MAINTENANCE MANUAL

FOR THE 1½ LITRE JOWETT

JAVELIN

P.A. and P.B. Models

JOWETT CARS LIMITED

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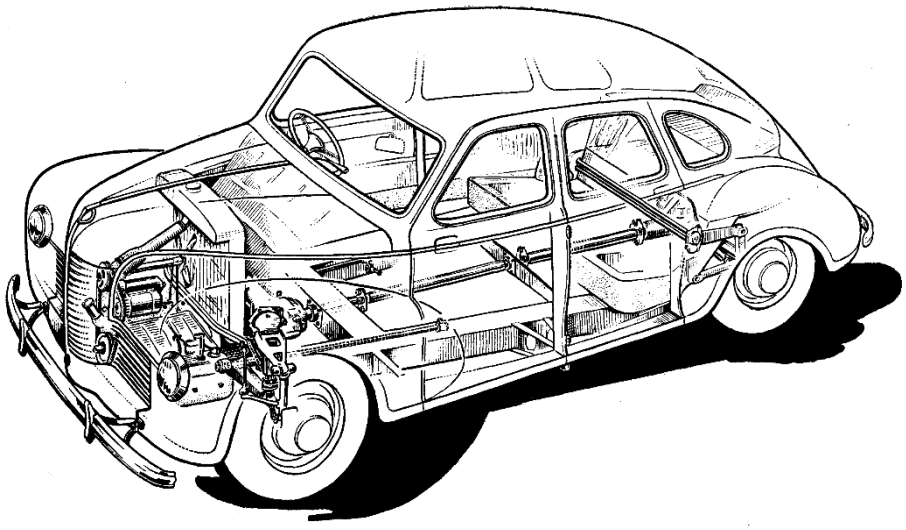

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1½ Litre Javelin Car

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Further copies of this Manual may be obtained through any Jowett Main Agent at ten shillings and sixpence each, net.

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Foreword

The Maintenance Manual, which is intended to act as a general guide to those concerned with the servicing of the Javelin 1½ Litre car, is divided for the convenience of the reader into three main Groups.

***GROUP I*.** Is directed mainly to the interested owner and consists of a general description of the components of the car, together with brief details of the servicing operations which may be required. The Service operator will also find that this Group is useful as a quick reference to details of assemblies.

***GROUP II*.** Provides details of the major operations normally carried out in a repair workshop.

***GROUP III*.** Describes the service operations for the Electrical Equipment of the car.

We would draw the attention of the owner and the Service operator to the fact that many of the operations detailed, particularly in Groups II and III call for special test equipment and tools. The owner is therefore strongly advised to contact his Main Agent. If major electrical operations are necessary, the owner and–or Agent is strongly recommended to contact the nearest Lucas Service Depot.

We would also point out that our Main Agents are kept in close touch with our Technical developments, and that both the owner and the repairer are strongly advised to make use of our Main Agent's specialised knowledge and up to date information whenever necessary. A full list of Main Agents will be supplied on demand.

The exploded drawings in the Parts Lists will be found most useful if used in conjunction with this manual.

NOTE: *Additional comments have been included, they are in italic text and are featured in the green colour that appears here.*

EXTRA NOTE: *This Maintenance Manual can be used in conjunction with the later Maintenance Manual that relates to Javelin PC, PD and PE Models, along with the Jupiter SA and SC Models.*

Service Bulletins issued by Jowett Cars Limited can also be referred to for added information.

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Maintenance Details and Operations

GROUP I. SECTION 1. ENGINE DETAILS

Item 1. Engine Data

Cylinders	4.	
Bore and Stroke	2·85 x 3·54-in.	(72·5 x 90 mm.)
Capacity	90 cu. ins.	(1,486 c.c.)
Rated H.P.	13·05.	
Maximum B.H.P	52·5 at 4,500 R.P.M.	(53·23 Continental B.H.P. at 4,500 R.P.M.)

Item 2. Engine Mounting

The front engine mountings consist of two rubber blocks bonded to brackets, mounted on the lower front of the crankcase, and bolted to extensions of the frame side members.

The rear mountings are two rubber bushes, cased in metal pressings and secured to the gearbox cross member with three setscrews.

It is most important that the rubber bushes in the rear mountings are not over-compressed, as engine roughness may result. If necessary, extra spacing washer should be fitted between the two sections of the mounting case.

Item 3. Crankshaft and Bearings

The crankshaft is carried in three main bearings, which are steel backed liners, located in the crankcase bearing bores with dowels. No scraping is permissible.

Front and centre bearing liners are interchangeable. The rear bearing liner controls crankshaft end float. *The rear end of the crankshaft forms the spigot for the flywheel. The rear main oil seal lip is in contact with the rear spigot surface.* The front end of the crankshaft is a parallel spigot, machined to carry a key, and on which the oil pump drive gear, the timing chain pinion and the fan pulley are fitted.

Item 4. Connecting Rods

The big end bearings are steel backed copper lead liners all of which are interchangeable. No scraping is permissible. Bronze bushes are fitted to the small ends.

Item 5. Crankshaft Data

Bearing Diameters		
Main Journal	2·250-ins.	57·150 mm.
Main Bearing*	2·253-ins.	57·226 mm.
Big End Journal	2·000-ins.	50·800 mm.
Big End Bearing*	2·0025-ins.	50·864 mm
Bearing Lengths		
Main Journal, Front	1·122-ins.	28·499 mm.
Main Journal, Centre	1·126-ins.	28·600 mm.
Main Journal, Rear	1·393-ins.	35·382 mm.
Main Bearing, Front	1·126-ins.	28·600 mm.
Main Bearing, Centre	1·126-ins.	28·600 mm.
Main Bearing, Rear	1·388-ins.	35·255 mm.
Big End Journals	1·003-ins.	25·476 mm.
Big End Bearings	0·875-in.	22·225 mm.
Flywheel Spigot Diameter	3·000-ins.	76·20 mm.
Running Clearances		
Main Bearings*	0·0015 – 0·002-in.	0·0377 – 0·051 mm.
Big End Bearings*	0·0015 – 0·002-in.	0·0377 – 0·051 mm.
End Play		
Rear Main Bearing*	0·003 – 0·004-in.	0·076 – 0·102 mm.
Big End Bearings*	0·007 – 0·010-in.	0·180 – 0·254 mm.

* In Situ

Item 6. Pistons

Aluminium alloy diecast, with one 'Vacrom', one compression, and one scraper ring, all fitted above the gudgeon pin. The gudgeon pin should be a tight push fit in the piston (cold) and an easy push fit in the small end. Ensure when fitting that the piston is accurately aligned with the crankshaft. When re-assembling, the piston and connecting rod must be fitted as an assembly from the cylinder head. Connecting rod will pass through cylinder bores.

Item 7. Piston Data

Clearances:	Top Land 0·0125-in, (0·317 mm.)
	Skirt 0·0015-in. (0·0377 mm.)
Gudgeon Pin Diameter	0·8127-in. (20·638 mm.)

Item 8. Cylinders

Diecast aluminium, integral with crankcase, fitted with Vacrit wet liners. A bonded washer seal is used between flange on external wall of liner and crankcase. Liners are retained in position by locking plates, and by the cylinder heads.

Cast iron cylinder heads with detachable valve guides and integral valve seats.

Diecast aluminium rocker covers, secured by Simmonds nuts.

Item 9. Camshaft and Valve Operating Gear

The camshaft is fitted direct into the crankcase with aluminium bearing surface. No bushes fitted.

Chain drive from crankshaft. Sprocket is located by dowel and bolted on front flange of camshaft (two setscrews with tab-washer).

Camshaft end movement is controlled by spring loaded plunger fitted in a drilling at the front end of the shaft and retained by the timing case front cover.

10. Camshaft and Valve Data .

Camshaft Material	Cast Iron	
Bearing Journal Length	1·094-in.	(27·781 mm.)
Bearing Journal Diameter	1·498-in.	(38·143 mm.)
Bearing Clearance	0·003-in.	(0·076 mm.)
Timing Chain Pitch (Double Chain)	0·375-in.	(9·527 mm.)
Number of Pitches	56	
Valve Head Diameter:		
Inlet	1·4375-in.	(36·513 mm.)
Exhaust	1·2187-in.	(30·725 mm.)
Valve Stem Diameter:		
Inlet	0·3115-in.	(7·912 mm.)
Exhaust	0·3115-in.	(7·912 mm.)
Spring Length (Free):		
Inner	1·395-in.	(35.433 mm.)
Outer	2·033-in.	(51·359 mm.)
Valve Seat Angles:		
Inlet	30° seat	60° Turbulence.
Exhaust	45°	
Valve Seat Widths:		
Inlet (Turbulence)	0·030-in.	(0·762 mm.)
Inlet (Seat)	0·035-in.	(0·889 mm.)
Exhaust	0·048-in.	(1·219 mm.)

Item 11. Engine Lubrication

Detachable sump, capacity 9 pints (5 litres), with a gear pump bolted to crankcase at front end of sump, and driven by a skew gear on crankshaft.

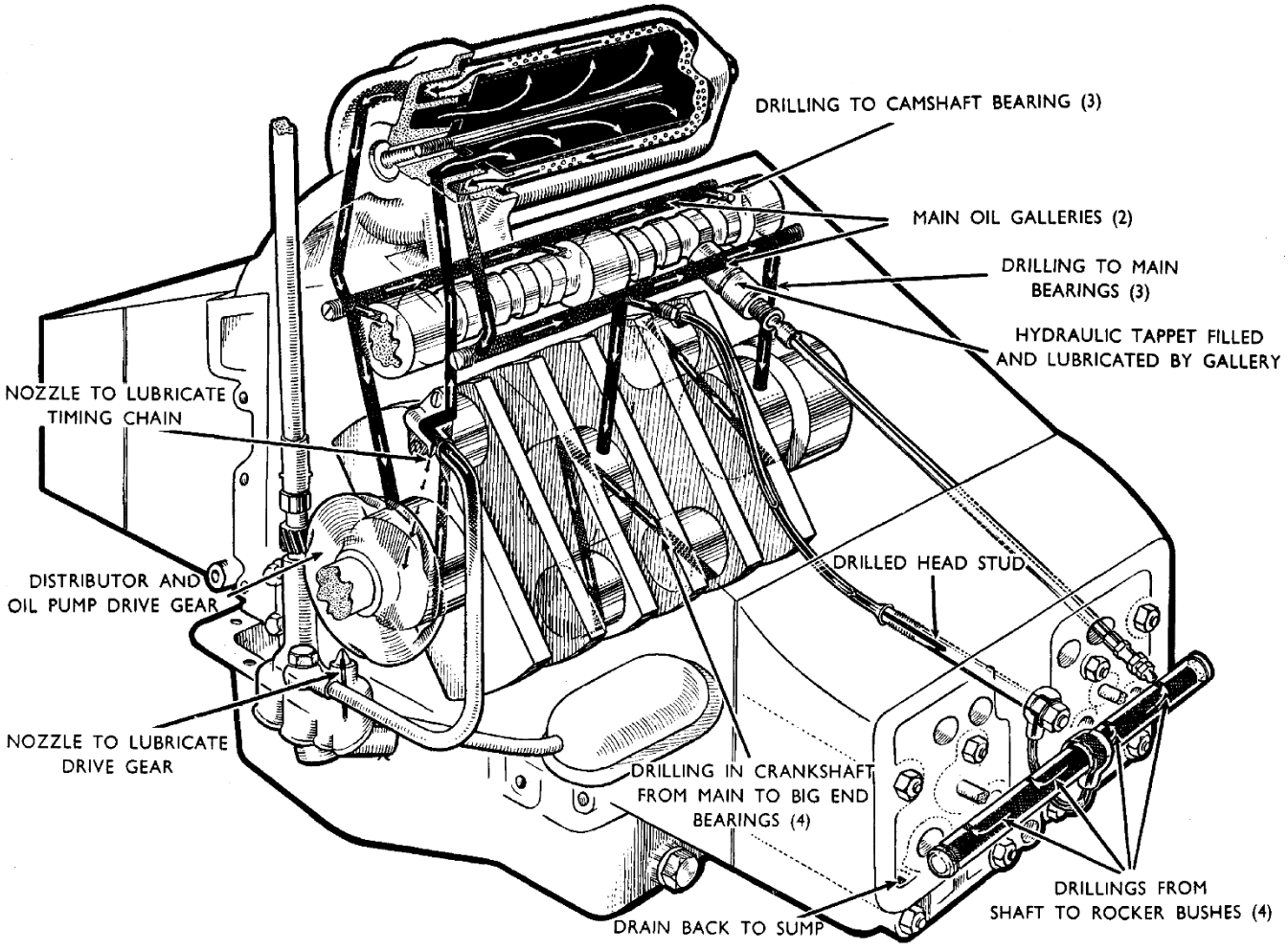


Figure 1.—Diagram Showing Engine Oilways.

Normal oil pressure is 50-60 lbs. per sq. inch (344·75-413·7 kPa) at 2,000 RPM. The oil pump intake is through a gauze strainer in the sump, connected by a pipe to the pump base.

Delivery is through a full flow filter mounted on the rear timing case cover, to main galleries on each side of the crankcase. Right hand gallery supplies oil to camshaft hearings and front main bearing. Left hand gallery supplies to centre and rear main bearings. Crankshaft drillings carry oil to big end bearings.

There is an oil feed from each gallery through oilways in the crankcase to the hydraulic tappets, and through oil pipes under the tappet covers and the drillings in the upper of the two middle studs in the cylinder heads to the valve rocker shafts.

A nozzle on the oil pump idler gear shaft delivers oil to pump drive skew gear, and a jet on the underside of the union which connects the delivery pipe to the crankcase galleries, supplies timing-chain lubricant. A piston type spring loaded release valve is fitted in the oil pump base, with a return into the sump. No adjustment is provided on this valve.

The element of the full flow filter should be changed at least every 10,000 miles (16,093 km.), or more frequently if necessary.

A green warning light on the facia board, to the left of the clock is extinguished when oil pressure rises above minimum safety level. This light is connected to an oil pressure switch mounted on the rear timing case cover immediately to the left of the full flow filter.

Item 12. Fuel System

Twin carburettors bolted to cylinder heads. The joint between cylinder head faces and carburettor flanges is made by ‘Hallite’ and paper packings, and aluminium distance pieces.

An A.C. mechanically operated petrol pump is mounted on the right of the crankcase, immediately in front of the right hand cylinder, and is operated by a plunger from a cam on the oil pump drive spindle.

The petrol pipelines from the petrol tank to the pump are connected by a union immediately behind the centre cross member. Access to the petrol gauge float unit can be obtained through an inspection cover on the left of the luggage compartment floor.

Air filters are mounted on underside of bonnet, and connected. to the carburettors by metal tubes mounted on the dash sides. The air filter element should be changed every 10,000 miles, or less if conditions warrant more frequent replacement.

An oil bath air filter has been fitted to all cars after D9/PA/5374. This filter should be serviced every 10,000 miles in the following manner:

Remove oil bath, drain off oil. Remove the filter element, and wash both the filter and the bath in petrol or paraffin, leaving them to dry in the air.

Resoak the element in the grade of engine oil normally used, fill the bath with ⅓ pint of engine oil, refit to the housing under the bonnet.

Item 13. Fuel System Data

Carburettors (Twin) 30 VM 5. Zenith Downdraught

Jet Settings	Up to Engine No. D8/PA/1753
Main	90
Compensating	50
Slow Running	50
Choke (Venturi)	23
Progression	170 (with 2 mm. Outlet Hole in Barrel)
No. 2 Cast Capacity Well	2·6 Screw Over Well
Needle Seat	1·5 mm.
Comp. Vent	1·2 mm.
Jet Settings	After Engine No. D8/PA/1753.
Main	90
Compensating	50
Slow Running	45
Progression	120 (with 180 Drilling)
Needle Seat	1.5 mm. (with 1 mm. Washer)
Fuel Pump	
A.C. Mechanical	Part No. 1524577
Pressure	1½ – 2½ p.s.i.
Tank Capacity	8 gallons (36 litres)

Item 14. Ignition

Lucas coil and distributor. Distributor advance is controlled by vacuum and by centrifugal weights. Distributor located in crankcase by a clamp plate and setscrew, and driven by a spindle connected to the oil pump drive shaft through a sleeved dog.

Item 15. Ignition Data.

Firing Point	T.D.C. to ⅜-in. (15·87 mm.) A.T.D.C. (on flywheel rim)
Contact Breaker Gap	0·010 – 0·012-in. (0·25 – 0·30 mm.)
Sparking Plugs	Champion L.10 14 mm.
Plug Point Gap	0·20 – 0·025-in. (0·50 – 0·65 mm.)

Refer to Item 96 for tuning details.

Item 16. Cooling System

Capacity 16 pints (9·1 litres). Circulation by *thermo-syphon assisted by an* impellor pump, controlled by a bellows type thermostat, with two $^{3}/_{16}$-in. (4·76 mm.) by-pass holes drilled in the valve.

The pump, fan and pulley shaft assembly are fitted in a housing above the timing case. Lubrication to front bearing is by a grease nipple reached through fan pulley. Rear bearing is a Reservoil bush. An oil hole is provided and it is recommended that a few drops of light oil are inserted periodically.

The fan belt pulley is retained by a Simmonds nut, and pump housing front cover is secured by four setscrews. It is important that the pulleys are accurately aligned before the fan drive belt is fitted.

Radiator mounted on scuttle dash and secured by two bolts.

A temperature gauge unit fitted in the header tank with lead to gauge clock on dash.

Item 17. Exhaust

The sliding joint in the front exhaust pipe immediately below the crankshaft pulley is provided to allow for heat expansion and contraction. This joint should not under any circumstances be welded or fixed.

SECTION 2. **ENGINE OPERATIONS**

Item 20. Removal From Frame

Detach radiator grille, front bumper, front apron panel, and sump protection bar, detaching stay from timing case cover when removing bar.

Disconnect coil lead, petrol pump line, throttle and choke cables, oil pressure switch and dynamo leads, speedometer cable (at the drive unit on right hand side of gearbox). Clutch linkage, gear change column linkage (through inspection cover in the left hand side on the incline board). Starter motor battery connection leads, propeller shaft coupling, gearbox coupling flange, exhaust flange, (behind left hand cylinder block).

Take the weight of the engine and gearbox unit on a cradle jack, disconnect the gearbox rear mounting on the crossmember, and two front engine mountings; raise the unit until just clear of the mountings and draw forward.

Removal of engine and gearbox as separate units is not practicable.

A suitable cradle jack, as illustrated below, can be manufactured to fit into the platform hole of a Lowlift Garage jack. Any hydraulic jack of this type can be adapted for the purpose.

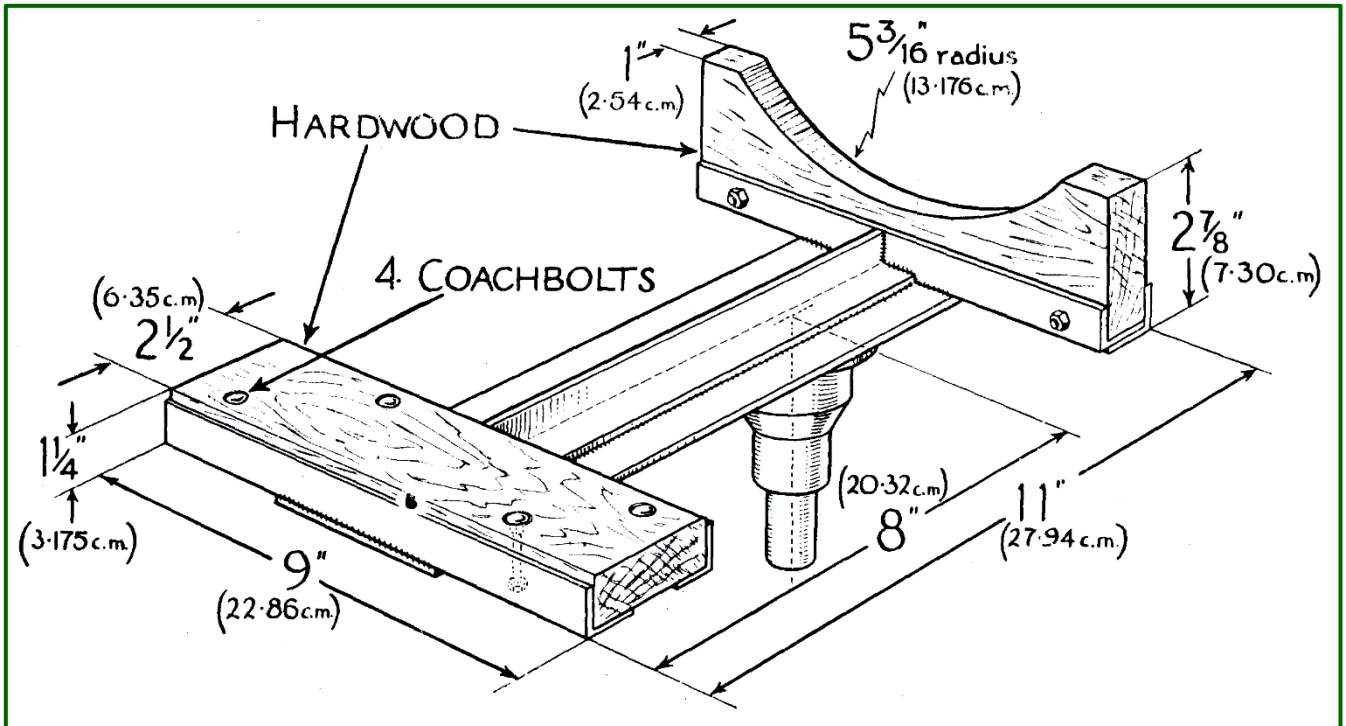


Figure 2.—Javelin Engine Cradle.

Item 21. Decarbonising

If decarbonising, and grinding in the valves is to be carried out with the engine in position, the cylinder heads can be reached from under the front wings once the front wheels have been removed.

To remove the cylinder heads, remove the water transfer 'U' tubes, cylinder head covers, rocker shaft, with rockers. (Two nuts securing the shaft to the cylinder head, and the banjo union linking the oil feed pipe must be released).

The cylinder heads can now be removed, with the valves in position.

Valves and valve springs are retained by split cones and collars which can be removed when the valve springs are compressed.

Detachable valve guides are a press fit and valve seats are integral with the cylinder heads.

Item 22. Tappet Service

It should be noted that the majority of Jowett engines have been converted to 'solid' type tappets, of which some were locally made.

Observe that the longitudinal oil galleries do break through into the tappet bores.

Tappet service as detailed in Item 90 and in the Lockheed Hydraulic Tappet Instruction Book can conveniently be carried out when cylinder heads are removed for decarbonising.

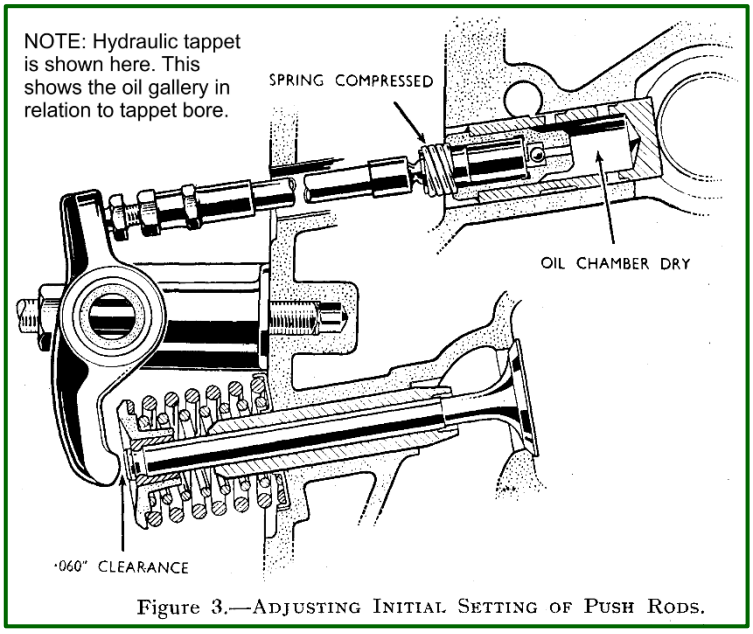


Figure 3.—Adjusting Initial Setting of Push Rods.

Should it be necessary to service tappets, when the head is in position, the rocker covers, the tappet covers and the rocker shaft assembly should be removed. The push rods and tappets can now be withdrawn from the crankcase and should be carefully marked for correct refitting. When assembling, the tappets should be fitted dry of oil, and the push rods set up so that there is 0·60 – 0·090-in. (1·5 mm.) free movement in the rockers.

(Note: This free movement only occurs when the tappets are completely empty of oil and the tappet spring compressed).

If at any time it is necessary to lift a valve manually (i.e., as in the case of a sticking valve), with the valve operating gear in position, the engine should not be turned over for at least 30 seconds after a valve has been lifted. If this interval is not allowed, pressure will be exerted along the valve train before the compression chamber in the tappet has drained, and damage to the push rod may result.

Item 23. Oil Pressure Check

Accurate measurement of oil pressure on PA and standard PB models can be made by removing the oil filter drain screw, which is fitted in the rear timing case cover to the right of the filter, and fitting in its place the adaptor to which is connected an oil gauge clock. *The adaptor can be machined from brass hexagonal bar.*

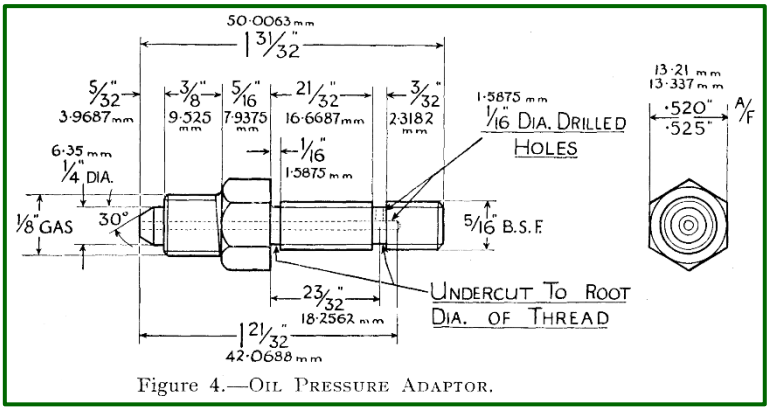


Figure 4.—Oil Pressure Adaptor.

Item 24. Valve and Ignition Timing

Arrowheads marked on crankshaft and camshaft sprockets should be set facing each other when re-timing valves. Inlet valve opens at 12° B.T.D.C. Markings on flywheel rim for T.D.C. 1&2 cylinders and T.D.C. 3&4 cylinders align with the crankcase division. An inspection hole in the clutch housing is provided.

Note: Not all chainwheels and pinions have timing marks stamped into them. The correct method for checking valve timing is in the Javelin and Jupiter Maintenance Manual.

Ignition timing should be set so that the contact breaker points are just breaking at T.D.C. to ⅝-in. (15 – 16 mm.) A.T.D.C. (measured on the fly-wheel rim). (A test lamp connected to distributor and earth should always be used for ignition timing check).

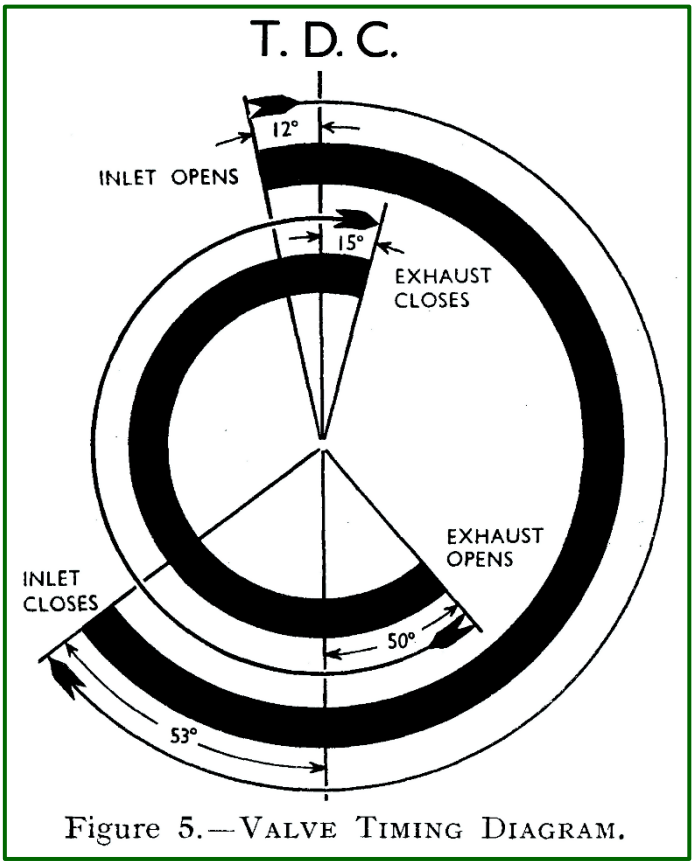


Figure 5.—Valve Timing Diagram.

Item 25. Camshaft Removal

Before withdrawing the camshaft it is first necessary to withdraw the tappets, by removing the rocker covers and rocker shafts and withdrawing the push rods. The tappets need not be fully drawn out, but can be left in position in the crankcase, clear of the camshaft. The front timing case should now be removed, taking care not to lose the spring and plunger fitted into the front end of the camshaft. Remove the timing chain and camshaft sprocket.

The camshaft can from this stage, be drawn forward, out of the crankcase.

Item 26. Cylinder Liner Replacement

Remove sump and detach the connecting rod from the crankshaft, remove rocker covers, rocker shafts and cylinder heads.

Remove cylinder locking plate (between the two cylinder liners) and draw out liner, piston and connecting rod.

When re-assembling, fit a new water seal washer at the bottom of the liner and ensure that the face on the outer flange of the liner stands slightly proud of the crankcase face. (Approximately 0·008 – 0·010-in.) – (0·200 – 0·250 mm.) *by use of copper shims*.

NOTE: *It is current practice to use a copper spacer ring in place of the cylinder liner seal ring (gasket). Consequently, the cylinder liner protrusion from the head gasket face of the crankcase needs to be reduced to 0·006 – 0·008-in. (0·152 – 0·200 mm.).*

Item 27. Connecting Rod Bearing Replacement

This can be carried out after removing the sump and detaching the connecting rod bearing cap. If it is necessary to remove the connecting rod completely, the cylinder head must be removed and the pistons and connecting rods drawn out through the liner, as the piston cannot pass between the crankshaft and the crankcase wall.

When refitting connecting rod caps use a Torque wrench loaded to 400 lb. in. (35 lb. ft.).

Item 28. Main Bearing Replacement

Replacement of main bearings involves the dismantling and dividing of the crankcase.

Divide by releasing two through bolts on the underside, two tie bolts at the front, one tie bolt at the top rear, five ¼-in. bolts along the top, and one tie bolt at the centre.

Rear main bearing, which is flanged, controls crankshaft end movement.

When re-assembling, use a Torque wrench loaded to 900 lb. in. (75 lb. ft.).

SECTION 3. **TRANSMISSION DETAILS**

Item 30. Clutch

The clutch assembly is a Borg and Beck single dry-plate unit, with a ball bearing thrust race, operated by a fork which is pivoted in the flywheel housing, and which is connected to the clutch pedal by a single link, the length of which is adjustable.

Adjustment is correct when there is approximately 1-in. (25·4 mm.) free movement at the pedal.

On all cars after Engine No. D8/PA/80, the flywheel and clutch are balanced as an assembly. Balance marks 'P' on the flywheel rim and on the edge of the clutch cover and pressure plate assembly should always face each other when the flywheel and clutch are assembled. Engine roughness may result if this point is not watched. In this connection refer to Item 103.

Item 31. Gearbox and Gear Change Lever

The four speed gearbox has constant mesh helical gears with synchromesh on second, third, and top. Oil capacity, 1½ pints (0·85 litres). The filler plug is located in the top wall of the gearbox case, and the drain plug in the side wall, immediately below the side cover. A dipstick is fitted to the right of the filler plug. Access to these is through a rubber grommet in the toe board. The drain plug is reached under the left hand side of the car.

The gear change assembly consists of :

(a) An outer column, movement on which is transmitted through the heavy arm at the base of the column and an adjustable rod, to the gear operating shaft on the top of the gearbox.

(b) An inner column, through which the 'up and down' movement on the gear lever at the steering wheel is converted into radial movement on the light arm at the base of the column, by helical grooves. This light arm is connected by an adjustable rod to the selector operating lever on the gearbox side cover.

Movement of the gear lever into the reverse gate is restricted by lugs on the inner column which butt against a shoulder on the outer column. When the reverse button is pressed, the inner column is moved over in the outer column and the lugs enter slots in the outer column.

Item 32. Propeller Shafts

Two shafts are fitted, with Layrub couplings. A Midship ball bearing is mounted on the frame cross-member. This bearing is bonded into a rubber ring, and should only be replaced as an assembly. The front shaft can only be fitted with the splined end at the midship bearing. The rear shaft is marked with arrows and should be fitted so that these arrows indicate the direction of rotation.

When refitting trunnion coupling bolts, it is most important that the nuts are fully tightened, and that the rubber bush spigots, and the recesses in the companion flanges are clean and free of any distortion. The midship bearing must be greased at least once every 5,000 miles (8,000 km.).

Item 33. Rear Axle

A Salisbury Hypoid Semi-floating axle is fitted, with shim adjustment for all bearings and for meshing of drive gear and pinion.

Axle shafts are splined at inner ends to engage in splines in the differential side gears, and outer ends of shafts are tapered and keyed for hub attachment.

Road wheels are supported on taper roller bearings, pressed into the axleshaft. Side thrust is transferred from one shaft to the other by a thrust block straddling the pinion mate shaft.

A cover is fitted on the rear of the gear carrier housing for inspection of the differential assembly. It is most important that only E.P. (Hypoid Lubricant) S.A.E.90 is used, and that brands of E.P. Lubricants are not mixed.

If any doubt exists concerning the brand of Hypoid oil previously used, the axle should be drained and flushed (using a flushing oil, or light engine oil) and refilled to the bottom level of the filler plug, with one of the recommended brands.

Wheel bearings are lubricated through grease nipples in the axle tube, near the brake back plates. *NOTE: There should be a grease relief hole in the axle housing at 30° above the centre-line, facing the rear – the details are in Service Bulletin 017.*

Item 34. Transmission Data

Clutch Linings:		
External Diameter	7 ¼-in.	(184·15 mm.)
Internal Diameter	5-in.	(127 mm.)
Thickness	⅛-in.	(3·175 mm.)
Gear Ratios:		
1st Gear	3·97 : 1	

2nd Gear	2·279 : 1	
3rd Gear	1·499 : 1	
4th Gear	1·000 : 1	
Reverse Gear	3·97 : 1	
Final Drive Ratios:		
1st Gear	18·9 : 1	
2nd Gear	11·6 : 1	
3rd Gear	7·31 : 1	
4th Gear	4·88 : 1	
Reverse Gear	18·9 : 1	
Differential Ratio	39 : 8	(4·875 : 1)

SECTION 4. **TRANSMISSION OPERATIONS**

Item 35. Access to Clutch

The clutch assembly can be reached for inspection after removal of the base cover, bolted to the underside of the clutch housing, but for major clutch service it is necessary to remove the engine, and detach the gearbox from the clutch housing.

Item 36. Clutch Dismantling

After removing the gearbox, withdraw the clutch shaft cover, fitted into the rear of the clutch housing, and draw back the clutch operating lever, and the ball pivot. This action releases the lever and the throwout bearing which can then be removed through the base of the housing. Note the position of the balance marks on the clutch assembly and flywheel and release the six setscrews securing the clutch assembly to the flywheel. Remove the assembly together with the clutch friction plate, through the base of the housing. *Should weight pieces have been welded to the clutch cover, then the clutch assembly may need to be rotated in the housing to facilitate withdrawal.*

Item 37. Clutch Re-assembly

When re-assembling it is important that the clutch friction plate is fitted with the face marked 'Fly-wheel Side' forward (i.e., with the large centre boss to the rear) and that the friction plate and cover plate assemblies are accurately centred with the clutch shaft and the spigot bearing in the end of the crankshaft. A spare clutch shaft is ideal for this purpose, but a 0·996-in. (25·302 mm.) diameter mandrel with a 0·4995-in. (12·68 mm.) diameter x 1·8-in. (45·72 mm.) long spigot will also be found satisfactory.

As the clutch cover plate assembly and flywheel are balanced together it is normally desirable that the components should be replaced together, but where this is not practicable the assembly must be re-balanced and re-marked in the manner outlined in Item 103.

Item 38. Clutch Adjustment

The only adjustment necessary is made on the clutch operating rod. The length of this rod can be altered after removing the split pin securing the rod to the clutch pedal, and should be set so that there is 1-in. (25·4 mm.) free movement at the clutch pedal pad.

Item 39. Further Clutch Service

For additional details on clutch service, reference should be made to Items: 99 and 104, and to the Borg and Beck Service Manual.

Item 40. Gearbox Dismantling

The following brief details are quoted for information only. Refer to Items: 105 – 107 for full operations.

After removing the gearbox from engine, the key at the rear of the main-shaft extension should be removed, and the rear end cover bolts slacked off.

Remove the side cover and lift out the selector bars. Withdraw speedometer drive after removing the locking setscrew in the side of the speedometer drive housing.

Remove the peg and withdraw the gear operating shaft to the half way position, remove the shaft spring and the Woodruff Key. Now remove the shaft completely.

Draw out the layshaft to the rear, and move the layshaft gears away from the main shaft.

Remove the rear and main-shaft bearing nuts and lock washers and withdraw the main-shaft bearing to the outside.

Withdraw the speedo drive bush. Withdraw the clutch shaft, remove the main-shaft, with gear assemblies through the gearbox side. Draw out reverse gear shaft.

Gear assemblies and bushes can be drawn off the main-shaft after pressing down the spring loaded locating pins and removing the main-shaft washers. Pins and springs should be removed and carefully stored.

When breaking down the gear assemblies, ensure that the synchro balls and springs are not mislaid.

To obtain access to the selector bar plungers and springs the two setscrews securing the plunger housing to the gearbox side cover (selector housing) should be released, and the housing removed. The plunger pivot rocker, spring seats, springs and plungers can now be withdrawn from the side cover.

Item 41. Gearbox Re-assembling

If the following points are not carefully checked when re-assembling the gearbox, difficulty may be experienced with engaging gears.

(a) The recess for the selector bars in the speedo housing extension must line up with the recess in the side cover.

(b) Selector forks must be dead square with the selector bars.

When refitting the side cover and the speedo housing extension new paper packings should be fitted and a slight smear of liquid jointing applied.

Item 42. Gearbox Selector Plunger Setting

Should the grubscrew in the selector plunger housing be disturbed, it is essential that this is correctly re-set after re-assembly of the gearbox.

(1) Set the gear operating shaft halfway between neutral and first gear position, slacken the grubscrew locknut, tighten down fully the grubscrew, and then slack back half a turn. Re-tighten the locknut with the grubscrew held in position.

If this adjustment is not set correctly, ‘jumping’ out of gear may be experienced. Should this fault persist after the adjustment has been set the following points should be checked :

1. On Cars before engine number D8/PA/150.

(a) Conical drillings in pivot rocker may have penetrated through to the opposite face of the rocker.

(b) Plunger springs may be weak.

Replacement parts should be fitted as necessary.

2. On all Cars.

(a) Selector bars binding in recess.

(b) Side cover and speedo housing extension recesses may not be correctly lined up. (Refer to Item 41).

It is most important that the adjusting grubscrew is NOT screwed in further, once the adjustment has been set.

Item 43. Rear Axle Removal

Lift the car to a convenient height, jacking under the frame side members (protect the side member with a wooden block placed between the jack plate and the frame). Disconnect shaft coupling and the rear brake cable. Detach the transverse stay at the axle, the shock absorber and the lower links at the axle.

Take the weight of the axle on a trolley or jack, disconnect the spring arms at the axle and lower the axle to the ground.

Item 44. Rear Axle Refitting

When refitting the rear axle always fit the spring arm bolt outward, as there is a danger of the bolt fouling the bodywork, if fitted with the head on the outside.

SECTION 5. **CHASSIS ASSEMBLIES DETAILS**

Item 46. Brakes

Girling hydraulic front brakes, operated from a master cylinder immediately behind the gearbox cross member, (access from under the right hand side of the car) with a hydraulic fluid reservoir fitted into the right hand side of the scuttle dash.

Girling mechanical rear brakes, operated by rod and cable to a compensator on the rear axle, and by transverse rods from the compensator to the hubs

The slip linkage, immediately behind the master cylinder, and the brake rods, are set to provide balanced braking on front and rear, and this setting should not be altered when adjusting brakes.

Item 47. Brake Data.

Lining Length	$7^{5}/_{16}$-in.	(185·74 mm.)
Lining Width Front Brakes	1½-in.	(38·10 mm.)
Lining Width Rear Brakes	1 ¼-in.	(31·75 mm)
Lining Thickness	$3^{1}/_{16}$-in.	(4·750 mm.)
Drum Diameter	9-in.	(228·6 mm.)

Item 48. Suspension

Independent front suspension is fitted, with springing controlled by longitudinal torsion rods fitted along the inside of the frame side members. The setting of the torsion rods is regulated by adjusting levers at the rear end of each rod.

The front spring arms, in which the front ends of the torsion rods are locked, are secured to the frame side member extensions by brackets at the front end. Endwise movement of the torsion rod is prevented by locating plates secured to the rear of the rods and to the frame side brackets immediately behind the adjusting lever.

The outer ends of the front spring arms are secured to the stub axle swivel pins, the upper end of which are connected through yokes, to the outer end of upper links. These upper links pivot in the upper link brackets on trunnion bushes. The upper link brackets also act as oil reservoirs, and supply lubricant through a tube to the swivel pin yoke.

This method of lubrication was discontinued on cars after D9/PB/5979 and a grease nipple at the outer end of each Upper Link substituted.

The front shock absorbers are of the Woodhead Monroe type, and are sealed after assembly. No adjustment is provided and the only lubrication necessary is an occasional spraying of the surface of the inner cylinder with a preservative oil.

Rear suspension springing is controlled by two transverse torsion rods, carried inside the rear body frame. Access to these rods is obtained by removing the rear seat cushion.

The rear torsion rods are retained in position at each end by spring bracket covers. No adjustment is provided. As on the front suspension, the rear shock absorbers are Woodhead Monroe with no adjustment and only external preservative lubrication necessary.

Item 49. Steering

Internal gear and pinion steering box assembly, with shim adjustment for inner column end float at the flange between the outer column and the box extension.

The steering box casing is a Welded assembly, and the steering box arm is rivetted to the internal gear. Reconditioned, replacement assemblies can be supplied.

The steering gear consists of a single connecting link, with an intermediate steering arm secured to the left hand side of the body frame, and coupling rods to the steering arms at the roadwheels.

Adjustable bearing cone nuts secure the steering box arm and the intermediate arm to the connecting link, and the intermediate arm is pivoted on a bearing cone which is spring loaded.

The coupling rods are secured to the connecting link by ball sockets. Adjustment for play in these sockets is by shims fitted behind the steering rod socket pads.

Castor angles can alter only if damage to the suspension linkage, the frame side member extensions, or the dash side panel assemblies had been sustained. Should these angles be found incorrect, it will be necessary to investigate the cause and repair or replace the damaged part.

Camber angles are controlled by the number of shims fitted behind the upper link bracket.

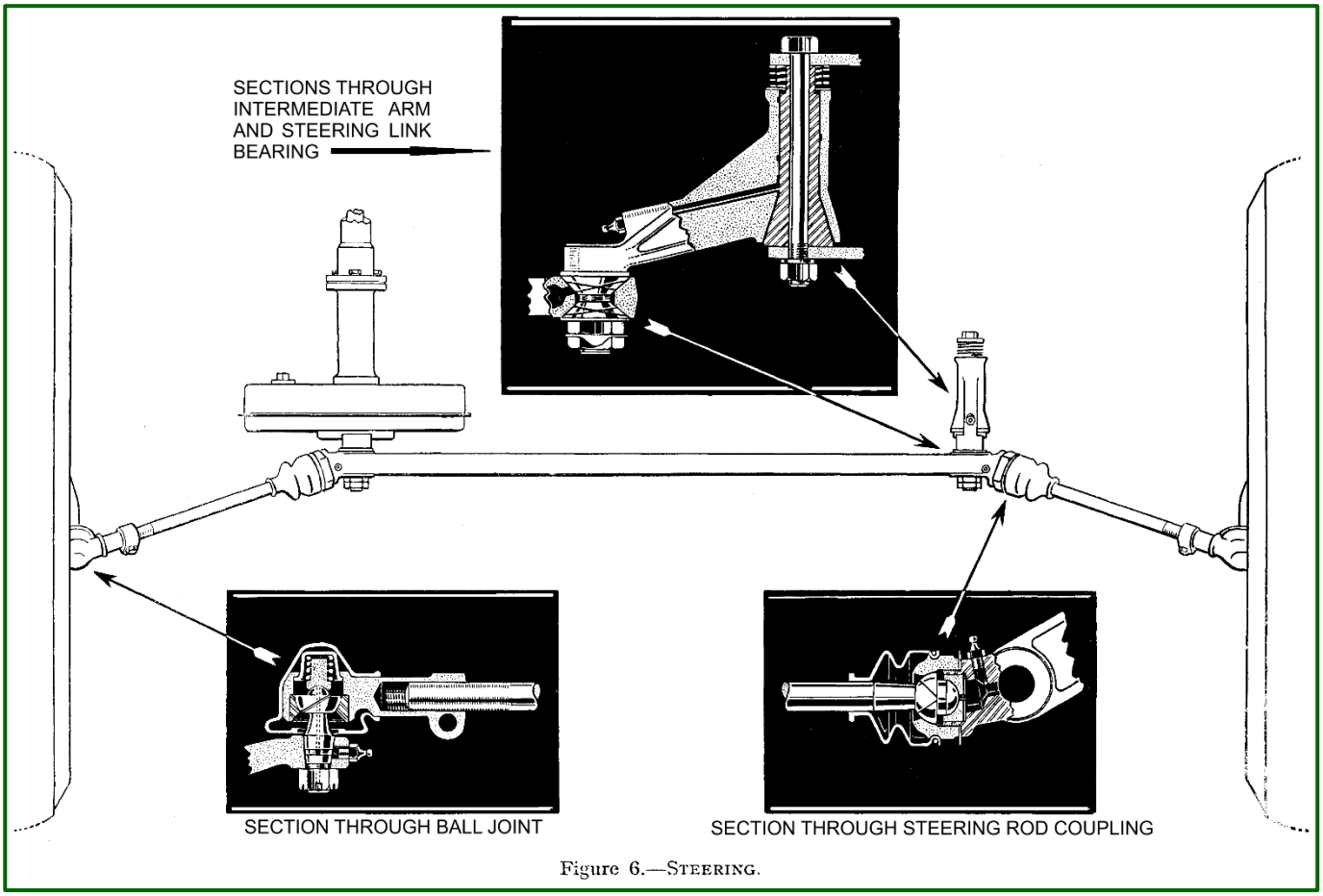


Figure 6.—Steering.

Item 50. Steering and Suspension Data

Castor Angle	Nil (Unladen)
Camber Angle	Nil (With Upper Links Horizontal)
Swivel Pin Inclination	10° With Stub Axle Horizontal
Angle of Swivel Pin to Stub Axle	100°
Steering Track	Parallel to $^{1}/_{16}$-in. (1·5 mm.) Toe Out
Steering Box Ratio	12 : 1
Turns of steering Wheel (Lock to Lock)	2¾
Turning Circle	32-ft. (9.75 m.)

SECTION 6. **CHASSIS ASSEMBLIES OPERATIONS**

Item 52. Front Brake Adjustment

Spin the road wheel in the forward rotation, and tighten the adjuster on the brake back plate (clockwise left hand, anti-clockwise right hand) until the brake shoes bind on the drum sufficiently to stop the wheel. Now slack off until the wheel spins freely.

Item 53. Rear Brake Adjustment

Tighten the adjuster (clockwise) as far as it will turn without forcing, and then turn back two notches (or ‘clicks’).

Item 54. Handbrake Adjustment

Handbrake adjustment should normally be correctly set after adjustment of the rear brake shoes. If further adjustment is found necessary this should be made at the slotted link, behind the gearbox cross member, which connects the handbrake cable to the brake rod. The handbrake should be set

so that the lever ‘clicks’ past six notches when pulled hard on. It is advisable to make sure that the rear wheels spin freely after adjusting the handbrake linkage.

Item 55. Brake Drum Removal

Remove the road wheel, split pin, axle nut and washer, and draw off the drum using Britool Drawer (Part No. 1092), for the rear hubs only.

Inner and outer hub bearings are pressed into the bore of the front drums.

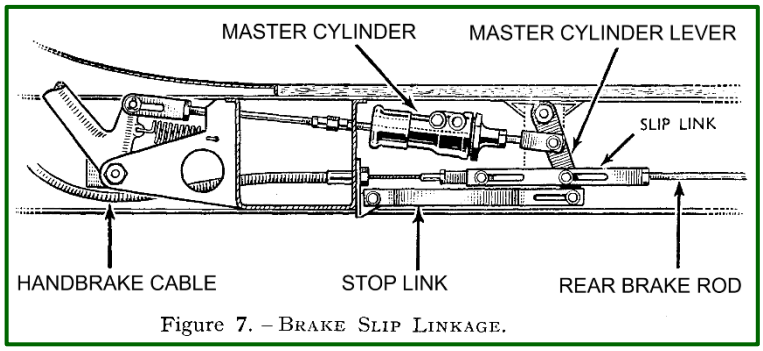


Figure 7. – Brake Slip Linkage.

Item 56. Front Torsion Rod Setting

Stand the car on level ground and measure the distance between the underside of the frame side members, at the front of the gearbox cross member, and the ground.

This distance should be 10-in. (254 mm.) when the car is unladen. If a measurement of less than 10-in. (254 mm.) is recorded, jack the front wheels clear of the ground and slack off the locknut on the adjusting lever pin at the rear of the torsion rod and screw in the pin until the distance between the side member and the ground is 10¼-in. (260 mm.) allowing ¼-in. (6 mm.) for settling.

If the measurement is more than 10¼-in. (260 mm.) the pin should be screwed out until the correct measurement is reached.

After finally checking the height of the side member make sure that the adjusting pin locknut is fully tightened.

Item 57. Front Torsion Rod Removal

The front torsion rods can be removed with the minimum of dismantling, by drawing from the rear, using the special puller illustrated in *Figure No. 53*.

Full details of this operation are quoted in Item 127.

Item 58. Front Torsion Rod Refitting

Before driving home the torsion rod, set the spring arm against the chassis rebound buffer and make sure that the faces of the octagons at each end of the rod, line up with the octagon faces in the spring arm tube and the adjusting lever.

After driving the torsion rod into position the adjusting lever pin should be screwed in until there is 10¼-in. (260 mm.) between the ground and the underside of the frame side member at the front of the gearbox cross member.

The torsion rod locating plate should then be refitted, and the adjusting pin locknut tightened up.

Item 59. Rear Torsion Rod Removal

Pull out the rear seat cushion. Detach the rear spring arm from the axle. Remove the spring bracket caps at each side (access under the rear wings) and draw off the spring arm from the torsion rod to be removed, taking care to save the rubber bushes between the arm and the body, if suitable for refitting.

Drive free the torsion rod towards the end from which the arm has been removed, and pull out the rod from inside the car, moving to one side as necessary in order to clear.

Item 60. Handling and Storage of Torsion Rods

Torsion rods in storage should be laid in a felt covered wooden stand, suitably ledged so that each rod is stored separately.

When handling the rods, make sure that they are not struck in any way likely to cause damage to the surface. Even a scratch can weaken a rod and exceptional care should be taken when handling.

Should surface damage occur, the torsion rod should be replaced at the earliest opportunity.

Item 61. Stub Axle Assembly – Removal

Remove the road wheel and disconnect the steering arm from the steering coupling rod, and the hydraulic brake pipeline at the brake back plate. Detach the swivel pin from its yoke at the outer end of the upper link, and remove the pin securing the swivel pin to the spring arm.

Item 62. Stub Axle Assembly – Dismantling

Remove the washers and distance tubes from the spring arm tube at the base of the swivel pin. Remove the swivel pin from the stub axle column. With the stub axle assembly held in a vice, remove the axle nut and washer, draw off the brake drum and draw out the stub axle bushes as necessary.

Item 63. Stub Axle Assembly – Refitting

When refitting the stub axle assembly, make certain that the spring arm sleeve at the base of the swivel pin is correctly aligned with the distance tube and with the bolt holes in the lower spring arm. Stiffness in the movement of the stub axle is likely to be caused by misalignment of this sleeve. Should this be experienced, slack off the spring arm pin and gently tap around the spring arm fork and the lower end of the stub axle column, in order to resettle the sleeve. Should the front brake back plates have been removed it is very important that the bottom rear setscrews are correctly refitted. These setscrews are ground across the heads, and they must be refitted so that the steering lock is not restricted.

Item 64. Suspension Linkage Removal

Disconnect the steering coupling rod, and the brake pipe line at the hub.

Detach the upper link from the upper link bracket on the body frame side by removing the trunnion bolt, taking care to save the oil seals and spacers.

Disconnect the shock absorber from the lower spring arm and detach the swivel pin from the spring arm fork. Now withdraw the assembly from the frame.

The shock absorber is secured to the upper link by two ‘U’ bolts and the swivel pin yoke to the upper link by a worm pin, which can be removed by drawing back the rubber seal, slacking off the nut at the front end of the pin, and screwing the pin out of the yoke.

The spring arm can be removed from the frame side extensions, after removal of the torsion rod, by slacking off the pinch bolt at the rear of the spring arm tube, and by removing the setscrews and bolt at the front securing the trunnion bracket to the frame extension. The arm can now be moved forward and lifted clear.

To remove the upper link bracket, release the seven setscrews securing the bracket to the body frame side. It is most important that the shims fitted behind the bracket, which align the suspension assembly, are saved and refitted in exactly the same positions as they are found when the bracket is removed.

Item 65. Suspension Linkage Refitting

When refitting the spring arm, make certain that the pinch bolt, and the trunnion nuts (where fitted) at the end of the spring arm tubes, are fully tightened down. Slackness in these may be found to cause a suspension ‘creak’.

The upper link lubrication tube, must always be fitted at the rear of the upper link when the link is being refitted to the bracket, the pin should be inserted from the rear and the head of the pin registered with the flat on the lubricating tube banjo union.

Make sure that the pin and nut are fully tightened down as the assembly is designed so that the upper link, the pin, the distance tube and the lubricating tube pivot as a unit on bushes in the upper link bracket. Should the pin be left slack, there is a danger that the upper link may turn on the pin, and if this occurs the lubricating tube is subjected to strain.

Note: The method of lubricating the outer end of the Upper Link through the tube was discontinued after Engine No. PA/5979 and a grease nipple substituted.

It is however also important that the Pin is fully tightened on cars after this engine number.

Item 66. Camber and Track

Camber is normally nil with the front of the car set so that the CHASSIS IS LEVEL TRANSVERSELY, and the spring arms are horizontal. The chassis and spring arm settings are vitally important, as a false camber reading will be obtained if these points are not carefully watched.

Track should be parallel, though between $^{1}/_{16}$-in. (1·5 mm.) toe in, and $^{1}/_{16}$-in. (1·5 mm.) toe out, is permissible. When adjusting track both coupling rods must be adjusted as it is essential that they are equal in length.

Full details of camber, track, and independent wheel alignment check are quoted in Item 119.

Item 67. Steering Column Play Adjustment

Steering column end play is controlled by the thickness of shims fitted between the steering box extension flange, and the flange at the base of the outer column.

To adjust the end play, the 'U' bolt securing the column to the facia board, and the setscrews securing the column to the box extension should be removed, and the complete inner and outer column assembly lifted clear of the box. (Note that it is not necessary to remove the steering wheel in order to do this). Shims should be removed to reduce the movement, adjustment should be made so that there is not more than 0·002-in. (0·051 mm.) end movement in the column, and the column and box assembly must move freely.

Item 68. Steering Linkage Adjustment

Adjustment for wear in the steering linkage can be made at the bearing cone nuts at each end of the steering connecting link, which should be fully tightened and then slacked back through $^{1}/_{6}^{th}$ of a turn. Check that there is no restriction in the intermediate steering arm, which should move freely, without play.

Note: *There have been instances where specialist workshops, during a roadworthiness check, have discovered 'play' when rocking the front wheels to check for slack. There have been instances where the spring (Part No. 52074) has been removed and the intermediate steering arm (Part No. 50571) shimmed (packed) to zero the perceived slack in the steering linkage. Such activity renders the Javelin as being practically not steerable. The spring is an important component.*

Stiffness in the steering linkage may be caused by over-tightening at these three points, and care should be taken to make sure that the linkage works freely before finally locking up the tab washers.

Adjustment of end play in the coupling rods is made by removing the steering rod socket nuts and adding shims behind the steering rod pads fitted in each end of the connecting link, the adjustment is correct when, with the socket nut tightened down fully, the coupling rod can be moved freely and there is no end play. This movement should be checked with the coupling rod disconnected at the outer end.

SECTION 7. **ELECTRICAL EQUIPMENT DETAILS**

Item 69. Batteries

The 12-volt battery (50 amp. hours rate) is fitted in a housing on the frame side member, immediately under the rear seat with access through a panel in the seat floor.

The battery leads are carried along the underside of the body floor boards, and the positive-earth is connected to the frame side member.

The following specific gravity readings indicate the condition of the batteries at a solution temperature of approximately 60 °F (15·55 °C).

1·280 – 1·300	Battery Fully Charged
About 1·210	Battery About Half Charged
Below 1·150	Battery Fully Discharged

Item 70. Charging Circuit

The dynamo is of the compensated voltage control type, operating in conjunction with the regulator unit, which is housed, with the cutout, in the control box fitted on the left hand side of the scuttle dash. The charge rate should be at 1½ amperes with all electrical load switched on.

The dynamo charge is indicated by the red warning light on the facia panel, which is extinguished as soon as the dynamo commences to generate.

Item 71. Wiring Layout

The trafficator and rear lamp wiring harness is carried from the switch panel, up the right hand windscreen pillar and along the right hand side of the roof, with a fork to the trafficators above the door pillar. The trafficator earth is on the door pillars, roof lamp earth on the metal cross bearer in the

roof, above the lamp, and the rear lamp is earthed on to one of the bolts securing the steady catch for the luggage boot.

The earth leads for the headlamps are carried back to harness clips on the scuttle dash, immediately behind the radiator.

Item 72. Electrical Equipment Data

Ignition System	12-volt Lucas Coil and Distributor
Batteries	1 x 12-volt 50 ampere-hour Lucas GTW9A
Dynamo	Lucas C39PV
Starter Motor	Lucas M35G
Distributor	Lucas DKY 448
Coil	Lucas Q12.8
Lighting and Ignition Switch	Lucas P.L.C. 6
Control Box	Lucas RF 95 2.L.2
Regulator	LRT 9.2.

Item 73. Heater and Cold Air Equipment (P.A. and P.B. de Luxe Models)

The heater fan and radiator unit is fitted below the dash panel, with a control button on the switch panel. The heater intake is connected to the engine cooling system at the pump housing on the engine side of the thermostat with a screw down type control tap. Outlet return from the heater is to the radiator bottom tank.

The cold air control levers fitted under the facia board, operate the ventilating doors to the air vents, immediately behind the radiator grille, which when open allows air to enter the body through louvres in the scuttle dash side.

When the heater tap on the pump housing is turned off the heater fan can be used to assist in the circulation of cold air inside the body.

SECTION 8. **ELECTRICAL EQUIPMENT OPERATIONS**

Item 74. Charge Rate – Checking

Remove the control box cover, and insert a piece of paper between the points of the cutout, on the left hand side of the box. (On the sealed type, with external fuses disconnect the leads from terminals A and A1 and join together).

Connect a moving coil voltmeter between terminals ‘D’ and ‘E’ on the control box, or between the metal frame of the cutout and earth.

Start up the engine, and increase the speed slowly until the voltmeter needle, which will have been moving across the dial, flicks and then settles down. Hold the engine speed steady at this point.

The reading at which the needle settles down should be between 16·1 and 16·7-volts at normal workshop temperature (50 °F; 10 °C) if the charge rate is correct.

Item 75. Charge Rate Adjustment

Should it be necessary to adjust the charge rate, stop the engine, slack off the lock nut on the regulator adjusting screw, located in the metal frame immediately above the regulator bobbin, and screw in the adjuster to increase, or screw out to decrease the charge rate.

The charge rate can be set, within the range of 16·1 – 16·7-volts according to the type of journeys undertaken, and the load carried by the battery.

When the voltage reading is satisfactory, remove the paper from between the cutout points and replace the control box cover.

SECTION 9. **BODY DETAILS**

Item 76. Body Frame Construction

The body frame is an integral unit of Welded steel construction, the framing consisting of side member and body side frame assembly sections linked by the box section cross member, the front end panel assembly, and the rear seat floor pan assembly, and stressed by strainers running across the roof.

The frame assembly is aligned on the relative positions of the rear torsion rod anchors and the end of the tubular front member, to which the front suspension upper link brackets are secured.

Until detailed instructions are issued it will be advisable to consult Jowett Cars Limited, Service Department, when major repairs involving realignment of body frame, are contemplated.

Item 77. Body Access Details

Access to gearbox oil filler is through a rubber grommet in the incline toe board, and the gearbox linkage, through an inspection plate. The petrol tank float unit can be reached after removing the inspection plate in the floor of the luggage boot on the left hand side.

Door trim pads are secured by ‘snap fasteners’ and by screws in each corner.

Item 78. Body Data

Overall Length	168-in.	(4·267 metres)
Overall Width	61-in.	(1·549 metres)
Overall Height	60½-in.	(1·536 metres)
Minimum Ground Clearance	7 ¾-in.	(196·85 mm.)
Front Seat Width	51-in.	(1·954 metres)
Rear Seat Width	49-in.	(1·2446 metres)
Boot Capacity	9½ cu. ft.	(0·29605 cu. metres)
Shipping Weight	2,200 lbs.	(996 kgs.)
Kerb Weight	2,300 lbs.	(1,038 kgs.)

Item 79. Jacking Points

Using the Stephenson Jack supplied in the tool kit, the car can be raised by inserting the jack into the socket immediately below the centre door pillar on each side.

Using a Loway (trolley) jack the car can be lifted by placing the jack pad under the frame side members, or under the box section cross members. It is advisable to use a timber protection pad at least 12-in. (305 mm.) long between the frame members and the jack pad.

Group II.

Major Service Operations

SECTION 10. **ENGINE**

Item 85. Engine Dismantling

The following suggested routine is recommended when completely dismantling the engine, but Items may be found to give a useful guide when partly dismantling the unit.

Remove front exhaust pipe, front engine mountings, and the water intake metal pipes. Remove gearbox and starter motor.

Place unit upright in stand (refer to *Figure 8*, Page 25), secure the fixed brackets of the stand to the water intake pipe studs, and the free brackets to the engine mounting studs.

Drain off engine oil from the oil filter and the sump.

Remove the clutch shaft cover.

Remove the dynamo, and the accessory drive. Remove the water pump and fan assembly.

Disconnect and remove the distributor leads.

Disconnect the suction control assembly at the carburettor.

Release the nut securing the distributor locking plate and lift the distributor with the suction control and drive shaft clear of the engine.

Disconnect and remove the pipeline from the petrol pump to the carburettors, and the throttle rods.

Remove the carburettors and the petrol pump.

Remove the oil filter.

Disconnect the breather pipe at the breather valve and at the union over the crankcase, and remove the breather valve.

Remove the tappet covers and the rocker covers.

Remove the water transfers.

Remove the rocker shaft assemblies complete, draw out push rods and tappets.

(**Note:** Refer to Item 12 for details of tappet service).

Remove the cylinder heads.

Remove the starting handle dog and the crankshaft pulley.

Release the four setscrews and the nut securing the timing case rear cover to the timing case cover, and the two setscrews securing the rear cover to the crankcase. Pull the rear cover clear.

Release the four setscrews from the sump to the timing case cover, and the eight setscrews securing the timing case cover to the crankcase. Remove the cover.

Remove the camshaft thrust plunger and spring from the camshaft, and the petrol pump push rod from the timing case cover.

Release the two setscrews securing the camshaft sprocket to the shaft and remove the sprocket, together with the chain pinion and the chain. Withdraw the camshaft from the crankcase.

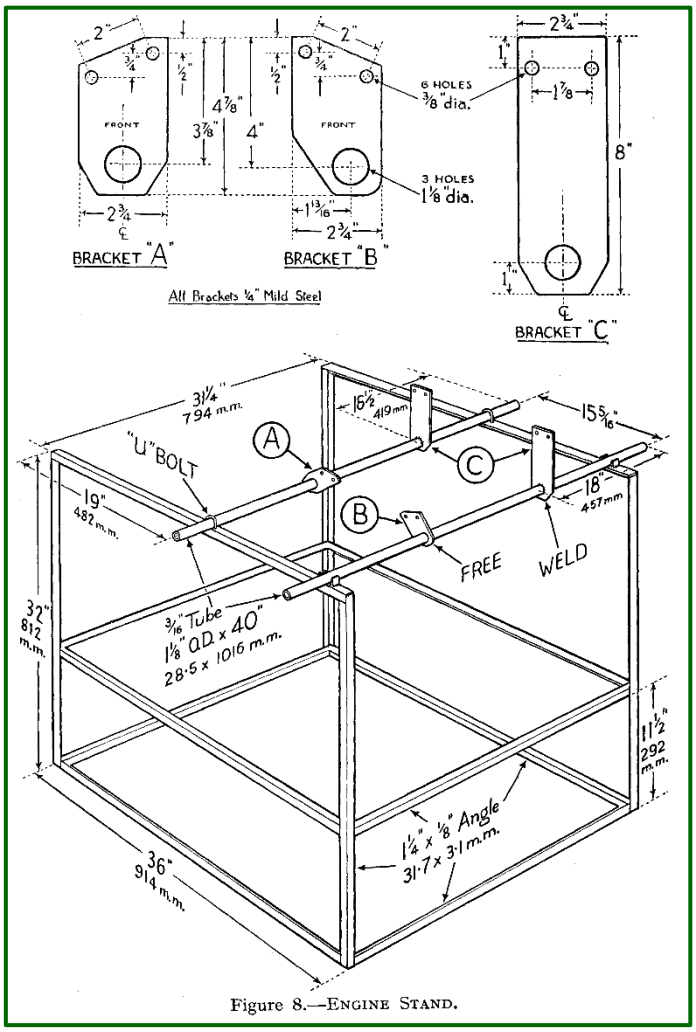


Figure 8.—Engine Stand.

Withdraw the oil pump drive gear from the crankshaft and remove the crankshaft key.

Disconnect the oil delivery pipe at the elbow union on the crankcase.

TURN UNIT OVER ON STAND

Draw back the lever ball pivot, and remove the clutch operating lever and the throwout bearing.

Release the setscrews securing the clutch cover and pressure plate assembly to the flywheel, and remove the assembly through the base of the housing.

Remove the friction plate.

(**Note:** For details of clutch service refer to Item 12).

Release the setscrews securing the flywheel to the crankshaft and remove the flywheel.

Remove the sump, and the sump tray assembly.

Remove the clutch housing.

Remove the oil pump assembly, with the oil delivery pipe.

Disconnect the connecting rod caps, remove the connecting rods and pistons through the cylinder heads, taking special care to ensure that the connecting rods do not damage the liner bores, and refit the caps.

(**Note:** Ensure that caps and rods are marked for correct refitting). *All Jowett engine connecting rods and caps are stamped with two-letter codes. Record these codes against cylinder numbers.*

DO NOT MARK CONNECTING RODS WITH FILE GROOVES OR HACKSAW CUTS!

Release the cylinder block bolts and tie bolts, and the five ¼-in. B.S.F. bolts along the top of the crankcase, thus dividing the two cylinder block sections.

Remove the crankshaft, the main bearing shells, and the balance pipe centre tube, with seals.

Remove the cylinder block sections from the stand, and draw out the cylinder liners, with the locking plate.

(Note: Should a liner prove difficult to remove, gently tapping on the base of the liner, using a wooden block, will be found effective).

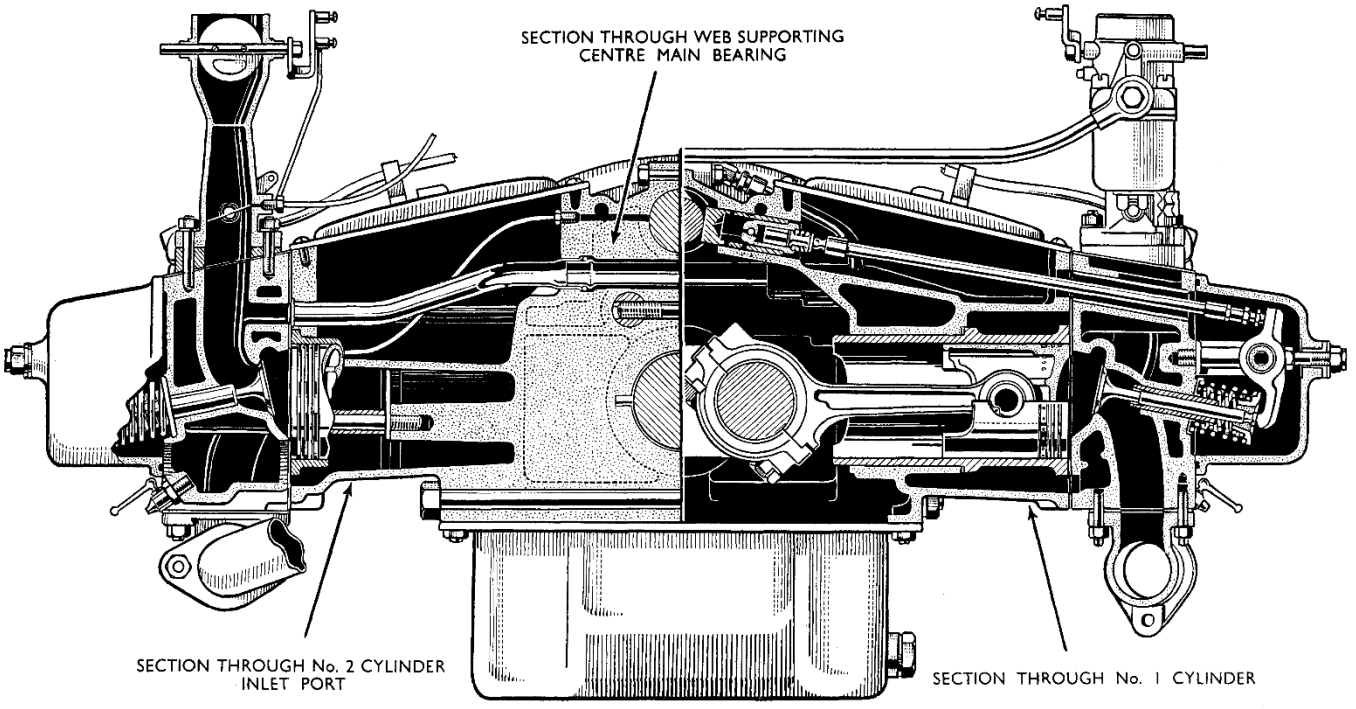


Figure 9.—Sectioned Engine.

Item 86. Dismantling Water Pump and Fan

Remove fan assembly by unscrewing from the spindle after releasing the locknut fitted in front of the fan.

Remove water pump pulley and key.

Release the four setscrews securing the front housing cover to the pump housing.

Remove the outer felt oil seal, and pressing.

Free the housing cover by gently tapping on the rear of the spindle, and draw the cover off the spindle. Remove the gasket.

Remove the circlip in front of the water pump bearing and press out the bearing.

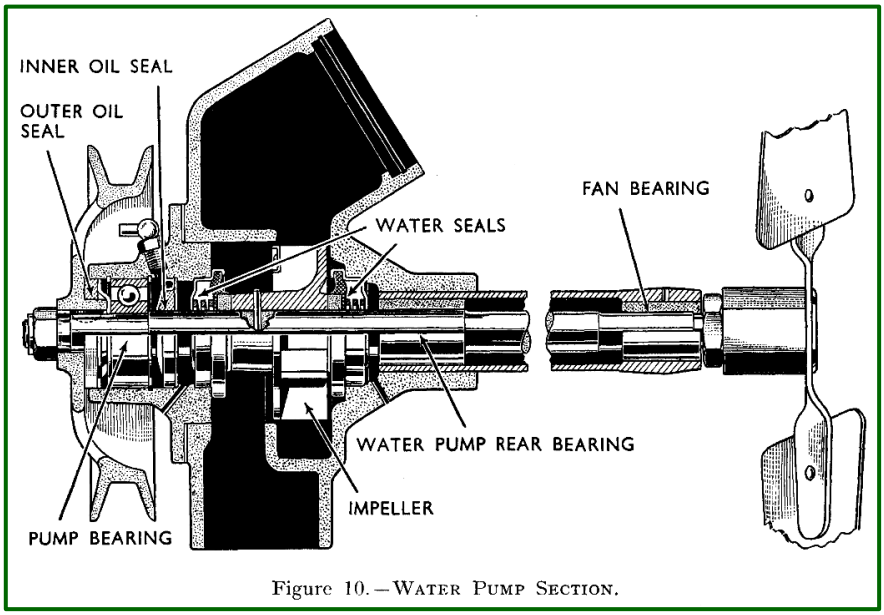


Figure 10.—Water Pump Section.

Remove the front water pump seal, the circlip and the inner oil seal washer, seal, and the seal housing.

Draw the spindle and impellor assembly from the housing. The impellor, with its brass ring, which is rivetted in position, can then be removed from the spindle by driving out the mills pin and drawing the impellor forward.

Remove the rear Water pump seal from the housing.

Finally, if it is necessary to replace the water pump rear bearing and the fan bearing, these can be drifted out.

To remove the thermostat, release the circlip, remove the steel and rubber washers, and lift out the thermostat.

Item 87. Water Pump Re-assembly

Reverse the operations detailed in Item 86, fitting a new gasket, and new oil and water seals if necessary. Special care should be taken to avoid damage to water seals. *Refer to Part 40 of the Technical Notes Series.* If new rear and fan bearings are fitted, these should, of course, be pressed into position, using the correct diameter fitting pins.

When refitting the thermostat fit a new rubber seal washer under the steel washer.

Refit the fan so that there is 0·031-in. (0·79 mm.) clearance between the fan locknut and the rear of the fan bearing, and make sure that the locknut is tightened back firmly against the fan hub. Any failure in this respect will allow the locknut and the fan hub to run up against the rear end of the housing extension and will result in seizure of the assembly.

NOTE Reservoil bushes as used in the water pump assembly must not in any circumstances be opened out. When fitting they should be pressed into position using the following fitting pins:

	Diameter
Water Pump Bearing	0·620-in. (15·75 mm.)
Fan Bearing	0·500-in. (12.70 mm.)

Item 88. Oil Pump Dismantling

Remove pump cover and filter assembly. Disconnect delivery pipe at union. Allow the gear to drop from the idler spindle.

Remove the drive spindle circlip, and, using a soft drift through the oil delivery hole, gently tap the drive gear off the spindle.

Remove the Woodruff key and draw the drive spindle out of the body.

Drift out the idler spindle, taking care not to damage the jet.

To dismantle the release valve, withdraw the split pin at the rear of the valve, and remove the retainer, spring and piston.

Item 89. Oil Pump Re-assembly

Reverse the operations detailed in Item 88, fitting the gears with the chamfered end of the bores at the lower end of the spindles.

It is recommended that before refitting the cover and filter assembly, compressed air is blown through the oil intake to ensure that any dirt which may be lodged in the filter is removed.

It should be noted that no release valve adjustment is provided, but the spring should be checked for signs of fatigue, against the following test data:

Free length: 2·00-in. (50·8 mm.)

Load at $1\frac{3}{16}$-in. (30·1 mm.) length: 8½ – 9 lbs. (3·856 – 4·082 kgs.)

Rate: 10·75 lbs. per inch. (191·97 grammes per mm.)

Item 90. Hydraulic Tappet Service

Information on tappet service may also be obtained from the Lockheed tappet instruction book.

The tappets operate through a supply of clean oil from the pressure lubricating system, therefore, they will not operate correctly if the oil is dirty, or if the oil level too low; carbon forming on the tappet will also cause faulty operation. The tappet itself may cause inefficient operation by too rapid leakage between the plunger and the cylinder wall, dirty or damaged ball valve, badly worn or damaged tappet face.

The most important factor in the servicing of the tappets is cleanliness. The working surfaces should be thoroughly cleaned to disperse dirt, oil, metallic particles and other foreign matter. The tappet parts should be thoroughly cleaned, not only at that

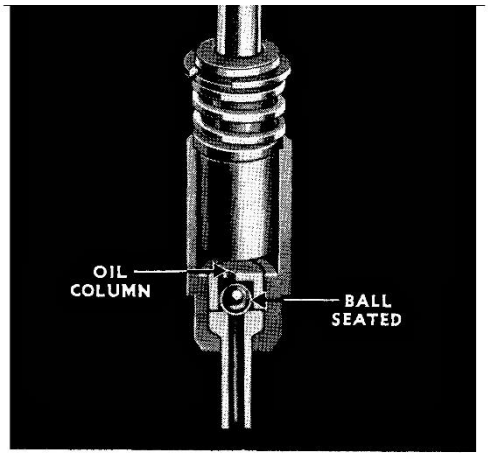


Figure 11.—Hydraulic Tappet Operation (1)

time in the servicing operation which is set aside for it, but at any time when the presence of dirt is suspected.

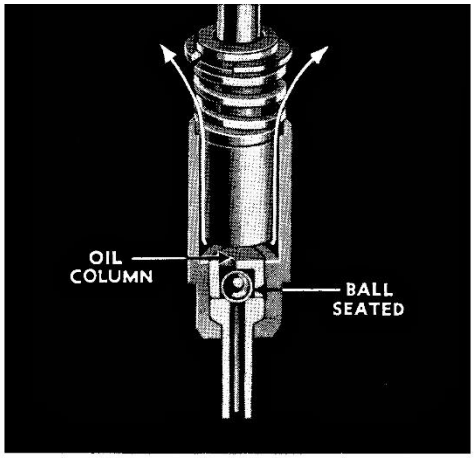


Figure 12. – Hydraulic Tappet Operation (2)

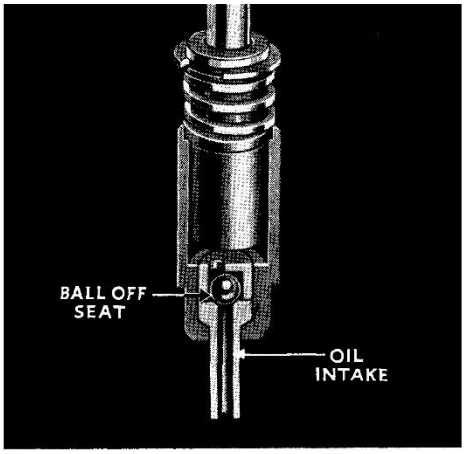


Figure 13. – Hydraulic Tappet Operation (3)

Equipment Required – Make sure that you are equipped with the proper tools and materials before you start. There are only a few items, but each has a definite use. If it is available at the time you need it, your job will be much easier.

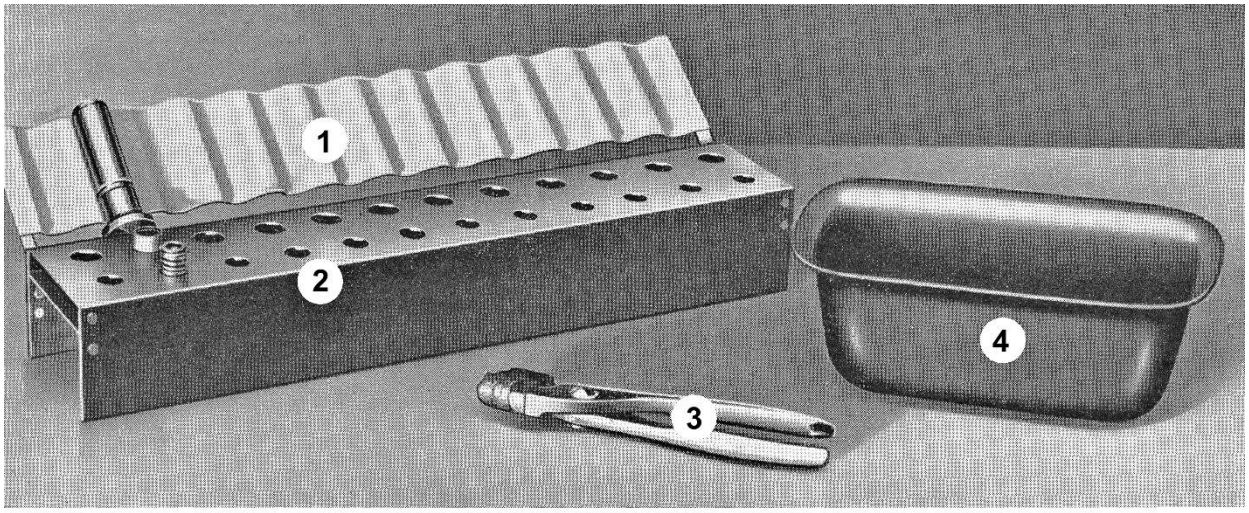


Figure 14. – Tappet Service Equipment.

1. Inclined rack with separate compartments to hold each tappet as it is removed from the engine.
2. The second rack is provided with holes to accommodate the separate parts of the hydraulic unit so that no interchange between plungers and cylinders will take place.
3. A pair of pliers with the jaws taped to avoid metal-to-metal contact with the surfaces of the plunger.
4. Pan for cleaning solution.

Cleaning – Clean each part thoroughly, even though they have received a preliminary cleaning when removed from the engine. They should be cleaned separately so that no possible trace of foreign matter can remain.

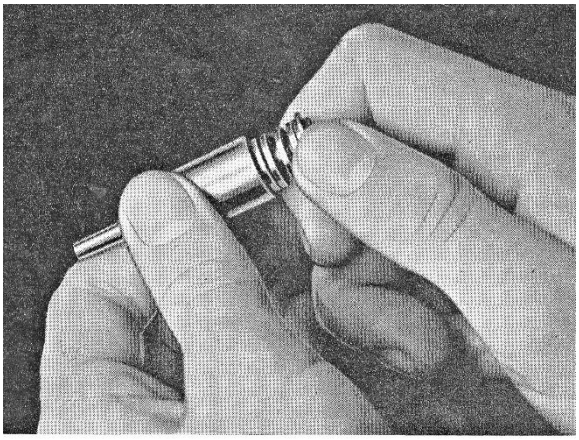


Figure 15. – Plunger Removal.

Dismantling – Remove the plunger from the cylinder by twisting the plunger and the spring in the direction that would ‘wind up’ the spring, pulling outwards at the same time (*Figure 15*). If the plunger does not come away easily from the cylinder, in rare cases it may be stuck. If it seems to be stuck it may be due to carbon forming at the shoulder of the cylinder above the plunger (see *Figure 16*). If the oil chamber is still filled with oil, sealed by the ball

valve, the plunger will be held rigidly against the carbon ring, and with oil trapped under the plunger will give the impression that it is stuck.

Testing – To determine whether the plunger is stuck, insert a length of soft wire through the oil hole in the side of the chamber, so that it enters the oil inlet of the cylinders, this will de-seat the ball valve and allow the trapped oil to drain away.

If the plunger can now be pressed down, it is not stuck but is held in the cylinder by the carbon deposit. Soak the assembly in clean paraffin, and if necessary, use taped pliers to withdraw the plunger (see *Figure 17*).

The plunger and the cylinder are selectively fitted and the plunger from one cylinder cannot be used in another cylinder. In servicing a tappet, should it be necessary to discard a plunger or a cylinder a new pair will be required. When separated, use the rack illustrated in *Figure 14* to keep the parts of each unit together.

Checking the Leak Down Rate – The leak-down rate means the rate at which oil escapes between the cylinder wall and the plunger. The leak-down may increase due to wear and can be checked as follows:

Make sure there is no lubricating oil on the cylinder wall or plunger. Hold the cylinder in an upright position and enter the plunger into the cylinder. Depress the plunger by means of a finger and release quickly (see *Figure 18*). The plunger is now operating against air instead of oil and this air is trapped by the ball valve and the close fit of the plunger in the cylinder. It should yield slightly to the pressure of the finger on the plunger, but the plunger should kick back upon release of the pressure. If it does not kick back it is due to one of the following conditions (see *Figure 19*).

(i) Air is escaping past the ball valve because dirt is preventing the ball from seating properly.

(ii) Air is escaping past the ball valve due to a damaged ball seat.

(iii) Air is escaping because the clearance between the cylinder wall and the plunger is excessive.

The tappet assembly should be carefully washed out in clean petrol or paraffin, and if this is ineffective the unit should be replaced.

It is most important that the hydraulic unit is held firmly in the cylinder by the pressed cap. No end movement or rotation being permissible.

Re-assembly – Insert the plunger in the cylinder. Both parts must be free of lubricating oil if the tappet is being installed in the engine immediately. If the unit is to be installed at a later date, the parts should be given a light film of oil to prevent corrosion. Push the plunger into the cylinder and twist the spring and plunger in the direction that 'winds up' the spring, so that it engages in the groove in the top of the cylinder.

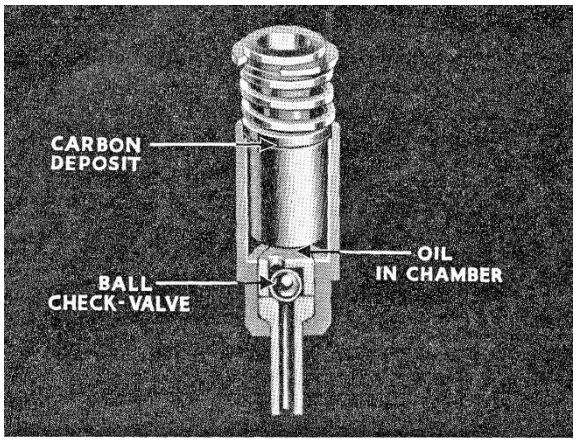


Figure 16.—Tappet Failure Due to Carbon.

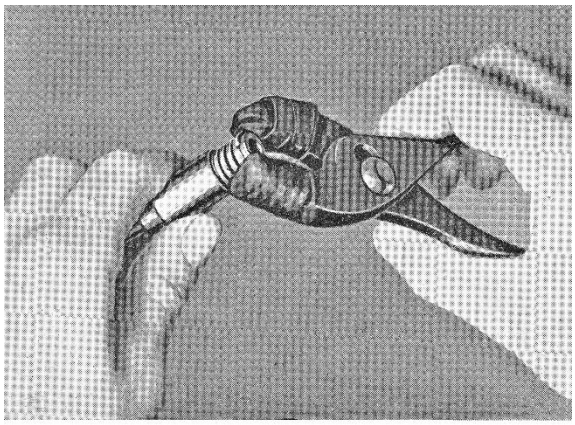


Figure 17.—Removing Seized Plunger.

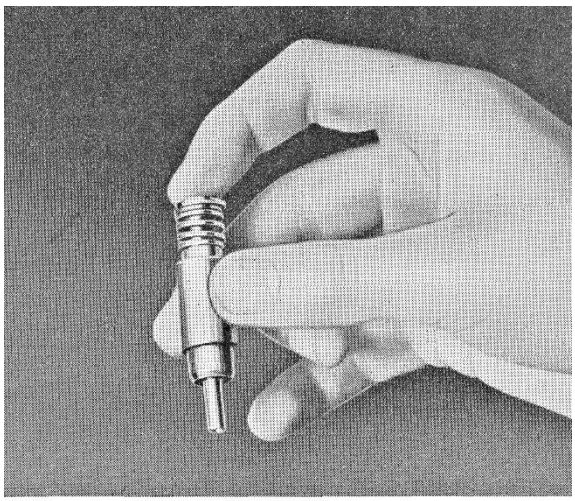


Figure 18.—Testing Plunger.

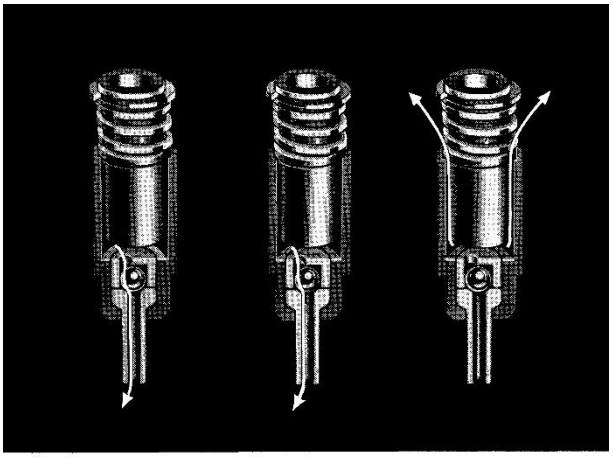


Figure 19.—Possible Tappet Faults.

91. Crankshaft Regrinding

When regrinding it may be found that the rear oil seal has cut a track in the surface of the flywheel spigot. This should be built up and the spigot then ground back to the standard diameter:

3·000 – 2·999-in.

It is of course vitally important that this diameter is accurately concentric with the main bearings and with the hole for the spigot bearing.

Crankshafts should be reground to the following undersizes :

	Main Journals	
First Regrind	2·245 – 2·244-in.	57·020 – 56·990 mm.
Second Regrind	2·240 – 2·239-in.	56·895 – 56·870 mm.
Third Regrind	2·230 – 2·229-in.	56·640 – 56·620 mm.
	Big End Journals	
First Regrind	1·990 – 1·989-in.	50·550 – 50·520 mm.
Second Regrind	1·980 – 1·979-in.	50·290 – 50·270 mm.
Third Regrind	1·970 – 1·969-in.	50·040 – 50·010 mm.
Fourth Regrind	1·960 – 1·959-in.	49·790 – 49·760 mm.

92. Cylinder Liner Boring

Cylinder liners should be rebored and honed, mirror finish, to the following oversizes, as necessary:

First + 0·010-in. (0·508 mm.)

Second + 0·020-in. (0·762 mm.)

Third + 0·030-in. (1·016 mm.)

Replacement liners, complete with pistons, gudgeon pins, rings, and liner seal can be supplied on a service exchange basis.

93. Rocker Shaft Assembly Service

To dismantle the rocker shaft assembly, remove the circlips, washers and short springs, and slide the exhaust rocker, pedestal, inlet rocker, and long spring from each end of the shaft. The oil pipe assembly can now be pressed off the shaft if necessary.

The bronze bushed rockers should slide freely on the rocker shaft without play. When pressing in replacement bushes, position these so that the oil hole in the bush is accurately aligned with the drilling in the rocker through which oil is fed to the push rod cup.

To re-assemble the rocker shaft press the oil pipe on to the shaft, positioned so that the oil-way in the pipe union aligns accurately with the inlet oil holes in the centre of the shaft, and so that each outlet oil hole is on the thrust side (i.e., on the cylinder head side of the assembly, the centreline of the oil hole to be at 90° to the cylinder head face).

Fit the long springs on each side of the oil pipe union, and fit the inlet rockers, the pedestals and the exhaust rockers, in that order. Fit the short springs and the steel washers, and secure at each end with circlips.

It will be noted that inlet and exhaust rockers are not interchangeable, the angle of the inlet rockers being 12° 20’ from vertical, and the exhaust rockers 18°. Rockers can be identified by the position of the push rod arm of the rocker, in relation to the centre hub. On the exhaust rocker this arm is at the inner end of the hub, while the arm on the inlet rocker is approximately central. The rockers also differ between left hand and right hand, the inclination of the rocker arms being towards the centre of the shaft in each case.

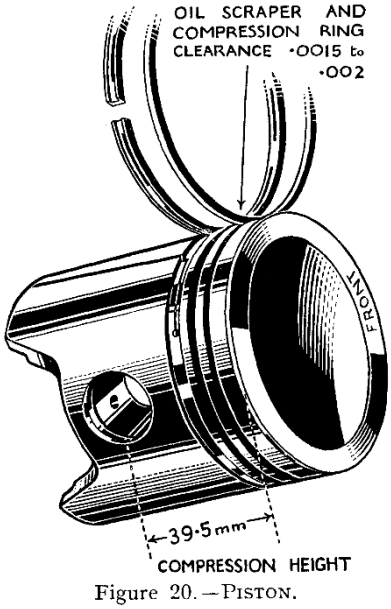


Figure 20.—Piston.

94. Engine – Assembly

The following parts should be replaced when re-assembling the engine unit.

The general routine for dismantling detailed in Item 85, should be reversed for re-assembly, but special attention should be given to the following points:

Assembling Cylinder Block Sections

Dowels are used to secure the front and centre main bearings into both cylinder blocks, but for the rear main bearing only the right hand block is dowelled.

Before assembling the two sections, fit the internal balance pipe, with rubber seals, into position in the left hand section, and also fit the two centre tie bolts into the left hand section. Place the left hand section, with the cylinder head face downward, on a clean bench, with the lower of the two bolts protruding. Make sure that the crankcase locating dowels are in position. Check that the oilways in the crankcase are accurately aligned with the oil drillings in the bearings, and fit the crankshaft.

Apply a light smear of gasket cement to the upper edge of the cylinder block faces, where the blocks are held together with 5 bolts.

Fit the two halves together, making sure that the internal balance pipe fits snugly into both sections, that the rubber seals are not distorted, and that the sections locate on the dowels.

Make sure that the crankshaft web, to rear of No. 2 journal, does not make contact with the internal balance pipe (Part No. 50628) as the crankshaft is rotated. Should there be contact then the pipe will require a flat on one side.

Gaskets And Seals

50643	Cylinder Liner Sealing Washers	4
50829	Balance Pipe Seals	2
50767	Sump Gasket	1
50698	Timing Case Cover Gasket	1
50692	Timing Case Rear Cover Gasket	1
50738	Cylinder Head Gasket	2
52192	Water Seal Rubber Washer	2
52708	Water Transfer Seals	4
50743	Tappet Cover Gasket	2
50876	Oil filter Housing Gasket	1
50881	Carburettor Flange Gasket	4
50867	Exhaust Gasket Long	2
50868	Exhaust Gasket Short	2
52027	Exhaust Flange Gasket	3
50687	Oil Pipe Elbow Washer	1
50833	Petrol Pump Flange Gasket	1
52162	Rocker Oil Feed Banjo Washers	4

Tab Washers And Lock Washers

50654	Connecting Rod Tab Washers	8
50663	Chainwheel Tab Washer	1
50700	Starting Dog Tab Washer	1

It may also be necessary to replace the following parts, which should be readily available when re-assembly is commenced.

50869	Rocker Cover Gasket	2
52055	Rocker Cover Grommet	4
52164	Self Locking Nut	4

The following parts will also be required if the components concerned have been dismantled.

52386	Oil Pump Paper Packing	1
50688	Union Fibre Washers	2
50853	Water Pump Gasket	1

Bolt up the two centre tie bolts, fit and bolt up the remaining tie bolts, and the 5 bolts along the top of the cylinder blocks. Tighten the tie bolts until a Torque wrench reading of 900 lb. in. (75 lb. ft.) is obtained.

Balance Pipe Seal

This seal is made by the two rubber rings fitted against collars at each end of the internal balance pipe, between the balance pipes in each of the cylinder block sections, and also by the mating of the outer ends of the balance pipes against the cylinder head gaskets. It is essential that the peened over ends of the balance pipes are slightly proud of the cylinder block faces, and that the surface presented by the peening is absolutely flat and even.

As failure of the balance pipe seal will lead to heavy oil consumption, resulting from suction through the balance pipe into the induction ports, it is essential that the seal is checked immediately after the cylinder block sections have been bolted together. A suggested method of testing the seals, using simple apparatus is illustrated in *Figure 21*, Page 13. The seals should hold 20 lbs. vacuum for 10 minutes.

Piston and Connecting Rod Assembly – The connecting rods and caps are normally supplied in sets, each set balanced axially and by weight.

Single rods should only be fitted in an emergency and should this be necessary the new rod should be balanced with the existing rods, both axially and by dead weight, within limits of 1·5 grammes, adjust-ment being made by removing metal from web of the connecting rod cap or from the outer surface of the small end.

Connecting rod caps are marked for fitting to the rods, and must be fitted so that the markings correspond. (*with unique two-letter codes*)

Before fitting the piston to the rod it is es-sential that the rod is very carefully checked for alignment and twist. In the absence of special connecting rod alignment equipment, the following method of making this check will be found satisfactory (*Figure 22*).

A surface plate, V blocks, a clock indicator, a mandrel which is a good fit on the big end, and a snug fitting pin, are required.

Fit the gudgeon pin and the mandrel to the rod, place the mandrel into the V blocks on the surface plate, and set the rod vertically. Mount the dial indicator on the scribing block and take readings on either side of the small end. The readings taken on the end of the gudgeon pin must be within limits of 0·001-in. (0·025 mm.).

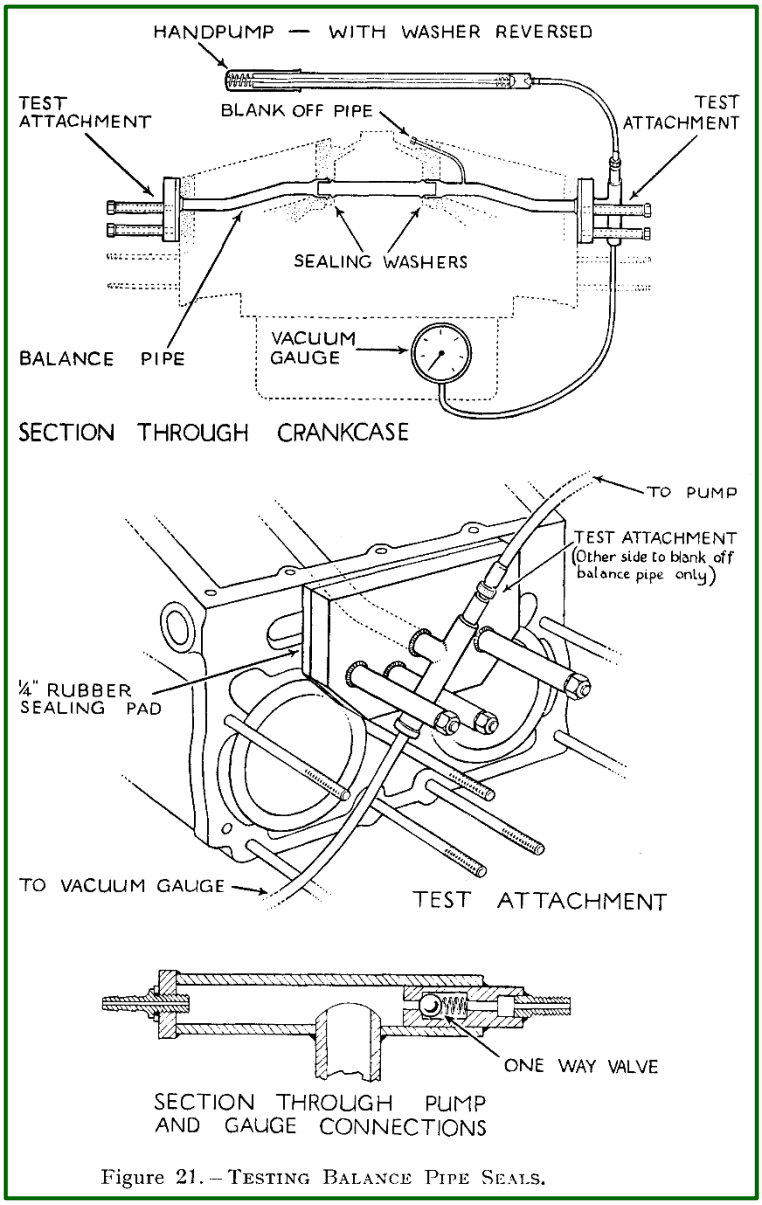


Figure 21. – Testing Balance Pipe Seals.

To check the rod for twist, lower it on its V block to the horizontal position, and take further readings. No twist is permitted, and if any variation is found this should be corrected by setting the rod.

If new pistons and liners are to be fitted, check that the dimension markings on the pistons and liners correspond. Liners are marked on the top flange face, and pistons on the crown, with the letters A or B, and it is most important that A pistons are fitted to A liners, and B pistons to B liners only. It should also be noted that pistons are marked 'front'. Connecting rods must be fitted to pistons so that when assembled in the engine the connecting rod caps will fit on the underside of the journals and the 'front' marking on the pistons is to the front of the engine.

Connecting rod bolts should be tightened using a Torque wrench set at 400 lb. in. (35 lb. ft).

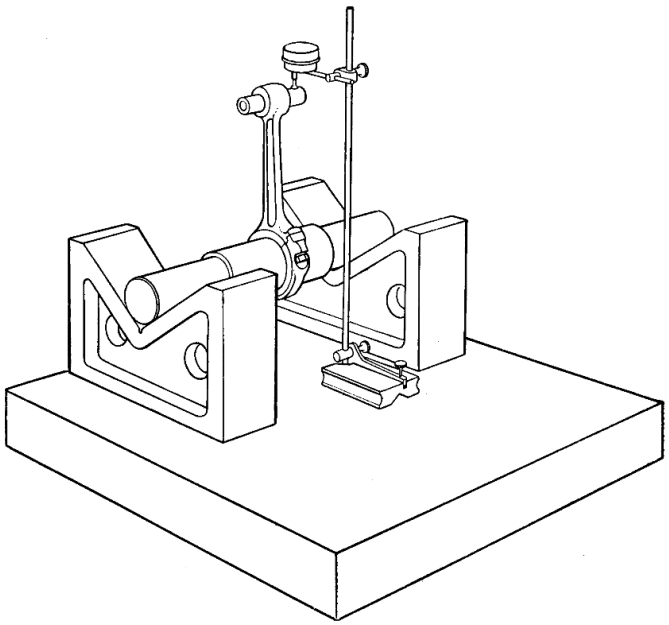


Figure 22. – Connecting Rod Alignment.

Cylinder Liner Assembly – Fit new liner sealing washers, before fitting the liners into the cylinder block. Liners, which are a push fit into the block, should be installed so that the flats on the sealing

flange register with the parallel sides of the locating plate. The two liners and the locating plate must be fed in together as the plate will not pass the top flanges on the liners once they are in position in the block. If at any time one liner only is removed or refitted the stud should be withdrawn from the crankcase so that the locating plate can be removed and refitted.

It is most important that with the liner hard home, the outer flange stands 0·008 – 0·010-in. (0·18 – 0·20 mm.) proud of the cylinder block faces, so that the liners are held in position by the cylinder heads. Should it be found that a liner does not stand proud of the block face, copper packing shims should be fitted between the sealing flange on the liner and the sealing washer, to the required 0·008 – 0·010-in. (0·18 – 0·20 mm.) stand out.

NOTE: Currently cylinder liners are seated on copper spacer washers, with shims added to set the revised stand out to 0·006 – 0·008-in. (0·152 – 0·203 mm.), should the crankcase be in sound condition, the stand out can be reduced 0·002-in. (0·051 mm.).

Check on Crankshaft Fitting – At this stage it is advisable to check the fitting of the bearings and connecting rods, by turning over the crankshaft using a dummy starting handle. The crank should turn over easily and evenly. Any evidence of excessive drag, or tightness should be corrected, before further assembly takes place. (Pay particular attention to the bearing clearances, shown in Group 1, Item 5).

NOTE: At some point in the engine's production life, a change was introduced at the connecting rod journals, whereby the ground radius at each end of each journal was increased to 0·100-in. There was an instruction to increase the counter-sink at both sides of the connecting rod big end bore. Those connecting rods with serrated big end cap faces should not require this instruction.

Clutch Housing Assembly – The crankshaft rear oil seal which is pressed into the front face of the clutch housing can be replaced as necessary. Gently warming the housing may be found helpful when pressing in a replacement seal.

When refitting the clutch housing to the cylinder block sections the two faces must be perfectly clean and free from distortion and should be sealed with a slight smear of gasket cement. Particular care must be taken to avoid damage to the lip of the oil seal, which should be led gently over the crankshaft spigot.

It is most important that the bolts securing the housing to the cylinder block sections are tightened down evenly, by diagonal selection. If a replacement housing is fitted the recess in the rear face of the housing into which the clutch shaft cover fits, must be line-reamed to 3·503 – 3·500-in. (88·9752 – 88·899 mm.) so that the clutch shaft spigot is accurately aligned with the crankshaft spigot bearing. A special mandrel and reamer (Jowett Tool No. 4493A) can be made available if necessary.

Flywheel Assembly – The flywheel dowel, the chamfered end of which is fitted into the crank, should be an interference fit in the crankshaft drilling, and a good fit in the flywheel. The fit of the flywheel can be conveniently checked before fitting the clutch housing, as detailed above.

The crankshaft spigot should be clean and free from burrs, and should fit snugly into the recess in the flywheel. Particular attention should be given to the rear face of the crankshaft and to the face of the recess in the flywheel, the depth of which should be ⅛-in. (3 mm.). These faces must not be damaged in any way and action must be taken to rectify any injury before finally fitting the flywheel. The securing setscrews are $^{7}/_{16}$-in. B.S.F., but on some early cars ⅜-in. B.S.F. setscrews were fitted. These should be modified to $^{7}/_{16}$-in. The setscrews must be tightened down evenly over shakeproof washers by diagonal selection, using a Torque wrench loaded to 720 lb. in. (60 lb. ft.).

The maximum permissible run out for the flywheel rear face is 0·003-in. (0·076 mm.), this may be checked using a dial indicator mounted on the clutch housing. Should the limit be exceeded it is probable that dirt or burrs are preventing the even seating of the flywheel on the crank spigot.

Service ring gears, specially heat treated, and ready for shrinking on the flywheel, can be supplied.

To remove the existing gear, split with a cold chisel, taking care to avoid damage to the machined face of the flywheel. Heat the replacement evenly to a temperature of 260 – 320 °C. (colour changing from deep straw to purple) and maintain this temperature for two minutes. Drop the gear into position on the flywheel, with the chamfered side of the teeth downward, tapping with a copper hammer if necessary, and allow to cool in the air.

Note: It is most important that the flywheel ring is not heated to more than 320 °C. as the temper will be affected if this occurs.

If no temperature gauge is available, a sensitised pencil, for the correct temperature range, can be supplied with the ring.

Camshaft, Oil Pump and Front Cover Assembly – Turn the crankshaft so that the T.D.C. 1 and 2 marking on the flywheel is approximately at T.D.C., fit the key to the spigot on the crankshaft and fit the oil pump drive gear (centre boss forward). Fit the oil pump assembly, locating on bushed dowels, and positioning the drive spindle so that the offset slot into which the distributor drive is fitted, is as illustrated in *Figure 24*.

Fit the oil pump delivery pipe, using a new elbow washer at the union with the crankcase, and fitting fibre washers above and below the banjo union at the pump.

Install the camshaft in the crankcase positioned so that, when the chainwheel is fitted the timing mark on the chainwheel is pointing vertically downward.

Fit the crankshaft chain pinion and the camshaft chainwheel into the timing chain so that the marked tooth on the chainwheel is directly facing the two pop marks on the pinion, and fit to the crankshaft and camshaft, moving the shafts as necessary so that the pinion slides easily on to the crankshaft key, and the chainwheel locates with the dowel in the camshaft. Fit and secure the chainwheel tab washer.

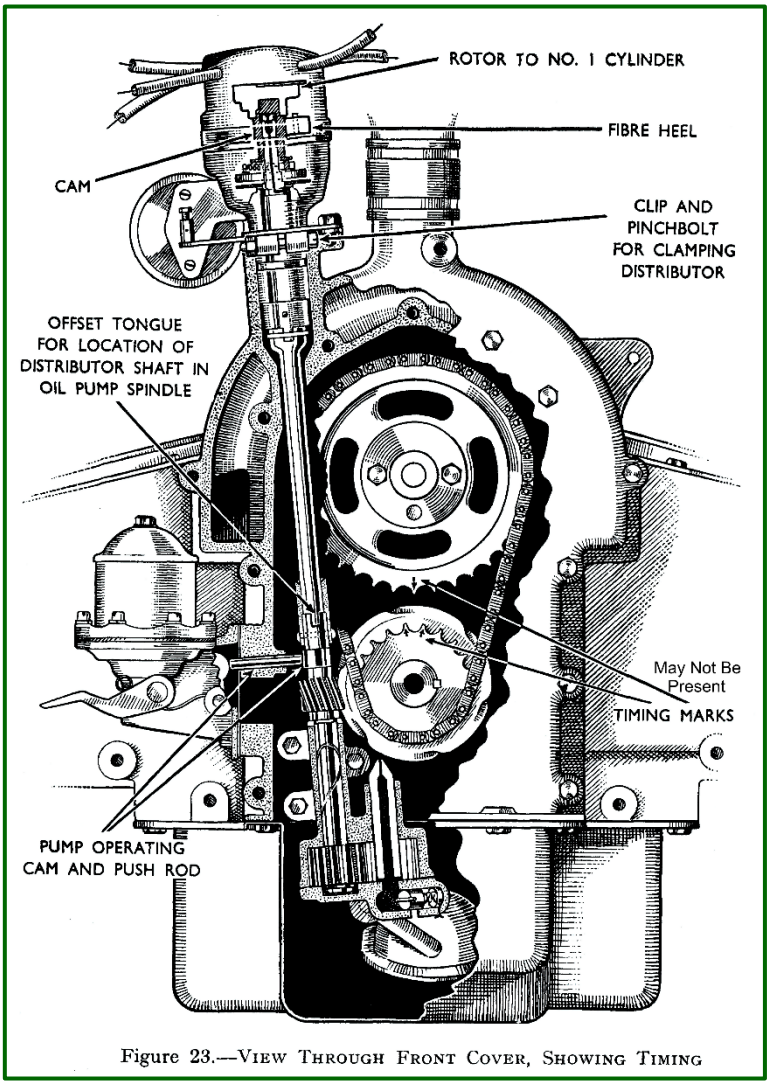
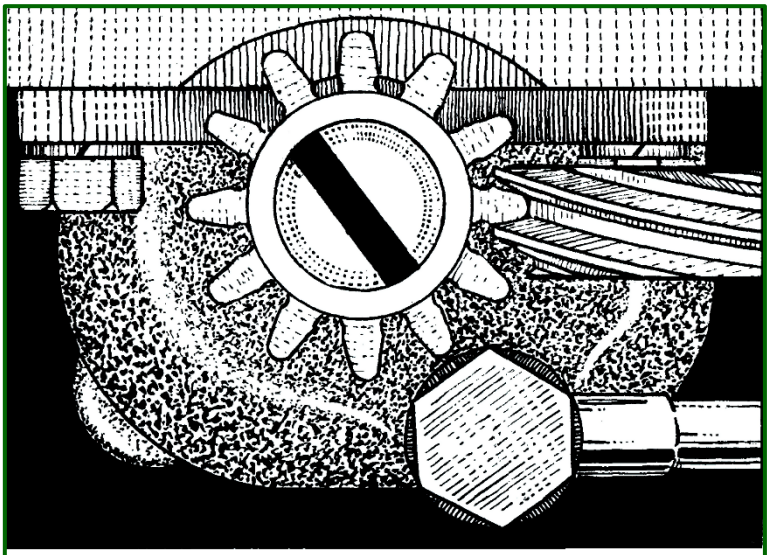


Figure 23.—View Through Front Cover, Showing Timing

NOTE: It is best practice to ignore any timing marks that appear on either chain wheel or chain pinion. The only course of action that ensures correct valve timing, is to employ a 360° timing wheel attached to the front of the crankshaft. This procedure is described on Page 18. Also, for later type camshaft, refer to Pages 25 and 26 of Part 00 Jowett Maintenance Manual in Technical Notes Series.

Fit the timing case rear cover, using a new gasket and felt seal, but do not tighten down. Fit the camshaft thrust spring and plunger, and the timing case cover, using a new gasket, and taking special care to avoid damage to the lip of the crankshaft front seal.

Start all timing case setscrews, fit the crank shaft pulley, making sure that the hub is centralised to the oil seal and sliding it very gently into the lip of the seal. Tighten all setscrews and bolts evenly, until all are dead tight, no individual screws should be tightened until all the others are almost up. If this point is not given careful attention, oil leaks, particularly from the rear cover, may result.



For Lucas DKY-H4A Distributor (Early)

Figure 24.—Oil Pump Offset Slot.

Fit the starting handle dog with a tab washer. Tighten up fully and fold over the tab washer.

Fitting Cylinder Head Assemblies – Fit the head with a slight smear of gasket cement on each side of a new gasket. Fit a rubber washer and a steel washer under head nut No. 4, and a lead washer (or a coil of fine lead wire – *or a bead of Loctite 518 Master Gasket*) under a steel washer on all other nuts.

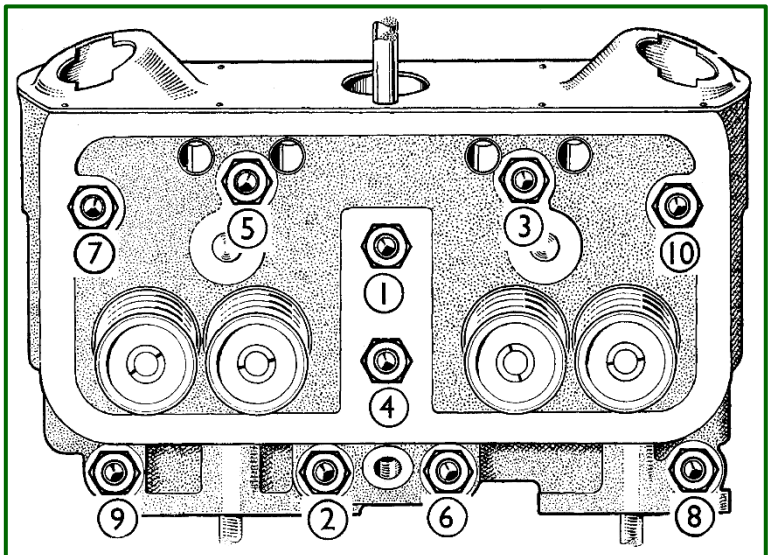


Figure 25. – Cylinder Head Tightening Order.

NOTE: Cylinder head stud No. 1 carries oil to the valve rocker gear, the stud bears on a flared copper oil feed pipe. It should not be tightened to the torque specification, due to the limited thread engagement into the crankcase. Currently, cylinder heads are tightened in three stages – 15, 25 and 35 lb. ft. At No. 4 stud, place an 'O' ring into the recess in the cylinder head, seal with Loctite 518, fit a snug fitting plain washer over the ring and place a large outer diameter plain washer over the assembly. It should be noted that the cylinder head securing nuts are thicker than standard ⅜-in. BSF nuts. All other nuts than, Nos. 1 and 4 should be fitted with close-tolerance plain washers that fit into the spot facings for Nos. 2, 6, 8, 9.

Tighten down in the order illustrated in *Figure 25*, using a Torque wrench set at 500 lb. ft, (42 lb. ft.).

Service the hydraulic tappets as outlined in Item 90, instal the tappets, which must not be a tight or slack fit in the crankcase, but must slide in easily, and turn freely with no play, fit push rods, and fit the rocker shaft assembly, with a fibre washer on each side of the oil feed banjo union.

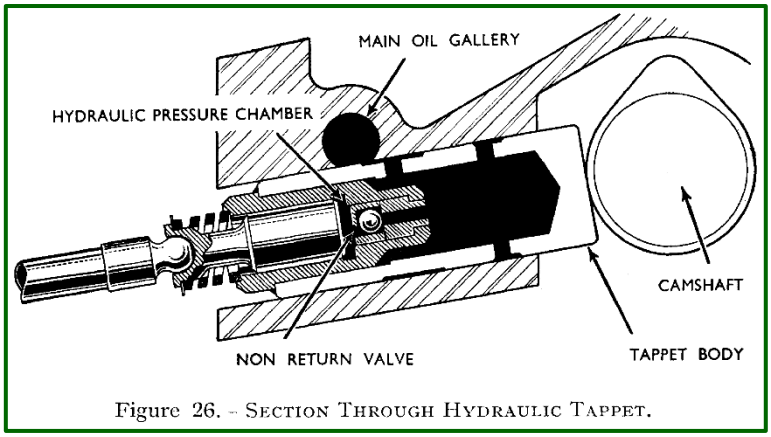


Figure 26. – Section Through Hydraulic Tappet.

With the appropriate cylinder on the firing stroke, and with the tappet piston fully home in its cylinder, (i.e., with the tappet dry of oil, and the spring fully compressed), set the push rod adjustment so that there is 0·060 – 0·090-in. (1·5 – 2·3 mm.) clearance between the rocker and the valve stem. (Refer in this connection to *Figure 3*).

Item 95. Decarbonising

The necessity for decarbonising is usually indicated by the following symptoms:

Excessive pinking, even on good quality petrol.

Overheating.

Lack of power.

The following routine for decarbonising and valve regrinding is recommended:

Drain off the cooling system, remove front road wheels, dynamo, carburettor petrol pipe, throttle controls and carburettors.

Remove rocker covers, tappet covers, and rocker assemblies, withdraw push rods and tappets, marking the rods and tappets (*use tie-on labels*) so that they can be refitted in their original positions. Remove the front exhaust pipe, and manifolds.

Remove water transfers.

The cylinder heads can now be removed. When removing the left hand cylinder head it may also be necessary to jack under the right hand side of the engine, so that the front corner of the head clears the dash side. *The cylinder liners should be clamped in place immediately after withdrawing the cylinder head, to prevent liner movement should the crankshaft be rotated.*

Valve springs are held in position by split cones and collars which can be removed once the springs are compressed.

Decarbonising and valve grinding now follows the normal procedure, with the usual precautions to prevent entry of carbon into the water passages, and into the oil drain holes at the lower corners of the heads.

Should reseating of the valve seats be necessary the angles of 30° Inlet and 45° Exhaust, must be maintained.

If replacement valve guides are to be fitted the worn guides should be pressed out of the head, and the replacements pressed into position with $^{11}/_{16}$-in. (17·5 mm.) protruding from the outer face of the head.

The hydraulic tappet Service detailed in Section 90 should invariably be carried out before refitting the tappets into the crankcase. The tappets must not be a tight or a slack fit in the crankcase bores, but must slide in easily and must turn freely, with no play. Action must be taken as necessary to ensure that these conditions are obtained. At the same time, the push rods should be examined for evidence of wear, and the rockers checked for excessive play on the shaft. Reassemble the heads to the engine as detailed in Item 94.

Finally remove and clean the sump, allow to dry in air, and clean the sump oil filter if necessary.

Note: Cloth must not be used for this purpose.

Item 96. Engine Tuning

The following points should be given attention when tuning the engine:

Contact Breaker Gap should be checked, and set at 0·010 – 0·012-in. (0·25 – 0·30 mm.).

Plug point gap should be checked and set at 0·020 – 0·025-in. (0·50 – 0·65 mm.).

The suction and centrifugal distributor advance mechanism must work perfectly freely. This point should be very carefully checked.

Ignition timing should be set at T.D.C., using a Test Lamp, subject, of course, to final adjustment on road test. With this setting, a very slight ‘pink’ will be experienced at speeds under 15 m.p.h. (24 k.p.h.) on part throttle, using 70 octane petrol, but no ‘pinking’ should occur on full throttle. On higher octane rating or high quality fuel, the ‘pinking’ should be considerably reduced. Should full throttle ‘pinking’ be experienced the ignition timing should be retarded slightly.

On cars before Engine No. D8/PA/1753, to which the original 30 VM 4 carburettors were fitted, Ignition Timing should be set at ⅝-in. (16 mm.) A.T.D.C., and then advanced as far as possible up to T.D.C., until ‘pinking’ occurs, as detailed above.

The petrol pump pressure should not exceed 2½ lbs. per sq. inch. If no proprietary test equipment is available this can be checked using a column gauge. The correct pressure will lift a column of petrol 5-ft. 6-in. (1·675 metres).

The carburettor throttle valves must be perfectly synchronised. To check this, withdraw both stop screws, close both throttles, and set the throttle rod so that there is no tension on the spring couplings.

Both choke *(strangler)* controls must close to the fullest extent, and both choke levers must return to the fully ‘off’ position, when released.

Throttle stop screws should be set at approximately a half turn open. Any further opening will allow the progression hole to ‘peep’ causing fade out on slow running.

The choke to throttle interconnection must be adjusted so that the engine runs at approximately 1,000 R.P.M. with the throttle levers clear of the stop screws by about $^{1}/_{16}$-in. (1·5 mm.).

With the engine temperature at 75 °C, the air screws should be adjusted so that the best mixture is obtained at the smallest possible throttle opening, without making the engine ‘hunt’. (The position of the air screws is approximately one and a half turns open, subject to the above conditions).

Should there be any reason to suspect that the valve timing is incorrectly set, the following quick check can be made.

Remove left hand front road wheel, and rocker cover. Fit a suitable pointer to a convenient stud in the timing case cover, so that the point is immediately over the edge of the crankshaft pulley, see *Figure 27*. Turn the crankshaft to T.D.C. 1 and 2, and mark off the position of the pointer on the edge

of the pulley. *A strip of masking tape can be marked with a ball-point pen.* Turn the crankshaft until the marking on the pulley shows roughly 30° before T.D.C.

Mount a dial indicator on the push rod arm of No. 1 cylinder inlet rocker (left hand) place a screw-driver or similar wedge tool between the rocker and the valve so that all free play in the valve train is taken up and all oil is drained from the hydraulic tappet. The dial indicator will, of course, stop moving as soon as the tappet piston is fully home in its cylinder, with the valve just off its seat.

For solid tappets, wedge a feeler gauge that is a snug fit, and does not fall out during timing check, when the tappet is against the heel of the cam.

Now turn the crankshaft steadily until the valve begins to lift, as shown by movement on the dial indicator and stop turning when the indicator shows 0·002-in. (0·05 mm.) lift. Now measure the distance round the periphery of the pulley from the pointer to the T.D.C. mark on the pulley. If valve timing is correctly set at 12° before T.D.C. this dimension will be ½-in. (12·7 mm.), but up to ⅛-in. (3·175 mm.) tolerance, either late or early, can be allowed. This tolerance represents a maximum variation in valve timing of plus or minus 3°.

A quick check of rocker clearances, without dismantling, can be made by removing the rocker covers, and draining each tappet in the manner described for the valve timing check, i.e., by inserting a wedge between the rocker arm and the valve stem and draining all oil out of the tappet.

The rocker clearances can then be checked and should be reset if necessary to 0·060 – 0·090-in. (1·5 – 2·3 mm.). Note that pressure on the push rod-and tappet should be maintained throughout the check. This can be done by holding the push rod arm of the rocker, in with the thumb when checking and setting the clearance.

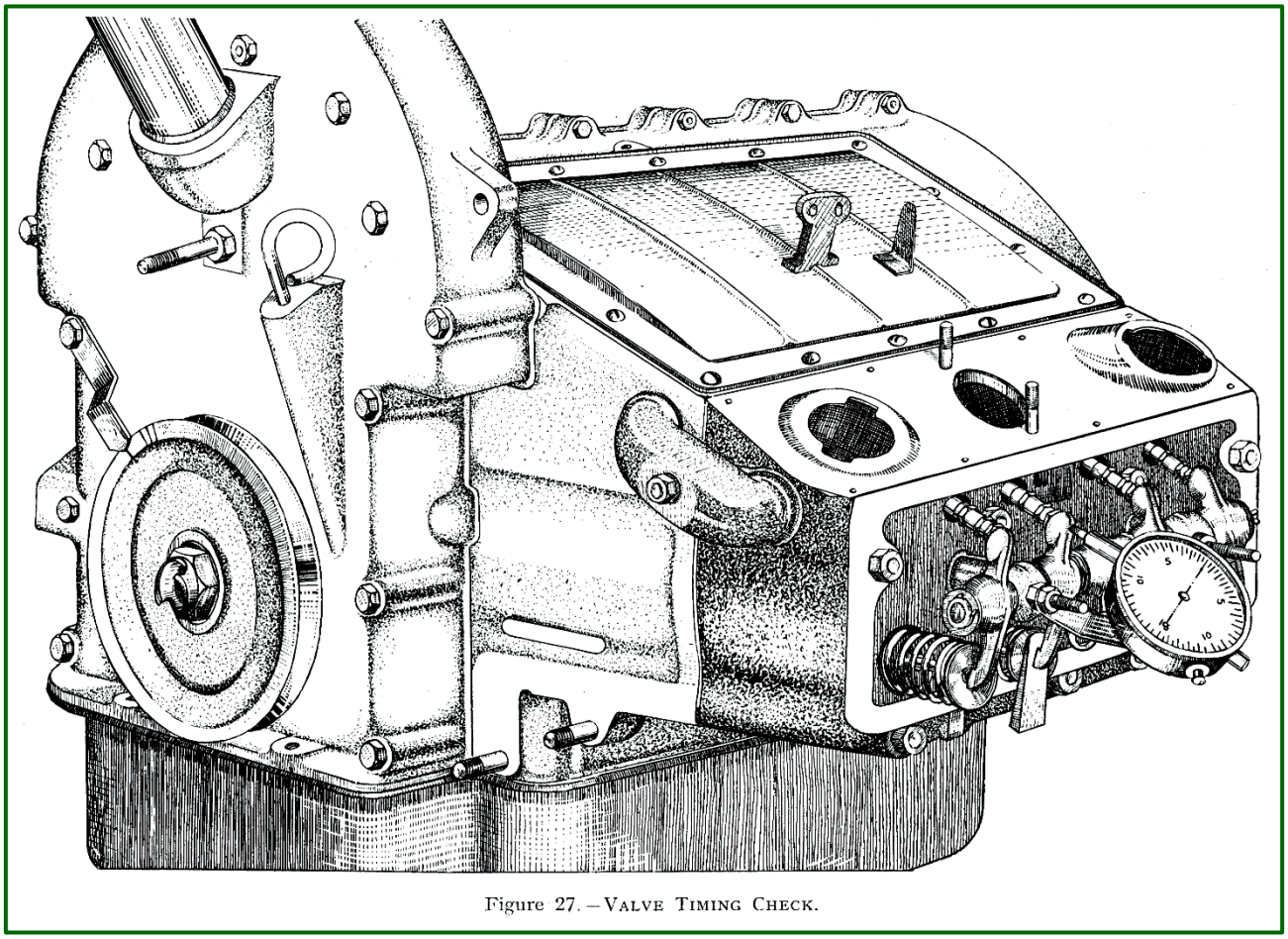


Figure 27. – Valve Timing Check.

Item 97. Engine Test Data

Valve Timing	Inlet Opens 12° B.T.D.C.	
Ignition Timing (Static)	⅝-in. (16 mm.) A.T.D.C. (on Flywheel) to T.D.C.	
C.B. Points Gap	0·010 – 0·012-in	(0·25 – 0·30 mm.)
Advance Range	18° – 22° on Crank	
Plug Point Gap	0·020 – 0·025-in.	(0·50 – 0·65 mm.)
Valve Lift – Inlet and Exhaust	0·315-in.	(8·001 mm.)
Valve Springs:		
Free Length – Inner	1·395-in.	(49·15 mm.)
Free Length – Outer	2·022-in.	(51·36 mm.)
Oil Pump:		
Speed	½ Crankshaft	
Capacity	3 gals. per min. at 2,000 R.P.M. (Pump) at 72 °C. Inlet Temp.	
Oil Pressure	50 lbs. per sq. inch (Controlled by Release Valve)	
Pressure Switch	Breaks contact at 8 lbs. per sq. inch.	
Oil Leak Rate From Rockers	60 Drops per Minute (Maximum)	
Performance:		
At 1,000 R.P.M.	12·5 B.H.P	
At 2,000 R.P.M.	28 B.H.P.	
Performance:		
At 3,000 R.P.M.	42 B.H.P.	
At 4,500 R.P.M.	52·5 B.H.P.	
Maximum Torque	76 lb. ft. at 2,600 R.P.M.	

Item 98. Special Service Points

A. One of the following may cause heavy oil consumption, if not watched carefully when assembling the engine.

Use only Hepolite 9620 pistons, ‘Vacrom’ top compression rings, (with the face marked ‘top’ to the crown of the pistons), and second compression and oil scraper rings with ‘lapped in’ side faces.

Grade marks on Liners and pistons must correspond.

Always check the balance pipe seals, immediately after assembling the cylinder block sections.

Make sure that the oil flow from the rocker shaft does not exceed 60 drops per minute, and that the drain holes in the lower corners of the cylinder heads are clear.

B. Lack of attention to the following may cause oil pressure failure:

The sump oil filter must be clear of the sump bottom. Sump should be inspected for damage, cleaned in paraffin and allowed to dry in air, not with a cloth, before fitting.

Delivery pipe joints at pump and crankcase must be pressure tight.

Full flow oil filter must be seated correctly on timing case rear cover, and the filter drain screw must be tightened fully before running the engine.

C. Difficulty in starting may be caused by:

Chokes not closing fully.

Petrol feed blocked.

Carburettors flooding (needle valve sticking).

Faulty or dirty sparking plugs, points out of adjustment.

Faulty high tension leads, or suppressors, if a radio is fitted.

Faulty or dirty distributor C.B. points, points out of adjustment.

Faulty distributor, cracked cap, or faulty condensor.

Advance weights jammed.

Coil to distributor L.T. lead, broken or loose. *Poor quality earth connection between distributor body and engine front timing cover – along with a poor quality earth strap connection at the starter motor mount bolt.*

Faulty coil.

Air leaks at carburettor induction joints, or in joints in breather pipe.

Sticking valves.

D. Lack of power can be caused by the faults mentioned under ‘C’, and by:

Distributor suction control faulty.

Decarbonising necessary.

Brakes or wheel bearings binding.

E. ‘Fading’ at low engine speeds due to petrol starvation may be found to result from blockage of the felt pads in the tappet covers. This blockage has the effect of increasing the crankcase depression to such an extent that the petrol pump diaphragm is held down.

Should this ‘fading’ occur, the first action should be to check the petrol level in the carburettor bowls. If these are empty the crankcase depression should be checked and if a reading of more than 10-in. (25 cm.), of water on slow running, is recorded, the felt pads should be cleaned or replaced if necessary.

F. The following special points must be given careful attention:

Make sure that the oil pressure switch does not foul the petrol pipeline.

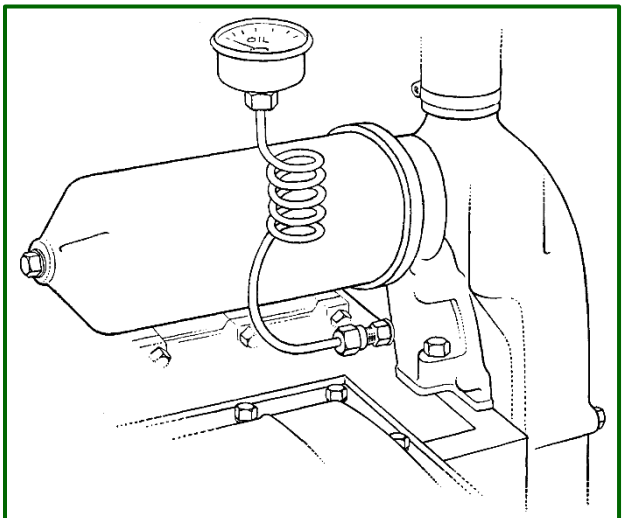


Figure 28.—Testing Oil Pressure.

When fitting the starting dog, tighten down *fully*, and make sure that the thread of the dog is not bottoming in the crankshaft drilling. This dog prevents end movement on the chain pinion and the oil pump drive gear, and also completes the front timing case oil seal.

Make sure that each tappet is fully collapsed and that the crankshaft is at T.D.C. for the appropriate cylinder, before attempting to check or adjust the rocker clearance.

Always fit packing washers as necessary between the rear engine mounting housing and bracket. Over-compression or under-compression of the rubbers can cause engine vibration, and roughness.

Never try to ‘hand fit’ main or big end bearing shells.

Make sure that the fan pulley is correctly aligned with the crankshaft and dynamo pulleys.

SECTION 11. **CLUTCH**

Item 99. Dismantling

Remove the engine from the chassis, remove the Housing base cover, and detach the gear box from the Flywheel housing. Remove the clutch shaft cover, the operating lever and the throwout bearing.

Mark the Clutch cover plate and the Flywheel together so that the Clutch Assembly can be refitted in its original position when reassembling.

Release the Setscrews securing the clutch assembly to the Flywheel by diagonal selection and withdraw the clutch through the bottom of the housing.

Mark the clutch cover, the lugs on the pressure plate, and the release levers, so that they can be reassembled in their original positions.

Before proceeding further refer to *Figure 29*.

Place the Clutch cover assembly on the bed of a press with the pressure plate (2) resting on blocks, so arranged that the cover is free to move downwards when pressure is applied. Place a block of wood across the cover, resting on the spring bosses, and compress the cover by means of the ram. While under compression, shear away the peening by exerting sufficient pressure on the nuts (9) and remove the nuts. Slowly release the pressure to prevent the thrust springs from flying out.

Remove each release lever (5) by holding the lever and the eyebolt (7) between the fingers and thumbs so that the inner end of the lever and the threaded end of the eyebolt are as close together as possible, keeping the eyebolt pin (6) in position in the lever. Lift the strut (10) over the ridge on the lever, and remove the eyebolt from the pressure plate.

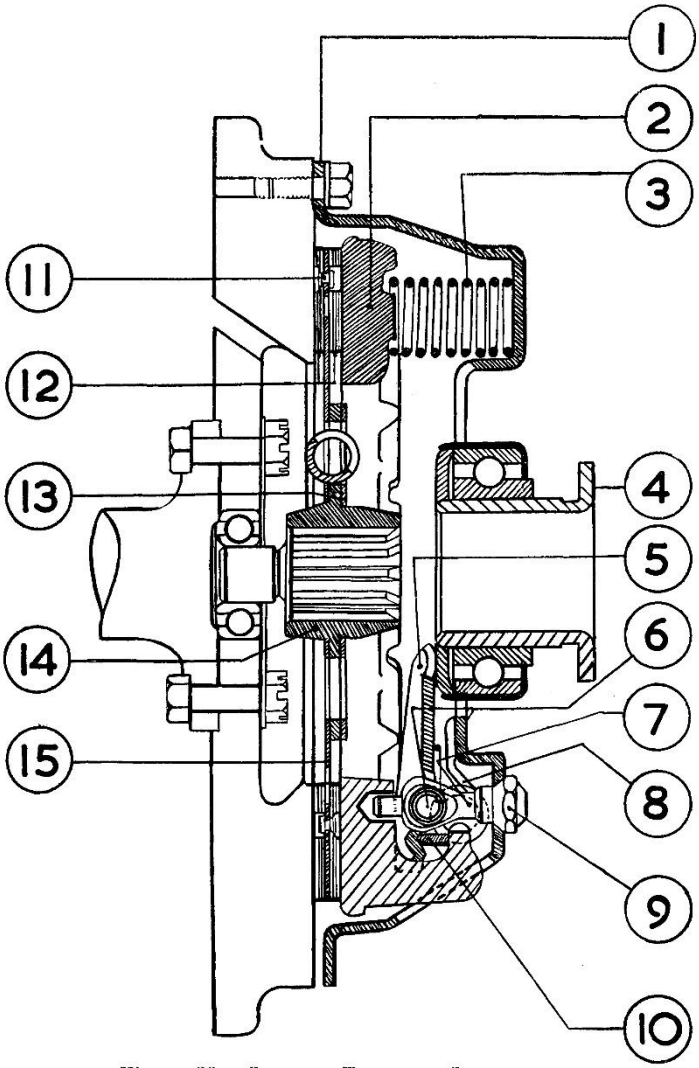


Figure 29.—Section Through Clutch

Item 100. Reconditioning the Friction Plate

When removing the old worn facings, the rivets should be drilled, not punched out. After removing the facings thoroughly examine the disc, or segments for cracks, if damaged a new driven plate assembly should be used. After refacing mount the driven plate on a mandrel between centres and check for 'run-out' by means of a clock indicator. Where the 'run-out' exceeds 0·015-in. (0·38 mm.) true the plate by prising in the required direction after finding the high spots.

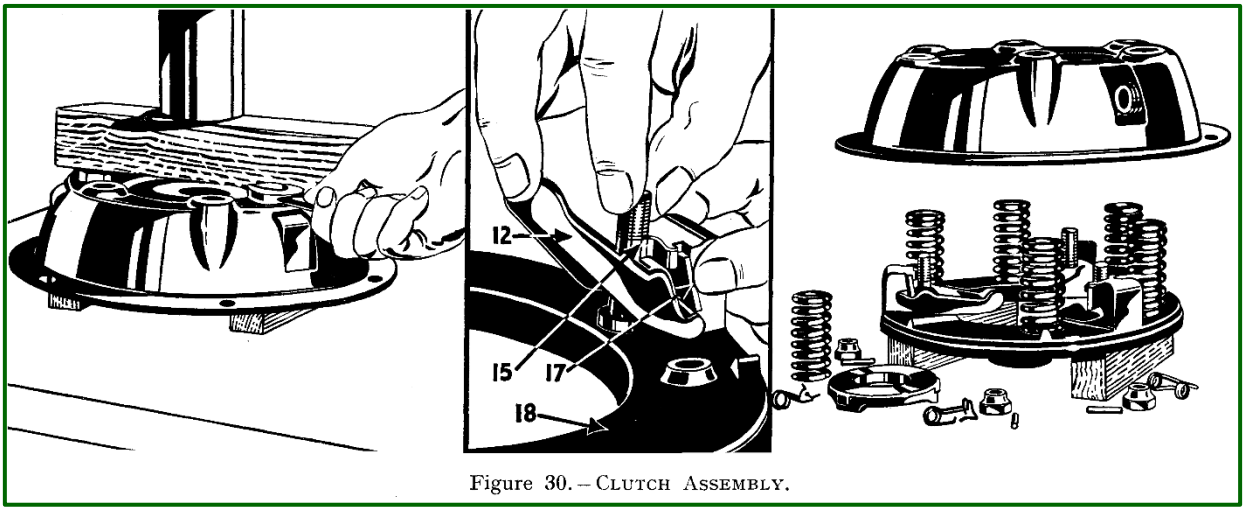


Figure 30.—Clutch Assembly.

Item 101. Reassembly of Clutch

Before assembly thoroughly clean all parts, and renew those which show appreciable wear. A very slight smear of grease such as Duckhams HP 2295, or Keenol, should be applied to the release lever pins, contact faces of the struts, eyebolt seats in the Clutch cover, drive lug sides on the pressure plate and the plain end of the eyebolts.

Assemble one Release lever (5) eyebolt (7) and eyebolt pin (6), holding the threaded end of the eyebolt and the Inner end of the Release lever as close together as possible. With the other hand insert the strut (10) in the slots in the pressure plate sufficiently to allow the plain end of the eyebolt to be inserted in the hole in the pressure plate. Move the strut upwards into the slots in the pressure

plate lug, over the ridge on the short end of the lever and drop it into the groove formed in the latter. Fit the remaining release levers in a similar manner.

Place the pressure plate (2) on blocks on the bed of the press and arrange the Thrust Springs (3) vertically on the plate, with a red spring on the leading side and a yellow spring on the following side of each release lever. Make sure that the springs seat on the bosses provided, lay the cover over the assembly ensuring that the anti-rattle springs (8) are in position, that the tops of the thrust springs are directly under the seats in the cover and that the machined portions of the pressure plate lugs are under the slots through which they have to pass.

Place the block of wood across the cover and compress the cover by means of the ram, guiding the eyebolts and pressure plate lugs through their respective holes. Screw the adjusting nuts (9) on to the eyebolts (7) and adjust in the manner detailed in Item 102. Secure by re-peening. Operate the clutch a few times, by means of the ram to ensure that the working parts have settled in their correct positions.

Item 102. Release Lever Adjustment

After reassembling the clutch the following operation for resetting the Release levers should be carried out.

Fit the Borg and Beck gauge plate (No. CG12916) to the flywheel in the position normally occupied by the driver plate and mount the cover plate on the Flywheel, tightening the holding setscrews a turn at a time by diagonal selection, and ensuring that the gauge plate is correctly centred with the three machined lugs directly under the Release levers.

Now place a short straight edge across the centre boss and the bearing surface of one release lever, then turn the adjusting nut until the boss is exactly the same height as the gauge plate boss. Repeat for the other levers.

Item 103. Reassembly to Engine

The reassembly to engine is already detailed in Item 37, but it is emphasised that the clutch and flywheel assembly must be fitted together in the same positions as they were on dismantling.

The setscrews securing the Clutch to the Flywheel should be tightened by diagonal selection.

Item 104. Pedal Adjustment

The clutch pedal should be set so that there is 1-in. (25 mm.) free movement at the pedal pad, by adjusting the length of the operating rod, as detailed in Item 38. With this setting there should be at least $^{1}/_{16}$-in. (1·5 mm.) clearance between the release bearing and the lever tips.

To ensure a clean change the pedal should move 2¾-in. (70 mm.) after the release bearing has made contact with the Release lever tips. At the end of this travel the clutch pedal should be down to the floor-board. Should excessive pedal movement be allowed, this leads to close coiling of the Thrust Springs, after which any pedal pressure exerted tends only to overstress the release gear and internal mechanism of the clutch.

When reassembling the gearbox to the Clutch housing, fit a new paper packing to the front face of the gearbox with a light smear of Gasket cement on each side, and make sure that the clutch shaft cover is square to the clutch housing bore.

NOTE: *Failure to ensure that the gearbox front face is correctly aligned with the flywheel rear face can result in the upper front gearbox stud lug breaking off. The gearbox should be fully home prior to tightening the four securing nuts.*

SECTION 12. **GEARBOX AND TRANSMISSION**

Item 105. Gearbox Dismantling

The following information on Gearbox dismantling supplements the brief details given in Item 40.

Remove the output flange key, withdraw the speedometer shaft and gear, and remove the Speedometer housing extension tube.

Remove the 1 ¼-in. nuts and Tab washers from the front of the clutch shaft and rear of the mainshaft, and remove the Speedo drive wheel.

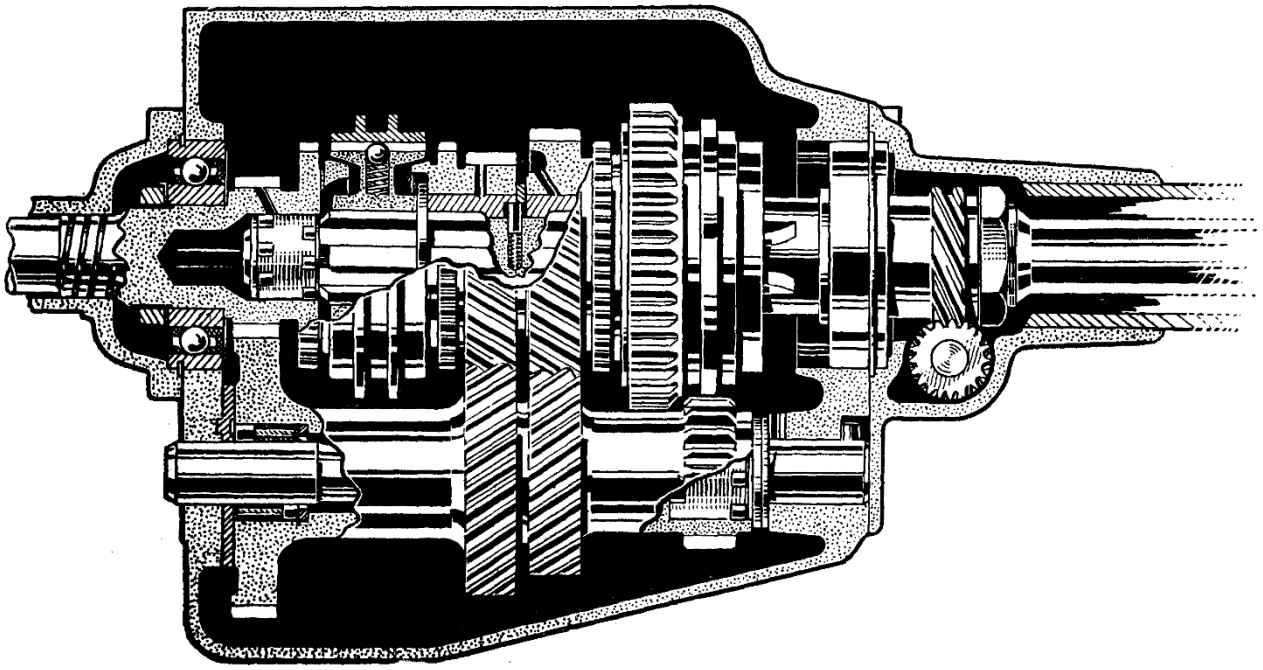


Figure 31.—Gearbox Section.

Remove the selector housing (side cover), remove the Selector Bars, remove the selector bar plunger housing, pivot rocker, spring seats, springs, and plungers from the housing.

Remove the mills pin from the Gear operating lever. Tap the lever down the gear operating shaft, and remove the woodruff key. The gear operating shaft, the lever, and the shaft spring can now be withdrawn from the gearbox.

If the gearbox is to be completely dismantled the Layshaft gear cluster should be lowered, at this stage, by drifting out the Layshaft from the FRONT of the box, this gives additional room for movement in the box and reduces the risk of damage to the gears. The main-shaft gears can however be removed without disturbing the Layshaft, if the gearbox is to be partially dismantled only.

Drift out the Clutch Shaft ball race, from inside the gearbox, taking special care not to damage the casting face. Once the race is clear of the gearbox face a puller can be used to draw the race off the shaft. Remove the main-shaft ball race in the same manner, and slide off the bearing spacing Washer.

Separate the Clutch Shaft from the Main-shaft pull the clutch shaft as far forward as possible, and remove the main-shaft with gears through the side of the gearbox. Remove the bearing oil thrower washer to avoid possible loss and remove the clutch shaft through the gearbox side.

Remove the reverse gear if necessary, by drifting out the shaft from the FRONT of the box.

When removing gears from the main-shaft, it is advisable to hold the shaft in a Vice, between the speedo gear thread, and the output flange taper, leaving both hands free.

Slide the top and third gear driving dog off the shaft.

Depress the washer locating pin, and turn the washer until the castellations are in line with the shaft spline, and slide the washer off the shaft.

Remove and save the locating spring and plunger.

Remove the Third gear and bush from the shaft.

Repeat for second gear and bush, and for the first and second gear, and sliding dog.

Remove the sliding gear lock plunger which penetrates the sliding dog from the main-shaft spline to the sliding gear. First and second, and third and top sliding gears can be removed from their sliding dogs by thumb pressure. When doing this it is advisable to cover the gear completely with a piece of cloth, so that the synchro balls are not lost when pressure on the springs released.

Item 106. Gearbox Reassembly

The following operations are recommended, for reassembling the gearbox. If the Layshaft gear cluster has been dismantled, insert the spacing washers and bearings into the gear cluster, place

the cluster in position in the gearbox, and insert the rear pad and rear washer, making certain that the tab on the rear pad is located correctly in the gearbox case.

Insert the Layshaft and drift through gently until the gear cluster is held in position. Insert front pad and washer and drift the Layshaft home, ensuring that the shaft does not protrude beyond the gearbox faces.

Up to 0·012-in. (0·305 mm.) end play in the gear cluster is permissible. Any play over 0·012-in. should be removed by fitting shims between the front spacing washer and the gearbox casing.

Place the reverse gear in position, and fit the shaft, by drifting in from the rear, making sure that the peg on the shaft locates with the recess in the box.

The following notes on assembling the gears onto their respective sliding dogs may be found helpful.

Grease the synchro balls and springs thoroughly, place in position. Now fit a Jjubilee Clip (or similar adjustable ring) over the balls and tighten until the clip is gripping the sliding dog face, place the sliding gear on the dog up to the edge of the hose clip, place the assembly endwise in the Vice (using soft clamps), and close up the Vice until the gear pushes the clip off the synchro balls, and slides over the balls itself. When fitting the first and second sliding gear make sure that the cutaway tooth in the internal gear is aligned with the drilled through hole in the sliding dog, which carries the lock plunger.

To assemble the gears onto the main-shaft, grip the shaft in a Vice, between the thread and the flange taper.

Insert first sliding gear lock plunger into first and second sliding dog and slide on the shaft up to the end of the splines with the drilled through hole in the dog aligned with the indentation in the Main-shaft. Insert spring and locating pin into the drilling in the main-shaft, slide on one of the thick main-shaft washers and turn until locked by the locating pin. Note that only one of the recesses in the washer will locate with the pin.

The second and third gear bushes which are dimensionally identical, can be distinguished by the fact that the second gear bush has internal oil grooves, while the third gear bush is not grooved.

Slide on the second gear bush, making certain that the recess in the bush registers with the locating pin allowing the bush to butt against the main-shaft washer, and that the oil grooves in the bush locate with the feed hole in the gear. Place the second gear on the bush with the taper synchromesh face towards the tapered recess in the first gear. Insert the spring and locating pin, slide on the thin main-shaft washer and turn to lock.

Slide on third gear bush, again registering with the locating pin. Place third gear on bush with synchro taper towards clutch end of main-shaft. Insert spring and locating pin, slide on the remaining thick washer and lock.

Slide third and top gear, and driving dog on the shaft with the inner boss, and the large synchro cone towards the Clutch shaft.

Fit the spacing washer and the spigot bearing into the rear end of the clutch shaft, fit the clutch shaft and the main-shaft into the gearbox, and fit together. Fit the clutch shaft oil thrower, the rear bearing washer, and the Ball bearings, tapping the bearings into position until the locating rings press against the gear box face. Fit the speedo drive wheel with the gear to the rear, fit the Tab washer and 1¼-in. nut, lock up and fold over tab.

Insert the gear operating shaft through the drilling in the top of the box, fit the distance collar and the gear operating lever onto the shaft, and fit the shaft spring into position. Fit the Woodruff Key and tap the lever into position on the shaft. Secure the lever to the shaft with the mills pin.

Check that the shaft springs back when pushed down and released and that it can turn freely until the lever comes into contact with the stop.

Check the selector bars are straight and true, that there are no rough surfaces on the bars or in the Selector housing grooves and that the selector forks are securely rivetted. Fit into the gearbox. Fit the Selector housing, fitting a new paper packing with a slight smear of gasket cement.

When fitting the Selector housing with the gearbox in position in the chassis, it will be found easier to fit the selector bars into the housing and not into the gearbox.

Fit Selector plungers, springs, spring seats, rocker and plunger housing. Fit the Speedo housing extension, with a new paper packing sealed with a slight smear of gasket cement. Take special care not to damage the main-shaft extension bearing and the oil seal, fit the speedo drive shaft and gear, and lock in position.

Item 107. Setting Gearchange Linkage

After refitting the gearbox in the frame, or after refitting a replacement gearbox, the gearchange and selector change links must be re-set before they are connected up. To do this:

A Set the gear operating shaft, on the gearbox top, in neutral position between first and second gears, and insert a $^{5}/_{32}$-in. (3·9 mm.) pin through the hole in the gearbox side, immediately below the gear operating shaft, so that the shaft is secured in position.

B Set the gear lever at the steering wheel in neutral and move slightly until the point is located where, with the reverse button depressed, a clean movement into the reverse 'gate' can be obtained. The gear lever at this point should normally be set 10° above horizontal.

C Adjust the length of the gear change link to line up with the position of the gear operating shaft as set in Para. A, and of the heavy arm at the base of the gear change column.

Connect the link to the shaft and to the arm.

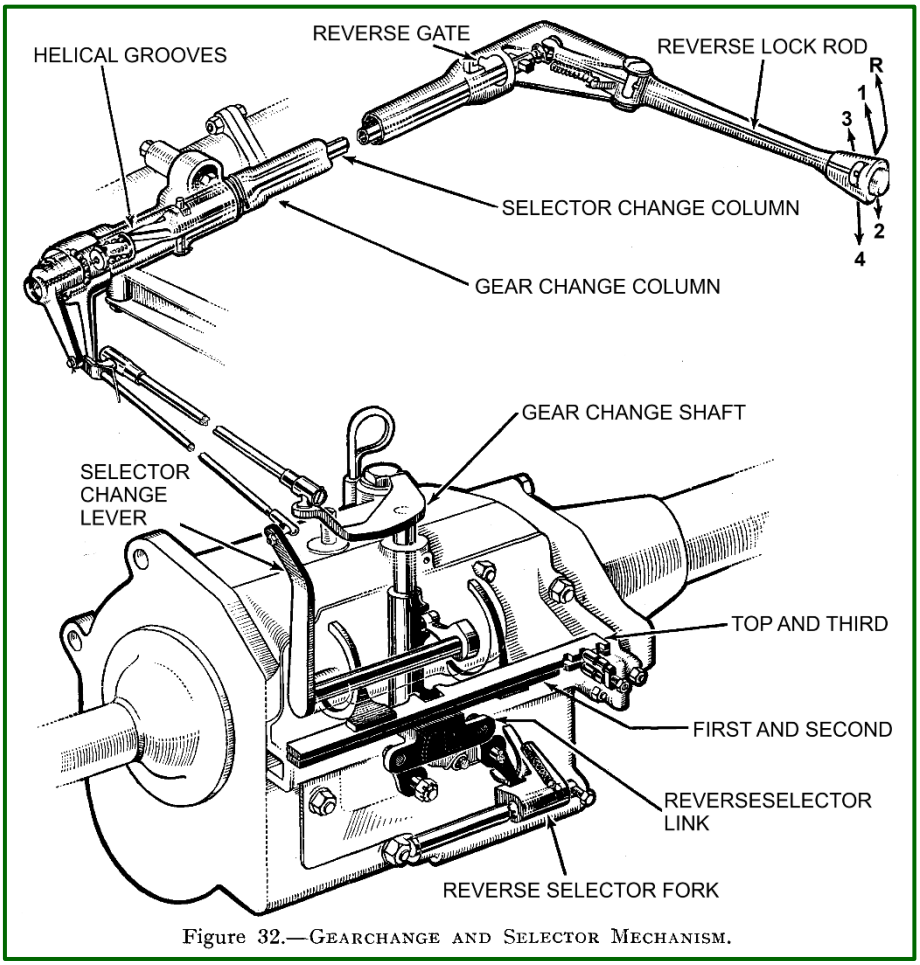


Figure 32.—Gearchange and Selector Mechanism.

D Set the gear lever at the steering Wheel in neutral between first and second.

With the gear lever held in this position, set the length of the selector change link to line up with the position of the light arm at the base of the column, and the selector operating lever on the gearbox, and fit the link onto the arm and the lever.

Remove the $^{5}/_{32}$-in. pin securing the arm and check the movement of the gear lever.

Note: On early production cars (engine numbers before D8/PA/300) no provision is made for movement into the reverse gear when the $^{5}/_{32}$-in. pin is in position and the selector change link is connected.

Should the gear change link be incorrectly adjusted it will be found difficult, or in certain cases impossible, to move the gear change lever into the reverse gate. Incorrect setting of the selector change link affects all gears.

Item 108. Dismantling Gearchange Column

Remove the column from the frame by disconnecting the 'U' bolt under the facia panel, the gear and selector change links, the steady stay (at the column) and the setscrew at the base securing the change column to the steering column (access from inside the body).

Remove the gear lever knob and draw out the reverse lock rod. Remove the gear lever by releasing the pivot pin and the gear lever spring.

Extract the reverse lock plunger after removing the taper pin securing the plunger to the selector change column. Remove the selector change pad spindle in the gear change column. Remove the grubscrew on the flange of the column heavy arm, which retains the selector change thrust cap, and release the cap. The selector change column can now be withdrawn from the outer column, care being taken to save the twelve steel balls which will be found under the thrust cap.

To remove the selector change nut from the change column, release the circlip at the base of the selector change nut and remove the thrust plate and spring.

Now move the sleeve to the top of the helical grooves in the column and remove the selector change screw circlip at the bottom end of the column. This action will release the steel balls which track in the helical grooves, the sleeve can be removed from the column, and the selector change nut circlip at the top of the selector change nut can also be removed.

Item 109. Reassembly of Gearchange Column

When refitting the steel balls in the selector column grooves, fit the change nut circlip, and fit the selector change nut assembly on the column. The column should now be held in an inverted position, the steel balls dropped into place in the grooves and the change screw circlip fitted at the bottom end of the column. The column is now ready for fitting into the gear change column.

When refitting the change screw circlip the width of the gap in the circlip must not exceed $^{3}/_{16}$-in. (4·76 mm.). Should the gap be wider than this, and a groove in the column coincides with the gap, the steel balls will drop through into the base of the change nut, blocking the movement of the column into first, second and reverse gears.

Item 110. Gearbox and Gearchange Adjustments

The selector plunger adjustment detailed in Item 42, should be carried out after reassembly of the box if this setting has been disturbed, or if there is any doubt about the accuracy of the setting. Gearchange linkage adjustment, as detailed in Item 106, should invariably be carried out after the Engine and gearbox have been fitted into the Chassis.

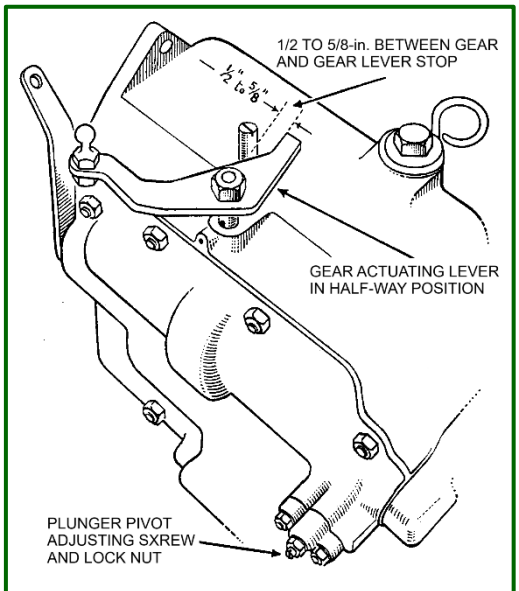


Figure 33.—Selector Plunger Setting

Item 111. Transmission

The following possible causes of transmission vibration may be encountered during the life of a car as a result of wear or damage.

The propellor shaft midship bearing may be dry or worn, or the rubber housing supporting the bearing may be damaged or distorted. If wear or damage has occurred the bearing assembly should be replaced.

It is possible for the Midship bearing support cross member to be fitted, or forced off centre, allowing metal to metal contact with the frame-side. Another possible cause of vibration is wear or damage to the rubber and fabric strips which retain the cross member to the frame-side. These should of course be replaced if any doubt exists.

The setscrew (*nut in later versions*) securing the companion flange to the rear end of the front propellor shaft must be fully tightened, and the flange must be a good fit on the propellor shaft splines.

Vibration can be caused by a loose Universal Joint bolt, or by wear on the Universal Joint rubbers. When examining these rubbers special attention should be given to any cracks appearing round the coupling bolt.

The possibility of damage to one of the propellor shafts, causing it to run out of line must not be overlooked, and it should also be noted that an arrow, showing the direction of rotation, is stamped on the forward end of the rear shaft.

As a general guide it can be taken that vibration at 2,000-2,500 propellor shaft r.p.m. is likely to be traced to the front end of the transmission, while a 4,000-4,500 r.p.m. vibration usually originates from the centre assembly, or the rear propellor shaft.

SECTION 13. **REAR AXLE**

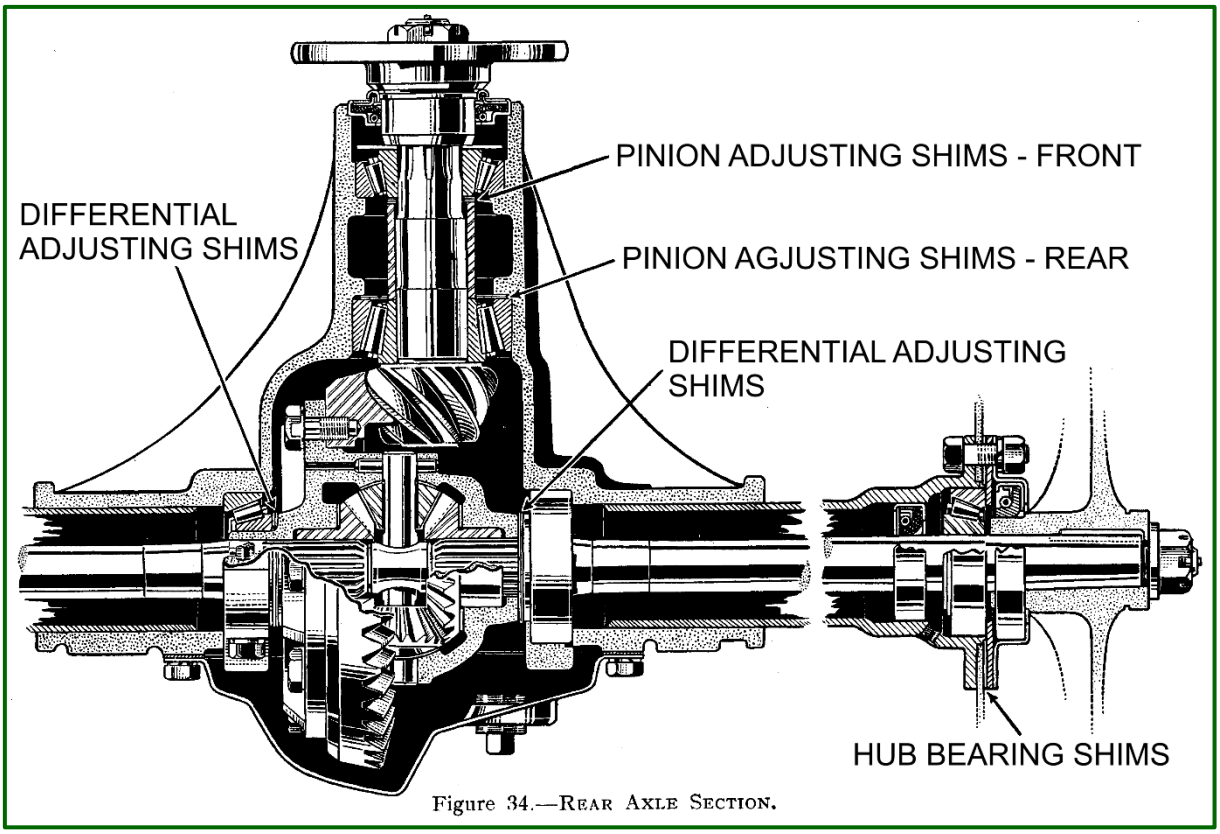


Figure 34.—Rear Axle Section.

Item 113. General Description

The Rear Axle Assembly, (*Figure 34*) is of the hypoid, semi-floating type with shim adjustment for all bearings and for the meshing of the driving gear and pinion. The Axle Shafts are splined at the inner ends to engage splines in the differential side gears. The outer ends of the shafts are provided with tapers and keys for attaching the rear wheel hubs. The wheels are each supported on a taper roller bearing pressed on to the axle shaft and the side thrust from the wheels is transferred from one shaft to the other by a thrust block straddling the differential pinion mate shaft. A cover on the rear of the gear carrier housing permits inspection and flushing of the differential assembly without dismantling the axle. The axle gear ratio is stamped on a plate attached to the assembly by one of the rear cover screws. The axle serial number is stamped on the top of the gear carrier casting on the width of the metal forming the facing for the rear cover.

Item 114. Lubrication

For the lubrication of the hypoid driving gears it is necessary to use an S.C.L. type of E.P. (extreme pressure) hypoid lubricant conforming to the S.A.E. 90 specification.

Always use one of the following lubricants:

Anglo-American Oil Co., Ltd.	Essoleum EXPEE Compound 90
Price's Lubricants, Ltd.	Energol Hypoid 90
Shell-Mex & B.P. Ltd.	Spirax E.P. 90
Vacuum Oil Co., Ltd.	Mobilube GX

C.C. Wakefield & Co., Ltd.	Castrol Hypoy
Duckham's	Adcol Hypoid 90

Do not at any time mix various brands of hypoid lubricants. Should there be any doubt concerning the brand of lubricant previously used, drain and flush the axle with a flushing oil or light engine oil before filling with the new lubricant. Do not use paraffin for flushing. Check the level of the lubricant every 1,500 miles (2,414 km.). The axle should be drained and re-filled to the bottom level of the filler plug hole every 10,000 miles (1,6093 km.).

Lubricant Capacity	2 pints
Refill Capacity	1¾ pints

Use only the recommended brands of hypoid oil in the rear axle.

Should there be any doubt about the type of oil in the axle, drain, flush and refill. Do not top up.

The wheel bearings are each lubricated by a grease nipple located in the axle tube housing adjacent to the brake back plate. Where, on the top side of the housing, a vent hole is provided, the greasing operation should be continued until grease appears at this hole indicating that the chamber is full. Do not overfill. The bearings should be lubricated with a good quality bearing grease every 5,000 miles (8,047 km,).

Item 115. Axle Shafts – Removal and Replacement

To remove the axle shaft, remove the road wheel and the axle shaft nut and washer. Withdraw the rear hub with a Britool drawer No. 1092, and before dismantling further, check the axle shaft end play with a dial indicator as shown in *Figure 35*.

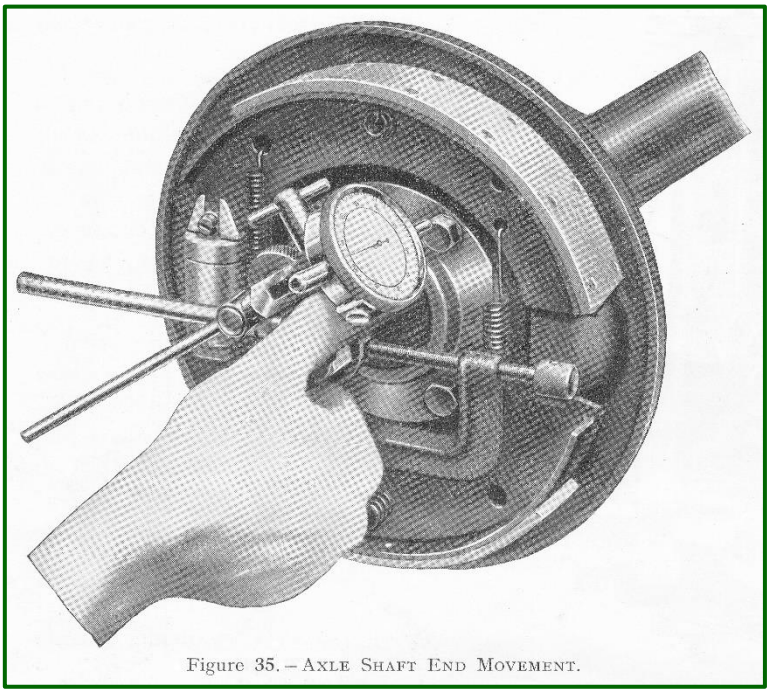


Figure 35. – Axle Shaft End Movement.

The recommended tolerance ranges from 0·003 to 0·006-in. (0·075 to 0·15 mm.) and the end play is controlled by shims located between the brake back plate and the axle tube flange. Shims are available in thicknesses of 0·003, 0·005, 0·010 and 0·030-in. Remove the brake back plate retaining bolts, the outer oil seal assembly, the wheel bearing retaining plate (if fitted) and the brake back plate, taking care of the wheel bearing adjusting shims. The axle shaft with its taper roller bearing may now be withdrawn with a puller and the axle shaft oil seal which is pressed inside the axle tube can be examined. Withdraw the oil seal and replace if necessary.

To replace the axle shaft: After lubricating the wheel bearing with a good bearing grease, instal the axle shaft with the taper roller bearing cone and then the bearing cup. Add or subtract adjusting shims to obtain the correct axle shaft end play of 0·003 to 0·006-in. (0·075 to 0·15 mm.) which will be just perceptible by hand (adding shims increases end play, subtracting shims decreases end play).

Remove or instal approximately an equal number of shims at each end of the axle so as to retain the axle shafts in a central position. Examine the hub oil seal and replace, if necessary.

Fit the brake back plate and centralise the hub oil seal. When re-installing, fit new paper gaskets on either side of the bearing retaining plate, or if a retaining plate is not fitted, between the brake back plate and the oil seal assembly to prevent grease leaking into the brake drum.

Item 116. Differential – Removal and Dismantling

Drain the lubricant from the gear carrier housing and remove the gear carrier rear cover, flushing out the unit thoroughly so that the parts can be carefully inspected. Remove both axle shafts as detailed in the foregoing chapter. Remove the four bolts which hold the differential bearing cap, and

using two pry bars, one on each side of the differential case opening, pry out the differential assembly, (*Figure 36*).

The differential bearing caps and the gear carrier gasket surface are marked during production and when re-assembling the bearing caps be sure that the position of the numerals correspond, (*Figure 37*).

Remove the universal joint companion flange with a puller and press the pinion out of the forward bearing. The pinion having been freed from its front bearing can now be removed from the axle housing.

Note: Keep all shims intact.

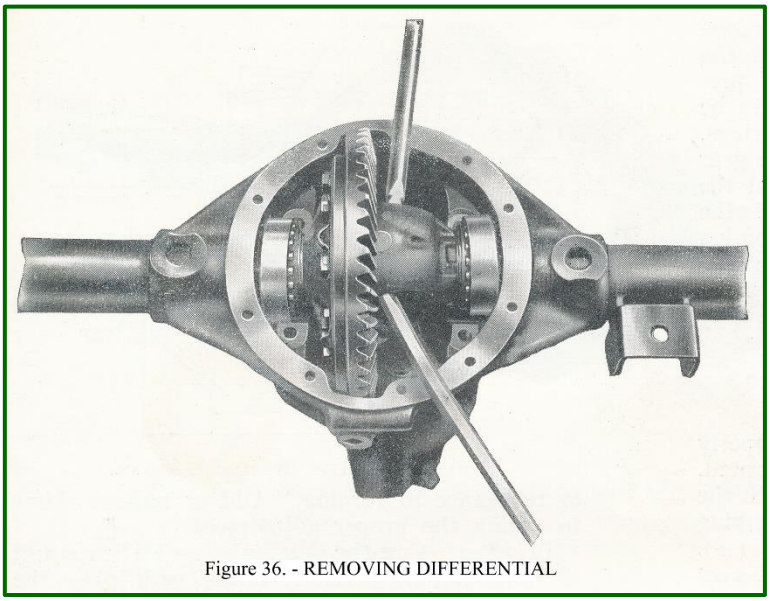


Figure 36. - REMOVING DIFFERENTIAL

Drive the front bearing cup and oil seal assembly out of the housing and if a damaged rear bearing cup is to be replaced, or if the pinion setting is to be changed, the rear bearing cup must be driven from the housing, care being taken of the shims which are fitted between the bearing cup and the housing abutment face. Remove the ring gear from the differential case by bending down the locking tabs and removing the mounting screws. Drive out the pinion mate shaft locking pin, which is secured in place by peening the case, and remove the pinion mate shaft. Take out the axle shaft spacer, and by rotating the gears by hand until the pinions are opposite the openings in the differential case, remove the differential gears and the thrust washers which are fitted behind them. If the ring gear setting is to be altered, it will be necessary to remove the differential bearing with a drawer to gain access to the shims located between the bearing and the abutment face on the differential case.

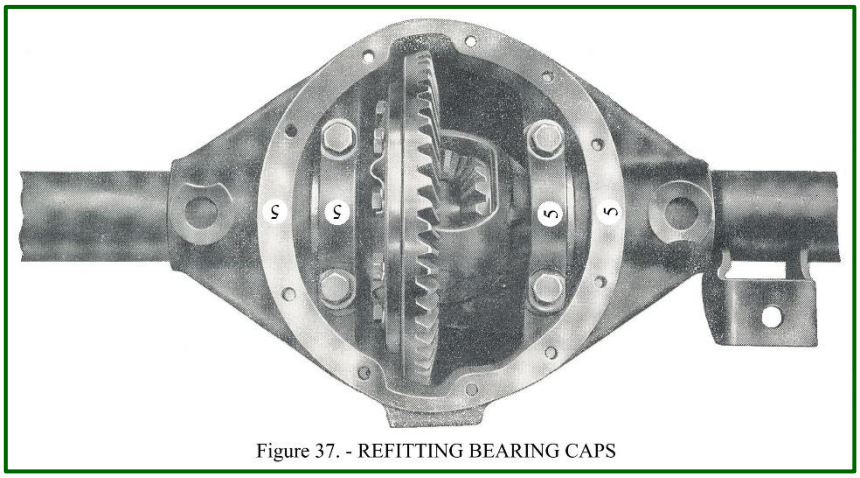


Figure 37. - REFITTING BEARING CAPS

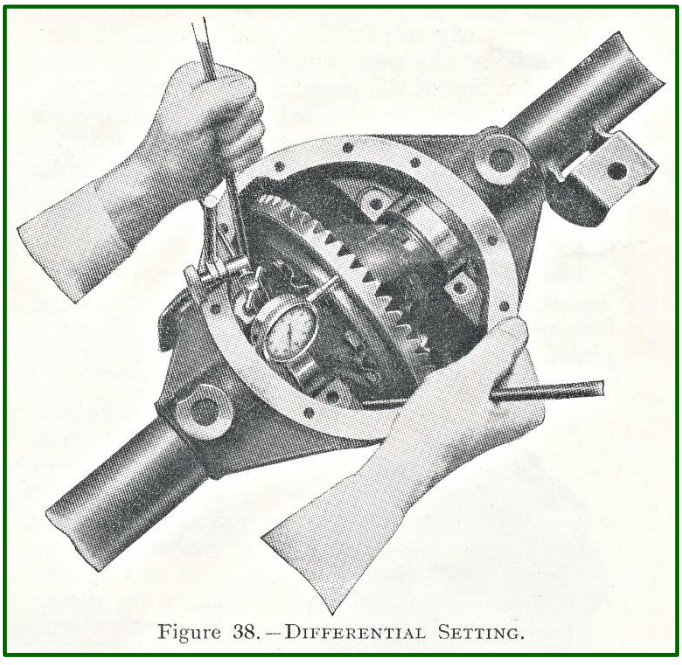


Figure 38. — DIFFERENTIAL SETTING.

Item 117. Differential – Assembly

Reassemble the internal parts of the differential and install the pinion mate shaft lock pin. Using a punch, peen some of the metal of the differential case over the end of the lock pin to prevent it working loose. The ring gear and differential case contacting surfaces should be cleaned and examined for burrs before the ring gear is fitted. When reinstalling the ring gear on the differential case align the attaching bolt holes in the ring gear with those in the case and tap the ring gear on the case with a lead hammer. Insert the ring gear set screws with new locking straps and tighten them uniformly. Then bend the locking tabs around the setscrew heads to prevent their working loose.

Install the differential bearings without shims on the differential case, making sure that the bearing cones and cups and the housings are perfectly clean. Place the differential assembly with the bearing cups in their housing in the gear carrier. Install a dial indicator in the gear carrier with the

button against the ring gear back face and, inserting two screwdrivers between the housing and the bearing cup, move the differential assembly to one side of the case as shewn in *Figure 38*.

Then after setting the indicator at zero move the assembly to the other side and record the indicator reading. This reading plus 0·08-in. (0·203 mm.) preload denotes the total thickness of shims to be used in the installation of the differential bearings. Remove the differential assembly from the gear carrier and, if it has been removed, reinstall the pinion front bearing cup. Also reinstall the original pinion adjusting shims and the pinion rear bearing cup. Using an arbor press and a length of tube, press the rear bearing cone on the pinion, the tube contacting the inner race only and not the roller retainer.

Item 118. Ring Gear and Pinion Adjustment

The rear axle pinion should be adjusted properly before further rear axle assembly is attempted. The ground end of the pinion is marked with the correct pinion setting (*Figure 39*). This marking may be zero (0), a minus (–) or a plus (+). When properly adjusted a pinion marked zero (0) will be at the zero cone setting distance from the centre line of the gear; a pinion marked plus two (+2) should be adjusted to the nominal cone setting distance, plus 0·002-in. (0·0508 mm.), and a pinion marked minus two (–2) to cone setting distance minus 0·002-in. (0·0508 mm.), see *Figure 40*.

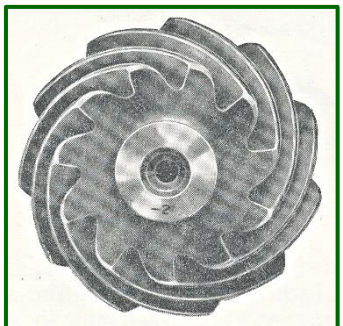


Figure 39. – Pinion Marking.

The Zero Cone Setting Distance is 2·125-in. (53·974 mm.)

Thus for a pinion marked minus two (–2) the distance from the centre of the ring gear to the face of the pinion should be 2·123-in. (53·9242 mm.), and for a pinion marked plus 3 (+3) the cone setting distance for this type would be 2·128-in. (54·0512 mm.).

Place the pinion with the rear bearing cone in the gear carrier and adjust the pinion to the correct setting distance by means of shims between the rear bearing cup and the housing. The pinion adjusting shims are available in thicknesses of 0·003, 0·005 and 0·010-in. (0·0762, 0·1270, 0·2540 mm.). Install the pinion bearing spacer and the original bearing adjusting shims on the pinion. Then instal the pinion front bearing cone, companion flange, washer and nut. The pinion oil slinger and oil seal should not be installed until the pinion bearing adjusting procedure has been completed.

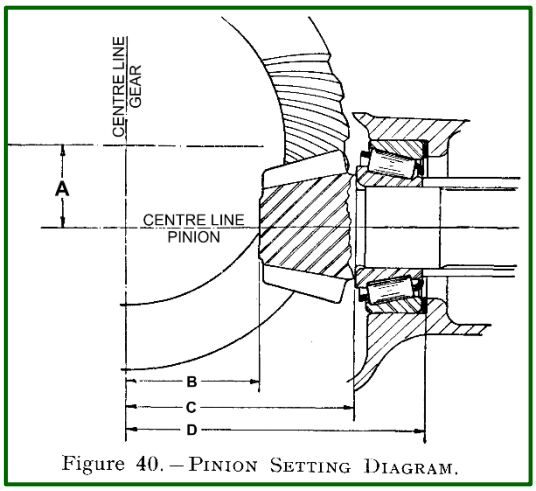


Figure 40. – Pinion Setting Diagram.

Tighten the companion flange nut and test the pinion bearing adjustment. The pinion should have no end play and should afford a slight drag or resistance to turning. Add or remove shims to obtain the proper adjustment.

Being sure that the bearing cones and cups and the housings are perfectly clean, again place the differential assembly with the bearing cups in the housing. Instal a dial indicator on the housing with the button against the ring gear back face and inserting two screwdrivers between the housing and the bearing cup, move the differential case and ring gear away from the pinion until the opposite bearing cup is seated against the housing. Then, after setting the indicator at zero, move the differential assembly towards the pinion until the ring gear contacts the pinion deep in mesh. The indicator reading now obtained (clearance between ring gear and pinion) minus 0·005-in. (0·1270 mm.) denotes the thickness of shims to be placed between the differential case and the bearing cone on the ring gear side of the differential. The quantity of shims inserted on the ring gear side, of the differential case should then be subtracted from the total indicator reading (see Item 117 Assembly). Insert a thickness of shims equal to this amount plus 0·008-in. (0·2032 mm.) for preload on the opposite side of the differential.

To simplify the differential and ring gear adjustment procedure we give the following example. Assume the total indicator reading to be 0·080-in. (2·032 mm. This figure plus 0·008-in. (0·2032 mm.) for the recommended preload equals 0·088-in. (2·2352 mm.) which denotes the total thickness of shims to be used. Assuming the clearance between the ring gear and the pinion to be 0·042-in. (1·0998 mm.), subtract 0·005-in. (0·127 mm) (the approximate backlash) from this 0·042-in. (1·0998

mm.) clearance. The 0·037-in. difference denotes the thickness of shims to be placed between the differential case and the bearing cone on the ring gear side of the differential. Then subtract the thickness of shims inserted on the ring gear side of the differential case from 0·088-in. (2·2352 mm.) and the 0·051-in. (1·2954 mm.) difference denotes the thickness of shims to be inserted on the opposite side of the case.

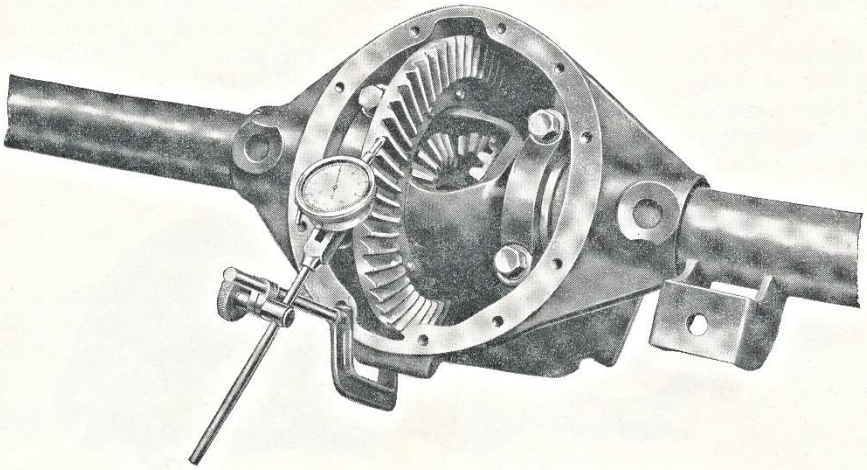


Figure 41. – Checking Backlash, Crown Wheel and Pinion.

To facilitate installation of the differential assembly, cock the bearing cups and tap them lightly into position with a lead hammer. When reinstalling the bearing caps be sure the position of the numerals marked on the gear carrier housing face and the caps correspond (see *Figure 37*).

Mount a dial indicator on the gear carrier with the button against one of the ring gear teeth as nearly in line with the tooth travel as possible. Move the ring gear by hand to check the backlash which should be between 0·003 and 0·006-in. (0·0762 and 0·1524 mm.), refer to *Figure 41*. If the backlash is not in accordance with the specifications transfer the necessary number of shims from one side of the differential case to the other to obtain the desired setting (*Figure 42*). Back-lash will be changed approximately two-thirds of the thickness of shims transferred.

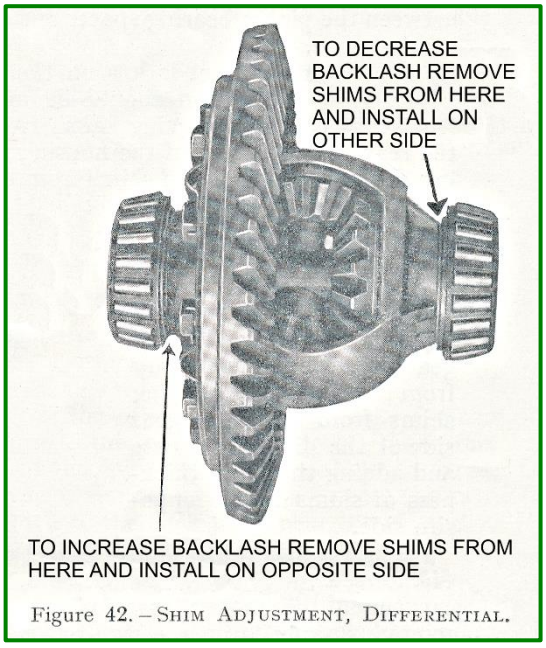


Figure 42. – Shim Adjustment, Differential.

After setting the backlash to the required figure, use a small brush to paint eight or ten of the ring gear teeth with a mixture of ground red lead and engine oil. Move the painted ring gear teeth over the pinion until a good impression of the tooth contact is obtained. The result impressions should be similar to the first example given in *Figure 43*.

If the tooth contact is high on the gear teeth, as shown in the second example, the pinion should be moved towards the gear by adding shims between the rear bearing cup and the housing, and adding the same thickness of shims between the pinion bearing spacer and the forward bearing cone.

If the tooth contact is low on the gear, as in Example 3, the pinion should be moved away from the gear by removing shims from between the rear bearing cup and the housing and removing the same thickness of shims from bet-ween the pinion bearing spacer and the forward bearing cone.

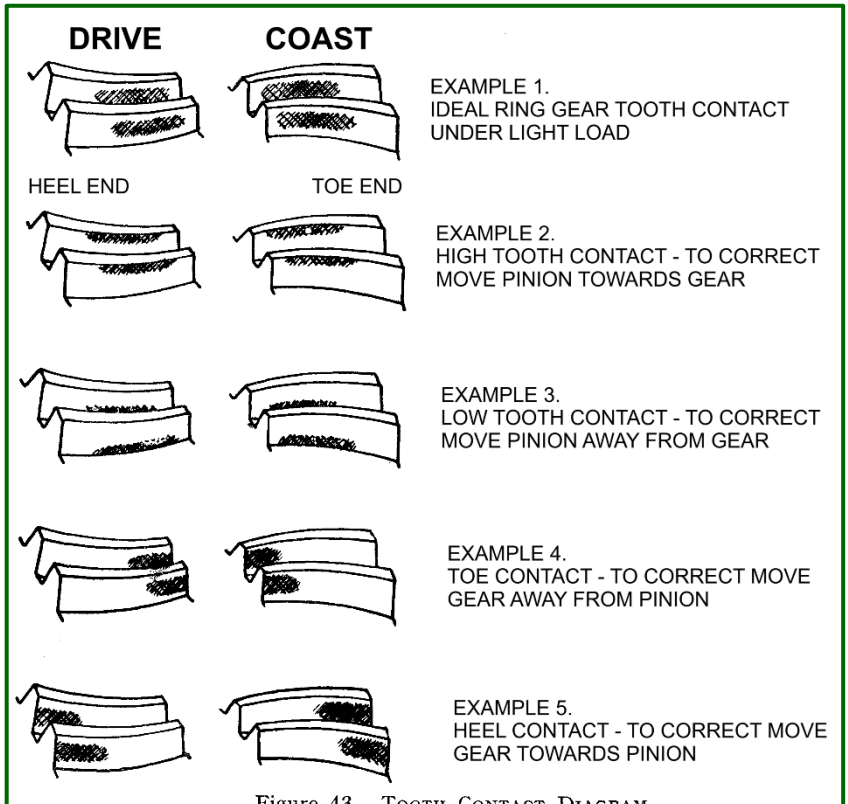


Figure 43. – Tooth Contact Diagram.

If the tooth contact is decidedly towards the toe or small end of the tooth as in Example 4, *Figure 43*, the gear should be moved away from the pinion by removing shims from the ring gear side of the differential case and adding the same thickness of shims to the opposite side.

If the tooth contact is on the heel or large end of the teeth, as shown in Example 5, *Figure 43*, the gear should be moved towards the pinion by removing shim's from the side of the differential case opposite to the ring gear and adding the same thickness of shims on the ring gear side.

It must be remembered that in making adjustments to correct a heel or toe contact that the backlash limits of from 0·003 to 0·006-in. (0·0762 to 0·1524 mm.) must be maintained. A reduction of the backlash within the above limits may correct an extreme heel contact while an increase of backlash may correct an extreme toe contact. Moving the ring gear 0·005-in. (0·127 mm.) will change the backlash approximately 0·0035 (0·0889 mm.) while moving the pinion 0·005-in. (0·127 mm.) will change the backlash about 0·001-in. (0·0254 mm.). Ordinarily it will not be desirable to move the pinion when making a backlash correction as the movement of the ring gear has a much greater effect upon the backlash.

Moving the gear out, changes the bearing towards the heel and slightly raises the bearing. Moving the pinion out raises the bearing on the face of the tooth and slightly towards the heel.

After removing the companion flange instal the oil slinger, oil seal gasket and the oil seal (*Figure 44*). Replace the companion flange and tighten; install both axle shafts, bearings and cups. Then install the rear cover using a new gasket and fill the housing with the correct amount of approved hypoid lubricant.

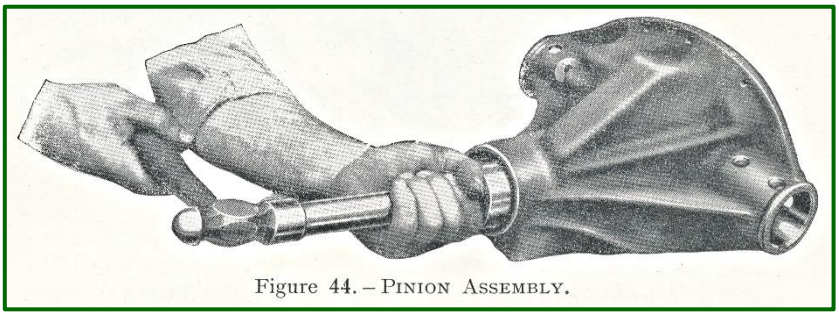


Figure 44. – Pinion Assembly.

SECTION 14. **BRAKES**

Item 119. Bleeding the Hydraulic System

This operation should be necessary only when part of the system has been disconnected, or when the level of the supply tank has been allowed to fall too low, allowing air to enter the fluid circuit.

It is emphasised that Girling Crimson brake fluid should be used when bleeding or when replenishing the fluid in the reservoir.

This special fluid is unaffected by high temperatures, is immune from freezing, and has no harmful effect on the rubber seals. Use of any other type of fluid may result in serious trouble.

Slack back front brake shoe adjusters to zero.

Fill up supply tank with fluid, taking great care to prevent entry of dirt.

Working on one brake assembly at a time, remove the rubber cap from the bleeder nipple of the hydraulic cylinder and fit a rubber bleeder tube in its place, allowing the tube to hang into a clean receptacle, preferably a glass jar or bottle. Pour sufficient Girling crimson brake fluid into the container to cover the end of the bleeder tube. Unscrew the nipple about three quarters of a turn, and operate the brake pedal up and down a few times, allowing two or three seconds between each stroke. One or two strokes will cause the fluid to start flowing, but pumping must be continued until the fluid appears entirely free from air bubbles.

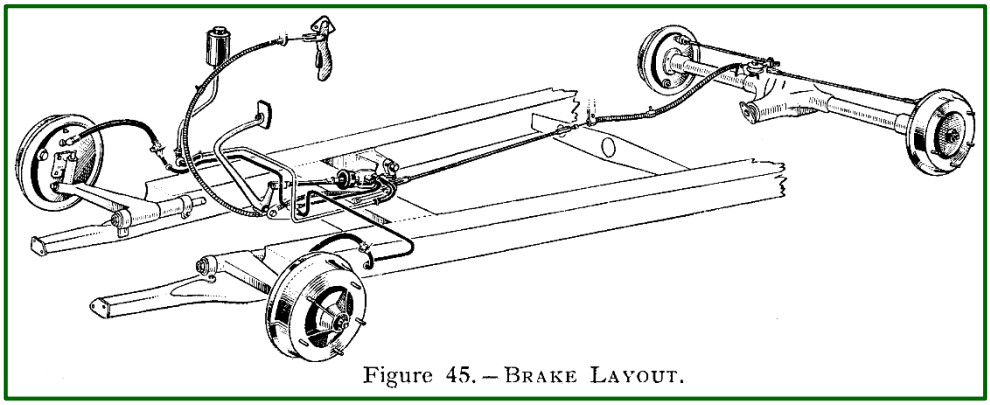


Figure 45. – Brake Layout.

It is important that the reservoir is frequently replenished during this operation, if it should be allowed to be-come empty more air will be drawn into the system.

As soon as all traces of air are expelled hold the brake pedal half way down and tighten up the bleeder nipple, refit the dust cap.

Repeat on the other front brake assembly.

On completion make sure that the supply tank is topped up to the correct level, 1-in. from the top of the tank, and reset the front brake adjusters. Never use fluid which has been bled through the system, to replenish the reservoir, as this fluid will have become aerated. Under no circumstances should fluid, other than that recommended, be used. Cleanliness should at all times be the guiding rule.

Item 120. Fitting Replacement Brake Shoes

Jack up car, and remove the road wheels and brake drums.

Dismantle front brake shoes. It is advisable to slip a rubber band over the pistons in the hydraulic cylinder to prevent them being forced out of the cylinder with consequent loss of fluid and admission of air into the system while the shoes are being changed.

It will be noted that the upper return spring is connected to the trailing shoe only, leaving the leading shoe in continuous light contact with the brake drum.

Clean the brake back plate, lightly smear the pivot pin and the shoe steady post with Girling Brake grease taking care that the grease is not allowed to contact the linings, and fit Girling replacement shoes.

Repeat on the other side. Refit brake drums.

To remove the rear brake shoes, slack the adjuster to the fully off position. Using a large screwdriver or similar lever, prise against the two studs welded to the back plate near the expander unit, and lift one shoe out of the groove in the expander. Both shoes and the shoe return springs can now be removed, leaving the expander and adjuster units in position on the backplate. Do not overstretch the shoe return springs when removing the shoes.

Clean down the backplate, check the expander unit for free float. Reset if necessary by tightening up the two self locking nuts and slacking back through a full turn. Check the adjuster unit for easy working.

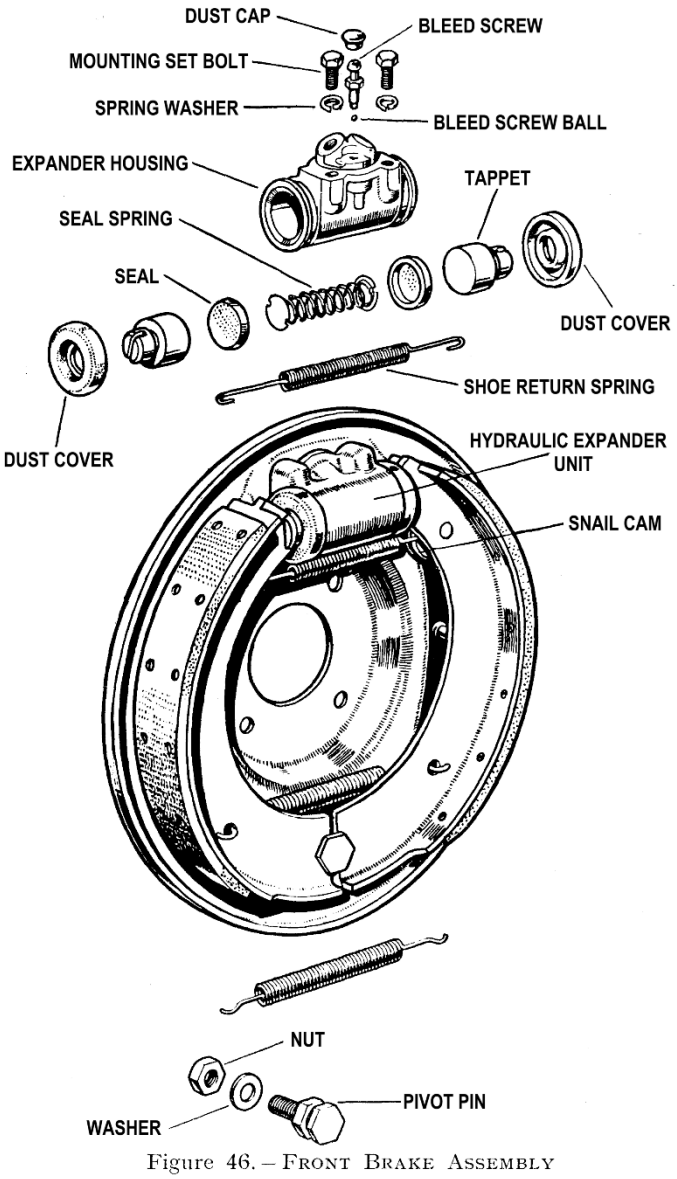


Figure 46. – Front Brake Assembly

Lubricate where necessary with Girling Brake grease.

Inspect the shoe pull off springs and replace if stretched or damaged.

To fit the new shoes, transfer the springs from the old shoes, fitting the springs between the shoe and the backplate. Place the shoes with the springs attached against the backplate, and fit the half round slots at one end to the adjuster links, then insert the other end of one shoe in the expander tappet.

Place a screwdriver under the web of the remaining shoe and against the stud on the backplate. Ease the shoe into the tappet groove.

Keep all grease off the linings and do not handle them more than absolutely necessary.

Repeat on the remaining brake assembly.

To ensure the correct clearance between the shoes and drums, slack off the set screws securing the adjuster unit to the backplate until the adjuster is able to float freely, and lock up the brake shoes in the drum by turning the adjuster wedge spindle in a clockwise direction. Tighten up the adjuster setscrews fully and slack off the adjuster two ‘clicks’ (which can be felt and heard). Apply the brake pedal firmly to ensure that the shoes are centralised at the expander end. The drums should now be quite free.

If during the operation of fitting the front shoes, fluid has inadvertently been allowed to escape from the cylinder the system will have to be bled, to expel air.

The following operation should be carried out as a final check.

Make sure the handbrake is off. Tighten up rear brakes on adjusters.

Check foot brake pedal, to ensure that there is 1-in. movement at the pedal pad, and that the pedal returns fully.

When these points are found to be correct slack off the rear brake adjusters through two ‘clicks’.

Two final points which are very important. Always fit Girling factory lined replacement shoes. These are correctly rivetted, and ground to the correct radius, ensuring a fast and easy ‘bed in’ to drums.

Never use any fluid other than the Genuine Girling brake fluid.

Item 121. Master Cylinder and Brake Linkage Setting

The Hydro-mechanical brakes are designed so that should a failure of front or rear brakes occur, the pedal is not put out of action, and one of the systems will always be in operation.

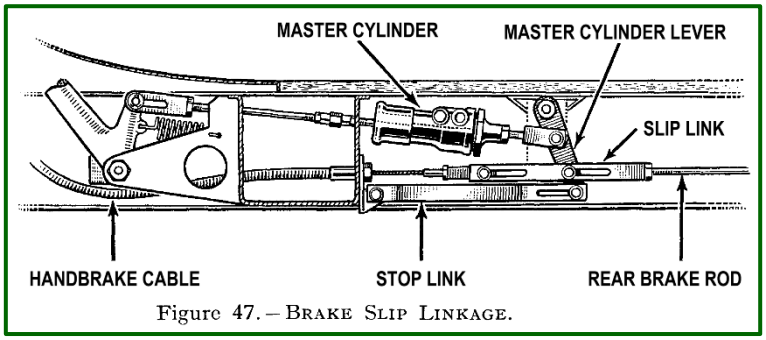


Figure 47.—Brake Slip Linkage.

Should a failure occur in the Hydraulic System the plunger in the Master cylinder travels forward until it contacts the stop at the end of its stroke in the cylinder. The cylinder is then in effect a solid unit and the remaining available pedal travel maintains mechanical operation of the rear brakes.

In the event of the failure of rear brakes, due to a broken or damaged rod or cable the master cylinder lever contacts the front of the slot in the stop link, arresting any further forward movement of the cylinder body. The remaining pedal travel maintains the hydraulic operation of the front brakes.

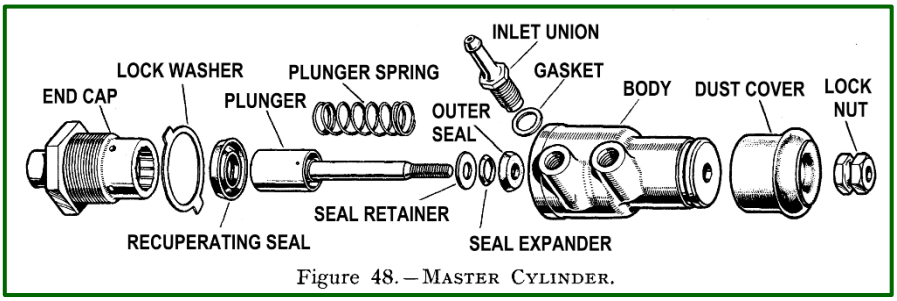


Figure 48.—Master Cylinder.

From this it will be readily understood that the correct setting of the brake slip linkage is very important indeed. This setting should not normally be altered, as all adjustments should be made on the brake shoe adjusters, but if any doubt exists as to the accuracy of the setting, or if the slip linkage is to be reassembled the following points should be very carefully checked.

A. The clevis pin securing the master cylinder lever to the stop link must rest hard against the rear end of the slot in the stop link.
B. The master cylinder rod must be set so that the plunger is fully retracted, and the pedal arm has $^{3}/_{32}$-in. (2·5 mm.) free movement at the slotted fork.
C. With the brake shoes set correctly, and in the ‘off’ position, the rear brake rod must be adjusted so that the slip link clevis pin is hard against the front end of the rear slot in the slip link.
D. With the handbrake lever on the first notch of the ratchet plate, and the cable taut, the clevis pin connecting the cable to the slip link is hard against the front end of the slot.
E. When checking points C and D it is important that there should be no tension on the rear brake rod and rear compensator, and that the brake shoe expanders are fully closed.

SECTION 15. **FRONT SUSPENSION AND STEERING**

Item 122. Torsion Rod Adjustment

The following method should be adopted for setting the chassis height, by adjusting the Torsion rod tension.

Stand the car on level ground, and measure the distance from the underside of each frame side to the ground. Measurements should be taken at the front of the gearbox cross member.

Jack up the car, using a jack under the centre of the gearbox cross member, until the wheels are just clear of the ground.

Note: As already stated in Item 79 it is important that a wooden protection pad should be placed on the Jack pad, to protect the frame member.

Slack off the Locating plates at the rear end of the Torsion rods, and slack back the locknuts on the adjuster.

Reset the adjuster as necessary, in relation to the measurements previously taken, to obtain a ground clearance of 10¼-in. (260·4 mm.) at each end of the underside of the gearbox cross member. Lower the jack, and measure the ground clearances again. Jack up and make final adjustments if necessary.

Finally lock up the adjuster locknut and the locating plate.

In isolated cases it may be found that the 10¼-in. (260·4 mm.) measurement cannot be obtained due to excessive wear on the adjusting bolt spigot or thread. This is normally caused by adjusting with the weight of the car on the road-wheels, and it will be necessary either to build up the spigot or to replace the bolt. It should be noted that no wear takes place once the adjusting bolt is locked in position.

Item 123. Steering Camber and Track

Camber angle and track should invariably be checked together as the Track cannot be checked effectively before the Camber is checked, and if necessary reset.

The following routine is the only satisfactory method of carrying out this check.

Slack off Torsion Bar adjusters completely.

Set the car level. To do this jack up the front of the chassis using a screw jack under each frame side member at the Gearbox cross member, so that the underside is approximately 10-in. (255 mm.) from the ground. The distance is not important at this stage and must be governed by the adjustment necessary to level the car transversely. The level gauge illustrated in *Figure 49* is essential for this purpose.

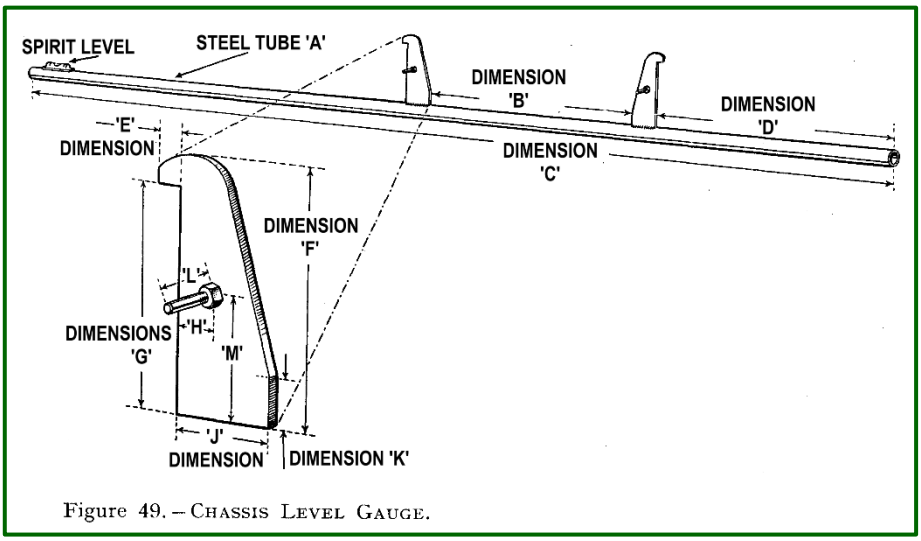


Figure 49. – Chassis Level Gauge.

Legend for *Figure 49* – Steel Tube ‘A’ 1⅜-in. (35 mm.) diameter; Dimension ‘B’ 17¾-in. (451 mm.); Dimension ‘C’ 72-in. (1828 mm.); Dimension ‘D’ 18-in.(457·2 mm.); Dimension ‘E’ ⅞-in. (22·23 mm.); Dimension ‘F’ 6⅝-in. (168·3 mm.); Dimension ‘G’ 5⅞-in. (149·23 mm.); Dimension ‘H’ ¾-in. (19 mm.); Dimension ‘J’ 2⅛-in. (53·97 mm.); Dimension ‘K’ 1⅛-in. (28·57 mm.); Dimension ‘L’ 1¼-in. (31·75 mm.); Dimension ‘M’ 2⅝-in. (66·67 mm.).

Jack up the spring arms until they and the Upper Links are horizontal. The wheels will now be clear of the ground.

Check the Camber angle, which should be zero, with the Suspension in this position, and the wheels ‘straight ahead’. The maximum tolerance permissible is:

Vertical minus ⅛-in. (3·175 mm.)

Zero minus 0° 27’

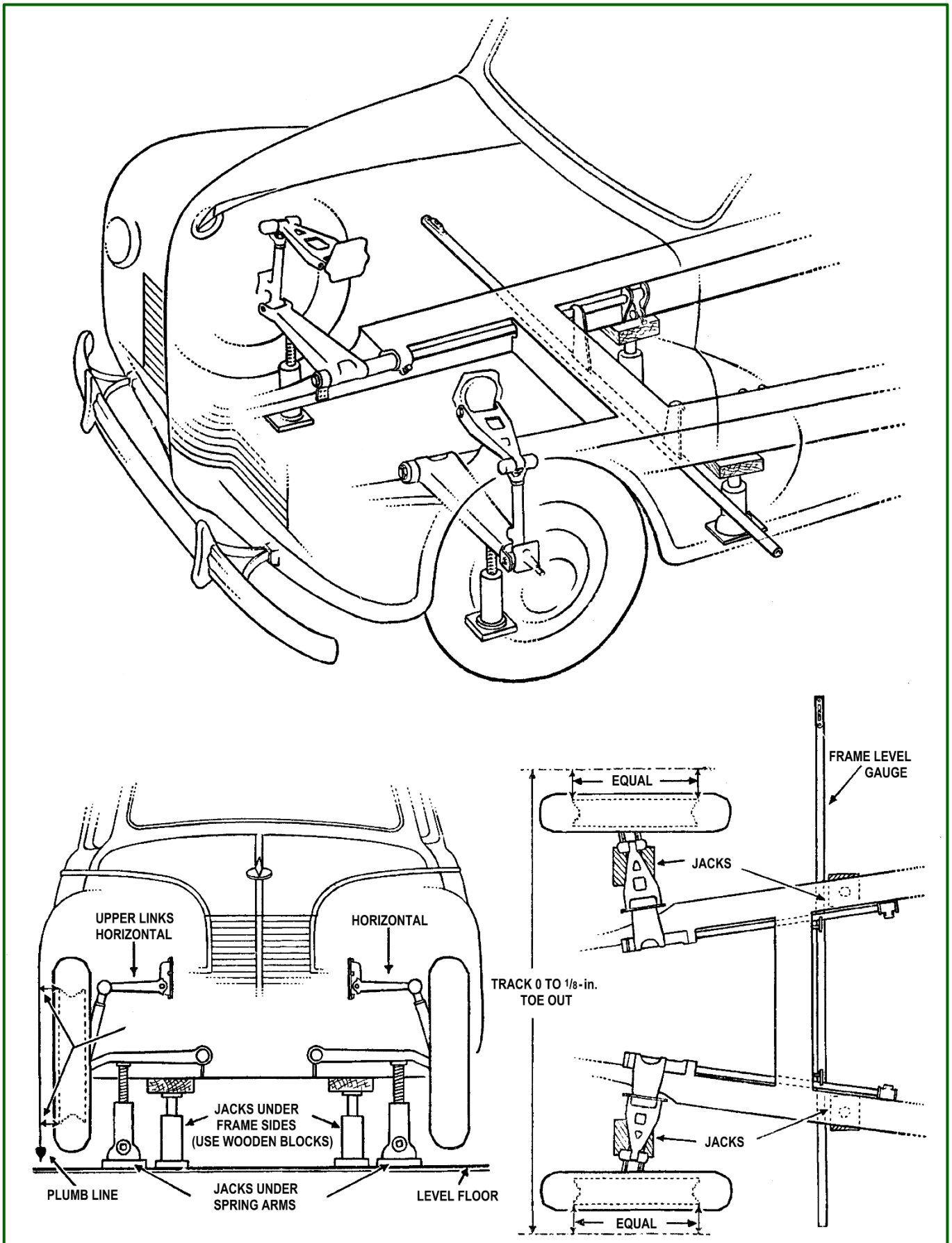


Figure 50. – Track and Camber Check.

Incorrect Camber angles can be re-set by adding or removing shims from behind the Upper Link bracket. As a general guide it can be taken that adding or removing ⅛-in. (3·175 mm.) thickness of shims alters the Camber angle by $^{5}/_{32}$-in. (0°35'). It will of course be understood that should a Camber angle be found incorrect a very careful check should be made of Upper Links, Lower Links, Stub Axles and wheel rims for damage, before re-setting by adding or removing shims.

A buckled wheel rim, for instance, can produce a false camber reading.

Now remove all jacks by lifting with a garage jack under the centre of the gearbox cross member. Lower the chassis until, with the wheels on the ground the Spring arms are again horizontal. Set the track to dead parallel.

Special Note: It is essential that the Steering rod assemblies are within 3/16-in. (4·5 mm.) of equal length. This length can be measured between the inner face of the Steering Ball Joints, and the face of the Steering rod socket. If this point is not given careful attention the steering assembly will be strained on an extreme lock. 'Kick-back' in the Steering wheel will also be experienced.

Lower chassis until the full weight of the car is resting on the front wheel buffer (Bump), and again check the track, which should be parallel to +⅛-in. (3 mm.).

Raise the chassis until the spring arms are hard on the chassis rebound buffer, with the wheels still touching the ground (Rebound), and again check track, which should be parallel to +⅛-in. (3 mm.) and which should not have varied more than ⅛-in. from the Bump position (i.e. If track at Bump was ⅛-in. toe out, track at rebound must be between parallel and ⅛-in. toe out).

Finally re-set the chassis height so that the underside of the frame side member at the gearbox cross member is 10¼-in. (260 mm.) from the ground.

Item 124. Independent Wheel Tracking

If the conditions outlined above cannot be obtained, or in any case when replacing the adjustable height steering ball joints, fitted to cars after Engine No. D9/PB/6562, the track reading should be checked on each wheel independently, using the wheel track equipment, illustrated in *Figure 51*.

To do this, check the steering linkage for play which may be found between the following:

- Steering cone nut and the steering link assembly.
- Excessive lift between swivel pin and stub axle assemblies. This must not exceed 0·010-in. (0·254 mm.).
- Steering rods and the steering link assembly.

Make quite sure the steering rods are exactly equal with the overall track parallel, and that there is no evidence of damage or distortion.

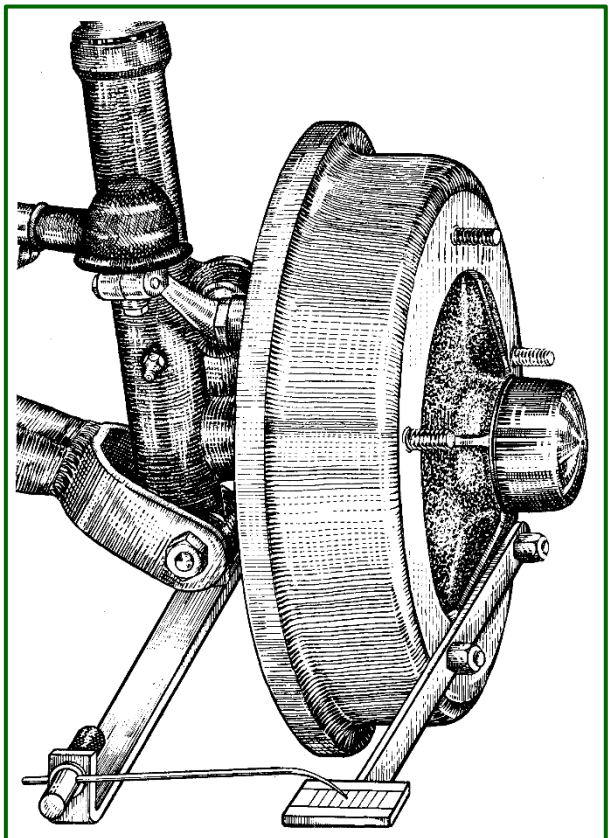


Figure 51.—Wheel Track Equipment.

Support the chassis on axle stands with the wheels clear of the ground and slack off the torsion rod adjusters completely. Place suitable jacks under each spring arm.

Lock the steering box, with the wheels straight ahead. It is essential that the straight ahead position is maintained during the whole of the check, the steering must therefore be locked by some method such as inserting a wooden wedge between the steering box case and the steering box arm. When doing this, special care should, of course, be taken to avoid damage to the box casing.

Remove the front road wheels, remove the grease nipple from the bottom of one of the swivel pin bosses, and thoroughly clean the boss. Fit the pointer and secure with an ⅛-in. gas setscrew, screwed into the greaser drilling. Take care to avoid distorting the pointer by overtightening the setscrew.

Fit the calibrated arm to the brake drum, and secure with road wheel nuts. Set the arm and the pointer, so that the pointer is reading on the centre mark of the calibrated plate on the arm with the arm horizontal. Tighten up the brake adjuster so that the drum is locked.

Raise the jack under the spring arm, until the spring arm is at the maximum bump position (i.e. until the full weight of the car is resting on the front wheel buffer).

Check the pointer in this position.

Lower the spring arm until it is resting hard against the rebound buffer on the frame side, and again note the reading.

The maximum difference in readings on the calibrated plate must not exceed $^{1}/_{32}$-in. (0·79 mm.). This tolerance constitutes an ⅛-in. (3 mm.) difference in track, which is the maximum variation permitted.

The ideal of course, is to have no track variation at all and this should be achieved wherever possible.

Note: $^{1}/_{32}$-in. reading on the plate represents a difference of $^{1}/_{16}$-in. on each wheel, which in turn represents ⅛-in. difference in tracking.

Should these limits be exceeded it will be necessary to alter the height of the steering ball, either by replacement if the ball joints are the fixed type, or by screwing as necessary if the balls are adjustable. For cars with fixed type joints the following steering balls, to correct track variations, can be supplied, assembled into steering ball joint assemblies:

Standard $^{25}/_{32}$-in. (19·84 mm.) shank height.

Plus ⅛-in. $^{29}/_{32}$-in. (23·01 mm.) shank height.

Plus ¼-in. $^{33}/_{32}$-in (26·19 mm.) shank height

The following will be found a useful general guide when correcting excessive track variation:

Steering Ball too short –

a. ‘Toe-in’ at rebound.
b. ‘Toe-out’ at bump.
c. Combination of conditions ‘a’ and ‘b’.

Steering Ball too high –

d. ‘Toe-out’ at rebound.
e. ‘Toe-in’ at bump.
f. Combination of conditions ‘d’ and ‘e’.

After checking, and if necessary correcting on one side, the operation should be repeated on the other side.

Finally, reset the torsion rods, refit the greasers and road wheels, remove the wooden block from the steering box, readjust the front brakes, and re-check the overall track.

Any final adjustment found necessary must be made by adjusting each steering rod an equal amount to ensure the rods retain equal length. This is very important.

IMPORTANT: *The procedure described here is the only method that should be used to set up the steering linkage and alignment on a Javelin or Jupiter. At* Figure 51*, the test equipment is only used for checking the behaviour of the linkage as the independent suspension is moved up and down through its normal travel. Very few systems feature height-adjustable track rod ball ends.*

Item 125. Hub Service

Jack up the front of the car, and remove the road wheel. Remove the split pin, the slotted hub nut, the front hub seal housing and the felt seal.

Remove the front hub. Draw off the outer bearing distance tube and inner bearing.

When re-assembling make sure that the bearings are reasonably free on the stub axle and that the side faces of the distance tube are parallel and square to the centre bore.

Assemble the outer bearing, the distance tube, the inner bearing, the inner oil seal and washer into the Brake drum bore, and fit the drum on to the Stub axle. It is important that this method is used, as difficulty will be experienced with the inner oil seal and washer if these are first fitted to the Stub axle. After fitting the outer oil seal and D washer, the bearings should be nipped up tightly against the distance tube by the Stub axle nut.

Item 126. Front Suspension Rebushing

Front Suspension bushes are likely to wear evenly, and the over-haul of swivel pin, Stub axle, and Upper Link bearings could normally be regarded as one operation. For convenience, however, these have been divided into two separate operations, which can be carried through consecutively if the complete overhaul is required.

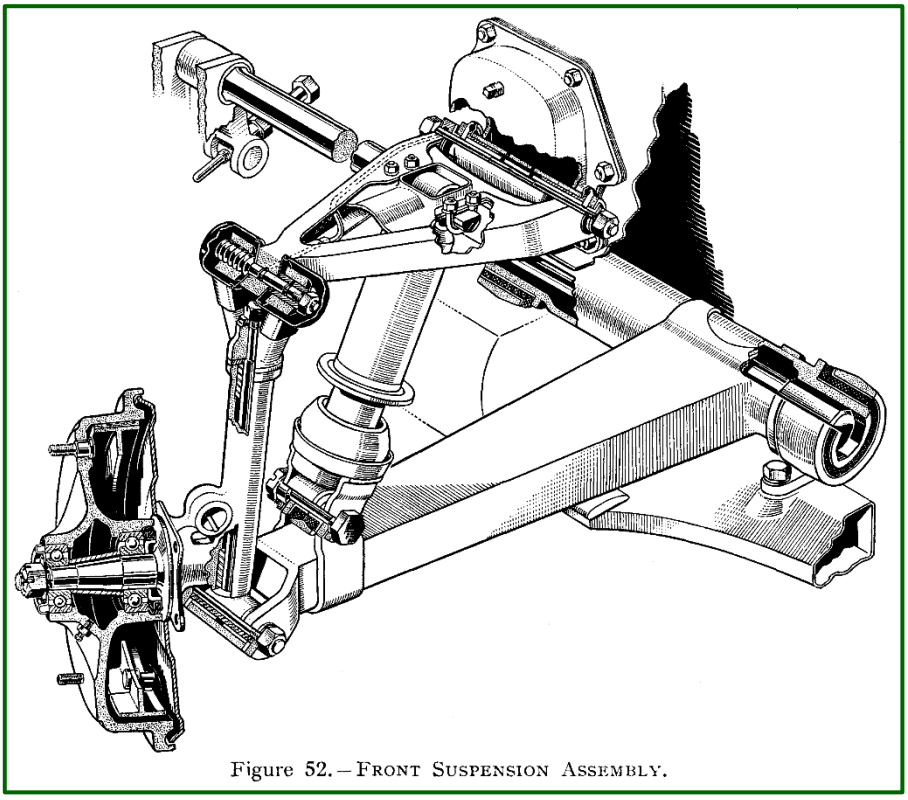


Figure 52.—Front Suspension Assembly.

A. Swivel Pin Bushes

Rebushing swivel pins and stub axles should be carried out in the following manner:

Remove the road wheel.

Disconnect and drain off the hydraulic brake pipeline. Detach the Swivel pin yoke from the upper end of the swivel pin. Lift the stub axle assembly clear of the swivel pin, saving the thrust washer fitted at the top, and the brass shims fitted at the bottom of stub axle column. Remove the swivel pin from the spring arm and remove the distance tube.

Draw out worn bushes from the swivel pin tube, and from the stub axle column, and press in replacements as necessary. Burnish the replacement bushes to size after fitting. Re-assemble the swivel pin to the stub axle assembly, refitting any shims at the lower end and the Thrust washer at the upper end. Fit the assembly to the Swivel pin yoke, tighten down, and check end movement of the Swivel pin in the column, which should not exceed 0·010-in. (0·25 mm.). If necessary fit additional shims at the lower end of the column to reduce end movement to less than 0·010-in. (0·25 mm.).

Check the spring arm distance tube and the pin for wear and replace if necessary. It should be noted that no wear will take place on this pin unless the nut has been loose for some time. Reassemble the swivel pin tube to the spring arm and tap lightly around the base of the stub axle column before tightening the pin, to make certain that the distance tube and the swivel pin tube are settled correctly. After settling it is most important that the pin and nut are fully tightened. On completing assembly, bleed the hydraulic brake system as described in Section 15, Item 119.

B. Upper Link Bushes

Disconnect the swivel pin Yoke from the Swivel pin and support the stub axle assembly so that the brake pipeline does not carry any weight. Remove the two ‘U’ bolts securing the shock absorber to the Upper Link.

Detach the Upper Link bracket from the dash side, taking care to note and save the shims behind the bracket, and remove the Upper Link and bracket assembly, which should now be placed in a suitable Vice.

Cut the cords securing the rubber seals to the seal washers at the outer end of the Upper Link, and fold back the Seals over the Yoke.

Release the nut securing the Upper Link pin, and screw out the pin.

Examine the bush, yoke and the pin for wear, and also check that the oil drillings in the pin are clear. Remove and replace the rubber seals if these have perished or are worn.

Check that the seal washers are a good fit against the side faces of the upper link, correct any distortion, or replace if necessary. Examine the side faces of the Upper Link and clean up if necessary.

Refit the bush. Fit the Upper Link and the Seal washers between the arms of the Yoke with the threaded arm to the rear, and fit the pin threading in to the tapped arm of the Yoke. Fit the washer

and nut, and tighten up fully, setting the pin as necessary in the Yoke so that when the nut is fully tightened down on the bush the Upper Link is central between the arms of the Yoke. Secure the rubber seals to the seal washers with cord and if necessary seal the arms of the Yoke to the rubber seals with Bostik, or a similar sealing compound.

From Engine No. D9PB5979, the use of oil flow lubrication to the outer end of the Upper Link was discontinued and a grease nipple substituted. This can also be done on earlier cars, if desired, by cutting and blocking the lubricating tube and by fitting a grease nipple into the tapped hole at the outer end of the upper link in which the Lubricating tube union was originally fitted.

Now release and remove the Trunnion pin, securing the Upper Link to the Upper Link Bracket, bend the lubricating tube clear of the Upper Link, remove and save the sealing sleeves fitted into the drillings in the Upper Link and the Trunnion Washers. Remove the trunnion rubber seals. Remove the Trunnion tube and replace if necessary.

Draw out the bushes from the bracket, and press in replacements, making sure that the seal retainers are fitted between the flanges of the bushes and the bracket.

Re-assembly is a reversal of the routine detailed above, but the following points should be given attention.

It will be found to ease fitting if the Trunnion Seals are fitted to the seal retainers first, and the locating pegs (dowels) in the Upper Link are removed or driven back before the Upper Link is fitted to the bracket.

Both ends of the Trunnion tube should be slightly proud of the flanges on the Trunnion Bushes. The sealing sleeves must be a good fit in the Trunnion washers. New trunnion rubber seals should be fitted and the fit and location of the trunnion washers should be very carefully checked.

Apply a mark on the edge of the upper link trunnion washer, Part No. 50302, adjacent to the peg bore to ensure that the peg can be driven into the bore.

The head of the trunnion pin, and also the lubricating tube must be fitted at the rear of the upper link. The flat on the lubricating tube banjo must engage with the flat on the head of the trunnion pin and the nut must be fully tightened so that the Upper Link turns as a unit with the Trunnion pin and the Trunnion tube.

It is of course important that the shims behind the Upper Link bracket are refitted in their original positions so that the correct castor and camber angle is maintained. The camber should always be checked as detailed in Item 123, after re-assembly.

It will also be necessary to bleed the Hydraulic Brake System, as described in Section 14, Item 119, if the brake pipeline had been disconnected.

Item 127. Front Torsion Rod Replacement

Legend for *Figure 53* – Dimension 'A' 3¼-in. (82·55 mm.); Dimension 'B' $^{5}/_{16}$-in. (8 mm.); Item 'C' $^{7}/_{16}$-in. x 4¾-in. BSF draw-bolt, threaded full length; Item 'D' 1⅝-in. (41·3 mm.) O.D. 8 S.W.G. steel tube; Distance between $^{15}/_{32}$-in. (11·9 mm.) hole and flat must be $^{5}/_{16}$-in. (8 mm.) to clear the chassis frame.

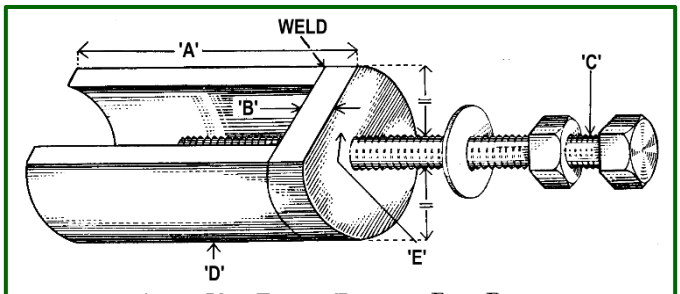


Figure 53.—Front Torsion Rod Puller.

The torsion rod can be removed with the minimum of dismantling using a special puller, illustrated in *Figure 53*. Jack the front of the car until the wheels are clear of the ground.

Remove the battery and disconnect the Midship bearing Support from the frame side, on the side from which the torsion rod is to be removed.

Slack off the torsion rod adjustment completely and remove the locating plate.

Place the drawer in position against the bracket on the frame side at the rear end of the torsion rod and insert the draw-bolt into the tapping at the rear end of the rod. Draw the rod clear of the Octagons in the normal manner.

Remove the Torsion rod to the rear, driving the front end Octagon through the adjusting lever. When refitting set the spring arm against the rebound rubbers, and the adjusting lever against the frame side, drive the Torsion rod ends into position, taking special care to guide the front end into position, and to make certain that the rod suffers no surface damage. The rod should of course be fitted with the tapped end at the rear.

The locating plate should now be fitted, and the adjusting bolts set so that both frame side members are 10¼-in. (255 mm.) clear of the ground at the gearbox cross member. (Refer to Item 122).

If the Torsion rod drawer is not readily available the rod can be removed by driving out to the front, after removing the front apron, disconnecting the front Engine mountings and jacking the Engine slightly so that the cylinder blocks are clear of the Torsion rod line. The rod can also be refitted from the front with the Engine in this position. Your attention is drawn to the method of storing torsion rods detailed in Item 60.

Item 128. Front Spring Arm Service

To remove a Spring arm; slack off the Torsion Rod adjustment. Remove the pin and distance tube securing the lower end of the stub axle column to the outer end of the arm, and the pin securing the lower end of the Shock Absorber to the bracket on the arm. Support the Stub Axle Assembly clear of the Spring Arm.

Slack off the clamp bolt at the rear of the spring arm trunnion, and detach the bracket from the frame side at the front end of the trunnion. Draw the Torsion rod clear of the Spring arm by the method detailed in Item 127, draw the Spring arm forward, clear of the clamp, and lift out. Alternatively if the Engine has already been removed from the chassis, the Torsion rod and Spring arm can be removed together, by detaching the Spring arm, as described above, removing the Rod locating plate, driving the Torsion Rod clear of the rear end octagons, and drawing the Rod and arm forward until clear of the chassis.

Check the outer end of the spring arm for excessive wear on the Swivel pin and Shock absorber drillings, and for any possible distortion. It should be noted that wear will occur only if these bolts are loose. Check the trunnion bushes for wear and, if necessary drive the Spring Arm Bracket and bush from the front end of the Trunnion, and press out the worn bush. Press the replacement bush into the bracket, and press the bracket on to the spring arm trunnion positioned so that the face of the larger of the two arms on the bracket is at approximately 80° to the line of the Spring Arm.

Drive or chisel off the bush at the rear of the Trunnion and press on the replacement, with the flanged end forward.

Special Note: On early cars the Trunnion bushes were retained on the tube by tab washered nuts. These should be tightened down fully. If this point is not carefully watched a suspension ‘creak’ may result. On later cars the bushes must be an interference fit with the trunnions and with the bracket.

To reassemble, reverse the routine outlined for dismantling, with special attention to the following points.

The Swivel pin and distance tube must be settled correctly in the outer end of the spring arm, so that the suspension movement is free.

Shock absorber bushes and thimbles should be examined for wear and replaced if necessary.

Set the chassis ground clearance to 10 ¼-in. (255 mm.) on completion of the operation.

Item 129. Steering Linkage Service

Adjustment for wear on the steering linkage is provided on the Bearing Cone nuts at each end of the Steering Link, Part No. 50537. To make adjustment, remove the Lock nut and Tab washers, fully tighten the bearing cone nut, and then slack back through $^{1}/_{6}$ of a turn. Fit new tab washers and lock up in this position. Before folding over tabs check that the steering is free. *See note in Item 68, Page 22. This note applies to both the intermediate arm and the steering box.*

Adjustment is also provided for end movement in the steering rod couplings at each end of the Link. Fold back the rubber cover at the inner end of each Steering rod, unscrew the socket, and withdraw the rod from the housing in the end of the link. The Steering rod pad can then be removed from the housing and sufficient shims fitted behind the pad to eliminate all end movement, while allowing the coupling to move freely.

It should be noted that stiffness in these couplings does not affect the freedom of steering movement, and that it is therefore necessary to disconnect the ball joint from the Steering arm at the brake drum, in order to check the full arc of the rod.

To remove the Steering Linkage from the car, detach. the ball joints at the outer end of the Steering Rods, from the Steering arms, and remove the Lock nuts and cone nuts securing the link to the Steering box arm and to the intermediate arm. The linkage can now be manoeuvred clear of the chassis.

No provision is made for adjustment of wear in steering ball joints, or for replacement of separate parts of the unit. Should it be necessary to replace these joints the track should be re-set, as detailed in Item 124.

With the linkage removed, check the steering intermediate arm for signs of wear or excessive play. The bolt securing the arm to the chassis should be tightened fully so that the bearing cone is nipped up, the arm should move freely without play.

Item 130. Steering Column and Box Adjustment

Adjustment is provided, on all cars, for pinion end movement, by means of shims fitted between the face of the column and the flange on the box. A flange on the pinion registers with the recess and with the flange. Removal of the shims reduces the end movement of the pinion.

To adjust, release the three setscrews securing the column to the box and also the column 'U' bolt and the gearchange column bolt, lift the column and pinion clear of the box, and remove shims as necessary, to reduce end movement.

Check that the pinion can move freely through the full arc of the quadrant before completing reassembly.

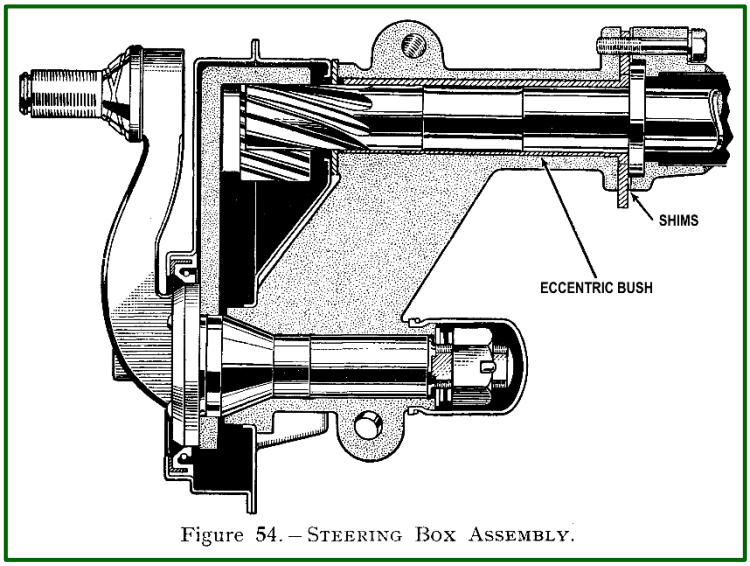


Figure 54. – Steering Box Assembly.

On early cars there is no adjustment for meshing of pinion to gear, but on all cars after Engine No. D9/PA/3871, an eccentric pinion bush is fitted into the bore of the Steering box bracket. A drilled lock-washer is keyed into the flange of the bush and fits between the flanges on the column and the box. To adjust, remove the three setscrews securing the column to the box and turn the lock-washer until the best possible meshing is obtained, bearing in mind that if wear has taken place this will be mainly in the centre of the gear, and that adjustment will be limited by meshing on each extreme lock.

Adjustment is also provided on all cars for steering box arm play. This can be re-set, by removing the rubber cover on the top of the arm shaft, removing the split pin, tightening down the nut fully and slacking back until the arm can move freely. Re-fit the pin and rubber cover.

Item 131. Steering Column and Box Service

To dismantle the steering column; release the setscrew on the side of the steering wheel hub and remove the horn push assembly, disconnect and remove the horn brush on the side of the column, release the Steering wheel nut, and draw off the wheel. Disconnect and remove the accelerator pedal. Release the three setscrews securing the column to the box, and the gearchange column bolt. Remove the 'U' bolt which retains the steering column and gearchange column to the facia panel. The steering column and pinion are now free for removal, and should be lifted upward, so that the pinion clears the box, before moving to the side. Note and save the shims and the Locking washer fitted between the flanges on the column and the box.

Remove the pinion downward from the column, check the felt bearing at the top of the column, and replace if necessary, and also check the horn slip ring and connection.

To remove the Steering box from the chassis, jack up the front of the car, remove the right hand front road wheel, detach the steering, detach the steering ball joint from the steering arm and lift clear. Disconnect the Stub Axle column and the Shock absorber at the lower pins, lift clear, and support, preferably by tying up. Release the bolt and setscrew (through the bottom rear of the upper link bracket) securing the Steering box to the dash side, and lower the box, which can then be removed from under the dash side.

It is not normally necessary to dismantle the Steering box assembly, as reconditioned units can be supplied and dismantling involves grinding away the welded edge of the box casing, and rewelding when reassembling.

The Steering box is filled with oil on assembly, but should be replenished with grease during service. Fill to the level of the plug hole, taking care to avoid air pockets in the grease. It is important that a grease nipple is not fitted to the Steering box as air locks will be experienced if this is done.

The eccentric bush fitted to all steering boxes after engine No. D9/PA/3871, can be replaced, if worn. The bush should turn freely in the bore of the Steering box bracket.

Reassembly of the Steering box and column is the reverse of the routine outlined for dismantling, but the following special points should be noted.

When fitting the column to the box add or remove shims as necessary to eliminate end float in the pinion, and set the eccentric bush adjustment to the best possible meshing position, in both cases allowing the column pinion and the gear to turn easily.

Make certain when securing the column to the facia panel that the column is settled in its normal position i.e., there must be no side strain whatever on the column.

Check that the horn brush is free to move up and down in its holder, and that the spring is working correctly before refitting the brush holder to the steering column. Also check that the horn push contacts are clean when refitting the push button.

SECTION 16. **REAR SUSPENSION**

Item 132. Rear Axle Removal and Refitting

Lift the car to a convenient working height by jacking under the frame side members, which should be protected with wooden blocks placed between the jack pads and the frame sides.

Disconnect the rear coupling of the propellor shaft from the Pinion Joint Jaw and support the propellor shaft. Disconnect the rear brake cable at the rear axle compensator.

Detach the transverse steady stay (*Panhard rod*) from the bracket on the axle casing, remove and save the outer cup and the rubber pad. The pad should of course be examined for wear or distortion and replaced if necessary.

Detach the shock absorbers and the lower links from the axle. Examine the Silentbloc bush pressed into the bore at the rear end of the lower link, and the shock absorber rubber bushes for wear or distortion.

Take the weight of the axle on a garage jack, or trolley, detach the spring arm from the bracket on the axle casing, and lower the axle clear of the suspension.

Before refitting the axle, examine the Silentbloc bushes in the brackets to which the spring arms are secured, and replace if worn or distorted.

Replacement axle units are usually supplied without brake back plates and linkage, brake drums and hub grease nipples, and these should be transferred from the existing axle if a replacement unit is to be fitted. The drillings for the grease nipples are normally protected by metal caps, which can be prised out with a screwdriver, and which should be fitted to the replaced axle if this is to be returned to the factory. Axle shaft end play should be set by the method detailed in Item 115, Page 47, before fitting the brake drums.

When refitting the axle, fit the spring arm bolt with the head on the inside. The bolt may foul the body side, if fitted with the head on the outside. Fit the transverse stay washers and thread the stay into the bracket as the axle is being lifted into position. Lever the axle into position so that the torque arm pin, which secures the lower link and the shock absorber, to the axle can be fitted easily. Finally

nip up all suspension bolts with the weight of the car resting on the axle. Tighten the transverse stay nut to hold the rubbers firmly, without over compressing.

Item 133. Rear Torsion Rod Removal and Refitting

To remove either of the rear torsion rods:

Jack up the rear of the car, remove the rear road wheels and support the rear axle on a jack or stand.

Pull out the rear seat cushion, detach the spring arm, for the torsion rod to be removed, from the bracket on the axle, remove the aluminium covers at each end of the torsion rods, and draw off the spring arm which has already been detached from the axle.

Drive free the torsion rod (taking care not to drive the rod so far that it fouls against the other spring arm), towards the end from which the arm has been removed and pull out the rod, from inside the body, moving to one side as necessary to clear. Remove the rubber bushes fitted at each side of the spring arm, replace as necessary. Worn rubber bushes will affect the height of the car at the rear.

Special attention should again be given to the notes on handling and storage of Torsion rods in Item 60.

When refitting the Torsion rod, make certain that the faces of the octagons line up with those in the bracket in the body frame side, before actually driving the rod home, and also, that the faces in the bore of the spring arm line up with those on the rod, when refitting the arm.

It should be noted that the arm can be fitted to the rod in only one position and that no adjustment for tension on the rods, is provided.

SECTION 17. **SHOCK ABSORBERS**

Item 134. Rebushing

The bushes fitted in the top and bottom eyes of the shock absorbers should be checked for distortion or wear whenever the shock absorbers are removed from the suspension.

Silentbloc bushes are at the upper end of the front shock absorbers. These should be pressed out, if worn, the top pin should be transferred from the worn bush to the replacement, and centralised in the new bush, and the new bush should be pressed into the shock absorber eyelet, positioned so that the flats on the pin register against the underside of the upper link when the car is in the normal road position, i.e. at about 60° to the centre line of the shock absorber.

The bushes at the lower end of the front shock absorber are plain rubber cones, supported on metal thimbles, and on the rear shock absorbers plain rubber cones supported directly on the retaining bolts. These can be removed by hand once the retaining bolt has been withdrawn. All the four pairs of bushes fitted to the rear shock absorbers are identical, and can be interchanged.

When refitting the lower end of the front shock absorber to the spring arm the following method should be adopted:

A. Fit rubber bushes and thimbles into shock absorber eye.
B. Fit the eye into the lugs on the spring arm.
C. Tap the buffer seat assembly into position, with the lugs on the seat outside the lugs on the spring arm.
D. Fit the shock absorber pin and nut, and tighten as necessary.

Special attention should be given to the condition of the front wheel buffer, and the buffer seat, as these carry the full bump load of the front suspension.

SECTION 18. **SHOCK ABSORBER SERVICE**

Item 135. Setting Adjustments, Dismantling, Re-assembly

General – As only the ‘bleed’ incorporated in the valve can be felt when operating the shock absorber manually even when new, no amount of hand testing will provide the true indication of the resistance of the shock absorbers at speeds obtained on bumpy roads. It will, therefore, be appreciated that a new shock absorber may appear to be weak when. operated by hand but this should not be taken as evidence of a fault. Air will bleed into the working parts of a shock absorber when

not in use, particularly if it is stored in any position other than vertical, and this air must be expelled before the shock absorber is tested.

Additionally, the shock absorber will only operate when in an approximately vertical position and should always be held in this position when checking for mechanical faults.

Checking For Faults – If a shock absorber fault is suspected, remove the unit from the car, remove the bushes from the loops and clamp the shock absorber vertically in a vice by the lower loop. Grip the dirt shield firmly in the hand and operate the shock absorber as rapidly as possible a number of times to expel any air in the working parts.

Having done this fully extend and compress the shock absorber feeling the nature of resistance. There should be a smooth action throughout both strokes and although the action is easy it should not be devoid of resistance altogether. If half an inch or so of free movement is felt towards the extended position this is likely to be due to the fact that air has not been completely expelled from the working parts. The shock absorber should again be operated rapidly up and down a number of times to clear away this air. Fully extend the shock absorber and examine for evidence of leakage.

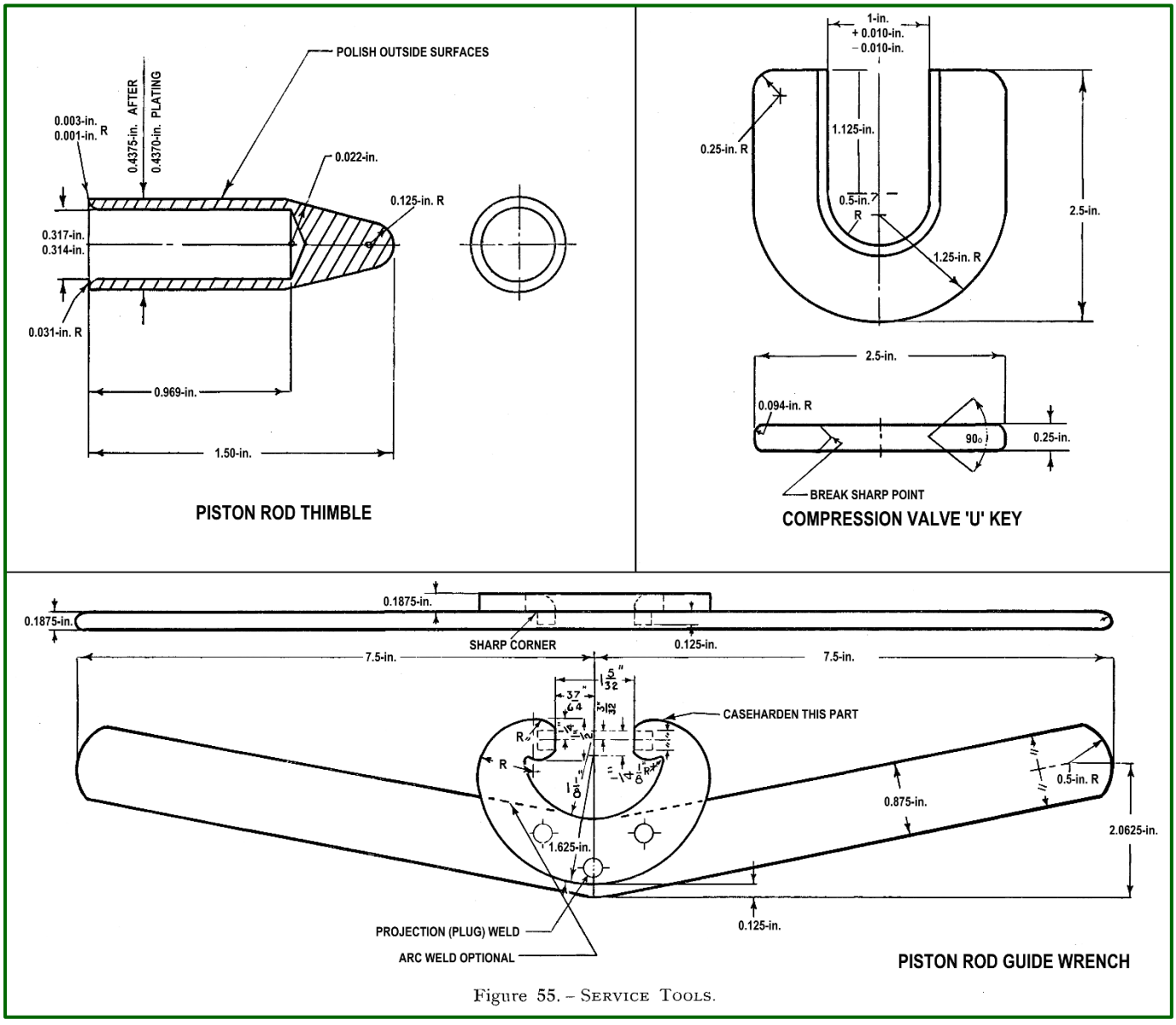


Figure 55. – Service Tools.

Possible Failures:

(a) Leaking. It is possible for the shock absorber to leak from three points – *Figure 56*:

(1) Oil seal (H).

(2) Reserve tube gasket (J).

(3) Oil seal gasket (K).

If the oil seal is leaking a new rod guide and seal assembly may be fitted but it will generally be found that when the oil seal leaks other parts such as the rod guide, piston, pressure tube, etc. will be so badly worn that no satisfactory repair can be made.

If a leak appears between the reserve tube and the rod guide the reserve tube gasket will most probably be faulty.

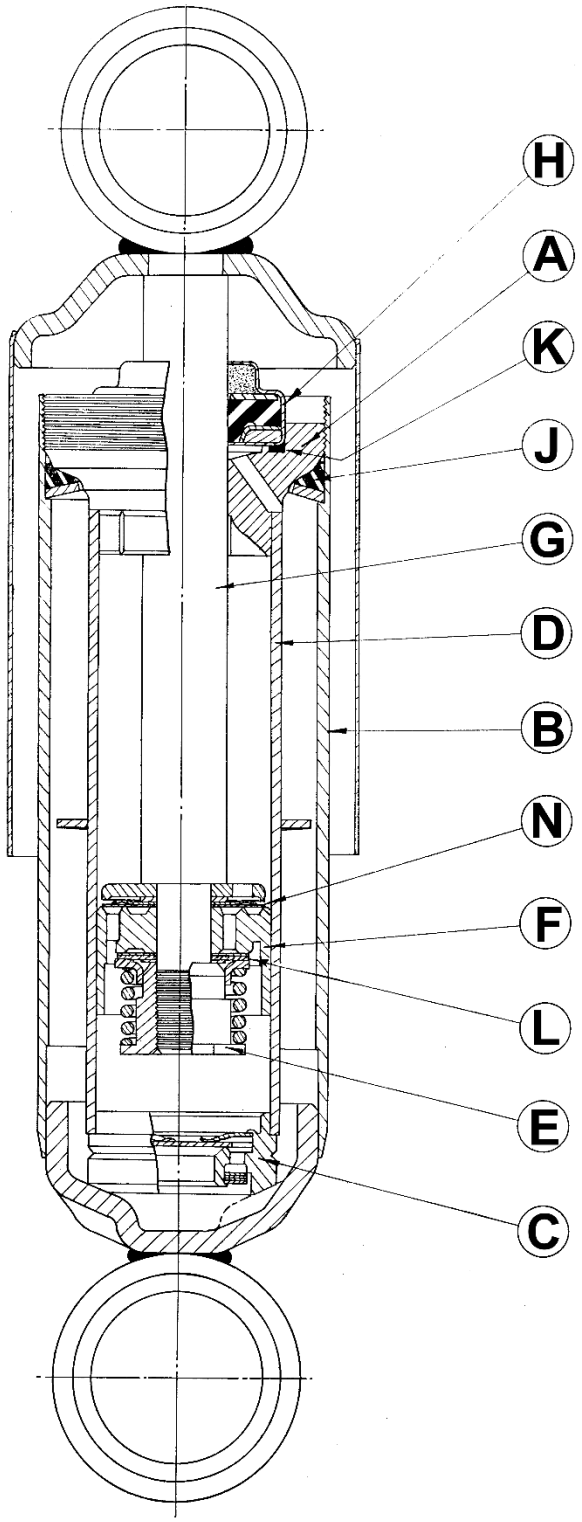


Figure 56.—Shock Absorber Section.

This can usually be corrected by checking the rod guide for tightness and screwing down as hard as possible.

If the oil is leaking between the outside of the oil seal cage and the recess of the rod guide (A) it is most likely that the oil seal gasket is allowing oil to pass and a replacement rod guide and seal assembly should be fitted.

(b) **Loss of Control –** Loss of control in the shock absorber is almost invariably due to dirt which has been left in the system when the shock absorber has been dismantled and reassembled becoming lodged in the discs and faces of the piston (F) or between the discs and faces of the compression valve (C).

If the loss of control is experienced on rebound only the shock absorber should be dismantled and thoroughly cleaned to eliminate all dirt. Dirt may have found its way into the intake valve (N) on the piston in which case the piston parts should be very carefully cleaned.

If rebound control is still absent the rebound disc (L) should be examined for possible fracture and replaced if necessary. Loss of control on rebound can, however, be caused by the piston rod nut (E) becoming loose which should, of course, be corrected by tightening.

If there appears to be any fault in the compression valve the only action which can be taken is to fit a replacement valve.

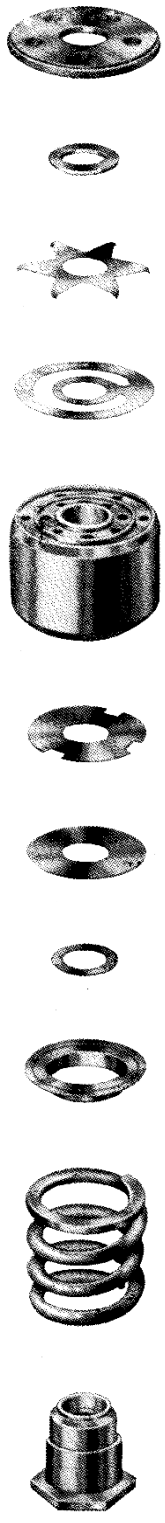


Figure 57. Assembly of Rebound Valve.

DISMANTLING SHOCK ABSORBER – Refer to *Figure 56*.

Clamp the shock absorber in a vice by the lower loop and carefully open the windows in the dirt shield with a screw-driver. Extend the shock absorber until the top of the rod guide (A) is visible through the window. Insert the piston rod guide wrench and screw the rod guide out of the reserve tube (B).

As soon as the guide is free remove the wrench and withdraw the top portion of the shock absorber leaving only the reserve tube in the vice. Remove this and place the top loop of the shock absorber in the vice so that the compression valve (C) is uppermost.

Insert the compression valve 'U-key' into the groove in the compression valve and withdraw the valve by giving the key a light upward blow. Remove the assembly from the vice and empty all oil from the pressure tube (D). Refit the loop in the vice and push the pressure tube down so that the piston rod nut (E) is exposed. Unscrew this and remove the piston with the rebound valve assembly (F).

If it is necessary to dismantle further, withdraw the pressure tube and rod guide from the piston rod (G). To remove the rod guide from the pressure tube insert a drift down the pressure tube and holding the tube in the hand tap off the rod guide taking special care not to damage the bore of the guide.

Re-Assembling – The importance of scrupulous cleanliness cannot be sufficiently emphasised and this point must be given very careful attention. The general routine for dismantling should be reversed.

Press the rod guide carefully into the pressure tube making sure that the oil seal (H) which is fitted into it is not damaged. Place the piston rod thimble (*Figure 55*, upper left) on to the screwed end of the piston rod before replacing the rod guide otherwise the oil seal will be destroyed.

Before fitting the compression valve (which should be hammered lightly into the Pressure tube), extend the rod and fill the Pressure tube with clean Monroe shock absorber oil. Before screwing the rod guide add clean oil in the Reserve tube until the total quantity of oil in the shock absorber is exactly 3¼ fluid ounces (92·5 cc.) for the front and 5⅞ fluid ounces (16·7 cc.) for the rear shock absorbers. It is important that the exact total quantity of oil is poured into each shock absorber.

Adjustment – The resistance of the shock absorber is determined by the components incorporated during manufacture and the settings were finalised after extensive tests.

If, however, local conditions make adjustment necessary fit new parts as indicated in the following table.

	Compression			**Rebound**		
	Compression Valve Coding			Number of Notches in Metering Spacer		
	Standard	To Weaken	To Stiffen	Standard	To Weaken	To Stiffen
Front Shock Absorber	A4	A6	B4	2	4	1
Rear Shock Absorber	B4	B6	C4	3	5	1

It will be noted that the metering spacer controls the rebound stroke and also that the rebound springs should not be changed. If alteration is made to the compression stroke this can only be done by replacing the compression valve assembly. These assemblies can be identified by the valve coding which is stamped on the body of the valve.

SECTION 19. **BODY – SERVICE OPERATIONS**

Item 136. Removing and Refitting Windscreen

To remove the windscreen, remove the interior finish moulding, the trim piping and the beading at each side of the screen, and also the wooden tacking rail.

Release the chrome windscreen finish moulding by sliding back the centre space cover, on the top edge, using a rubber block or a similar tool. Ease the moulding out of the rubber at the top centre edge and gradually follow round, taking care not to distort the moulding.

Ease the rubber moulding off the body frame and tap the screen inwards, with the palm of the hand, towards the inner recess. As the screen moves inwards work gradually round the outside edge until the screen drops into the inner recess. Insert a lever between the body frame and the outside edge of the screen, and lever out of the recess towards the inside of the car.

To refit the windscreen, fit the rubber moulding round the edge of the screen, noting the positions of the five 'pop marks' which indicate the lower edge of the screen. Place a length of stout cord in the outer groove of the rubber moulding, to meet at the bottom centre with two loose ends, at least 6-in. (150 mm.) long. Apply soft soap liberally, on the surface of the rubber moulding near the groove which fits over the body frame lip. Place one end of the screen into the frame recess, and lever the

opposite end over the inner frame lip into the recess. Lift the two loose ends of the cord over the outer lip of the body frame, and leave resting on the cowl.

Two men are now needed. Press the screen and rubber, from the inside, against the outer lip of the frame and lift the edge of the rubber over the lip by pulling one end of the cord towards the middle of the screen. Follow the rubber all the way round, pulling the cord steadily towards the middle of the screen.

Now seal the moulding by inserting Expandite Seelastik (trowelling grade) or a similar sealing compound, between the body frame and the rubber moulding, and between the windscreen and the moulding.

Apply soft soap to the face of the rubber moulding, on which the chrome moulding fits. Insert a corner of the chrome moulding in the groove in the rubber, and tap home with a soft rubber block. Follow round the moulding to the top centre. Repeat for the opposite side. Lock the chrome moulding at the top centre with the spacing cover.

Finally replace the wooden tacking rails, the trim piping, and the interior finish moulding, fitting rubber finish spacers at the joints in the moulding.

Item 137. Removing and Refitting Rear Window and Quarter Lights

The method used for removing and refitting the rear window follows very closely the routine for the windscreen in that it is necessary to remove the interior moulding, and to slide back the spacing cover on the chrome moulding and ease out the moulding. The rubber moulding can then be eased over the metal lip of the body.

To remove a rear quarter light, lift clear the interior moulding which is secured by three screws and then simply press the window inwards. When refitting the window a good seal should be made between the rubber and the glass and between the rubber and the body frame.

Item 138. Doors and Bonnet

Adjustments can be made to the fit of doors by slacking off the setscrews securing the door hinges to the centre pillar and moving the hinge in or out as necessary. Adjustment to obtain a snug fit at the top or bottom of a door can be made by placing a block of wood, wrapped in felt for protection, between the door edge and the lock pillar, and by springing the door as necessary.

Provision is made for resetting the fit of the Luggage boot door. The bolt-holes, through which the hinges are secured to the door and to the body, are elongated so that adjustment can be made as necessary. The tension on the Luggage boot door support catch can also be adjusted, by slacking off the setscrews which retain the catch to the body, and moving the catch assembly forward or back, as required.

Horizontal adjustment of the Bonnet fit can be made by slacking off the setscrews securing the hinge to the bonnet, and moving the setscrews in the elongated bolt-holes in the hinge. Vertical adjustment can be made in the same way on the arm of the hinge fitted to the Dash side.

The door trim pads can be removed, after removing the door handles and window winders and releasing the two screws at each bottom corner, by gently prising out the springs clip around the edge of the pad, and then lowering the pad clear of the window moulding. Access is then gained to the door lock, the window winding mechanism, and to the door check arm.

To remove the quarter panel trim pads, first remove the rear seat, which is secured to the frame by five setscrews, access to which is obtained from the Boot. The spring clips securing the trim pad to the panel. can then be gently prised out. Removal of quarter trim pads should be necessary only if access is required to the chrome finish moulding on the quarter panel, or for accident repair work.

To release the door check arm, after removing the door trim pad, remove the split pin which retains the rubber buffer to the arm, and draw off the buffer. This should be examined and replaced if necessary. The check arm is drilled so that any desired opening of the doors can be obtained, by fitting the split pin in the drilling at the position required.

The door outside handle assembly is secured by a setscrew under the handle lever and by a nut on the door panel edge.

To remove the door lock, release the outside handle, and the setscrews securing the lock to the door edge and to the inside frame. The lock is now free and should be lowered until clear of the inside panel.

Item 139. Finish Moulding

The following details are likely to be helpful when removing or refitting the chromium finish mouldings.

Bonnet mouldings are retained by bolts at each end, and by spring clips fitted at regular intervals along the moulding.

Door mouldings are clipped over the panel edge at one end, and secured by spring clips fitted along the moulding.

The quarter panel mouldings are secured by setscrews at each end of the moulding and by spring clips. To gain access to these, remove the quarter panel trim pad and the Boot side trim pad.

When mouldings are refitted, 'Dum-dum' or similar sealing compound must be applied liberally to the inside of each spring clip, so that the end of the clip is completely hidden, to prevent water percolating between the moulding and the body, and through the spring clip holes into the body.

SECTION 19. – **BODY – ACCIDENT REPAIR OPERATIONS**

It is impossible, within the scope of this manual, to give full details of body repair operations and the information quoted in the following pages is intended as only a general guide to the skilled operator concerned with body repairs.

Illustration Nos. 58 and 59, show the method of Body and Side frame assembly, and also illustrate the panels and assemblies which can be supplied as replacements. We do of course appreciate that in some cases a complete panel will not be required, but we cannot normally undertake to supply part panels on demand. For the repairer engaged in a regular flow of work this problem will naturally resolve itself, but when isolated repair jobs are undertaken we will certainly do everything we can to help; usually however it will be necessary to purchase the standard panel and to cut out the section required.

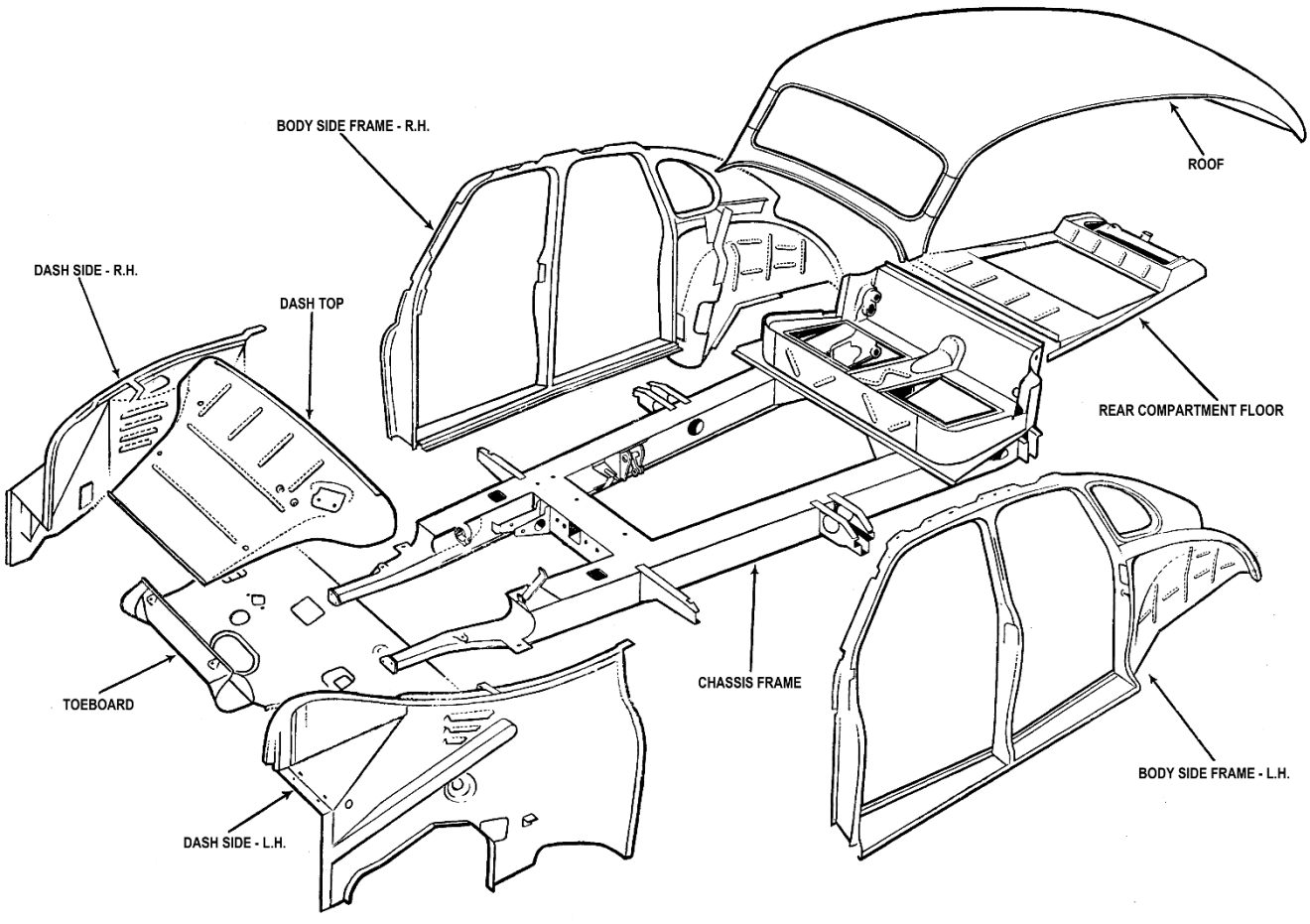


Figure 58.—Body Assembly.

Item 140. Chassis Alignment

It is important that the following points are checked in all cases of accident damage, where there is any possibility that chassis distortion has taken place.

A. Lines drawn:

i. Between the right hand front engine mounting fixing points, and a point 1¼-in. (32 mm.) behind the left hand mounting fixing point.

ii. Along the gearbox cross member.

iii. Between the rear Torsion rod anchor brackets.

Must be parallel, and must be at right angles to the centre line of the chassis, drawn through the centre point of each of the three lines.

B. The fixing points for the suspension upper link brackets on each dash side must be accurately centralised and aligned in relation to the Front Torsion Rod trunnion tubes.

The undermentioned jigs, for checking these points can be supplied on loan, through our Main agents, or alternatively, drawings can be supplied, so that the jigs can be manufactured locally. In either case, full instructions and illustrations, showing the correct methods of fitting and using the Jigs will be supplied.

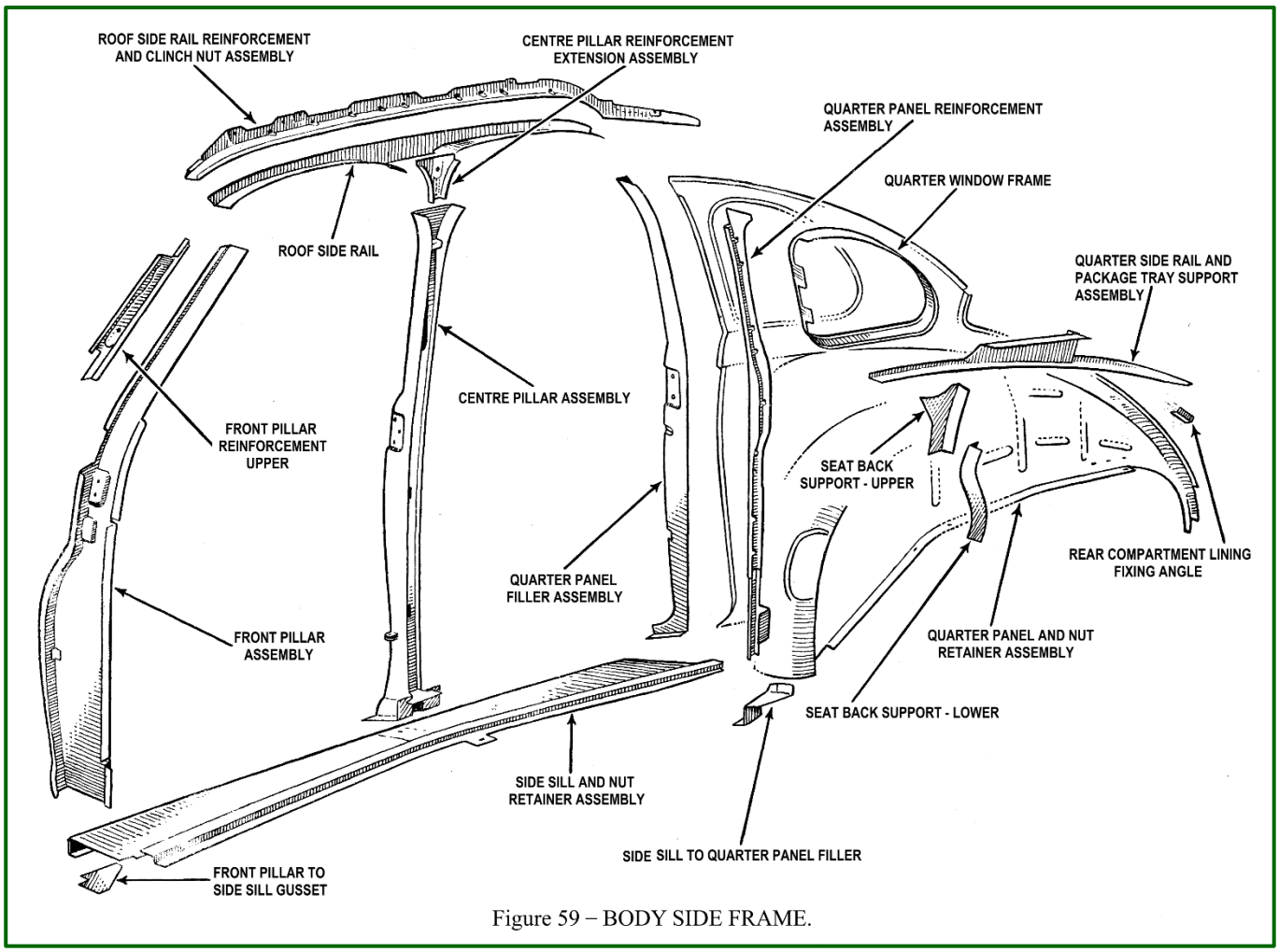


Figure 59 – BODY SIDE FRAME.

Chassis Checking Jigs:

Main Frame alignment jig	JB. 001.
Suspension Setting jig	JB. 002.
Front end frame alignment jig}	
Engine mounting alignment jig}	JB. 003/4.
Dash front opening jig	JB. 005.

Item 141. Replacement of Distorted Panels

In cases where a panel is seriously damaged it may be found advisable to replace the damaged portions with new panels, which can be obtained from our Spares Dept. The illustration *Figure 58*

indicates the location of joints used in body construction, and after breaking the welding where necessary, any portion of the body can be removed and a suitable replacement installed.

Often, due to the localised nature of damage, it will be found that replacement of a complete panel or unit is uneconomical. In these circumstances it will be perfectly satisfactory to cut a corresponding part from a replacement unit, and to fit into position by gas welding. An example of this is possible damage to the front of the dash side panel, with twisting of the ventilating tube. The appropriate portion of the front end of the assembly could be cut, together with the tube, and a corresponding replacement welded into position.

Item 142. Pillars and Side Sills

The body side frame can be supplied as a complete assembly or alternatively sections of the assembly can be supplied separately. The pillars and rails will normally be supplied assembled to the reinforcements, although again these can be supplied separately, if required.

Illustration *Figure 59* shows clearly the location of joints in the Body Side frame, and there is no reason why, if these are cut and welded correctly, the repair should not be as strong as the original construction.

Item 143. Further Information

Our Service Technical Department will gladly supply further information to any repairer requiring assistance. The repairer, faced with an accident damage problem, is invited to submit full details, including if possible rough sketches, when any information required, will be supplied.

Group III.

Electrical Equipment Service

SECTION 20. – **THE BATTERIES 2 x 6-VOLT UNITS – MODEL SLT W11E**

Item 144. Routine Maintenance

In order to keep the batteries in good condition, a periodical inspection of the batteries should be made and the following carried out:

(i) **Topping Up**

About once a month, or more often in warmer climates, remove the vent plugs from the top of each of the cells and examine the level of the electrolyte. If necessary, add distilled water until the top edges of the separators are just covered. Do not fill above this level, otherwise the excess electrolyte will be thrown out from the cell. A hydrometer will be found useful for topping up, as it prevents distilled water being spilled on the top of the battery.

Note: In very cold weather it is essential that the car be used immediately after topping up the battery to ensure that the distilled water is thoroughly mixed with the electrolyte. Neglect of this precaution may result in the distilled water freezing, causing damage to the battery.

When examining the cells, do not hold naked lights near the vent holes, as there is a danger of igniting the gas coming from the plates.

(ii) **Testing the Condition of the Batteries**

Occasionally examine the condition of the batteries by taking hydrometer readings. There is no better way of ascertaining the state of charge of a battery. The hydrometer contains a graduated float which indicates the specific gravity of the acid in the cell from which the sample is taken.

The specific gravity readings and their indications are as follows:

1·280 – 1·300 Battery fully charged.

About 1·210 Battery about half discharged.

Below 1·150 Battery fully discharged.

These figures are given assuming an electrolyte temperature of 60 °F (15·6 °C). If the electrolyte temperature exceeds this, 0·002 must be added to observed hydrometer readings for each 5 °F

(example 65 °F = 18·3 °C) rise to give the true specific gravity at 60 °F (15·6 °C). Similarly 0·002 must be subtracted from hydrometer readings for every 5 °F (–15 °C) below 60 °F (example 55 °F = 12·8 °C).

The readings for each of the cells should be approximately the same. If one cell gives a reading very different from the rest it may be that the electrolyte has been spilled or has leaked from one of the cells or there may be an internal fault. In this case it is advisable to have the battery examined by a battery specialist. Should the battery be in a low state of charge, it should be recharged by taking the car for a long daytime run or by charging from an external source of D.C. supply at a current rate of 5 amperes until the cells are gassing freely.

After examining the battery, check the vent plugs, making sure that the air passages are clear, and screw the plugs into position. Wipe the top of the battery to remove all dirt and moisture.

Item 145. Storage

If the batteries are to be out of use for any length of time, they should first be fully charged and then given a freshening charge about every fortnight.

A battery must never be allowed to remain in a discharged condition, as this will cause the plates to become sulphated.

Item 146. Initial Filling and Charging

Usually, the batteries will have been filled and initially charged. If, however, it should be found necessary to prepare the new batteries, supplied dry, for service, proceed as follows:

(a) **Preparation of Electrolyte**

The specific gravity of the electrolyte necessary to fill the new batteries, and the specific gravity at the end of the charge, are as follows:

Climate	S.G. of Filling Acid	S.G. at End of Charge
	Corrected to 60 °F (15·5 °C)	
Ordinarily below 80 °F (27 °C.)	1·350	1·280 – 1·300
Between 80 – 100 °F (27 – 38 °C.)	1·320	1·2501 – 0·270
Over 100 °F. (38 °C.)	1·300	1·2201 – 0·240

The electrolyte is prepared by mixing distilled water and concentrated sulphuric acid of 1·855 S.G. The mixing must be carried out in a lead-lined tank or a suitable glass or earthenware vessel. Steel or iron containers must NOT be used. The acid must be added slowly to the water, while the mixture is stirred with a glass rod. NEVER ADD THE WATER TO THE ACID, as the resulting chemical reaction may have dangerous consequences. To produce electrolyte of the correct specific gravity as stated above, use proportions of acid and distilled water as below:

To obtain Specific Gravity, corrected to 60 °F (15·5 °C).	Add 1 part by volume of 1·835 S.G. acid to distilled water by volume as below.
1·350	1·8 parts
1·320	2·2 parts
1·300	2·5 parts

Heat is produced by the mixture of acid and water, and it should, therefore, be allowed to cool before pouring it into the battery, otherwise the plates, separators and moulded container may become damaged.

(b) **Filling-In and Soaking**

The temperature of the filling-in acid, battery and charging room should be above 32 °F (0 °C).

Carefully break the seals in the filling holes and half fill each cell in the battery with dilute sulphuric acid solution of the appropriate specific gravity (according to temperature). The quantity of electrolyte to half fill a two volt cell is ½ pint (0·284-litre).

Allow the battery to stand for at least six hours before further electrolyte is added. After the lapse of this period add enough dilute acid to fill each cell to the top edge of the separators.

Then allow to stand for a further two hours, before commencing the charge.

(c) **Duration and Rate of Initial Charge**

Charge at a constant current of 3·5 amps, until voltage and temperature-corrected specific gravity readings show no increase over five successive hourly readings. This period is dependent upon the length of time the battery has been stored since manufacture, and will be from forty to eighty hours, but usually not more than sixty.

Throughout the charge, the acid must be kept level with the tops of the separators in each cell by the addition of acid solution of the same specific gravity as the original filling-in-acid.

If, during charge, the temperature of the acid in any cell of the battery reaches the maximum permissible temperature of 120 °F (48·89 °C), the charge must be interrupted and the battery temperature allowed to fall at least 10 °F (Minus-12·2 °C) before charging is resumed.

At the end of the first charge, i.e. when specific gravity and voltage measurements remain substantially constant, carefully check the specific gravity in each cell to ensure that it lies within the limits specified. If any cell requires adjustment, the electrolyte above the plates must be syphoned off, and replaced with either acid of the strength used for the original filling-in, or distilled water, according to whether the specific gravity is too low or too high respectively. After such adjustment, the gassing charge should be continued for one or two hours to ensure adequate mixing of the electrolyte. Recheck, if necessary, repeating the procedure until the desired result is obtained.

Note: On later models one 12-volt battery model GTW9A is fitted in place of the two 6-volt units model SLTW11E. The servicing of battery model GTW9A is identical to that of the 6-volt units described above.

SECTION 21. – **DYNAMO MODEL C45XV**

Item 147. Test in Position

Take out the plug-in connectors, join the sockets by a short length of wire and connect a voltmeter (0–20-volts) between the sockets and a good earth on the dynamo yoke. Increase the engine speed gradually and note the voltmeter reading; this should reach 12-volts at a comparatively low speed. Do not run the engine at a speed above 1,500 r.p.m. If no reading is given, or if it is low or erratic, the dynamo must be removed for examination.

Item 148. To Dismantle

Take off the driving pulley, remove the Woodruff key, un-screw the two through bolts and pull off the commutator end bracket.

The driving end bracket complete with armature can then be withdrawn from the dynamo yoke (body). If it is necessary to remove the armature from the driving end bracket, it can be done by means of a hand press. It should be noted that there are no connections to be uncoupled between the dynamo yoke and commu-tator end bracket.

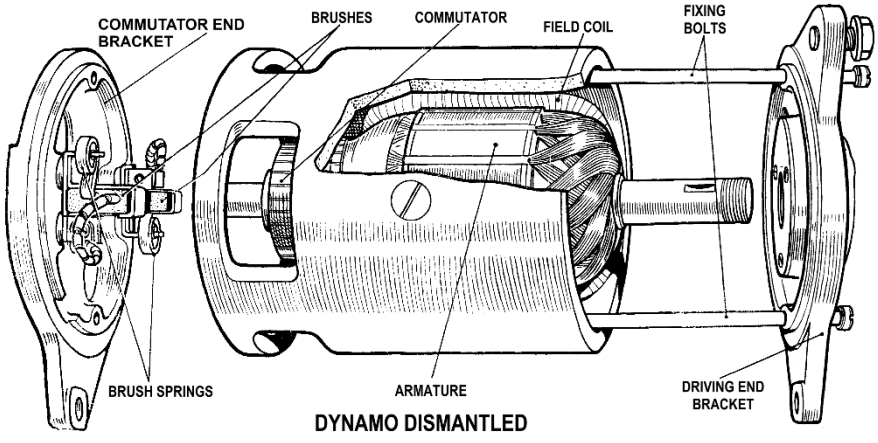


Figure 60. – Exploded View of Dynamo C45XV.

Item 149. Commutator

Examine the commutator and if burned or blackened, clean with a petrol-moistened rag or in bad cases by carefully polishing with very fine glass paper (*not emery cloth*). If necessary, undercut the mica insulation to a depth of $^{1}/_{32}$-in. (0·79 mm.) with a hacksaw blade ground down to the thickness of the mica.

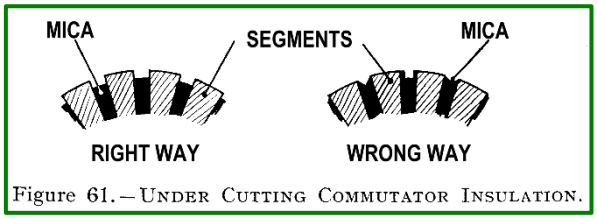


Figure 61. – Under Cutting Commutator Insulation.

Item 150. Armature

Check the armature by means of a growler test or volt drop test, and test the insulation by connecting a test lamp at mains voltage between the commutator segments and the shaft.

Item 151. Brush-gear

Examine the brushes. If they are worn so that they do not make good contact on the commutator or if the brush flexible (*multi-strand wire*) is exposed on the running face, take out the screw securing the eyelet on the end of the brush fiexibles and remove the brushes. Fit new brushes into holders and secure eyelets on the ends of the brush lead in the original positions. Brushes are pre-formed and do not require bedding.

Item 152. Field Coils

Test the resistance of the field coils by means of an Ohm-meter, when the reading should be 6·3 Ohms. If this is not available, connect a 12-volt D.C. supply with an ammeter in series, between the field terminal and the dynamo frame. The ammeter reading should be approximately 2 amps. If no reading, the field coils are open circuited and must be replaced.

To test for earthed field coils, unsolder and isolate the end of the field winding from the earth terminal of the dynamo yoke and, with a test lamp connected from supply mains, check between field terminal and yoke. If lamp lights, field coils are earthed and must be replaced.

When replacing field coils, an expander should be used so as to press the pole shoes into position. A few taps on the outside of the dynamo yoke with a copper-faced mallet will assist the expander to seat the pole shoes. When pole shoes are finally home, fully tighten up fixing screws and caulk to lock them in position.

Item 153. Bearings

Bearings which are worn to such an extent that they will allow excessive side movement of the armature shaft must be replaced.

Commutator End – To remove and replace bearing bush at commutator end proceed as follows:

A. Remove the small metal cap from the exterior of the commutator end bracket.

B. Press the bearing bush out of bracket by means of a hand press or bench drill.

C. Press the new bearing bush into the end bracket using a shouldered mandrel of the same diameter as the shaft which is to fit in the bearing.

D. Replace the small metal cap.

Note: Before fitting a new porous bronze bearing bush, it should be immersed for 24 hours in clean thin engine oil.

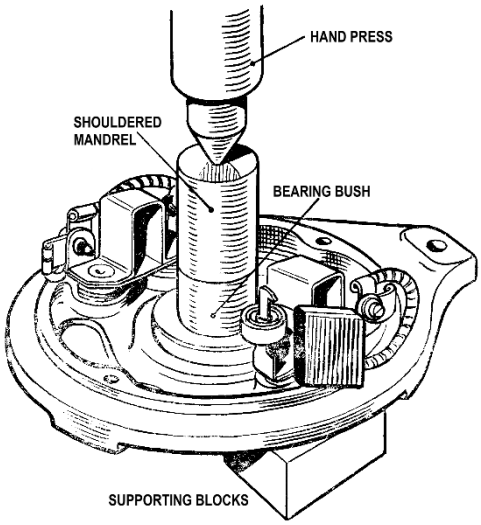


Figure 62. – Fitting Bearing Bush.

Driving End – The ball bearing at the driving end is replaced as follows:

A. Knock out the three rivets which secure the bearing retaining plate to the end bracket and remove the plate.

B. Press the bearing out of the end bracket and remove the corrugated washer, felt washer and oil retaining washer.

C. Before fitting the replacement bearing see that it is clean and lightly pack it with high melting point grease.

D. Place the oil retaining washer, felt washer and corrugated washer in the bearing housing in the end bracket.

E. Locate the bearing in the housing and press it home by means of a hand press.

F. Fit the bearing retaining plate. Insert three new rivets from the outside of the end bracket and open the rivets by means of a punch to secure the plate rigidly in position.

Item 154. To Reassemble Dynamo

A. If the armature has been removed from the driving end bracket, first press the armature shaft into the bearing in the end bracket and then fit the armature in position in the dynamo yoke and locate driving end bracket.

B. Raise the brushes in their holders and wedge in this position by locating the springs on the sides of the brushes.

C. Fit the commutator end bracket until the brushes are just started on the commutator and then raise the springs to release the brushes and ensure that the ends of the springs are central on the top of the brushes. The end bracket can then be pushed home, *being sure to locate the alignment pegs with the notches in the yoke*, and the through-bolts inserted and tightened up.

Before refitting the dynamo to the car, unscrew the lubricator on the end of the dynamo, lift out the felt pad, and spring and about half-fill the lubricator with H.M.P. grease. Replace the spring and felt pad, and screw the lubricator in position.

DYNAMO MODEL C39PV

Item 155. Testing in Position

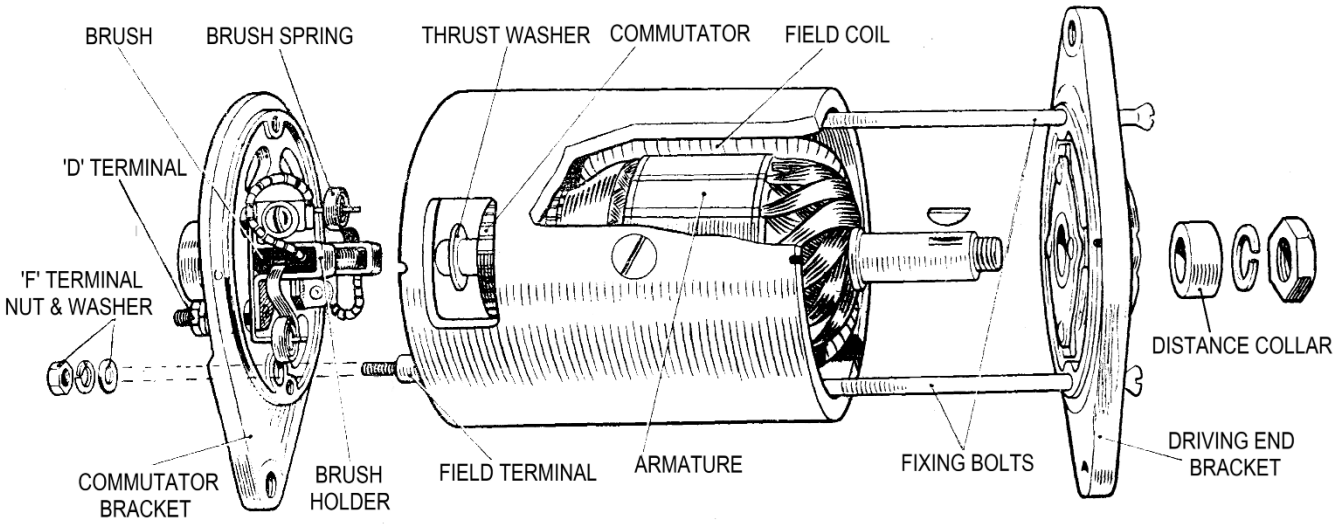


Figure 63. – Exploded View Dynamo C39PV

Withdraw the leads from the 'D' and 'F' terminals and connect the terminals with a short length of wire. Connect a voltmeter (0–20-volts) between the dynamo terminals and a good earthing point on the dynamo yoke. Increase the engine speed gradually and note the voltmeter reading; this should reach 12-volts at a comparatively low speed. Do not run the engine at a speed above 1,500 r.p.m. If no reading is given, or if it is low or erratic, the dynamo must be removed for examination.

Item 156. To Dismantle

1. Take off the dynamo pulley.
2. Remove the cover band, hold back the brush springs and remove the brushes from their holders.
3. Unscrew the locking nuts from the through bolts at the commutator end.
4. Withdraw the two through bolts from the driving end.
5. Remove the nut, spring washer and flat washer from the smaller terminal (i.e. field terminal) from the commutator end bracket and remove bracket from dynamo yoke.
6. The driving end bracket together with the armature can now be lifted out of the dynamo yoke.

Commutator Armature and Brush-gear

Field Coils and Replacement of Bearings

Carry out instructions as described for Model C-45XV, Pages 72 – 74.

To Reassemble Dynamo

In the main, reassembly of the dynamo is a reversal of dismantling.

Before refitting the dynamo to the car, unscrew the lubricator on the end of the dynamo, lift out the felt pad and spring, and about half-fill the lubricator with H.M.P. grease. Replace the spring and felt pad, and screw the lubricator in position.

SECTION 22. – STARTER MODEL M35G. SERVICE No. 25012. STARTER MODEL M35G. SERVICE No. 25025.

Item 157. Starter Drive Maintenance

If difficulty is experienced with the starter not meshing correctly with the flywheel, it may be that the starter drive requires cleaning. The pinion should move freely on the screwed sleeve; if there is any dirt or other foreign matter on the sleeve it must be washed with paraffin.

In the event of the starter pinion becoming jammed in mesh with the flywheel, it can usually be freed by turning the starter armature by means of a spanner applied to the shaft extension at the commutator end. This is accessible after removing the cap.

If it is necessary to remove the starter from the engine disconnect the earthing cable (positive) from the battery terminal to avoid any danger of causing short circuits and remove cables from the starter.

Item 158. Dismantling Starter Motor Model M35G. Service No. 25012

Take off the cover band at the commutator end, hold back the brush springs and take out the brushes from their holders.

Remove the starter switch (refer to notes on Page 77).

Unscrew the nut (accessible on the commutator end bracket) securing the field coil lead to the contact plate.

Unscrew and withdraw the two through-bolts and take off the commutator end bracket.

Remove the armature complete with drive from the starter frame.

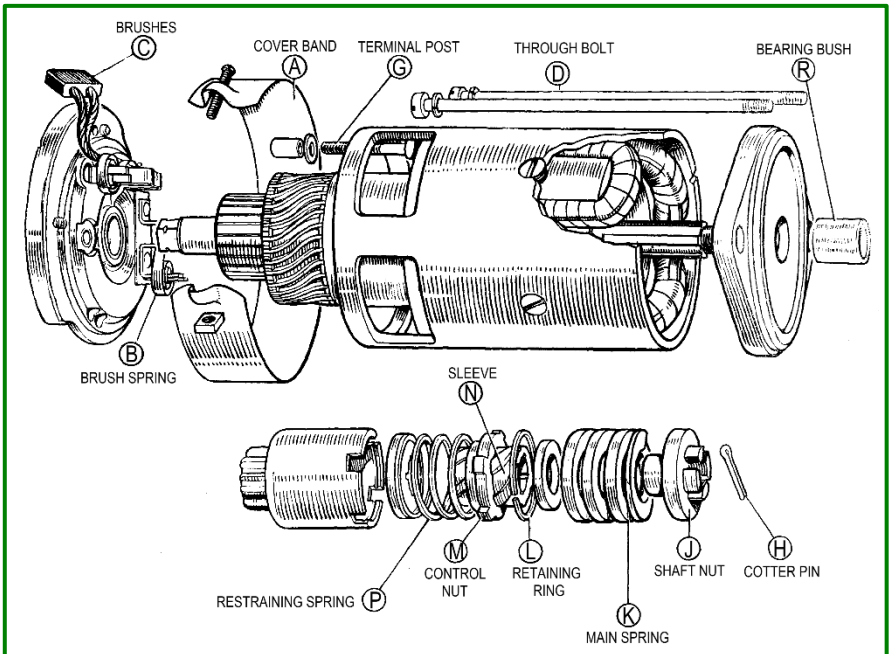


Figure 64.—Exploded View of Starter

Dismantling Starter Motor Model M35G. Service No. 25025

Take off the cover band at the commutator end, hold back the brush springs and take out the brushes from their holders.

Withdraw the two through bolts. The armature complete with driving end bracket can then be withdrawn.

Remove the terminal nuts and washers from the terminal post at the commutator end bracket and remove the commutator end bracket.

Item 159. Starter Drive

Remove the cotter pin and the nut at the end of the shaft.

Remove the main spring.

Unscrew the screwed sleeve from the barrel assembly.

Further dismantling of the barrel assembly is carried out by removing the large retaining ring.

Item 160. Commutator

Examine the commutator and if burned or blackened, clean with a petrol-moistened rag or in bad cases by carefully polishing with very fine glass paper.

Note: The mica on the starter commutator must not be under cut.

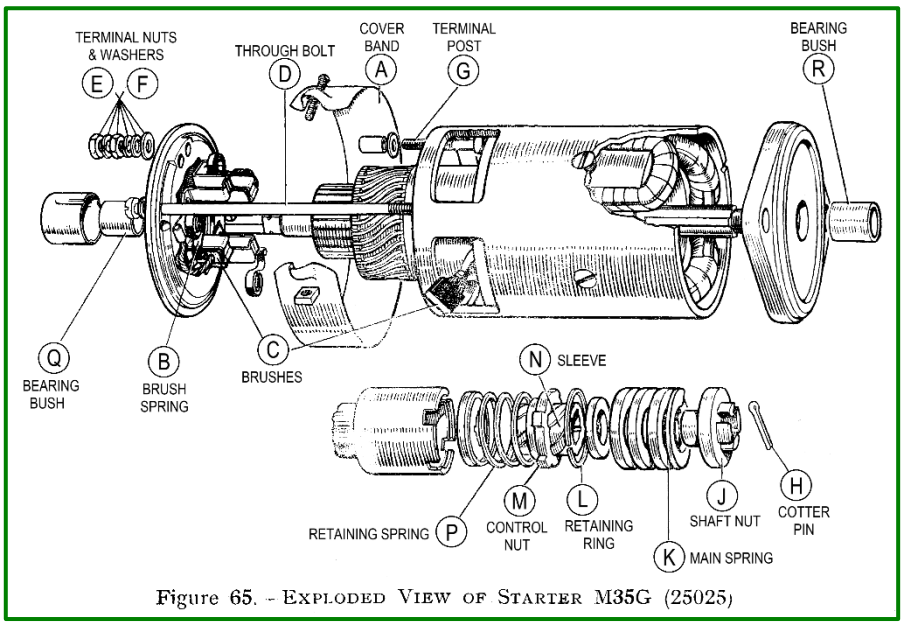


Figure 65. – Exploded View of Starter M35G (25025)

Item 161. Brushes

Examine the brushes. If they are worn so that they do not make good contact on the commutator, or if the brush flexibles are exposed on the running face, they must be replaced. The brushes are connected to the starter as follows:

Model M35G Service No. 25012. This is a two-brush machine. One brush is connected to a terminal eyelet on the brush box and the other to a tapping on the field coil.

Model M35G. Service No. 25025. This is a four-brush machine; two brushes being connected to terminals on the brush boxes and the other two brushes to a tapping on the field coil.

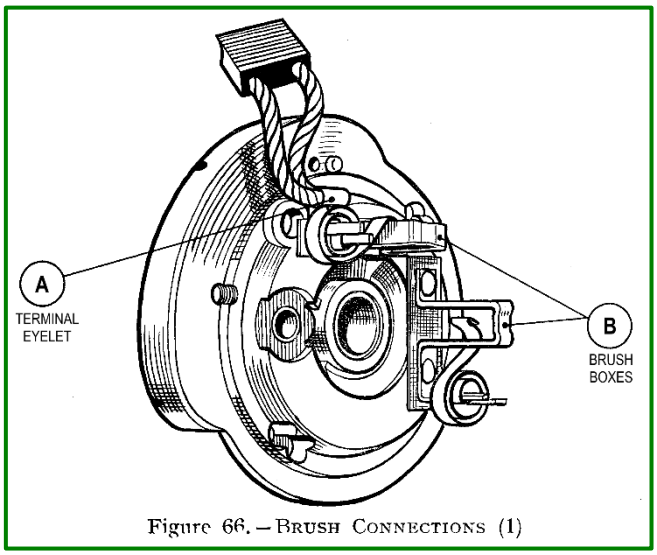


Figure 66. – Brush Connections (1)

When replacing brushes the flexible connectors must be removed by unsoldering and the connectors of the new brushes secured in their places by soldering. The brushes are pre-formed so that bedding to the commutator is unnecessary.

Check the tension of the brush springs. This should be 30 – 40 oz. (850 – 1,134 g.) in the case of the two-brush machine or 18 – 25 oz. (510 – 708 g.) for the four-brush machine.

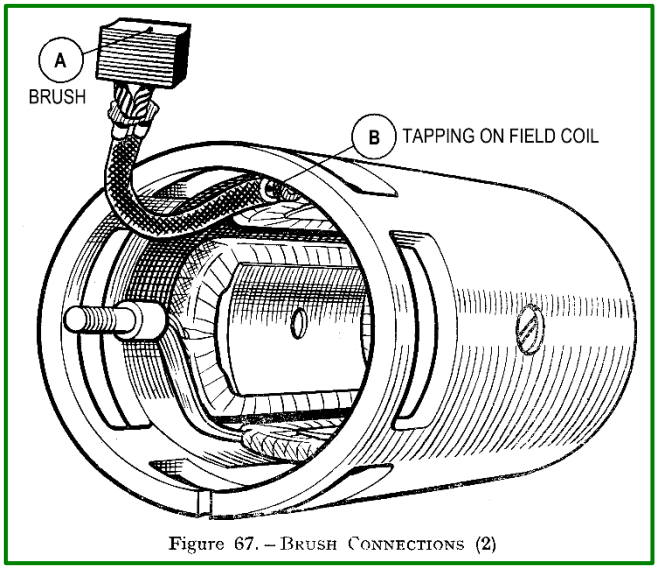


Figure 67. – Brush Connections (2)

Item 162. Field Coils

The field coils can be tested for open circuit by connecting a 12-volt battery and test lamp between the tapping point on the field coils at which the brush or brushes are connected and the field coil connecting bolt. If the lamp does not light there is an open circuit on the wiring of the field coils. Lighting of the lamp does not necessarily mean that the field coils are in order, as it is possible that one of them may be earthed to a pole shoe or to the starter yoke. This may be checked With a test lamp connected from supply mains, the test leads being connected to the field coil connecting bolt and to a clean part of the starter yoke. Should the lamp light it indicates that the field coils are earthed and must be replaced. When replacing field coils the procedure as detailed in the dynamo sections should be followed.

Item 163. Bearings

Bearings which are worn to such an extent that they will allow excessive side play of the armature shaft must be replaced. To replace the bearing bushes proceed as follows:

A. Press the bearing bush out of the end bracket.

B. Press the new bearing bush into the end bracket using a shouldered mandrel of the same diameter as the shaft which is to fit in the bearings.

Note: Before fitting a new porous bronze bearing bush it should be immersed for 24 hours in clean, thin engine oil.

Item 164. Reassembly

The reassembly of the starter is a reversal of the dismantling procedure.

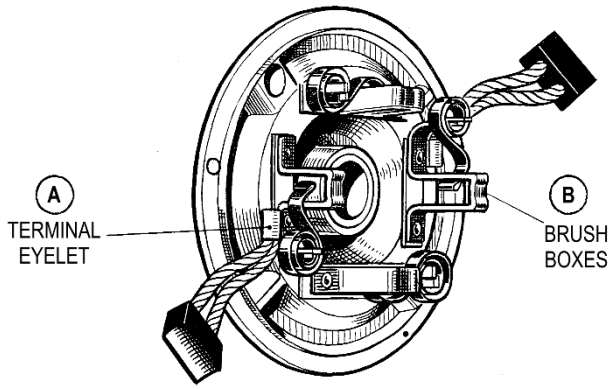


Figure 68. – Brush Connections (3)

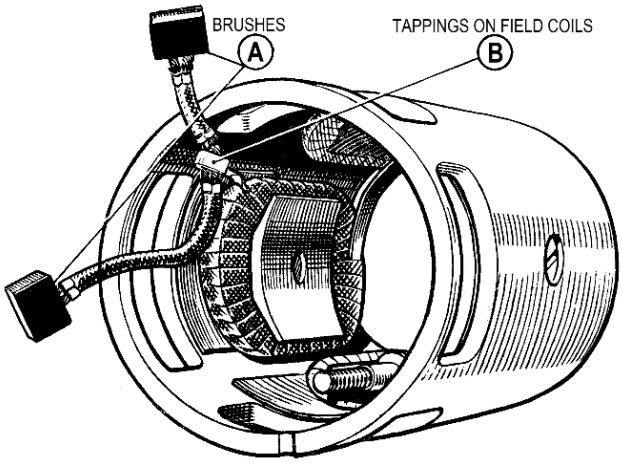


Figure 69. – Brush Connections (4)

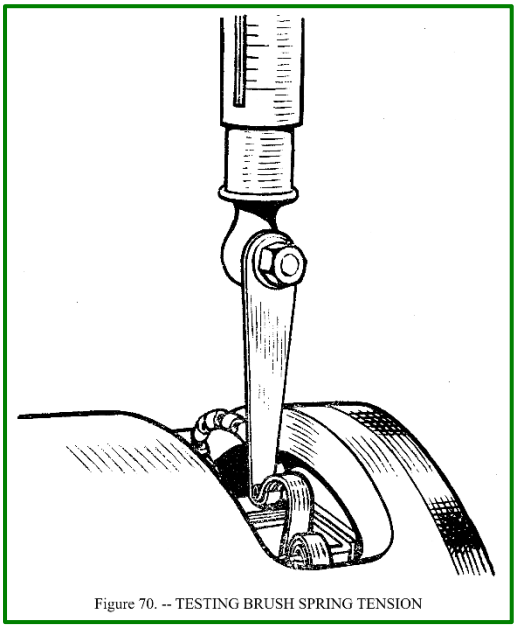


Figure 70. -- TESTING BRUSH SPRING TENSION

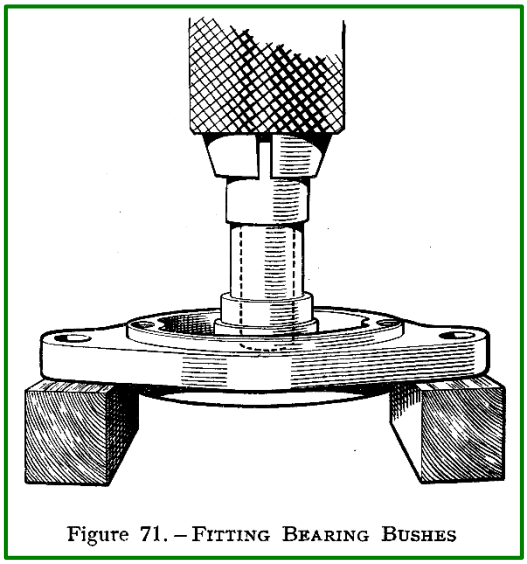


Figure 71. – Fitting Bearing Bushes

SECTION 23. **– STARTER SWITCH MODEL ST900**

(Fitted on Commutator End Bracket of Starter Model M35G. Service No. 25012).

Item 165. Test in Position

If the switch operates but does not complete the circuit to the starter, the switch must be removed for examination and, if necessary, replacement of the contacts.

Item 166. Removing Starter Switch from Starter

A. Take out the four screws securing the switch to the starter end bracket. One screw is positioned under the rubber insulator.

B. Pull the complete switch away from the end bracket.

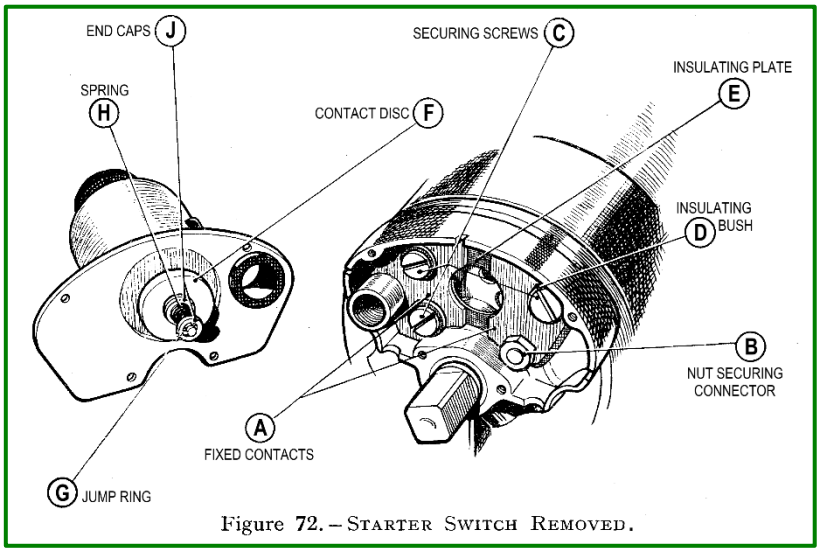


Figure 72. – Starter Switch Removed.

Item 167. Replacement of Contacts

If examination shows that the contacts are badly burned they must be renewed.

The contacts must be replaced as a complete set, comprising two fixed contact plates for fitting in the commutator end bracket and the moving contact disc for mounting on the switch plunger. The new components must be accurately fitted to the dimensional limits that are shown in *Figure 74*.

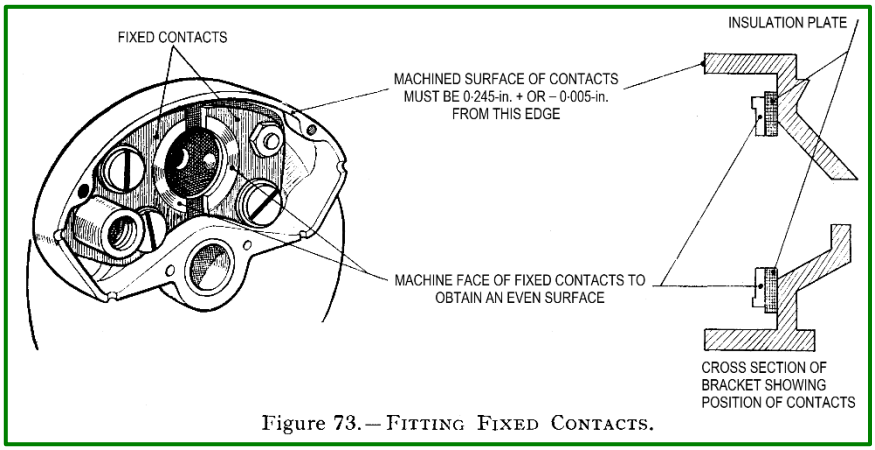


Figure 73. – Fitting Fixed Contacts.

To remove the old fixed contacts from the starter end bracket, remove the nut (B) securing the connection from the starter field coils and withdraw the three screws (C) and insulating bushes (D). Fit the replacement contacts in position, taking care to place the insulating bushes (D) over the securing bolts before screwing them home.

After fitting the two fixed contacts, the faces of the contacts must be machined in order to obtain a flat surface. The diameter of the machined portion must be 1-in. (25·4 mm.) and the depth of the machined surface must be 0·245 +0·005-in. (6·22 mm. +0·127 mm.) from the edge of the starter end bracket, see *Figure 73*.

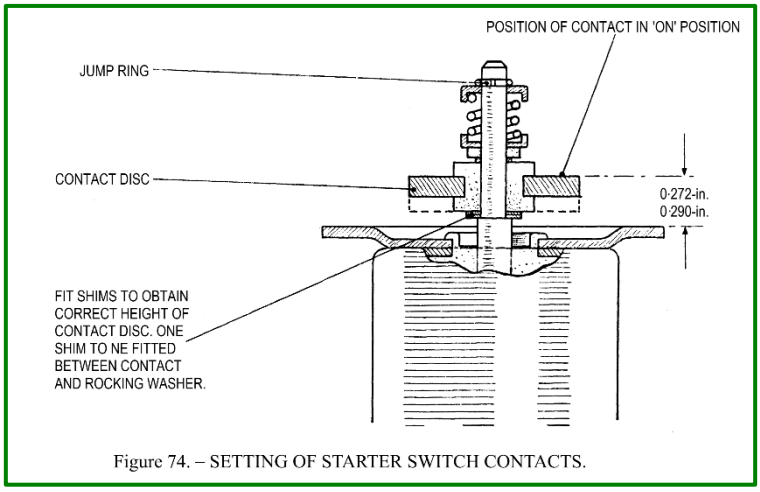


Figure 74. – SETTING OF STARTER SWITCH CONTACTS.

To remove the original contact disc from the starter switch withdraw the jump ring (G) from the end of the spindle. The correct position of the contact disc relative to the switch fixing plate, as shown in *Figure 74*, must be obtained by fitting shims behind the disc. Replace the spring (H) with its end caps (J) on the spindle and secure by means of the jump ring. Finally, fit the switch to the starter end bracket and reconnect the cable to the switch.

STARTER SWITCH MODEL ST950

(Fitted on underside of body floor.)

Item 168. Testing in Position

Press the starter push and listen to see if the solenoid starter switch operates. If not, connect a 12-volt supply directly across the small terminal on the solenoid switch and the switch body. If the switch still does not operate, a replacement unit must be fitted. If the switch operates but does not complete the circuit to the starter (checked by means of a 12-volt test lamp between starter terminal on switch and earth) an indication is given that the contacts are faulty and the switch must be replaced.

SECTION 25. – DISTRIBUTOR

Item 169. Routine Maintenance Every 3,000 Miles

Lubrication – Lightly smear the cam with a very small amount of clean engine oil.

Apply a spot of clean engine oil to the top of the pivot on which the contact breaker works.

Lift the rotor arm from the top of the spindle by pulling it off vertically and add a few drops of thin machine oil to lubricate the cam bearing and distributor shaft. Do not remove the screw exposed to view as the screw is drilled to enable the oil to pass through. Take care to refit the rotor arm correctly, pushing it on to the shaft as far as it will go. Add a few drops of thin machine oil through the hole in the contact breaker base through which the cam passes, to lubricate the automatic timing control. Do not allow any oil to get on or near the contacts.

Every 6,000 Miles

Cleaning – Wipe the inside and outside of the distributor cap with a soft dry cloth, paying particular attention to the spaces between the metal electrodes. See that the small carbon brush on the inside of the moulding moves freely in its holder.

Examine the contact breaker.

The contacts must be free from grease or oil. If they are burned or blackened, clean them with a fine carborundum stone or very fine glass paper, afterwards wiping away any trace of dirt or metal dust with a petrol-moistened cloth. Cleaning of the contacts is made easier if the contact breaker lever carrying the moving contact is removed. To do this, slacken the nuts on the terminal post and lift off the spring, which is slotted to facilitate removal.

After cleaning, check the contact breaker setting.

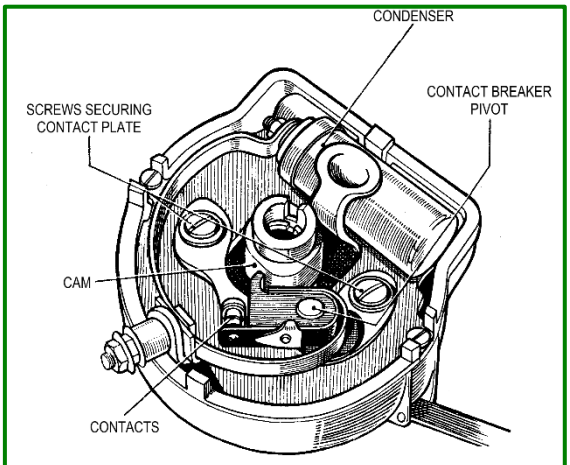


Figure 75.—Contact Breaker Assembly.

Item 170. Contact Breaker Adjustment

Turn the engine by hand until the contacts are seen to be fully opened, and check the gap with a gauge having a thickness of 0·010 – 0·012-in. (0·254 – 0·305 mm.). If the gap is correct, the gauge should be a sliding fit, but if the gap varies from the gauge, the setting must be adjusted. To do this, keep the engine in the position giving maximum contact opening and slacken the two screws securing the fixed contact plate. Adjust the position of the plate until the gap is set to the thickness of the gauge and tighten the two locking screws. Recheck the gap for other positions of the engine giving maximum contact opening.

Item 171. High Tension Cables

Examine the high tension cables. Any which have the insulation cracked or perished, or show signs of damage in any other way, must be replaced by 7 mm. rubber-covered ignition cable. To fit new high tension cable to the distributor, unscrew the pointed fixing screw on the inside of the moulding and push the cables, which should not be bared but cut off flush to the required length, well home, into their respective terminals. The screw securing the centre cable is accessible when the carbon brush is removed. Finally tighten up the screws which will pierce the insulation and make contact with the cable core.

The method of fitting high tension cables to the coil is to thread the knurled moulded nut over the cable, bare the end for about 1-in. (25 mm.), thread the wire through the copper washer removed

from the end of the original cable and bend back the wire strands. Trim the strand ends as shown in *Figure 77*. Finally screw the nut into its terminal.

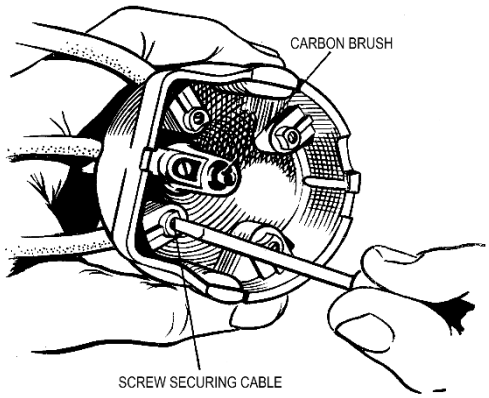


Figure 76. – Fitting H.T. Cable to Distributor.

Item 172. Dismantling

A. Spring back the securing clips and remove the moulded cap.

B. Lift the rotor arm off the top of the spindle. If it is a tight fit it should be carefully levered off with a screwdriver.

C. Slacken the nut on the terminal post and lift off the end of the contact breaker spring. The contact breaker lever can now be lifted off its pivot. Take out the two screws, com-plete with spring washers and flat steel washers, which secure the plate carrying the fixed contact, and remove the plate.

D. Take out the two machine screws and spring washers fitted at the edge of the contact breaker base, which can then be removed from the body of the distributor.

E. Remove the driving dog from the shaft.

F. Lift the cam, automatic timing control and shaft assembly from the distributor. Take out the screw from inside the top of the cam spindle. (Before dismantling, carefully note the positions in which the various components are fitted so that they can be replaced correctly). Lift off the cam, when the automatic timing control will be accessible.

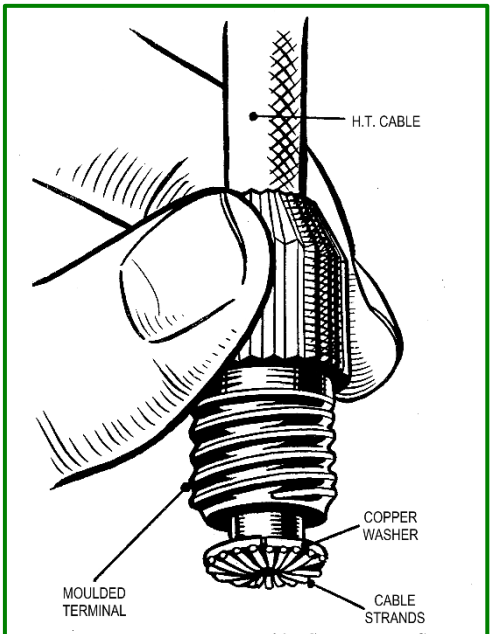


Figure 77.—Fitting H.T. Cable to Coil.

Item 173. Condenser

The best method of testing the condenser is by substitution. Disconnect the original condenser and connect a new one between the low tension terminal of the distributor and earth.

Should a new condenser be necessary, it is advisable to fit a complete condenser and contact breaker plate assembly, but should a condenser only be available, care must be taken not to over-heat the condenser when soldering in position.

Item 174. Replacement of Bearing Bushes

A. In order to ensure easy running of the distributor shaft, when the shank has been re-bushed, the new porous bronze bushes must be fitted so that they are in correct alignment.

The bushes must be fitted by means of a vertical drilling machine or hand press, using a mandrel and a packing block of the type shown.

B. Fit the mandrel in the drilling machine or hand press and place the distributor body in an in-verted position on the table below it.

C. To remove the bushes, a sleeve must be fitted over the mandrel to build it up to the required size. With this sleeve fitted in position, force the old bushes out of the shank by applying a steady pressure.

D. Before new bushes are fitted they should be allowed to stand for 24 hours immersed in thin engine oil.

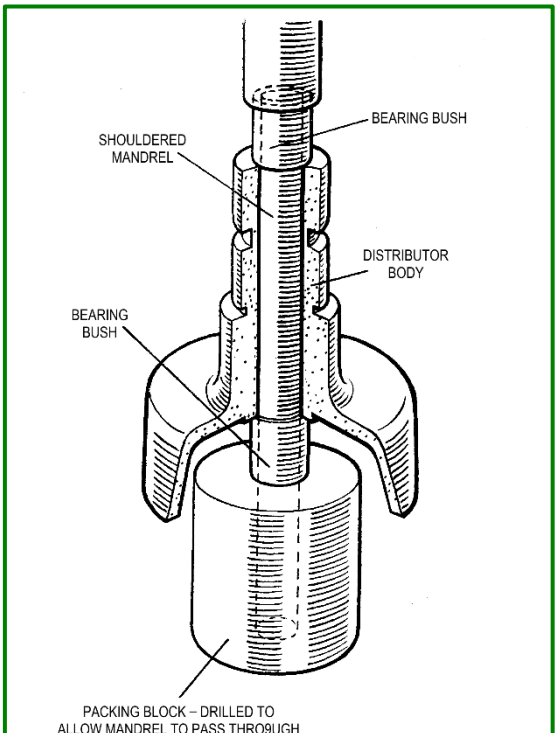


Figure 78. – Replacement of Bearing Bushes.

E. Take the sleeve off the mandrel. Place one of the longer bushes on the mandrel, then the distributor body in an inverted position and finally one of the smaller bushes.

F. Locate the end of the mandrel through the packing piece and press the mandrel downwards, taking care that both bushes enter the distributor shank squarely. Continue forcing the bushes into the shank until they are correctly located in the body.

G. After fitting, the bushes must not be opened out as this would tend to impair the porosity of the bushes and so prevent effective lubrication.

Item 175. Reassembly

Note: Before reassembly, the distributor shaft, automatic advance mechanism, and the portion of the shaft on which the cam fits must be lubricated with thin engine oil.

A. Assemble the automatic timing control, taking care that the parts are fitted in their original positions, and that the control springs are not stretched. Two holes are provided in each toggle; the springs must be fitted to the inner hole in each case. Place the cam on its spindle and secure by tightening the fixing screw.

B. Fit the shaft assembly in position in the body and replace the driving member.

C. Place the contact breaker base in position on the distributor body and secure by replacing the two fixing screws. A spring washer must be fitted under each of the screw heads, and the screws must be fully tightened.

D. Position the plate carrying the fixed contact on the contact breaker base and secure it in position by means of the two screws, first placing a spring washer and flat steel Washer under the head of each screw.

E. Place the insulating washer over the contact breaker pivot pin and position the contact breaker lever on the pin. Locate the slotted end of the contact breaker spring under the head of the terminal screw and tighten the nut to lock the spring in position. Adjust the contact breaker setting to give a gap of 0·010 – 0·012-in. (0·254 – 0·305 mm.) when fully opened.

   Note: If it becomes necessary to renew the contacts, a replacement set comprising fixed and moving contacts must be fitted.

F. Place the rotor arm on top of the spindle, locating the register correctly and pushing the rotor fully home.

G. Fit the distributor cover moulding and secure by means of the spring clips.

Item 175a. The Ignition Coil

In this Maintenance Manual there is no separate mention of the Ignition Coil. The coil is a reliable part of the ignition system, however, the following points should be noted:

1. The original coil was filled with bitumen for cooling purposes. Such coils can be successfully mounted in the engine compartment with the terminal posts at the bottom, to help prevent water ingress.
2. New manufacture coils are filled with oil for cooling purposes, the oil being carefully metered in through a threaded hole in the base of the high tension lead housing. A screw is commonly used to effect a form of seal. Should such an ignition coil be mounted horizontally, or upside down, then the oil can leak at the plug screw. This can be to the extent that the internal windings overheat and burn the insulation – ultimately causing engine stoppage.

SECTION 25. **– CONTROL BOX REGULATOR**

Item 176. Adjustment

The regulator is carefully set before leaving the works to suit the normal requirements of the standard equipment and in general it should not be necessary to alter it. If, however, the battery does not keep in a charged condition, or if the dynamo output does not fall when the battery is fully charged, it may be advisable to check the setting and if necessary to readjust.

It is important, before altering the regulator setting, when the battery is in a low state of charge, to check that its condition is not due to a battery defect or to the dynamo belt slipping.

Item 177. How to Check and Adjust Electrical Setting

The regulator setting can be checked without removing the cover of the control box.

Withdraw the cables from the terminals marked ‘A’ and ‘A1’ at the control box and join them together. Connect the negative lead of a moving coil voltmeter (0–20-volts full scale reading) to the ‘D’ terminal on the dynamo and connect the other lead from the meter to a convenient chassis earth.

Slowly increase the speed of the engine until the voltmeter needle ‘flicks’ and then steadies this should occur at a voltmeter reading between the limits given below for the appropriate temperature of the regulator.

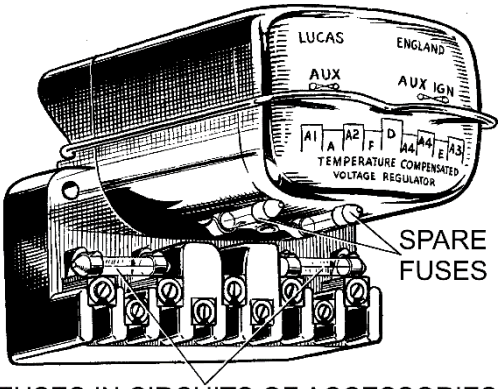


Figure 79. – Control Box.

Setting at 10 °C	(50 °F)	16·1 – 16·7-volts
Setting at 20 °C	(68 °F)	15·8 – 16·4-volts
Setting at 30 °C	(86 °F)	15·6 – 16·2-volts
Setting at 40 °C	(104 °F)	15·3 – 15·9-volts

If the voltage at which the reading becomes steady occurs outside these limits, the regulator must be adjusted (*Figure 80*).

Shut off the engine, remove the control box cover, release the locknut (A) holding the adjusting screw (B) and turn the screw in a clockwise direction to increase the setting. Turn the adjustment screw a fraction of a turn and then tighten the locknut.

When adjusting, do not run the engine up to more than half throttle, as while the dynamo is on open circuit, it will build up to a high voltage if run at a high speed, and so a false voltmeter reading would be obtained.

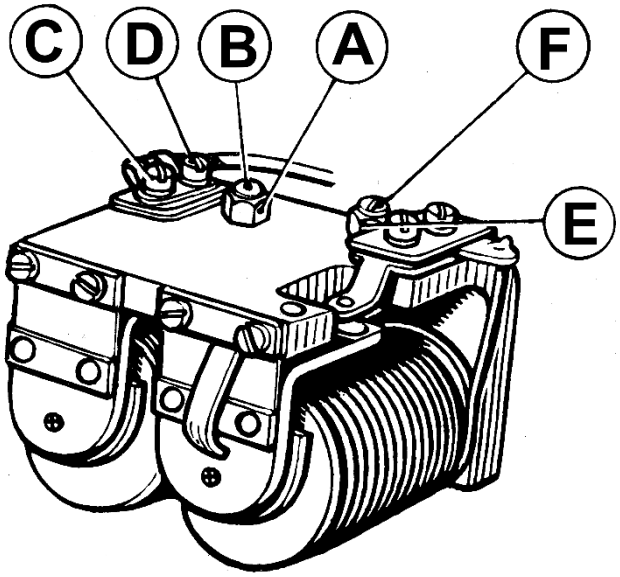


Figure 80.—Cutout and Regulator Assembly.

Item 178. Mechanical Setting

The mechanical setting of the regulator is accurately adjusted before leaving the works and provided the armature carrying the moving contact is not removed, the regulator will not require mechanical adjustment. If, however, the armature has been removed from the regulator for any reason, the contacts will have to be reset.

To do this proceed as follows (*Figure 81*):

i. Slacken the two armature fixing screws ‘E’. Insert a 0·018-in. (0·46 mm.) feeler gauge between the back of the armature ‘A’ and the regulator frame.

ii. Press back the armature against the regulator frame and down on to the top of the bobbin core with gauge in position and lock the armature by tightening the two fixing screws.

iii. Check the gap between the underside of the arm and the top of the bobbin core. This should be 0·012 – 0·020-in. (0·305 – 0·508 mm.). If the gap is outside these limits correct by adding or removing shims ‘F’ at the back of the fixed contact.

Note: Earlier types of control boxes are fitted with a stop rivet on the underside of arm instead of a shim. When checking on this type the gap should be 0·22 – 0·030-in. (0·559 – 0·762 mm.) between the underside of the arm and bobbin core. *Do not check gap between stop rivet and bobbin core*.

iv. Remove gauge and press the armature down when the gap between the contacts should be 0·006 – 0·017-in. (0·152 – 0·432 mm.).

Item 179. Cleaning Contacts (*Figure 80*)

To render the regulator contacts accessible for cleaning, slacken the screws securing the plate carrying the fixed contact. It will be necessary to slacken the upper screw (C), *Figure 80*, a little more

than the lower (D) so that the contact plate can be swung outwards. Clean the contacts by means of fine carborundum stone or fine emery cloth. Carefully wipe away all traces of dirt or other foreign matter. Finally tighten the securing screws.

CUT-OUT

Item 180. Adjustment

If it is suspected that the cutting-in speed of the dynamo is too high connect a voltmeter between the terminals marked 'D' and 'E' at the control box and slowly raise the engine speed. When the voltmeter reading rises to about 12·7 – 13·8-volts the cut-out contacts should close.

If the cut-out has become out of adjustment and operates at a voltage outside these limits it must be reset. To make the adjustment, slacken the locknut (E), *Figure 80*, turn the adjusting screw a fraction of a turn in a clockwise direction to raise the operating voltage or in an anti-clockwise direction to lower the voltage. Tighten the locknut after making the adjustment.

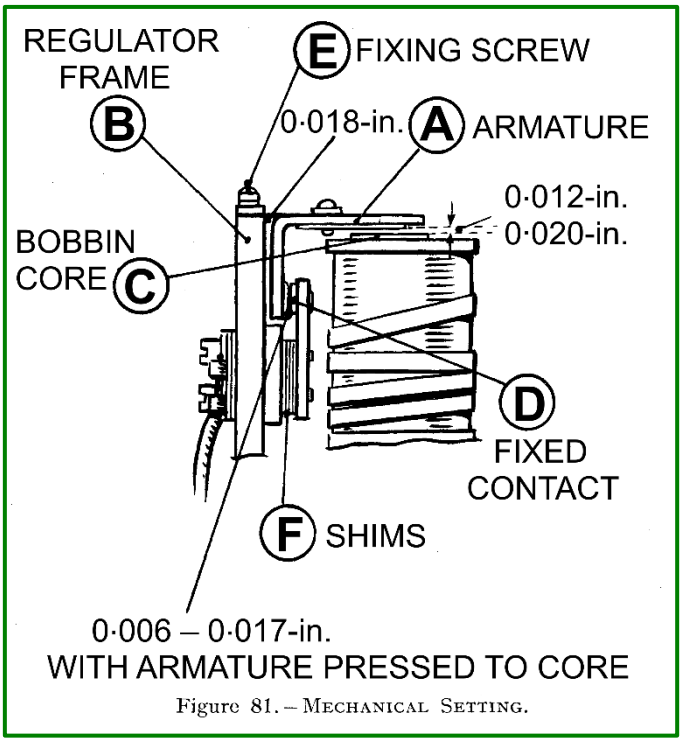


Figure 81. – Mechanical Setting.

Item 181. Cleaning

To clean the contacts remove the cover, place a strip of fine glass paper between the contacts and then, closing the contacts by hand, draw the paper through. This should be done two or three times, with the rough side towards each contact.

SECTION 26. **LIGHTING**

Item 182. Headlamp Bulb Replacement

To remove the Light Unit for bulb replacement, unscrew the screw. securing the front rim and lift off the rim. Next remove the dust-excluding rubber when three spring-loaded adjustment screws will be visible. Press the Light Unit in against the tension of the adjustment screw spring and turn it in an anti-clockwise direction until the heads of the screws can be disengaged through the round portions of the slotted holes in the Light Unit rim. Do not disturb the screws as this will alter the lamp setting.

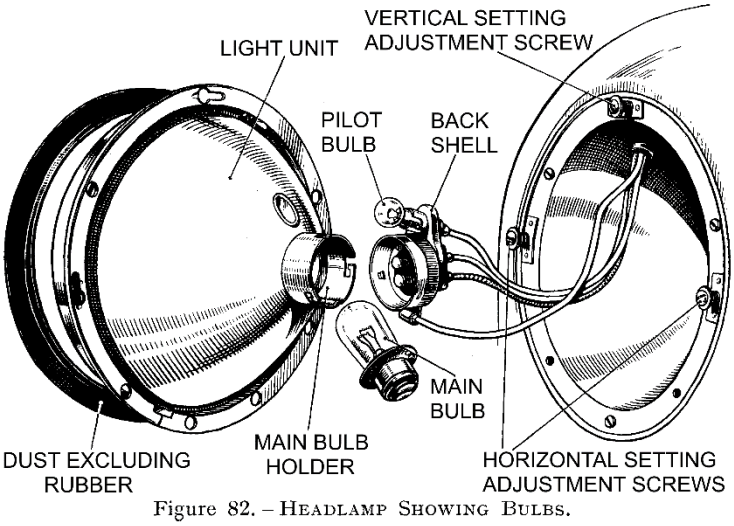


Figure 82. – Headlamp Showing Bulbs.

Twist the back shell in an anti-clockwise direction and pull it off. The bulb can then be removed.

Place the replacement bulb in the holder taking care to locate it correctly. Engage the projections on the inside of the back shell with the slots in the holder, press on and secure by twisting it to the right.

Position the Light Unit so that the heads of the adjusting screws protrude through the slotted holes in the flange, press the Unit in and turn in a clockwise direction. Replace the dust-excluding rubber and refit the front rim.

Item 183. Headlamp Setting

If adjustment to the setting is required, first remove the front rim and rubber, as described above.

Vertical adjustment is made by turning the screw at the top of the lamp. Horizontal adjustment can be altered by the adjustment screw on each side of the Light Unit.

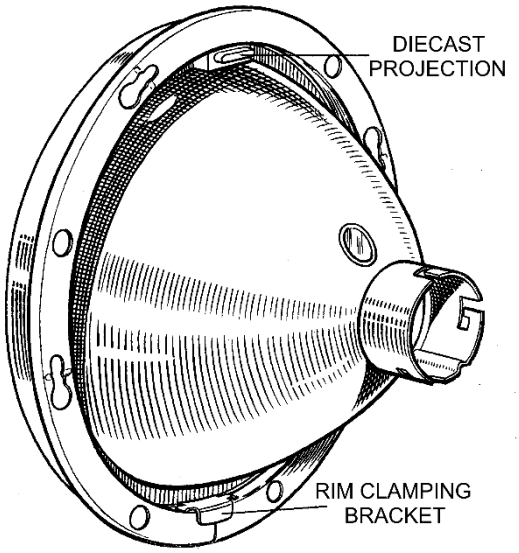


Figure 83. – Light Unit Assembly, Showing Rim Clamping Bracket.

Item 184. Replacement of Light Unit Model F575P Mark II

In the event of damage to either the front lens or reflector, a replacement Light Unit must be fitted as follows:

1. Remove Light Unit assembly as already described.
2. Remove the small clamping bracket on the Light Unit rim by bending back the two metal tags, and remove the rim from the Light Unit taking care that the sealing ring remains in position.
3. Position the replacement Light Unit in the rim so that the die cast projection at the edge of the Light Unit fits into the indentation in the rim, taking care that the sealing ring is correctly positioned.
4. Replace the rim clamping bracket and secure by the metal tags, making sure that the two edges of the rim make a neat and secure joint.

Item 185. Replacement of Light Unit Model F575P Mark III

In the event of damage to either the front lens or reflector, a replacement Light Unit must be fitted as follows:

1. Remove the Light Unit assembly as has already been described.
2. Withdraw the three screws from the unit rim and remove the seating rim and unit rim from Light Unit.
3. Position the replacement Light Unit between the unit rim and seating rim taking care to see that the die cast projection at the edge of the Light Unit fits into the slot in the seating rim and also see that the seating ring is correctly positioned. Finally secure in position by means of the three fixing screws.

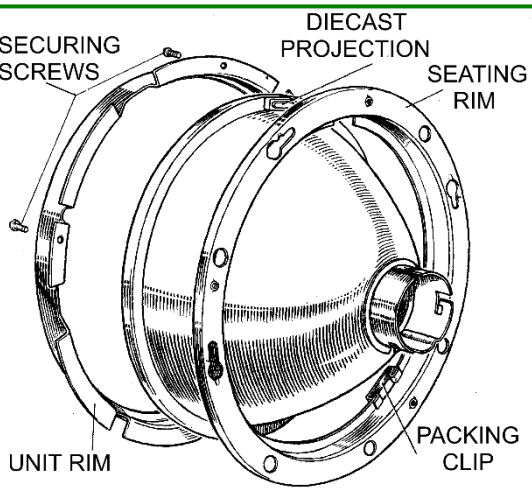


Figure 84. – Light Unit Assembly.

Item 186. Stop/Tail Lamp

This lamp incorporates a double filament bulb, the higher wattage filament being utilised for the stop light. Take care when fitting a replacement bulb to see that it is correctly fitted, i.e. the smaller wattage filament for the tail lamp. To gain access to the bulb remove the glass cover by slackening its securing screw.

Item 187. Foglamp (when fitted)

To remove the front rim and Light Unit for bulb replacement slacken the screw at the top of the lamp and remove the rim and Light Unit assembly. Twist the back-shell in an anti-clockwise direction and pull it off. The bulb can then be removed. It will be noticed that the lamp is fitted with a bulb shield; this is to prevent the emission of direct light rays from the bulb.

Place the replacement bulb in the holder, taking care to locate it correctly. Engage the projections on the inside of the back-shell with the slots in the holder, press on and secure by twisting it to the right. Engage the bottom of the rim with the lamp body, press on and secure by tightening the screw at the top of the lamp.

Item 188. Replacement Bulbs

Description	Volts	Watts	Lucas No.
Headlamps:			
Home Models – L.H.	12-v	36/36-W	Lucas No. 167 (Vertical Dip)
Headlamps (Main):	12-v	36/36-W	Lucas No. 300 (Dip to Left)
Home Models – R.H.	12-v	36-W	Lucas No. 162
Export Models	12-v	36/36-W	Lucas No. 300 (Dip to Left)
Export Models	12-v	36/36-W	Lucas No. 301 (Dip to Right)
Headlamp (Pilot)	12-v	6-W	Lucas No. 989
Stop/Tail Lamp	12-v	6/24-W	Lucas No. 189
Fog Lamp	12-v	36-W	Lucas No. 162
Trafficators	12-v	3-W	Lucas No. 256
Instrument Panel Lights	12-v	T.B.A.	Lucas No. 987

SECTION 27. **– TRAFFICATORS**

Item 189. Lubrication

If the action of a Trafficator becomes sluggish it must be lubricated as described below.

In order to raise the arm of the Trafficator for lubrication purposes or bulb replacement, switch on the Trafficator and then, supporting the arm in a horizontal position, move the switch to the 'off' position.

Catch Pin – Apply by means of a small brush, a drop of thin machine oil, such as sewing machine oil to the Catch pin between the arm and the operating mechanism. Use only the slightest trace as any excess may affect the operating mechanism.

Arm Pivot Bearing – Withdraw screw on underside of arm and slide off the cover. Place the connecting wire to the bulb on one side and apply two or three drops of thin machine oil to the lubricating pad at the top of the arm.

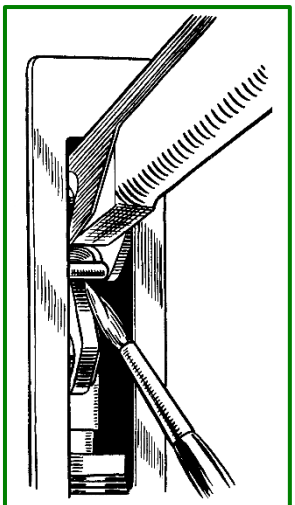


Figure 85.—Lubricating Trafficator Catch Pin.

Item 190. Bulb Replacement

Withdraw the screw on the underside of the arm and slide off the metal plate; the burnt-out bulb may then be replaced. To replace the metal plate, slide it on in an upwards direction so that the side plates engage with the slots on the underside of the spindle bearing. Finally secure the plate by means of its fixing screw.

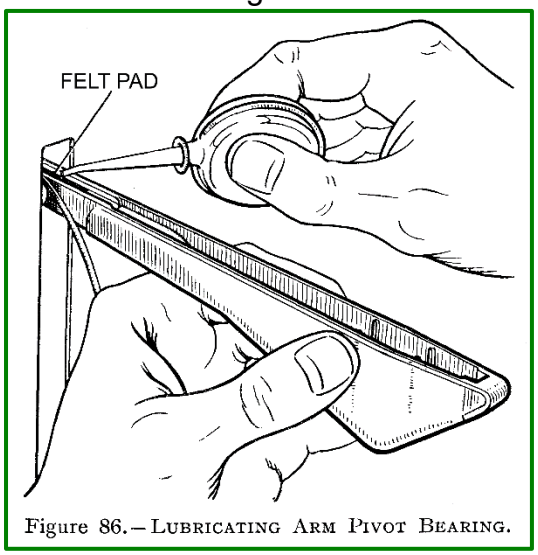


Figure 86.—Lubricating Arm Pivot Bearing.

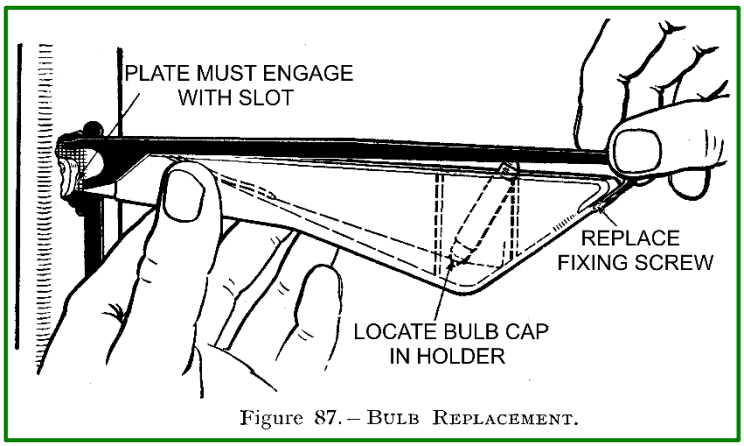


Figure 87.—Bulb Replacement.

SECTION 28. – WINDSCREEN WIPER SERVICE OPERATIONS

Item 191. Windscreen Wiper

Normally the Windscreen wiper will not require any servicing apart from the occasional renewal of the rubber blades.

Should any trouble be experienced, first check for loose connections, worn insulations, etc., before dismantling the motor.

Access to the motor drive can be gained under the dash, once the glove box has been removed.

Item 192. To Detach the Cable Rack from the Motor and Gearbox

Remove gearbox cover.

Remove split pin and washer from crank pin and final gear wheel.

Lift off the connecting link.

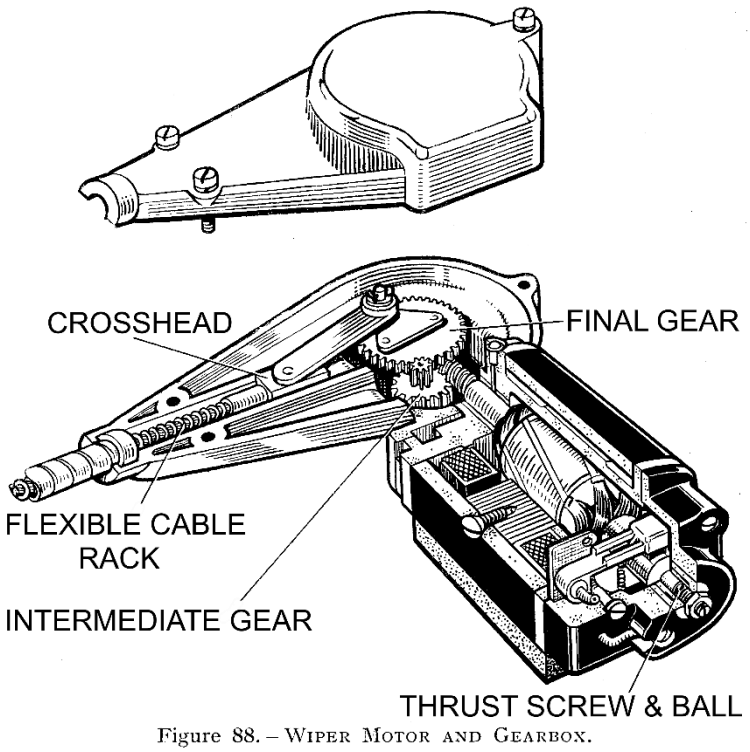


Figure 88. – Wiper Motor and Gearbox.

Item 193. Commutator Dirty

Removing the connecting leads to the terminals, unscrew the three screws securing the cover at the commutator end. Lift off the cover. Clean the commutator with a cloth moistened with petrol and carefully remove any carbon dust from between the commutator segments.

Item 194. Brush Gear

Check that the brushes bear freely on the commutator. If they are loose, and do not make contact, a replacement tension spring is necessary. The brush levers must be free on their pivots. If they are stiff they should be freed by working them backwards or forwards by hand and by applying a trace of thin machine oil. Packing shims are fitted beneath the legs of the brush levers to ensure that the brushes are central and that there is no possibility of the brush boxes fouling the commutator. If the brushes are considerably worn they must be replaced.

Item 195. Motor Drive Failure

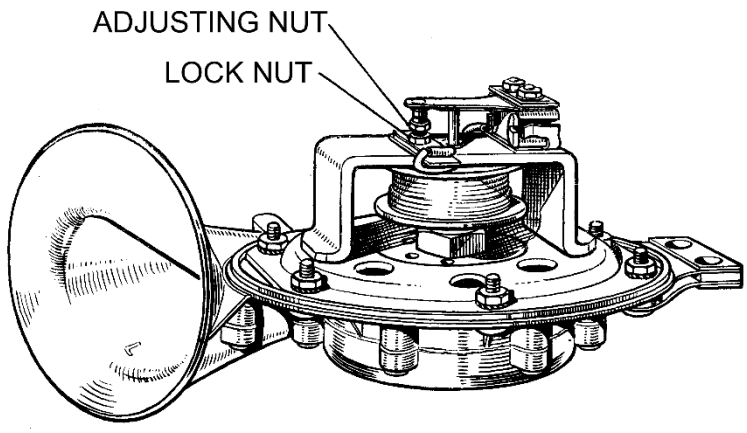
Remove the cover of the gearbox. A push-pull motion should be transmitted to the inner cable of the flexible rack. If the crosshead moves sluggishly between the guides, lightly smear a small amount of medium grade engine oil in the groove formed in the die casting housing. When overhauling, the gear must be lubricated by lightly packing the gearbox with a grease of the zinc oxide type (white grease).

SECTION 29. – HORNS

Item 196. Electric Horns WT29, WT614

All horns before being passed out of the works are adjusted to give their best performance and will give a long period of service without any attention: no subsequent adjustment is required.

If one of the horns fails or becomes uncertain in its action, it does not follow that the horn has broken down. First ascertain that the trouble is not due to a loose or broken connection in the wiring of the horn. If both horns fail or become uncertain in action, the trouble is probably due to a



WIND TONE HORN, MODEL WT614, WITH COVER REMOVED

Figure 89. – Horn Adjustment

blown fuse or discharged battery. If the fuse has blown, examine the wiring for the fault and replace with the spare fuse provided.

It is possible that the performance of a horn may be upset by the fixing bolt working loose, or by some component near the horn being loose. If after carrying out the above examination the trouble is not rectified, the horn may need adjustment, but this should not be necessary until the horns have been in service for a long period.

Adjustment does not alter the pitch of the note, it merely takes up wear or moving parts. When adjusting the horns, short circuit the fuse, otherwise it is liable to blow. Again, if the horns do not sound on adjustment, release the push instantly.

When making adjustments to a horn, always disconnect the supply lead of the other horn, taking care to ensure that it does not come into contact with any part of the chassis and so cause a short circuit.

Item 197. Adjustment

Remove the fixing screw from the top of the horn and take off the cover. Detach the cover securing bracket by springing it out of its location.

Slacken the locknut on the fixed contact and rotate the adjusting nut until the contacts are just separated (indicated by the horn failing to sound). Turn the adjusting nut half a turn in the opposite direction and secure it in this position by tightening the locknut.

NOTE: The Electrical System part of this Maintenance Manual should be used while having the Lucas Overseas Training Course at hand. The Course is available as PDF from the Jowett Car Club's Website. It does provide much greater detail about the 'how' and 'why' of the electrics in your Jowett motor car.

SECTION 30. – WIRING DIAGRAM – JAVELIN P.A. MODEL

Item 198. Key to Wiring Diagram

The Maintenance Manual used for this digital version did not feature a Wiring Diagram. Jowett Cars Limited supplied such diagrams in the Owner's Handbook. Such a diagram is featured on Page 87.

The wiring cable colour codes are listed below:

Javelin De-Luxe, R.H.D. Wiring Diagram Key to Cable Colours

Description	No.	Colour	Description	No.	Colour	Description	No.	Colour
Headlights	1	Blue	*Ignition-Fused*	23	Green/Brown	*Horn (Cont.)*	40	Brown/Black
	2	Blue/White	*(Cont.)*	24	Green/Black	*Side Light*	41	Red
	4	Blue/Red	*Dynamo*	25	Yellow	*Fog Lamp*	42	Red/Yellow
Ignition	9	White		29	Yellow/Green		44	Red/White
	10	White/Red	*Battery*	33	Brown	*Battery-Fused*	49	Purple
Ignition-Fused	17	Green		36	Brown/Blue	*Earth*	57	Black
	18	Green/Red		37	Brown/White	*Screen Wiper*	62	Black/Green
	21	Green/White				*Trafficator -L*	21	Green/White
	22	Green/Purple	*Horns*	38	Brown/Green	*Trafficator-R*	18	Green/Red

Note: First colour is dominant colour of cable; second colour is stripe colour.

SOUND EARTH STRAP CONNECTIONS ARE VERY IMPORTANT!

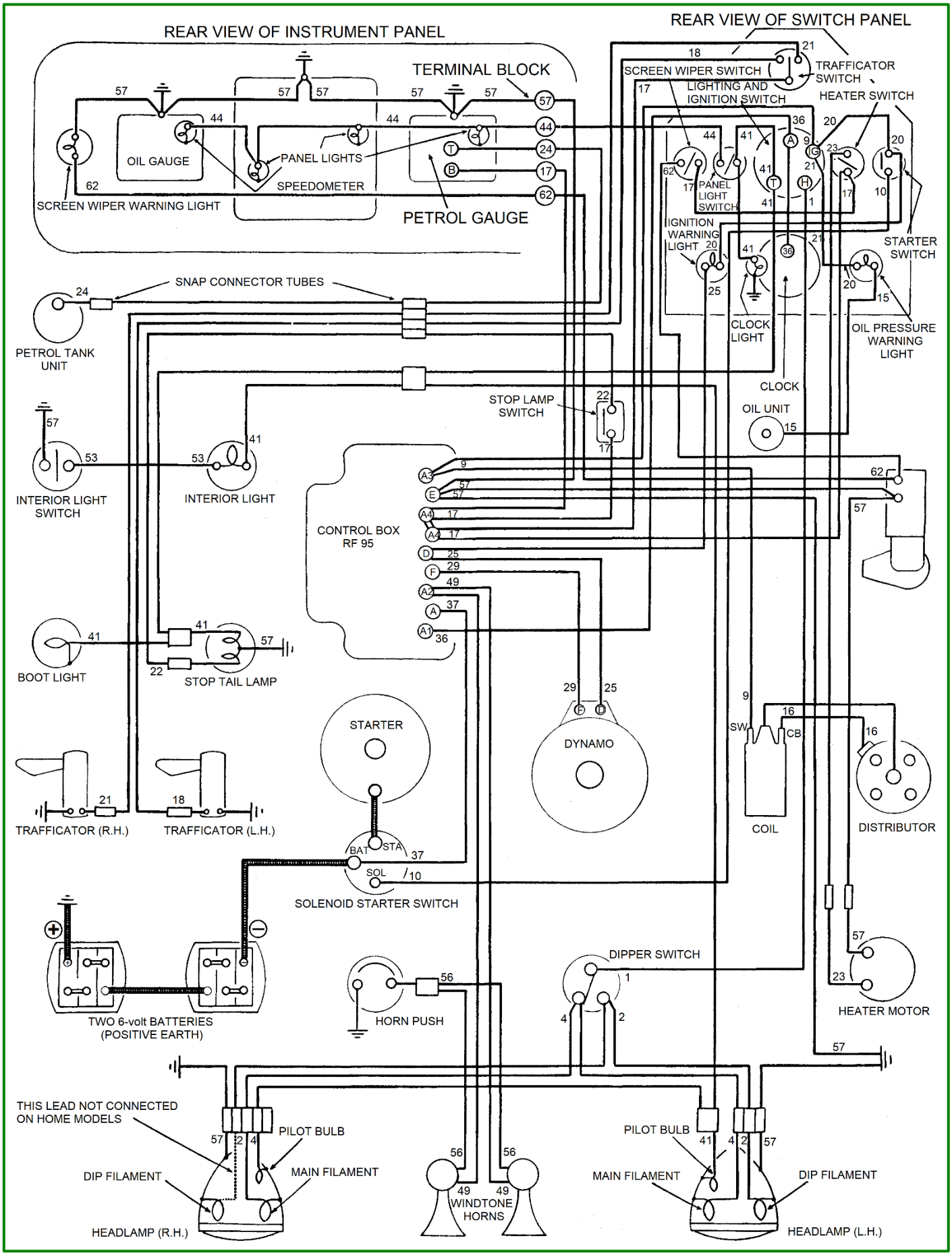


Figure 90. WIRING DIAGRAM – JAVELIN PA MODEL – DE-LUXE.