675 ±.0005.
New clearance	.0005 to .00225.
Speedometer bearing internal diameter	15/32 ±.0005.
Speedometer driven gear shaft diameter	15/32 (—.0007 —.0017).
New clearance	.00025 to .00225.
Countershaft:	
Shaft diameter	.7913 (+ .000—.0005).
Bore in casing for shaft	.7923 to .7915.
New clearance	.00025 to .00175.
Bore of countershaft gear for needle rollers	1.0284 to 1.0289.
Thickness of front thrust washer	.066 to .068.
Thickness of rear thrust washer	.105 to .107
Overall width of countershaft gear	6.5837 to 6.5817.
Overall width of thrust washers and countershaft gear	6.7587 to 6.7527.
Internal width of gearbox casing for countershaft gear	6.758 (+.011 +.013).
Countershaft gear end float	.006 to .010.

Propellor Shaft

Make	Hardy Spicer.
Type	KR111O.
Number of universal joints	2.
Tube diameter	2.00.
Overall length	47 ⅛ (Face to end length).

Rear Axle

Type Hypoid	semi-floating.
Side bearings	Taper roller.
Number	2.
Pinion bearings	Taper roller.
Number	2.
Crown wheel and pinion	Pinion set by shims. Crown wheel set by shims.
Axle shaft end float	Nil.
Crown wheel run out	Not more than .003.
Backlash between crown wheel and pinion	.004 to .006,
Distance from ground thrust face on bevel pinion to centre of crown wheel bearings	3.4375.
Diameter of differential bearing	2.8446 to 2.8440.
Dimension from centre of crown wheel bearings to machined face of casing	1.489 to 1.491.
Axle shaft end nut tightening torque	125 ft./lbs.
Pinion nut tightening torque	65 to 80 ft./lbs.

Steering and Front Suspension

Type of steering box	Bishop cam.
Model	T.
King pin inclination	7°.
Camber	2°.
Castor	Nil.

Steering, back lock	31°.
Steering, front lock	24°.
Front wheel movement	3.00, bump; 2.25 rebound.
Section of coils	.50 ±.005.
Number of free coils	8 ¾ .
Mean diameter of coils	3.50 ±.010.
Rate	238 lbs./ins. (approximately).
Free length	12.25.
Fitted length	8.5 ±3/32.
Static deflection	3.74.
Fitted load	890 pounds.
Solid length	5.25 maximum.
Weight	5.85 lbs

Rear Suspension

Type	Semi-elliptie.
Leaf:	
Number of leaves	8.
Thickness of leaves	1 to 4, .231; 5 to 7, .208; 8, .188,
Static deflection	6.65.
Static load	690 lbs.
Laden camber	Zero ±.25.
Rate	104 lbs./ins.

Brakes

Type;	
Foot brake	Hydraulic.
Hand brake	Mechanical.
Drum to lining clearance	Minimum.
Brake pedal clearance	.50.

Wheels and Tyres

Type of wheel	Pressed disc.
Make	Dunlop
Tyre size	5.50 x 15.
Make	Dunlop.
Pressures:	
Front	20 lbs./sq. in.
Rear	25 lbs/sq. in.

Electrical System

Fuses

Number used	2.
Circuits	Aux. Ign. And horns,

Starter

Make	Lucas.
Model	M35G.
Voltage	12.
Drive, type	SB.
Direction of rotation, commutator end	Counter clockwise.

Dynamo

Make	Lucas.
Model	C39PV.

Voltage	12.
Direction of rotation, commutator end	Counter clockwise.

Battery

Make	Lucas.
Model	GTW7A.
Capacity	38 ampere hours at 10 hour rate.
Number of plates per cell	7.
Earth terminal	Positive.
Height	9 ¼
Width	6 ⅞
Length	10 ¾

Horns

Make	Lucas.
Model	WT614
Current consumption	6 amps, each. 12 amps, total.

Windscreen Wiper

Make	Lucas.
Model	CR5

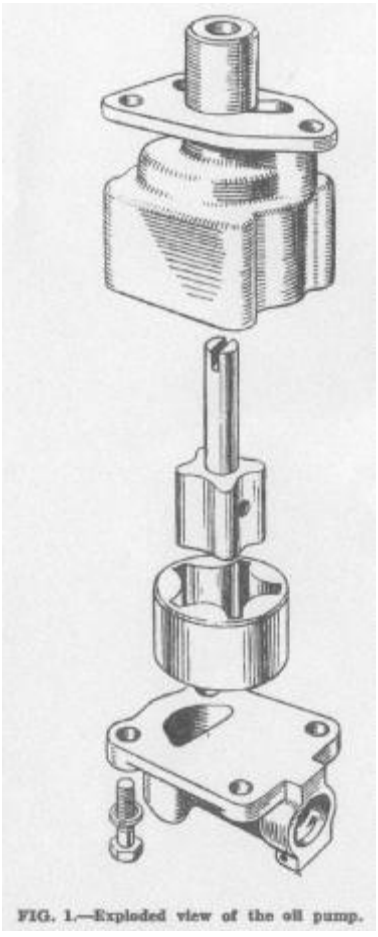


FIG. 1.—Exploded view of the oil pump.

THE OIL PUMP

To Remove the Oil Pump.

Drain and remove the sump and then withdraw the pump, which is secured to the cylinder block by three studs, nuts and lock washers.

To Dismantle the Oil Pump.

Remove the split pin which locates the floating oil intake pipe in the pump cover and withdraw the intake assembly.

Remove the four setscrews which secure the cover assembly to the pump casing and detach the cover assembly, thus providing access for the withdrawal of the two rotors.

THE ENGINE

To Set the Valve Timing.

When the timing gears are marked, turn the crankshaft until Nos. 1 and 4 pistons are on T.D.C. and fit the crankshaft gear.

Fit the camshaft timing gear and chain on to the camshaft spigot, matching up the centre punch and scribed markings on the camshaft and timing gear faces. The alternative pair of setscrew holes in the camshaft gear provide a half tooth variation in timing.

Having suitably matched the timing markings, with the driving side of the timing chain tight, the two securing setscrews and locking plate should be fitted, the setscrews tightened and their heads locked by turning up the corners of the locking plate.

When the timing gears are not marked, place Nos. 1 and 4 pistons on T.D.C. In this position the keyway on the forward end of the crankshaft will be pointing vertically upwards.

Rotate the camshaft until the tappets for No. 4 cylinder are on the concentric portions of their respective cams. Set the two tappets for this cylinder to the working clearance of .015. Similarly set the tappet clearances for No. 1 cylinder.

Turn the camshaft until the exhaust and inlet valves for No. 4 cylinder are equidistant from their respective seatings. (A feeler gauge may be used to check this clearance.)

Engage the timing chain with the crankshaft wheel and fit the camshaft gear in such a way that when this is spigotted on to the end of the camshaft, the setscrew holes in the camshaft wheel are exactly aligned with those in the camshaft, with the driving side of the chain tight. The employment of the alternative pairs of setscrew holes in the camshaft wheel provides a half tooth variation in timing, and by turning the wheel back to front quarter and three-quarter tooth alterations are available.

Apply the timing wheel setscrews and locking plate. Tighten the setscrews and locate with the locking plate.

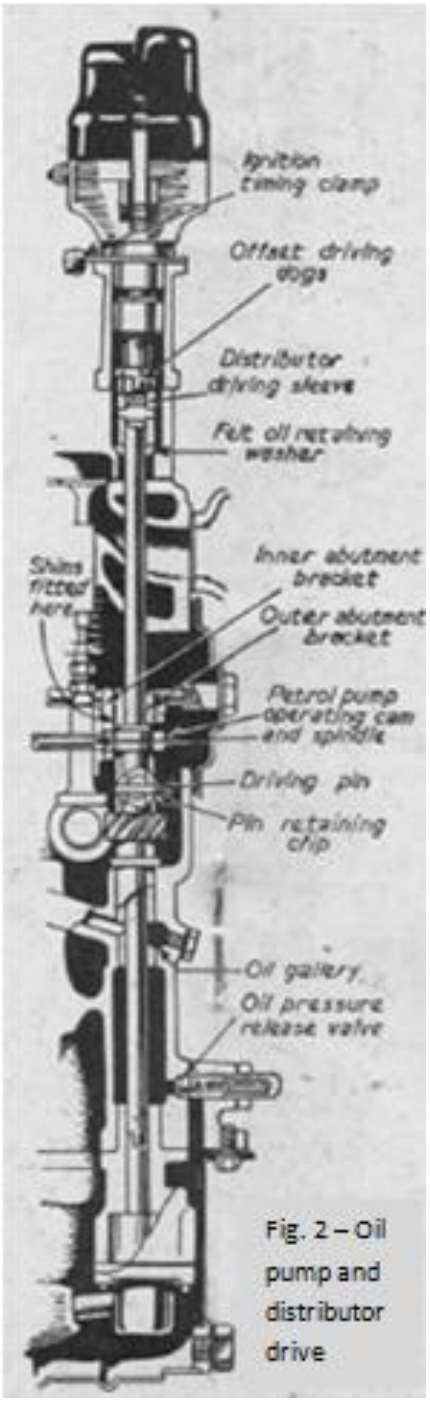


Fig. 2 – Oil pump and distributor drive

To Remove and Refit the Distributor Driving Shaft.

Withdraw the distributor assembly after disconnecting the H.T. leads from the coil and sparking plugs and the L.T. leads from the coil and removing the two securing nuts and spring washers.

Remove the tappet cover and packing.

Withdraw the two setscrews, which secure the outer abutment bracket to the inner one and remove the latter bracket, taking care not to drop the packing shims into the sump.

Remove the two bolts, which secure the main abutment bracket and inner ends of the two guide blocks to the cylinder block, and withdraw this bracket.

Remove the petrol pump and withdraw the operating spindle. This operation is necessary before refitting the distributor shaft, to allow the cam to pass over its operating spindle, which is loaded by pump spring pressure. It will also permit the vertical driving shaft to go properly home.

Remove the driving pin retaining clip and withdraw the pin.

The driving shaft can now be withdrawn.

The Camshaft and Timing Gears.

The camshaft for engines up to and including engine number TT 1407E is made of a special alloy cast iron, which has chilled faces for the eight cams and four journals. No bearings are provided for the camshaft, the four journals being accommodated in the housings machined in the cylinder block.

From engine number TT1408E a change in material was made to a case hardened steel camshaft, which is bonderised after finished grinding.

With this change of camshaft material, which naturally affects the helical driving gear, a similar change in material was made for the driven gear and it is important to pair equivalent specifications when changing the camshaft for any reason.

End thrust of the camshaft is taken by a keep plate which is bolted to the front engine plate and cylinder block.

To Remove the Camshaft.

Drain the water and remove the radiator and grille.

Remove the manifold assembly.

Remove the tappet cover.

Withdraw the petrol pump after removal of the two securing nuts; the removal of the petrol pump is necessary to free the operating spindle from its cam on the vertical shaft.

Withdraw the distributor head after detachment of the H.T. and L.T. connections and the removal of the two securing nuts.

Remove the distributor and oil pump driving gear abutment and tappet guide block.

Disconnect the clutch coupling rods by removal of the nut, which secures the trunnion piece to the clutch operating lever and the split pin which attaches the other rod to its flexible coupling bracket.

Disconnect the two gear operating cross shafts from their attachment to the respective levers.

Apply a lifting bracket to the cylinder head and take the weight of the engine.

Remove the two Simmonds nuts which secure the gearbox extension bracket to the cross member.

Having taken the weight off the cross member with a lifting jack and detaching the petrol pipe holding clip from the member, remove the two bolts from the cross member, and withdraw this member.

Remove the four (2 on each side of the engine) bolts which secure the front engine mountings to the chassis side member. The earthing wire will come away with one of these bolts.

If the rear supports for the car are high enough, the lifting out of the engine unit should now be a straight forward operation. Care should be taken not to damage the steering centre tie rod when removing the engine.

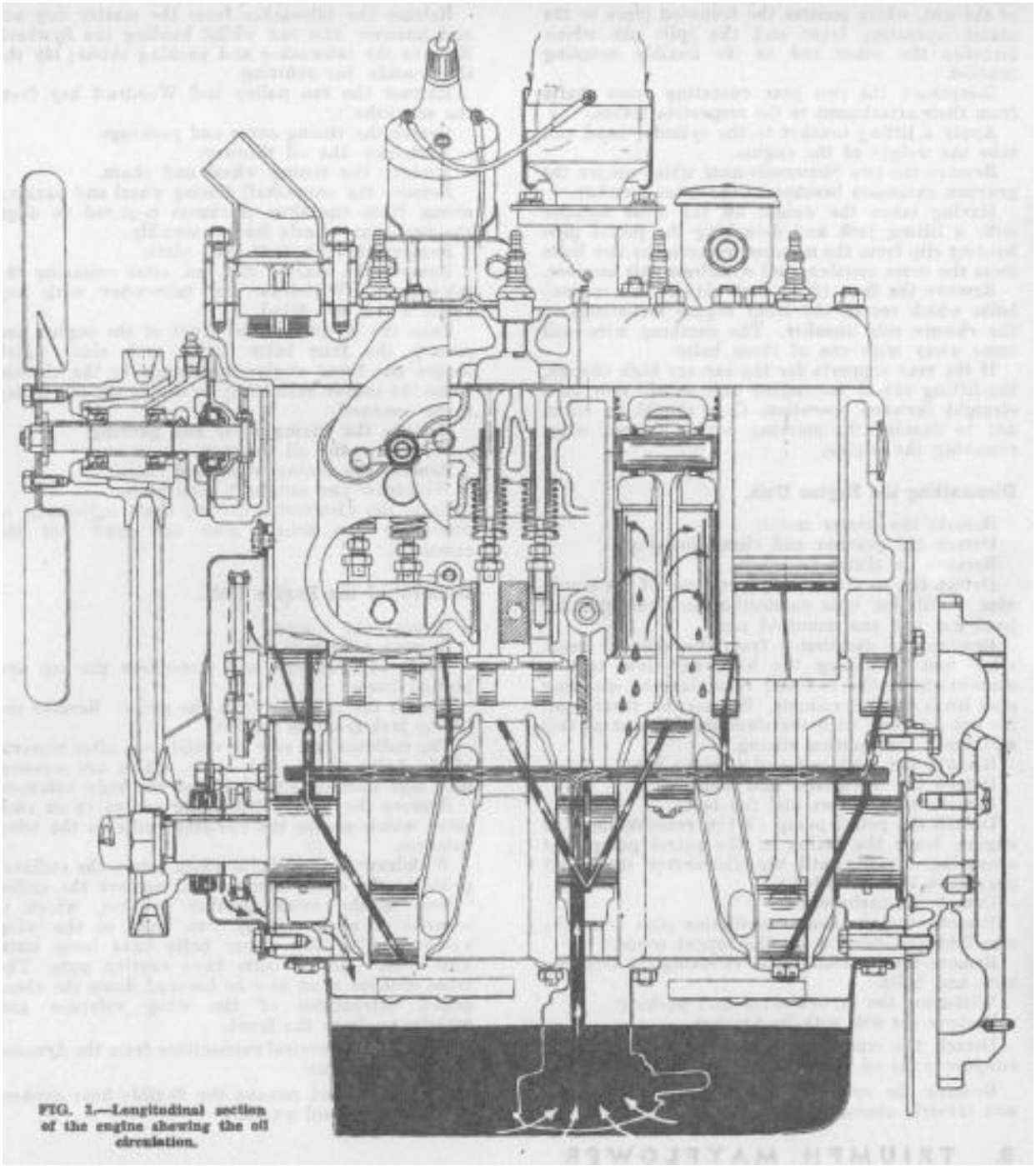


FIG. 1.—Longitudinal section of the engine showing the oil circulation.

Dismantling the Engine Unit.

Remove the starter motor.

Detach the gearbox and clutch housing.

Remove the clutch assembly.

Detach the air cleaner after removal of the crankcase ventilation hose connection and one cylinder head nut and one manifold nut.

Remove the distributor from the cylinder head, after first detaching the high and low tension connections to the coil and removing the sparking plug leads at the terminals. Release the distributor. Do not interfere with the clamping bracket as this will upset the ignition timing.

Remove the inlet and outlet water hose.

Detach the thermostat and housing.

Remove the dynamo and fan belt.

Detach the petrol pump (When reassembling the engine, leave the fitting of the petrol pump and operating spindle until the distributor shaft and gear have been installed.)

Detach the carburettor.

Remove the crankcase ventilation pipe from the manifold and adaptor on the tappet cover.

Remove the manifold, after releasing the securing nuts and bolts.

Withdraw the tappet cover and packing.

Remove the coil with its bracket.

Detach the crankcase ventilation pipe from the adaptor in the oil filler and at the cylinder head nut.

Remove the cylinder head, gasket, petrol pipe and throttle abutment bracket.

Detach the water pump.

Release the tabwasher from the starter dog nut and unscrew this nut whilst holding the flywheel.

Remove the tabwasher and packing shims; lay the shims aside for refitting.

Extract the fan pulley and Woodruff key from the crankshaft.

Detach the timing cover and packings.

Withdraw the oil thrower.

Remove the timing wheel and chain.

Remove the crankshaft timing wheel and packing shims. Note the shim thickness required to align the two gear wheels for re-assembly.

Remove the camshaft keep plate.

Remove the starter dog nut after releasing the tabwasher. Withdraw the tabwasher with any shims which are fitted.

Take the weight off the front of the engine and remove the four bolts (2 on each side) which secure the front engine mountings to the chassis. Raise the engine sufficiently to enable the fan pulley to be removed.

Remove the timing cover and packing.

Withdraw the oil thrower.

Remove the timing wheel and chain.

Withdraw the camshaft keep plate.

Raise the distributor driving shaft sufficiently to disengage the helical gear and draw out the camshaft.

Removal of the Engine Unit.

Remove the bonnet.

Remove a battery lead.

Drain the radiator and disconnect the top and bottom hoses.

Detach the radiator from the grille. Remove the lifting jack from its bracket.

The radiator can now be withdrawn after removal of six bolts (3 on each side), which are screwed into cage nuts on either side of the body valances.

Remove the eight self-tapping screws (4 on each side) which secure the radiator grille to the wing valances.

Withdraw the two bolts which secure the radiator grille to the cross member and remove the grille.

Remove the cross member bracket, which is secured at each end by two bolts to the wing valances. The two upper bolts have loose nuts. The lower pair of bolts have captive nuts. The cross member must now be lowered down the channelled extremities of the wing valances and withdrawn from the front.

Detach the electrical connections from the dynamo and starter motor.

Disconnect and remove the flexible hose connection to the petrol pump.

Detach the exhaust downtake pipe from the manifold.

Detach the thermometer lead from the cylinder head.

Where a heater is fitted disconnect the inlet and outlet hose connections.

Detach the oil pressure gauge flexible hose connection.

Detach the throttle wire on the throttle lever trunnion piece.

Jack up the rear of the car and apply supports under the rear jacking brackets.

Remove the propeller shaft.

Remove the front engine bearer plate, after withdrawal of three securing setscrews (2 only for the 1st 25 engines).

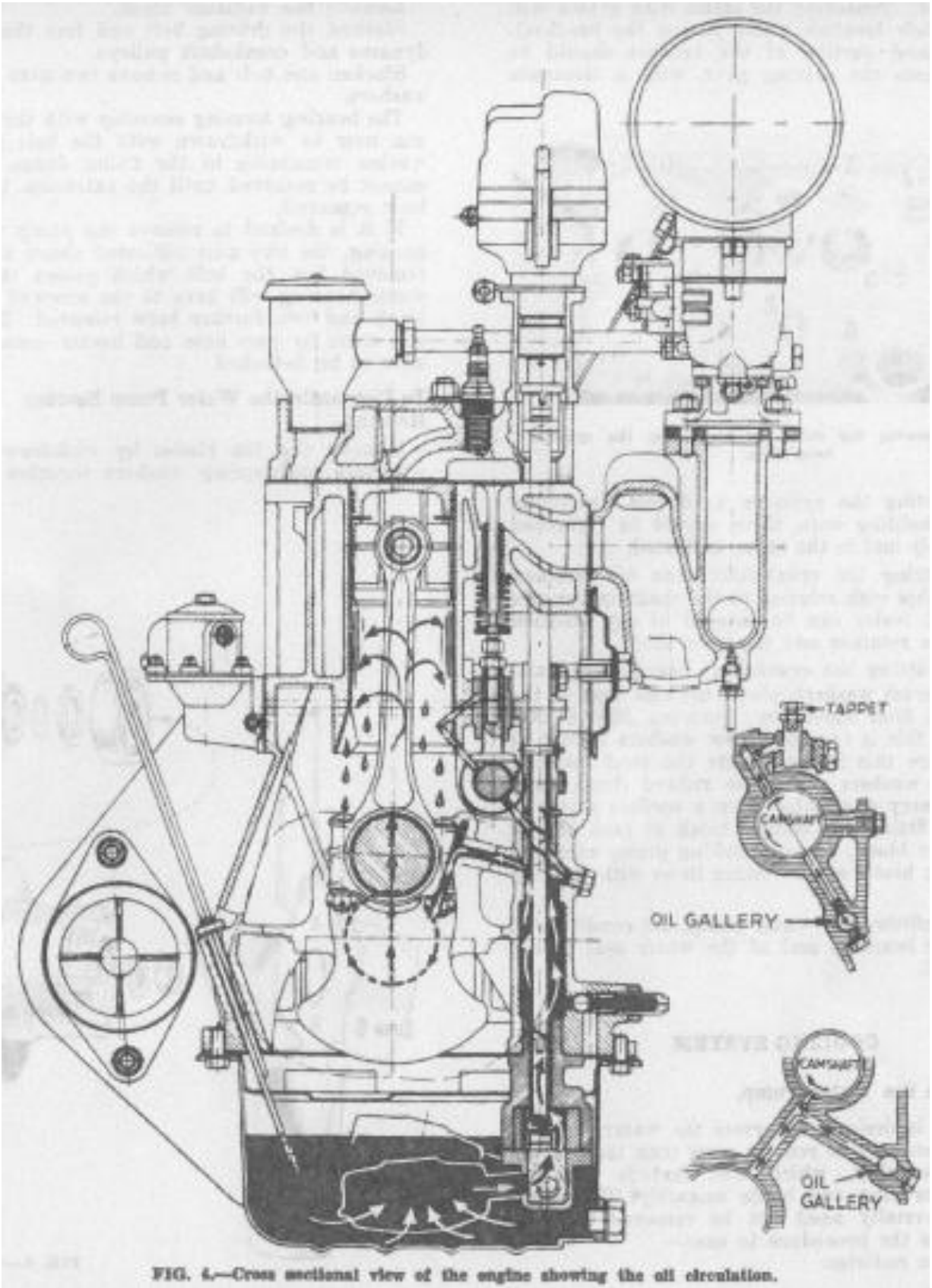


FIG. 4.—Cross sectional view of the engine showing the oil circulation.

Remove the distributor shaft abutment outer bracket with packing shims. Note the packing shims for reassembly and the position of the machined portion of the bracket towards the skew gear with .003 gap. **Shims should be just sufficient to provide a clearance between shaft and bracket**.

Remove the valve tappet guide blocks and inner portion of the distributor shaft abutment.

Note the position of the longer pair of setscrews, through the inner ends of the two guide blocks and abutment bridge piece, for reassembly.

Remove the spring clip from the distributor shaft.

Withdraw the locking pin.

Remove the distributor shaft and driving gear.

Withdraw the camshaft.

Withdraw the fuel pump spindle.

Remove the valve spring collars, springs and valves. Note the numbering of the valves from the front of the engine.

Withdraw the oil sump.

Remove the flywheel.

Remove the oil pump and floating filter with packing.

Remove the locking wire from the heads of the sealing block securing screws and withdraw the screws. Tap out the sealing block.

Remove the aluminium oil retaining cover after withdrawal of the 5 securing setscrews and withdrawal of the locking wire from the inside bolts.

Remove the connecting rod caps. Note the position of the markings on the connecting rods in relation to those on the cylinder block.

Remove the main bearing caps. Note the markings on the bearing caps in relation to those on the cylinder block flange.

Remove the crankshaft and oilite bush for the constant pinion shaft spigot.

Remove the connecting rods and piston assemblies, noting the lettering on the piston tops and cylinder block, also the offsetting of the big end housings on the front and rear pair of assemblies. Remove the gudgeon pin circlips, push out the pins and release the piston assemblies.

Reassembly of the Engine.

Reassembly of the engine involves approximately the reverse procedure to that employed for dismantling. When reassembling, apart from the normal replacement of defective or worn parts, attention is drawn to the following points:—

Carefully clean the cylinder block, ensuring that the core plugs are in order. Blow out the oil ways with compressed air. Examine the cylinder bores for excessive wear and where this exceeds .007 at the tops of the bores, regrinding of the cylinder block will be required. Where wear is appreciably less than this figure, the replacement of worn pistons and rings should be satisfactory.

Three sizes of pistons are used, "F" slightly below nominal size, "Q" mean size and "H" slightly oversize. The piston tops are marked with the appropriate letter and the right hand upper side of the cylinder block, adjacent to the piston, is similarly identified. Replace "F" or "G" marked pistons by ones having an "H" marking, where it is considered replacements are required and a rebore is not justified.

Examine the crankshaft bearings for wear or damage. Where the clearance exceeds that given, new bearings should be fitted and where the crankshaft wear exceeds that given, or where the journals are scored, the crankshaft should be reground to suit the undersize bearings available, i.e., —.020, —.030 or —.040. **No attempt should be made to take up wear by filing the bearing caps. Where such filing has occurred the main bearing housings will have to be line bored and the big end bearing housings similarly restored to their original dimensions.**

When refitting the timing wheels and chain, where the timing wheels are marked, the markings should be matched up with the driving side of the chain held tight. Varying degrees of adjustment may be arranged by employing the two alternative pairs of holes in the camshaft.

The distributor shaft should be fitted before the petrol pump, otherwise some difficulty will be met in engaging the cam for the petrol pump with the operating spindle and thus preventing the engagement of the helical gears. Before engaging the distributor shaft, the engine should be turned until No. 1 cylinder is on T.D.C. of the compression stroke.

When refitting the distributor outer abutment bracket and shims, sufficient shims should be used to ensure a working clearance between the shaft and bracket. (Smearing the shims with grease will assist in their location whilst fitting the bracket). The machined portion of the bracket should be fitted towards the driving gear, with a clearance of .003.

When fitting the cylinder head and tightening down the holding nuts, these should be tightened progressively and in the order indicated.

When fitting the crankshaft rear oil retainer, centralize this with relation to the shaft and ensure that a .002 feeler can be entered i n any position between the retainer and the crankshaft.

When refitting the crankshaft bearing caps and two half thrust washers, check the end float of the shaft. End float should be between .004 to .006, and where this is exceeded, new washers should be used. Where this is inadequate the steel faces of the thrust washers should be rubbed down on a piece of emery cloth placed on a surface plate.

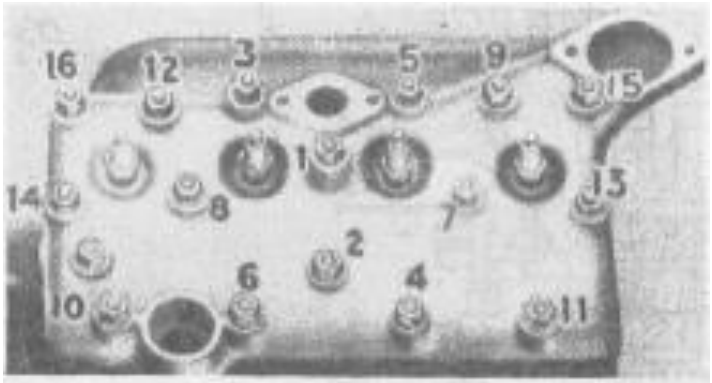


FIG. 5.—Shewing the order for tightening the cylinder head nuts.

When refitting the sealing block at each end of the cylinder block, fit new packing pieces at either end of each block, after coating these with jointing compound.

Before refitting the water pump, the condition of the spindle bearings and of the water seal should be checked.

COOLING SYSTEM

To Remove the Water Pump.

When it is desired to service the water pump it is rarely necessary to remove more than the bearing housing assembly, which will include the fan extension bracket and blade assembly. The water housing normally need not

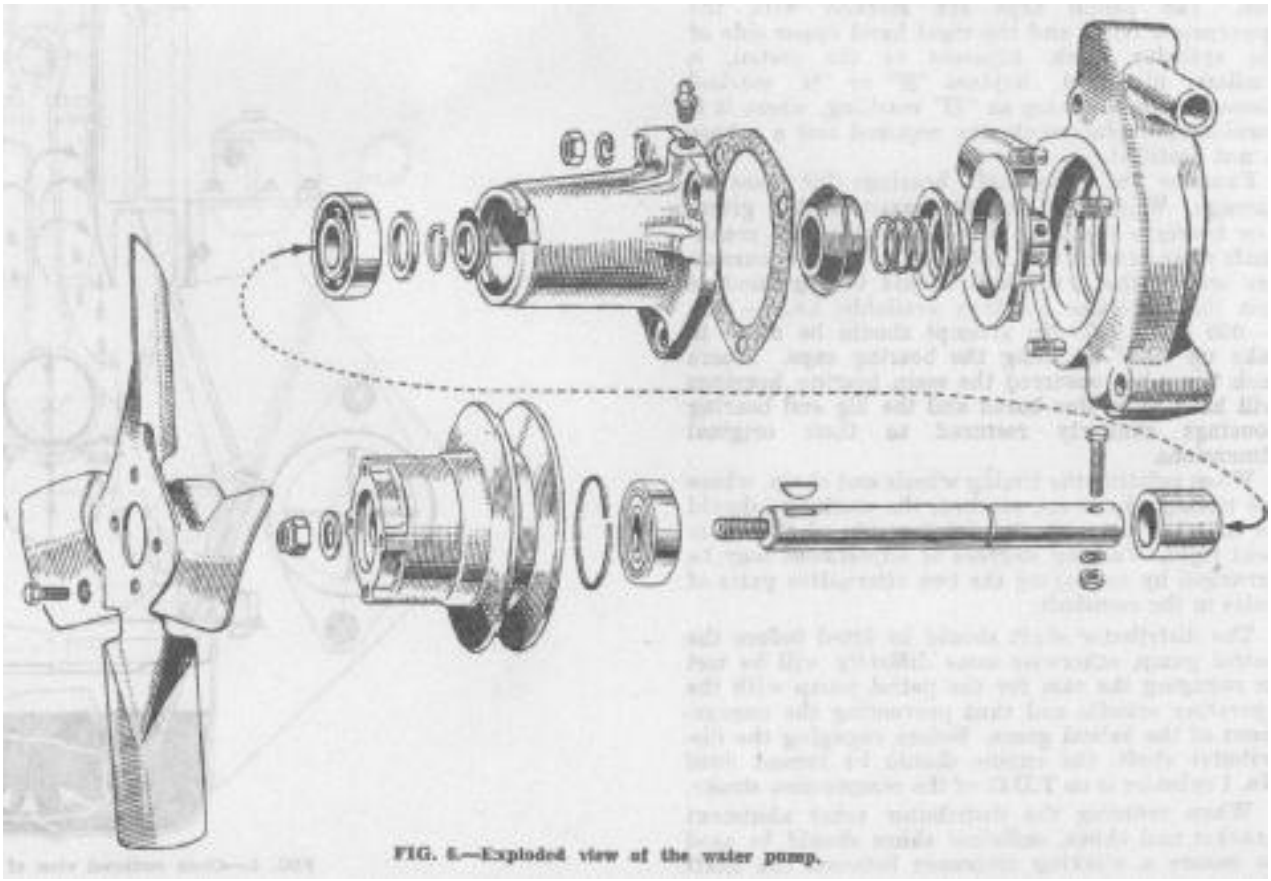


FIG. 6.—Exploded view of the water pump.

be removed and the following is the procedure to use:—

Drain the radiator.

Remove the radiator block.

Slacken the driving belt and free this from the dynamo and crankshaft pulleys.

Slacken one bolt and remove two nuts and spring washers.

The bearing housing assembly with the fan blades can now be withdrawn with the bolt and spring washer remaining in the fixing flange. The bolt cannot be removed until the extension bracket has been removed.

If it is desired to remove the pump with water housing, the two nuts indicated above need not be removed but the bolt which passes through the water housing will have to the screwed out of the block and two further bolts removed. In addition, the water by-pass hose and heater connection will have to be detached.

To Dismantle the Water Pump Bearing Housing.

Remove the fan blades by withdrawal of four setscrews and spring washers together with any balancing pieces which may be in use. Note the drilled hole i n such balancing pieces for reassembly.

Remove the Simmonds nut and washer from the pump spindle and extract the fan extension bracket.

Withdraw the rotor securing pin and lever the rotor off the spindle.

Remove the bearing locating circlip from the housing bore.

Tap the pump spindle out from the rear of the bearing housing, with bearings, spacer etc.

Remove the bearings, spacer circlips, thrust washer and synthetic rubber spinner from the pump spindle.

Reassembly procedure is approximately the reverse of the foregoing. When refitting the rotor, a flexible type of jointing compound should be applied, to the spindle, around the hole through which it fits, and the bolt securing the rotor. The jointing compound is essential if a water leak is to be prevented.

THE CLUTCH

Pedal Adjustment.

The only adjustment necessary through the life of the driven plate facings is to restore periodically the free movement of the clutch pedal, i.e., movement of the pedal before the release bearing comes in contact with the release levers and commences to withdraw the clutch. To ensure this free movement, a clearance of not less than 1/16 must be provided. As the driven plate facings wear, the pressure plate moves closer to the flywheel and the outer ends of the release levers follow.

This causes the inner ends of the release levers to travel further towards the gearbox and decreases the release bearing clearance or free pedal movement.

Adjust the clutch pedal stop until free movement is approximately 1.00. Press the pedal down and note the distance the release bearing travels after the release bearing clearance has been taken up. To obtain a clean release, the inner ends of the release levers should be pushed towards the flywheel .50. When the inner ends of the release levers have travelled this amount and no more, the clutch pedal should be in contact with the pedal stop. If such is not the case, the stop must be adjusted.

Should excessive pedal movement be made to release the clutch, this leads to close coiling of the thrust springs, after which any pedal- pressure exerted only tends to overstress the release gear and internal parts of the clutch.

Removal of the Clutch from the Chassis.

Withdraw the gearbox, which can be done quite easily owing to the detachable rear cross member which is fitted.

Slacken the holding screws a turn at a time by diagonal selection until the thrust spring pressure is relieved. Remove the screws and lift the complete clutch away from the flywheel Remove the driven plate assembly.

GEARBOX

To Remove the Gearbox.

Disconnect a battery lead.

Disconnect the clutch coupling rods from the housing by removal of the spilt pinned nut which secures the trunnion piece to the operating lever. Withdraw the split pin which secures the other rod to the fixed bracket on the housing.

Disconnect the two gear operating cross shafts, from their attachment to the respective levers.

Remove the propeller shaft.

Remove the steering centre tie rod after slackening off the locknuts and screwing the rod out of the end assemblies.

Detach the exhaust down pipe from the manifold flange.

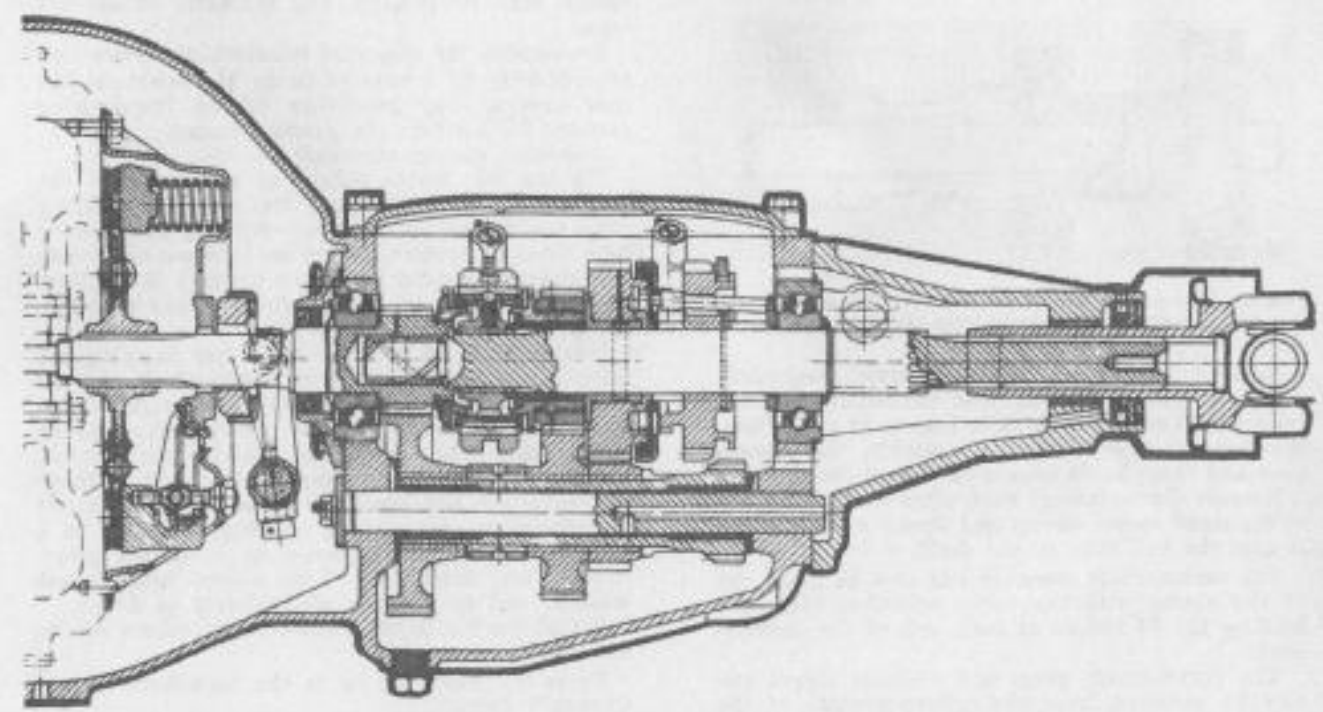


FIG. 7.—General arrangement of the clutch and gearbox.

Place the lifting jack under the engine sump and take the weight of the engine off the rear mounting.

Remove the nuts and bolts which secure the clutch housing to the engine.

Detach the petrol pipe clip from the detachable cross member, to which the gearbox is secured.

Remove the two Simmonds nuts which secure the rear engine mounting to the cross member.

Having ensured that the jack is taking the weight off the rear cross member, remove the two bolts which secure this member to the chassis frame.

Lower the engine on the jack just sufficiently to enable the clutch housing to clear the toe board as it is drawn back to withdraw the constant pinion shaft from the clutch assembly.

Reassembly involves approximately the reverse procedure to the foregoing, but where it is found necessary to remove the clutch for any reason, the clutch centre plate should be centralized with a mandrel after refitting the assembly.

To Dismantle the Gearbox.

Detach the gearbox top cover and dipstick.

Withdraw the clutch operating shaft after removal of the locating bolts and operating fork.

Remove the taper setscrew which is screwed into the side of the gearbox easing and which secures the selector rod.

Withdraw the selector locking plungers and springs after removing the securing screws.

Withdraw the speedometer drive.

Remove the gearbox extension and packing.

Tap out the selector from the rear of the casing after removal of the stop screw.

Withdraw the countershaft locating setscrew.

After removal of the countershaft front cover plate, which is secured by two wired setscrews and spring washers, drive out the countershaft. Use a tube to retain the 48 needle rollers in position, maintaining contact all the time between the tube and countershaft.

Remove the gearbox front end cover after cutting the wire in the setscrew heads and withdrawing these setscrews noting the spring and plain washers and lead wire used on each of the bolts.

Extract the constant pinion shaft assembly. The further dismantling of this assembly necessitates the removal of the smaller circlips and thrust washers which fit against the inner ring of the ball race. After extraction of the ball race, the oil thrower may be withdrawn, but owing to probable damage to this thrower during the extraction, a new one may be required when reassembling the unit.

Tap the mainshaft towards the rear with a soft metal drift until the bearing is clear of its housing and then tilt the shaft sufficiently to enable the second and top synchro unit to be withdrawn. Note the position of the short boss on the synchro hub towards the mainshaft circlip for reassembly.

Remove the mainshaft circlip with the special extractor. The extraction of this circlip is difficult due to the adjacent thrust washer, which has three lugs, equally spaced, and engaging alternate splines on the mainshaft. Quite apart from the necessity to engage the three available splines with the full length prongs, in some cases it may be necessary to tap the circlip round on these prongs, to free it from, its recess, before it can be withdrawn. A new circlip should always be used when reassembling.

Remove the thrust washer, second mainshaft constant gear and bush, first mainshaft constant gear, thrust washer with three lugs to fit the splines, the first speed synchro cup assembly, the reverse gear and three baulk pins with the retainer spring.

Extract the mainshaft race, after the withdrawal of the small seeger circlip and thrust washer which locates the ball race on the shaft.

The countershaft assembly can now be lifted out of the casing with the roller retaining tube still holding the 24 rollers at each end of the countershaft.

The countershaft gears and distance sleeve can now be removed from the splined portion of the countershaft gear, noting their position for reassembly.

Remove the reverse pinion by tapping out its spindle through the rear of the easing, the retaining setscrew having been removed in a previous operation.

Lay aside the two phosphor bronze thrust washers for reassembly.

To remove the selectors and interlock device, withdraw the taper setscrew from each selector spindle and withdraw the brackets. Remove the parts inside the casing.

The interlock spigot can now be withdrawn as can the selector housings with their oil seals, by removal of the securing setscrew—two in the case of the interlock housing and three for each selector housing.

Reassembly of the Gearbox.

Clean out the casing and examine it for cracks, the race housings for wear and any other damage.

Fit the reverse pinion, with reduced end towards the front of box, having first ensured that there is no question of tooth damage, or wear on either of the two thrust washers or in the bush. Do not fit the locating setscrew until the countershaft has been assembled in its normal fitted position.

Refit the selectors and bracket on each spindle, taking care to position the synthetic rubber oil seals.

Reassemble the spigotted interlocking device and subsequently fit a bracket to fix the selectors and thus prevent any possibility of the interlocking plunger falling into the gearbox casing.

Assemble the countershaft.

Fit the 24 needle rollers at each end of the countershaft gear, ensuring first that the locating rings are in position. Alternatively they should have been fitted in position, before the previous operation. The chamfer should be placed towards the bottom of the bore for the inner retainer rings and outwards for the outer rings.

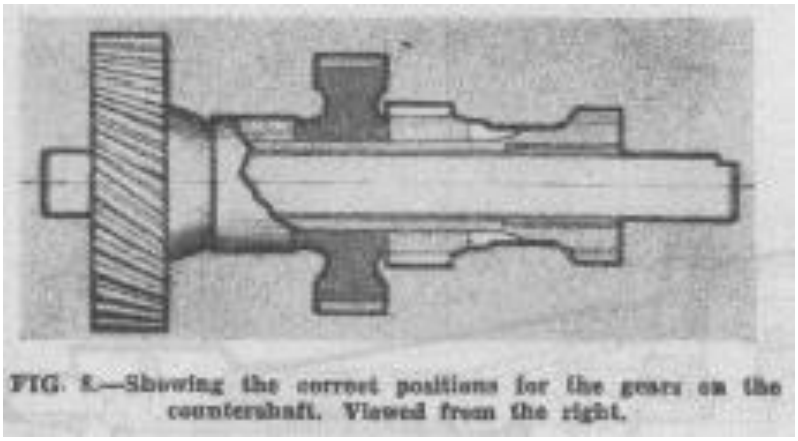


FIG. 8.—Showing the correct positions for the gears on the countershaft. Viewed from the right.

Next apply the retainer and after locating the front thrust washers with the countershaft and the smaller one with grease - position the assembly in the casing.

Before fitting new thrust washers gauge check them. The correct end float for the countershaft gears should be between .006 to .010. If there is insufficient end float, the distance collar should be reduced as necessary by rubbing this down on a piece of emery cloth placed on a surface plate. Where too much end float exists, new thrust washers and or distance piece should be fitted.

Install the baulk pin washer on its splines on the mainshaft.

Press the ball race on to the mainshaft with a Churchill fixture.

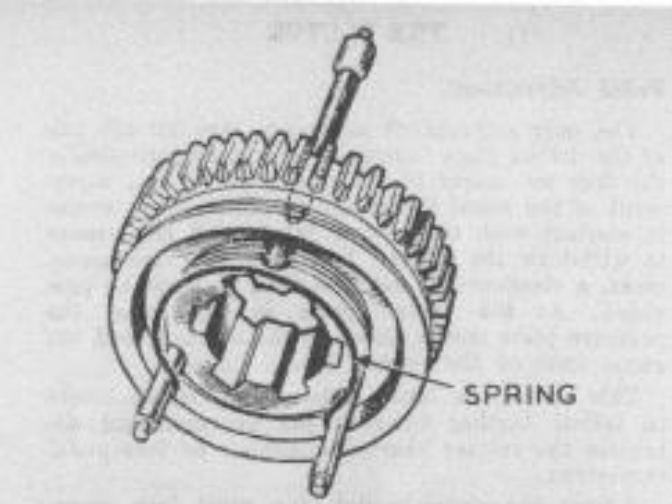


FIG. 9.—Fitting the baulk pins and semi-elliptical coil spring to "first" gear.

Fit the three baulk pins and semi-elliptical coil spring to the reverse gear. Install this assembly on the mainshaft, afterwards fitting the first speed cup, noting the splines engaged by its three lugs.

Apply the first mainshaft gear thrust washer, ensuring that its three lugs engage alternate splines to those occupied by the synchro cup mentioned in the previous operation.

Fit the first mainshaft gear and bush, following this with the second mainshaft gear and bush. Where new gears are being used, the appropriate end float on the bushes should be checked as directed below. Fit the hardened thrust washers.

Fit a new circlip. It is important to ensure that the thrust washer which abuts against the second mainshaft gear, whore new parts have been fitted, permits the circlip to go properly home in its recess and if it is necessary, the thickness of the thrust washer should be suitably adjusted to just provide the necessary clearance to allow the circlip to be rotated freely in its recess.

When reassembling new gears and bushes on to the mainshaft, there should be a clearance, measured between the "first gear" synchro cup and the "first gear" itself of .065 to .070, with the gear synchro cup and cone in contact.

When reassembling new gears and bushes on to the mainshaft the bushes should stand "proud" of the gears sufficiently to permit an end float of .004 to .006 in the first and second constant gears. Overall float on these gears can be measured and should be from .007 to .012.

The mainshaft may now be installed in the gearbox casing. Assemble the mainshaft gears in the correct sequence. Fit the mainshaft circlip.

Where the "second" and "top" synchro sleeve has been dismantled it will be necessary to fit up the three synchro balls and springs and, whilst it is possible to estimate approximately by manual means the axial load required for release, which is 19 to 21 lbs., a more precise means of measuring this figure involves the use of a special fixture. The application of, or withdrawal of, shims must be carried out to increase or decrease the loading.

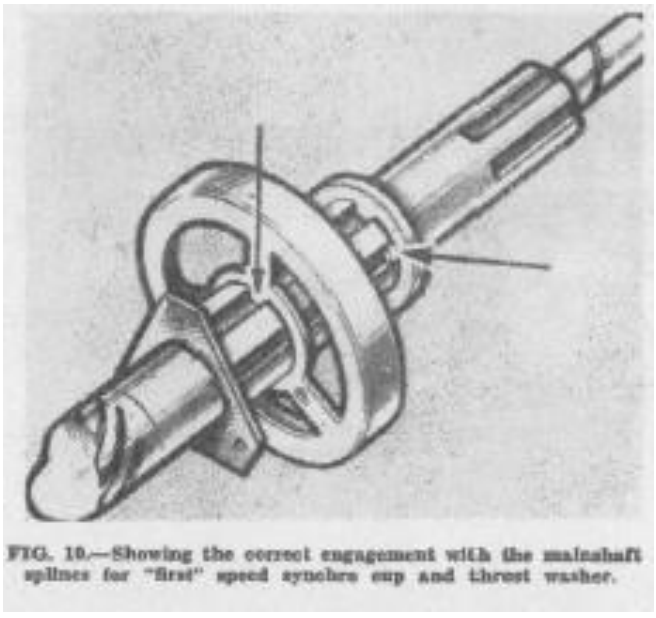


FIG. 10.—Showing the correct engagement with the mainshaft splines for "first" speed synchro cup and thrust washer.

Assemble the second and top synchro unit on the mainshaft. The position of the outer or operating sleeve in relation to the synchro hub cannot be at fault, but it is necessary to fit the short boss of the synchro hub towards the circlip or front of the gearbox.

Assemble the oil thrower on to the constant pinion shaft and press the ball race on to the shaft, ensuring that this goes right home and that in this position, with the correct thrust washer fitted, the small seeger circlip fits properly into its recess. When passing this circlip along the ground portion of the constant pinion shaft, take care not to score the shaft as such damage may cause subsequent leakage of oil. Fit the larger circlip into its recess in the ball race extension.

Fit the oilite spigot bush into the constant pinion, placing the internally bevelled portion of this towards the mainshaft.

Drive the constant pinion shaft and bearing into the gearbox casing.

Fit the selector forks on the respective gears and thread the selector rod into position and then secure it in position by the locating taper setscrew and locknut. The selector rod is "handed" for left or right hand drive by the drilling of the rod for the locating setscrew. The "top" and "second" selector fork is interchangeable to "left" or "right" hand drive, but the "first" and "reverse" fork is "handed" by its offset construction and is not interchangeable.

Fit the selector locking plungers, springs and adjusting screws. Adjust the screws so that the upper faces of these are approximately flush with the upper face of their respective selector forks. The correct axial load for release should be 22 to 26 lbs., measured with a spring balance on the selector fork.

Fit the selector rod stop screw, wiring this carefully so that the free travel of the fork is unrestricted.

Having fitted the front cover oil seal, apply the cover and packing, utilising a fitting tool to protect the oil seal. Fit four setscrews and plain washers with lead wire, after positioning the slot in the face of the front cover at 9 o'clock. Then wire the setscrew heads.

Fit the core plug at the front end of the selector rod if this has been removed.

Utilise a pilot to align the thrust washer and countershaft gear. Drive out the needle roller retaining tube and countershaft, which was fitted to position the forward thrust washer, with the pilot, subsequently ejecting the pilot tool with the actual countershaft. I t is important, when carrying out this operation, that the pilot spindle should maintain contact with the retaining tube or countershaft throughout the operation.

Fit the taper locating setscrew through the countershaft and that relating to the reverse spindle, first checking the alignment of the hole in the reverse gear spindle and that in the countershaft. Tighten up the locating setscrew.

Fit the oil seal into the rear of the gearbox extension.

Fit the speedometer driving gear and housing, locking this in position with its locating setscrew.

Fit the top cover, securing it with eight setscrews and spring washers. Install the dipstick.

Fit the clutch operating shaft and withdrawal fork together with the return spring and abutment bracket.

Defects and Causes.

Poor Synchronisation of Gears.

Where difficulty in synchronisation is encountered the trouble in the case of the "second" and "top" gear will probably be explained by incorrect synchro sleeve spring loading, or be due to the condition of the contacting coned faces.

Where the synchronisation of the "first" gear is unsatisfactory the trouble may be caused either by the condition of the surfaces on the cone and/or cup, or, if experienced at slow speeds alone, be explained by a misplaced, weak or broken semi elliptical baulk pin spring.

To deal with poor synchronisation with the "first" gear, it will become necessary to dismantle the mainshaft. Having dismantled the mainshaft gears, the condition of the coned faces should be ascertained as should that of the baulk pin semi-elliptical spring.

If doubt exists as to the condition of the coned faces, they should be lapped in together, employing burnishing paste and holding the cup on a special fixture. All traces of paste should be removed with a petrol-moistened rag, Carburundum paste should NEVER BE EMPLOYED for this lapping-in process. If the baulk pin spring has become damaged it should be replaced. Where difficulty arises with synchronisation of the "second" and "top" gears, the usual explanation will be the incorrect spring loading of the operating sleeve and for this reason should first receive attention. The correct axial loading for this operating sleeve should be between 19 and 21lbs., and can be checked on a spring testing machine, employing a suitable ring fixture to support the unit.

Oil Leakage from the Gearbox.

The following sources of trouble should be investigated:

(a) Faulty joints between the gearbox easing and the cover plate, the extension or the front cover. To deal with all but the cover plate, it will be necessary to remove the gearbox unless such trouble is due to loose setscrews which are accessible.

(b) Defective front and/or rear oil seal. To replace the front seal it will be necessary to remove the gearbox.

The replacement of the rear oil seal will necessitate the removal of the detachable cross member which supports the rear of the gearbox, the removal of the propellor shaft and speedometer drive and then the detachment of the extension and the exchange of the oil seal, fitting the replacement with a special tool.

When replacing the front seal it will naturally be necessary to remove the gearbox and withdraw the front cover and to fit a new oil seal with a special tool and to use a protective sleeve, when replacing the cover.

Care should always be taken when fitting an oil seal to place the lipped portion inwards towards the inside of the gearbox and to avoid damaging the fabric face when threading it over a shaft or spindle.

REAR AXLE.

To Remove and Dismantle the Axle Shafts.

Jack up the rear of the car and remove the rear wheels.

Remove the brake drums after the withdrawal of the countersunk grub screws.

Disconnect the brake hydraulic connection at each brake backing plate and uncouple the handbrake lever cables from their operating levers.

Remove the four bolts and nuts which secure each backing plate and bearing housing to the flanged portion of each axle sleeve.

Withdraw each axle shaft assembly, together with the brake shoes and backing plate assembly.

The hub can now be extracted from each axle shaft after removal of the castellated nut, washer and taper collar. Alternatively the hub can be extracted with a puller, before removing the axle shaft.

The extraction of each hub will release the respective bearing housing and oil seal.

The oil seals can now be driven out of their respective housings.

The wheel bearing is next extracted.

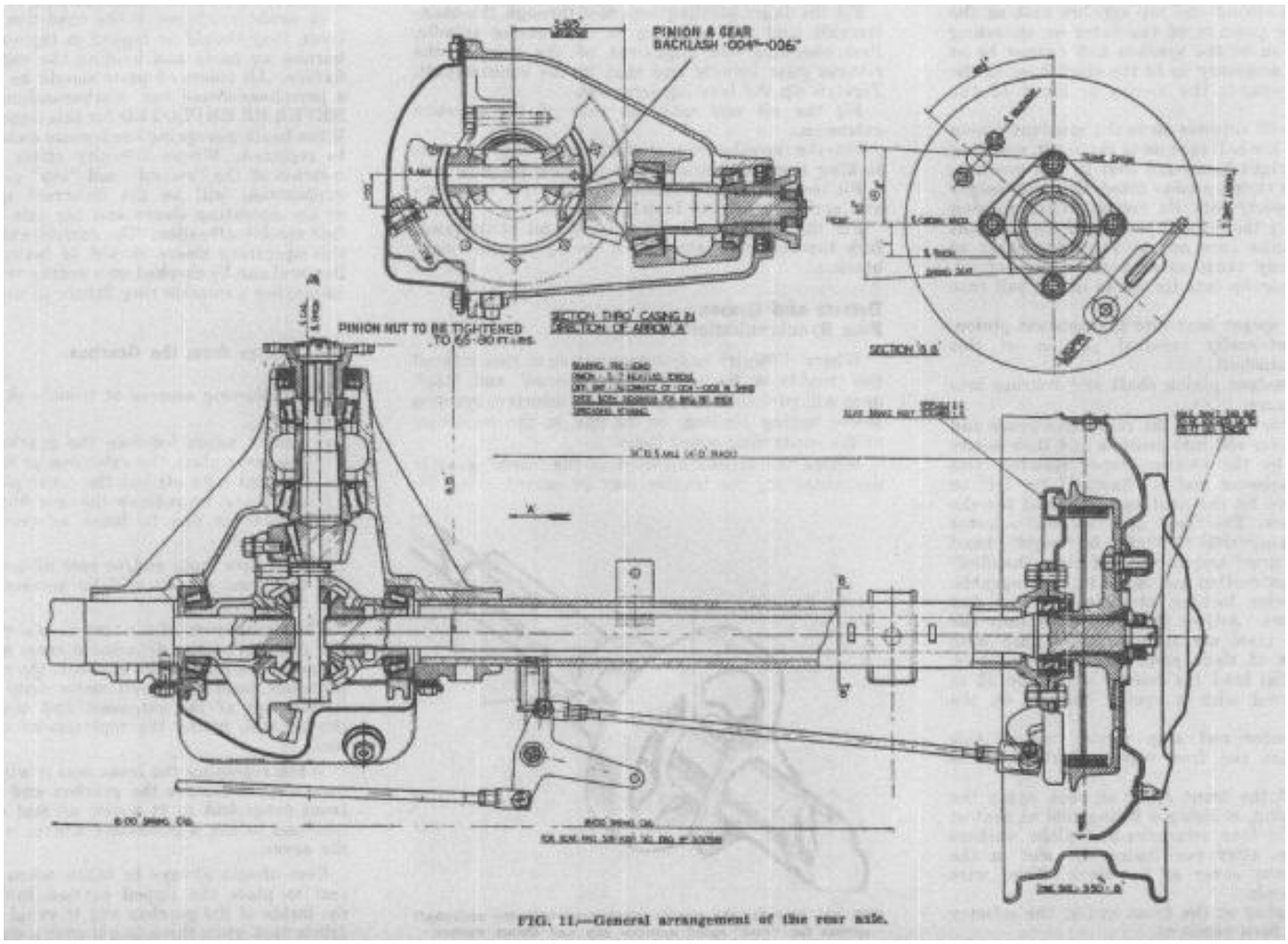


FIG. 11.—General arrangement of the rear axle.

Reassembly of these parts is approximately the reverse of the procedure given above with the necessity to drive or press the bearings on to the shafts. In the absence of a press, a special sleeve tool may be used with a hammer to drive on the bearings.

Bleed the brakes.

To Remove the Rear Axle from Chassis.

Jack up the chassis frame and remove the rear road wheels, Fit supports under each rear jack bracket.

Take the weight of the axle on a lifting jack and remove the Simmonds nut from the bottom eye of each shock absorber, subsequently remove the two half rubber bushings from the respective eyes and force these clear of their mountings. (It is important that the weight is taken off the shock absorbers when carrying out this operation.)

Detach the propellor shaft from the pinion flange and push the propellor shaft forward and away.

Disconnect the handbrake lever from its attachment at the compensator and free the cable from the abutment by removing the pinch bolt.

Disconnect the hydraulic brake line from its attachment to the rear axle.

The four Simmonds nuts securing the " U " bolts to the shock absorber spring plate are next removed and the axle lifted out of the chassis. Replacing the rear axle is the reverse of the removal procedure.

To Dismantle the Rear Axle.

Remove the brake drums.

Remove the hydraulic brake pipes and the connection and remove them from the rear axle. Remove the handbrake operating rods and compensator gear.

Remove four bolts which secure the bearing housings and brake backing plate assemblies to the axle casing, (If preferred, the rear hubs may be extracted with a puller before removal of the bearing housings.)

The axle shaft, hubs, bearing housings, oil seals and backing plates can now be removed from the rear axle.

Remove the rear hubs from the axle shafts. This may or may not be possible without an extractor or press. Under certain associations of hub and axle shaft machining limits an interference fit is possible. The further resistance offered by the special hub locking collar will necessitate additional force.

The bearing housing oil seals are next removed.

Remove the axle casing cover and packing.

Remove the differential bearing caps, noting the markings stamped on the face of these and the corresponding abutting portions of the casing. The existing relation between the caps and casing must be retained when re-assembling.

Apply an axle casing spreader and prise the differential assembly out of the axle, taking steps to protect the machined face against which the cover fits. Spreading should be limited to that required to just free the assembly in the casing.

Suitably identify the respective outer portions of the differential bearings with their inner races. The inter-relation of the component parts of these races must be retained when reassembling the rear axle.

Extract the differential bearing inner races. (The outer races should be paired with their respective inner portions and laid aside for reassembly. The shims removed with each race should also be laid aside with the respective races as a guide when estimating the shims for reassembly.

Remove the pinion flange nut and having removed the flange, drive the pinion out through the casing with a hide faced hammer, lay aside the shims which are fitted between the spacer and the tail race for possible use when reassembling. Remove the pinion head bearing inner cone.

Drive out the pinion outer races. The removal of the ring for the tail bearing will also eject the oil seal and tail bearing inner cone. The ejection of the head bearing outer ring will uncover the shims fitted between this and the casing and these shims should be laid aside with the component parts of this race as a guide when reassembling.

All that remains now is to dismantle the differential unit.

Withdraw the ten crown wheel securing bolts after first flattening the tab washers.

Drive out the cross pin locating pin and tap out the cross pin, thus releasing the sun and planet wheels and completing the dismantling of the rear axle.

T HE CROSS PIN CANNOT BE DRIVEN OUT UNTIL AFTER THE CROWN WHEEL HAS BEEN REMOVED.

To Reassemble the Rear Axle.

Where it is found necessary to replace the crown wheel or pinion the gears must be replaced as a pair.

The datum position of the pinion with relation to the crown wheel is 3.4375 from the ground thrust face on the back of the pinion to the centre line of

the differential bearings. It is also important that not only should this datum position be achieved, but that sufficient bearing pre-load should be arranged to ensure the maintenance of the specified relation in service.

Having cleaned the abutment faces and bearing housings, the following is the reassembly procedure.

The fixture is inserted in the axle casing and used to assess the shim thickness, which is required under the pinion head bearing, to bring the pin on into its correct datum position.

Although the packing shims are supplied in nominal thicknesses, the dimensions specified cannot be depended upon and for this reason the shims must be measured with a micrometer. It is important that undamaged shims are used and that they are cleaned before measurement.

Having measured the pack of shims, the thickness of which was assessed with the special fixture, the pack of shims is inserted on the head bearing abutment face and the outer portion of the two pinion bearings pulled into place with the special tool.

The sun and planet gears are now assembled into the differential casing, the cross pin bearing being used to locate the two planet gears temporarily in position. Subsequently the planet gears are rotated around the sun wheels through 90°, the cross pin being withdrawn to allow the gears to assume their normal fitted position. The cross pin is finally fitted and secured by its locking pin, this pin being located by centre popping.

Where the crown wheel and pinion are to be replaced the new crown wheel is fitted to the differential casing, the ten fixing bolts are thoroughly tightened and secured with their respective locking plates. The crown wheel is checked for flush fitting against the flanged face on the casing with a feeler gauge, thus ensuring that the crown wheel goes right home and also that there can be no question of casting distortion.

The differential assembly bearings are now fitted without installing any packing shims. A driver should be used for driving the bearings on to the casing.

The bearing housings in the centre casing are now carefully cleaned and the differential assembly dropped into position in the easing. A dial indicator gauge is mounted on the centre casing with the plunger resting on the back of a crown wheel bolt. The assembly is forced away from the dial gauge as far as possible and then the indicator set to zero. The assembly should then be levered in the opposite direction without tilting until the taper rollers go hard home. A dial gauge reading of .062, for example, indicates the total side float in the differential assembly.

The differential assembly is again removed from the centre casing and laid aside.

The inner portion of the pinion head bearing is pressed into position on the pinion with a special fixture.

The bearing spacer is threaded on to the pinion shaft with the chamfer outwards and the shims, previously removed when dismantling the axle, are placed in position on the pinion and the assembly fitted into the axle casing. The thickness of the shims fitted will probably have to be adjusted to provide the correct preload figure.

The inner ring of the pinion tail bearing is tapped into position on the pinion and up against the shims on the distance collar.

The driving flange is fitted on the end of the pinion shaft and firmly secured with the castellated nut and plain washer. (A tightening torque of 65 to 80 lbs. feet is specified.) **The oil seal is not fitted until the bearing preload has been checked.**

The fixture is now applied and the preload of the bearings checked. The correct preload should fall between five and seven inch lbs. If the preload is inadequate, shims must be withdrawn, if an excessive figure is obtained additional shims must be fitted.

The differential assembly is again installed in the axle casing and a dial gauge fitted on the casing so that the plunger of the dial gauge bears against the back of a crown wheel bolt.

The assembly is now forced away from the dial gauge until the teeth on the crown wheel go fully home with those on the pinion. The dial gauge is now set to zero and the assembly levered towards the dial gauge. As an example, let this dimension be .045,

The side float of the assembly measured in the last operation, less the crown wheel and pinion backlash specified, will indicate the shim thickness required on the crown wheel side. The backlash is specified as between .004 and .006 and an average figure of .005 should be used for this calculation, giving .040.

To obtain the thickness of shims required between the other differential bearing and casing the figure arrived at in the previous operation, .040, should be subtracted from the side float measured plus an allowance of .005 to provide the necessary degree of bearing preload. This gives a total shim thickness of .067 and thus shims on the two bearings will be .040, already estimated, and .067 — .040 = .027, on the other side.

Having decided the thickness of shims required behind each differential bearing these bearings are extracted with the special tool. The respective shim packs are measured with a micrometer, after ensuring that the shims are clean and undamaged, and then allocated to their respective sides of the differential casing.

As each bearing is extracted, the two portions of each must be laid aside for refitting in the same relation and position as that used during initial assembly. Failure to fit these bearings in their original positions will upset the measurements.

Having fitted the two packs of shims in their respective positions, the bearing inner cones are driven on to the easing with a suitable sleeve tool, and the outer rings applied.

The differential assembly is now fitted into the axle casing, and owing to the preloading of the bearings, a certain amount of casing spread is desirable to complete this operation. **The casing spreader should be used and the spreading of the case should not be overdone and limited to that required to just enable the entry of the differential into the casing.**

The bearing caps are now fitted, having regard to the markings indicated on the abutting face. The letters and figures used for these markings will vary.

The pinion and crown wheel backlash is checked with a dial gauge. An average should be taken on several teeth,

A tooth marking test should now be carried out and to enable this to be done a few teeth should be painted with a suitable marking compound. The pinion should be rotated backwards and forwards by the driving flange, over the marked teeth on the crown wheel.

The oil seal is fitted in its respective housing and then each housing is pressed on to its wheel bearing.

The wheel bearings and housings are driven on to their respective axle shaft, and the housings and axle shaft assemblies fitted.

The brake backing plate and shoe assembly is placed in position on each axle sleeve.

The four bolts are fitted through each bearing housing and brake backing plate, ensuring that both these items assume their appropriate relation with the axle sleeve, and after applying the locking plates the nuts are screwed into position and firmly tightened, finally engaging the flats on the nuts with the ears of the locking washers.

The hubs are next fitted and tightened on to their splines by means of the taper collar washer and slotted nut. A substantial socket spanner will be required to tighten the slotted securing nut. (A tightening torque of 125 lbs./ft. is specified.) Having thoroughly tightened up this nut the hole in the axle shaft is lined up with one of the slots and the cotter pin fitted.

The brake drum is next fitted to each hub and secured thereto by means of the two countersunk grub screws.

A new axle cover packing is fitted together with the cover itself and the later secured with the eight setscrews.

AXLE REPAIRS AND ADJUSTMENTS.

Oil Leakages.

Where loss of oil from the rear axle unit is experienced, the following points of possible leakage should be investigated;

(a) Poorly fitting axle cover plate due to a loosely bolted or distorted cover plate, faulty packing or a damaged casing face.

(b) Pinion oil seal damaged or worn. Where this difficulty arises a new seal should be installed, care being taken to protect its fabric face. A proper installing tool should be employed.

(c) Loss of oil past the wheel bearing oil seal; this leakage will also affect the brake linings. To deal with this difficulty a new oil seal should be installed, after the removal of the rear hub, with the special sleeved tool. Obvious precautions not to overfill the axle should be taken.

(d) Leakage may occur around one or more of the four pegs which locate each axle sleeve in relation to the centre casing, into which these sleeves are pressed. To deal with such a difficulty, the offending pegs should be welded into the casing.

Loose Rear Hubs.

Where a rear hub is found to be loose on its shaft, immediate steps should be taken to tighten up the axle shaft nut. I f this hub has been allowed to run for any length of time in a loose condition damage will most likely have occurred to the splines of the hub and shaft and replacements for both these items will be required.

Providing proper attention is given to the tightening of the axle shaft nut and the condition of the splines is satisfactory, as also that of the special split collar, this difficulty should not arise.

FRONT SUSPENSION AND STEERING

To Remove the Front Suspension Unit.

Jack up the front of the ear, remove the road wheel and place a support under the jacking bracket. Then withdraw the jack.

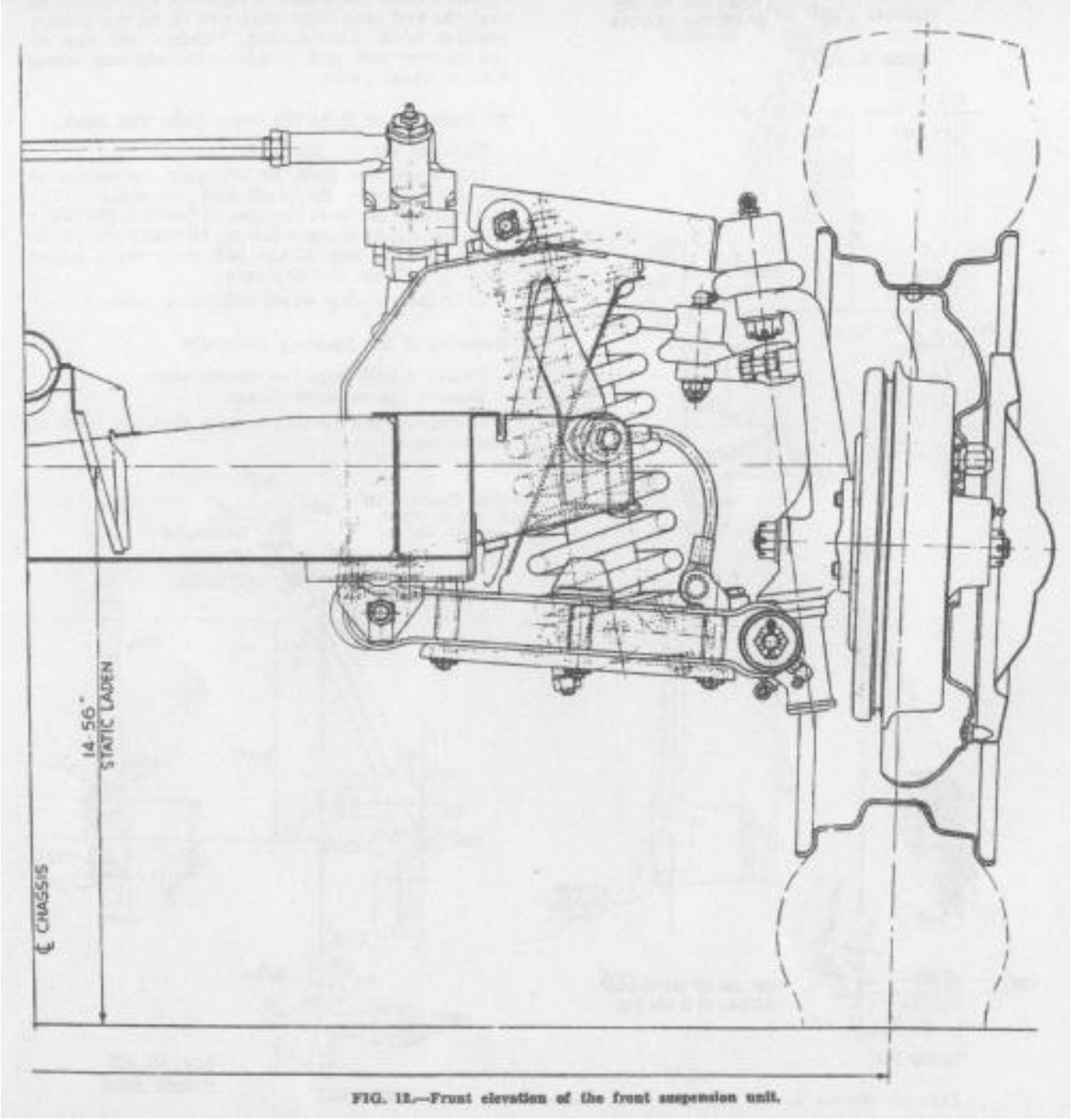


FIG. 12.—Front elevation of the front suspension unit.

Disconnect the steering outer tie rod from the steering lever.

Compress the front spring by applying a lifting jack under the brake drum.

Remove the locking nut on the upper end of the shock absorber, whilst holding the larger nut on this spindle with a thin spanner.

Remove the four plain nuts on the studs which secure the shock absorber; these should not be confused with the six castellated nuts which secure the spring pan.

The shock absorber can now be driven down through the spring pan with a hide-faced hammer.

Remove the split pins which secure the six spring pan securing nuts and **remove the centre bolt on each side and replace them with guide pins,** leaving the other four for removal.

Place a jack under the centre of the spring pan with a suitable packing to provide clearance on the four shock absorber mounting studs. **Note.—**One or two guide pins used.

Remove the four spring pan securing bolts not already withdrawn and lower the jack, thus releasing the spring pan. On all but early models, a rebound cable is attached to a special bolt which is substituted for the front outer spring pan securing bolt and this bolt will then be left attached to the cable. **Note.—It is most important that the inner end of the cable shall be free to rotate on the attachment bolt, otherwise the cable will break.**

Disconnect the brake hose from the body valance.

Release the locking plates which lock the four bolts on each side of the bottom inner fulcrum bracket and remove these bolts, thus releasing the bottom wishbones from, the chassis side member.

To complete the removal of the assembly, withdraw the four bolts which secure the top inner fulcrum bracket to the spring abutment bracket. The two rear bolts are provided with loose nuts, but the outer pair screw into captive nuts.

Reassembly of the front suspension assembly is the reverse procedure to the foregoing, with the additional necessity for “bleeding”' the brakes. The use of guide pins when fitting the spring and pan is necessary.

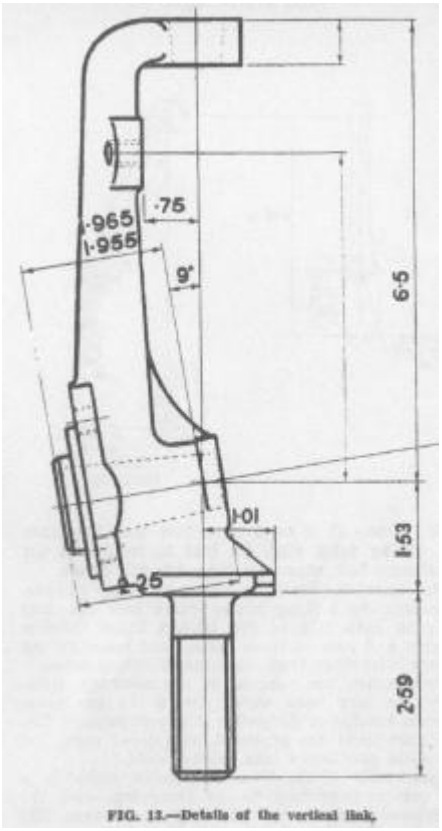


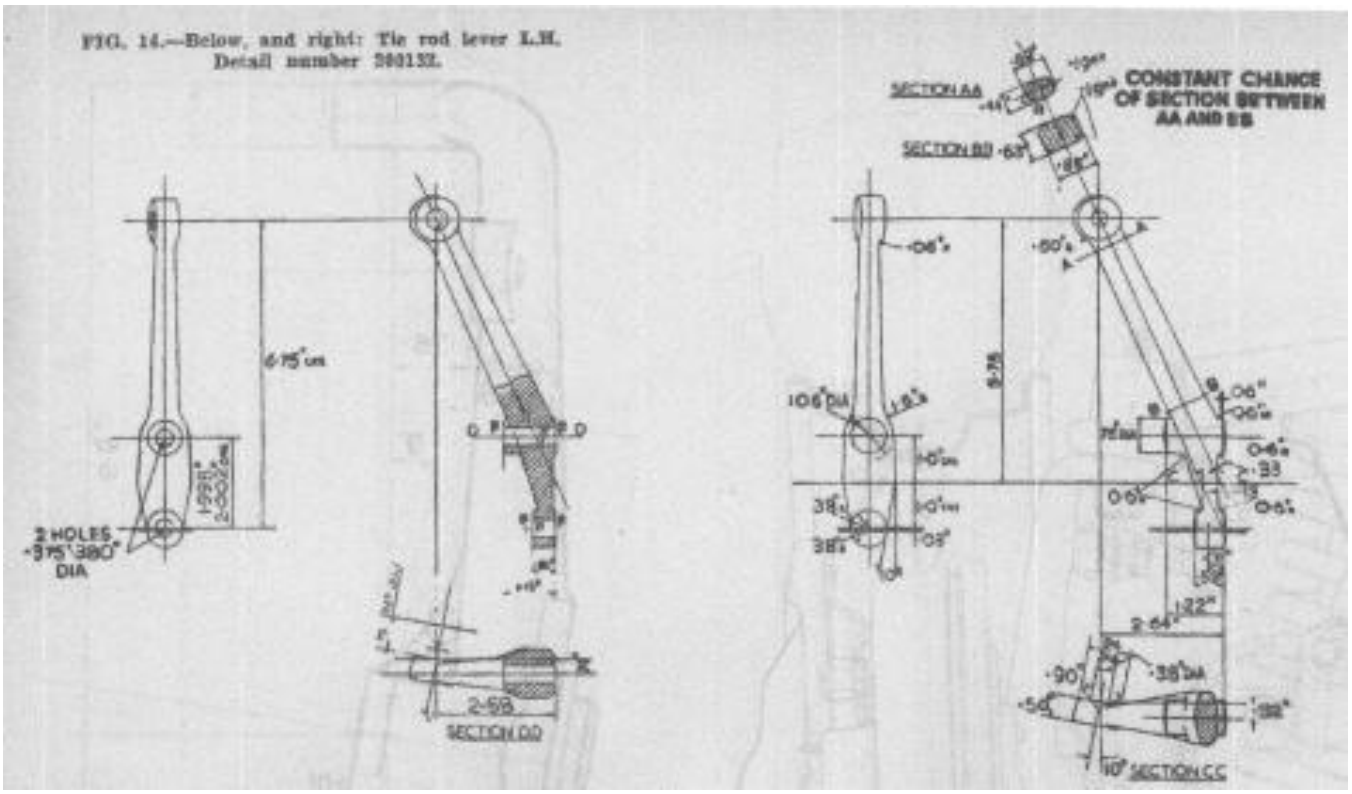
FIG. 13.—Details of the vertical link.

To Remove and Refit the Steering Wheel.

Disconnect the wires which pass through the steering column, taking careful note of the terminals to which each wire is connected.

Slacken off the nut on the olive clamping the stator tube at the bottom of the steering box. Have a receptacle ready to catch the escaping oil.

Loosen the three grub screws in the steering wheel and withdraw the stator tube and trafficator control. It is advisable to mark the position on the multiple splines before the wheel is right off the splines so that the self cancelling slots will be in the correct position when reassembling. Unscrew the nut on the steering boss and withdraw the steering wheel with a wheel puller.



To Remove and Refit the Outer Tube Top Bush.

Pick out the old felt bush.

Insert the new bush by inserting the corner of the felt between the shaft and outer tube. The remainder of the bush can then be inserted gradually with the aid of a screwdriver. Graphite should be applied to the side of the felt strip which makes contact with the steering tube.

Refit the steering wheel and stator tube.

Removal of the Steering Assembly.

Detach a lead from the accumulator.

Remove the radiator block.

Disconnect the steering column electrical leads at the junction.

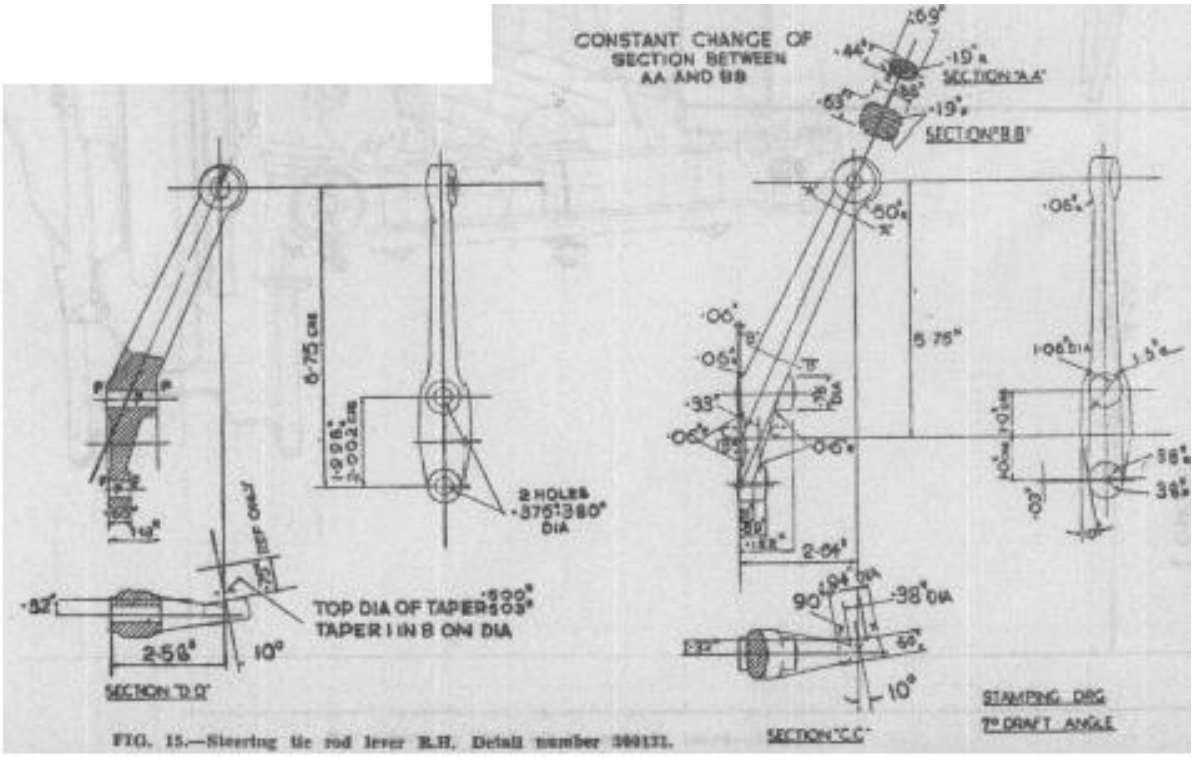


FIG. 15.—Steering tie rod lever R.H. Detail number 300131.

Release the lock nut at each end of the steering centre tie rod and screw the tie rod out of the ball pins.

Remove the dynamo and disconnect the battery to starter motor lead.

Disconnect the petrol pump hose to prevent this being damaged.

Disconnect the two gear change operating rods from the levers on the steering column. This should be done by removal of the castellated trunnion nut on each rod.

Partially remove the Simmonds nut which secures the outer tie rod end to drop arm.

Having partially removed the tie rod end nut, a pinch bar suitably supported on the chassis may be used to prise the tapered end of the ball pin out of the drop arm.

Remove the stator tube assembly from the steering column after removal of three grub screws, from under the steering wheel. Withdraw the union which secures the olive at the base of the steering column.

Remove the draught excluder rubber and keep plate which surrounds the steering column and is secured to the dash by four self tapping screws.

Remove the nut which secures the steering wheel to the inner column and remove the steering wheel with an extractor.

Remove the millboard steering column cover from the cubby hole by removal of the securing screws. This uncovers the column bracket and steady bar.

Free the bolt which secures the steady bar to the support bracket and remove the " U " bolt nuts which secure the two halves of the bracket to the cubby hole.

Remove the pinch bolt from the upper steering column change speed bracket, after first marking each side of the bracket with a scriber for reassembly. When a new steering unit is to be fitted the method of fitting these controls given later in this section should be adopted.

Remove the steering box trunnion bolt.

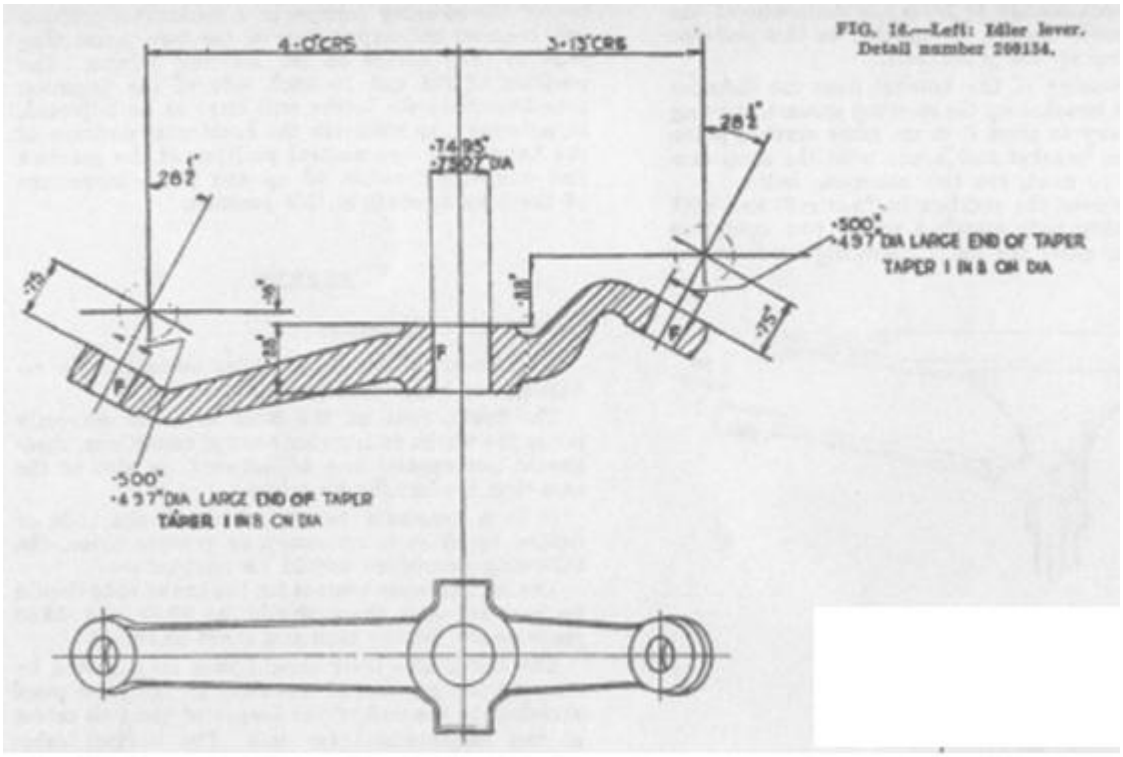


FIG. 16.—Left: Idler lever. Detail number 200134.

Remove the two bolts which secure the lower change speed mechanism brackets to the steering column after first marking the position of the assembly on the steering column to assist in reassembly, and fold back the upper half of this bracket, thus freeing it from the steering column. Movements of the steering unit will facilitate this operation, which, under any circumstances, is rather an awkward one.

The steering assembly can now be removed from the car.

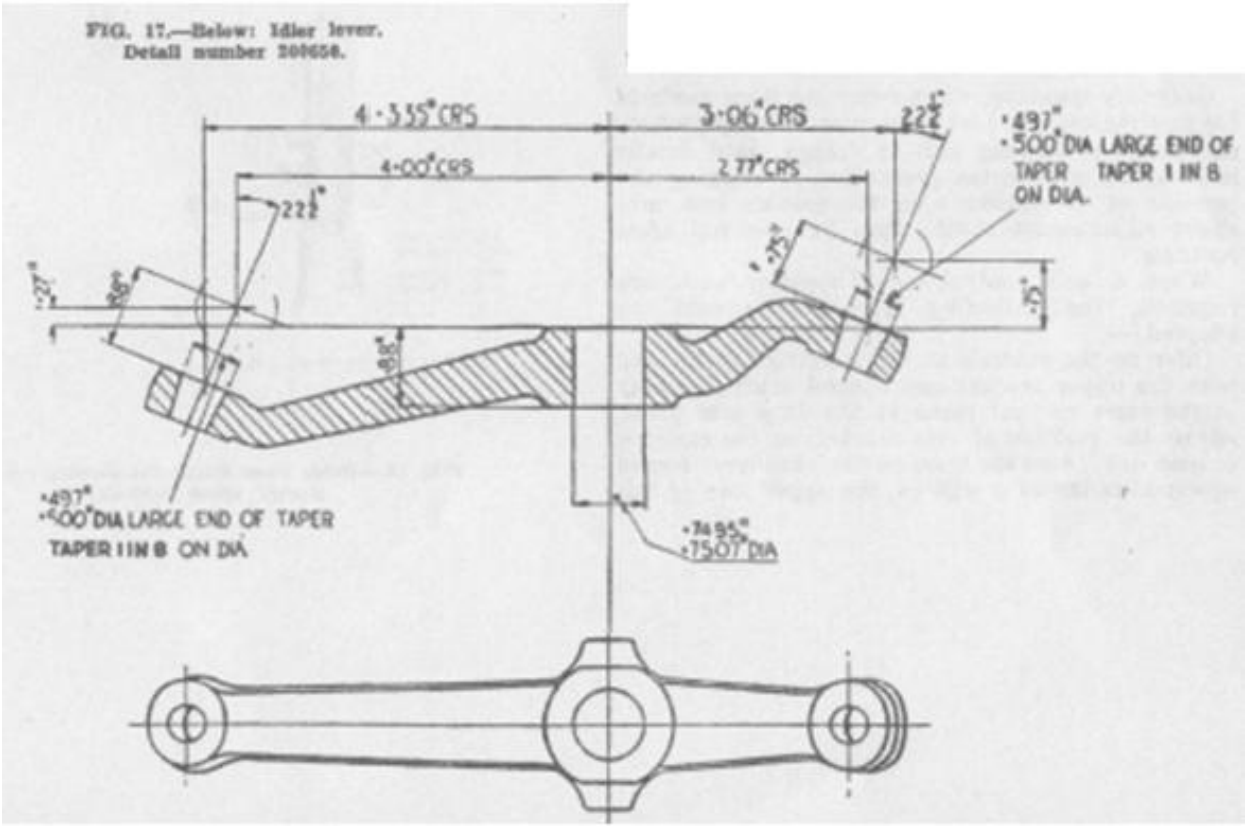


FIG. 17.—Below: Idler lever. Detail number 200650.

Reassembly is approximately the reverse, but the front wheel alignment will have to be re-set after the centre tie rod has been refitted. The length of this tie rod should be adjusted to provide an alignment of parallel to 1/8 toe-in.

Setting the Steering Lock Stops.

The steering lock stop consists of an eccentric roller secured to each of the front suspension vertical link trunnions by means **of** a setscrew.

It is most important that the lock stops come into action before the rocker shaft follower reaches the end of its cam path.

The correct adjustment of the lock stops should allow a back lock of 31° and a forward lock of 24°.

The best way of checking and setting this lock is to place the road wheels on a wheel movement measure and to measure the wheel movement from the straight-ahead position, making any necessary correction to the lock stops. In the absence of such equipment, a protractor and straight edge should be used.

If it is impossible to obtain the appropriate lock positions in spite of attention to the lock stops, this indicates either a damaged drop arm or steering lever or a fault in the steering unit itself.

Fitting the Steering Column Controls.

Generally speaking, when removing these controls for any reason, the best procedure to adopt, where no change of steering unit or change speed details Is involved, will be the precaution of marking the position of the brackets on the column and only slight adjustments should then be required after refitting.

When a new control, or a steering unit, are required, the following procedure should be adopted:—

Offer up the controls to the steering column and with the upper bracket and control shaft assembly in the same vertical plane as the drop arm pivot, adjust the position of this bracket on the steering column until, with the knob on the hand lever forced upwards as far as it will go, the upper side of this knob is approximately 1 3/8 from the underside of the steering- wheel. Secure the bracket in this position by tightening up the pinch bolt.

The positioning of the bracket fixes the distance of the lower bracket up the steering column, it being only necessary to align it in the same vertical plane as the upper bracket and hence with the drop arm pivot. Secure next, the two clamping bolts.

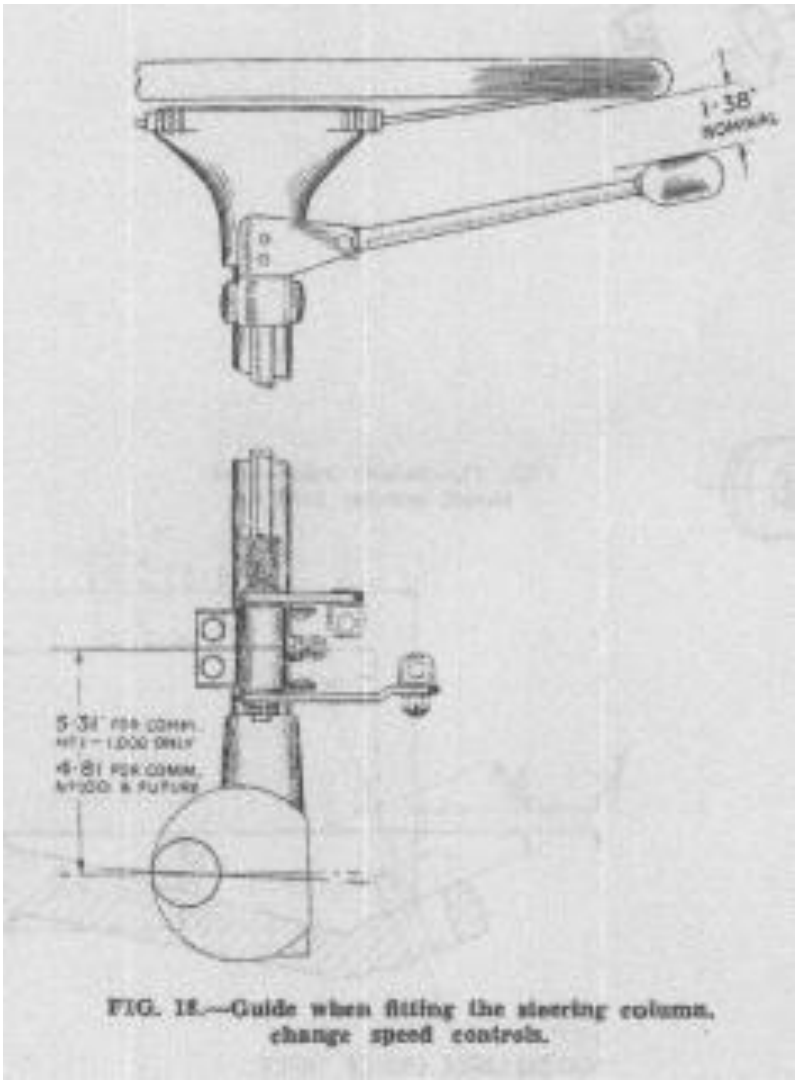


FIG. 18.—Guide when fitting the steering column, change speed controls.

Having placed the gearbox in "neutral" and with the connecting rods attached to the two operating cross shafts, place the hand operating lever at the top of the steering column in a horizontal position and connect the upper ends of the two connecting rods in their levers on the steering column. The position of the nut on each side of the trunnion attachment on the levers will have to be adjusted, as necessary, to maintain the horizontal position of the hand lever, the neutral position of the gearbox and complete freedom of up and down movement of the control shaft in this position.

BRAKES

Handbrake Adjustment.

Adjustment of the brake shoes automatically readjusts the handbrake mechanism.

The brake rods on the back axle are correctly set at the works and, under normal conditions, these should not require any adjustment, as also is the case with the handbrake cables.

If it is necessary to replace the brake rods or cables, or, if it is necessary to remove these, the following procedure should be adopted :—

The approximate centres for the brake rods should be ensured, and these should be 28.69 and 14.88 respectively for the long and short links.

The handbrake lever should then be adjusted by altering the position of the nuts on the yoke piece attached to the end of the longer of the two cables at the handbrake lever end. The normal cable adjustment should allow the handbrake lever to be fully on at 3 to 4 notches.

Brake Pedal Adjustment.

The correct amount of free play between the push rod and the piston is set when the vehicle is assembled and should not be altered. If the adjustment has been disturbed, reset the length of the rod connecting the push rod to the pedal so that the pedal can be depressed approximately .50 before the piston commences to move; this free play can readily be determined if the pedal is depressed by hand.