



Workshop Manual



Rolls-Royce Silver Cloud I Bentley S1

Printed and Published by

**Rolls-Royce Motors Limited
Crewe CW1 3PL
Cheshire
England**

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Workshop Manual

**Rolls-Royce Silver Cloud I
Bentley S1**

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Please refer to your authorised Bentley dealership for any update/changes.
Originally printed in 1956

TSD Publication 2735
Published by:-
Bentley Motors Limited.

Re-printed by Elanders Hindson Limited, England.

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GENERAL INFORMATION

SECTION A

GENERAL INFORMATION

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SPECIFICATION**ENGINE**

Type	Six cylinders, in line, with overhead inlet and side exhaust valves.
Bore	3.750" (95.3 m/m.).
Stroke	4.500" (114.3 m/m.).
Cubic capacity (piston displacement).	298 cu. ins. (4887 c.c.).
Rated H.P.	33.7 on R.A.C. rating.
Compression ratio	6.6:1 7.25:1 or 8.0:1 (Continental)
Suspension	The engine and gearbox are of unit construction. The unit is flexibly mounted on rubber at three points.

CYLINDER BLOCK

Type	Monobloc casting, integral with crankcase.
Material	Cast iron with full length, high phosphorus iron cylinder liners. Phosphor bronze exhaust valve guides.

CYLINDER HEAD

Type	Detachable, 6 port type.
Material	Aluminium alloy, with nickel chrome steel inlet valve seat inserts and cast iron inlet valve guides.

CRANKSHAFT

Material	Nitride hardened chrome Molybdenum steel. Dynamically balanced.
Number of journals ...	Seven.
Balance weights ...	Integral with shaft.
Crankshaft vibration damper.	Internal. Combined spring drive and friction type damper.

MAIN BEARINGS

Number of	Seven
Type	Copper, lead-indium lined thin steel shells with "pre-sized" bores to suit diameter of crankshaft journals.

CONNECTING RODS

Type	"H" section. Fully machined and balanced.
Material	Chrome Molybdenum steel.
Big-end-bearings ...	Copper, lead-indium lined thin steel shells with "pre-sized" bores to suit diameter of crankpins.
Gudgeon pin bush ...	Pressed in rod.

PISTONS

Material	Aluminium alloy, split skirt.
Number of rings ...	Three compression and one Duaflex oil scraper. Top compression chromium plated.

CAMSHAFT

Material	Case hardened nickel steel.
Number of journals ...	Four.
Bearings	Four Babbitt lined steel shells.
Thrust taken	Front.
Drive	Helical tooth gears.

VALVE GEAR

Inlet valves	Overhead push rod operated. Dual springs. Gland packing to control lubrication.
Exhaust valves	Side. "Brightray" heat-resisting faces to prolong life.
Valve tappets	Barrel type, flat face.

LUBRICATION SYSTEM

General	High pressure feed to crankshaft, connecting rod and camshaft bearings and to the distributor drive skew gearing. Dual oil relief valve providing a positive low pressure oil supply to engine gears and to the hollow valve rocker shaft from which valve
----------------	--

	rockers, push rods, tappets and cams are lubricated.
Type	Pressure throughout.
High pressure supply ...	25 lbs./sq. in. (approx.).
Low pressure supply ...	5 lbs./sq. in. (approx.).
Sump capacity ...	2 galls. (Imperial), 2.4 galls. (U.S.A.), 9.1 litres.
Oil pump	Spur gear type with floating intake strainer.
Oil pressure relief valve unit	Dual type, controlling both high and low pressure feeds.
Oil filter	"British" Full-Flow type.

FUEL SYSTEM

Carburettors	Two S.U.HD.6 Diaphragm type. Automatic choke for cold starting.
Continental	Two S.U.HD.8 Diaphragm type.
Air cleaner	Mesh or oil bath.
Fuel pumps	S.U. Twin electric type "L".
Fuel Tank capacity ...	18 galls. (Imperial) 21.6 galls. (U.S.A.), 81.8 litres.
Fuel strainers	Main fuel strainer mounted on side frame member in front of fuel tank. Small gauze strainer at carburetter inlets and in petrol pumps.
Fuel gauge	Electric. Registers when ignition switch is "ON".

COOLING SYSTEM

Cooling system capacity	3½ galls. (Imperial) 4.2 galls. (U.S.A.), 16 litres.
Pump	Centrifugal.
Fan	Five blade.
Fan diameter	18" driven at 0.85 times engine speed.
Pump and fan drive ...	Adjustable Vee belt.
Radiator matrix	Film type.
Radiator shutters ...	Fixed.
Coolant temperature control.	Thermostatically controlled by a by-pass thermostat valve allowing a minimum running coolant temperature of 75°C.—80°C.
Temperature indicator ...	On instrument panel. Electric; registers when ignition switch is ON.
Coolant	An inhibited solution of

ethylene glycol (DTD 779).

EXHAUST SYSTEM

Straight-through large diameter pipe with three acoustic type silencers in series, each tuned to absorb a different range of frequencies. The power loss is very low.

AUTOMATIC GEARBOX

This comprises a fluid coupling and an epicyclic gearbox arranged to provide four forward speeds and reverse. The forward speeds are obtained entirely automatically depending on road speed and engine load, but there is also an overriding hand control which enables the owner to effect manual gear changes to suit prevailing road conditions, etc.

Gearbox ratios	1st speed—3.82:1. 2nd speed—2.63:1. 3rd speed—1.45:1. 4th speed—Direct. Reverse—4.30:1.
Oil capacity	20 pints (Imperial), 24 pints (U.S.A.) 11.36 litres.

PROPELLER SHAFT

Type	Divided open type, having a ball and trunnion universal joint and two needle roller universal joints. The shaft is supported in the centre by a flexibly mounted ball race.
-------------	---

REAR AXLE

Type	Semi-floating.
Final drive ... ..	.650" off-set Hypoid bevel gears.
Standard—	
Pinion teeth	12.
Crown wheel teeth ...	41.
Ratio	3.42:1.
Continental—	
Pinion teeth	13.
Crown wheel teeth ...	38.

Oil capacity of box	...	2 pints (Imperial) approx., 2.4 pints (U.S.A.), 1.3 litres.
Ratio	...	2.92:1.
Pinion thrust bearing	...	Opposed taper rollers.
Oil capacity	...	1 $\frac{3}{4}$ pints (Imperial), 2.1 pints (U.S.A.), 1 litre.

BRAKES

General	...	Servo operated hydra- mechanical type. Front brakes entirely hydraulic- ally operated, rear brakes simultaneously operated both hydraulically and mechanically in proportion of 60 per cent hydraulic and 40 per cent mechanical. Hand brake mechanical operation on rear wheels.
Brake shoe linings	...	Ferodo DS.2 or Mintex M14.
Friction lining area (4 brakes).	...	240 sq. ins. (1548 sq. cms.).
Hand brake lever	...	Twist grip barrel type.

SERVO MOTOR

General	...	Dry single disc brake type, driven from the gearbox at approx. 1/5th propeller shaft speed.
Servo motor lining	...	Mintex M.19.

FRONT HUBS

General	...	Two taper roller races.
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WHEELS AND TYRES

Wheels	...	Bolted on pressed steel wheels with covering discs.
Rim-wheel	...	Well-base rims, 6L. by 15.00".
Tyres	...	8.20" by 15.00". 7.60" by 15.00" (Continen- tal).

STEERING

General	...	Divided track rod with transverse type drag link; designed to maintain correct geometry of road wheels under all conditions of road undulations.
Steering unit	...	Cam and roller.

Drive	...	Right-hand or left-hand.
Steering wheel, diameter	...	18" (457 m/m.).

SUSPENSION

Front	...	Independent front wheel suspension by means of coil springs with hydraulic dampers, and anti-roll tor- sion bar.
Rear	...	Semi-elliptic leaf springs controlled by hydraulic shock dampers. "Z" type torsion bar to control torque reactions.
Front shock dampers	...	Rolls-Royce hydraulic double-acting.
Rear shock dampers	...	Rolls-Royce hydraulic double-acting. Controllable through switch on steering column.

CHASSIS LUBRICATION

System	...	Luvax Bijur centralised chassis lubrication system supplied by a pedal operated oil pump mounted on the dashboard.
Capacity chassis oil pump	...	2 pints (Imperial), 2.4 pints (U.S.A.), 1.14 litres.

CHASSIS FRAME

Type	...	Box section throughout, with all welded joints.
------	-----	--

JACKING SYSTEM

Type	...	Smith Bevelift Jacks.
------	-----	-----------------------

BATTERY

Make and type	...	Either P. & R. Dagenite, 6 HZP.9/GZ or Exide 6.XCV.9L.
Voltage	...	12 v.
Capacity	...	57 ampere/hour at 20 hour rate.
Earth	...	Negative to chassis frame.

IGNITION DISTRIBUTOR

Make and type	...	Delco-Remy. Twin contact breaker with synchronised contact breaker arms.
Rotation	...	Clockwise.
Advance mechanism	...	Automatic (centrifugal governor).

Firing order ... 1, 4, 2, 6, 3, 5, No. 1 being the front cylinder.

IGNITION COILS

Make ... Delco-Remy or Lucas.

SPARKING PLUGS

Make and type ... Lodge, type CLNP or Champion N8BR.

Continental ... Lodge, type CLNP or Champion NA8.

DYNAMO

Make ... Lucas.

Type ... C.47.

Maximum output ... 30 amperes at 13.5 volts.

Drive ... By adjustable Vee belt.

Voltage regulator and cut-out. Lucas RB.310, current-voltage type.

STARTER MOTOR

Make and type ... Lucas M-45G 12 v. with Rolls-Royce built in planetary reduction gear (2.21:1 ratio). Overall reduction 18.05:1.

Cranking speed ... 80 to 160 engine r.p.m. (under normal temperate climate conditions).

Rotation ... Clockwise.

Pinion to flywheel ratio 14/115.

HORNS

Make and type ... Lucas, Model CT.750 — Windtone or "Clear-Hooter" (Wind Tone).

DIRECTION INDICATORS

Make and type ... Lucas, FL.3 "Flashing" type indicators.

WINDSCREEN WIPERS

Make and type ... Lucas Model DR1. Two-Speed Self-Parking.

HEADLAMPS

Make and type ... Lucas R.700 (R.R. styling).

General ... A small red warning light, mounted in the speedometer, is illuminated when

ever the headlamps are on the "Driving Beam" (full on).

FOG LAMPS

General ... Two combined Flasher-Fog lamps, double filament bulb.

FUSE BOX

General ... Large box contains eight circuit fuses. Circuit fuse: one strand No. 31 SWG tinned copper wire. Spare wire provided in fuse box. Small box contains separate fuse for horns, 25 amp. Cartridge type.

CAR HEATER

Alloy heat exchanger under right-hand front wing ducted to slots under the scuttle and to an outlet in the floor of the rear compartment at the back of the front seat.

DE-MISTER AND DE-FROSTER

Alloy heat exchanger under left-hand front wing delivering hot or cold air to windscreen. Rear window electrically heated, controlled by switch on parcel tray.

WINDSCREEN WASHER

Make ... Trico.

General ... Vacuum operated. Special liquid has low surface tension and anti-freeze properties.

RADIO

Make and type ... The receiver consists basically of a high sensitivity permeability tuned super-heterodyne circuit incorporating one stage of RF amplification prior to the frequency changer. Mechanically pre-set push-button tuning is provided in addition to the normal manual control. The amplifier/power unit

provides push-pull output, the high tension supply being by means of a non-synchronous vibrator rectified conventionally by a compact metal rectifier. An exterior aerial is normally fitted.

COACHWORK

General ... The body has been tastefully styled in the modern manner, permitting the maximum space to be devoted to passenger and luggage accommodation.

Steel and light alloy stressed skin construction has been employed, the floor being an integral part of the body, to ensure optimum strength and rigidity consistent with lightness.

Full width English hide-covered seats, the front with individually adjustable backrests, give adequate accommodation for five persons with an occasional

sixth. The woodwork is finished in French walnut veneer and pile carpets are fitted.

The body is fitted to the chassis on rubber mounts in a special manner with no metal to metal contact. This method has been designed to ensure minimum transference of road and chassis vibration to the body.

DIMENSIONS

Wheelbase	...	10' 3" (312.4 cms.).
Track, front	...	4' 10" (147.3 cms.).
Track, rear	...	5' 0" (152.4 cms.).
Overall length, including bumpers.	...	17' 8" (539.5 cms.).
Overall width (over wings)	...	6' 2½" (190.5 cms.).
Overall height, unladen	...	5' 4½" (163.0 cms.).
Turning circle diam. (to outside edge of tyre).	...	41' 8" (12.7 m.).
Weight, kerbside, with automatic gearbox.	...	39 cwt. (approx.), (1953 kgs.).

UNIFIED SCREW THREADS

The need for a common standard of screw threads in the United Kingdom, Canada and the United States, has led to the agreement between the countries concerned to use UNIFIED THREADS of a mutually acceptable form, pitch and diameter.

There is little difference between the form of the American National Thread and the Unified Thread, and the new threads are therefore largely interchangeable with S.A.E. standards. They are not, however, interchangeable with B.S.F., and although B.S.W. have the same number of threads per inch as the Unified Coarse Series, interchanging is not recommended due to a difference in the thread form.

All Rolls-Royce and Bentley nuts, bolts and castings on which Unified Threads are used, are clearly identifiable by the standard system of markings as illustrated in Fig. A.1.

There are three types of unified thread:—

1. Unified Coarse —UNC.
2. Unified Fine —UNF.
3. Unified Special —UNS.

Rolls-Royce and Bentley Motors employ the Unified Fine thread for all sizes from $\frac{1}{4}$ " to $\frac{3}{4}$ " diameter. All sizes above $\frac{3}{4}$ " diameter have been classified by Rolls-Royce and Bentley Motors as Unified Special and carry 16 threads per inch; below $\frac{1}{4}$ " diameter B.A. threads are employed. The Unified Coarse thread is not employed.

Where they occur in the text of this manual, in Dismantling or Assembling Instructions, nut, bolt and setscrew sizes are given by the "Across the Flats" (A/F) measurement to assist spanner selection.

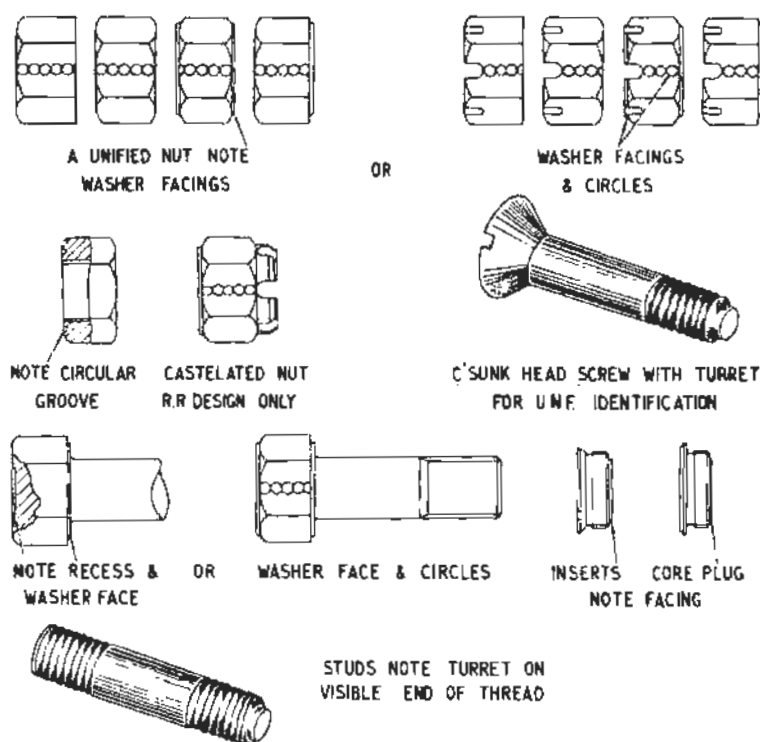


Fig. A.1.—Unified Thread Identification.

SPECIAL PROCESSES

SECTION B
SPECIAL PROCESSES

SUB-SECTION

Storage	B1
Shipment Overseas	B2

STORAGE

PREPARATION FOR STORAGE

The following recommendations are given for storage for periods of six months or longer. Success depends upon correct initial preparation and regular inspection and maintenance. The storage building should be dry, well ventilated and preferably heated.

ENGINE AND CHASSIS

Preparation

- (i) Run the vehicle for a sufficient mileage to warm up the oil in the engine sump, gearbox and back axle.
- (ii) If the coolant contains anti-freeze DO NOT DRAIN. If not, and there is a danger of freezing, drain and refill with a recommended anti-freeze solution. Run the engine to ensure uniform distribution of the anti-freeze throughout the system.
- (iii) Jack up the car on blocks under the lower triangle levers in line with the coil springs at the front end and under the centre of the rear springs. Drain the engine sump and rear axle completely and refill to the correct level with one of the following recommended anti-oxident oils. As a reminder, attach a label to each unit. Run engine gently for a few minutes with a gear engaged. Discard the oil filter element.

DO NOT DRAIN THE OIL from the automatic gearbox. Top up with the recommended running oil and leave the gear range selector lever in neutral

- (iv) Drain the fuel tank. Run the engine to empty the fuel system. Remove covers from float chambers of carburettors, lift out floats and wipe out chambers. Refit floats and covers. Remove petrol pump filters to drain pumps and refit. Add two gallons of paraffin to the petrol tank. Switch on ignition to operate petrol pumps to fill system with paraffin.
- (v) Cover the tyres to exclude light but do not deflate.
- (vi) When the engine is cold, remove the sparking plugs and inject two tablespoonfuls of anti-oxident oil into each cylinder. Turn the engine on the starter motor to distribute the oil on the piston walls. Replace the sparking plugs, screwing down lightly.
- (vii) Liberally oil the rocker gear with anti-oxident oil.
- (viii) Leave the handbrake in the off position.

- (ix) Remove the battery, clean, top up with distilled water and charge fully at the normal rate recommended by the manufacturers.

Recommended Storage Lubricants

Manufacturer

B.P.	..	Energol Protective Oil 20.
Wakefield's	..	Castrol Storage Oil.
Shell	..	Shell Ensis Oil 452.
Mobil	..	Infilrex 109 SAE 30.
Equivalent oils are Esso Rust Ban 603, Speedolene BKX and Duckham's No. 20.		

Periodic Maintenance

- (i) Inspect the rubber connections of the cooling system and replace if unsound.
- (ii) Maintain reasonable pressure in the tyres.
- (iii) Every four to six weeks give the battery a freshening charge, continuing the charge until the specific gravity of the acid has remained constant for about 10—12 hours on each occasion.

BODY

Preparation

- (i) Wash down thoroughly and make good any paint blisters or rust patches to prevent further deterioration. Apply a good quality polish such as Lifeguard Car Wax, and polish well. In no circumstances use any polishing compound containing ammonia.
- (ii) Thoroughly brush and clean all carpets, upholstery and cushions. Sprinkle with anti-moth powder and store in a dry place. Treat leather upholstery with an application of "Connolly's Hide Food".
- (iii) If the place for storage is dry, leave the car windows slightly open. If there is any tendency to dampness shut the car doors and windows and leave some form of anti-moisture preparation such as Calcium Chloride Crystals in a metal container inside the car.
- (iv) Cover the car with a dust sheet.

Periodic Maintenance

- (i) Repolish the paintwork at regular intervals.
- (ii) Regularly inspect the upholstery, carpets and cushions for moth and treat accordingly.
- (iii) Renew the anti-moisture compound as necessary.

RECOMMISSIONING AFTER STORAGE

Provided the car has been stored in accordance with the recommended procedure, the following points only should require attention before recommissioning for use on the road:—

- (i) Check the tyre pressures.
- (ii) Fully charge the battery and replace it on the car.
- (iii) Drain the engine sump and rear axle and refill with the recommended oils. Prime the cylinders with engine oil. Replace new filter element.
- (iv) Check the tappet clearances, plug gaps and contact breaker points. Lightly grease the distributor cam and lubricate the contact breaker pivots. Recharge the distributor grease lubricator and screw down a turn or two.
- (v) Drain paraffin from fuel tank. Disconnect inlet pipes to carburetters, switch on ignition to operate petrol pumps to empty paraffin from system. Remove covers from float chambers of carburetters, lift out floats and mop out paraffin.

Replace floats, float chamber covers and inlet pipes. Remove petrol pump filters to drain pumps and replace.

- (vi) Check the dynamo brushes for freedom of movement in their holders and clean the commutator.
- (vii) Check the oil level in the oil reservoir for the one shot lubrication system. Pump the pedal and check that oil is reaching the lubrication points. Grease the universal joints and sliding joint of the propeller shaft.
- (viii) Check the oil levels in the steering box, shock dampers, starter motor reduction gear, and brake master cylinder reservoirs.
- (ix) Adjust the brakes and oil the jaws and pins of the linkage.
- (x) Fill up the fuel tank and start the engine. Check the oil pressure and check for petrol, oil and coolant leaks.
- (xi) Check the operation of all instruments, lights and accessories.

SHIPMENT OVERSEAS

PREPARATION FOR SHIPMENT OVERSEAS

UNCRATED

It is unnecessary to drain the coolant system or to drain the engine crankcase, gearbox and rear axle.

- (i) Drain all petrol from the tank and run the engine until the carburettors are dry.
- (ii) Prime the cylinders with a small quantity of anti-oxident oil, turn the engine by the starter motor and replace the sparking plugs.
- (iii) Fit a fully charged battery.
- (iv) Smear the exhaust system and all chassis parts liable to rust with "Sozol" or a similar rust inhibitor.
- (v) Cover the radiator and all chromium parts with masking tape to prevent accidental damage.

CRATED

- (i) Drain all petrol from the tank and run the engine until the carburettors are dry. Thoroughly

clean the pumps, filters and carburettors.

- (ii) Drain the coolant system.
- (iii) Drain the engine crankcase, and pour in approximately 1 pint of anti-oxident oil (See Sub-Section B.1). Do not drain the automatic gearbox, but top up with the recommended running oil to the correct level.
- (iv) Remove the sparking plugs and inject 10 ccs. of Intava Inhibiting Oil into each cylinder. Turn the engine on the starter motor and replace the plugs.
- (v) Fit a new battery in the dry condition.
- (vi) Smear the exhaust system and all chassis parts liable to rust with "Sozol" or similar rust inhibitor.
- (vii) Cover the radiator and all other chromium parts with masking tape.
- (viii) Tie a large warning label to the radiator and place a copy of the following in a prominent position in the front of the car, or tied to the engine of a body-less chassis.

INSTRUCTIONS WITH CAR

ALL ROLLS-ROYCE AND BENTLEY CARS ARE SPECIALLY PREPARED FOR SHIPMENT BEFORE DISPATCH

The oil has been drained from the engine of this chassis and a small quantity of anti-oxident oil run into the working parts for protective purposes only. The quantity is not sufficient to allow for the running of the engine.

The automatic gearbox is filled to the correct level with the recommended running oil.

It will be necessary to refill the crankcase with the correct oil before running the engine.

The rear axle is filled to the correct level with Wakefield Hi-Press S/C oil and does not require attention.

The cylinder bores have been treated with an inhibitor and do not require priming.

The battery is dry and requires filling with electrolyte and charging.

Before starting the engine.

Fill the engine with one of the following oils:—

B.P. ....	...	...	...	Energol SAE 20/W.
Wakefield ...	...	...	...	Castrolite.
Shell ...	...	...	...	X-100-20/20 W.
Mobil ...	...	...	...	Mobiloil Arctic.
Capacity ...	...	...	...	16 pints (9.1 litres).

Starting up the Engine

Ensure that the gear range lever on the steering column is in neutral, quadrant position "N", also, that the handbrake is on.

Before starting the engine, the accelerator pedal must be depressed to its full extent and then released entirely. This will allow the fast idle cam to position itself in relation to engine temperature, and so set the throttle to the correct opening for starting.

Start the engine, and as soon as it is running, slightly depress and release the accelerator pedal. This will allow the fast idle cam to again reposition itself in relation to engine temperature and set the throttle at a slightly lower engine speed.

Before taking the car onto the road, allow the engine

to warm up to its normal operating temperature, at which, the engine will tick-over at the normal pre-set speed.

During this procedure, an inspection should be made to ensure that there is no leakage from the petrol, oil or coolant systems.

WORKSHOP TOOLS

Workshop Tools are of a specialised and expensive nature, therefore, it is not considered practical to issue Section C in this publication.

If Workshop Tools are required, a Rolls-Royce and Bentley Distributor should be consulted.



LUBRICATION AND MAINTENANCE

SECTION D

LUBRICATION AND MAINTENANCE

	SUB-SECTION
Recommended Lubricants	D.1
Maintenance Data	D.2
Periodic Lubrication and Maintenance 5,000, 10,000 and 20,000 mile Schedules.	D.3
Centralised Chassis Lubrication System	
Description—Testing the pump—	
Dismantling and rebuilding the pump—	
Gravity leakage.	D.4

RECOMMENDED LUBRICANTS

	B.P.	WAKEFIELD'S.	SHELL.	MOBIL.
ENGINE—Winter. Summer.	Energol SAE.20. W. Energol SAE.30.	Castrolite. Castrol XL.	X-100.20/20W. X-100.30.	Mobiloil Arctic. Mobiloil A.
Carburettor Damper. Contact Breaker. Hand Oiling Points.	Energol SAE.20. W.	Castrolite.	X-100.20/20W.	Mobiloil Arctic.
† Automatic Gearbox Shock Dampers.	Energol A.T.F.	Castrol T.Q.	Donax T.6.	Mobilfluid 200.
Steering Box. Chassis Oil Pump. Starter Motor Gears.	Energol S.A.E.30.	Castrol XL.	X-100.30.	Mobiloil A.
Rear Axle.	Energol EP.SAE.90.	Castrol Hi-press S.C.*	Spirax EP.90.	Mobilube GX.90.
Distributor Greaser. Propeller Shaft Centre Bearing. Front Hubs. Rear Hubs. Servo.	Energrease N.3.	Castrolase WB.	Retinax A.*	Mobilgrease No. 5 or Mobilgrease MP.
Propeller Shaft—Sliding and Rear Universal Joints.	Energrease A.O.	Castrolase C.L.	Retinax A or CD.	Mobilgrease No. 2 or Mobilgrease MP.
Propeller Shaft—Front Ball and Trunnion Joint.	—	—	—	Mobilgrease No. 2.
HYDRAULIC BRAKES	WAKEFIELD-GIRLING BRAKE FLUID—CRIMSON.			

† General Motors Hydramatic Fluid Type AQ. ATF is also recommended.

* First recommendation.

APPROVED LUBRICANTS**ENGINE.**

B.P. Energol Viscostatic.

Shell X.100-10W 30.

MAINTENANCE DATA**ENGINE**

Valve Clearance.	
Inlet ... ..	.006" (cold) (.15 m. m.).
Exhaust ... ..	.012" (cold) (.30 m. m.).
Distributor contact breaker gap	.019" to .021" (.438 to .533 m. m.).
Sparking plugs	Lodge CLNP or Champion N8BR.
Spark plug gap ... ..	.025" (.635 m. m.).
Firing order	1, 4, 2, 6, 3, 5.
Ignition timing	2° B.T.D.C.
Valve timing	No. 1 inlet valve opens at T.D.C. with .030" valve clearance.

"Continental" models, Lodge CLNP or Champion NA.8.

CAPACITIES

Engine sump	16 pints, 19.2 pints (U.S.A.), 9 litres.
Automatic gearbox	20 pints, 24 pints (U.S.A.), 11.4 litres.
Rear axle	1½ pints, 2.1 pints (U.S.A.), 1 litre.
Steering box	2 pints, 2.4 pints (U.S.A.), 1.3 litres.
Coolant—engine and radiator	3½ galls. (Imp.), 4.2 galls. (U.S.A.), 16 litres.
Fuel tank	18 galls. (Imp.), 21.6 galls. (U.S.A.), 81.8 litres.

LEVELS

Engine sump	"MAX" mark on dipstick.
Automatic gearbox	"F" line on dipstick.
Rear axle	Bottom of level plug orifice.
Steering box	Filler plug orifice.
Starter motor drive	Bottom of filler plug orifice.
Shock dampers	Bottom threads of filler plug orifice.
Hydraulic fluid reservoir	1" below the top of the filler orifice.
Chassis lubrication reservoir	1" below the top of the filler orifice.
Coolant level	Bottom of the radiator filler orifice.
Battery electrolyte	¾" above the top of the separators.
Windscreen washer reservoir	1" below top of filling orifice.

TYRE PRESSURES

Tyres Cold.		
Front	19 lbs./sq. in.	1.33 kg./cm².
Rear	26 lbs./sq. in.	1.83 kg./cm².
Tyres Hot.		
Front	22-23 lbs. sq. in.	1.55-1.62 kg./cm².
Rear	32-34 lbs. sq. in.	2.25-2.40 kg./cm².

"Continental" models, see Section "R".

ELECTRICAL EQUIPMENT

Battery	Dagenite 6H.ZP.9/G.Z or Exide 6 XCV 9/1. 12 v. 57 ampere/hour.
Earth	Negative to frame.
Dynamo	Lucas C-47 12 v.
Starter motor	Lucas M-45.G 12 v.

Horns	...	...	...	...	Lucas CT.750 wind tone.
Bulbs.					
Headlamps	...	...	...	...	12 v. 60/36 w. Standard. 12 v. 42/36 w. Canada and South America. 12 v. 45/36 w. "Granilux" France. 12 v. 45/40 w. Europe except France.
Side Lamps	...	...	...	...	12v 6w
Stop Tail Lamps	...	...	...	...	12v 18/6w
Rear Winkers	...	...	...	...	12v 21w
Fog Lamps	...	...	...	...	12v 38/21w
Reverse Lamp	...	...	...	...	12v 21w
Number Plate Lamp	...	...	...	...	12v 6w
Boot Lamp	...	...	...	...	12v 6w
Roof Lamp	...	...	...	...	12v 6w
Companion Lights	...	...	...	...	12v 6w
Map Lamp	...	...	...	...	12v 6w
Inspection Lamp	...	...	...	...	12v 6w
Fuses	...	...	...	...	30 amperes, one strand of No. 31 S.W.G. tinned copper wire.
Horn fuse	...	...	...	...	25 amp. Cartridge type.

MAINTENANCE SCHEDULES

Schedules "A" "B" and "C" are designed to cover normal routine maintenance on a set mileage basis so that Retailers may offer owners in their area the benefits of a regular maintenance service. The Schedules are a consolidation of the various items given in the Handbook for owners who wish to carry out their own maintenance and are not in any way intended to supersede them.

SCHEDULE "A" To be carried out at the conclusion of every 5,000 miles. The Schedule covers all the items associated with the engine, chassis and coachwork requiring lubrication, cleaning or adjustment.

SCHEDULE "B" To be carried out at the conclusion of every 10,000 miles. In addition to the repetition of the whole of Schedule "A", this Schedule covers the inspection and rectification of items not included at the lower mileage.

SCHEDULE "C" To be carried out at the conclusion of every 20,000 miles. This Schedule repeats Schedule "B" and principally covers change of lubricant for the automatic gearbox, rear axle and propeller shaft ball and trunnion joint.

SCHEDULE "A"

EVERY 5,000 MILES

LUBRICATION

1. Ignition distributor shaft, contact breaker pivots and cam.
2. Gear range selector controls and accelerator linkage.
3. Brake system pivot pins and bearings.

OIL LEVEL CHECKS

1. Steering box.
2. Chassis lubrication tank.
3. Clean carburettor air valves and check oil level in hydraulic damper chambers.
4. Brake master cylinder reservoir.
5. Automatic gearbox.
6. Rear axle.
7. Drain and refill crankcase. Renew oil filter element.

ENGINE AND CHASSIS ADJUSTMENTS

1. Check coolant level and top up if required. (When climatic conditions warrant, check specific gravity of coolant and advise owner if additional anti-freeze is required).
2. Check fan belt tension. Adjust if necessary.
3. Check and reset inlet tappet clearances.
4. Clean sparking plugs. Check and reset gaps.
5. Clean contact breaker points. Reset gaps, check and reset ignition timing.
6. Check functioning of fuel pumps (disconnect electrical leads and check each pump independently).
7. Adjust rear brakes and servo.
8. Check for excessive leakage at any point in the central chassis lubrication system.
9. Check and adjust tyre pressures.
10. Clean oil bath air filter element, if fitted, and refill with oil.

ELECTRICAL SYSTEM

1. Check battery acid level. Top up with distilled water if required. Clean, re-vascline and tighten battery terminals.
2. Check complete electrical system for correct functioning.

ROAD TEST

1. Test the car on the road.

SCHEDULE "B"

EVERY 10,000 MILES

1. Repeat Schedule "A".
2. Grease propeller shaft universal joints (2 points) and sliding joint (1 point).
3. Check starter motor reduction gear oil level and refill if required.
4. Check oil level in front and rear shock dampers.
5. Remove the carburetter air filter element and wash in petrol or paraffin and then oil with engine oil. Allow to thoroughly drain before re-fitting.
6. Clean the fuel strainers.
 - (i) The main fuel filter on the chassis cross member just forward of the petrol tank.
 - (ii) The filter gauzes in each carburetter float chamber feed connection.
 - (iii) The filter gauzes in the petrol pumps.
7. Lubricate track rod ball joints with Molybdenum disulphide grease.

SCHEDULE "C"

EVERY 20,000 MILES

1. Repeat Schedule "B".
2. Drain and refill the automatic gearbox. Clean oil breather in top of dipstick.
3. Drain and refill rear axle.
4. Clean and re-pack front propeller shaft ball and trunnion joint with 1½ ozs. of Mobilgrease No. 2.
5. Remove front drum and inspect brake linings for wear. (Lining face should not be less than 1/32" (.8 m/m.) above rivets.)
6. Renew oil filter pad in chassis lubrication pump.

THE CENTRALISED CHASSIS LUBRICATION SYSTEM

GENERAL

The Luvax Bijur foot-operated pump and combined oil reservoir is fitted on the front of the dashboard and supplies oil through brass tubing of $\frac{3}{8}$ " (.4 m/m.) outside diameter to all front chassis lubrication points as shown in Fig. D.4. The rear springs are interleaved and pre-packed with grease. They and the rubber bushed shackle pins require no additional lubrication. The oil delivered is not metered by drip plugs as previously and each bearing point is designed to ensure that correct lubrication is effected. As this is a total loss system, oil leakage from the points is desirable but excessive individual leakage should be rectified. Joints and connections in the piping are made by cap nuts and olives.

The construction of the pump is shown in Fig. D.2. Pressure on the foot pedal raises the piston and compresses the return spring. Oil is drawn through a non-return ball valve in the centre of the piston to the underside of the piston. On releasing pressure from the pedal, the piston is forced downwards by the return spring and oil through the filter pad to the outlet pipe. The spring is so rated that the pressure is practically constant throughout the stroke and the rate of discharge depends upon the viscosity of the oil. Normally it should take approximately five minutes for the pedal to return to its original position. At the end of its stroke the piston seals the hole in the filter retaining plate, preventing oil leakage by gravity.

The pump should be operated twice every 200 miles to ensure adequate lubrication.

PUMP FILTER

If, with the pump unit correctly coupled up to the pipe lines, the pump lever does not return to its normal position after being pressed down, it is probable that the filter is clogged.

Disconnect the chassis oil line at the pump outlet and unscrew the cap nut below the reservoir. Note the positioning of the filter retaining plate and gaskets to ensure correct re-assembly. Discard the felt disc and replace with a new one. Re-assemble and reconnect. Prime the system until oil is exuding from each bearing.

TO TEST THE PUMP

Disconnect the chassis oil feed pipe from the connection at the bottom of the pump and seal the outlet with a plug or reconnect a short piece of tube with its end hammered flat. Press down the pedal.

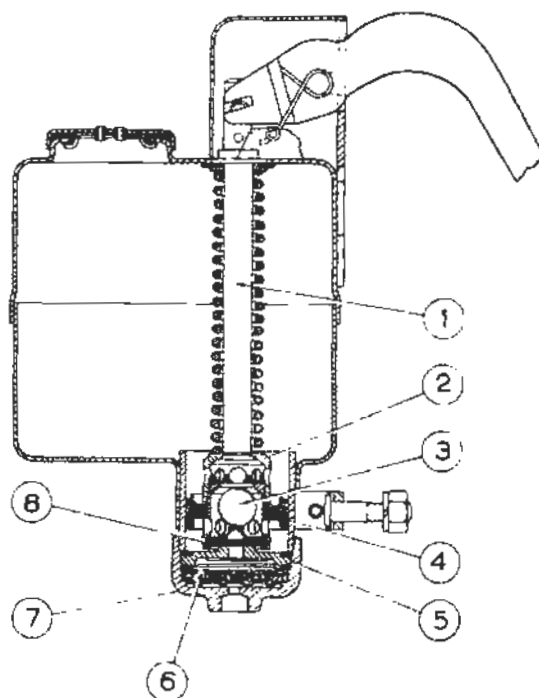


Fig. D.2.—Chassis Lubrication Pump.

- | | |
|--------------------------|-----------------------|
| 1.—Piston rod. | 5.—Strainer plate. |
| 2.—Piston rod valve nut. | 6.—Felt strainer. |
| 3.—Piston valve ball. | 7.—Cylinder cap nut. |
| 4.—Piston cup. | 8.—Piston valve disc. |

If the pedal shows any upward movement during a period of 2 minutes a leak past the piston is indicated, either at the leather cups or at the ball valve. Check that the reservoir is filled with the correct viscosity oil, as too thin an oil will give the same effect. If a leak is evident replace the pump unit.

TO DISMANTLE THE PUMP

Normally reconditioning of an oil pump is only undertaken by the manufacturers, and it is advisable to fit a replacement unit and to return the original for repair. The following instructions are given for occasions when this is impracticable.

Disconnect the chassis feed pipe from the pump. Remove the three nuts, bevelled and plain washers, situated under the carpet and insulating material at the front of the dashboard. The stirrup, which acts as a

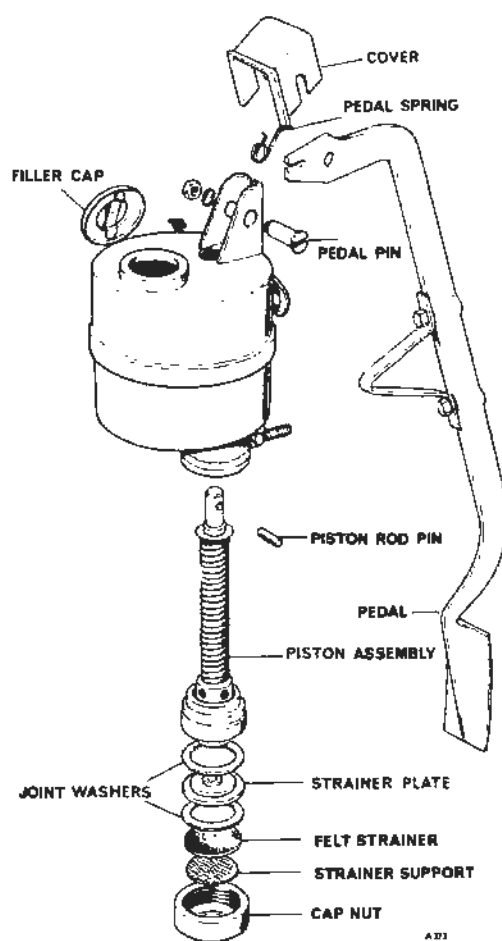


Fig. D.3.—Exploded View of Pump.

travel limiter, must be removed from the pedal because there is insufficient room for the pedal assembly to pass through the bulkhead. The pump may now be removed. Collect the three plain washers fitted between the pump and the dashboard.

Remove the filler cap. Remove the nut and spring washer from the cheese-headed pedal pin. Slide the pedal spring cover forward and remove.

Tap out the pedal pin, collect the hairpin type spring. Slide the pedal off the flats on the piston rod pin, remove the pin from the piston rod. Remove the cap nut and remove the piston valve assembly downwards.

TO RE-ASSEMBLE

Thoroughly clean all parts.

Oil the piston cup. With the leather joint washer in position on the collar near the top of the piston rod, fit the piston assembly to the tank. Fit the piston rod pin to the piston rod and slide the pedal into the flats on the pin. Fit the pedal pin and pedal spring, the shorter leg in the pedal notch and the longer leg under the small projecting pin (see Fig. D.3). Fit the pedal spring cover. Push it fully home against the pedal pin and tighten the pedal pin nut.

With the strainer support, strainer, strainer plate and two washers in position in the cap nut, fit the nut to the tank and fully screw up.

Refit the pump to the dashboard and connect the feed pipe.

GRAVITY LEAKAGE FROM THE PUMP

A gravity leakage from the pump, due to the piston sealing disc not seating correctly on the raised face of the brass strainer plate, will be noticeable by excessive oiling and external leakage from the stub-axle bearings and the centre steering bearing. Incorrect sealing of the piston discs may be due to the cylinder cap nut (7, Fig. D.2) not being sufficiently tightened, or to foreign matter between the piston valve disc and strainer plate.

To check for leakage disconnect the chassis feed pipe from the connection at the bottom of the pump and leave a piece of paper beneath the connection. Inspect after about half an hour.

If tightening the cap nut or stripping and cleaning does not effect a cure a new pump should be fitted.

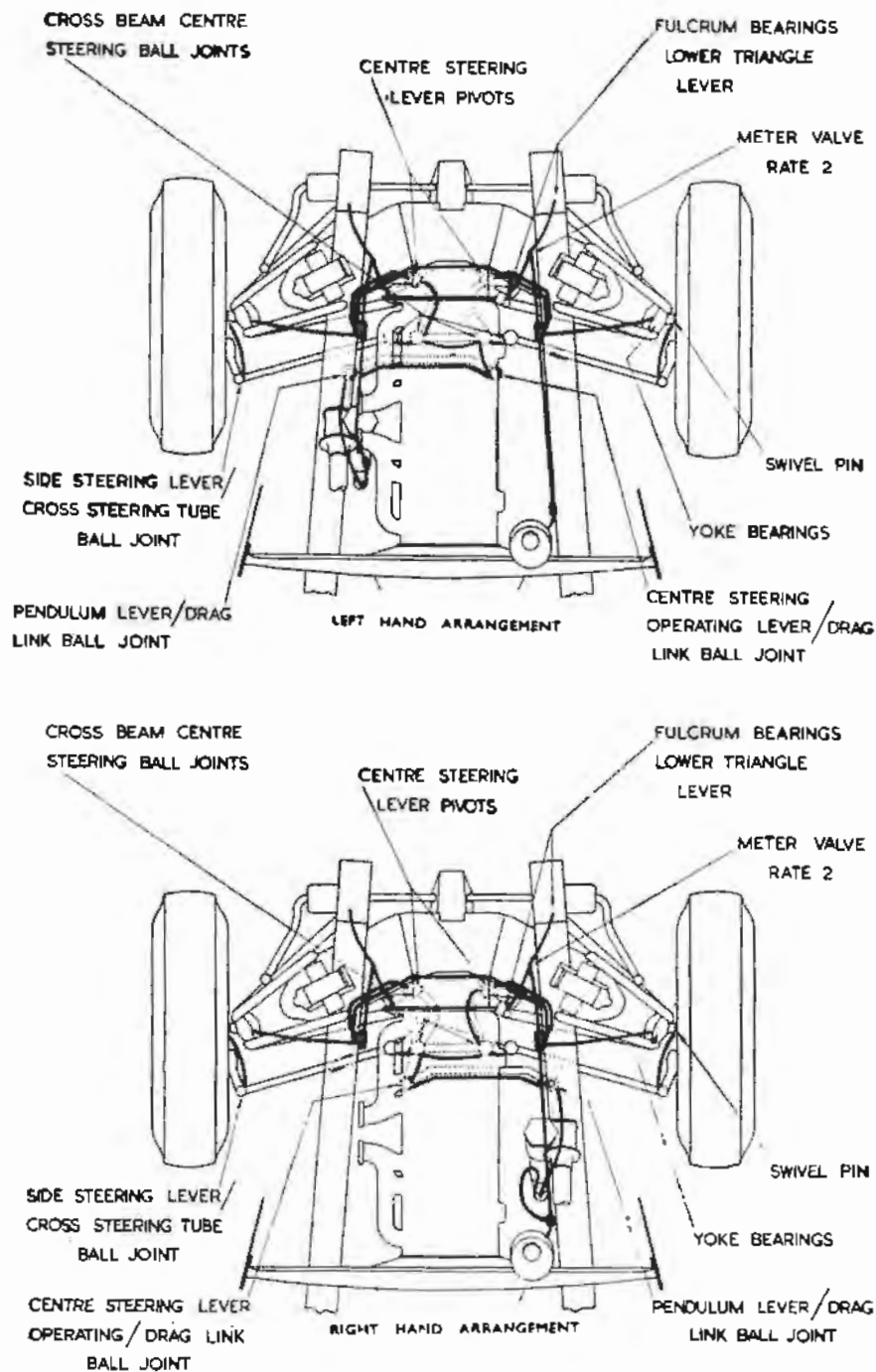


Fig. D.4.—Chassis Lubrication System.



ENGINE

SECTION E.**ENGINE****SUB-SECTION**

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(Continued.)

SUB-SECTION

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ENGINE DATA CHART

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSIONS	REMARKS
CYLINDERS AND PISTONS Cylinder Liners.	Yellow Liner 3.8785"—3.879" fits crankcase bore of 3.8755"—3.8760" Blue Liner 3.878"—3.8785" fits crankcase bore of 3.875"—3.8755"	—	Interference of .0025"— .0035" in crankcase obtained by colour selec- tion.
Cylinder Bore (Standard).	3.750"—3.7515"	.004" Wear .003" Ovality requires rebore	3.790" maximum rebore size.
Piston Grading F. G. H. J.	Piston Diameter (Standard) 3.7485"—3.7488" 3.7489"—3.7492" 3.7493"—3.7496" 3.7497"—3.750"	—	Piston clearance in the bore .0012"—.0015", measured at top of skirt at 90° to the gudgeon pin.
Compression Rings—end gap measured in position.	.015"—.019"	.025"	Must be assembled with gaps staggered.
Compression Rings—clearance of rings in grooves.	.002"—.0035"	.005"	—
Gudgeon Pin diameter.	.7499"—.7501"	—	—
Gudgeon Pin interference in piston bosses.	.0002"	—	At room temperature 68°—72°F.
Gudgeon Pin in connecting rod bush—running clearance.	.0001"—.0003"	.0005"	—
CONNECTING ROD AND CRANKSHAFT BEARINGS Connecting rod—small end bush interference.	.0025"—.004"	—	—
Connecting rod end float.	.007"—.022"	—	Controlled by clearance between rod and piston bosses.
Connecting rod and cap diameter of bolt hole.	.375"—.3755"	.3765"	—
Connecting rod bolt diameter.	.3745"—.375"	.3735"	.002" and .004" oversize bolts available.
Relation of connecting rod bolt split pin hole to tang on head.	90°	—	Any variation is a measure of bolt twist.
Connecting rod bore for bearing shell.	2.142"—2.1425"	—	—
Connecting rod nip on bearing.	.004"—.006"	—	—
Connecting rod—big end clear- ance.	.0012"—.002"	.003"	Clearances measured ver- tically. Renew bearing if lead plating is worn through.

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSIONS	REMARKS
Crankpin diameter.	1.9985"—1.999"	1.9975"	—
Crankshaft journal diameter.	2.7495"—2.750"	2.7485"	—
Crankshaft Main Bearings running clearance.	.0012"—.002"	.0045"	Renew bearing if lead plating is worn through.
Crankshaft end float.	.002"—.006"	.008"	—
FLYWHEEL Starter motor pinion—flywheel face clearance.	.175"—.200"	—	—
Backlash of starter pinion teeth on flywheel.	.015"—.025"	.030"	—
DAMPER AND SPRING DRIVE Crankshaft Damper Radial Driving Springs. Outer Springs. Inner Springs.	Free length: .800" (approximately). Load when compressed to .640": 32—35 lbs. Load when compressed to .525": 55—61 lbs. Free length: .725" (approximately). Load when compressed to .525": 10 lbs. \pm 6ozs.	— — —	— — —
Crankshaft Damper.	Steady slip poundage 14—15 lbs. at 17.5" radius.	—	—
Presser Plate thickness.	.160"—.175"	.150"	—
Back drum depth. Lip —friction face. Friction Plate thickness.	.422"—.425" .128"—.132"	.475" .105"	Total reduction in assembly dimensions must not exceed .060".
VALVE GEAR Camshaft gear backlash.	.002"—.004"	.006"	
True running of camshaft gear face.	.000"—.002"	—	—
Camshaft end float.	.002"—.006"	—	—
Thickness of camshaft thrust button flange.	.146"—.148"	.140"	—
Camshaft journal diameter.	1.9975"—1.998"	1.9965"	—
Camshaft bearing internal diameter.	2.000"—2.0005"	2.005"	—
Camshaft journal clearance.	.002"—.003"	.004"	—
Camshaft bearing external diameter.	2.1315"	—	—
Camshaft bearing interference in crankcase.	.003"	—	—
Inlet cam and base circle diameter—overall dimension.	1.517"	1.497"	Cam lift is .317". Minimum permissible lift is .297".

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSIONS	REMARKS
Exhaust cam and base circle diameter—overall dimension.	1.575"	1.555"	Cam lift is .375". Minimum permissible lift is .355".
Inlet and Exhaust valve tappet clearance in crankcase.	.0005"—.001"	.0025"	—
Valve Tappets. Colour Code Blue. Green. Yellow. Black. Black & Yellow. Green & Yellow.	Diameter 1.8675"—1.870" 1.870"—1.8725" 1.8725"—1.875" 1.875"—1.8775" 1.8775"—1.880" 1.880"—1.8825"	—	—
Exhaust Valve Guide external diameter.	.6270"—.6275"		
Interference in crankcase.	.0035"	—	—
Exhaust valve guide internal diameter.	.3755"—.376"	.378"	"Bellmouth" at the upper end is permissible up to .006" for a depth of .375".
Exhaust valve stem diameter.	.37175"—.372"	.3705"	—
Exhaust valve stem clearance.	.0035"—.00425"	.0075"	—
Exhaust valve head side movement.	—	.0113"	Measured with valve open .375".
Exhaust valve spring compressed to 1.170".	111—118 lbs.	85 lbs.	Valve open.
Exhaust and Inlet valve seat angle.	45°	—	"Crown" with 30° cutter to avoid pocketing after regrinding seat.
Exhaust valve seat insert outside diameter.	1.8150"—1.8155"	—	.005"—.007" interference. .010" oversize seats available.
Inlet valve seat insert diameter.	1.750"—1.760"	—	Seat screwed into head .002" interference.
Inlet guide interference in head.	.001"—.0015"	—	—
Inlet valve guide internal diameter.	.3437"—.3442"	.3455"	—
Inlet valve stem diameter.	.3417"—.3422"	.3405"	—
Inlet valve stem clearance.	.0015"—.0025"	.0052"	—
Inlet valve head side movement.	—	.0084"	Measured with valve open .317".
Inlet valve outer spring compressed to 1.600".	41.8—48.8 lbs.	35 lbs.	Valve closed.
Inlet valve inner spring compressed to 1.300".	13—17 lbs.	10 lbs.	Valve closed.
Rocker arm bush internal diameter.	.7495"—.74975"	.751"	—

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSIONS	REMARKS
Rocker shaft diameter.	.74825"—.7485"	—	—
Rocker shaft clearance.	.001"—.0015"	.0035"	—
OIL PUMP Shaft diameter.	.498"—.499"	.496"	—
Shaft clearance in bushes.	.001"—.0025"	.0055"	—
Bush internal diameter.	.500"—.5005"	.5015"	—
Bush interference in case.	.0005"—.0015"	—	—
Stationary spindle diameter.	.4985"—.499"	.496"	—
Stationary spindle clearance.	.0005"—.0015"	.004"	Permissible only when radial clearance of gears in case exceeds this figure.
Diametrical clearance between gears and side of chamber.	.0005"—.002"	.006"	—
Pump gears—backlash.	.002"—.006"	.010"	—
Pump gears end—float.	.001"—.003"	.004"	—
Drive gear backlash.	.002"—.008"	.020"	—
OIL PUMP TEST RIG PERFORMANCE			
Pump R.P.M.	Oil Pressure Restricted to	Minimum Flow (Pints per minute)	Oil Temperature (Inlet)
500	8 lbs./sq. in.	11.2	90°C.
1000	18 lbs./sq. in.	26.4	194°F.
1500	28 lbs./sq. in.	42.6	
Engine Oil Pressure— normal running.	High Pressure System: 25 lbs./sq. inch (approx.). Low Pressure System: 5 lbs./sq. inch (approx.).		
OIL RELIEF VALVES			
H.P. Valve Spring	Free length: 1.8125". Load when compressed to 1": 4½ lbs.		
L.P. Valve Spring	Free length: 1.750". Load when compressed to .900": 4 ozs.		

ENGINE

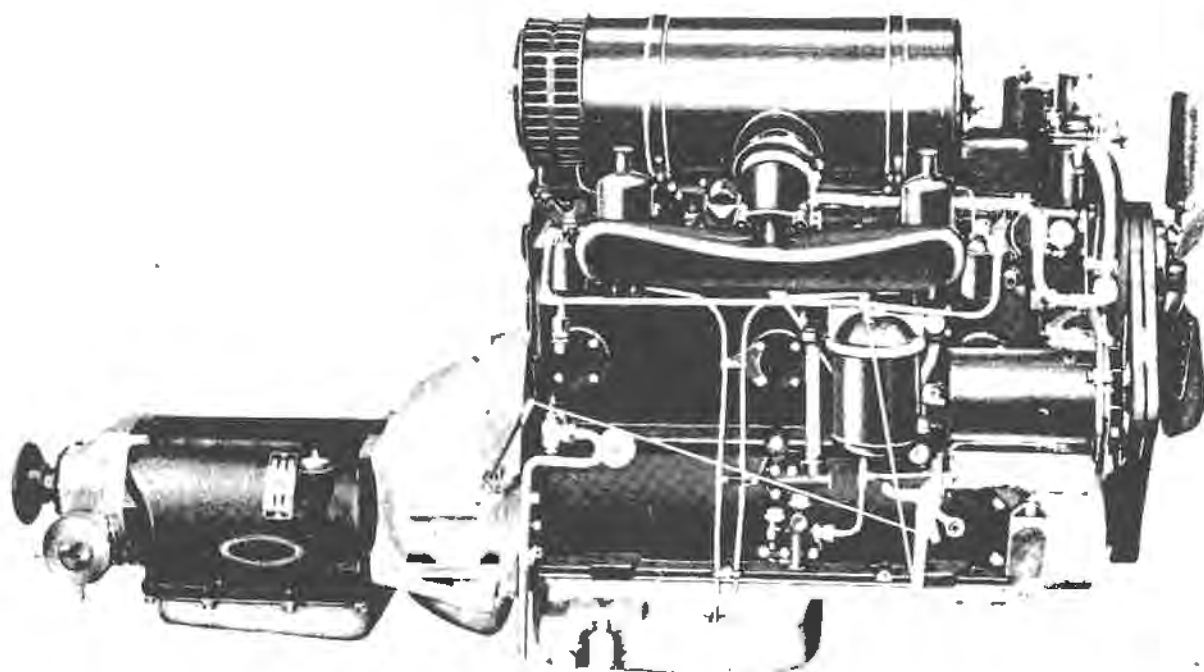


Fig. E.1.—Engine and Gearbox.

DESCRIPTION

The six cylinder in-line engine is mounted with the gearbox as one unit on rubber three-point suspension which provides insulation and controlled flexibility. An iron monobloc casting of crankcase and cylinders incorporates full-length dry liners of high chrome steel, with a six-port head and sump of aluminium.

The crankshaft is a chrome molybdenum steel forging, nitride hardened, and dynamically balanced. It is carried in seven main bearings of the split steel-backed shell type lined with copper-lead-indium. End thrust is taken by the centre main bearing which is fitted with split thrust pads front and rear. Detachable caps are fitted to the hollow crankshaft journals for cleaning purposes. A combined spring drive and damper is fitted, which utilises frictional, spring and inertia loadings to smooth crankshaft vibration and camshaft drive.

The fully machined connecting rods are of forged chrome molybdenum steel, with gudgeon pin bushes of phosphor bronze. The rods are drilled to permit high pressure lubrication of the gudgeon pins, and a small cross-drilling in the rod provides positive additional lubrication of the cylinder wall and piston

thrust face. The big-end bearings are of similar material to the main bearings.

Aluminium split skirt pistons with four rings are carried on gudgeon pins located by circlips in the pistons. The top ring is chrome plated, the two intermediates are of taper section, and the fourth is a Duaflex oil control ring.

The push rod operated overhead inlet valves in cast iron guides, and the side exhaust valves in bronze guides are operated via chilled iron tappets, by a forged hardened nickel steel camshaft carried in four "Babbitt" lined steel shell bearings, with a spring-loaded thrust pad at the forward end. A helical gear on this shaft drives a spur gear type submerged oil pump, and the ignition distributor.

REMOVING THE ENGINE AND GEARBOX AS A UNIT

The recommended procedure for removing the engine from the frame is to remove engine and gearbox as a unit, as detailed below.

Disconnect the earthing strap from the battery negative terminal. Remove the bonnet, windscreen washer

reservoir, air cleaner assembly and oil level dipstick. Drain the coolant and disconnect hoses, including the heater and demister return hoses at the radiator, and the feeds to the vacuum-operated water valves on each side of the engine.

Remove the fan blade assembly, replacing the set-screws to retain the pulley in position. Remove baffle plate from beneath radiator shell, after which the front apron and radiator shell may be removed as an assembly. Unbolt matrix from the valances and tubular stays and lift out.

Disconnect the horns. Remove matrix stay and support assembly complete with horns and the silent-bloc bushed mount.

Disconnect exhaust manifolds at down pipes. Remove the tubular stay between downtake pipe breeches piece and the crankcase lug.

Disconnect starter cable from solenoid to starter, at the starter terminal. Disconnect the long throttle rod between the accelerator and the lever on the bracket attached to the dynamo end plate.

Disconnect the flexible petrol pipe to carburettor at the union nut on the adaptor attached to the frame immediately ahead of dash.

Disconnect the electrical wiring from the engine at the following points:—

Temperature indicator transmitter in the thermostat housing.

Dynamo terminals.

Solenoid on the choke butterfly housing.

Oil pressure operated choke switch in the oil filter adaptor.

Oil level gauge unit of the sump.

Oil pressure switch, adjacent to the cylinder drain tap.

These wires form a loom, carried in spring clips fitted to the induction manifold. Remove the loom without disturbing the spring clips.

For convenient identification, the wires may be labelled as disconnected.

Disconnect the wire running along the left-hand valance to the positive side of the ignition coil.

Disconnect the tubes from the two vacuum lines fitted to the induction manifold.

Disconnect gear range lever from gear range cross shaft and remove the cross shaft (R.H. cars) below the flywheel housing.

Disconnect the speedometer cable from the gearbox.

Disconnect and remove the servo, as a precaution against possible damage.

Remove four bolts and nuts coupling the front universal joint to the gearbox output flange.

Remove four .375" bolts and nuts (2 each side) from engine front supports, leaving the mounts attached to the frame.

Remove the single setscrew holding the gearbox rear mount to the transverse member.

Make a careful check to ascertain the wires, hoses and pipes are clear for engine removal.

Sling engine between 5th and 6th exhaust port, then lift the complete unit from the frame.

To install the unit, reverse the steps taken for removal, connecting the battery last.

New joints must be used when connecting the exhaust line, and any coolant or heater hoses showing signs of deterioration should, of course, be renewed.

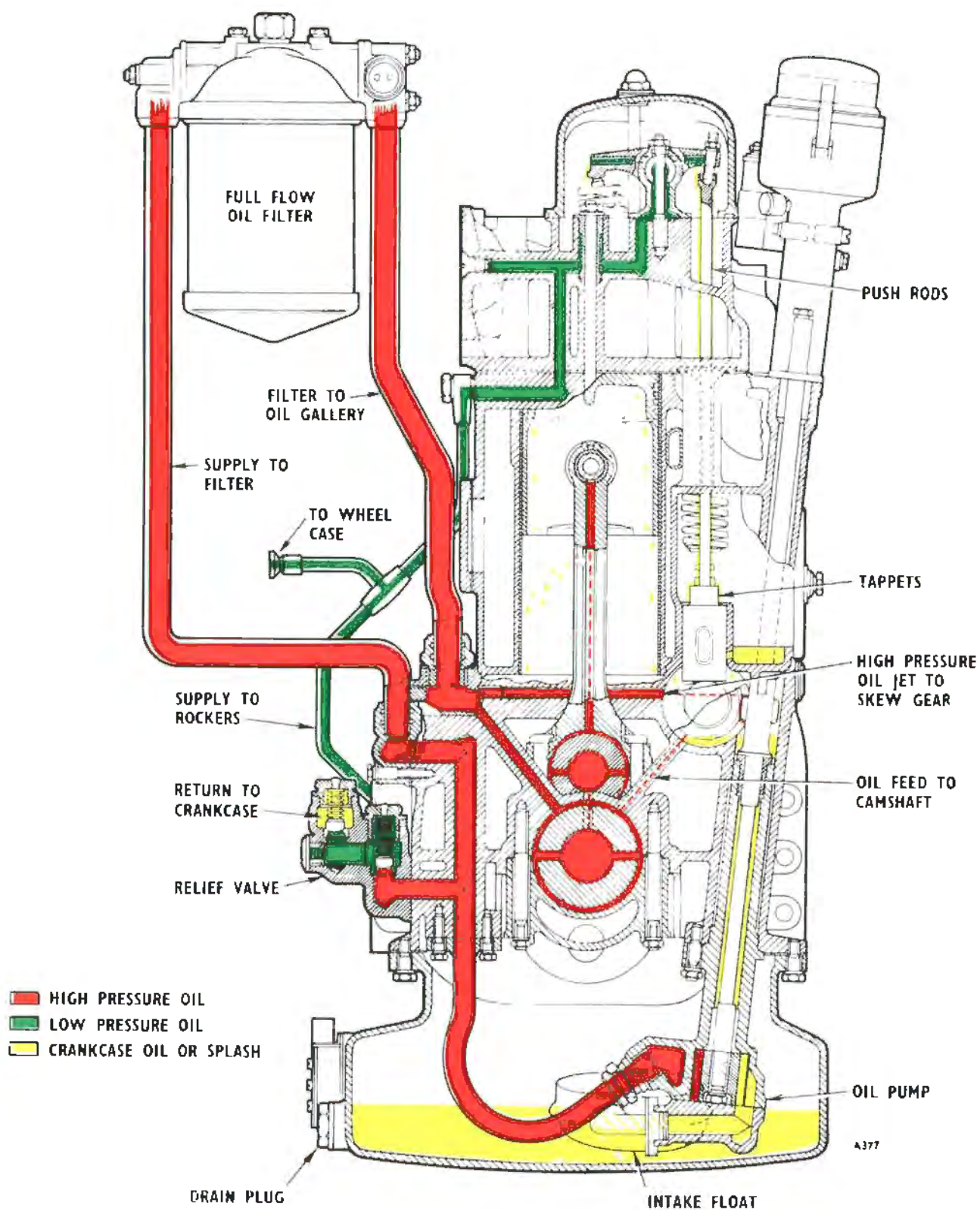


Fig. E2 Engine lubrication system

ENGINE LUBRICATION

DESCRIPTION

Pressure lubrication is employed throughout, the oil being delivered from a spur gear type pump, driven at camshaft speed, direct from the camshaft.

The oil enters the suction side of the pump through a fine mesh strainer floating just below the surface of the oil level. This ensures the collection of clean oil. The discharge side of the pump is connected by a passage in the crankcase to the full-flow oil filter. The pressure is controlled by an externally fitted dual relief valve unit. See Fig. E.5.

The relief valves are connected in series and no means of adjustment is provided. On no account must the springs be altered or the plug washers varied. A slot is provided in the H.P. valve seat to ensure a supply of oil to the low pressure system under all running conditions.

The oil discharged from the "British" full-flow oil filter enters the internal oil gallery in the right-hand side of the crankcase, at approximately 25-30 lbs./sq. in.

From the main oil gallery the oil is fed to the crankshaft main journals, via a drilling in the upper bearing shells. The connecting rod big-end bearings receive oil through drillings in the crankshaft webs and journal pins which also feed, via a drilling through the connecting rods, the gudgeon pin bushes. A small cross-drilling directs a feed to the thrust side of the cylinder walls.

The camshaft bearings are supplied at high pressure through integrally cast passages in the crankcase webs from Nos. 1, 3, 5 and 7 main bearings. The camshaft skew gear is lubricated by a high pressure jet direct from the oil gallery.

Low pressure oil, at approximately 5 lbs./sq. in. is fed to the overhead valve mechanism and after circulation drains back through the push rod tunnels in the cylinder head and through the exhaust valve chamber to the sump, lubricating the tappets, cam lobes and exhaust valve stems. A separate pipe conveys oil to a jet in the timing cover to lubricate the timing gears.

Oil pressure is registered on an electrically operated indicator on the fascia panel, the gauge being connected to and operated by a bi-metal transmitter screwed into the main oil gallery. Being a sealed unit, this cannot be repaired or adjusted and whenever suspect, it must be replaced with a new one.

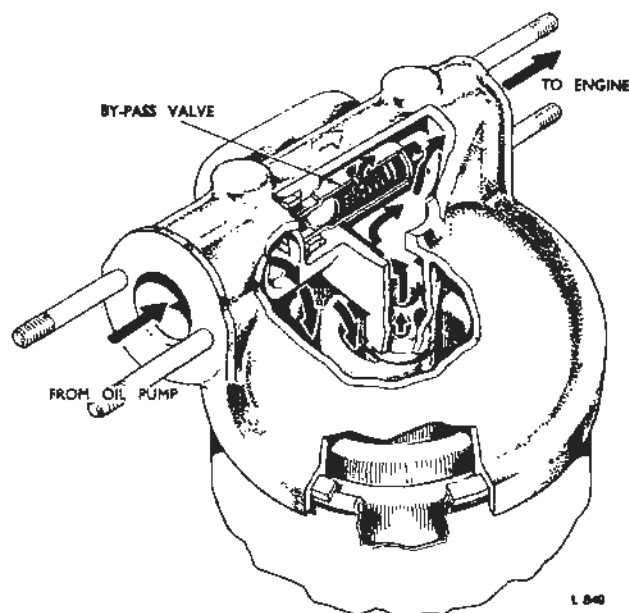


Fig. E.3.—Filter By-Pass.

The "British" full-flow type LF.2R oil filter used, has a spring-loaded ball relief valve incorporated in the head. Should the filter element become clogged and cause restriction of the oil flow through the element, the relief valve opens and allows the oil to by-pass the filter when the back pressure caused by the restriction reaches approximately 6 lbs./sq. in. (See Fig. E.3.)

THE OIL PUMP

Special Tools Required:—

RH.132—Reamer, Oil Pump Drive Shaft Bushes.

The oil pump is attached to the lower face of the crankcase by a single nut and stud and is enclosed within the sump.

To remove the pump it is necessary to remove the distributor assembly. First remove distributor cap and rotate the crankshaft until No. 1 piston is at T.D.C. and the rotor arm points towards No. 1 segment in the distributor head. Remove the two .250" nuts securing distributor housing to cylinder block and lift distributor assembly off the studs. Note and mark the position of the drive shaft tongue before

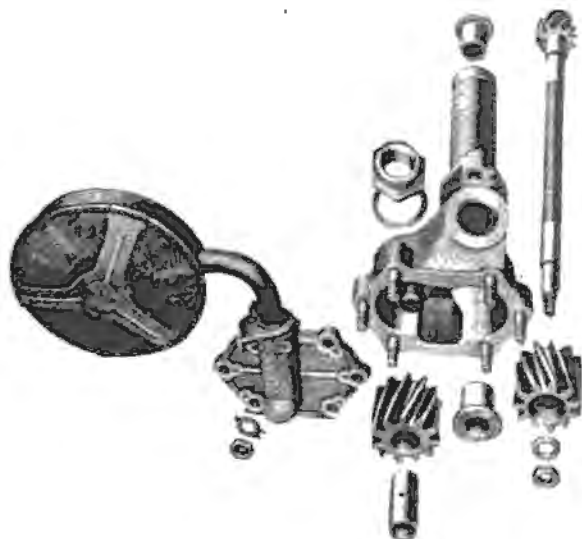


Fig. E.4.—Oil Pump.

withdrawing shaft. Remove the oil dipstick and guide tube from the sump and disconnect the oil gauge wire.

Drain off oil and remove sump. Disconnect and remove the delivery pipe between pump and crankcase. Remove pump assembly with suction line and gauze float attached.

Remove the end cover and phosphor bronze bushed driven gear. (See Fig. E.4.)

After removal of the retaining nut, a light tap on the end of the driving shaft with a soft drift will dislodge the gear, and the keyed shaft may then be pushed out of the casing without disturbing the key. Three centre-punch indentations lock the nut to the shaft.

All parts must be cleaned and carefully checked for wear. Refer to the table for new and worn tolerances.

The driven gear bush is drilled with four oil holes. It is a floating fit in the gear bore, and no fitting is necessary. The shaft is retained in the casing by means of a taper pin.

The end cover should be tested on a face plate for distortion and any irregularity rectified. A taper pin locks the suction line and float to the end cover.

Drive shaft bushes fitted to the pump casing should be replaced only where absolutely necessary. Oil grooves are machined in these bushes.

When renewing, care must be taken to ensure the bush is pressed against the shoulder of the casing bore and not allowed to cant during installation, and so distort or damage the casing. The bushes should be reamed in line, using tool RH.132.

End float of gears is .001" to .004", with a permissible

worn maximum of .007". If float exceeds this figure, remove the six studs from the casing and face off as necessary.

A new nut must always be used on the shaft and centre popped when tightened. Fit of suction line in pump end cover is not important because the suction line is submerged in oil.

The float gauze should be carefully examined for punctures and must be replaced if any irregularity is apparent. Cleanliness is of the utmost importance in servicing the lubrication system.

The pump should be replaced and the driving gear engaged in such a position that the distributor drive shaft tongue is aligned with the marking made prior to removal.

OIL PUMP PRESSURE AND FLOW SPECIFICATION

Pump R.P.M.	500	1000	1500
Oil pressure restricted (lbs. per sq. in.)	8	18	28
Min. acceptance flow (pints per minute)	11.2	26.4	42.6
Oil temperature (inlet)	{ 90°C. 194°F.	{ 90°C. 194°F.	{ 90°C. 194°F.

THE OIL SUMP

The cast aluminium sump carries the dipstick tube and the electric oil level gauge unit. A baffle surrounds the unit to eliminate gauge fluctuation by preventing oil surge around the float. Whenever the sump is drained a new aluminium washer should be used when the drain plug is replaced.

REPLACING THE OIL FILTER ELEMENT

It is recommended that the oil filter element be renewed at 5000-mile intervals.

To replace the filter element unscrew the central nut and remove the casing containing the element. This may be withdrawn through the rearmost portion of the triangular aperture formed by wing valance, air intake manifold and dashboard. Install the new element so that the drilled sleeve is uppermost. The lower sleeve which is not drilled, seats against a spring-loaded cork washer on the central stud.

The grooved rubber ring in the filter head must always be replaced when an element is changed. Care must be taken to ensure the element corners are not trapped between the casing and the head, and as a precaution, the corners may be turned inwards. Fill the casing with one pint of fresh oil and assemble the filter, using a new annealed copper washer between the central nut and filter head.

OIL PIPES

The oil filter pipe connections are grooved to carry a pair of sealing rings. Grooves and pipe end must be carefully cleaned and all sharp edges removed before assembly. Apply a little light grease to sealing rings and pipe ends and press together while twisting. A sharp tap from a hide mallet may be necessary to ensure the end of the pipe seating against the shoulder in the connection. The faces of the connection can be aligned by twisting. Use new "Klingerite" gaskets between all face joints when refitting pipes.

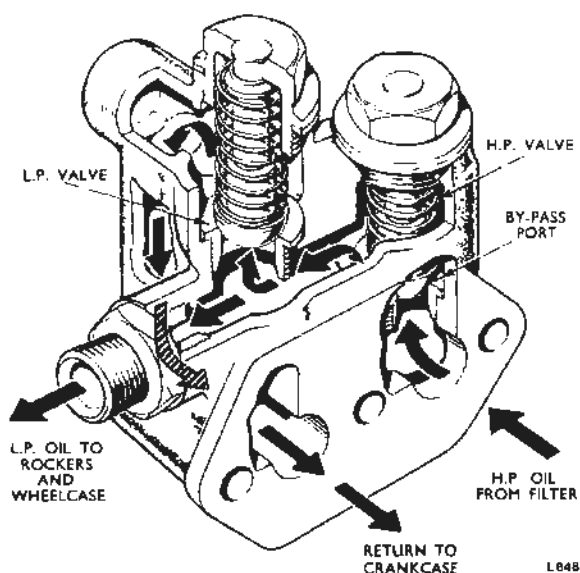


Fig. E.5.—Dual Relief Valve Unit.

THE RELIEF VALVES

Cleaning and inspection of the relief valves may be performed without removing the assembly from the crankcase.

Remove both the plugs, which are assembled with a guide pin and appropriate poundage spring. These plugs must only be replaced as an assembly and are not interchangeable.

Withdraw low pressure and high pressure valves, clean and carefully examine both seats and valves for signs of pitting. If it is necessary to lap the valves, the relief valve casing should be removed from the crankcase by disconnecting the L.P. feed line and removing three .250" setscrews securing the casing to the crankcase. The H.P. and L.P. plungers are dimensionally interchangeable and care must be taken to ensure the plungers are installed in their respective seats after lapping. Only an extremely fine preparation may be used for lapping such as Turkeystone powder and thin oil.

Thoroughly clean all parts with paraffin and compressed air before re-assembly.

H.P. Valve Spring: —

Free length 1.8125"; load when compressed to 1"—4½ lbs.

L.P. Valve Spring: —

Free length 1.750"; load when compressed to .900"—4 ozs.

The phosphor bronze valve seats are threaded and are made with a special spannering head which is machined off when the seats are screwed into the valve casing. No provision is made for removal, but a suitable tool that can be driven in to provide a strong "bite" will remove the seat. Care must be taken to fit the slotted H.P. seat in the H.P. side of the casing to ensure a constant flow of oil to the L.P. circuit under all running conditions.

ENGINE OIL PRESSURE

The engine oil pressure may be checked by removing the transmitter of the oil pressure indicator from the crankcase main oil gallery, and substituting a pressure gauge adaptor.

The following figures are quoted for guidance.—

Engine R.P.M.	Oil Pressure, lbs./sq. inch	
	Average Value	Minimum Acceptable
500	8	5
1,000	18	
1,500	26½	
3,000	31	25

CYLINDER BLOCK AND LINERS

Special Tools Required:—

- RH.441—Exhaust Valve Spring Compressor.
- RH.643—Puller, Valve Guide.
- RH.613—Extractor and Puller—Camshaft Bushes.
- RH.562—Camshaft Bush Reamer.

DESCRIPTION

The cylinder block is a monobloc casting of close-grained cast iron. Front suspension of the engine is by rubber mountings bolted to both sides of the crankcase upper half.

The usual means of cooling passage cleaning are provided by core plugs and removable plates on the block. An internal water distribution gallery directs coolant to ensure cooling of exhaust valve seats.

Full-length high chrome steel cylinder liners are pressed into the cylinder bores, and have an interference fit of .0025" to .0035" which must be maintained. Two liners of different external diameters are available for service replacement, permitting slight dimensional variations in cylinder block bores to be compensated by selection of the appropriate liner. These are colour coded for identification. (See Data table.)

The liners are pressed into the cylinder block under a pressure of approximately 1 ton, until they are .015" proud at the top of the block and are then ground flush before being bored and honed to size. The bottom of the liner is undercut for a distance of .200" to provide a lead-in when pressing into the cylinder block.

Pistons and bores are graded to maintain a .0012" to .0015" clearance at the top of piston skirt. Standard and oversize pistons are available in four grades. (See Sub-Section E.7.)

The standard bore is 3.750" to 3.7515". Cylinder wear of .004" will necessitate the fitting of oversize pistons and the cylinders must be bored and honed. A .003" undersize should be kept when boring for final finishing by honing. The final surface should show a fine "diamond" pattern.

Cylinders may be bored and pistons fitted with the engine in position, but this procedure is not recommended. Adequate precautions must be taken against swarf or grindings entering the oil passages of the crankshaft, and the crankpins must be wrapped with adhesive tape during the operation.

Where bore dimensions will not permit further reboring to suit oversize pistons, bore out the liner until about .015" remains. This will curl up and fall out when split with a sharp chisel. Press in a Yellow or Blue coded liner as required to maintain the correct interference fit. (See Data Chart.) After boring and

honing, chamfer the top edge at 45° for a depth of .010".

EXHAUST VALVE SEATS

The exhaust valve seats are pressed in with an interference fit of .005"—.007" and may be removed in a similar manner to the cylinder liners, the seat being bored until it can be split with a sharp chisel. The seat pocket must be thoroughly cleaned before pressing in the new seat.

Valve seat dimensions are 1.8185" (— .001") outside diameter with a depth of .250".

Where valve seat inserts and guides are being replaced simultaneously, the guide must be installed and reamed before machining the valve seat angle, to ensure concentricity of seat angle to valve guide.

The seat angle is 45° and should be carefully machined free from scratches for a width of .062". When necessary to avoid pocketing, this should be "crowned" with a 30° cutter.

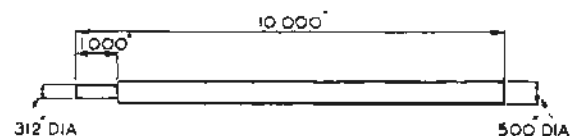


Fig. E.6.—Drift for Removing Valve Guide.

THE EXHAUST VALVE GUIDES

Exhaust valve guides are of phosphor bronze, .6257" outside diameter. Replacement guides are .002" oversize on the outside diameter to retain the correct interference fit. When replacing a guide, press upwards into position, using Special Tool, R.H.643. The shoulder of the guide must seat against the recess in the boss. A slight undercut on the outside of the guide above the shoulder ensures the guide fitting squarely against the boss recess. When in position ream the guide bore .3755".

The guides are removed by driving downwards with a suitable punch, after tappets, valve springs and washers have been removed.

THE VALVE TAPPETS

Inlet and Exhaust valve tappets are of cast iron and are chill cast on the camshaft end to resist wear.

Exhaust valve tappets are fitted with adjusting screws and locknuts, while inlet tappets are finished with a seating for the inlet valve push rod.

The inlet and exhaust valve tappets are graded in steps of .00025" to give a selective fitting. They are colour coded and should be ordered by colour only. The external size and colouring of both exhaust and inlet tappets is as follows:—

Diameter in ins.	Colour
1.8675 to 1.870	Blue
1.870 to 1.8725	Green
1.8725 to 1.875	Yellow
1.875 to 1.8775	Black
1.8775 to 1.880	Black and Yellow
1.880 to 1.8825	Green and Yellow

A master set of six should be used for gauging purposes.

Carefully wipe clean the tappet bore. Select a tappet from the gauge set that will just slide down the bore without lubricant with the finger pressing *lightly* on the top.

Select a new tappet from stock that is *one size less* than the gauge tappet. Thus if a "yellow" gauge tappet is found to give the required feel a "green" tappet should be selected for fitting to the bore. Repeat for all the tappet bores.

Wash and wipe clean the new tappets without removing the "Parkerising" from the bottom face. This surface, as well as being rustproof, is of value during running in. Etch the appropriate number from 1 to 6 on the top of each tappet to correspond with its bore, inlet or exhaust, commencing from the front of the engine.

Fit the tappets to the bores smearing the sides and bottom face with Mobilgrease 234. This grease has a high film strength and will assist in obtaining a good bedding surface during running in. It may be obtained in small quantities from the manufacturers.

Tappets should be changed if pitted on the bottom face. Serviceable tappets should be replaced in their original bores.

REPLACING CAMSHAFT BUSHES

Remove engine and gearbox in one unit as described in Sub-Section E.1.

Place engine on a suitable stand, drain oil and remove the sump.

Remove rocker cover and rocker arm assembly, and cylinder head, as detailed in Sub-Section E.8. Remove inlet push rods, exhaust valve cover plates, valves, springs and washers.

Remove all tappets and place valves and tappets in a suitable stand in numerical order. Remove crankshaft pulley.

Disconnect L.P. oil line to wheel case and remove wheel case.

Remove slipper drive assembly, as described in Sub-Section E.5.

Remove distributor, drive shaft and oil pump as described in Sub-Section E.2.

Remove camshaft gear and thrust plate, and withdraw the camshaft.

Remove flywheel. There is no need to mark the flywheel to crankshaft position as one hole is offset 2° and thus the flywheel can only be installed in one position.

Remove the flywheel front housing from the crankcase, and camshaft rear bearing cover.

Using Special Tool RH.613, withdraw the camshaft bushes, and draw in the replacements, using the same tool. Position the front bush .010" below the front edge of the boss to eliminate any possibility of a foul between the bush and the thrust plate. Oil drillings in shells must be correctly aligned with crankcase oil passages.

Ream the bushes using Tool No. RH.562. Afterwards the engine must be cleaned carefully and all swarf removed. Before replacing the camshaft, the bushes should be oiled and the oil holes carefully checked to see they are unobstructed. Care must be taken to make certain the rear bush cover is oil tight before replacing flywheel housing and flywheel, as it is not accessible after these units are replaced. A test should be made with a lubrication pressure tester if available. If a coating of "Wellseal" is used on both sides of the new Vellumoid joint, no leak should occur.

The exhaust valves require grinding in before replacing and new gaskets must be used on all joints when re-assembling, which is a reversal of dismantling procedure.

The valve timing must be set correctly before the ignition timing can be attempted. This is described in the following paragraph under Valve Timing.

The sump is not replaced before ignition timing is set, see Sub-Section E.2. under the Oil Pump.

VALVE TIMING

The flywheel is marked 20° before and after T.D.C. in 5° graduations, which are clearly visible through an

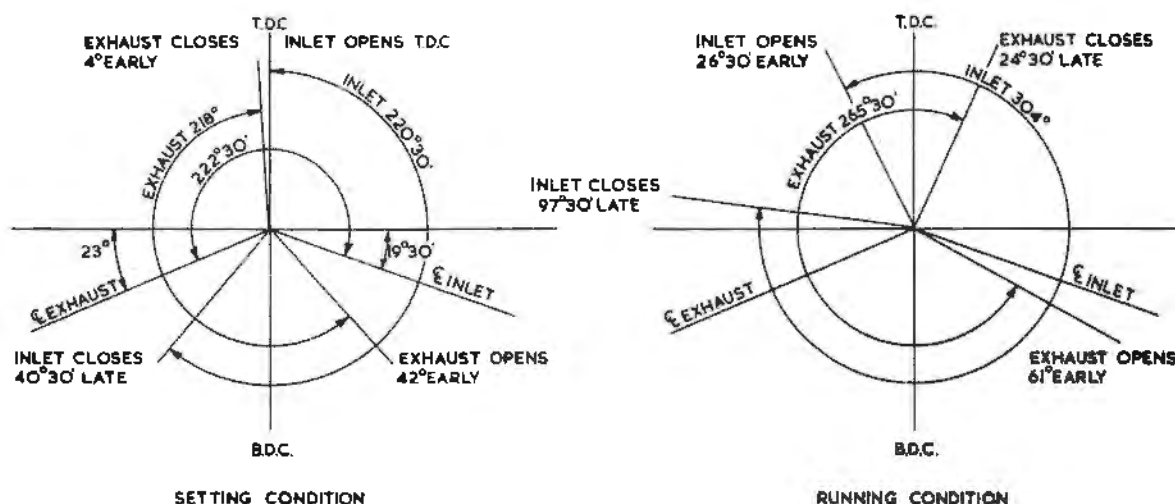


Fig. E.7.—Valve Timing.

inspection port in the flywheel lower cover. Valve timing procedure is as follows:—

Provisionally assemble the camshaft gear using two setscrews, then rotate the crankshaft in the direction of rotation (clockwise when viewed from the front of the engine), until No. 1 inlet valve is opened to the maximum. Rotate crankshaft one complete turn. Set the rocker clearance of No. 1 inlet valve to .035".

Rotate the shaft again in the same direction until the valve just commences to open, as ascertained by inserting between the valve stem and rocker arm a .005" feeler which should be just movable at this point.

Remove the camshaft gear without moving the cam-

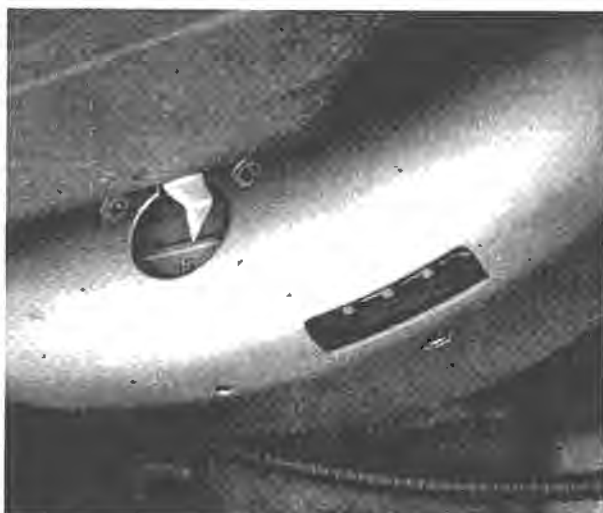


Fig. E.8.—Flywheel Timing Mark.

shaft, and set the crankshaft so that the flywheel T.D.C. mark registers with the timing pointer.

Replace the camshaft gear to engage with the teeth on the crankshaft pinion. Check that the correct alignment of setscrew holes in camshaft gear and hub are obtained. Secure with two setscrews.

Recheck timing and verify that timing pointer registers with T.D.C. mark.

If found to be incorrect, the timing must be altered by remeshing the camshaft gear, making use of the vernier adjustment. The cam wheel has 54 teeth. Rotating this wheel to the next fixing hole (45°) turns

the gear $(54 + 1) \left(\frac{45}{360} \right) = 6\frac{1}{2}$ teeth, i.e., $\frac{1}{2}$ of a tooth

variation on the original setting. Refreshing adjacent teeth will alter the timing by 3° 20' at the flywheel. If difficulty is experienced in obtaining the exact timing, it is preferable to be on the late side.

When the correct timing is obtained, replace the remaining setscrews and lock. Finally set the valve clearances to the running conditions.

Inlet rocker clearance—.006".

Exhaust tappet clearance—.012".

THE TIMING GEARS

These gears are rig paired in manufacture to give .002"—.004" backlash and must, therefore, be replaced as a pair.

Camshaft end float is .002"—.006" and is controlled by a brass thrust plate bolted to the crankcase by three .250" setscrews locked by tab washers.

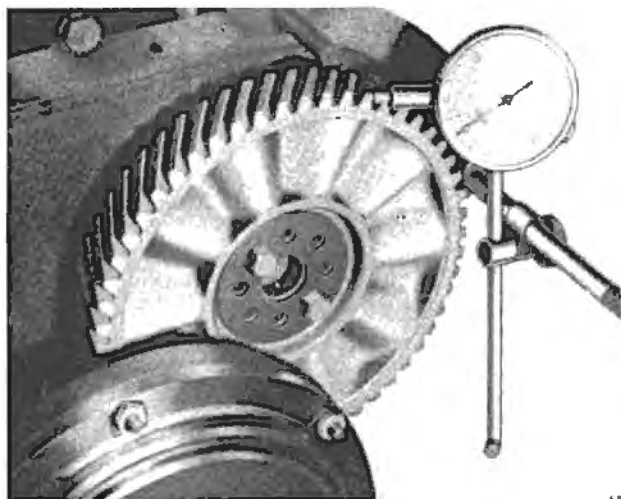


Fig. E.9.—Checking Camshaft Backlash.

Gears are lubricated from a jet screwed into the wheel case and fed from an exterior pipe at approximately 4 lbs. per sq. in.

A hardened steel thrust pad in the wheel case, and a bronze spring loaded plunger, maintain approximately a 15 lbs. end load on the camshaft to absorb end float and flutter.

The crankshaft gear, which forms part of the slipper drive assembly, is bushed with a Babbitt lined shell and

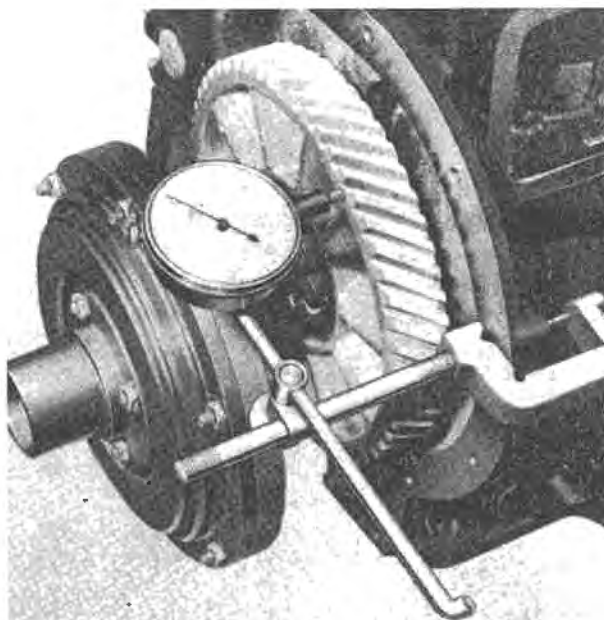


Fig. E.10.—Checking Camshaft End-Float.

is a .002" running fit on the journal. Lubrication is from a drilling in the journal.

When replacing the timing gears reference should be made to the instructions given for slipper drive servicing in Sub-Section E.5.

CRANKSHAFT AND MAIN BEARINGS

Special Tool Required:—

RH.410—Bearing Cap Extractor.

DESCRIPTION

The crankshaft is of nitride hardened chrome molybdenum steel with integrally forged balanced weights. The journals are bored and fitted with steel caps. The shaft is both statically and dynamically balanced, and is supported in seven steel backed copper-lead-indium split type shell bearings.

End thrust is taken by two thrust washers, arranged either side of the centre main bearing. The lower halves of these washers are keyed to the bearing cap to prevent rotation.

NOTE.—Front end washers are etched "X" on original assembly.

To prevent oil leakage past the rear main bearing cap, the shaft has a single start R.H. Acme thread, which returns any surplus oil from the rear main bearing into a recess in the main bearing cap, from where it drains back into the sump.

REMOVING THE CRANKSHAFT

Remove engine and gearbox assembly as detailed in Sub-Section E.1.

Place engine unit on a suitable stand, remove sump, wheel case and flywheel lower cover.

Remove the spring drive unit, as described in Sub-Section E.5, and the flywheel, only if the shaft is to be re-ground, otherwise they are left in position.

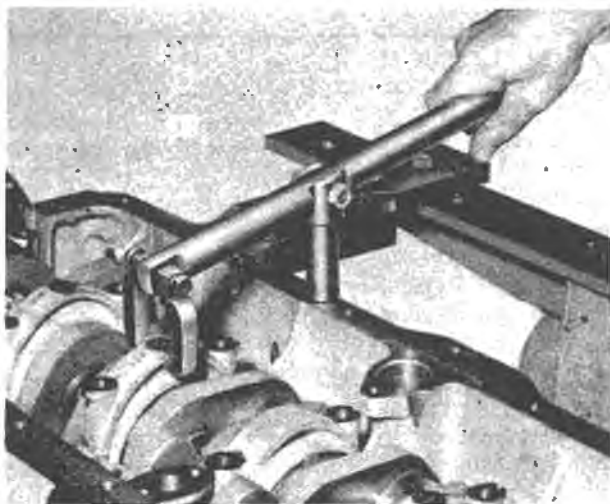


Fig. E.11.—Removing Main Bearing Caps.

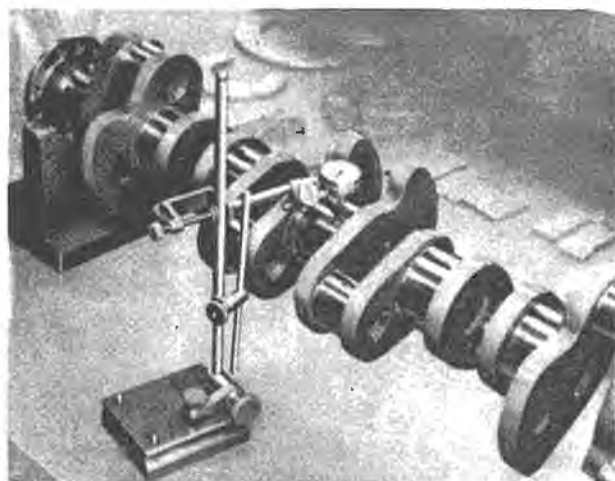


Fig. E.12.—Checking Crankshaft Bow.

Remove oil pump delivery pipe, oil pump assembly and the connecting rod caps.

Remove main bearing caps using extractor RH.410. The shaft may now be lifted out.

INSPECTING THE CRANKSHAFT

Before inspecting the crankshaft for wear or bowing, check whether the journals or crankpins have previously been re-ground. It is possible that a second re-grind would reduce the hardness value below the minimum of 570 VPN on the Vickers Diamond Pyramid Machine with a 10Kg load. Shafts below 570 VPN should be nitride hardened. If facilities are not available to carry out this treatment, a replacement should be fitted.

1. Mount the crankshaft on a suitable stand and check with a micrometer for wear on the journals and crankpins. Any wear of the journals must be taken into account when checking for bow. For dimensions see data chart.
2. Mount the shaft with journals Nos. 1 and 7 in a pair of vee-blocks placed on a marking out table, and ensure that the crankshaft axis is parallel with the table and the shaft free to rotate. Before mounting the crankshaft, it would be advisable to use a test bar on the vee-blocks to ensure that the crankshaft will be parallel with the table. If a test bar is not available, the journals Nos. 1 and 7 should be checked for diameter, and after the crankshaft is mounted on

the vee-blocks, a second check should be made with a dial height gauge over the journals. If the axis is not parallel, packing pieces should be inserted under the vee-blocks.

3. Turn the shaft in the blocks, and test for bowing on the centre journal by means of the dial indicator gauge.

The maximum permissible bow before re-grinding is .010". Over this figure, a replacement shaft should be fitted.

The errors due to ovality of the journals must be taken into account in arriving at the figure for bowing which will be half the maximum dial reading of the indicator.

Next, turn the shaft so that the webs of each crankpin are first at 45°, and then at 135° to the table and check the crankpins in each position for parallelism. (See Fig. E.13.)

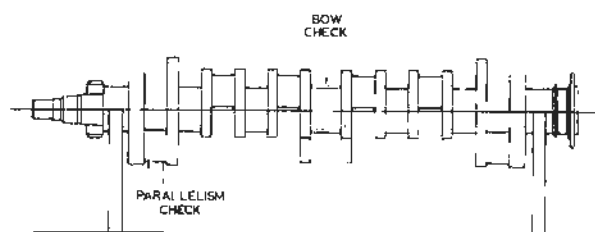


Fig. E.13.—Crankshaft Bow and Parallelism.

REGRINDING AND LAPPING

Shafts should not be ground unless it is necessary to remove more than .005" to restore a true diameter. Up to this amount, the journal or pin should be rectified by lapping only.

The combined operations should result in the diameter of the journals or crankpins being reduced from standard in multiples of .010" to a maximum of .060" undersize.

The shaft should be set up on the grinding machine, using an adaptor for the flanged end, and centring plug for the other end when grinding the journals.

The grinding wheel must not be allowed to touch the journals before the crankshaft is thoroughly wetted with the grinding lubricant, and this should be fed in liberally on the ingoing side of the wheel. In order to avoid cracking, it is desirable that arrangements should be made to heat the lubricant and maintain it at a temperature of 65 degrees to 69 degrees C. *On no account must the grinding wheel touch the side radii of the crank-web. Stops must be arranged on the machine to limit the travel of the grinding wheel to approximately 0.010" from each face.* (See Fig. E.14.) The radius of the wheel should be carefully controlled to

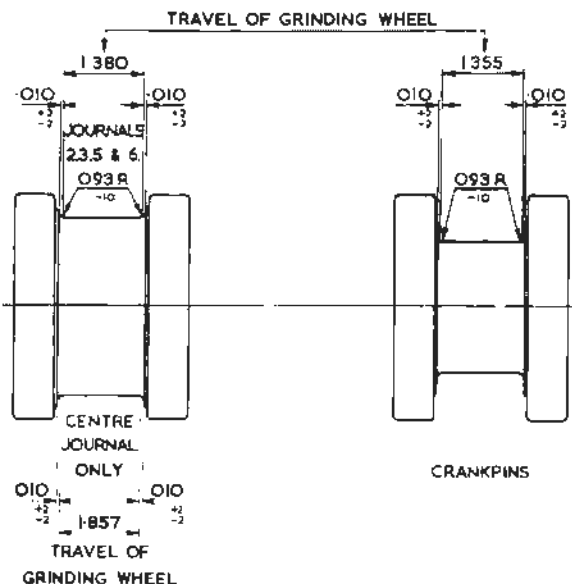


Fig. E.14.—Crank Pin and Journal Grinding Dimensions.

ensure that the grinding fades out not more than half-way round the radius.

Grind to .001" above finished size.

Having re-ground the pins and journals, a final operation should be effected whereby the front face of the driving flange is ground true. This should only necessitate a light skimming with the grinding wheel.

Upon completion of the grinding operation, the crankshaft should be tested magnetically for cracks.

After grinding lap the crankshaft to remove the remaining 0.001" of metal and obtain a perfectly smooth finish to the work. If the shaft is to be nitride hardened, this 0.001" of metal must be left on. Afterwards the consequent scale and this 0.001" of metal should be removed by lapping. Mount the shaft on a suitable machine using cast iron laps. Run at approximately 220 to 250 r.p.m. and lap the crankpins and journals separately for convenience of operation. Plug the oil holes in the shaft with corks. Inject lapping compound at frequent intervals. Leave the pins and journals very slightly oversize and allow to cool, when it will be found that they contract. No fixed rule can be specified in regard to this procedure, which depends entirely upon the skill of the operator.

After lapping wash the crankshaft thoroughly in a high pressure paraffin wash, blow off the surplus with compressed air, and dry with soft lint-free cloth. After removal of all traces of the compound, return the shaft to the lapping machine and hand polish.

Before commencing, ensure that all corks are in position. Polish by using Corolite abrasive strip 1"

wide. Continue the polishing until all traces of lapping in the surface have been removed. After polishing, wash the shaft again in a high pressure paraffin wash and remove all traces of polishing compound.

CRANKSHAFT OIL CAPS

Reconditioned crankshafts supplied from the Service Dept. are not supplied with oil caps. Remove and fit oil caps from original shaft, with new aluminium washers.

Clean off any slight signs of corrosion. Badly pitted caps should be renewed. Seating should be checked with Prussian Blue to ensure oil tightness.

MAIN BEARINGS

Bearings removed from an engine during overhaul, must be refitted in the original positions occupied. This applies particularly to the top halves, as these are drilled to register with the oilways in the crankcase casting.

In no case should upper and lower half bearings be interchanged, and care must be taken to see that the locating lips correctly register in their recess.

TO RENEW A BEARING WITHOUT REMOVING CRANKSHAFT

It is possible to replace both upper and lower bearing shells without removal of crankshaft, but it is not possible to check the crankshaft journals for wear.

1. Drain and remove the engine sump. To afford better access to the centre main bearing, the oil pump delivery pipe should be removed. It is not necessary to remove the oil pump assembly, although it is easier if this is done. It must be remembered that if the oil pump is removed the ignition will need retiming.
2. Remove sparking plugs and lower flywheel cover, to allow engine to be turned by hand.
3. Remove the cap of the bearing to be renewed. If the rear bearing cap is to be removed, the special tool RH.410 will be required. This tool can be used to remove other caps if necessary. If more than one bearing is to be removed, remove only one cap at a time.
4. Slide the top half of the bearing out around the crankshaft in the direction of crankshaft rotation, using a thin strip of flexible steel. It will assist if the engine is also simultaneously turned by hand, in the running direction. Alternatively a setscrew with the head reduced to .078" depth, may be located in the journal oil hole, when rotation of the shaft will eject the bearing shell.
5. Note the size stamped on the back of the removed bearing and replace accordingly. The shell may

be tapped into position for the last half inch by a thin piece of hardwood until the locating lip on the shell is fully registered in the locating slot. No attempt must be made to press the lip into the slot by drawing up the bearing cap.

6. Clean and oil the lower shell, place the shell in the cap, and tap the cap into position with a hide mallet. Ensure that the shell has not been dislodged before tapping the cap home. Tighten and lock the bearing cap using new lock washers. The shaft should turn easily by hand when all bearings have been installed and tightened.

The thrust washers may be removed in a similar manner to the above.

MAIN BEARING INSPECTION AND REPLACEMENT

1. The main bearings and thrust washers should be removed from the crankcase with their respective caps, and thoroughly washed in paraffin.
2. Visually inspect. Reject bearings obviously damaged, or those showing any wearing through of the lead indium plating.

A range of pre-finished undersize bearings are available in steps of .010" for use with reground crankshafts.

No reaming is necessary. If the crankshaft has been reground, for example, .010" undersize from standard, a set of .010" undersize bearings will give the correct running clearance.

To check the bearing fit, all bearings must be fitted and bolted down, when the crankshaft should be free enough to turn by hand.

No filing or shimming or scraping of bearing caps is permissible.

REPLACING THE CRANKSHAFT

After the crankshaft has been overhauled and correct bearing shells have been selected, the crankshaft is replaced in the following manner. Particular attention should be paid to cleanliness during this operation and only lint-free wiping material used.

Insert the upper bearing shells in the crankcase, pressing fully into position by hand.

Install thrust washers in recesses of centre bearing webs, taking care to place the bearing faces towards the thrust faces of the crankshaft.

Oil all bearings and thrust washers with clean engine oil.

Carefully lift crankshaft into place, install bearing shells in caps, and thrust washers in the centre bearing cap.

Tap bearing caps into place in their respective numbered order with the numbers towards the cam-



Fig. E.15.—Replacing Thrust Washers.

shaft, using a hide mallet and making certain the shell does not dislodge.

Fit new tab washers under the setscrews and tighten down but do not lock, in the following order—No. 1, 7, 3, 5, 2, 6. Check for correct end float. Do not lock the setscrews until the pressure test has been carried out.

Assemble connecting rods to crankpins, tighten but do not split pin nuts until the oil pressure test has been carried out.

Drive the white pine oil seals into the hole each side of the rear main bearing cap and the crankcase. The seals should be dipped in oil to facilitate entry. When fully home, cut excess length from the seal flush with the cap, using a sharp knife.

The crankshaft must turn freely by hand, with all caps tightened.

CHECKING CRANKSHAFT END FLOAT

To determine the end float, insert a pinch bar between an intermediate bearing web and crankshaft web, and move the shaft to the full extent in either direction, then measure clearance between the crankshaft thrust face and thrust washer at the centre main bearing, move the shaft in the opposite direction, and take a reading at the same point of the opposite side. These measurements should be equal, but it must be remembered that the lesser measurement will, of course, be the governing factor of the end float.

Recommended end float clearance is .002" to .006" and must not exceed .008".

Move the crankshaft back and forth several times before finally verifying the end float, then fit new tab lock washers, and lock the bearing cap setscrews.

Fig. E.16 shows a dial gauge mounted in position for

checking crankshaft end float when the wheel case, or the engine unit is removed. Where it is desired to measure and correct end float with the engine and wheel case in position, a dial gauge can be set up on the lower face of the flywheel housing and a measurement taken off the front face of the flywheel itself.

CRANKSHAFT OIL FLOW CHECK

When the crankshaft has been installed in an overhauled engine, and before proceeding with further rebuilding, a check should be made to ensure that there is a satisfactory oil flow to the main bearings; connecting rods and camshaft bearings.

Remove the camshaft skew gear oil jet and blank off the drilling with a .3125" diameter plug threaded 24 T.P.I. RH UNF/2A. Connect a suitable oil pump (to give approximately 30 lbs./sq. inch pressure) to the main oil gallery and blank off remaining external outlets.

Operate pump while slowly turning the crankshaft and check oil flow to main bearings, connecting rods and camshaft. Check for oil leaks from the crankshaft journal oil caps.

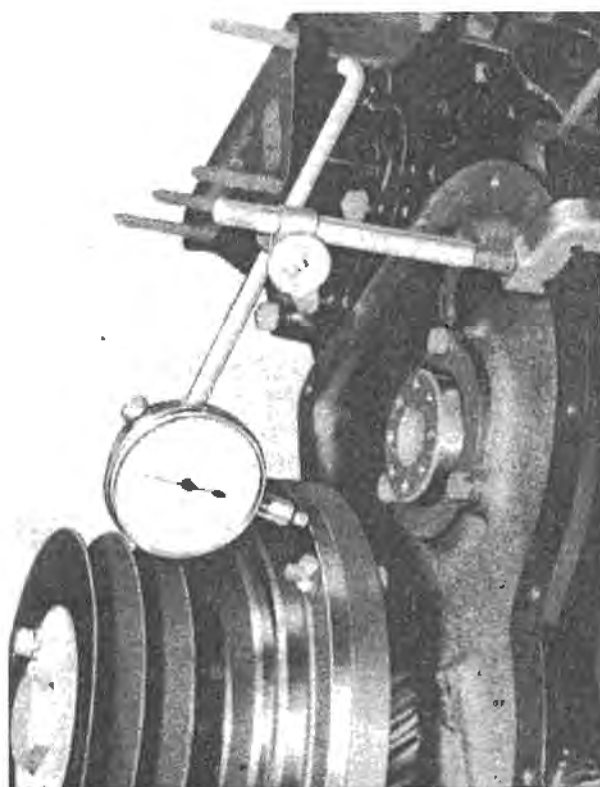


Fig. E.16.—Checking Crankshaft End-Float.

CRANKSHAFT DAMPER AND SPRING DRIVE

Special Tools Required:—

RH.552—Serrated Spanner—Crankshaft.

RH.560—Extractor—Spring Drive.

RH.546—Mandrel—Spring Drive.

RH.564—Poundage Checking Lever.

A suitable spring scale graduated 0-25 lbs.

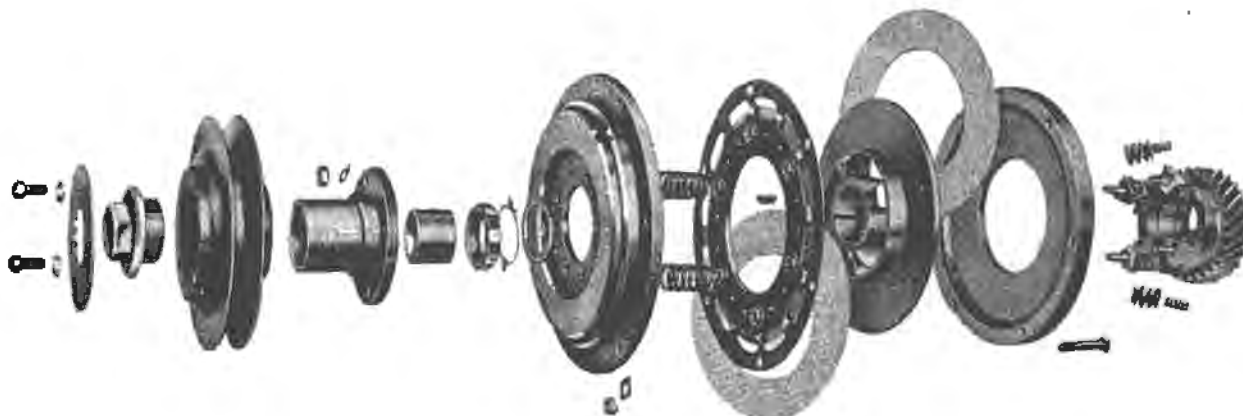


Fig. E.17.—Crankshaft Damper Spring Drive.

DESCRIPTION

A friction plate, keyed to the crankshaft, transmits frictional drive via cotton duck washers, to the damper inertia wheels between which it is bolted. (See Fig. E.17.) Between the front washer and wheel is a presser plate, the thrust being provided by coil springs which seat in the front wheel.

At the rear of the unit is the crankshaft timing wheel. Four dogs on this pinion enter apertures in the friction plate hub, which transmits a cushioned drive to the pinion by coil springs. Studs in the pinion dogs pass through the assembly and secure the front damper wheel and fan pulley hub.

The relative movement between crankshaft and the damper and timing pinion assembly is thereby controlled by the spring drive and by the inertia and friction loadings which also absorb crankshaft oscillation.

The rear damper wheel is precisely balanced by means of .250" diameter Allen screws. These screws should not be disturbed when the damper is removed and dismantled for overhaul.

The unit is free from derangement due to mechanical failure and should not normally require attention between periodic engine overhauls, except in cases

where the car has been idle for prolonged periods, such as storage.

In such cases the damping qualities of the unit may become seriously impaired by the adhesion of the cotton duck washers to the friction faces of the damper wheel and friction drum. This condition will cause engine vibration, which is particularly noticeable at approximately 2,500 r.p.m., half the torsional period of the crankshaft and equivalent to between 50-55 m.p.h.

To remove the unit proceed as follows:—

Remove radiator and shell assembly.

Remove wheel case as described in Sub-Section E.6 unlock and remove four .250" nuts securing damper hub to pinion studs, which protrude through the front wheel of the damper.

Before extracting the assembly, the valve timing should be set, in order to facilitate assembly.

Remove inlet valve rocker cover and turn engine over until No. 1 cylinder is on firing position, i.e., both valves closed and piston at T.D.C.

Unlock and remove the crankshaft serrated nut, using special tool RH.552.

Attach the extractor to the four pinion studs using the original nuts and extract the unit.

DISMANTLING THE DAMPER

Clamp special mandrel, tool RH.546 in a vice.

Place damper unit over tapered end of mandrel and turn unit until key in mandrel enters any one key way in the friction plate.

Unlock and remove the six .250" bolts and nuts holding the damper wheels together, while supporting the rear wheel by hand to prevent possible damage to pinion teeth.

Remove front wheel and the six springs between the wheel and the presser plate.

Remove the cotton duck washers.

Remove the friction plate and pinion assembly from the mandrel.

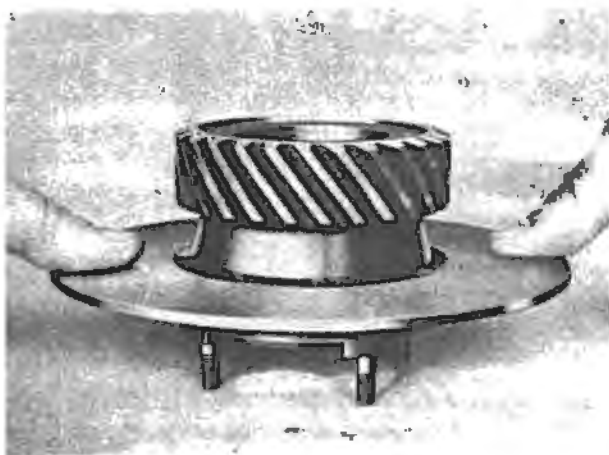


Fig. E.18.—Removing Drive Springs.

Place the pinion studs on a flat bench and press downwards on the friction plate; the driving springs will then dislodge allowing the pinion to be removed from the plate. The cotton duck washers must always be renewed when the unit is overhauled, as they tend to harden and become glazed in service, thereby losing their original frictional characteristics.

It is important that the mandrel be kept clean and free from burrs and thus prevent possible damage to the babbit bush pressed into the pinion assembly.

THE DAMPER WHEELS AND SPRINGS

Thoroughly wash all dismantled parts and inspect the friction surfaces for score marks.

Light score marks may be polished out by mounting the wheel in a lathe and polishing with fine emery cloth and oil.

If the above operation does not remove the scores, the

friction surfaces may be ground. Minimum permissible dimensions of the rear wheel, friction plate and presser plate are given in data chart. Where these finished limits are not obtainable, the particular part must be renewed. Packing washers may have to be used under the damper springs, to allow for the metal removed in grinding.

The inner and outer radial driving springs must be carefully examined for signs of fatigue and replaced as necessary. Lengths and loads of the springs are given below:—

Outer Springs:—Free length .800" (approximately).
Load when compressed to .640"—
32-35 lbs.
Load when compressed to .525"—
55-61 lbs.

Inner Springs:—Free length .725" (approximately).
Load when spring is compressed to
.525" is 10 lbs. \pm 6 ozs.

PREPARING THE COTTON DUCK WASHERS

The cotton duck friction washers should be soaked in a mixture of 75% Castrol Hi-Press and 25% SAE20 oil for at least 24 hours and then placed on a press under 75 lbs./sq. inch pressure for a further 24 hours. This will reduce the final smoothing or "ironing" during re-assembly to a minimum, and ensure consistent operation.

IRONING THE DUCK WASHERS TO OBTAIN SLIPPING POUNDAGE

Place the mandrel in a vice and position the rear damper wheel on the mandrel. Liberally oil, and place one duck washer against the friction surface.

Place the pinion and friction plate in position on the mandrel. Oil and position the other duck washer against the friction surface of the plate with the scarfed joint diametrically opposed to that on the first washer.

Place the presser plate assembly on the duck washer and position the six damper springs on the spigots. Fit the front damper wheel over the springs and lift the rear damper wheel and pinion up to meet the front damper wheel, after the co-relation marks have been lined up; fit two opposite bolts to the wheels, but do not tighten fully until the remaining four have been installed, when all bolts may be fully tightened.

Fit the hub to the pinion studs using two opposite nuts, attach the poundage checking lever to opposite pinion studs and test the slipping poundage before "ironing" is commenced, noting the poundage with the spring scale attached to the lever as shown in Fig. E.19. The break-away torque figure is higher than that

required to maintain a slow steady slip. Ignore the high initial value when testing.

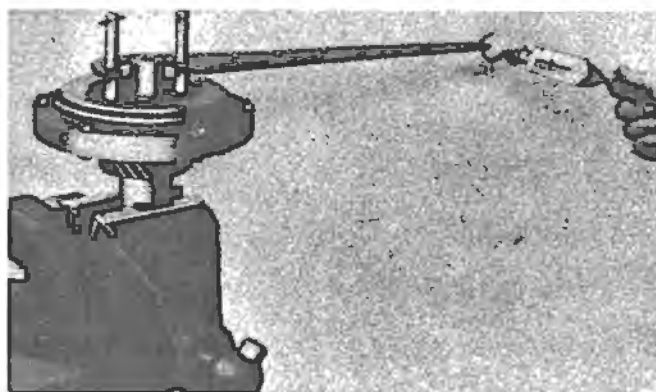


Fig. E.19.—Slip Poundage Test.

The washers are ironed by moving the lever back and forth, over the full travel between the dogs for as long as necessary to obtain the required slipping poundage of 14-15 lbs. at a 17.5" radius. The radius is measured between the centre of the mandrel and the notch in the lever to which the spring scale is attached and is a predetermined measurement incorporated in the manufacture of the lever.

A poundage test lower than 14 lbs. indicates that thin packing washers are needed between each damper spring and the front wheel. These washers are .020" thick and are the only washers recommended for the operation. They are supplied under part number K.8808/Z. A maximum number of four under each spring is permitted and where a greater number is indicated, a careful check of the damper springs and friction surfaces should be carried out to determine which part, or parts, are below the required standard.

Test the slipping poundage in each direction several times, a 14-15 lbs. reading indicating no further ironing is necessary. When a satisfactory reading has been obtained, the radial driving springs between the pinion and drum dogs may be installed.

Remove poundage checking lever and hub, supporting the rear damper wheel while removing the six bolts and nuts. Remove the front damper wheel and the six springs, being careful not to misplace the special washers (if used).

Fit two bolts to secure the presser plate to rear damper wheel. Screw poundage checking lever to two opposite pinion studs.

Insert the inner and outer radial spring assemblies between alternate dogs, using the lever to compress the springs against the dogs when in position and so facilitate fitting of the other spring assemblies.

Attach the lever to alternate pinion studs as neces-

sary to allow access to other springs. A suitable screw-driver may be used to compress and position the springs. When all springs have been replaced carefully check to make sure the springs are in their correct position on the pinion spigots and against the friction plate dogs.

Refit front damper wheel, after ascertaining that duck washers, damper springs and special washers (if used) are correctly positioned, then lightly tighten the six bolts after new lock plates have been fitted. Make sure the co-relation marks are aligned during the re-assembling of the unit.

The cotton duck washers must not be disturbed when the damper is dismantled to install the radial drive and springs and before closing up the unit. A check should be made to ascertain that the washer scarf joints are diametrically opposed.

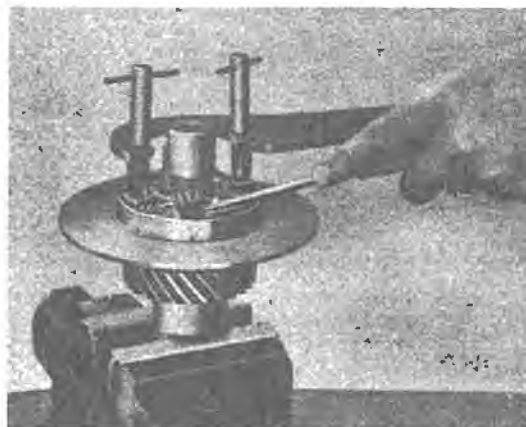


Fig. E.20.—Replacing Drive Springs.

REFITTING THE DAMPER UNIT TO THE CRANK-SHAFT

Examine tapered end of friction plate and crankshaft and make certain both are clean and free from burrs; also that the three woodruff keys are in place in the crankshaft.

Install the damper assembly without disturbing the position of the camshaft gear, otherwise the valve timing will be upset.

Fit the plain washer against the hub of the friction plate followed by the tab lock washer and retaining nut. Tighten and lock the retaining nut. Fit the hub, tightening and locking the four nuts, using new lock washers. Tighten and lock the six damper wheel bolts.

Check valve timing and replace the wheel case.

Refit, tighten and lock fan pulley, then fit and adjust fan belt.

Refit radiator shell, etc., and test for oil or coolant leakage while the engine is running.

WHEEL CASE AND FAN PULLEY

Oil is supplied to the wheel case through a jet which is fed at approximately 4 lbs./sq. inch from the L.P. oil circuit, and gives constant lubrication to the enclosed timing gears and spring drive and vibration damper assembly.

A three start left hand Acme thread on the fan pulley prevents oil leakage from the wheel case.

It is most important that this thread is not damaged. No wear takes place between the Acme thread of the pulley and the bore of the case as there is .006"—.008" radial clearance. The pulley is removed without use of any special tool.

To remove the wheel case, first remove the radiator shell and matrix. Remove fan belt, and blade assembly.

Remove fan pulley nut and pulley. Disconnect oil supply pipe to jet and remove the jet and aluminium washer. The wheelcase may then be removed.

In replacing the wheel case, it is not necessary to use the alignment tool RH.547 as the case is located by dowels. If a new wheel case is being fitted, the alignment tool may be used for alignment verification.

Be careful when removing the wheel case not to damage the end of the oil sump joint and so have to remove the sump and replace the joint. Use a new Vellumoid joint, lightly coated with "Wellseal" and a new aluminium washer between the oil nozzle and wheel case, also a light coating of "Wellseal" between the wheel case and the sump joint. Complete by reversing the dismantling procedure.

CONNECTING RODS AND PISTONS

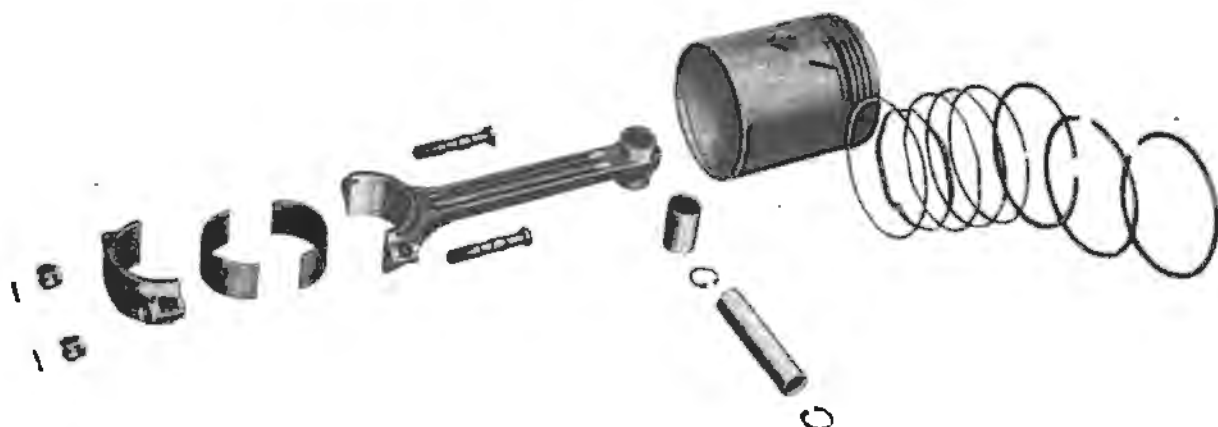


Fig. E21.—Exploded View of Piston and Connecting Rod.

DESCRIPTION

Connecting rods are "H" section forgings of molybdenum steel, accurately balanced and fully machine finished. The rods are drilled internally to provide high pressure lubrication to the small, or top end bush, and also have a .031" hole in the side of the rod to provide a feed to the cylinder wall. Detachable split steel shell lower, or big end bearings, lined with copper lead-indium alloy .00175" minimum thickness, are lubricated under a pressure of approximately 25-30 lbs./sq. inch from the drilled crankshaft.

Weight of the rod assembly including cap, bolts, nuts and gudgeon pin bush, but excluding the big end bearing, is approximately 1 lb. 12 ozs. The weight is etched on the rod in the vicinity of the bolt holes. Side float (.007" to .022") is controlled at the top end by the clearance between rod and piston bosses.

Pistons are of aluminium alloy with split skirts, which are cam ground to permit a close fit between piston and cylinder. After grinding, the pistons are tin coated to a depth of .0003" to reduce friction. Pistons are supplied in standard and four ranges of oversize (see Spares Schedule).

The top compression ring is chrome plated for a depth of .003" to .004", the outer edges of the ring have a .010" radius, and the inner edges are chamfered to prevent the rings sticking in their grooves.

Both lower compression rings are finished with their outer edges tapering at 1° towards the upper face. These rings are clearly stamped "TOP" on the upper face and must, of course, be fitted in this manner. The

inner edges of these rings are also chamfered to prevent sticking, or binding in the piston ring grooves.

The Duaflex oil scraper ring assembly is composed of an octagonal spring steel expander, which cushions a centre scraper spring ring between the cylinder wall and the oil ring groove, the spring ring being located between one lower and two upper thin spring side rails.

Refer to data chart for table of fits and clearances.

REPLACING CONNECTING ROD BEARINGS

Connecting rod bearings (big end) may be replaced with the engine in position, after the sump has been removed.

Remove spark plugs to permit the crankshaft to be turned over easily. This can be done by hand, after removing the flywheel lower cover.

Turn engine until the connecting rod cap is at bottom dead centre, and remove split pins and nuts. Lightly tap on the ends of the bolts with an aluminium drift, at the same time pulling down on the cap, which can then be removed with the lower bearing shell. Oil may sometimes cause the shell to stick to the crankpin. Push up the rod sufficiently to allow the bolts to be swung clear of the crankshaft journal; remove the shell from the rod. Wipe the journal clean, using lint-free cloth and carefully measure the journal for wear and ovality with a micrometer.

Journal diameter of the crankpin is 1.9985" (+ .0005") when new and worn dimension must not be below 1.9975".

Running clearance between the crankpin and con-

necting rod big end bearing is .0012" to .002" measured in the plane of the rod centre line. The worn clearance must not exceed .0045". Bearings on which the lead plating has worn through should be discarded. The "draw" between the bore of the rod and the outer diameter of the bearing shell (the amount the diameter of the shell is larger than the bore of the rod) is .004" to .006". This "draw", or nip, is necessary to ensure the shell is firmly positioned between the rod and the cap, to prevent the bearing rocking or fretting in the bore. Upper and lower bearing shells are interchangeable.

The new bearings must be thoroughly cleaned before inserting in the rod and cap. Fit the shell in correct position in the rod, smear the shell with oil, and pull the rod down on the crankpin.

Fit the shell in position in the cap, oil the bearing and replace the cap on the rod, to line up with the number mark on the connecting rod. Tap lightly into position, using an aluminium drift. Be sure the bolt head tangs are fully registered in their slots before replacing, tightening, and split-pinning the nuts. When tightened, the rods should be such a fit that they can be laterally moved along the crankpin. No cap, or connecting rod, must ever be filed.

Oversize connecting rod bolts are available in .002" and .004" shank oversizes, where required. No attempt must be made to drive the bolts into the rod. The bolts should be a hard push fit in their holes.

FITTING PISTONS, RINGS AND GUDGEON PINS

Remove cylinder head as detailed in Sub-Section E.8.

Remove the sump. Remove the piston and connecting rod assemblies.

Clean and measure the cylinder bore, using a suitable dial gauge.

No attempt should be made to fit new pistons in cylinders which are outside the wear and ovality limits. Cylinders which measure in excess of .004" wear or .003" ovality must be rebored and oversize pistons and rings fitted.

Slightly scored pistons may be stoned, but heavily scored pistons must be discarded.

Remove piston rings, clean rings, grooves and pistons. Check ring clearance in grooves. Measure pistons across thrust axis at top of skirt. Pistons are graded for size and weight by figures and symbols stamped on the crown:—

Grading Letter	Piston Diameter (Standard)
F	3.7485" to 3.7488"
G	3.7489" to 3.7492"
H	3.7493" to 3.7496"
J	3.7497" to 3.7500"

Oversize grading symbols may be determined by adding the oversize figure to the above. For example, .005" O/S pistons graded "F" would be 3.7535" to 3.7538". Piston clearance in the bore should be .0012" to .0015", measured at the top of skirt at 90° to the gudgeon pin axis.

Compression rings must be the same oversize as the pistons to which they are fitted. When checking gaps in a worn bore, this must be carried out on the least worn portion. If the ring is to be filed by hand, this can best be done by placing on a smooth block of wood and using a smooth file. Avoid clamping a ring in vice jaws. Ring gap is .015" to .019"

The Duaflex scraper ring requires no fitting. The standard ring is suitable for use up to .019" above nominal bore size. A .020" oversize ring covers the remainder. Assemble the Duaflex rings first from the top of the piston, and not by sliding the ring up the skirt, and so avoid any risk of scoring the skirt.

Fit the octagonal expander in the ring groove then fit one scraper rail followed by the wavy centre spring, and finally the other two scraper rails above the centre spring.



Fig. E.22.—Checking Freedom of Piston Rings.

Install the two lower compression rings, and then the chrome plated compression ring. Ensure that the markings on the compression rings are at the top.

Before fitting the rings roll the rings around the grooves to be sure they do not bind or stick.

When withdrawing or replacing the gudgeon pins, immerse the pistons in hot water for a few minutes. The resultant expansion permits the pin to move freely in the pistons.

Pistons and gudgeon pins are supplied as an assembly, and carefully weighed in order to preserve engine balance. Gudgeon pins are individually fitted and must be kept to their individual pistons.

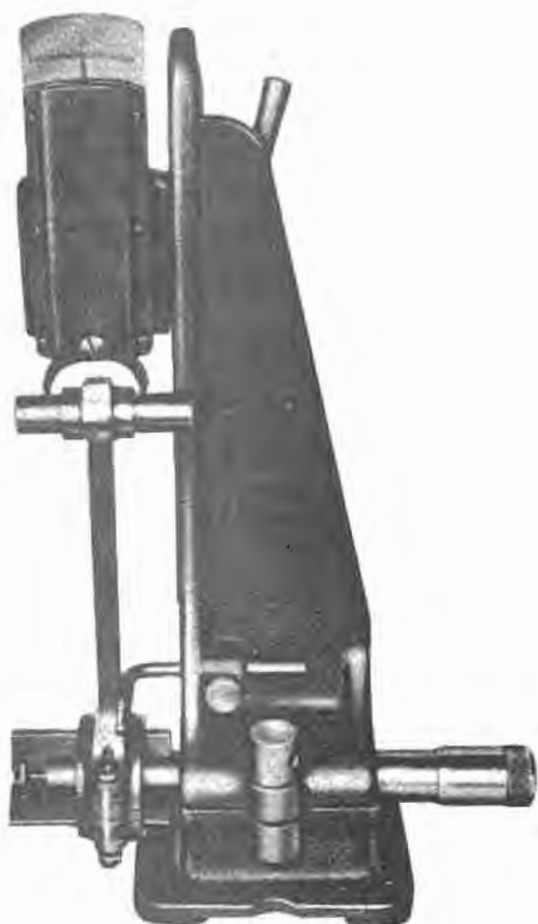


Fig. E.23.—Connecting Rod Alignment Test.

Pistons should be selectively gauged and fitted to cylinders and properly stamped, then fitted to their respective rods after checking rod alignment and gudgeon pin fit in the rod bush.

The piston must be fitted to the rod so that the split of the piston skirt is opposite to the .031" oil hole in the side of the rod, and assembled with slit to camshaft side of engine.

Before assembly, the interior of the crankcase must be thoroughly washed with paraffin, then dried under air pressure. Special attention should be paid to the crankshaft and main bearing and camshaft bearing webs. Oil pistons, rings and bearings before assembly and stagger ring gaps.

THE GUDGEON PINS AND BUSHES

The gudgeon pin bushes are pressed into the connecting rod small ends with the split in the bush facing away from the oil spray hole in the rod. Interference fit between the rod and bush is .0025" to .004".

The bush is diamond bored in position and bushes should only be replaced if the clearance exceeds .0005". Piston pin interference in the piston bosses is .0002".

Where diamond boring facilities are not available, the bushes must be high-speed turned and as fine a finish as possible obtained. Reaming does not give satisfactory results, and should not be attempted. The final machined bush bore is .7501" (+ .0002") giving a gudgeon clearance of .0001" to .0003".

ALIGNING THE CONNECTING RODS

Alignment of the connecting rods is of the utmost importance. The rods should be aligned after rebushing and boring, on a reliable connecting rod aligning fixture. Bent connecting rods will produce a light knock under acceleration, besides causing uneven and premature wear between the cylinder and piston.

If no alignment indicator is available, a check may

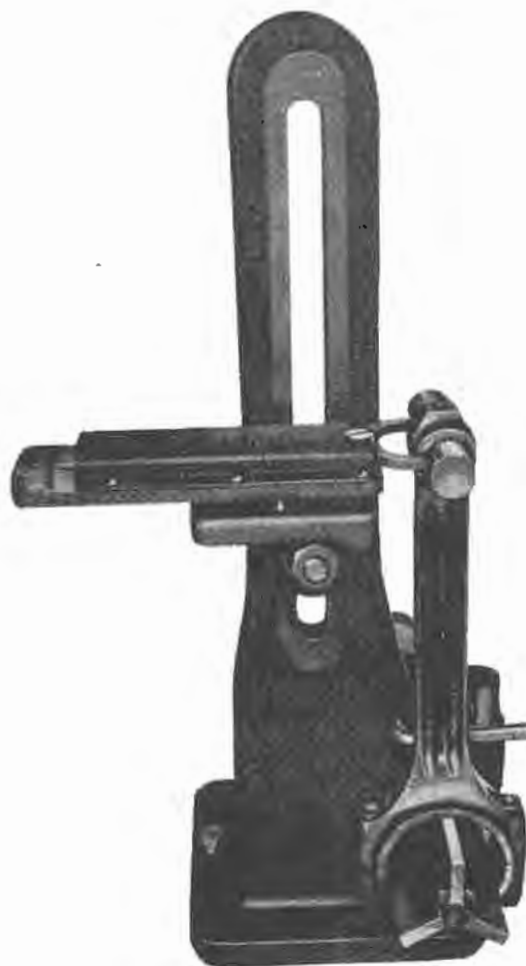


Fig. E.24.—Connecting Rod Twist Check.

be made with the aid of a surface table, vee-blocks and dial gauge. Insert a gudgeon pin in the bush, and a mandrel in the lower end. With the mandrel levelled in the vee-blocks and the rod vertical, take readings at both ends of the gudgeon pin. The discrepancy must not exceed .0005" per inch length between the two test points on the gudgeon pin.

The rod must then be tested for "twist". With the rod centre line parallel with the table, test in a similar manner to the alignment test. The discrepancy in this case must not exceed .001" per inch between test points.

A rod will respond to corrective treatment where the inaccuracies are small, but where larger errors are

found, a new rod must be fitted.

CONNECTING ROD BOLTS

The connecting rod bolts must be replaced if overstressed or stretched. This will be indicated by "waisting" of the bolt. Take micrometer readings, and renew any bolt showing a variation of over .001" along its shank.

The bolt diameter is .3745"—.375", and should be a push fit in the rod and cap. Where a new bolt is found to be a loose fit, the rod and cap should be reamed, and oversize bolts fitted. These are available in .002" and .004" oversizes.

THE CYLINDER HEAD

Special Tools Required:—

- RH.365—Compressor, Inlet Valve Spring.
- RH.558—Valve Holder.
- RH.561—Reamer, Inlet Guide.
- RH.167—Dowel Pin, Cylinder Head.
- RH.643—Guide Drawer.
- Local manufacture—Drift, Removing Inlet Valve Guide.

DESCRIPTION

The detachable aluminium alloy cylinder head is fitted with nickel chrome steel inlet valve seats and cast iron valve guides. The top face carries the rocker shaft and inlet valve operating rockers.

The core plugs are of nickel plated brass and the screwed-in sparking plug adaptors of aluminium bronze.

The compression ratios for the different models are:—

Rolls-Royce Silver Cloud ...	6.6:1	
Bentley "S" Type Saloon ...	6.6:1	
Bentley "S" Type Continental	7.25:1	BC-1-AF to BC-20-BG.
Bentley "S" Type Continental	8.0:1	BC-21-BG onwards.

REMOVING THE CYLINDER HEAD

Disconnect earth connection to negative side of battery. Remove oil level dipstick, and cover the aperture. Remove air cleaner assembly, being careful not to spill the oil in the reservoir of the oil bath type cleaner if used.

Drain coolant and disconnect upper radiator hose and by-pass hose. Disconnect supply hoses to vacuum water taps for heater and demister systems. Disconnect tube to windscreen washer.

Remove the rocker cover breather and the rocker cover together with the H.T. leads and conduits.

Disconnect the throttle controls and petrol feed pipes at the carburetters. The head may be removed without disturbing the carburetters, if desired. Disconnect and unclip the electric lead to the thermometer transmitter. Disconnect leads to automatic choke.

Disconnect the H.T. lead from the ignition coil and the L.T. lead from the coil and distributor. Remove the coil, then the distributor complete with its housing, having previously marked the driving shaft for re-assembly. Cover the aperture.

Disconnect the induction manifold hot-spot pipe at the coolant pump, and the fuel drain pipes from the float chamber cover.

Progressively unscrew, half-a-turn at a time, the five nuts securing the valve rocker shaft pedestals to the head and remove the rocker shaft assembly.

Remove the tappet covers. Lift out the push rods. The inlet tappets are numbered 1 to 6 and must be replaced in their respective bores if removed.

Disconnect the clip situated under the left-hand side of the water pump retaining the oil supply pipe to the distributor. (This operation applies to Continental "S" Type only.)

Progressively unscrew the cylinder head setscrews commencing with those at the ends and working inwards. Lift the cylinder head from the block, using a "T" piece, screwed onto the rear rocker cover stud and lift with equal upward pressure on the thermostat casing. Should the joint be difficult to break, the engine should be motored over with the sparking plugs in position, but not connected.

TO RENEW INLET VALVE GUIDES

Using the piloted drift made up as shown in Fig. E.6 drive out the old guide from the combustion chamber end. Clean the bore in the head.

Push the new guide into position by hand as far as it will go and measure the clearance between the shoulder of the guide and the face of the cylinder head. This should be between .050" and .075". If below this limit, fit a .002" oversize guide.

Draw the guide in using the draw-bolt, Special Tool No. RH.643.

Ream out the guide with the special reamer Tool No. RH.561, using a suitable cutting oil.

TO RENEW INLET VALVE SEAT

The valve seat inserts are screwed into the head and have an interference fit of .002"

Heat the cylinder head in an oven at 300° F.

(150° C.) for one hour. Tap a square section tapered drift into the insert to obtain a good "bite" and unscrew it with a suitable spanner.

When cool, clean up the threads in the head.

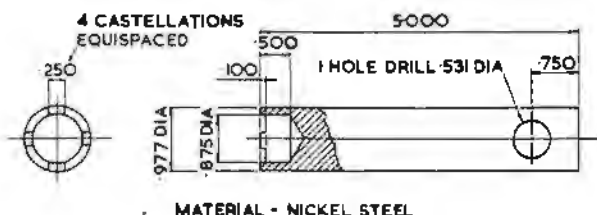


Fig. E.25.—Plug—Locking Ring Removing Tool.

Reheat for one hour at 300° F. and screw in the insert. Machine off the spannering head and lock the insert in position by centre punching. Grind and finish seats as described in Sub-Section E.10.

TO RENEW SPARKING PLUG ADAPTOR

The plug adaptors are screwed into the head and have an interference fit of .002" which must be main-



Fig. E.26.—Cylinder Head Tightening Sequence.

tained. Oversize adaptors are available if necessary.

Unscrew the locking ring, which has a left-hand thread, with a peg spanner. Tap in a square section tapered drift and unscrew the adaptor, which has a right-hand thread.

Clean up the threads in the cylinder head and select an adaptor to give the required interference fit.

Heat the cylinder head in an oven for one hour at 300° F. (150° C.), and screw in adaptor. Screw in and tighten the locking ring.

REPLACING CYLINDER HEAD

The order for replacing the cylinder head is the reversal of the removal instructions.

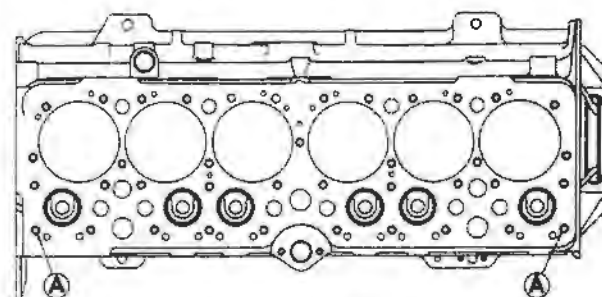


Fig. E.27.—Cylinder Head Dowel Position.

It is essential that the new steel gasket is accurately positioned relative to the cylinder bores and to ensure this, the two special dowel pins RH.167, should be secured into the upper crankcase face in the positions shown in Fig. E.27.

No jointing compound is necessary.

For final assembly and tune up instructions see Sub-Section E.10.

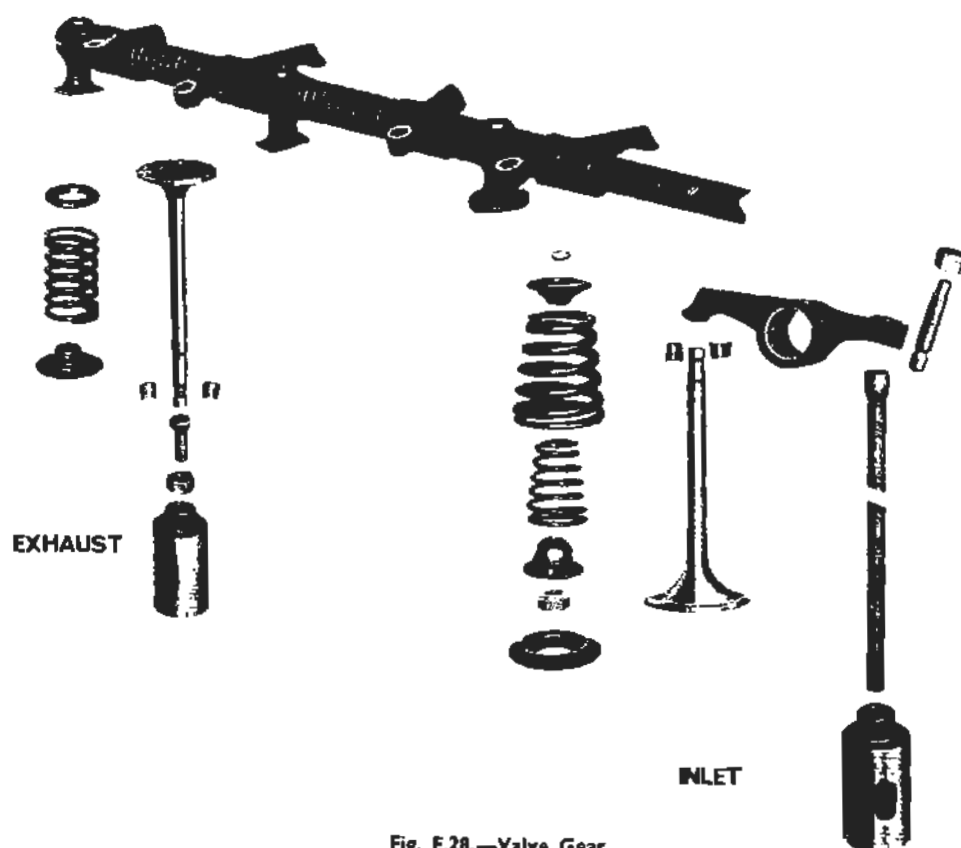
VALVE GEAR

Fig. E.28.—Valve Gear.

DESCRIPTION

Overhead, push rod operated inlet valves and side exhaust valves are fitted. The exhaust valves have Stellite treated, heat resisting faces. Dual springs are fitted to the inlet valves.

The overhead valve gear is lubricated by the low pressure delivery from the relief valve unit via the external rocker and timing case feed pipe, and internal drillings in the cylinder head, pedestal and rocker shaft. The rocker arms and bushes are drilled to provide a delivery to push rod cup and valve stem end face.

Whenever an overhaul is carried out, the push rods should be checked for bow, and rods out of truth should be renewed.

The maximum permissible wear between rocker arm bush and shaft is .003" with a maximum of .001" wear on the shaft. If worn in excess withdraw the shaft from the rocker arm assemblies, placing them in a suitable container to facilitate assembly in their original positions.

Press out the old bush and remove the valve adjusting screw and locknut. Position the new bush with the split uppermost so that when pressed into the rocker arm the groove will be in line with the oil drilling leading from the adjusting screw end.

Drill .125" through the oil groove in the bush. Ream the bush to .7495" (+ .00025"), giving a running clearance of .001" to .0015". Wash off with paraffin and dry using a high pressure air supply. If it is found necessary to rebush any rocker arm the remaining bushes should also be renewed.

Examine the valve stem contact face of the rocker arm pad for wear and reface if worn.

N.B.—This pad is case hardened to a depth of .015"–.025" and after grinding or stoning must be of Rockwell hardness C57–C65. If readings are below this figure renew the rocker arm.

Lubricate all bearing surfaces with engine oil, re-assemble the rocker arms and springs to the shaft, ensuring that these are fitted in their original position.

TO CHANGE INLET VALVE SPRINGS WITHOUT REMOVING CYLINDER HEAD

Special Tools Required:—

RH.365—Compressor—Inlet Valve Spring.

RH.588—Valve Holder.

With the rocker shaft assembly removed, set up the spring compressor and valve holder as shown in Fig. E.29. The locking nut "A" on the valve holder should be unscrewed sufficiently to release the split taper collet that grips the spindle "B". The curved end of the spindle can then be inserted into the sparking plug hole and the holder "C" screwed into position. Tighten nut "A" whilst holding the spindle up in the hollow of the valve head by the tommy bar.

Compress the spring and remove the split wedges. Renew the springs and refit the retaining wedges. Remove the spring compressor and valve holder.

NOTE.—For Removing and Refitting Valves, Reconditioning Valves and Seats, Testing Valve Springs and Setting Valve Clearance, see under

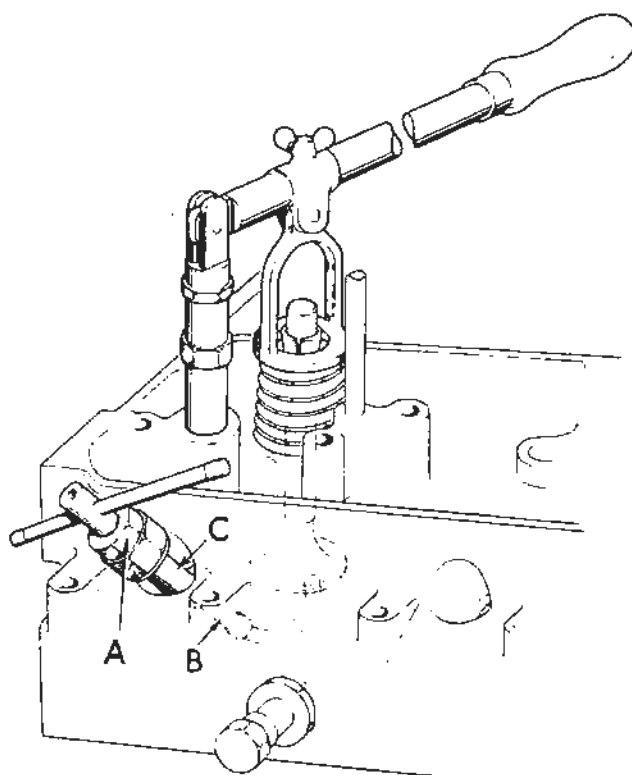


Fig. E.29.—Changing Inlet Valve Springs in Position.

"Decarbonisation" Sub-Section E.10.

For Renewing Valve Guides see under "Cylinder Block" Sub-Section E.3, and "Cylinder Head" Sub-Section E.8.

DECARBONISATION

Special Tools Required:—

- RH.365—Compressor—Inlet Valve Spring.
- RH.441—Compressor—Exhaust Valve Spring.
- UR.964— $\frac{5}{16}$ " U.N.F. Jaw Spanner.
- RH.571—Tappet Holding Spanner.
- UR.960—Inlet Rocker Screw Spanner.
- RH.167—Cylinder Gasket Dowel Pins (2).

NOTE.—Normally top decarbonisation is required after periods of 20,000 to 25,000 miles running.

TO REMOVE THE CYLINDER HEAD

See under Cylinder Head, Sub-Section E.8.

TO REMOVE THE CARBON

The carbon should be removed from the cylinder head, piston crown and cylinder block face with a blunt tool or a wire brush. Sharp tools must not be used on the aluminium head and pistons. Care must be taken not to allow carbon to enter the coolant holes of the cylinder block. The head should be washed in paraffin and blown out with compressed air. Ensure that the oilway to the centre rocker pedestal is clear.

TO REMOVE THE INLET VALVES

Insert a block of wood of suitable size in the combustion chamber to support the valve. Secure the inlet valve spring compressor on the appropriate rocker shaft pedestal stud, and press down the lever. Remove the split wedges.

Parts from each valve assembly should be retained in sets and restored to the valve from which they were removed. The valves should be refitted to their original guides. On initial assembly the valves are numbered from 1 to 6 by etching near the bottom of the stem.

TO REMOVE THE EXHAUST VALVES

Block up the oil return holes in the bottom of the tappet chamber and the large hole from the tappet chamber to the wheelcase with clean cloth to prevent parts falling into the sump.

With the valve closed mount the exhaust valve spring compressor on the appropriate exhaust manifold studs and compress the spring (Fig. E.30). Remove the split wedges and then the valve and spring. Should the top washer be displaced when removing the spring, smear it with grease and replace it in position.

Parts from each valve assembly should be retained in sets and restored to the valve from which they were

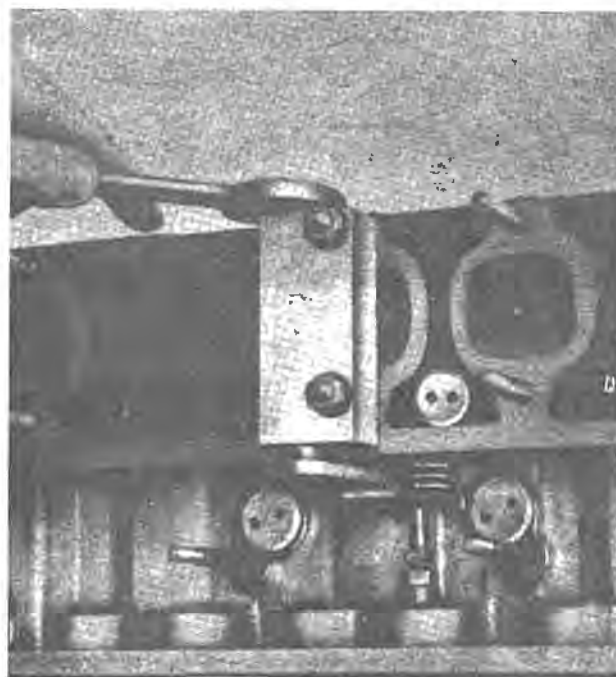


Fig. E.30.—Removing Exhaust Valves.

removed. The valves should be refitted to their original guides. The valves are etched from 1 to 6 near the bottom of the stem.

EXAMINATION FOR VALVE GUIDE WEAR

Insert a new valve in the guide, and with the valve in its "OPEN" position, i.e., inlet valve lifted .317", exhaust valve lifted .375", check the maximum movement from side to side of the valve head with a dial gauge.

The maximum permissible valve head side movement, when using a new valve, is:—

Exhaust: .0113". Inlet: .0084".

Further movement of either valve head will necessitate the renewal of the valve guide.

Fig. E.31 illustrates the dial gauge in position. It will be necessary to manufacture locally a suitable extension piece for the needle as shown. The vertical portion of the extension should be kept as short as possible.

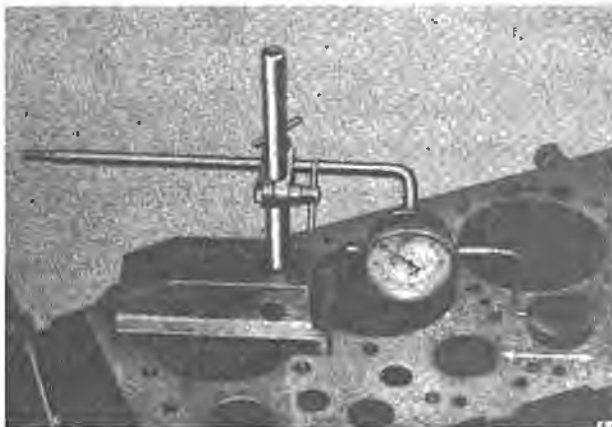


Fig. E.31.—Checking Valve Guide Wear.

TO REFACE THE VALVES AND SEATS

Remove all carbon from the valve heads and stems with a wire wheel or suitable scraper.

Reface the valves and seats to 45° with standard valve reconditioning equipment removing the least amount of metal possible to give a clean face. Care must be taken to prevent grinding dust from entering the tappet chambers or cylinder bores. The diameter of the pilot should be .343" for refacing the inlet valve seats, and .375" (9.53 mm.) for the exhaust valve seats. If necessary valve seats may be crowned with a 30° cutter, to avoid pocketing. If seats require renewing, see Sub-Section E.3 (Exhaust Valve Seats) or E.8 (Inlet Valve Seats).

Lightly lap each valve onto its seat with a fine, good quality lapping compound and test the seating with Prussian Blue. Before lapping the exhaust valves the tappet adjusting screws should be screwed down several turns to provide clearance. Wash the valves and seatings with paraffin to remove all traces of lapping compound, ensuring that this is not permitted to enter the crankcase.

If valve reconditioning equipment is not available the valves may be ground by hand using a good quality paste and a rubber suction valve holder. Test the seatings with Prussian Blue.

TO TEST THE VALVE SPRINGS

The valve springs should be examined for visible defects and checked for poundage on an accurate Valve Spring Tester in accordance with the following data:—

Spring	Compressed to	Poundage New	Minimum Acceptable Poundage
Inlet, Outer ...	1.600"	42— 48 lbs.	35
Inlet, Inner ...	1.300"	13— 17 lbs.	10
Exhaust ...	1.170"	111—118 lbs.	85

TO REFIT THE VALVES

Inlet

Oil the valve stems and fit a new valve stem packing and retaining ring. Reverse the procedure for removal. After fitting, tap the top of the stem with a hide mallet to ensure that the wedges are seating correctly.

Exhaust

With the oil return holes in the tappet chamber covered and the washers in position, oil the valve stems and refit them by reversing the procedure for removal. Ensure that the retaining wedges are correctly seated with the aid of a hand lamp and mirror.

TO SET THE EXHAUST VALVE TAPPET CLEARANCE

Exhaust tappet clearance: .012" cold.

Reconnect the battery and crank the engine by means of the starter motor, operating this by pressing in the rubber starter button of the solenoid switch

Ensure that the tappet to be adjusted is on the base of the cam. When No. 6 valve is fully open, No. 1 will be on the cam base, and similarly with Nos. 2 and 5, and 3 and 4. After adjusting No. 1 rotate the crankshaft one-third of a revolution, when No. 3 will be fully opened. Adjust No. 4 tappet and carry on in the normal firing order.

Place the tappet spanner (Fig. E.32) onto the exhaust and adjacent inlet tappet to prevent the exhaust tappet from turning.

Slacken the locknut and adjust the adjusting screw to give the correct clearance using two spanners. Tighten the locking nut whilst holding the adjusting screw. Re-check clearance.

Replace the tappet covers.

TO REFIT THE CYLINDER HEAD

See under Cylinder Head, Sub-Section E.8.

Replace the push rods. They are numbered to ensure correct re-assembly.



Fig. E.32.—Exhaust Tappet Locking Tool.

Unlock the locknut of each valve clearance adjusting screw on the rockers and unscrew the adjusting screws as far as possible. Replace the rocker shaft, spherical washers and nuts. Tighten down progressively working from the centre outwards to prevent distortion of the shaft.

Adjust the inlet valve rocker clearance to .006" cold. Ensure that the tappet of the valve to be adjusted is on the base of the cam before adjusting.

FINAL ASSEMBLY AND TUNE UP

Remove the contact breakers from the ignition distributor, trim the points and set the gaps to .019"—.021". Refit the distributor and housing as follows:—

- (a) Turn the crankshaft until No. 1 piston is at T.D.C. on its firing stroke.
- (b) Turn the distributor spindle until the rotor arm is in line with No. 1 cylinder firing position

(approximately 11 o'clock). Fit the distributor and secure the housing to the cylinder block. Full details of ignition timing are given in Sub-Section M.5.

Fit a new element, rubber seal to cover, and washer to retaining nut, to the Full-Flow Filter, before replacing the induction manifold. The Full-Flow Filter should be filled with clean engine oil on re-assembly.

Clean the sparking plugs and set the gap to .025".

Drain and renew the engine oil, and refill the cooling system.

Remove and clean the filter gauzes of the fuel strainer located on the cross member in front of the petrol tank. Drain and clean the bowl, fitting a new cork joint to the cover if necessary. Remove and clean the gauze filters at the unions of the fuel inlets to the carburetters.

Clean out carburetter float chambers. Full details of Carburation are given in Sub-Section K.3.

Start up the engine and check for oil and coolant leaks. Check that oil is escaping from the oil holes in the rockers onto the valve stems and the end of the push rods. The holes may be cleaned with fine wire but must not be enlarged.

Replace the rocker cover and its breather.

Replace air cleaner. (See Sub-Section K.4.)

After the road test and with the engine warm, remove the rocker shaft and tighten the cylinder head setscrews in the correct sequence (Fig. E.26). Replace the rocker shaft and set the inlet rocker clearances to .006" with the engine cold.

Re-assemble the remaining parts.

**PROPELLER SHAFT
AND UNIVERSAL
JOINTS**

F

SECTION F

PROPELLER SHAFT AND UNIVERSAL JOINTS

SUB-SECTION

Description, Operation and Lubrication

Removing and Dismantling F.1

PROPELLER SHAFT AND UNIVERSAL JOINTS

DESCRIPTION AND OPERATION

A divided open type propeller shaft is used to transmit engine torque to the rear axle unit.

The front shaft is connected to the gearbox output shaft by a ball and trunnion type universal joint. The rear end of the front shaft is carried in a heavy ball race mounted in a carrier bracket, which is suspended from the frame by an arrangement of Silentbloc bushes, friction washers and two tension springs.

This flexible mounting of the centre bearing carrier, while allowing perfect alignment of front and rear shafts, prevents propeller shaft vibration being transmitted to the chassis.

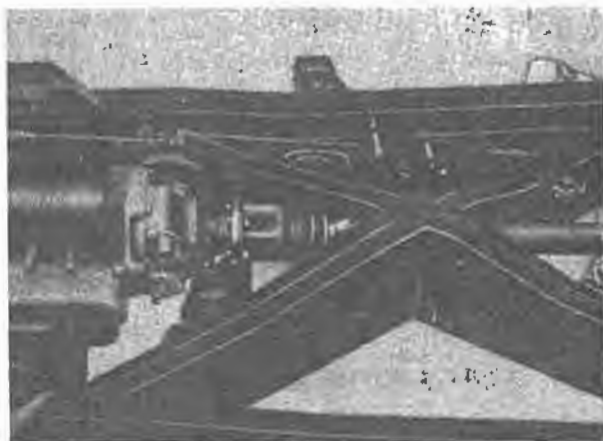


Fig. F.1.—Front Universal Ball and Trunnion Joint.

A flange is keyed and locked to the tapered rear end of the front shaft, and this flange is bolted to the combined Hardy Spicer needle-roller universal and sliding joint, sliding on the splines of the front end of the rear shaft.

A Standard Hardy Spicer universal joint on the rear end of the rear shaft is bolted to the rear axle bevel pinion flange.

Both shafts are dynamically balanced on assembly, and care must be taken to preserve this balance by marking all parts prior to dismantling in order to re-assemble in a relative position.

LUBRICATION

The front ball and trunnion universal joint is packed

with approximately $1\frac{1}{2}$ oz. of Mobilgrease No. 2 on assembly, and should be examined every 20,000 miles.

The centre ball joint is packed for normal life with a special grease during initial assembly and requires no maintenance.

The Hardy Spicer universal joints and the sliding joints are fitted with grease nipples and these should be lubricated every 10,000 miles.

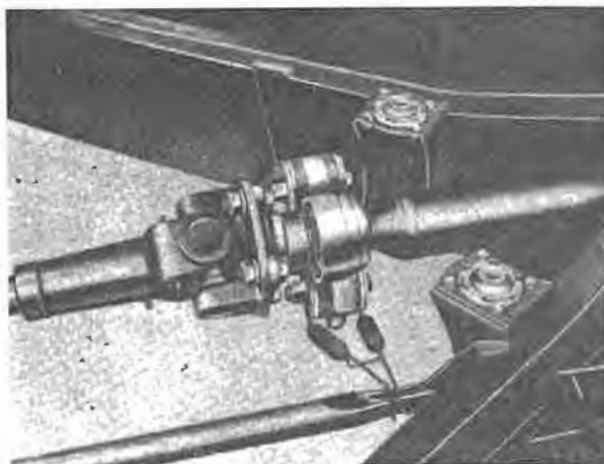


Fig. F.2.—Propeller Shaft Centre Bearing.

REMOVING AND DISMANTLING PROPELLER SHAFTS AND UNIVERSAL JOINTS

Remove the four bolts and nuts securing front joint to gearbox output shaft.

Remove the two tension springs between centre bearing carrier housing and equaliser steady bar.

Remove the single split-pinned bolt attaching the centre bearing assembly to the frame bracket. The mounting can then be detached from the bearing housing by removing the nut and lockwasher from the securing stud and the mounting stripped by removing the two large split-pinned bolts which pass through the Silentbloc bushes. Collect the friction washers.

To remove without the centre bearing mounting, remove the lock washered nut only, so splitting the bearing housing from the first Silentbloc bush assembly of the mounting.

Remove the four bolts and nuts attaching rear universal joint to the pinion flange.

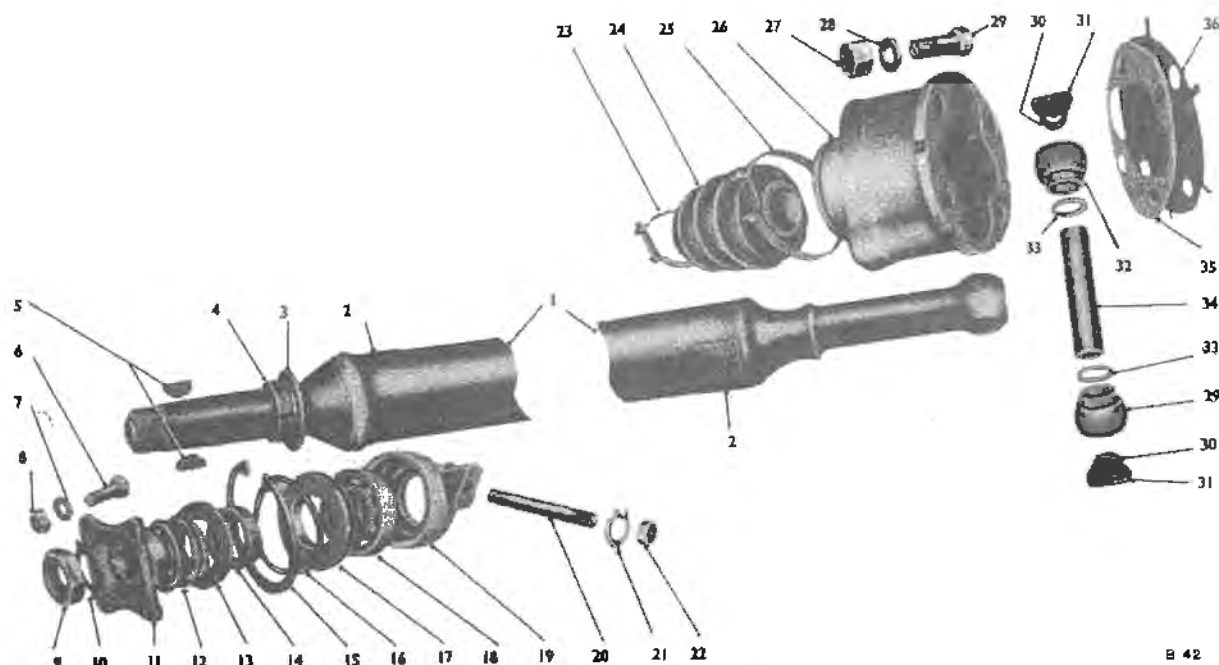


Fig. F.3.—Front Propeller Shaft & Centre Joint.

- | | | |
|---------------------------|------------------------------|--------------------------------|
| 1. Front Propeller Shaft. | 13. Spacing Washer. | 25. Clip, Front. Rubber Boot. |
| 2. Balance Weights. | 14. Grease Retainer. | 26. Housing, Ball and Trunnion |
| 3. Washer. | 15. Circlip. | 27. Nut. |
| 4. Grease Seal. | 16. Rubber Sealing Ring. | 28. Plain Washer. |
| 5. Woodruff Keys. | 17. Spacing Ring. | 29. Bolt. |
| 6. Bolt. | 18. Bearing. | 30. Spring Washer. |
| 7. Plain Washer. | 19. Housing. | 31. End Pad. |
| 8. Nut. | 20. Mounting Stud. | 32. Needle and Race Assembly. |
| 9. Flange Retaining Nut. | 21. Locking Washer. | 33. Washer. |
| 10. Locking Washer. | 22. Nut. | 34. Pin. |
| 11. Flange. | 23. Clip, Rear, Rubber Boot. | 35. Klingerite Joint. |
| 12. Spring. | 24. Rubber Boot. | 36. End Cover. |

The front and rear shafts can then be withdrawn as an assembly and taken to a bench, where front and rear shafts can be separated by removing the four bolts and nuts attaching front shaft rear flange to rear shaft front joint. Clamp front shaft in vice, being careful not to over-tighten vice and damage the shaft.

Remove the end metal cover from forward end of the joint body, and push body along shaft, sufficient to remove the two end buttons and the two outer races containing the 62 needle rollers. A spring tension washer will be found under the end buttons, and a plain hardened washer below the outer races.

Tie the housing and rubber boot back, and press out the trunnion pin, supporting the trunnion shaft. A force in excess of 2½ tons will be required. On no account should heat be used in this operation.

Remove rubber boot, housing and clips; clean all parts for inspection. Assembly is the reverse procedure to dismantling but the following instructions must be adopted in the fitting of the trunnion pin.

The pin is to be fitted within .003" of true central position relative to the centre line of the shaft using a minimum press load of 2½ tons. The pin must be fitted to this limit to ensure correct dynamic balance of the shaft. Even if the dynamic balance is corrected, an out of true pin will cause uneven and rapid wear of the housing due to the whirling action of the shaft on one or other of the end pads.

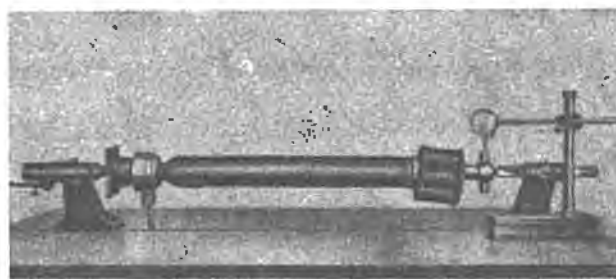


Fig. F.4.—Checking Centre Pin.

To check that the pin is correctly fitted, the shaft must be fitted between centres and the vertical position of the pin checked with a clock dial indicator. Care must be taken to ensure that the pin is truly vertical when this test is being carried out.

Whenever the joint is dismantled, the opportunity should be taken to fit a new rubber boot.

Pack the joint with 1½ ozs. of Mobilgrease No. 2 before replacing the end cover and new Klingerite joint.

The rubber boot may be changed without removing the trunnion pin by adopting the following procedure:—

Remove the propeller shaft assembly from the car and clamp lightly in a vice. One end of the shaft should be resting on the bench in a horizontal position, then proceed as follows:

- (i) Disassemble joint, removing all parts except the body and pin.
- (ii) Clean body, ball head, and pin thoroughly.
- (iii) A complete coating of grease (or suitable rubber lubricant) must be smeared on the outside and inside of dust cover, entire surface of the ball head, pin, and inside of body. (It is very important that this instruction be followed.)
- (iv) Stretch the grease-soaked boot or dust cover over the pin and ball head as shown in Fig. 5.
- (v) Work the dust cover into the body as far as possible.



Fig. F.5.—Rubber Boot—First Position.

CAUTION

USE NO TOOLS FOR THIS OPERATION

- (vi) With the body in position so the pin can enter the ball channels, pull the body sharply over the pin, thereby forcing the dust cover into the body.

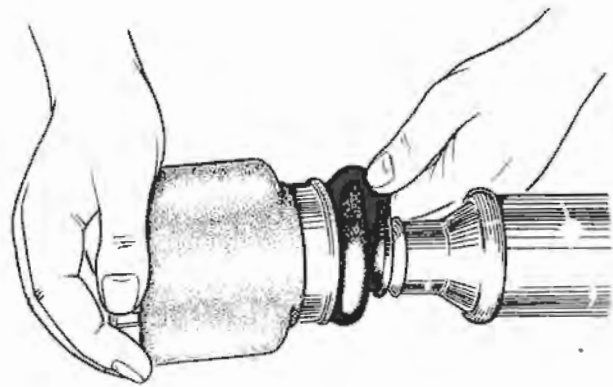


Fig. F.6.—Working Boot through Cover.

- (vii) With one hand, grip the end of the dust cover, protruding through the back end of body. With the other hand, pump the body back and forth, as shown in Fig. 6, until the entire dust cover has passed through the body.
- (viii) During the operation the cone may have reversed itself inside the dust cover. Pull it out to its normal position.
- (ix) Slide the dust cover in the ball head groove and over the neck of the body, then secure with clips provided.

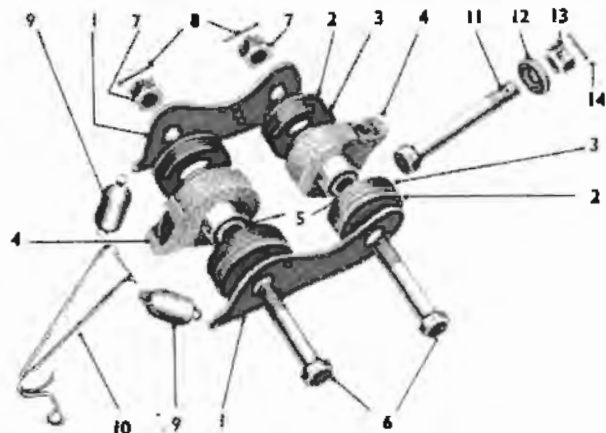
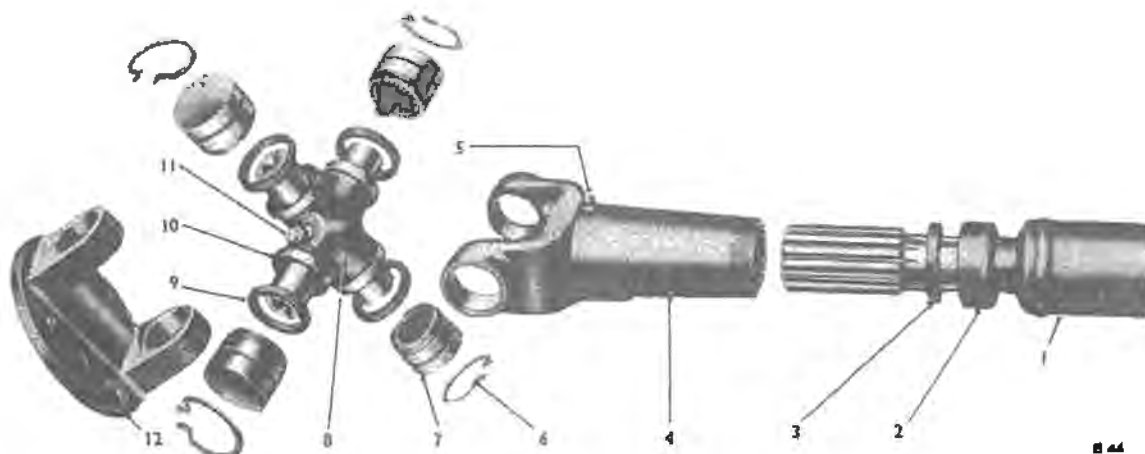


Fig. F.7.—Centre Bearing Support.

- | | |
|-------------------------------|-----------------------------|
| 1. Link. | 8. Split-pin. |
| 2. Friction Disc. | 9. Suspension Spring. |
| 3. Rubber Compression Washer. | 10. Suspension Spring Link. |
| 4. Housing. | 11. Bolt, Mounting. |
| 5. Silentbloc Bush. | 12. Plain Washer. |
| 6. Bolt, Link Assembly. | 13. Nut. |
| 7. Nut. | 14. Split-pin. |

**Fig. F.8. - Universal Joint Dismantled.**

- | | | |
|--------------------------|------------------------------|----------------------------|
| 1. Rear Propeller Shaft. | 5. Grease Nipple. | 9. Grease Seal, Cork. |
| 2. Grease Seal Retainer. | 6. Circlip. | 10. Retainer, Grease Seal. |
| 3. Grease Seal. | 7. Needle and Race Assembly. | 11. Grease Nipple. |
| 4. Yoke, Sliding. | 8. Spider, Universal Joint. | 12. Front Yoke. |

To remove the centre ball race, the flange must be unlocked and pressed or drawn from the keyed tapered end of the shaft. Remove both woodruff keys and spring-loaded washer against oil retainer.

Remove housing and bearing as an assembly from shaft by tapping end of shaft against a hardwood block. Remove circlip and push oil retainer and bearing from housing. A new oil retainer must be used on assembly, which is the reverse of dismantling, using Retinax A or its equivalent to pack the bearing.

To dismantle the Hardy Spicer joints, it is first necessary to remove the circlips holding the needle bearing races in the yoke eyes.

Using a hide mallet, tap the yokes until the races are driven out of the eyes.

Use new seals on the universal spiders, also on sliding yoke, before assembly. A light coating of grease will hold needle rollers in position during assembly.

The needle roller assemblies can be pressed into the yoke eyes with a press, being careful not to press the races more than necessary to insert the circlip, otherwise the oil seals will be damaged.

The shafts may be installed as individual units, the front joint being connected to the gearbox output flange, the centre bearing carrier bolts being left loose until the rear shaft has been replaced.

Tighten the twelve flange bolts, and if the centre bearing mounting has been dismantled, the two large bolts through the Silentbloc bushes must be tightened with the front shaft held in the correct position.

The front shaft should lie along the centre line of the chassis in plan view and slope downwards to the rear at approximately $1\frac{1}{2}^{\circ}$ to the horizontal. It is usually sufficient for this to be lined up by eye.

Lubrication of the joints should be carried out, using Mobilgrease No. 2.

BRAKES

G

SECTION G

THE BRAKING SYSTEM

	SUB-SECTION
Data—Description—Operation—Hydraulic System	G.1
Service Operations and Adjustments—Lubrication	G.2
Brake Shoes—Drums—Expander Mechanism	G.3
Servo Motor	G.4
Master Cylinder	G.5
Handbrake Ratchet Assembly	G.6
Basic Adjustment of Brake Rods and Linkages	G.7

THE BRAKING SYSTEM

DATA

Drum Diameter	...	...	11.250"
Brake Lining Type	...	...	Ferodo DS.2 or Mintex M.14.
Length	...	...	10" (approximately).
Width	...	...	3.00"
Thickness	...	...	.322"
Diameter of Wheel Cylinder Bores			
Front	...	...	1.375"
Rear	...	...	.875"
Diameter of Master Cylinder Pistons			
Dual Cylinder System	...	{Upper Cylinder .980"	{Lower Cylinder .747"
Single Cylinder System	...	.980"	
Servo Lining Type	...	Mintex M.19.	

DESCRIPTION

The braking system incorporates a gearbox-driven friction type servo motor which is engaged by the brake pedal, the output from the servo being transmitted through hydraulic cylinders which operate Girling Hydrastatic brakes incorporating special Rolls-Royce features.

In addition to operating the servo, the brake pedal is also connected to the rear brakes through a mechanical linkage of rods in tension, as also is the handbrake, and supplies 40 per cent of the effort applied to the rear brakes, the additional 60 per cent being provided hydraulically.

Front brakes are of the "two trailing shoe" type employing two brake operating cylinders for each wheel. The lower "shoe factor" due to absence of self-wrapping effect with trailing shoes renders them less prone to pulling and grabbing troubles, sometimes associated with leading shoe type brakes. The drum diameter has, of necessity, been reduced to 11 $\frac{1}{4}$ " and this, combined with the absence of self-wrapping effect necessitates the employment of higher shoe tip operating pressures to obtain the same total braking. This higher shoe tip force is derived from the servo motor and increased hydraulic leverage, made possible by the use of self-adjusting shoes.

The importance of self-adjusting shoes in this system lies in the fact that the displacement of fluid when the brakes are applied is much less than in a normal system, since there is virtually no initial shoe

clearance to be taken up. With less fluid movement, it has been possible to employ master cylinders of smaller bore diameter than that of the wheel cylinders, thus providing an increased hydraulic leverage without introducing excessive linear travel of the master cylinder pistons.

Self-adjustment of the shoes is achieved by a friction device known as the "Shake-back stop". This device retains the front shoes in the expanded position when the hydraulic pressure is released, thus achieving near zero shoe clearance. The "shake-back stop" is located radially by a steady post attached to the brake carrier plate. Sufficient clearance is provided in this location to allow slight shoe to drum clearance with the brakes off. The tension of the brake shoe return springs (or more correctly "bias springs") is such that the shoes are in equilibrium with the springs in the wheel cylinders. These exert a slight pressure on the back of the operating rubber cup and piston in the expanders. In consequence, there must be sufficient friction between the shake-back stop and the brake shoe web to prevent the shoe being shaken back by the vertical forces imposed on it when traversing rough roads.

As the front brakes are applied entirely by the servo there would normally be no increase in pedal travel as the linings became worn. A strong pull-off spring is therefore fitted to the shoes which takes effect only when the linings are near the end of their life, and, by the increase in pedal pressure above that which would normally be required, gives warning that the linings require renewal.

The rear brakes comprise a leading and trailing shoe expanded by a double acting wheel-cylinder in conjunction with a mechanical flat wedge type expander, the latter being operated by direct foot pedal linkage and also by the handbrake. The shoes are inter-connected by a special equal-wear linkage which converts the floating shoes to a "fixed-cam" equivalent, thus reducing the self-wrapping effect of the leading shoe and allowing the use of a single shake-back stop on the trailing shoe which simultaneously adjusts both shoes to near zero clearance. As lining wear takes place with consequent automatic adjustment, the shoes move away from the tappets of the mechanical expander in the "off" position; an adjuster is therefore provided to enable the shoes to be re-positioned radially thus bringing the heels into contact with the tappets again.

A light rubbing when the brakes are "off" is quite normal with this type of automatic shoe adjustment.

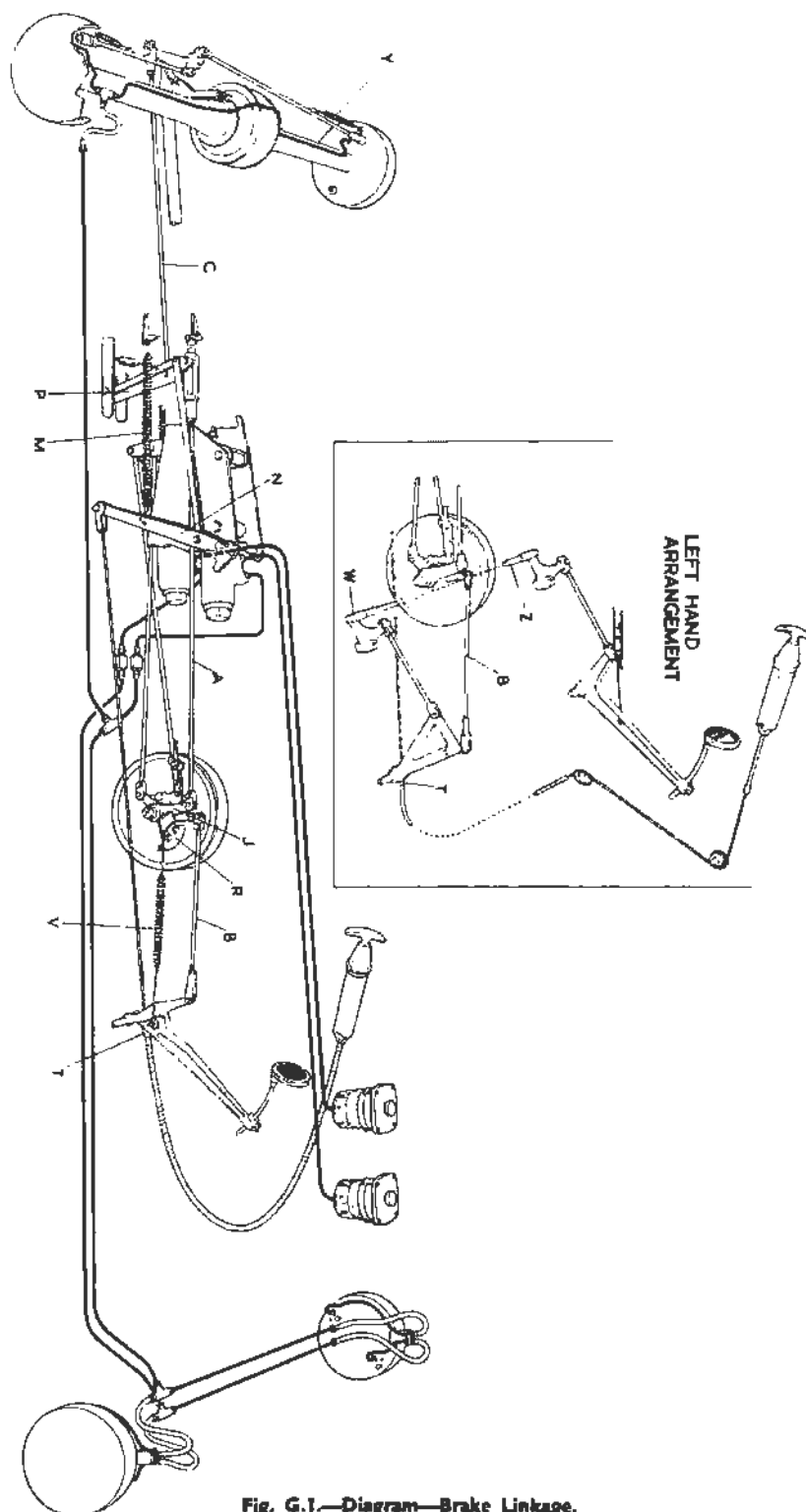


Fig. G.1.—Diagram—Brake Linkage.

OPERATION

Initial movement of the foot pedal first applies the rear brakes through the mechanical linkage, and when the rear shoes are expanded to touch the drums, further pressure on the pedal engages the servo motor, which operates the hydraulic cylinders. On brake release, the master cylinder pistons return by means of an internal spring only.

Fig. G.1 shows the brake linkage for a right-hand drive car with the modifications necessary for a left-hand drive model shown inset. A pull rod (B) operated by the pedal is coupled to a lever on the servo motor shaft, the motor itself being mounted on the right-hand side of the gearbox and driven at approximately one-fifth of the propeller shaft speed. The lever has inclined cams formed on the face to its boss which engage through the medium of steel balls with similar cams formed on the boss of a second lever (J). From the latter, rod (A) actuates the rear brakes through an intermediate lever which is pivoted on a bracket bolted to the crossmember of the frame, through the rod (C) and rear equaliser mounted on a bracket suspended from the rear axle.

Movement of the servo lever cams engages the servo motor and its output is taken by one of the two output rods depending on the motion of the car, either forward or reverse, to the master cylinder operating lever assembly.

The handbrake is mounted under the fascia board and is connected by an enclosed cable to the handbrake lever which is carried on the master cylinder support bracket. This lever is linked to a second lever which picks up the intermediate lever (P) by means of a pin. The linkage is then the same as for the footbrake. The intermediate lever is permitted to slide along the slotted link on rod "A" so that application of the handbrake does not disturb the foot pedal.

HYDRAULIC SYSTEM

Two glass reservoirs, one feeding each master cylinder, are mounted on the wing valance, and incorporate fine mesh gauze filters under the covers. The pipes to the master cylinders are arranged to fall in such a manner that no air trapping takes place, and any air present in cylinders or lines, is expelled into the reservoirs. Check valves have been inserted in the delivery lines from the master cylinders, to control the high depressions (up to 12" mercury) set up on brake release. The valves open at 8 lbs./sq. inch pressure differential in either direction, but normal brake release is by an internal bleed which equalises the pressures comparatively slowly, thus obviating the possibility of air ingress at the wheel cylinders.

On cars prior to Rolls-Royce Silver Cloud chassis number SYB-50, Bentley 'S' Type saloon B-245-BC, and Bentley 'S' Type Continental BC-21-BG (approximately) a single master cylinder operates all brakes. In the event of a failure of the hydraulic system, the rear brakes remain effective through the mechanical linkage; similarly, provision is made to ensure that the hydraulic system remains effective should the mechanical application fail.

Later cars are equipped with two reservoirs and two master cylinders, the upper cylinder (.980" piston dia.) operating the upper shoe in each front brake, and the rear brakes, while the lower cylinder (.747" piston dia.) operates only the lower shoe in each front brake. The two sub-divisions of the system are not interconnected hydraulically, and in the event of failure of one, braking is still retained on all four wheels by the mechanical application of the rear brakes and the operation of the second cylinder. Balance between the two cylinders, and therefore between front and rear brakes, is obtained mechanically by means of a balance lever.

SERVICE OPERATIONS

Special Tools required:— RH.322—Brake and Servo Testing Lever. (Single Cylinder System.)
RH.417—Brake and Servo Testing Lever. (Dual Cylinder System.)
Spring Balance—100 lbs. reading.

The front brakes are self-adjusting and no external adjuster is provided. Every 20,000 miles, a front drum should be removed and the condition of the liners examined. The lining face should not be less than 1.32" above the rivet heads. If wear is excessive, the shoes will pick up on the safety springs provided on the brake carrier plate whenever the brakes are applied and self adjustment will be prevented.

The rear brakes are provided with an adjuster unit and should be adjusted once every month or every 2,500 miles whichever is the earlier. The need for adjustment will be indicated by excessive travel of the handbrake grip. An adjustment of the rear brakes will also adjust the handbrake.

The rear brake adjuster unit allows the only adjustment necessary to compensate for wear of the brake linings. It is important that no attempt is made to adjust at any other point by altering the length of the rods. The linkage is carefully set on initial build to synchronise the front and rear stops, ensuring that in the event of failure of any parts of the system at least one pair of brakes is available. If dismantled for any reason, the linkage should be re-set to the original setting as described in Sub-Section G.6.

TO ADJUST THE REAR BRAKES

Release the handbrake. The adjuster unit is mounted on the brake carrier plate and has a squared end on the adjuster screw protruding through the water excluder for spanning purposes (Fig. G.2).



Fig. G.2—Adjustment of Rear Brakes.

Four clicks can be felt for each complete turn of the adjuster screw. Turn the adjuster screw clockwise until considerable resistance is felt. Turn back anti-clockwise two "clicks". Repeat for the adjuster on the other side of the car.

It is not necessary to jack up the car. The shoes remain in light contact with the drum and a light rub when the brakes are off is normal. The handbrake should have approximately 3" of free travel.

If replacement shoes with new linings have been fitted the adjuster screw should be set back five "clicks" to allow for the initial growth of the linings. After a road test the brakes should be re-adjusted and the adjuster screws set back three "clicks". By the time a new adjustment is necessary the linings will have stabilised and the normal adjustment may be carried out.

TO BLEED THE HYDRAULIC SYSTEM

It is important that the following method of bleeding the hydraulic system is always employed as it has been found that air can be induced into the wheel cylinders via the screw thread of the bleed screws unless the bleed screw is closed on the return stroke of the master cylinder piston.

- (i) Fit a rubber bleeding tube to one of the front brake bleed screws and immerse the end in about 1" of brake fluid in a clean bottle.



Fig. G.3—Bleeding Front Brakes.

Check that the reservoir on the right-hand valance plate is full with Girling Crimson Brake Fluid.

- (ii) Using the lever (Tool No. RH.322 or RH.417) operate the master cylinder with a rapid and deliberate forward movement and at the same time

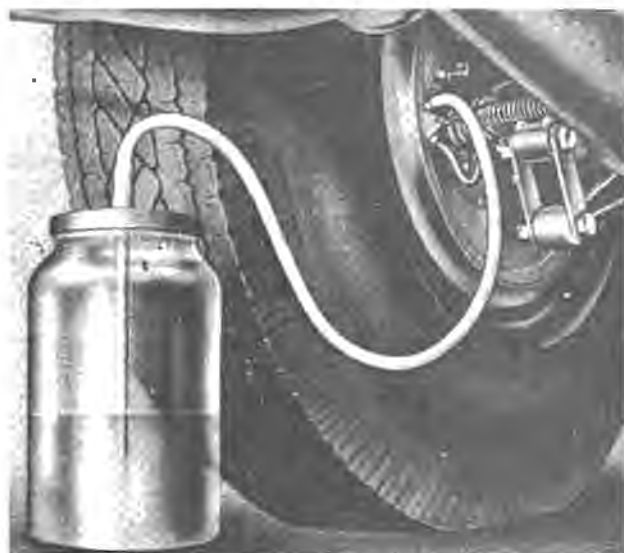


Fig. G.4.—Bleeding Rear Brakes.

- open the bleed screw. At the end of the forward stroke close the bleed screw, pull the lever right back and pause for 5 seconds to allow the master cylinder plunger to return under the influence of its return spring.
- (iii) Repeat the pumping action for about 10 cycles or until air bubbles no longer appear from the bleed tube, opening and closing the bleed screw and pausing for 5 seconds before commencing a forward stroke as in (ii).
- (iv) Repeat for the other front brake and the two rear brakes, topping up the supply reservoir as necessary.

On dual cylinder systems, it is essential to bleed both cylinders on each front wheel, since these are operated by separate master cylinders and are not inter-connected.

On single cylinder systems, it is necessary to bleed each front brake only at the point shown in Fig. G.3, as the two wheel cylinders are inter-connected.

The Wakefield Girling Pressure Bleeding Canister which gives a controlled pressure of not more than 30 lbs. per sq. in. may be used but other systems are not recommended due to the possibility of aeration of the fluid.

After bleeding a check must be carried out to ensure that the system is completely free of air.

TO CHECK THAT THE SYSTEM IS FREE OF AIR

Single Cylinder System

- (i) Ensure that the rear brakes are correctly adjusted.
- (ii) Operate the master cylinder with the lever (Tool No. RH.322) so that the shoes take up their operating positions. Draw back the lever and allow the master cylinder plunger to return fully.
- (iii) Fix a spring balance to the lever and operate the master cylinder with a pull of 100 lbs. as shown in Fig. G.5. Measure the length that the push rod has travelled from rest. In the rest position the on-stop bar (Fig. G.5) should be 1.60" from the edge of the master cylinder mounting bracket and the travel of the push rod with 100 lbs. pull on the lever (RH.322) must not exceed .85". If the travel exceeds this figure the brakes should be bled again and the test repeated.

LUBRICATION

The brake linkage clevis and fulcrum pins should be lightly lubricated with engine or penetrating oil every 5,000 miles.

The ball bearing cams which actuate the servo motor are packed with grease on initial assembly and require no attention between chassis overhauls.

Dual Cylinder System

- (i) Ensure that the rear brakes are correctly adjusted.
- (ii) Operate the master cylinder with the lever (Tool No. RH.417) so that the shoes take up their operating positions. Draw back the lever and allow the master cylinder plunger to return fully.
- (iii) Fix a spring balance to the lever and operate the master cylinder with a pull of 100 lbs. as shown in Fig. G.6. Measure the movement at the bottom clevis pin in the master cylinder lever ("K", Fig. G.6). Should the movement exceed 2.250", the brakes should be bled again and the test repeated.

LUBRICATION

The brake linkage clevis and fulcrum pins should be lightly lubricated with engine or penetrating oil every 5,000 miles.

Every 10,000 miles, the master cylinder balance lever pivot bearing (Fig. G.6) should be lubricated with Shell Retinax "A" Grease.

The ball bearing cams which actuate the servo motor are packed with grease on initial assembly and require no attention between chassis overhauls.

On dual cylinder systems, it is essential to bleed both cylinders on each front wheel, since these are operated by separate master cylinders and are not inter-connected.

Dual Cylinder System

Measure the forward movement of the master cylinder lever at the bottom clevis pin ("K", Fig. G.6) should this movement exceed 2.250" the brakes should be bled again and the test repeated.

Every 10,000 miles, the master cylinder balance lever pivot bearing ("M", Fig. G.6) should be lubricated with Shell Retinax "A" Grease.

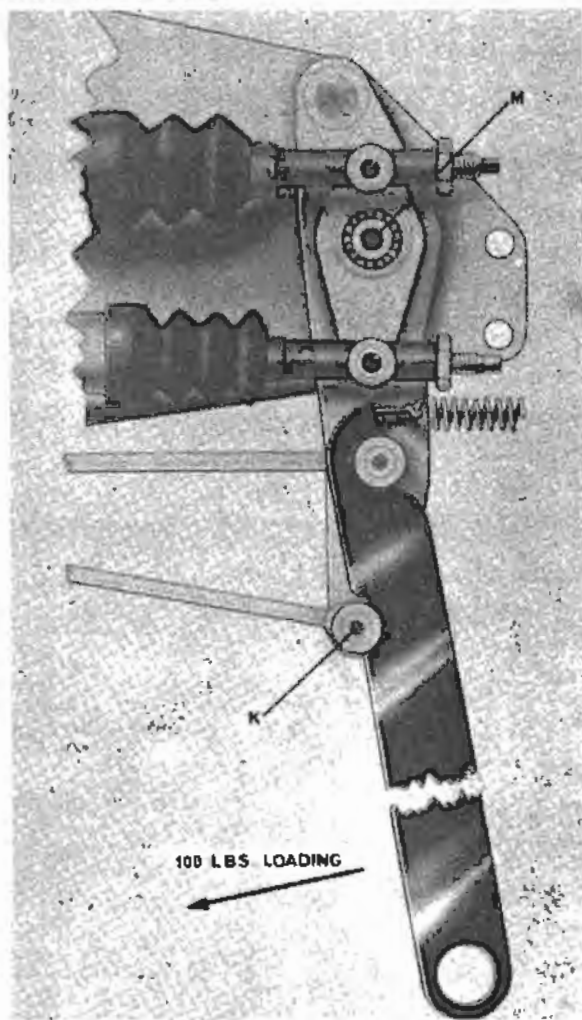


Fig. G.6.—Lever RH.417 in Position.

On single cylinder systems, it is necessary to bleed each front brake only at the point shown in Fig. G.3, as the two wheel cylinders are inter-connected.

Single Cylinder System

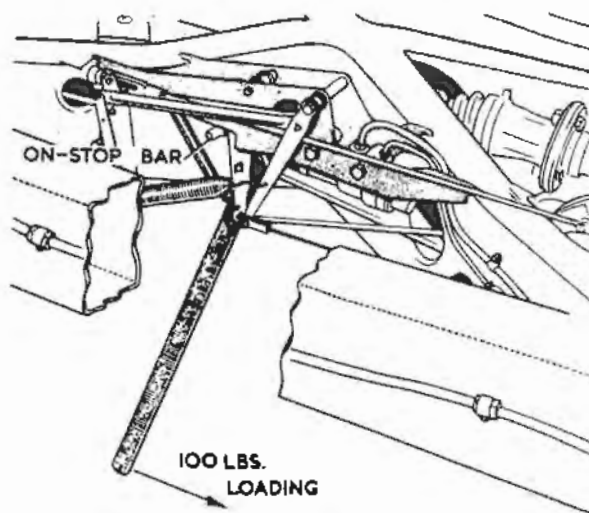


Fig. G.5.—Lever RH.322 in Position.

THE MASTER CYLINDERS

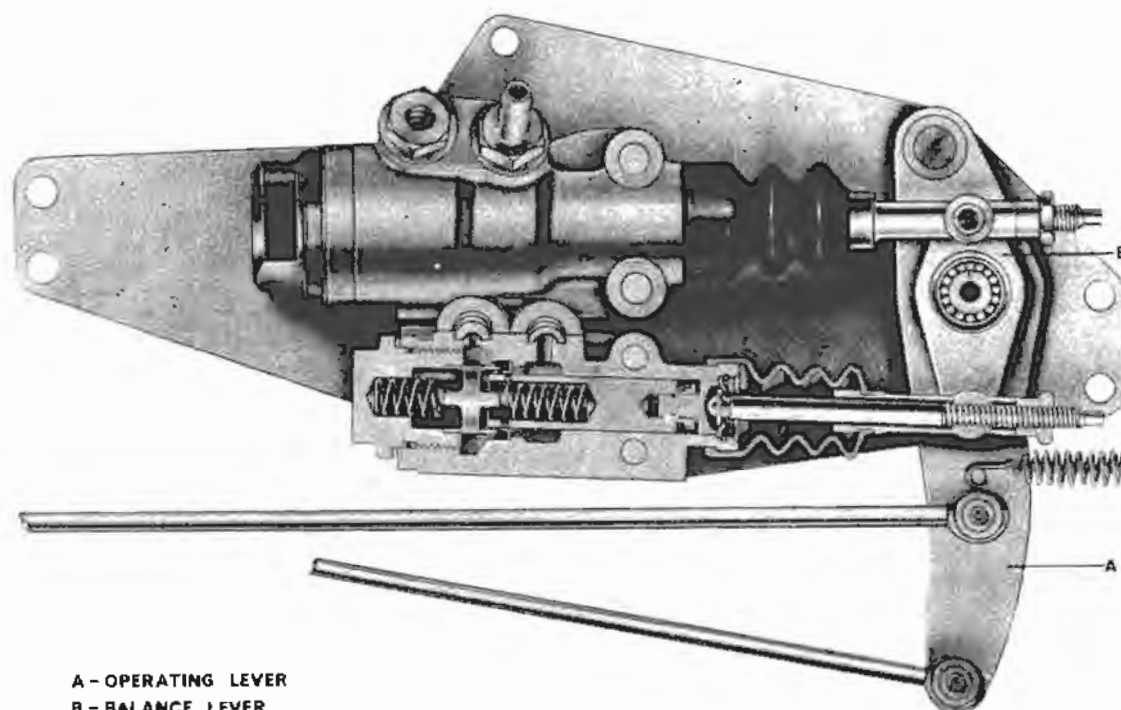


Fig. G.7.—Dual Master Cylinder.

Two Girling master cylinders are fitted to a bracket on the cruciform member, and are operated by drag links from the servo motor. On the RH wing valance are two separate fluid reservoirs, each of which is connected to a master cylinder by means of piping arranged to fall in such a manner that no air trapping takes place, and any air in cylinders or lines is expelled into the reservoirs.

Servo motor operation draws forward the master cylinder operating lever ("A", Fig. G.7). Pivoted on this is the balance lever to which is connected the two master cylinder push rods.

On the single cylinder system, the master cylinder push rod is connected direct to the operating lever.

In the rest position, the main seal floats forward

slightly, and two recuperating holes in the plunger are uncovered, permitting communication between wheel cylinders and reservoir. This prevents the build up of pressure differentials due to thermal expansion and contraction.

The initial movement of the plunger brings the recuperating holes forward of the main rubber sealing lip, after which further movement will produce a proportionate movement of the wheel cylinder plungers.

On brake release, the push rod is returned immediately by the operating lever return spring, but master cylinder plunger return is by means of the internal spring only. The plunger should contact the push rod retaining washer between one and four seconds after release.

TO REMOVE THE MASTER CYLINDER

Dual Cylinder System

Disconnect pipes and drain reservoirs. Disconnect return spring and servo rods from master cylinder operating lever. Disconnect handbrake cable and return spring from handbrake operating lever. Remove the pivot bolts and distance pieces from the handbrake operating and intermediate levers, to permit the levers, together with rods "A" and "C", to be lowered in order to gain access to the master cylinder carrier plates.

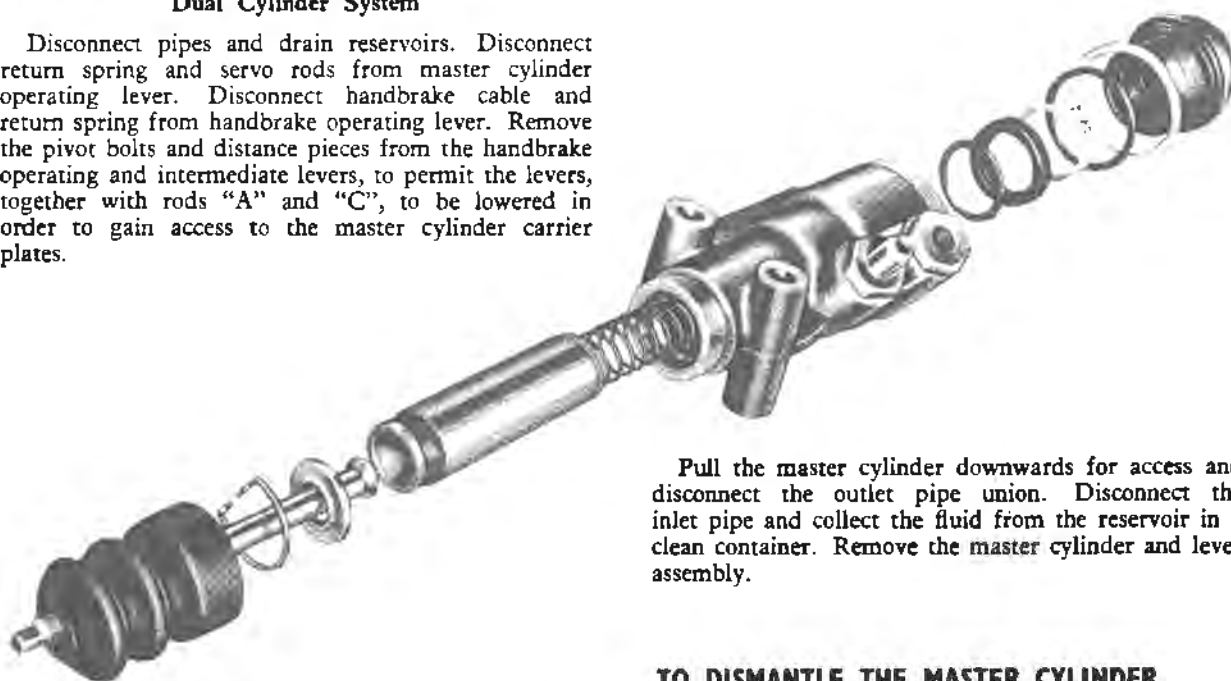


Fig. G.8.—Master Cylinder—Exploded View.

Remove the master cylinder operating lever pivot bolt and carrier plate upper securing bolt. Remove the remaining carrier plate setscrews and master cylinder mounting bolts, and withdraw the carrier plate, master cylinders and lever assembly.

Single Cylinder System

Disconnect lever return spring and servo motor drag links from master cylinder operating lever.

Remove operating lever fulcrum pin and the two through bolts securing the master cylinder to its bracket.

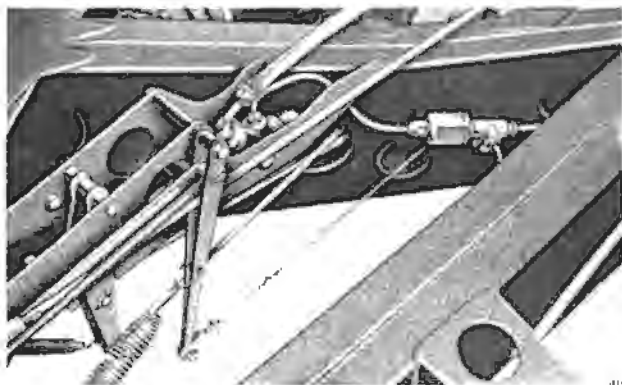


Fig. G.9.—Master Cylinder in Position.

Pull the master cylinder downwards for access and disconnect the outlet pipe union. Disconnect the inlet pipe and collect the fluid from the reservoir in a clean container. Remove the master cylinder and lever assembly.

TO DISMANTLE THE MASTER CYLINDER

Remove the rubber boot and the circlip retaining the push rod washer. Remove the push rod, plunger and spring.

Remove the end cap. This nut will be found very tight and will require a spanner or tommy bar giving about 2-foot leverage. The master cylinder should be held in a vice fitted with jaw protectors, clamping on the lugs for the fixing bolts.

INSPECTION

Extract the recuperating seal and seal shim.

Examine the bore of the master cylinder and the plunger for scoring. The plunger is chromium-plated and should be renewed if scored or worn. The master cylinder bore, if scored, should be renewed.

TO RE-ASSEMBLE THE MASTER CYLINDER

The importance of cleanliness when re-assembling units of the hydraulic system cannot be over-emphasised. All internal parts must be free from grease, grit and lint from cleaning rags. Parts should be freely lubricated with clean brake fluid during assembly.

Refit the seal shim, main seal, gasket and end cap. Tighten the end cap. Insert the plunger spring and plunger, and work the small seal carefully into the cylinder bore. Fit the push rod and circlip.

TO ADJUST THE MASTER CYLINDER PUSH ROD**Dual Cylinder System**

Adjust the upper cylinder push rod to 3.7" between its pivot centre on the balance lever and the master cylinder end face before refitting (Fig. G.10).

After refitting master cylinders and re-connecting linkage, take up all clearances on the lower cylinder push rod, by means of the adjuster, and then slacken back $\frac{1}{4}$ turn.

No "on-stop" adjustment is provided.

Single Cylinder System

Refit master cylinder to the frame.

Push the rear end of the rubber boot forward to give

access to the locknut and spannering flats. Release the locknut and shorten the push rod as far as possible so that there is slack between the end of the push rod and the plunger. The slack can be felt by moving the lower end of the operating lever gently backwards and forwards. Do not pull hard on the operating lever or the plunger will be forced along the cylinder, and as it returns slowly the subsequent adjustment may be false.

Lengthen the push rod until free movement at the lower end of the operating lever is just lost. Shorten the push rod one flat ($\frac{1}{4}$ turn) and lock up the nut. Refit the boot.

Adjust the on-stop bar to travel 1.600" before it contacts the edges of the master cylinder support bracket (Fig. G.9).

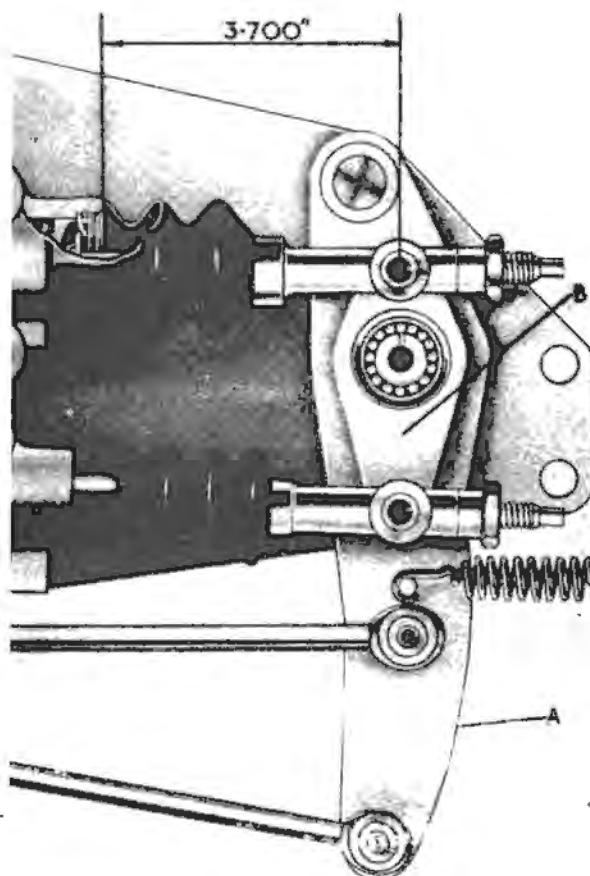


Fig. G.10.—Dual Cylinder Adjustment.

THE SERVO MOTOR



Fig. G.11.—Servo Motor—Exploded View.

The servo motor operates on the principle of the dry disc clutch. The lined friction plate (Fig. G.11) is driven from the gearbox final shaft at approximately one-fifth of the propeller shaft speed and is in continuous rotation whilst the car is in motion.

The pressure plate is freely mounted on a co-axial shaft and is brought into contact with the friction plate when the brake pedal is depressed, by means of cams and steel balls between the operating levers. The motion imparted to the pressure plate causes the pin to pick up one of the brake actuating levers, according to the motion of the car, forward or reverse, and to apply the master cylinder by means of the drag link and operating lever.

TO REMOVE THE SERVO

Remove the right-hand undershield. Disconnect the rods from the servo cam levers by removing the setscrews that retain the clevis pin retaining plates and

removing the clevis pins. Similarly disconnect the drag links from the servo brake actuating levers.

Remove the servo on-stop, to provide clearance.

Release the handbrake so that the cable is slack and may be lifted to give additional clearance.

Remove the centre bolt and remove the servo motor.

TO DISMANTLE THE SERVO

Remove the protector ring, and the spring plate.

Should difficulty be encountered in separating the surfaces sealed with Bostik adhesive, the application of trichlorethylene will assist dismantling.

Mount the pressure plate assembly vertically in a fibre-jawed vice, clamping on the inner end of the servo shaft. Remove the locknut and the adjusting nut and lift off the components from the shaft (Fig. G.11). Collect the three steel balls fitted between the servo cam levers. Lightly tap out the ball race from the pressure plate hub.

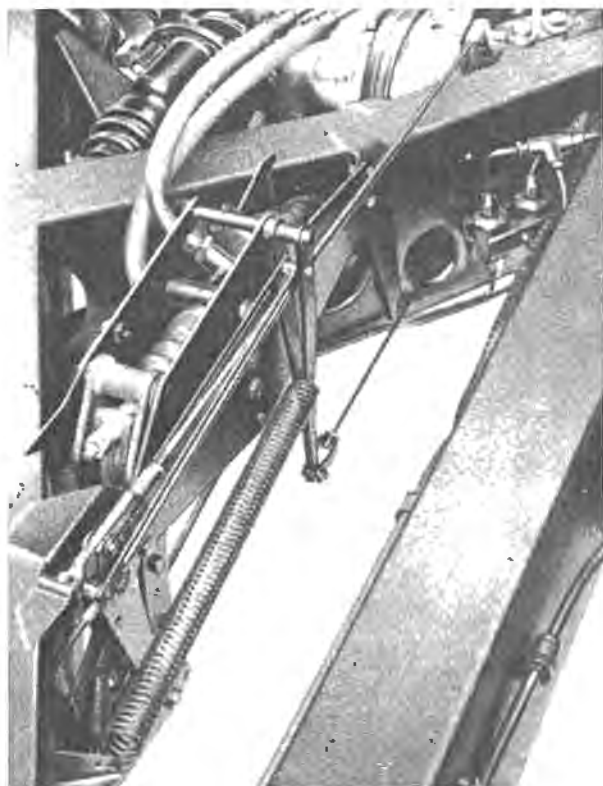


Fig. G.12.—Servo Motor and Actuating Rods.

INSPECTION

Thoroughly clean all parts and examine for wear. Examine the condition of the friction lining for wear. A glazed friction lining can cause inefficiency of the brakes.

Check the set of the spring plates behind the lining to be between .032" and .035" with feeler gauges inserted between the spring and the lining and between the spring and the friction plate (Fig. G.13). If below this limit a replacement assembly or new spring plates should be fitted. The spring plates are riveted to the friction plate.

If the pressure plate is scored it should be replaced. A bent or distorted spring plate should also be replaced.

TO RELINE THE FRICTION PLATE

Release the pressure of the Belleville washer by inserting a screwdriver between the inertia ring and the friction plate, as shown in Fig. G.14. Turn the screwdriver so that the ring and plate are separated and hold it in that position. Insert a second screwdriver between the ring and plate, diametrically opposite the first, and turn it. The Belleville washer will spring away from the inertia ring. Remove the screwdrivers.



Fig. G.13.—Checking Set of the Spring Plates.

Turn the inertia ring until the three access holes line up with three rivets. Drill the rivets to a depth of 1/16" with a 5/32" drill. Repeat for all the rivets and then punch them out with 1/8" diameter pin punch.

Apply a thin smear of Retinax "A" grease between the Belleville washer and the driving plate and, with a piece of string smeared in the grease, between the inertia ring and the driving plate. Do not allow any grease to contact the lining. Snap back the Belleville washer.

Fit the new lining by inserting and lightly swaging over two rivets opposite to each other to hold the lining in position. Insert and lightly swage the remaining rivets.

Finally swage over all rivets with a spigoted flat punch (Fig. G.15).

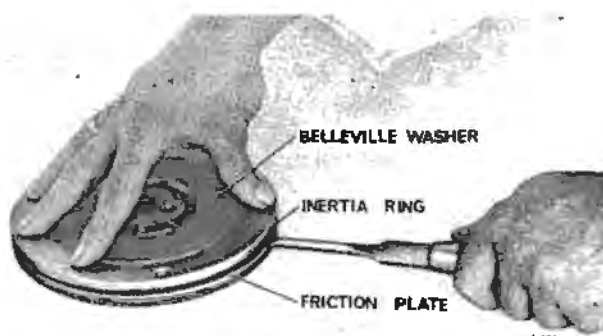


Fig. G.14.—Releasing the Belleville Washer.

It should now be possible to turn the inertia ring by hand. If the assembly feels quite solid even with considerable effort the Belleville washer should be renewed by drilling out the old rivets and re-riveting.

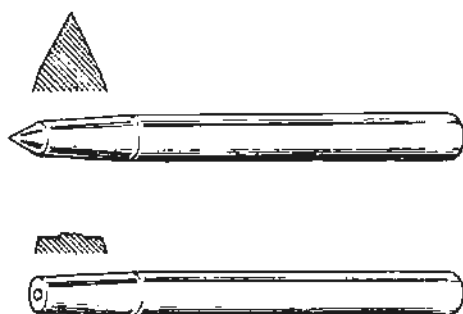


Fig. G.15.—Punches—Servo Relining.

SERVO SEALING

When re-assembling the servo, care should be taken to obtain complete re-sealing, as shown in Fig. G.16. On cars fitted with the earlier pattern pressure plate incorporating three ventilation slots, sealing should be carried out as illustrated in Fig. G.17 when re-assembling.

TO REFIT THE SERVO TO THE GEARBOX

Place the Ferodo sealing washer on the servo driving shaft.

If the Ferodo sealing washer on the servo motor spring plate ("A", Fig. G.11) has broken away a replacement spring plate assembly must be obtained. No attempt should be made to restick the washer to the spring plate as this is carried out by a special process.

Position the servo motor on the driving shaft ensuring that the three driving pins engage with the holes in the friction plate and the servo shaft flange. Insert and tighten the centre bolt.

Rock servo, to ensure that it is free. Slacken off adjusting nuts if necessary, and re-tighten centre bolt.

Reconnect the brake rods. Refit the on-stop and ensure that the handbrake cable is correctly positioned under the servo shaft, before replacing undershield.

SERVO CAM ANGLE

Should the servo motor be changed as a unit, or the cam levers be renewed, ensure that the correct cams are fitted. The single cylinder system cam angle is 52° ; these may be identified by the numbers "1126 FC" and "1127 FC" on the levers. The dual cylinder system cam angle is 47° ; there is no identification number on these levers.

Position according to the sequence of adjustment given in Sub-Section G.6.

Tighten the adjusting nut (Fig. G.11) until drag between the plates can just be felt on rocking the servo. Undo the adjusting nut two flats ($\frac{1}{2}$ of a turn) to free the servo. Apply the pedal once to ensure that the outer servo lever has followed back the adjusting nut. Hold the adjusting nut and tighten the locknut.

SERVO ON-STOP ADJUSTMENT

It is essential when refitting the servo on-stop bracket to ensure that it is correctly adjusted. With the actuating rod ("C", Fig. G.1) disconnected, by leaving out the clevis pin from the rear equaliser, place a 1.250" distance piece between the rear end of the operating rod "A" and its off stop. Position the on-stop bracket in contact with the outer servo cam lever and tighten the clamping bolts to locate in this position.

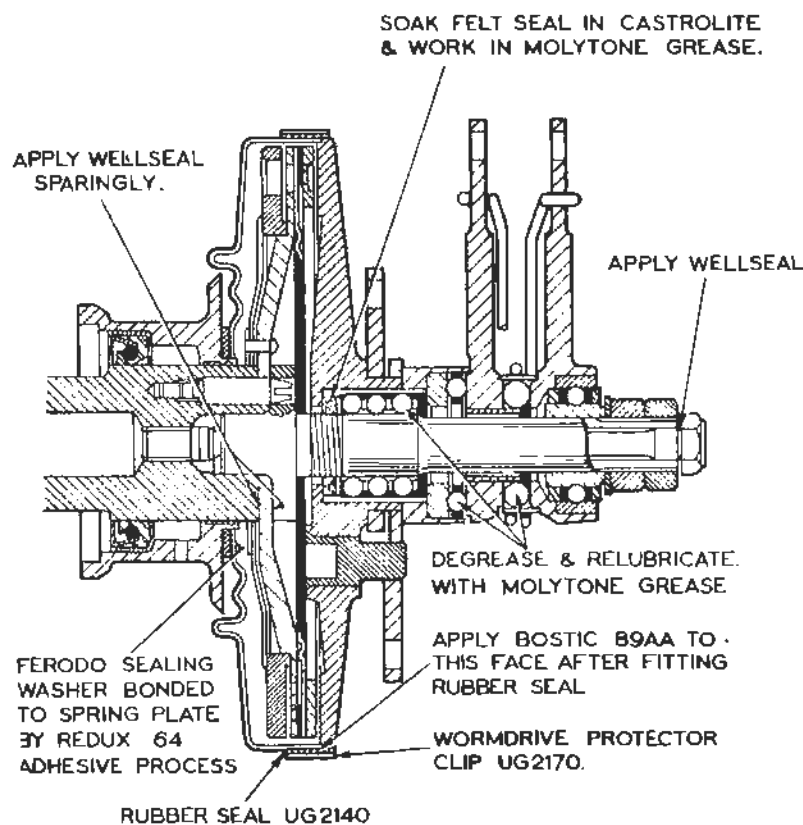


Fig. G.16.

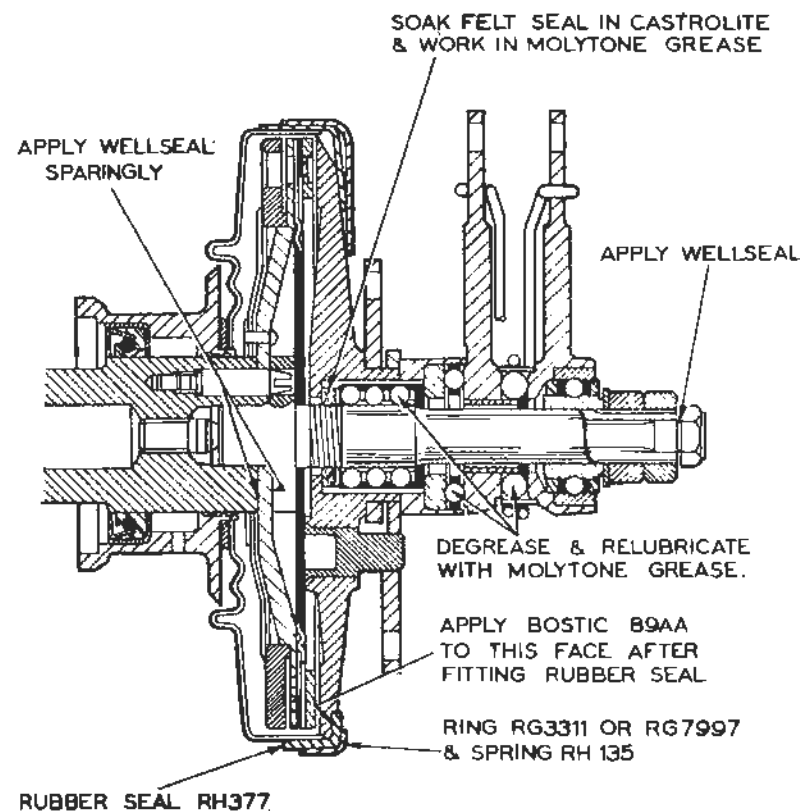


Fig. G.17.

Servo Assemblies.

BRAKE SHOES, DRUMS AND EXPANDER MECHANISM

Special Tool required:—

Spring Balance—30 lbs. reading.

RH.627—Trammel.

Replacement shoe and liner assemblies are available and should always be fitted when relining is necessary.

The front shoe operating fork of the dual cylinder system has a larger jaw than on the single cylinder system, to accommodate the stiffened web of the later pattern shoe. Shoes are interchangeable only if the operating forks also are changed.

When relining due to wear, as a normal service replacement, it is recommended that the following operations should be carried out:—

1. Fit replacement shoes.
2. Overhaul wheel cylinders and fit new rubber seals.
3. Overhaul the master cylinder and fit new rubber seals.
4. Dismantle, clean and grease the rear adjusters.
5. Renew the flexible brake hoses. In the interests of safety, it is recommended that these hoses are changed every 40,000 miles.

FRONT BRAKES

TO DISMANTLE

Remove the wheel and brake drum. If the drums are tight, screw two $\frac{1}{4}$ " U.N.F. bolts into the tapped extraction holes provided.

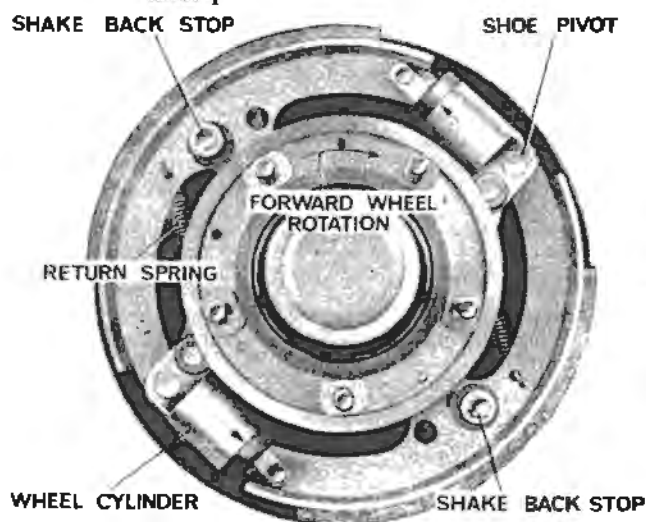


Fig. G.18.—Front Brake—Drum Removed.

Pull the shoes away from their steady posts and out of the wheel cylinder rubbers. Pull the shoes out of the anchor slots in the back of the wheel cylinders. Unhook the pull-off springs from the shoes and remove the shoes.

The wheel cylinder rubber seals may be removed without removing the cylinders by removing the dust covers and extracting the internal parts (Fig. G.21).

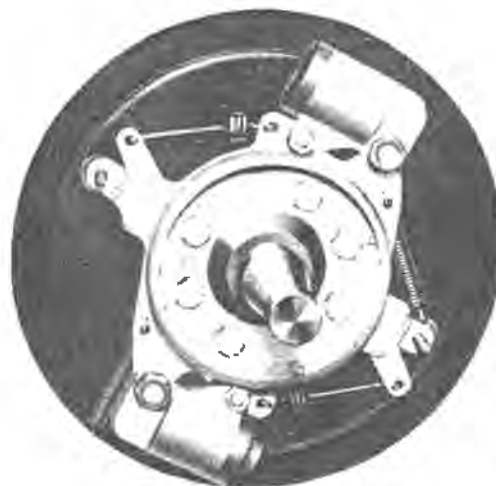


Fig. G.19.—Front Brake—Hub and Shoes Removed.

On early cars, aluminium wheel cylinders were fitted. No attempt should be made to overhaul these; all aluminium cylinders should be replaced with the later cast iron pattern, when attention to cylinders is required.

On cars produced prior to the introduction of check valves, spreaders were not fitted to wheel cylinders. Retrospective action was taken to instal check valves on all cars, and on these spreaders should be fitted, when attention to the cylinders is required. Cylinders incorporating spreaders may be identified by the letter 'S' stamped on the casing.

Any car not fitted with check valves should be modified as detailed in the appropriate Bulletin.

Check the wheel cylinder bores for scores and corrosion and replace if necessary. Renew the paper gaskets and locking strips if removed.

Renew the rubber seal, smearing the piston with Molytone C grease.

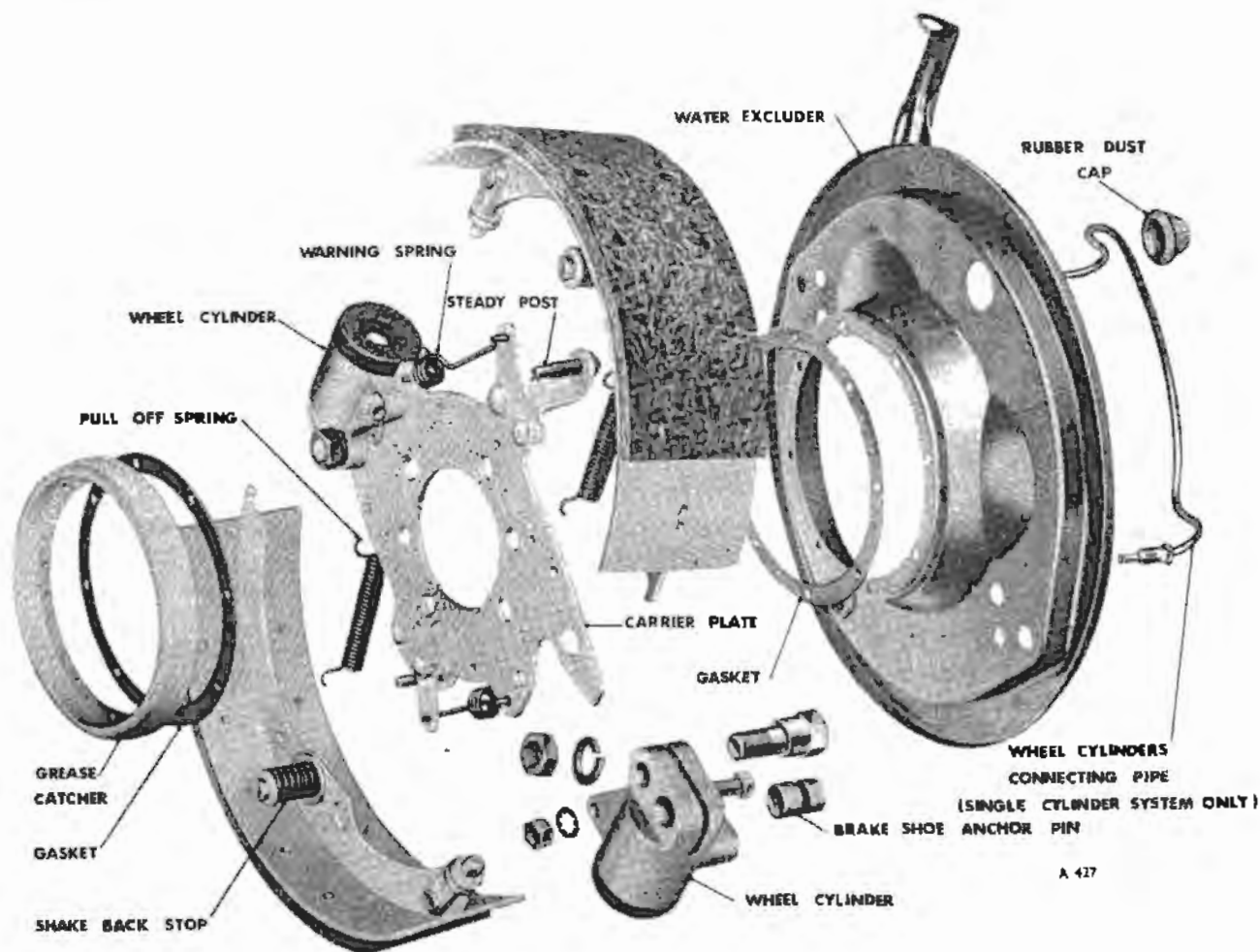


Fig. G.20.—Front Brake—Exploded View.

When reassembling, do not fully tighten cylinder mounting bolt until shoes have been centralised.

THE SHAKE-BACK STOPS

The shake-back stops prevent the shoes from shaking away from the drum, when travelling over rough surfaces. The stops consist of two unpolished chromium-plated washers held either side of the shoe web by a collar and loaded by a spring as shown in Fig. G.22. The stop is free to slide in the slot in the web against the frictional resistance of the washers. With the shoes assembled to the carrier plate, the shake-back stop collar fits over the steady post and on brake application the shoe web can slide between the friction washers to position the stop so that the zero clearance between shoe and drum is maintained. The radial clearance between the steady post and collar allows the operating movement for the shoes.

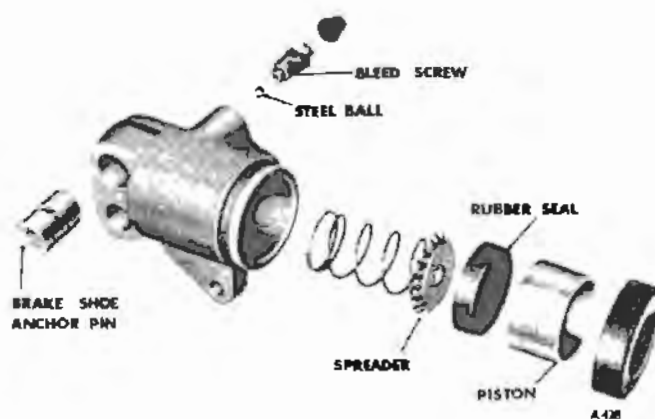


Fig. G. 21.—Wheel Cylinder—Exploded View.

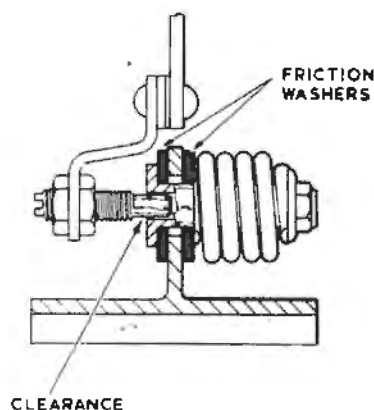


Fig. G.22.—Shake-Back Stop.

When fitting replacement shoes the slipping poundage of the shake-back stops should be checked with a spring balance to be within 20—30 lbs. Hold the shoe vertically in a vice and connect up the spring balance with a suitable wire hook, so that one end fits into the shake-back stop collar. Pull on the spring balance so that the direction of pull is parallel to the shoe web and along the centre line of the slotted hole. Note the spring balance reading at which the shake-back stop commences to move. If the poundage is outside the limits fit new washers or spring as necessary. No grease or lubricant of any kind should be used on the stop assembly.

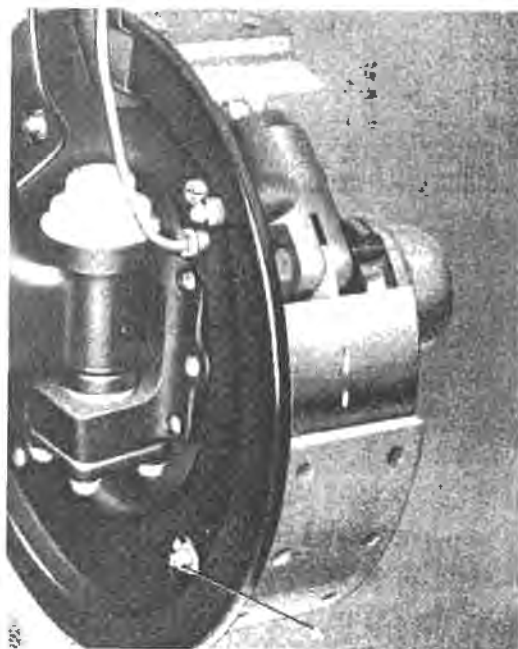


Fig. G.23.—Front Brake—Rear View.

Ensure that the steady posts are correctly entered into the shake-back stop collars.

In order to give more positive engagement, the steady posts were increased in length, and where replacement shoes have been fitted it is essential that steady post and shake-back stop are a pair. The early pattern post with short nose permits the end of its thread to take the thrust of the later pattern shake-back stop collar. It is essential that there is a small clearance between thread and collar, as shown in Fig. G.10.

Check that the lining faces are at right angles to the hub flange. The check may be made with trammel RH.627, or a parallel bar and a set square as shown in Fig. G.30 for the rear shoes; adjustment is made by screwing the steady posts in or out as necessary. Remove the dust cover in the back of the water excluder and release the steady post locknut just sufficiently to permit rotation of the post. Adjust the steady post by the screwdriver slot provided in its end and tighten the outside locknut with a box spanner whilst holding the steady post with the screwdriver placed through the spanner. Pull the shoe forward away from the carrier plate and tighten the inside locknut on the steady post. On later models the inside locknut is welded to the steady post bracket and does not therefore require tightening.

Press both shoes inwards and temporarily replace the drum, taking care that the shake-back stops are not pulled off their steady posts.

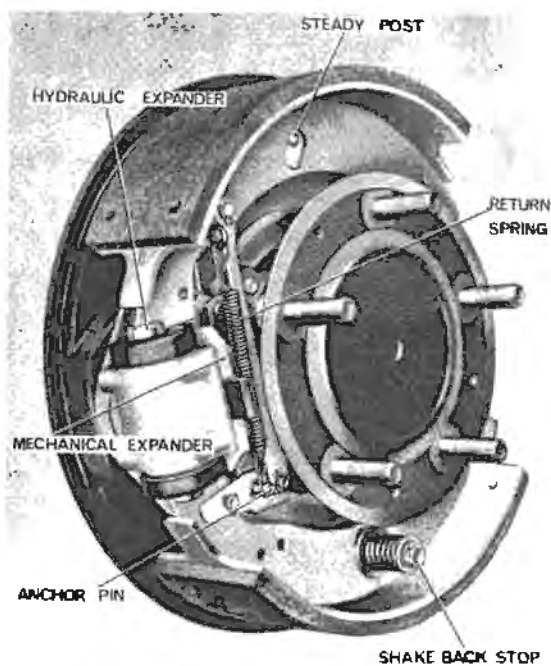


Fig. G.24.—Rear Brake—Drum Removed.

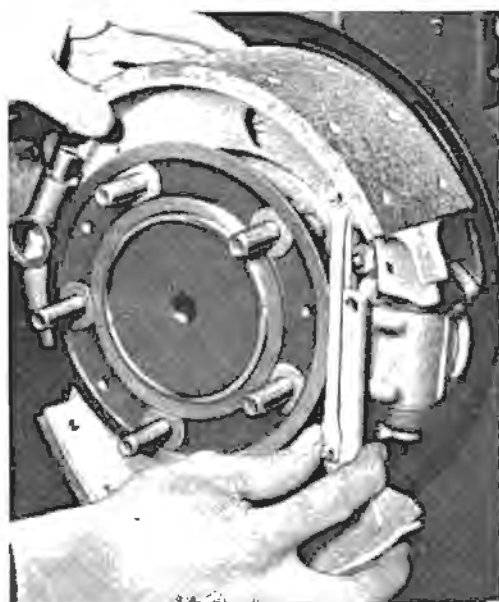


Fig. G.25.—Rear Brake—Removing Shoes.

When all cylinders, shoes and drums are re-assembled, apply the brakes by means of the Test Lever RH.322 or RH.417 to centralise the shoes. Remove the front drums, tighten cylinder mounting bolts, and finally refit drums.

REAR BRAKES

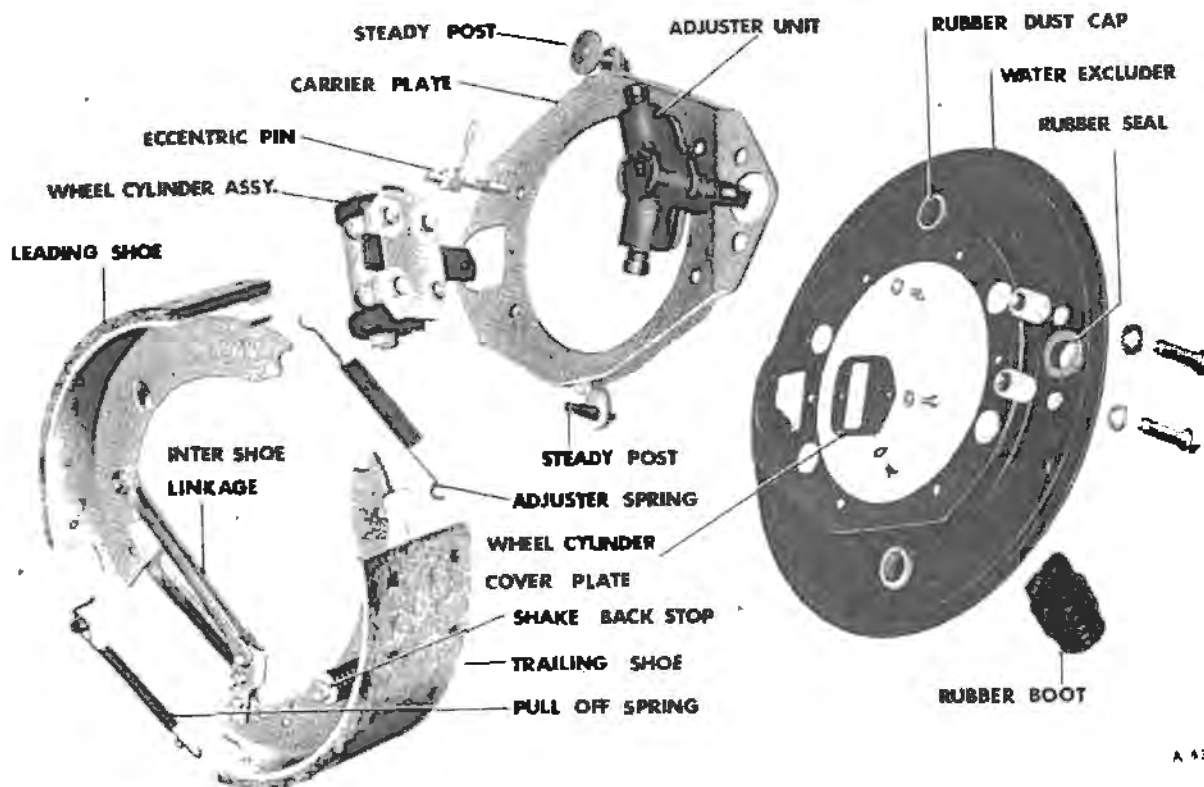
DISMANTLING

Remove the wheel and brake drum. If the drum is tight, screw two ¼" U.N.F. setscrews into the tapped extraction holes provided.

Pull the shoes away from their steady posts and out of the adjuster plungers. Unhook the return spring adjacent to the expander from its anchor pin on the inter-shoe linkage. A loop is provided in the spring for gripping with pliers.

Remove the shoes, working the inter-shoe linkage out between the expander unit and hub (Fig. G.25).

Disconnect the hydraulic pipe at the expander unit. Release the lock tab and remove the 2 BA setscrew securing the expander unit to its cover plate on the water excluder. Remove the expander unit forwards.



A 433

Fig. G.26.—Rear Brake—Exploded View.

Remove the two setscrews and plain washers retaining the adjuster unit and remove the unit, collecting the distance pieces fitted between the water excluder and carrier plate.

TO OVERHAUL THE EXPANDER UNIT

On early cars, aluminium wheel cylinders were fitted. No attempt should be made to overhaul these; all aluminium cylinders should be replaced with the later cast iron pattern when attention to cylinders is required.

On cars produced prior to the introduction of check valves, spreaders were not fitted to wheel cylinders. Retrospective action was taken to instal check valves on all cars, and on these, spreaders should be fitted when attention to the cylinders is required.

Any car not fitted with check valves should be modified as detailed in the appropriate Bulletin.

Remove the dust covers and extract the pistons, rubber seals and spreaders. Remove the four 2 BA nuts, shakeproof and plain washers and remove the tappet guide (Fig. G.27).

Thoroughly clean all parts and inspect for wear.

Renew the rubber seal, smearing the pistons with Molytone C grease.

Inspect the wheel cylinder bore for scoring and corrosion and replace if necessary.

Lubricate the wheel cylinder parts liberally with clean brake fluid and re-assemble.

Re-assemble the mechanical expander, applying Molytone grease freely to the internal parts.

Check the clearance between sandwich plate and draw link. This was increased from a min. of .011" to a min. of .031" as a precaution against seizure, and longer distance pieces should be fitted if this has not been carried out, as detailed in the appropriate Bulletin.

It should be noted that the expander unit for the right-hand side of the car has a straight draw link but that the unit for the left-hand side has a bent draw link in order to obtain a straight pull from the rear equaliser.

TO OVERHAUL THE ADJUSTER UNIT

Remove the plungers, noting that they are handed and must be replaced in their original bores on re-assembly. Screw in the adjuster screw and remove (Fig. G.28).

Thoroughly clean all parts and re-assemble in white grease. If the plunger ends are pressed in against the adjusting cone there should be four evenly spaced "clicks" for each turn of the adjuster screw.

TO REFIT THE SHOES

Turn the adjuster screw fully anti-clockwise. Fit the return spring at the adjuster end of the shoes. Position



Fig. G.27.—Expander Unit—Exploded View.

the shoes against the back plate working the inter-shoe linkage between the hub flange and the expander unit. Fit the shoes into the expander slots and the compression link of the inter-shoe linkage onto the eccentric pin. Fit the shoes into the adjuster slots, ensuring that the shake-back stop of the lower trailing shoe fits over its steady post. Refit the return spring at the expander end of the shoes. The top end of the spring is retained by the wire hook which passes through the top shoe and hooks into the wire loop attached to the eccentric pin. A loop is provided in the spring for gripping to stretch the lower end down on to the anchor pin on the inter-shoe linkage.

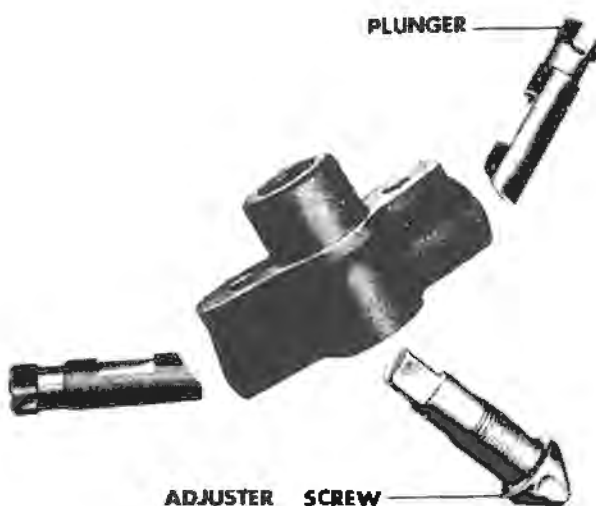


Fig. G.28.—Adjuster Unit—Exploded View.

TO SET THE SHOES

Check that the lining faces are at right angles to the hub flange with trammel RH.627 or a parallel bar and set square as shown in Fig. G.29.

Do not fully tighten adjuster unit setscrews until this adjustment has been carried out.

Adjustment can be made by screwing the steady posts in or out. Remove the dust cover in the back of the water excluder and release the steady post locknut. Adjust the steady post by the screwdriver slot provided in its end and tighten the locknut with a box spanner whilst holding the steady post with the screwdriver placed through the spanner. Pull the lower shoe away from the carrier plate and tighten the inside locknut on the steady post. On later models this nut is welded to the steady post bracket and does not require tightening. The mushroom headed steady post for the leading shoe has no inner locknut.

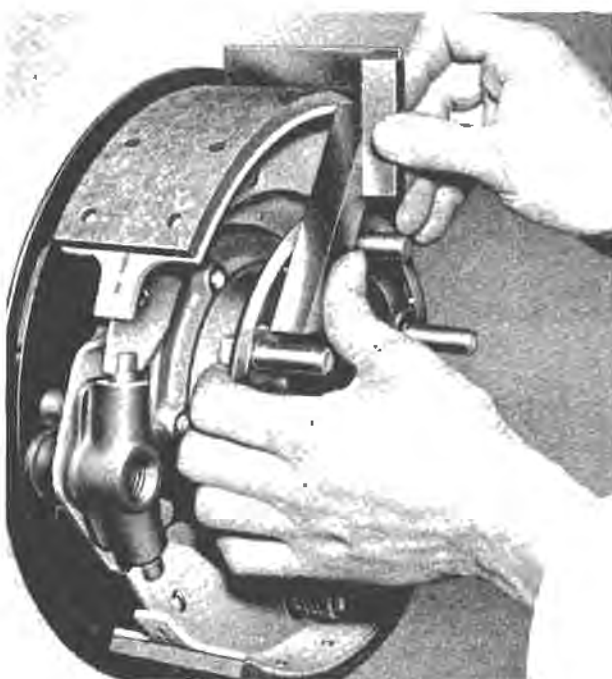


Fig. G.29.—Aligning the Brake Shoes.

Slacken the adjuster unit setscrews slightly and the eccentric pin lock nut (see Fig. G.2). The latter should not be slackened more than half a turn, or just sufficient to permit the pin to be turned by means of the inlet valve adjusting spanner provided in the tool kit.

Temporarily replace brake drum, and disconnect the rear end of rod C from the rear brake equaliser. Tighten the adjuster screw to centralise the adjuster unit by expanding the brake shoes, and tighten the adjuster setscrews. Slacken off the adjuster screw two clicks, remove drum and adjust eccentric pin to obtain final centralising of the shoes, using trammel RH.627. Tighten pin lock nut.

In cases where the trammel is not available, the eccentric pin must be adjusted with the drum in position. The pin should turn about 45° in either direction when a positive stop will be felt as the shoes are expanded against the drum. If the pin appears to toggle over when turned in either direction, tighten the adjuster screw one click and repeat. Set the pin midway between its stop positions and tighten locknut.

The adjuster screw is normally adjusted two clicks back, but when new linings have been fitted this should be increased to five clicks to allow for their initial growth during road test.

Reconnect the brake actuating rod and refit the pull-off spring and rubber boot.

Bleed the brakes.

BRAKE DRUMS

It is permissible to regrind brake drums to remove scores or ovality in accordance with the following data.

Standard internal diameter of brake drum 11.250"

Grinding limit050" oversize.

HANDBRAKE RATCHET ASSEMBLY

This assembly, which is of the twist-to-release type, incorporates two ratchet pawls which provide lock positions at half the pitch of the ratchet teeth. Two rollers running in guide slots, and a coil spring, carry the forward end of the ratchet slide and retain the slide rod in the normal position for ratchet engagement (see cut-away view, Fig. G.30).

The ratchet pawls may be eased and lubricated should the necessity arise. In the event of the inner cable bracket loosening, it is possible to tighten the clamping bolt through the forward end aperture.

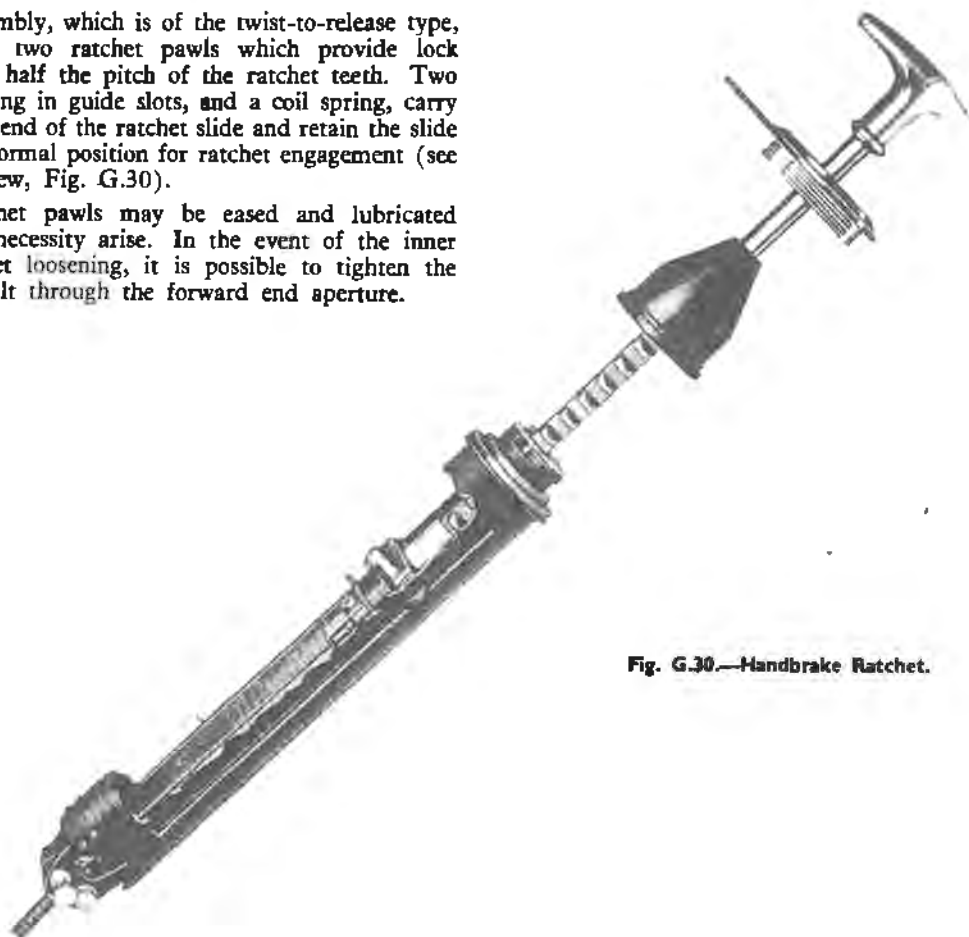


Fig. G.30.—Handbrake Ratchet.

BASIC ADJUSTMENT OF BRAKE RODS AND LINKAGES

Refer to Fig. G.1, and disconnect the following:—

1. Pedal return spring V.
2. Handbrake cable and return spring from lever N.
3. Front end of handbrake transfer link, from lever N.
4. Front end of rods A and B and rear end of rod C.
5. Pin W (rod Z) L.H. cars only.
6. Rod return springs from rear brake back plates Y.

Slacken the bolts retaining on-stop R to the frame, and tighten the rear brake adjusters to lock the rear brakes.

A Rod Adjustment

With rear end of rod in contact with its off-stop, adjust clearance between servo lever J and frame to .200"—.300".

Adjustment of on-stop R

With a 1.250" distance piece between the rear of rod A and its off-stop, and the on-stop in contact with servo lever J, lock in position. The continued operation of the hydraulic system in the event of failure of the mechanical rear brake operation, will depend on this adjustment, and it is essential that this is correctly carried out.

Z Rod Adjustment—L.H. cars only

Adjust rod to nearest turn of yoke to give 19.875" between pin centres.

B Rod Adjustment

With rod A held rearwards on the off-stop, adjust rod B so that the seal on the pedal stem is compressed approximately .200" by contact with the pedal gap plate.

C Rod Adjustment

Adjust to eliminate all free movement without tensioning rods. In some cases it may be found that there is insufficient thread on this rod to permit adjustment of the fork piece. In this case the rear end of the C rod should have its screw thread extended by a $\frac{1}{4}$ " with a .250" Dia.—U.N.F. Die.

Check to ensure that no foul occurs between the end of the rod where it protrudes through the fork piece and the equaliser lever when the brakes are fully applied. If a foul occurs, the C rod should be shortened by cutting a $\frac{1}{4}$ " off the rear end.

Readjust the rear brakes as detailed in sub section G.3.

Handbrake Adjustment

Connect handbrake cable and return spring.

Adjust the cable at the abutment T, to give $\frac{1}{4}$ " free movement of cable before rod C moves.

Adjust master cylinder and servo as detailed in Sub-Sections G.5 and G.4.

**SUSPENSION,
SHOCK DAMPERS,
PIVOT PINS
AND STUB AXLES**

SECTION H**SUSPENSION AND SHOCK DAMPERS****SUB-SECTION**

Front Suspension—Description and Operation—Data— Standing Height—Toe-in—Castor—Camber— Geometric Correction of Ball Pin Relative Height	... H.1
Front Hubs—Replacement of Hub Bearings	... H.2
Stub Axles and Pivots—Removal and Replacement— Lubrication	... H.3
Road Spring (Front)—Removal and Replacement	... H.4
Upper and Lower Triangle Levers and Yoke— Removal and Replacement—Replacing Lower Yoke Pin—Replacing Fulcrum Pins or Bushes Lubrication	... H.5
Rear Suspension—Description and Data—Rear Spring Standing Height—The 'Z' Bar	... H.6
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Shock Dampers—Description—Removal—Dismantling— Rebuilding—Refitting—Testing and Adjustment— Ride Control	... H.8

FRONT SUSPENSION

DESCRIPTION AND OPERATION

The independent front wheel suspension system consists of two upper and two lower radius arms (triangle levers), of different lengths, set at a trailing angle, with open type coil springs mounted between the frame and the lower radius arms as illustrated in Fig. H.1.

The upper radius arms are directly connected to, and constitute the arms of the double-acting hydraulic shock dampers, which damp the movement of the springs. The lower radius arms are attached by threaded bearing blocks to fulcrum brackets bolted to the underside of the front frame cross-member.

The yokes carrying the stub axles are mounted between the outer ends of the lower and upper radius arms by means of threaded bearing blocks, one at the top and two at the bottom.

The front springs have a poundage rating of 1460—1560 lbs. at 9.550". Steel washers of 5.375" diameter are fitted on the top of the coil springs, which permit adjustment to be made to the standing height. As many

as seventeen washers may be fitted on each coil spring.

Provision is also made for the adjustment of castor and camber angles if necessary.

Rubber bump stops are bolted to the underside of the upper radius arms and also to the frame to cushion the effect of extreme travel of the upper and lower arms.

A transverse stabiliser bar is fitted ahead of the radius arms and is mounted to the frame on three rubber cushioned blocks, the outer ends of the bar being connected to the lower radius arms by means of steel links carried in rubber bushes.

All bearings on the front suspension unit are lubricated under pressure from the Centralised Chassis Lubrication System. The lubricant is fed to the pivot pin bearings, outer track rod ball joints, and outer fulcrum bearings through drillings in the yokes and pivot pins. The lubricant enters the yoke through a flexible rubber pipe. Inner fulcrum bearings are fed through a drilled lower fulcrum bracket, which is supplied with lubricant by a pipe fed from a distribution block on the inside of the frame, behind the front cross-member.

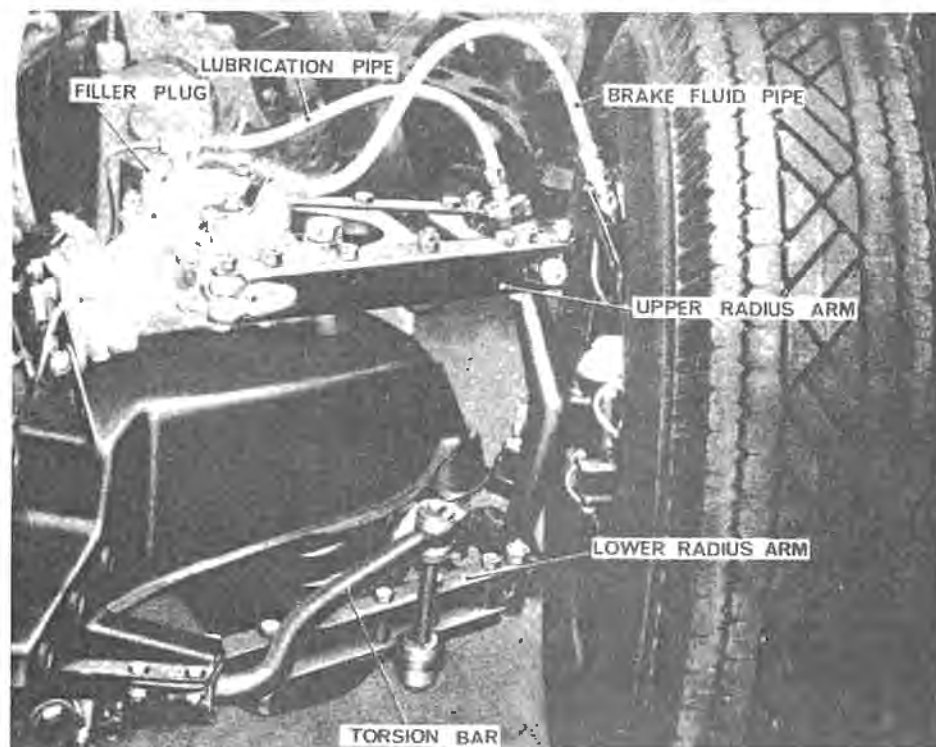


Fig. H.1.—Front Suspension Details.

FRONT SUSPENSION DATA

Camber Angle	...	Zero.
Castor Angle	...	$\frac{1}{2}^{\circ}$ to 1° Negative.
		Difference between two sides not to exceed $\frac{1}{4}^{\circ}$.
Toe-in	...	$1/16''$ — $5/32''$.
Pivot Pin Inclination		$4\frac{1}{2}^{\circ}$ at Zero camber angle.

STANDING HEIGHT

The standing height must be checked whenever a front coil spring has been replaced.

The car must be on a level floor with the tyres inflated to the correct pressures.

With the car in the unladen condition, i.e., without driver, passengers or luggage but with five gallons of petrol in the tank, point "A", Fig. H.2, should be .600"—1.200" above point "B".

With the car in the fully laden condition, points "A" and "B" should be horizontal.

Adjustment of standing height is provided for by special washers between the rubber seat on the spring top spigot and the flat end of the spring. There are no adjusting washers fitted on the bottom of this type of spring, as was the case in previous models.

When measuring front suspension standing height, the front of the car should be pressed down and gently released and readings taken. The front of the car should be then raised by hand and released gently, and a second set of readings taken. These two sets of figures should be averaged for comparison with the figures given above.

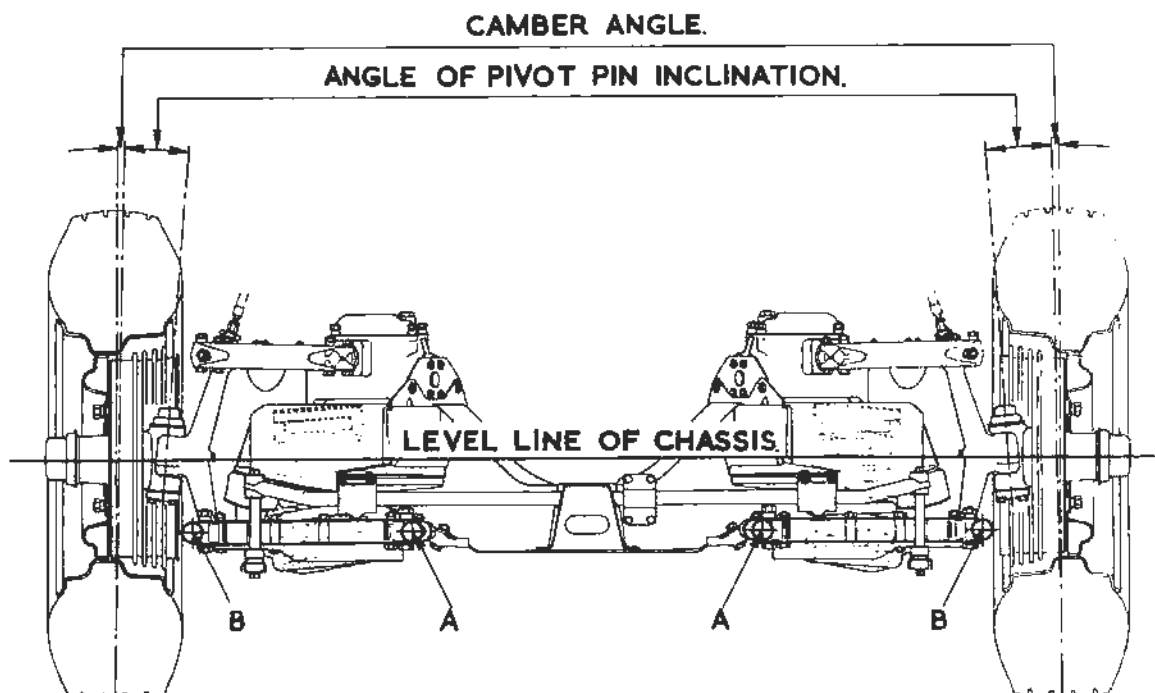


Fig. H.2.—Front Standing Height.

TOE-IN

To measure—the car should be set on a level floor with the front wheels in the straight ahead position. The car should then be rolled forward, not less than half a turn of the wheels, and a first measurement taken, with a standard optical alignment gauge.

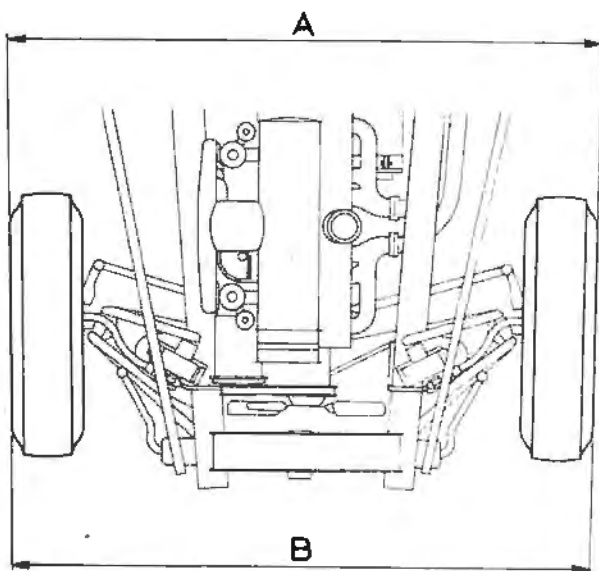


Fig. H.3.—Toe-in.

The car should then be rolled forward a further half a turn of the front wheels and a second measurement taken. The true toe-in is the average of these two readings. Rolling the car rearwards instead of forwards will give an incorrect reading.

Adjustment is obtained by removing the track rod outer ball joint from the side steering lever, slackening the pinch bolt on the outer end of the track rod and screwing in or out as necessary. Where more than one turn is necessary to obtain the desired adjustment, the number of turns should be equally divided between both track rods. Both track rods should be so adjusted to centralise the steering wheel in the straight ahead position.

CAMBER ANGLE

The camber angle should be checked with the car on a level floor in the unladen condition, and with the tyres inflated to the correct pressures.

Before measuring the camber angle of the front wheels both ends of the car should be pushed down and gently released. This will prevent friction in the suspension linkage from holding the car in a rolled position.

Adjustment is by moving the upper triangle arms in elongated slots provided in the upper fulcrum pin blocks, by slackening bolts "A" (Fig. H.4).

Should the camber angle be changed by adjustment as above, the castor angle will also be changed by approximately .4 of the change of the camber angle. If the camber angle is made more positive the castor angle also moves in the same direction.

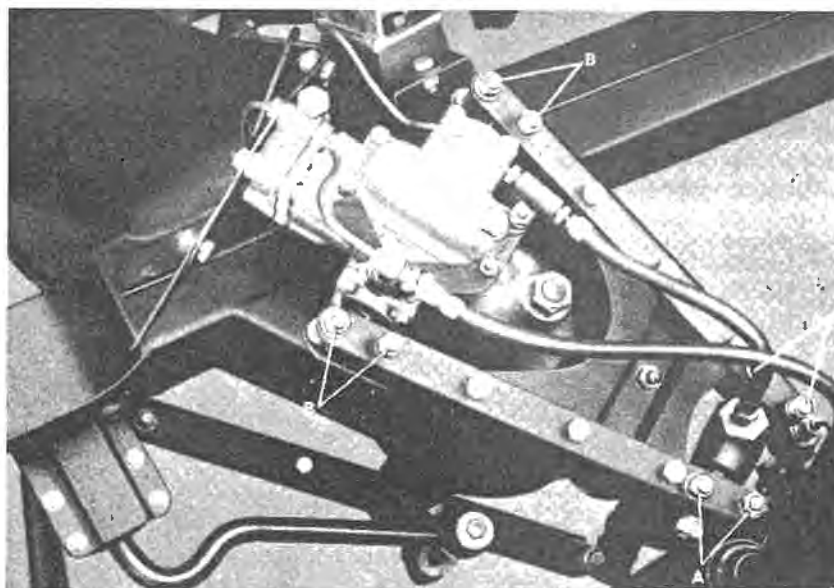


Fig. H.4.—Camber and Castor Adjustments.

CASTOR ANGLE

Special Tools Required:—

RH.197—Castor Angle Checking Gauge.



Fig. H.5.—Castor Angle Checking Gauge.

Castor is the forward or backward angle of inclination of the pivot pin in relation to the vertical, see Fig. H.6.

To check the castor angle, the car should be set on a level floor. The gauge (RH.197) should be placed on the chassis frame side member, lengthwise along the member, a suitable point, accessible from underneath is opposite the centre of the cruciform where there is approximately an inch and a half space between floor and frame. Unlock screw "A" and set spirit level to zero.

Remove gauge and insert long end as illustrated in Fig. H.6, between lower flat face of the stub axle and the pivot pin housing of the yoke.

Unlock screw "B" and move pointer to bring spirit level to zero. Read off position of pointer on scale, marked in half degrees on side of gauge, for castor angle.

Adjustment is effected by the lateral movement of the upper triangle arms on the front damper shaft. Slacken off bolts "B", Fig. H.4, and position arms on shaft as necessary.

Should the castor angle be altered by adjustment as above, the wheel camber will also be altered. If the castor angle is made less negative the wheel camber is made more positive by approximately .4 of the castor angle change.

Adjustments to either castor or camber also change

the height of the side steering lever ball pins and thus affect toe-in.

GEOMETRIC CORRECTION OF BALL PIN RELATIVE HEIGHT

Ball pins with necks of varying lengths are used to adjust the steering geometry to ensure that the alignment of the front wheels may be retained within prescribed limits during the vertical oscillations of the front suspension.

The correct length of ball pin will have been fitted on production, and it is necessary to ensure that the same length of ball pin is used should replacement ever be necessary.

Replacement with the incorrect length ball pin may cause an increase in car shake or the steering to pull more during high speed driving over uneven roads.

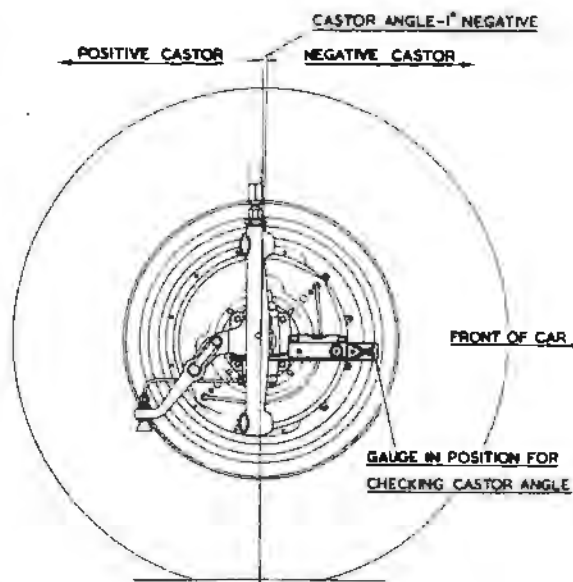


Fig. H.6.—Castor Angle.

Castor and camber angles should be verified before the adjustment is attempted.

Lock the centre steering levers in the straight ahead position by using the Special Tool, as shown in Fig. H.7.

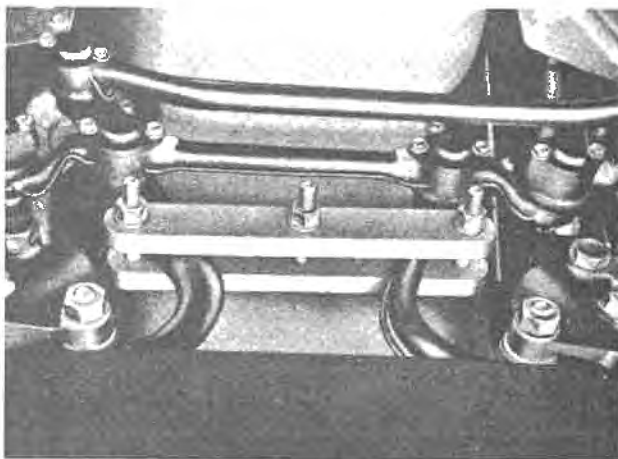


Fig. H.7.—Steering Levers—Locking Tool.

Put front wheels on turntables which have lateral freedom, to cope with the alterations in car track.

Put sufficient weight on front of car to bring front suspension in light contact with rubber bump stops. Sand bags may be used on the front fenders in this purpose, after fenders have been covered to protect the paint work.

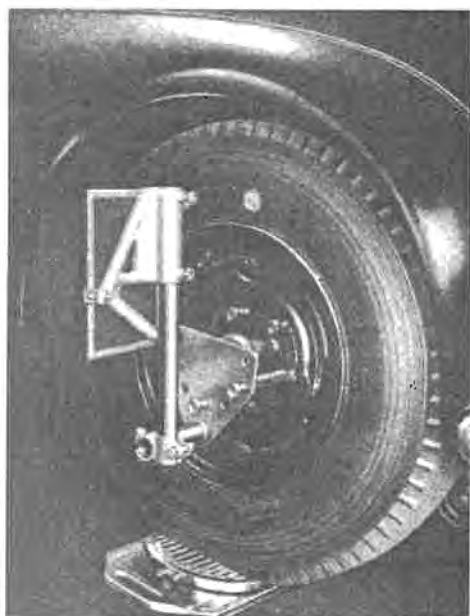


Fig. H.8.—Front Wheel and Turntable with Mirror and Bracket.

Place a jack under front pan and take up on jack until contact is just made with pan.

Remove front wheel disc and remove the three lowest wheel nuts. Screw on the three special extension nuts. These nuts have left- or right-hand threads for use on appropriate sides. Fit mirror support plate, using the three holes which bring the mirror bar nearest the bottom. Secure mirror support on extension nuts, using three wheel nuts. The mirror can be mounted on either front wheel.

Fit telescope to jacking bracket and adjust until measurement marks are centralised.

Note the toe-in reading.



Fig. H.9.—Car Loaded with Jack in Position.

Raise car 3.00" on jack, and take another reading. The toe-in must increase when the car is raised, if it decreases the reading is incorrect. Subtract both readings to obtain difference in toe-in. The reading should be between $1/32$ " and $5/64$ ", check toe-in on other side.

Lowering the steering side lever ball decreases the toe-in, while raising it increases the toe-in.

It is often possible to correct small errors by loosening the side lever screws and pushing the lever in the required direction and re-tightening and locking the bolts, while holding the lever.

If the above procedure fails to correct the error, then the track rod outer end ball pins will have to be replaced with the longer neck pins.

To correct too much toe-in fit a pin .100" or .200" longer, using the appropriate oil seal washer on the pin being used.

The .100" longer pin decreases the toe-in by approximately $1/16$ ", while the .200" similarly decreases the toe-in by approximately $7/64$ ".



Fig. H.10.—Telescope on Bracket.

If a reading of insufficient toe-in is given on either side, fit ball pins having .100" or .200" neck to both centre steering levers, using the appropriate oil seals. Re-track the car.

At kerb standing height, the toe-in should read $1/16"$ to $5/32"$. If castor angle is changed, the ball pin heights will be altered and consequently will require re-checking.

Full details on changing ball pins and Special Tool required is contained in Section N, Sub-Section N.9.

NOTE.—If the slope on the underside of the pan to which the fulcrum brackets are bolted is not $25^{\circ} 40' + 40'$, the above procedure will not put the ball pin heights correct on lock.

It is hardly likely that any variation will ever be encountered in this specification, unless the car has suffered a front end collision. A reading less than the minimum will increase car shake and a reading in excess of the maximum will cause the steering to pull more during high speed driving over uneven roads.

FRONT HUBS

REPLACING FRONT HUB BEARINGS

Jack up front of car and place a suitable support under lower front triangle lever.

Remove hub cap and wheel disc and prise off hub dust cover, by inserting screwdriver between dust cover and shallow flange on hub. The cover contains an earth contact. Remove wheel.

Remove split-pin and castellated nut from stub axle,

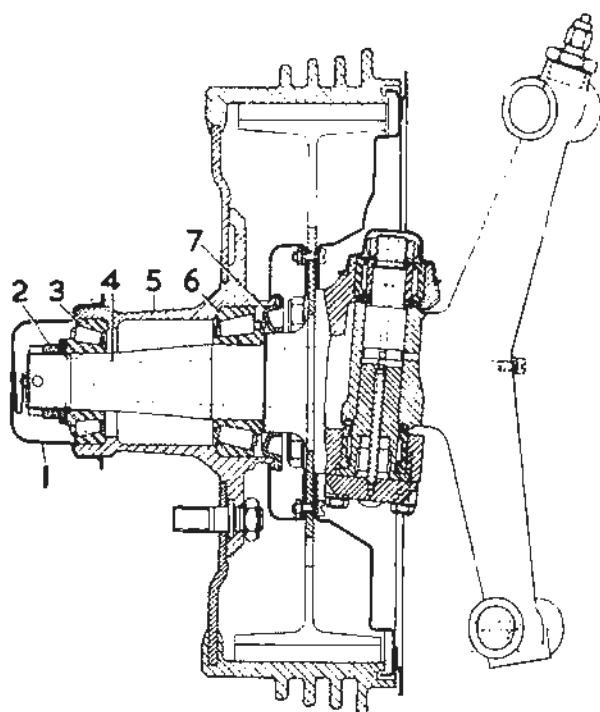


Fig. H.11.—Front Hub Bearings.

- | | |
|--------------------|--------------------|
| 1 Dust Cover. | 5 Hub. |
| 2 Castellated Nut. | 6 Inner Bearing. |
| 3 Outer Bearing | 7 Grease Retainer. |
| 4 Stub Axle. | |

it will be necessary to break the sealing ring before the split-pin can be removed, and a new sealing ring should be fitted on re-assembly. Note that the right-hand stub axle has a right-hand thread and the left-hand axle has a left-hand thread. Withdraw the hub.

Lift out the inner race and roller cage from the outer bearing. Prise out the grease retainers, three slots are incorporated for extraction purposes. The grease retainers have either right-hand or left-hand Acme threads and must be fitted to their respective sides, each is marked "Off-side Right-hand" or "Near-side Left-hand". Using a hardwood drift, tap out the outer races of the two bearings. Clean hubs thoroughly.

Tap in the new outer races so that the smaller end of the taper faces outwards, lightly grease, and fit the new inner races and rollers to their respective positions.

Pack the hub with approximately 2½ ozs. of the recommended grease and replace the grease retainer tapping into position with an aluminium drift.

Place hub assembly on stub axle and replace plain washer between outer roller bearing and castellated nut. Replace nut and tighten slowly whilst rotating the hub continuously until slight resistance is felt. The nut should then be let back until the split-pin can be inserted. Note that there are two split-pin holes at right angles to each other.

The continuous rotation of the hub is essential in order to ensure that the taper rollers correctly seat on the tracks of the inner races. If the rotation is omitted the taper angle on the rollers is so small that they will not be correctly positioned and the hub may be left with an excessive amount of slack.

Refit new sealing band on nut and split-pin.

Replace wheel, dust cover, hub cap and wheel disc.

Particular care should be exercised to prevent any grease or oil from coming into contact with brake lining, while hub is removed.

While hub is off, the opportunity should be taken to examine condition of brake shoes, also for any signs of leaking hydraulic wheel cylinders.

STUB AXLES AND PIVOTS

REMOVING STUB AXLE FROM YOKE

Jack up car and place supports under the front lower triangle arms. Remove front wheel and hub.

Disconnect the hydraulic brake pipe at union mounted on bracket fitted to front damper side plate.

Remove the steering arm from stub axle.

Remove the six bolts holding brake shoe carrier plate and remove plate with brake shoes attached.

Prise off top cover and remove pivot-pin nut, lockwasher and plain washer. Disconnect oil pipe from lower flange to ball joint. Remove lower flange with thrust washer.

Drive pivot pin downwards using an aluminium drift, and should difficulty be encountered, a tapped hole 11 16 Whit. thread, in the base of the pivot pin can be used for extraction purposes.

Collect all parts and wash thoroughly.

REPLACING STUB AXLE BEARING ASSEMBLIES

Tap out the upper and lower outer races with a suitable drift.

A press should be used to replace these parts. The top bearing is pressed in as an assembly. The lower consists of a bearing outer race and 34 needle rollers. Both the upper assembly and lower outer race should be pressed hard against the shoulders in the stub axle.

FITTING STUB AXLE TO YOKE

Apply a coating of thick grease to the lower outer race and position the 34 needle rollers.

Install the felt sealing washers in the appropriate places and mount the stub axle to the yoke. Refer Fig. H.12.

Push the pivot up as far as possible by hand. Check that the grub screw in yoke is tight.

Using an aluminium drift, drive pivot pin upwards until the shoulder on the pivot pin is hard against the shoulder in the yoke.

Replace restricting pin in the top of the pivot pin and replace plain washer, lockwasher and nut on top of pivot pin and tighten, but do not lock nut at this stage.

Lubricate and place thrust washer in lower flange and fit with cover to lower end of stub axle, tightening

set screws. A new washer should be fitted if it is at all worn. The thickness of a new washer is .098"—.001". The permissible end lift of the stub axle is .007" to .017". Move stub axle from lock to lock, any binding being relieved by a few sharp blows on the lower flange.

Retighten and lock pivot pin nut, then replace top cover.

A liberal amount of jointing compound should be applied to lower flange and top cover. Replace oil line from lower flange to ball joint and test lubrication flow to all points.

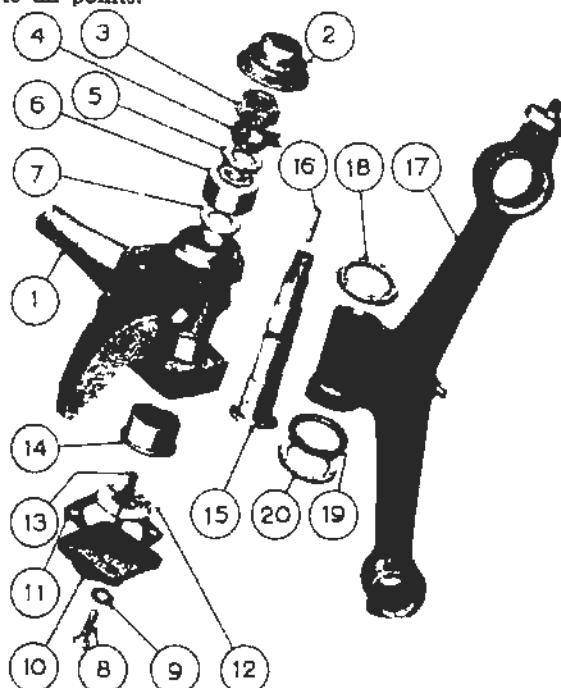


Fig. H.12.—Exploded View of Stub Axle.

- | | |
|------------------------------|---------------------|
| 1. Stub Axle. | 11. Packing Plate. |
| 2. Top Cover. | 12. Thrust Washer. |
| 3. Nut-Pivot Pin. | 13. Oil Tube. |
| 4. Lockwasher. | 14. Lower Bearing. |
| 5. Plain Washer. | 15. Pivot Pin. |
| 6. Upper Bearing. | 16. Restrictor Pin. |
| 7. Distance Washer. | 17. Yoke. |
| 8. Setscrew - Bottom Flange. | 18. Felt Washer. |
| 9. Plain Washer. | 19. Retainer. |
| 10. Bottom Flange. | 20. Felt Washer. |

Mount steering arm to stub axle, tightening and locking set screws.

Connect up brake hose and bleed front brakes. Fit wheel and hub assembly, adjusting and locking bearings as previously described.

LUBRICATION

Oil under pressure from the centralised chassis lubrication system is delivered by a flexible rubber

pipe to the top of the yoke.

Midway down the yoke there is an oil feed to the pivot pin. The oil passes up the pin, past a restricting pin to the upper bearing, and down the pin to lubricate the thrust washer and lower bearing.

An oil feed tube projects upwards into the pivot pin and carries oil to the outer ball joint of the cross steering tube via an external pipe. This tube acts as a restriction to the oil feeding the lower bearing, the restriction for the ball joint being the fit of the ball in its sockets.

ROAD SPRINGS (FRONT)

Special Tools Required

RH.195—Spring Compressor, Front Suspension.

DESCRIPTION

The front coil springs are suitably fitted with packing washers to suit the front axle weight and the terrain over which the car will operate. Packing washers are available which allow the effective poundage of the springs to be adjusted with considerable accuracy to suit individual requirement, but, it is advised that with any front suspension problem, retailers should contact the London Service Depot. Front springs are

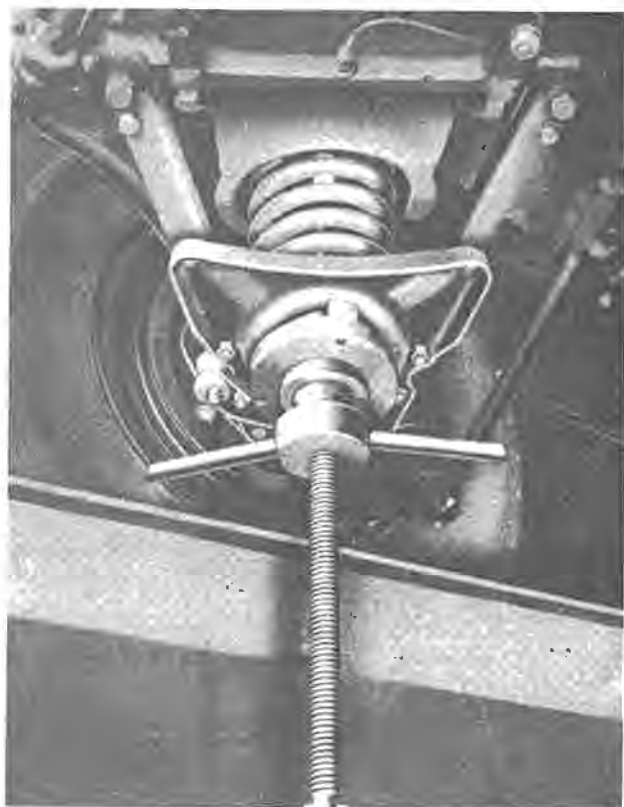


Fig. H.13.—Front Spring Compressing Tool in Position

normally supplied with the correct number of packing washers to suit individual chassis.

TO REMOVE FRONT COIL SPRING

To facilitate operation, the car should be placed over a pit and the hand brake applied.

Jack up the car at the centre of the front pan using a suitable plate on the jack head to spread the load.

Remove the stabiliser bar link on the side concerned. Place the special compressing tool RH.195 through the coil spring, until the hook on the top end of the tool engages in a special eye, which protrudes from the front cross-member for this purpose. Refer to Fig. H.13.

Take up on the tool until sufficient pressure is taken to enable the eight (8) bolts securing the coil spring lower seat on the lower triangle arm, to be safely removed.

Gradually release the pressure on the tool until the coil spring tension is fully released, before attempting to detach the tool from the special eye on cross-member.

Care should be taken not to misplace the height adjusting washers on the top of the coil spring.

TO REPLACE FRONT COIL SPRING

The spring may be replaced by reversing the operation for removal and using two long pieces of steel placed in opposite bolt holes, to act as guides to align the remaining bolt holes.

It will be noted the top coil of the spring is ground flat.

When the operation has been completed, and the jack has been removed from under the chassis, the car should be rocked from side to side to allow the coil spring to settle into position.

A check should be carried out of the standing height and steering geometry on completion of this operation.

Refer to Sub-Section H.1 for specifications and methods of adjustments.

UPPER AND LOWER TRIANGLE LEVERS

REMOVING AND REFITTING TRIANGLE LEVERS AND BEARING BLOCKS

Remove the front coil spring, as described in Sub-Section H.4. Disconnect the oil line union on lower fulcrum bracket. Disconnect the oil line union on top of cross beam idler pin and remove pin from fulcrum bracket and frame bracket eyes.

Support the idler cross beam, to prevent dropping and possible damage to rubber oil seals on the ball joints.

Remove the remaining two bolts holding the triangle levers to the yoke fulcrum lower bearing. This can then be screwed off the yoke pin when triangle levers have been removed.

Unlock and remove the four bolts and nuts securing the fulcrum bracket to the front chassis member.

The fulcrum bracket bearing blocks can be dismantled from the triangle levers, by removing the four retaining bolts and unscrewing the bearing blocks from the fulcrum bracket.

The right- and left-hand fulcrum brackets are interchangeable, as are the right- and left-hand triangle levers. The front and rear triangle levers are not interchangeable, owing to the rear lever edges being recessed to prevent the track rod inner ball joints fouling when on full lock.

The front and rear fulcrum bracket bearing blocks are interchangeable, as are the yoke bearing blocks.

New rubber sealing rings must always be used when the bearing blocks have been removed.

The triangle arms should be assembled on the bench, before being attached to the yoke bearing blocks. Clamp the fulcrum bracket horizontally in a vice being careful not to damage the lubrication fitting.

Fit new rubber sealing rings against shoulder of the threaded end of the fulcrum bracket, then screw on bearing blocks, which have been lubricated with a few drops of oil. It will be noted that the start of the threads on the fulcrum bracket is opposed by 180°. These blocks should be screwed on just sufficiently to compress the rubber sealing rings, before being attached to the lower triangle levers.

The two retaining bolts on each block may then be tightened.

REPLACING LOWER YOKE PIN

If it is necessary to replace the yoke lower pin, a

press must be used to remove and replace this part, which should be firmly pressed in against the locating shoulder in the yoke.

The lower yoke pin should be pressed in with the thread start at shouldered end, 9° clockwise of yoke centre line, Fig. H.14. This is necessary for correct mounting of bearing blocks and to ensure that the rubber sealing rings, between the yoke and the bearing blocks, are equally compressed.

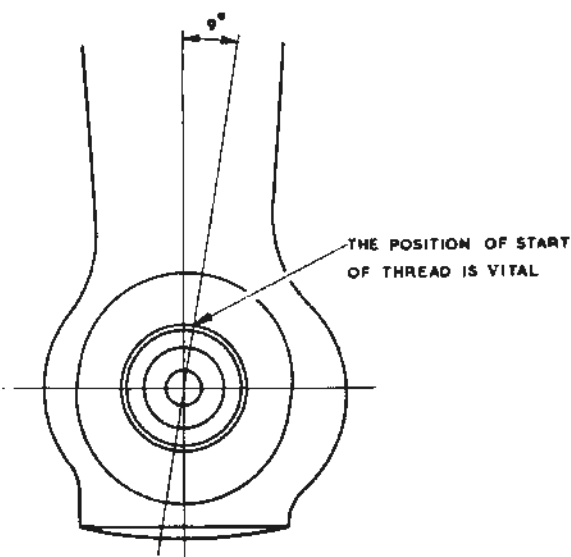


Fig. H.14.—Lower Yoke Pin Thread Start.

The yoke pin bearing blocks are screwed on the pin, after new sealing rings have been installed and the blocks must be screwed on until the sealing rings are just compressed, when the blocks are positioned to connect to the triangle levers.

Fit the two larger bolts, but do not fully tighten until the coil spring and seat have been replaced and the holes lined up. Mount the fulcrum bracket on the chassis front member and tighten and lock the four bolts and nuts.

Fit the cross beam idler and tighten the nut on the pin.

Reconnect oil line unions on fulcrum bracket and cross beam idler pin, and test for lubrication flow.

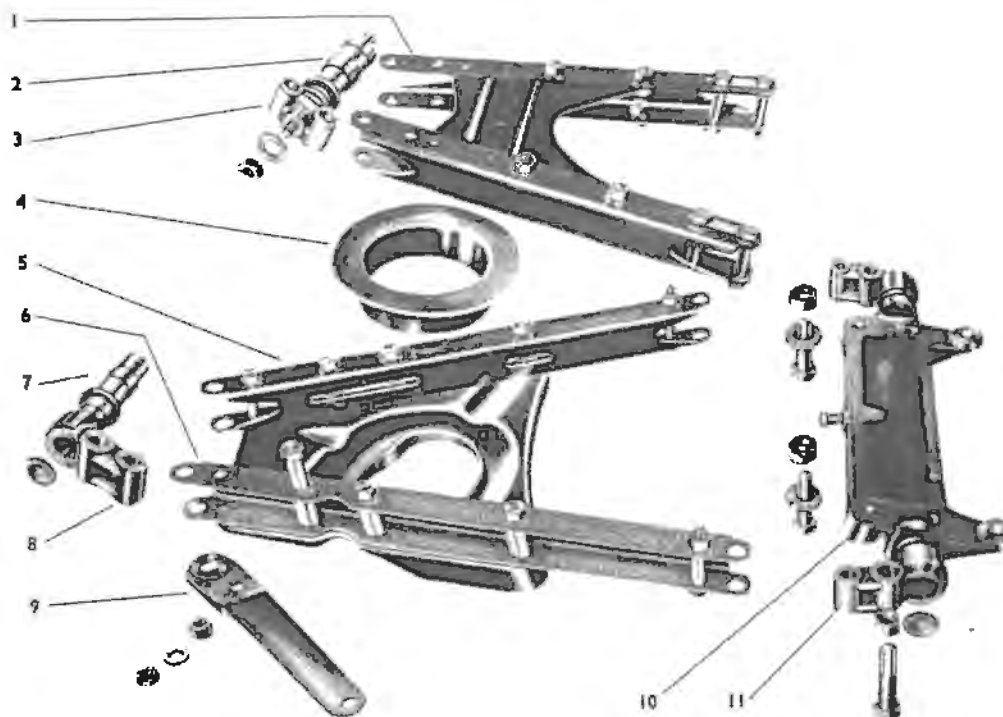


Fig. H.15.—Triangle Levers, Fulcrum Bushes, and Bearing Blocks.

- | | |
|---|------------------------------------|
| 1. Upper Triangle Levers (Front and Rear) | 7. Lower Fulcrum Pin. |
| 2. Upper Fulcrum Pin, Bush and Rubber Sealing Ring. | 8. Lower Bearing Block. |
| 3. Upper Bearing Block. | 9. Stabiliser Attachment Bracket. |
| 4. Rubber Sealing for Suspension Spring. | 10. Fulcrum Bracket. |
| 5. Lower Front Triangle Lever. | 11. Fulcrum Bracket Bearing Block. |
| 6. Lower Rear Triangle Lever. | |

REPLACING FULCRUM PINS OR BUSHES

The upper fulcrum pin is screwed into the bushed yoke, the pin being clamped and located in between the upper triangle levers by means of bearing blocks and nuts at each end of the pin.

Four bolts secure the bearing blocks to the levers. It is necessary to remove both triangle levers from the front shock damper to replace the upper fulcrum pin, bush and bearing blocks.

The upper fulcrum bush must be removed and installed by a press.

New rubber oil seals must be used whenever the upper fulcrum pin is dismantled for any reason. If it is desired to replace the upper fulcrum bush in the yoke, or replace the fulcrum lower pin, the yoke may be removed with hub and stub axle assembled and taken to a press for these operations.

Assuming the front coil spring has been removed, proceed as follows to remove the yoke and stub axle as an assembly.

Remove road wheel and disconnect brake hose at union on front shock damper.

Disconnect the lubrication hose from the top of yoke.

Remove oil pipe to track rod ball joint at stub axle.

Remove steering side lever from stub axle.

Remove the upper triangle levers and the two nuts securing upper bearing blocks to fulcrum pin and screw out fulcrum pin.

Remove the four bolts and nuts holding lower fulcrum pin bearing blocks to lower triangle levers, and wire the blocks together in position, to prevent possible damage to threads on lower fulcrum pin.

Having correctly pressed the new bushes in their respective positions, the assembly may be replaced by reversing the order of removal. After assembly, bleed the front brakes, and finally check and correct the steering geometry to the specifications given in Sub-Section H.1.

LUBRICATION

As previously mentioned, oil under pressure from the chassis lubrication system is delivered by a flexible pipe to the top of the yoke.

The oil passes through four holes to lubricate the upper fulcrum pin and then round the undercut on the bush and down the two grooves cut in the hard-

wood pegs, inserted in the yoke, to the lower fulcrum pin.

The oil passes along the lower fulcrum pin to each end and lubricates the threads. As the pins are fixed in relation to the yoke, the yoke will alternately compress each rubber sealing ring on bump and rebound. (.007" total movement.)

THE REAR SUSPENSION

DESCRIPTION

Semi-elliptic springs, each containing nine leaves are used on both models and it will be noted that these springs are suspended inside the frame.

A "dimple" pressed into the leaves replaces the usual centre bolt, and the "dimple" in the main leaf registers with a "pip" on the rear axle housing spring saddle, for spring location. The leaves are grooved and secured together with four riveted clips to ensure proper alignment. "Neoprene" pads, or interleaving, are glued to the tapered ends of the four leaves below the main leaf, to prevent metal to metal contact at these points. "Bescoprene" No. 1400 adhesive is used for this purpose, and the maker's instructions must be closely followed for satisfactory results.

Another feature of the rear suspension on both

models is the use of "Silentbloc" bushes throughout. This type of bush minimises road noise and requires no lubrication. A "Silentbloc" mounted "Z" bar is fitted between the frame and the rear axle housing on the right-hand side, to control the torque and brake reactions. Double acting controllable shock dampers are used on the rear springs to damp the spring action on both deflection and rebound.

On initial assembly, the springs are padded with "Ragoline" Moly Spring Lubricant No. 240G, and no further attention is required for 50,000 miles, unless the springs are dismantled. Two leather gaiters on each spring retain the lubricant and exclude dust and moisture.

It will be noted that the front eye of the main leaf is welded at the joint. This is to eliminate any possibility of the eye "uncurling" and allowing the large bushes to become slack in the eye at this important point.

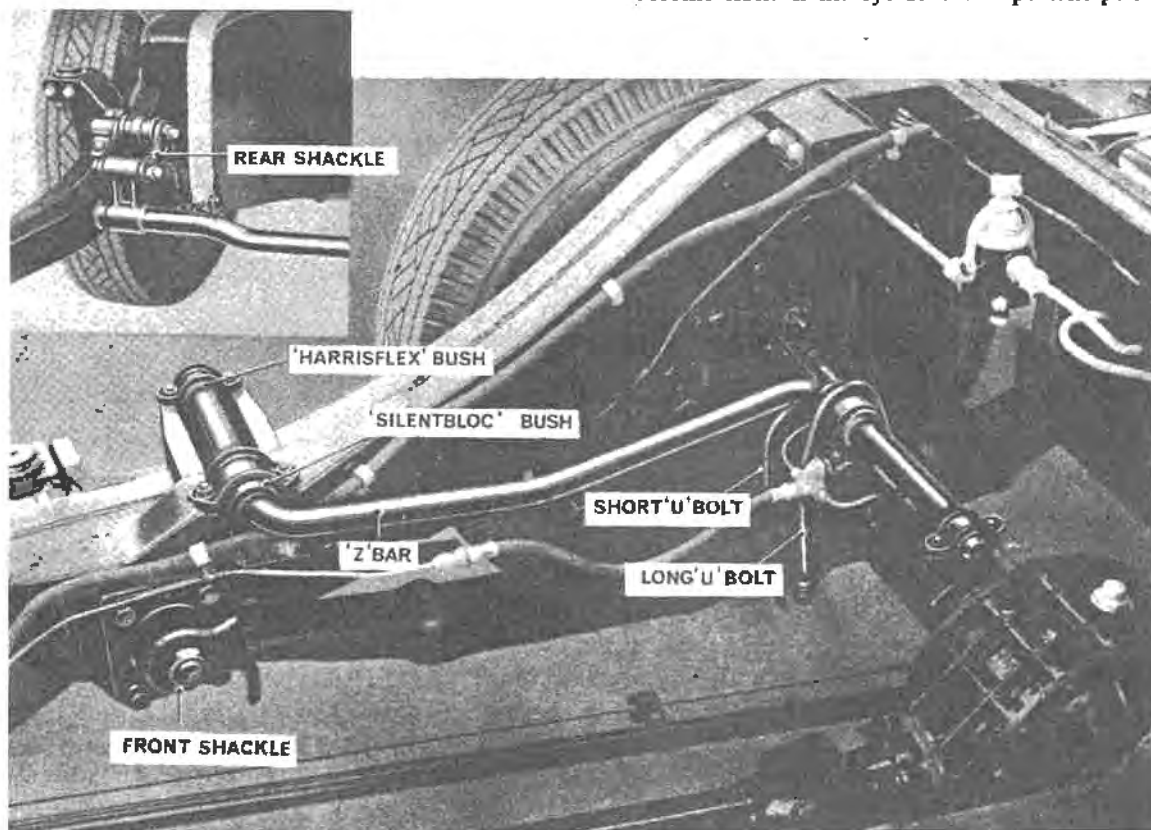


Fig. H.16.—Rear Spring Shackles, "U" Bolts and "Z" Bar.

Springs of various poundages are used and a brief description of the applications is listed below.

Model.		Spring Poundage Rating.	
		Near Side.	Off Side.
Silver Cloud	Right-hand	1,100 lbs.	1,200 lbs.
Bentley 'S' Type	Controls.		
Silver Cloud	Left-hand	1,100 lbs.	1,100 lbs.
Bentley 'S' Type	Controls.		
'S' Type Continental	Right-hand	900 lbs.	1,000 lbs.
	Controls.		
'S' Type Continental	Left-hand	900 lbs.	900 lbs.
	Controls.		

Poundage identification of the springs will be found stamped on the main leaf rear shackle eye centre land. All springs have a "Parkerised" finish, which provides a "sponge" base for the special lubricant.

REAR SPRING STANDING HEIGHT

The point for measuring rear spring standing height is illustrated in Fig. H.17.

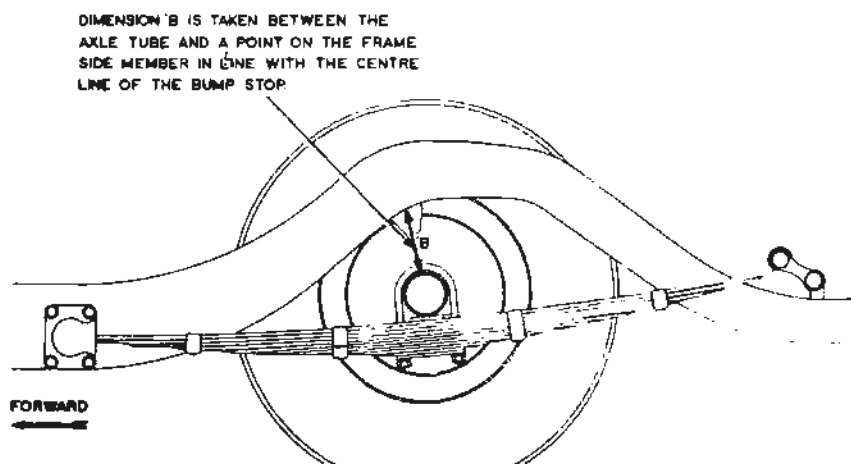


Fig. H.17—Rear Spring Standing Height.

Dimension "B"—6.900" when the tank contains 5 gallons of petrol. Tolerance on this dimension to be plus or minus .300".

If the tank contains less than 5 gallons of petrol, add .400" to the 6.900" dimension.

THE "Z" BAR

This bar is fitted between the frame and the right-hand axle housing. Each end of the bar on one "Silentbloc" bush, and one "Harrisflex" bush and no lubrication is required at these points.

When replacing the bushes on this car, it is necessary to remove the bar in order to press the "Silentbloc" bushes off and on.

The bar is fixed to the axle housing by the inner "U" bolt and one bracket. A split steel sleeve is fitted over the "Silentbloc" bush to prevent collapse of the bush, when the "U" bolt is tightened.

Two brackets retain the front, or shorter end, of the car to the frame mounting.

The outer "Harrisflex" bushes can be easily prised off, using a screwdriver.

The "Silentbloc" bush on the rear, or longer arm of the bar, should be pressed on until the inner sleeve is approximately 8½" from the end of the arm.

The bush on the front, or shorter arm of the bar, should be pressed on until the inner sleeve is approximately 6-11/16" from the end of the arm.

The "Silentbloc" bushes are identical and have an inside and outside diameter of 1.000" and 1.812" respectively. The outer sleeve width of the bush is 2.500", the inner sleeve width being 2.687".

When the "Silentbloc" bushes are correctly positioned the "Harrisflex" bushes may be slipped on the outer ends of the arm, using a little Lanoline to assist assembly. These bushes are 1.312" in length and have inside and outside diameters of .750" and 1.250" respectively.

Care should be taken to ensure that the split steel sleeve is properly placed over the rear "Silentbloc" bush before the "U" bolt is tightened down.

When pressing on the "Silentbloc" bushes, pressure should only be exerted on the outer sleeve of the bush as explained in Sub-Section H.7.

ROAD SPRINGS (REAR)

Special Tools Required:—

RH.196—Rear Spring Compressing Tool.

RH.344—Extractor "Silentbloc" Bush.

REPLACING REAR ROAD SPRINGS

Place car on level floor and apply handbrake.

Jack up car on side from which spring is to be removed and place a suitable stand under the frame, forward of the front shackle anchorage.

Disconnect rear damper shackle.

Remove both spring gaiters before fitting the spring compressing tool.

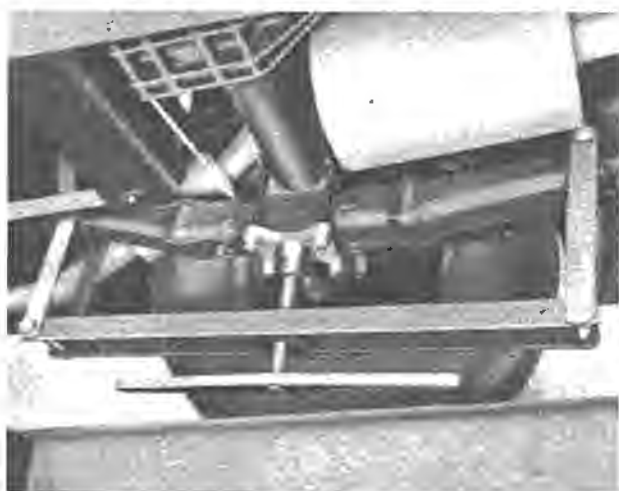


Fig. H.18.—Rear Spring Compressing Tool in Position

Fit compressing tool in position as shown in Fig. H.18, and take up on tool sufficient to prevent spring flying apart when "U" bolts are released.

Progressively slacken the four nuts retaining the "U" bolt plate and remove the "U" bolts. The plate cannot be removed until the spring has been removed and the compressing tool released.

Remove rear shackle bolt nuts and plate.

Spread spring sufficiently with compressor to enable shackle bolts to be pushed out, without damaging the threads. Support spring by hand during this operation.

Remove the four bolts and nuts holding front anchorage assembly to the frame, and remove assembly with the spring.

If it is desired to replace the "Silentbloc" bushes in the spring eyes, it will be necessary to use a press for this operation. The front "Silentbloc" bushes are

pressed into the spring eye under a pressure between 1,400 lbs. and 2,500 lbs. The shoulders of these bushes are pressed against the spring eyes and as yet no tool is available for their removal. A suggested method of removal is to tap the inside of the bush for a distance of approximately one inch and screw in a suitable bolt which when pressed from the opposite side will withdraw the half of the bush to which it is screwed. The other bush may then be pressed out with a suitable mandrel.

The rear spring eye "Silentbloc" bush is fitted under a pressure between 500 and 1,000 lbs. and will press through from either end. This bush will be approximately 5/32" proud of either side of the spring eye.

The rear fixed shackle brackets are also fitted with "Silentbloc" bushes and tool No. RH.344 must be used to extract or replace these, as approximately an eight-ton pressure is required.

When pressing "Silentbloc" bushes into position the pressure must be exerted on the *outer* sleeve and not on the inner sleeve, or rubber core.

Front spring eye bush inside dia.	...	.875" + .005"
Front shackle bolt dia.	...	.870" + .005"
Rear spring bush inside dia.	...	.625" + .005"
Rear shackle bolt dia.	...	.625"
Bolt holes in the rear shackle plates	...	.625" + .010"

Care must be taken to allow no oil or grease to come into contact with the "Silentbloc" bushes, because of their detrimental effect on rubber.

As an aid to the assembly of the shackle pins to the bushes a small amount of Lanoline may be used. Oil may be used with discretion on the threads of the "U" bolts and shackle pins.

It will be noticed that in each front anchorage bracket, the four bolt holes are elongated for alignment purposes. If both rear springs are removed together, the right-hand spring must be replaced first. The "Z" bar will allow the right-hand spring to find its normal position in relation to the front anchorage, which should then be tightened.

The position of the front anchorage for the left-hand spring is determined by measurement.

With the axle "U" bolts tightened in position, a measurement should be taken from the inner "U" bolt on the right-hand side to the pivot pin of the right-hand front idler lever, as shown in Fig. H.19. A similar measurement from the left-hand inner "U" bolt to the pivot pin of the left-hand front idler lever

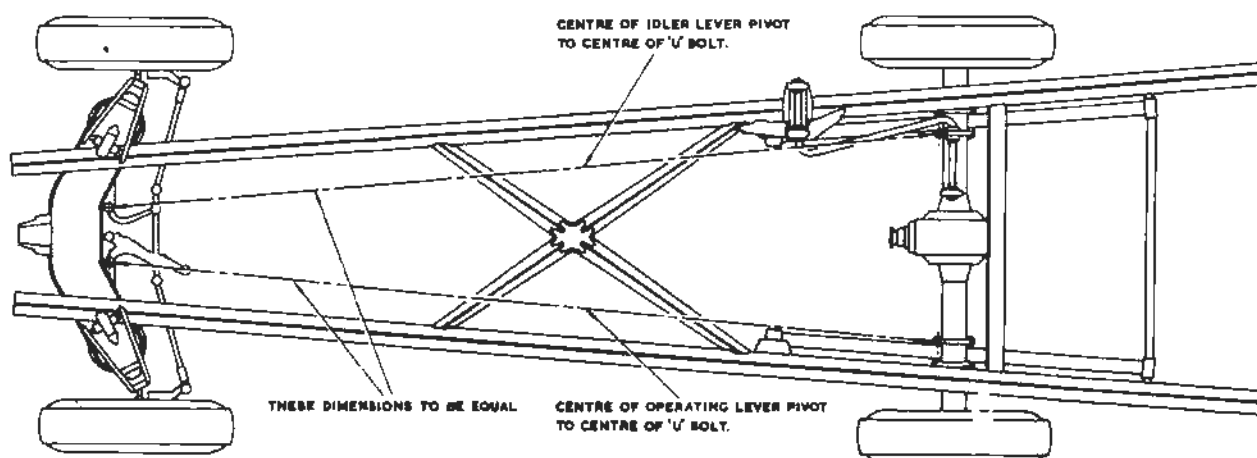


Fig. H.19—Rear Axle Alignment.

should be made to correspond with the right-hand, when the alignment will be correct.

It is essential that the rear spring shackle bolts are

left slack until the jacks have been removed from the car. The "Silentbloc" bushes of the rear suspension must be finally tightened when the car is on the floor in its free standing condition.

SHOCK DAMPERS

GENERAL DESCRIPTION AND OPERATION

The front and rear shock dampers are similar in construction and operate on the same principle. A horizontal piston assembly operates in a cylinder maintained full of oil which is displaced from one end of the cylinder to the other via a drilling running parallel to the main cylinder and past a spring-loaded valve. A slow leak passage past the main valve is also arranged. The diameter of this passage is controlled by the position of the slow leak valve. On the rear shock dampers only, an electric solenoid is arranged so that it can move the slow leak valve to reduce the diameter of the slow leak passage, and thus stiffen up the ride, when a switch on the steering column is closed. Two bleed jets are arranged at each end of the cylinder to bleed any air that may be trapped between the ends of the piston and the cylinder. The piston is made in two parts held together by spring-loaded bolts so that it clamps on the main lever. A recuperating valve is provided in each end of the piston.

NOTE.—The setting of the main and slow leak valves and hence the degree of damping, can only be carried out on a special shock damper testing rig. It is most important, if the dampers are stripped to replace the main shaft seals or for any other reason, that the main valve cap nut (Fig. H.32) is not disturbed or the setting will be destroyed.

The dampers should give long service without attention but if loss of damping is experienced that is not attributable to evident leakage, it is recommended that the unit is replaced, and, when practicable, returned to the London Service Station for re-conditioning and re-setting.

SPECIFICATION

Front Damper

Internal dia. of Cylinder ...	1.750" + .001
Dia. of Piston ...	1.749" - .0005
Dia. of Rocking Shaft Journals ...	.9995" - .00025
Internal dia. of Bush (after reaming in position) ...	1.000" + .00025
External dia. of Bush ...	1.1305" - .0005
Internal dia. of Bush Housing ...	1.125" + .001
Rocking Shaft and Float ...	.001 to .004

Rear Damper

Internal dia. of Cylinder ...	1.750" + .001
Dia. of Piston ...	1.749" - .0005
Dia. of Rocking Shaft Journals—	
Large Journal ...	1.2807" - .0005
Small Journal ...	.9995" - .0005
Internal dia. of Bushes (after reaming in position)—	

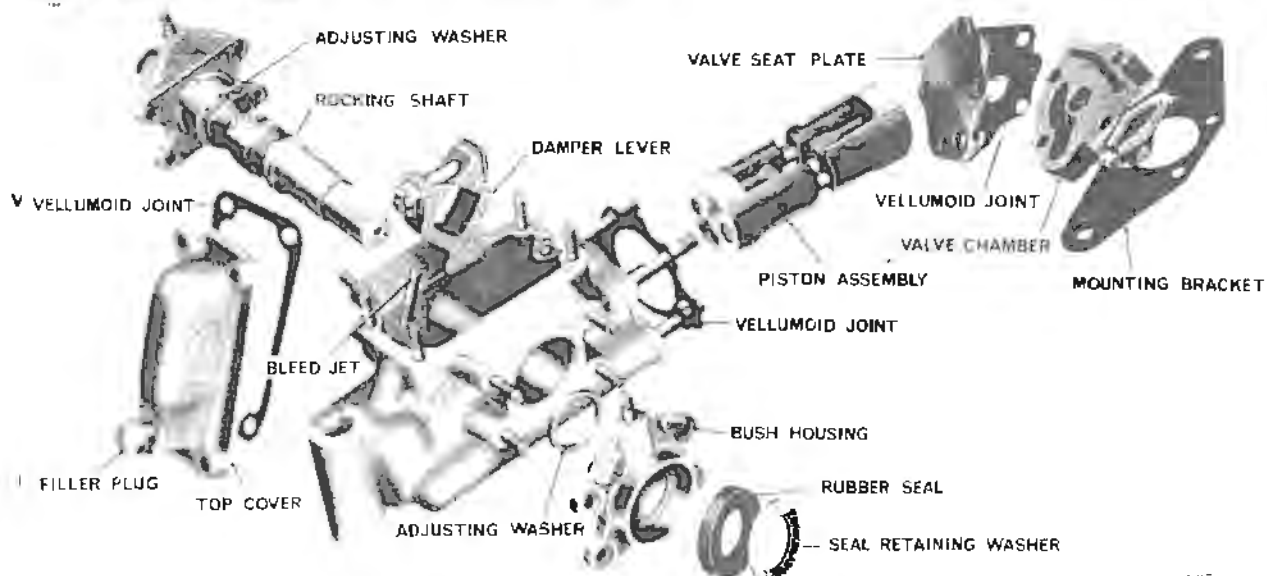


Fig. H.20.—Front Damper.—Exploded.

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Large Bush	1.2812" \pm .001
Side Cover Bush	1.000" \pm .001
External dia. of Bushes—			
Large Bush	1.440" \pm .0005
Side Cover Bush	...	...	1.1587" \pm .0005
Internal dia. of Bush Housing—			
Blind Cover	...	...	1.4375" \pm .001
Side Cover	...	...	1.1562" \pm .001

SERVICE OPERATIONS

Every 10,000 miles the oil level in the front and rear shock dampers should be checked. Carefully clean all dirt and grit from the area of the filler plug before removing. Top up as necessary with the correct fluid to the bottom threads of the filler plug orifice. Cleanliness is essential as small particles of grit lodging under the main or recuperating valves will completely destroy the efficiency of the damper.

TO REMOVE A FRONT SHOCK DAMPER

Jack up the car at the front pan on blocks under the lower yoke bearings so that the upper and lower wishbones are approximately horizontal. Remove the three 9/16" A/F setscrews and four 1/2" A/F nuts and locking tabs on the front arm of the upper wishbone and remove the arm from the damper spindle and upper yoke bearing block. Release the lock tab and slacken off the two 1/2" A/F nuts clamping the rear arm to the damper spindle.

Remove the two 7/16" A/F nuts and plain washers securing the bracket for the brake hose and the bracket for the chassis lubrication hose to the damper casing. The pipes need not be disconnected.



Fig. H.21.—Removing the Bleed Jets.

Remove the two 9/16" A/F setscrews securing the damper inner mounting plate to the frame. Remove the 13/16" A/F mounting bolt at the outer end of the damper and remove the damper.

TO RENEW THE MAINSHAFT OIL SEALS

The rubber mainshaft oil seals are held in the bush housings on each side of the damper by aluminium washers that are a press fit on the shaft. The seals may be replaced without dismantling the damper. Prise off the washers and prise out the seals. The new seals should be fitted dry but a little Palmolive grease may be smeared on the inside edge to ease fitting over the shaft. Tap the seal into its housing with a blunt drift. Fit new retaining washers, tapping them onto the shaft with a hollow drift placed over the shaft, until they are flush with the end of the journal.

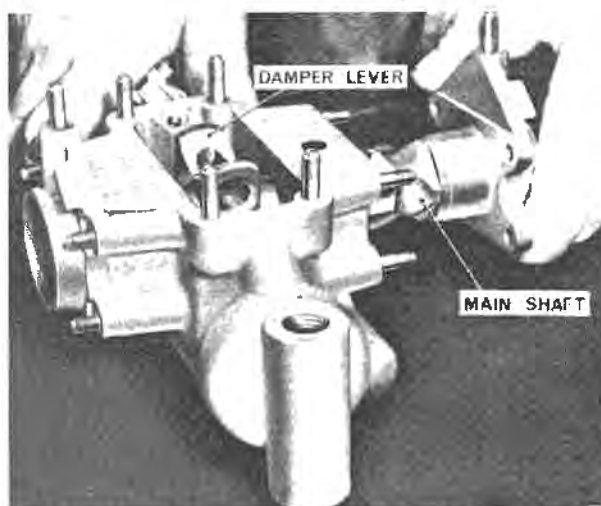


Fig. H.22.—Removing the Main Shaft.

TO DISMANTLE

NOTE.—When dismantling, the damper body should not be clamped directly in a vice. Clamp on the mounting plate or the squared ends of the mainshaft.

Remove the filler plug and drain out the oil. Remove the four 7/16" A/F nuts and plain washers and remove the top cover. Collect the Vellumoid joint. Unscrew and remove the two bleed jets. (Fig. H.21.)

Remove the eight 7/16" A/F nuts securing the bush housings to the sides of the damper. Mark the housings to ensure that they are replaced on the same sides of the damper. Remove the split pin and remove the pinch bolt from the damper lever. Drive out the mainshaft from one side (Fig. H.22). One bush housing will remain on the shaft. Collect the two end float adjusting washers. Remove the other bush housing from the damper body.

Remove the damper lever by levering with a short rod as shown in Fig. H.23.

Remove the four $\frac{1}{2}$ " A/F nuts and remove the mounting plate, valve chamber, two Vellumoid joints and valve seat plate. Collect the oil that will not have drained. Extract the piston assembly.



Fig. H.23.—Removing the Damper Lever.

NOTE.—Further dismantling of the valve chamber should not be undertaken as any disturbance of the main valve cap nut will affect the damper poundage which can only be re-set on a special rig. The valve chamber is identical with that for the rear dampers but a blanking plate is fitted over the aperture for the solenoid.

INSPECTION

Thoroughly clean all parts. The joint edges are painted on initial assembly with Osotite which may be removed with methylated spirits. It is not soluble in paraffin. Check the cylinder for scoring or abrasions. The cylinder bore may be cleaned up with fine emery paper but if deeply scored should be replaced. The indentation at the centre of the bottom of the bore acts as a grit trap and is a feature of the design. Check that the recuperating valves in the ends of the piston are seating correctly. Test by pouring a little paraffin oil mixture into the boring for the valve. If the mixture leaks away the spring-loaded ball valve is not seating and the piston assembly should be removed.

Check that the bushes are a tight fit in the bush housings. If not renew the bush and housing. The bushes are pressed into the housing and reamed in position and can be supplied as an assembly. Similarly check the bushes for wear and replace as necessary.

Remove any burrs from joint faces and renew all Vellumoid joints. *It is essential that the correct Vellumoid*

joints are used because joints of incorrect thickness will alter the setting of the valve. Renew the rubber seals and seal retaining washers. Blow out the bleed jets with compressed air.

TO REASSEMBLE THE DAMPER

It is essential that all parts are assembled in a scrupulously clean condition. Lubricate internal parts with Mobilfluid 200.

The sequence for assembly is the reverse of that for removal. Smear the joint face of the bush housings with Wellseal or similar jointing compound. The piston assembly is reversible and may be inserted into the cylinder either end first. The damper lever should be fitted so that the head of the pinch bolt is towards the valve chamber.

After assembly fill up the damper with the correct fluid and bleed by pumping the damper with a slave arm fitted to the rocking shaft, topping up as necessary.

Paint the edges of the valve chamber to main body joint with Osotite and test all joints for leakage by chalking.

TO REFIT THE DAMPER TO THE FRAME

The procedure is the reverse of that for removal.

NOTE.—After refitting the damper to the frame it is important that the Castor and Camber Angles are reset to standard. (See Sub-Section H.1.)

TO REMOVE A REAR SHOCK DAMPER

Jack up the rear of the car on stands under the centre of the rear springs. Disconnect the shock damper operating arm at the "Silentbloc" bush by removing the split-pinned $\frac{3}{4}$ " A/F nut, plain washer and through bolt. Remove the $\frac{9}{16}$ " A/F and $\frac{3}{4}$ " A/F mounting bolts and remove the damper from the frame.

TO DISMANTLE

NOTE.—The shock damper must not be held in a vice by clamping on the body. If necessary, clamp on the arm during preliminary dismantling.

Remove the filler plug and drain the oil. Remove the four $\frac{1}{2}$ " A/F nuts and plain washers and lift off the top cover, collecting the Vellumoid joint.

Remove the 2 B.A. setscrew and plain washer and 2 B.A. nut and plain washer and remove the solenoid. Collect the small rubber ring seal and push rod.

Remove the valve casing, collecting the oil that will not have been drained. Collect the two Vellumoid joints and valve seat plate.

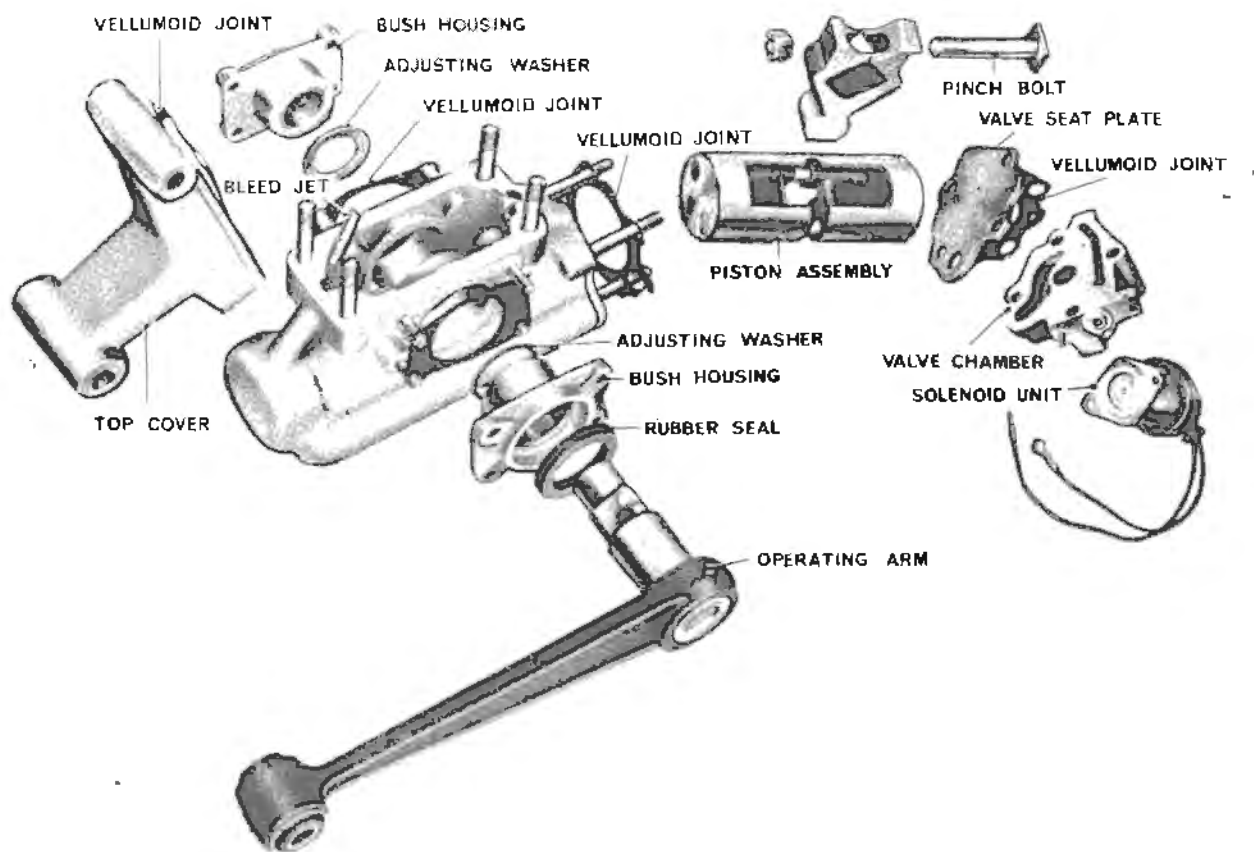


Fig. H.24.—Rear Damper—Exploded.

NOTE.—Further dismantling of the valve chamber should not be undertaken as any disturbance of the main valve cap nut will effect the damper poundage which can only be reset on a special rig.

Remove the four 7/16" A/F nuts and plain washers and remove the bush housing on the opposite side to the lever. Collect the Vellumoid joint and end float adjusting washer.

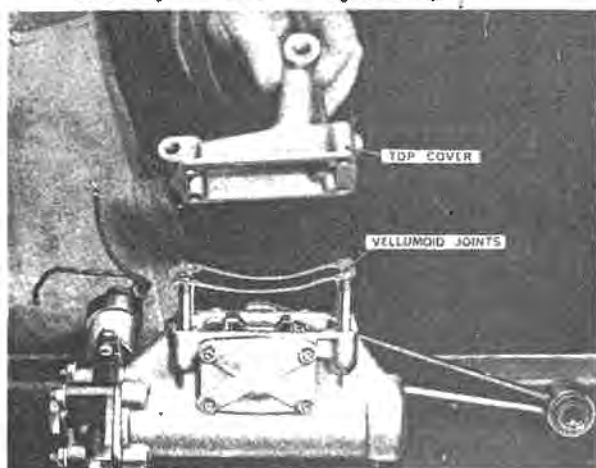


Fig. H.25.—Removing the Top Cover

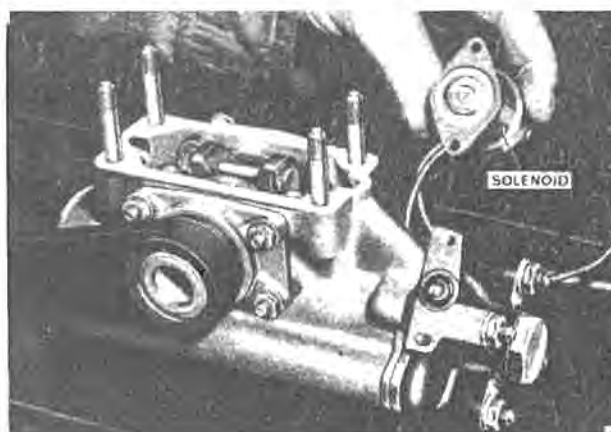


Fig. H.26.—Removing the Solenoid.

Remove the split-pin and 11/16" A/F nut from the damper lever pinch bolt and withdraw the bolt.

Tap out the rocking shaft and operating lever assembly with an aluminium drift.

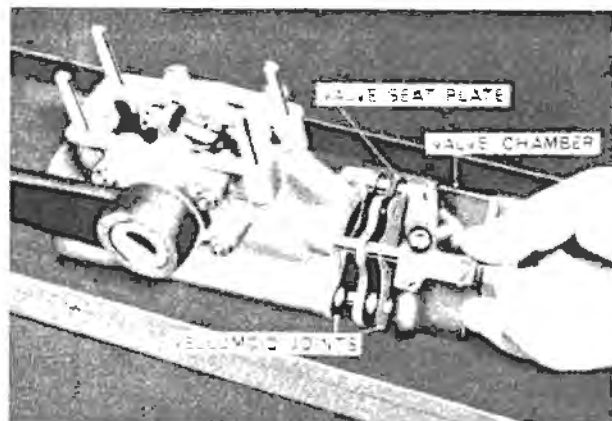


Fig. H.27.—Removing the Valve Chamber.

Remove the bush housing and collect the end float adjusting washer and the Vellumoid joint.

Remove the damper lever by levering with a small rod. (Fig. H.29.)

Extract the piston assembly and unscrew and remove the two bleed jets.

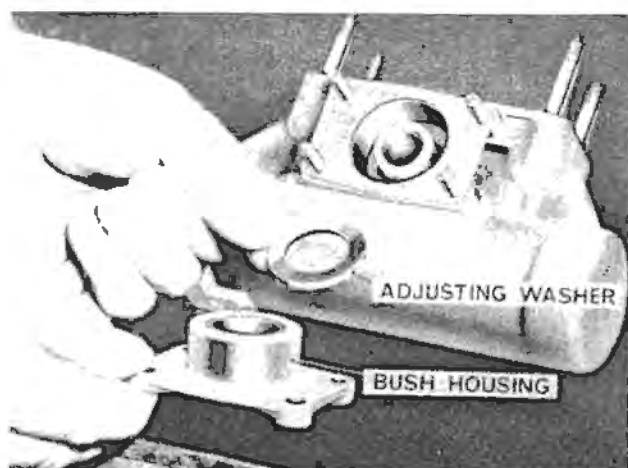


Fig. H.28.—Removing the Bush Housing.

INSPECTION

Thoroughly clean all parts. The joint edges are painted on initial assembly with Osotite which may be removed with methylated spirits. It is not soluble in paraffin. Check the cylinder for scoring or abrasions. The cylinder bore may be cleaned up with fine emery paper but if deeply scored should be replaced. The

indentation at the centre of the bottom of the bore acts as a grit trap and is a feature of design. Check that the recuperating valves in the ends of the piston are seating correctly. Test by pouring a little paraffin/oil mixture into the boring for the valves. If the mixture leaks away the spring-loaded ball valve is not seating and the piston assembly should be renewed.

Check that the bushes are a tight fit in the bush

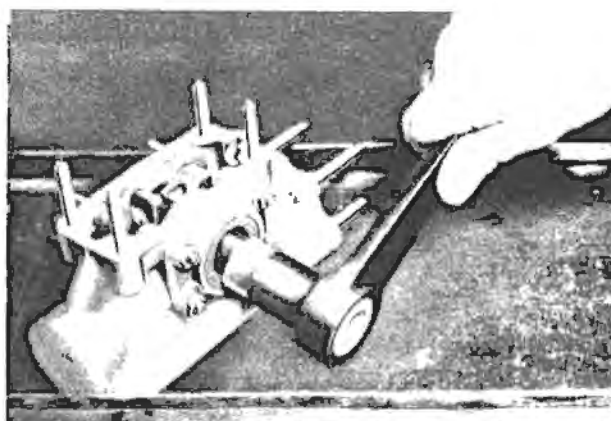


Fig. H.29.—Removing the Damper Lever.

housings. If not renew the bush and housing. The bushes are pressed into the housing and reamed in position and can be supplied as an assembly. Similarly check the bushes for wear and replace as necessary.

Remove any burrs from joint faces and renew all Vellumoid joints. *It is essential that the correct Vellumoid joints are used because joints of incorrect thickness will alter the setting of the valve.* Renew the rubber seals and seal retaining washers. Blow on the bleed jets with compressed air.

Check the operation of the solenoid by connecting across a 12-volt. battery. The plunger should protrude as the circuit is joined.

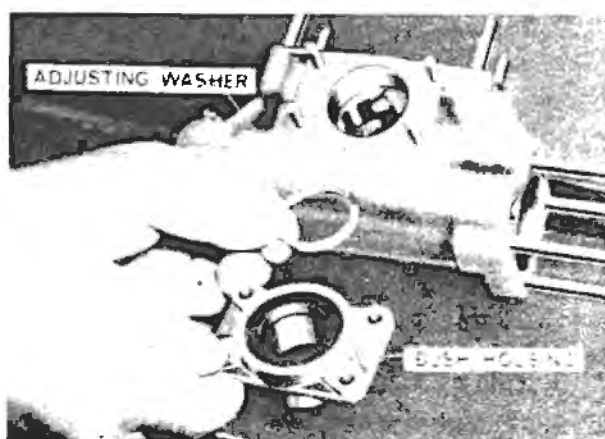


Fig. H.30.—Removing the Bush Housing.

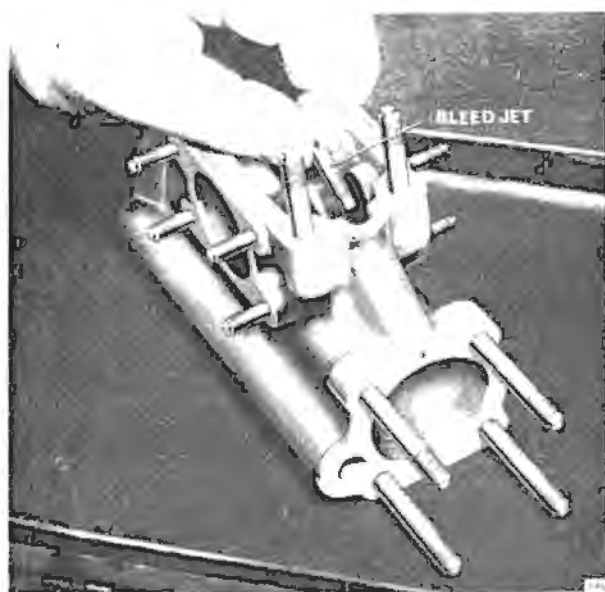


Fig. H.31.—Removing the Bleed Jets.

TO RE-ASSEMBLE THE DAMPER

It is essential that all parts are assembled in a scrupulously clean condition. Lubricate internal parts with Mobilfluid 200. Tighten all nuts to the torque figures given in the table.

Replace the piston in the cylinder. The piston is reversible and may be fitted either end first, but the small bar between the two halves must be at the bottom. Insert the damper lever so that the head of the pinch bolt will face the valve chamber and push it into position between the halves of the piston assembly.

Fit the rubber seal to the rocking shaft assembly. The seal should be fitted dry but a little Palmolive grease may be smeared on the inside edge to ease entry of the rocking shaft. Fit the bush housing to the shaft and press the seal into its housing with a blunt drift. Apply Wellseal to both sides of a new Vellumoid joint and fit it and the large bore adjusting washer to the shaft. Fit the shaft and bush housing to the damper body.

Fit the small bore adjusting washer, new Vellumoid joint, smeared with Wellseal on both sides, and bush housing to the other side of the damper body. Fit the damper lever pinch bolt, and replace split-pin.

Refit the bleed jets and top cover. Fit the valve chamber, noting that the joint with the centre cut out should be positioned between the valve seat plate and the damper body. Fit the rubber sealing ring and fit the solenoid with the wire leads towards the damper body. The solenoid unit is sealed with Selastik under

the rubber cap. If necessary renew the Selastik ensuring that the hole in the cover through which the leads emerge is sealed.

Fill the damper with the correct fluid pumping the arm to bleed out the air and topping up as necessary. Paint the valve chamber to body joints with Osotite and check all joints for leakage by chalking.

TO REFIT THE DAMPER TO THE FRAME

The procedure is the reverse of that for removal. The bolt through the "Silentbloc" bush should be tightened and split-pinned after the car has been lowered to the ground and the suspension has adopted its normal ride position.

THE VALVE CHAMBER

Although stripping of this unit is not recommended as the damper poundage can only be reset accurately with a special rig, a few notes are included in this section so that the operation of the damper may be better understood.

The slow leak valve has a cut-away section at its centre which, in the normal ride position, lies opposite a small transverse drilling in the valve bore. This drilling forms the slow leak passage. On moving the switch on the steering column, the solenoid is energised and a plunger moves out to push the valve forward in the bore against its spring by means of a push rod. The

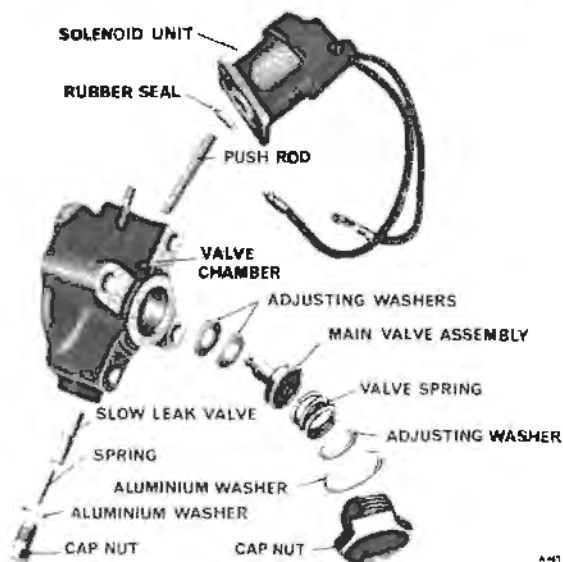


Fig. H.32.—Valve Chamber.—Exploded.

diameter of the slow leak passage is thus reduced and the ride stiffened up in consequence. The slow leak poundage is set by selective fitting of the valve. A range of valves with cut-away sections of different widths being available on production. Minor adjustments may be made by varying the length of the push-rod.

Any grit or foreign matter in the damper might cause the slow leak valve to stick in its bore. The assembly may be removed for cleaning but it is most important that the valve is replaced in the bore the same way round as the cut-away section may not be exactly central.

The main valve is adjusted by selective fitting of the adjusting washer under the valve spring, a thicker washer increasing the spring poundage to stiffen the

ride and vice versa. The adjusting washers under the valve head are selected by measurement to give the correct valve-seating. Tightening the cap nut will cause the aluminium sealing washer to collapse and will increase the damper poundage. It is therefore recommended that this nut is not disturbed.

The valve spring should normally be set to exert a pressure of 6½ lbs. on the main valve. The operating length of the spring to give this pressure is .422", and it is essential that this dimension is set accurately. A decrease of only .010" in this dimension can have the effect of increasing the work done by the damper by about 50 per cent.

On no account should the spring operating length be reduced below .422" as severe damage may result.

REAR AXLE

J

SECTION J

REAR AXLE

SUB-SECTION

Description, Data, Fits and Clearances	J.1
Axle Shafts	J.2
Reconditioning Final Drive	J.3

GENERAL DESCRIPTION AND DATA

The rear axle is of the semi-floating design with the final drive through a hypoid crown wheel and an off-set pinion having a 44°—46' spiral angle.

A die cast aluminium centre casing housing the pinion, crown wheel and differential assembly, is bolted centrally between the two forged steel axle tubes. Tapered roller bearings support the differential case,

and opposed tapered roller bearings support the pinion shaft and a parallel roller double row bearing supports the pinion nose.

The axle shafts are forged integrally with the wheel hubs, and can be extracted without dismantling the axle. The inner ends are splined into the differential bevel wheels, the outer ends are supported in single row

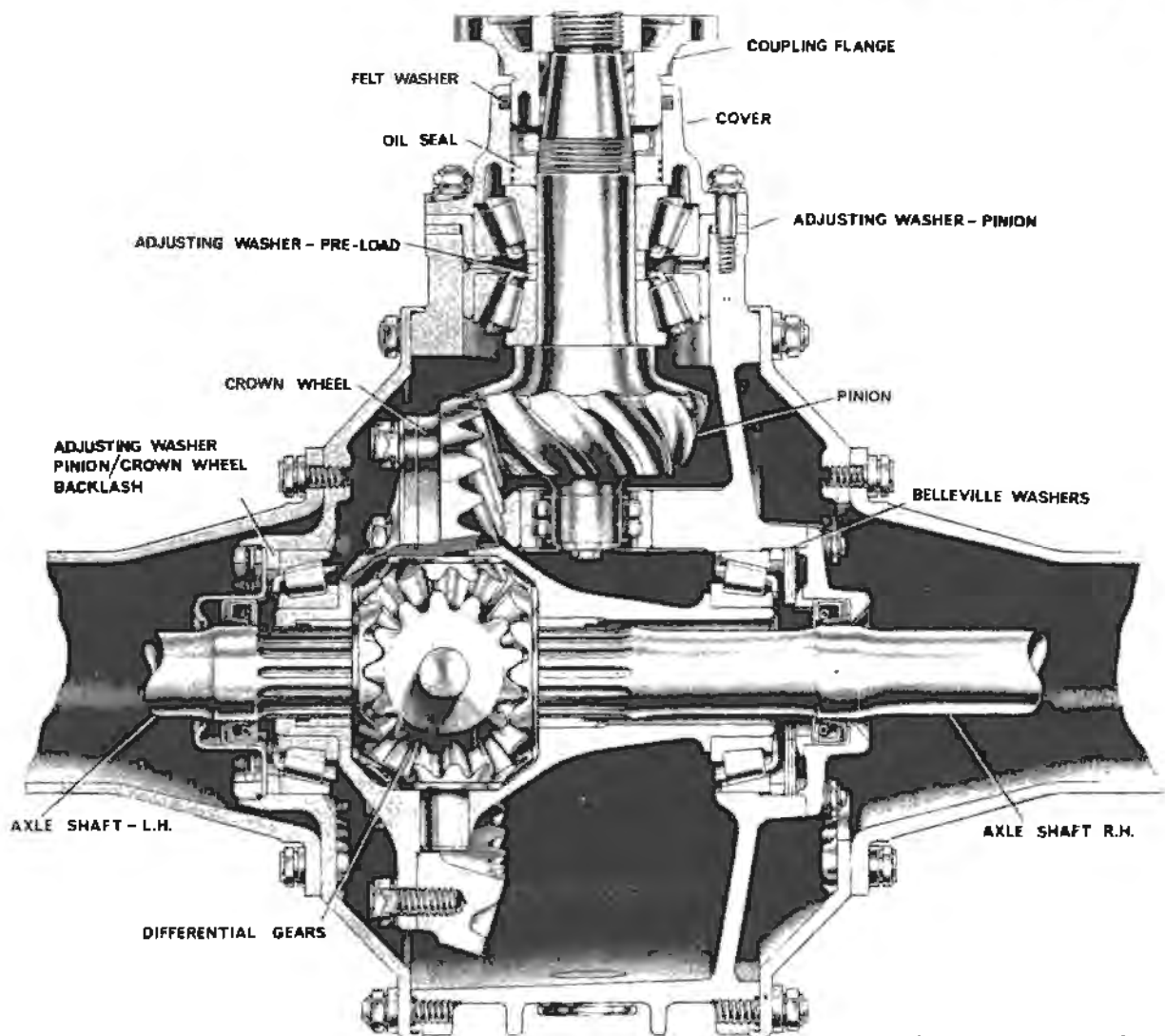


Fig. J.1.—Section through Rear Axle.

ball bearings mounted in a housing bolted to the axle tubes.

Rear Axle Ratios 12:41 Silver Cloud and "S" Type.
13:38 "S" Type Continental.
Oil Capacity 1½ pints.

FITS AND CLEARANCES

	Inches.	M/M.
Backlash, pinion to crown wheel ...	Etched on Crown Wheel.	
Backlash, differential pinions to bevel wheels ...	Nil.	Nil.
End-float, differential pinions and wheels	Nil.	Nil.
Differential trunnion bearing diam. ...	.686 — .6865	17.42—17.44
Differential pinion bore ...	.6875— .68775	17.46—17.47

Crown wheel run-out, maximum ...	.002	.05
Axle shaft bearing end-float ...	.013 — .017	.33—.43
Diameter of axle shaft at bearing ...	1.7725—1.77225	45.59—45.58
Axle shaft bearing bore ...	1.7710—1.7715	45.21—45.22
Axle shaft bearing retaining collar bore	1.768 —1.7685	44.90—44.91
Axle shaft bearing outside diam. ...	3.937 —3.9365	99.99—99.98
Axle shaft bearing housing bore ...	3.9367—3.93695	99.99—99.997
Hypoid bevel pinion shaft ...	1.3795—1.37925	35.03—35.02
Pinion bearing bore diam. ...	1.378 —1.3785	35.00—35.01
Pinion nose bearing shaft diam. ...	1.0630—1.06275	27.68—27.67
Nose bearing running clearance ...	.0003— .0008	.009— .020

AXLE SHAFTS

TO REMOVE AXLE SHAFT

Jack up the car and place suitable support under rear axle, remove wheel.

Remove the three countersunk brake drum retaining screws. Withdraw the wheel disc support and drum.

Remove the three nuts and bolts and also the nut and washer from the square-ended eccentric adjuster, holding the brake carrier to the bearing housing. It is essential that arrangements are made to take the weight of the carrier plate off the brake pipe.

Remove the ten $\frac{3}{8}$ " bolts retaining the bearing housing to the axle tube, hold the brake carrier in position and withdraw the shaft. The shaft should be extracted carefully to avoid damage to the seals adjacent to the crown wheel bearing.

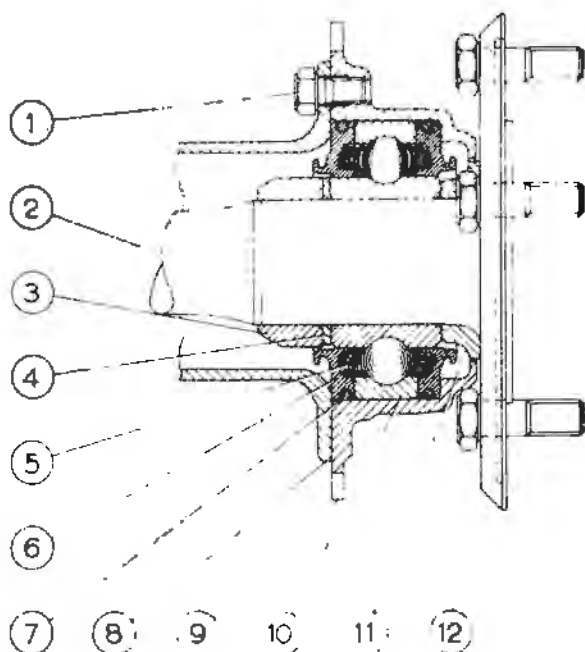


Fig. J.2. Section through Bearing Assembly.

- | | |
|-------------------|-------------------|
| 1 Axle Tube Bolt | 7 Sealing Ring |
| 2 Axle Shaft | 8 Axle Tube |
| 3 Collar | 9 Bearing Housing |
| 4 Spring Plate | 10 Bearing |
| 5 Grease | 11 Distance Piece |
| 6 Grease Retainer | 12 Wheel Stud |

TO RENEW THE BEARINGS

Special Tool 733 T1002 Extractor required.

Attention is drawn to the appreciable end float which exists on new bearings .013"—.017". Bearings should not be renewed unless end float considerably exceeds this figure or they are rough in operation.

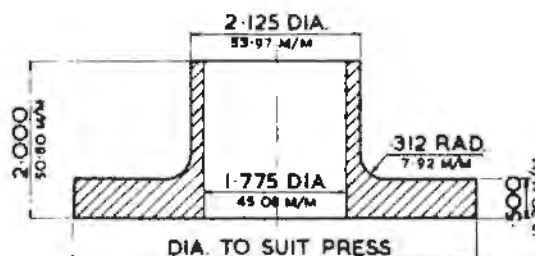


Fig. J.3. Hollow Press Tool for Pressing on Collar.

TO REMOVE

Mount the assembly in a lathe, turn the collar down until it is thin enough to split. This avoids damage to the shaft by the turning tool.

Press the bearing from the housing. Remove all grease, especially from between the outer grease retainer and housing.

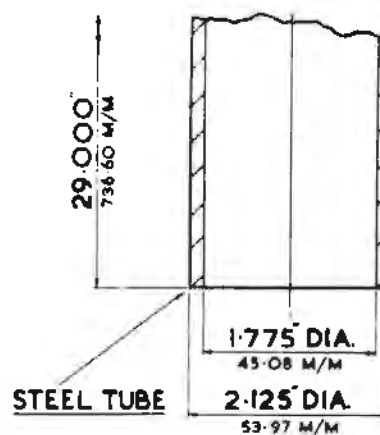


Fig. J.4. Solid Press Tool for Pressing on Collar.

NOTE.—If the bearing journal is worn due to the ball race having revolved on the shaft, a new shaft should be fitted, and the original returned if possible, to the London Service Station for salvaging.

TO REFIT NEW BEARING AND ASSEMBLY

Fit the distance piece on the shaft.

Press the new bearing and grease retainer with new sealing rings into the housing. The bearing should be packed with 1 oz. of "Retinax A", *not more*.

Slide the spring plate onto the shaft.

Place the assembly in a suitable press. Lubricate the bore of the new collar and press it home. A load of 3.5 tons (min.) is required.

Figs. J.3 and J.4 show suggested tools for pressing on the collar, Fig. J.3 for use with a hollow press and Fig. J.4 for use with a solid press. It is also important that a circular block $4\frac{1}{2}$ " diam. by $1\frac{1}{2}$ " thick should be placed beneath the flange to protect the studs when using the steel tube.

THE GREASE RETAINER

If it is suspected that the wheel bearing is running dry, it is possible to remove the inner half of the grease retainer for inspection, by using the special extractor 29590/T1002.

Withdraw the half shaft and fit the extractor as shown in Fig. J.5.

The amount of grease is of the greatest importance as over-filling will cause the grease to creep, and may find its way to the brake shoes.

The grease retainers are handed. Arrows on the retainers point in the direction of wheel rotation.

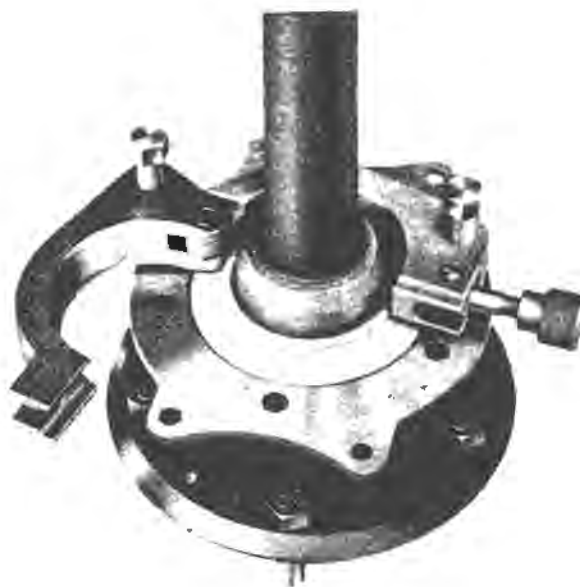


Fig. J.5. Grease Retainer Extractor.

It must be understood that this operation should only be carried out if the bearings are suspected of running dry, and not treated as a normal maintenance item.

TO REPLACE AXLE SHAFT

The procedure for re-assembly is the reverse of removal.

RECONDITIONING FINAL DRIVE

TO REMOVE REAR AXLE

Jack up the car, then place trestles or wooden blocks under the rear shackle brackets. Remove the wheels.

Disconnect the propeller shaft at the rear end.

Disconnect the brake rods from the equaliser, and the equaliser support from the right-hand side axle tube.

Disconnect and remove the rear silencer.

Disconnect "Z" bar from brackets and disconnect brake oil pipe at junction.

Jack up the rear axle sufficiently to lift the shock damper arms from their rebound stops and disconnect

the forked links from the main arms. Remove the jack

Disconnect the four U-bolts.

Withdraw the axle from between the springs and chassis frame to the "off-side".

TO REPLACE REAR AXLE

Replacement is an approximate reversal of the operations for removal.

Renew the rubber mounting pads if necessary.

Check that the rear equaliser support is correctly positioned.

THE BEVEL PINION

TO REMOVE PINION ASSEMBLY

Remove the nine nuts securing the pinion housing to the axle casing and withdraw the housing complete with the pinion. It may be necessary to use small levers if the housing is tight.

TO RENEW TAPER ROLLER BEARINGS

Retailers in the British Isles are advised that the London Service Station will undertake the fitting and pre-loading of new taper roller bearings on their behalf should they require it, if the bearing housing and

the old adjusting washers are returned to them.

Special tools required:—

RH 369 bevel pinion race extractor.

Holding block as shown in Fig. J.7.

Box spanner (1.478" across flats).

RH.339 serrated box spanner.

STD-717 pre-load gauging tackle (see alternative overleaf).

A range of adjusting washers is also required (see Spares Schedule).

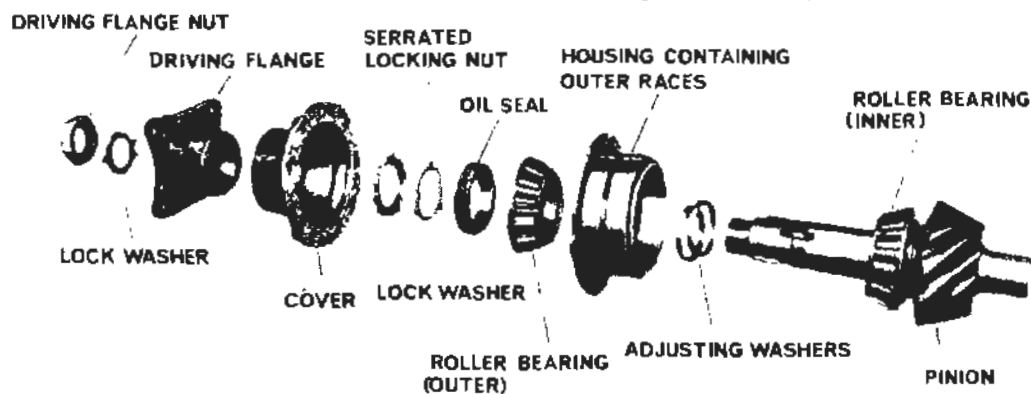


Fig. J.6.—Pinion Assembly.

Place the nose of the pinion in the holding block and tighten in a vice. Remove the driving flange retaining nut and lock-washer. Withdraw the flange with a suitable extractor, collecting the two Woodruff keys, and remove the bearing housing cover.

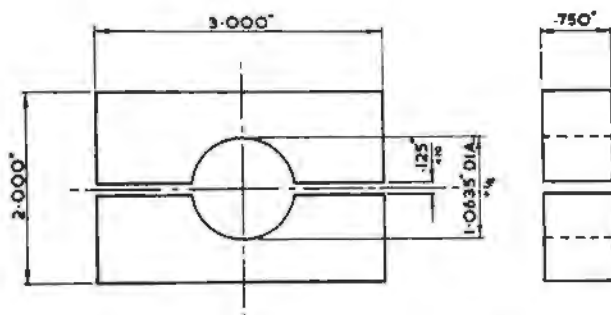


Fig. J.7.—Details of Holding Block.

Using the spanner RH.339, remove the pinion bearing retaining nut (left-hand thread) and lock-washer. Remove the oil seal. Place the pinion housing downwards on a supporting tube and press out the pinion.

Collect the outer bearing and adjusting washers. Remove the inner bearing from the pinion shaft with a suitable extractor, RH.369, as shown in Fig. J.8, fix in position under inner bearing and use press to remove. Tap out the outer races from the housing.

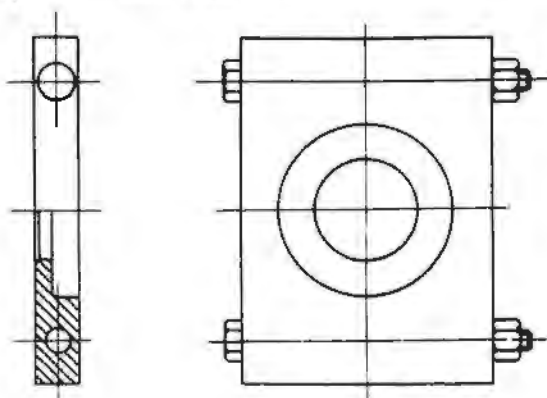


Fig. J.8.—Tool for Removing Inner Bearing.

Tap the new outer races into the bearing housing. Assemble the new bearings and housing in a clean and dry condition on the dummy pinion as shown in Fig. J.9.

Tighten the knurled nut until the drag torque, measured by means of the arm and weight provided hooked into a hole in the bearing housing flange, is between 5 and 12 in./lbs. The fixed weight and jaw assembly measures 5 in./lbs. and with the addition of

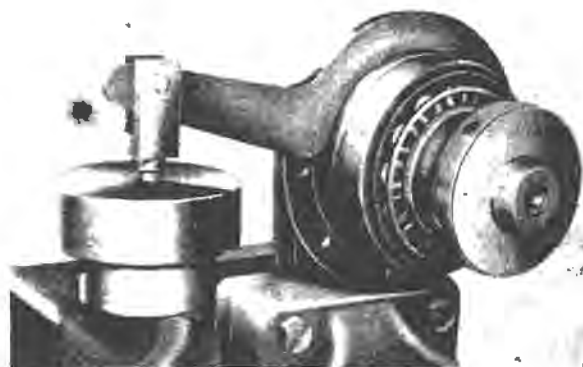


Fig. J.9.—Measuring Drag Torque.

the removable weight measures 12 in./lbs.

With a $\frac{4}{5}$ in. micrometer, measure the overall dimension between the outer face of the flange on the dummy pinion and the outer face of the knurled nut as shown in Fig. 10. Record this dimension.

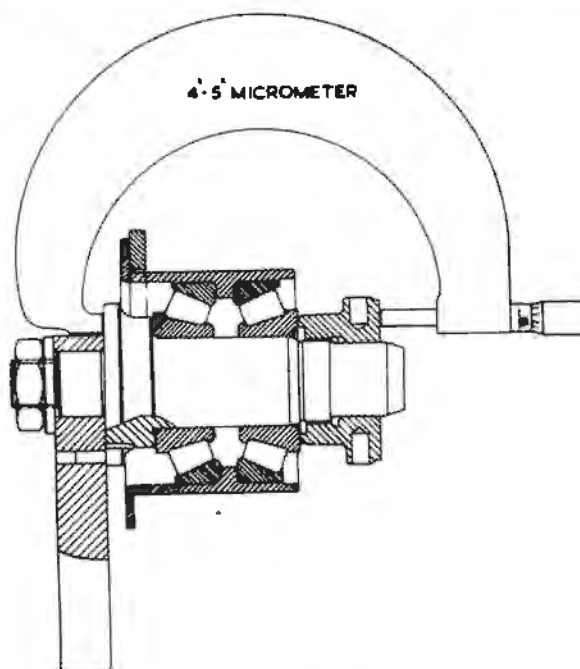


Fig. J.10.—Micrometer Measurement.

Strip the assembly and measure the overall width of each inner race. The total width of the two inner races plus 2.00", the width of the knurled nut and flange, deducted from the first dimension recorded, will give

the width of adjusting washers required to obtain the correct pre-loading.

Select two adjusting washers from the available range to give this thickness and re-assemble the pinion and housing. It has been established that the overall thickness of the two adjusting washers required to give 5 to 12 in./lbs., can vary between .352" and .378". By suitable pairing of the adjusting washers this range can be covered in steps of .001".

Lubricate the bearings. Fit a new oil seal felt in the cover and replace the driving flange. The new seal should be pressed firmly down into the recess. Refit the pinion housing to the axle casing and check the oil level.

ALTERNATIVE METHOD

If the special tool, No. STD.717 is not available, pre-loading can be carried out by trial and error, using a mandrel as shown in Fig. J.12, on which the inner races of the bearings are slide fit, and an accurate spring balance clipped to one of the holes in the flange of the pinion bearing housing.

Tap the new outer races into the bearing housing and assemble the bearings and housing in a clean and dry condition on the mandrel held vertically in a vice, using the two adjusting washers removed with the old bearing. Do not oil (see Fig. J.12).

Fit the left-hand threaded retaining nut, and gradually screw it down, at the same time turning the housing by hand to ensure that no undue load is being applied to the bearings. Thicker adjusting washers must be fitted if the drag measured by the spring balance at the bearing housing flange begins to exceed 6 lbs. It is important not to crush the bearings.

The correct pre-load is obtained when, with the nut fully tightened, the spring balance shows a drag of between 2½ lbs. and 6 lbs., as the pitch radius of the

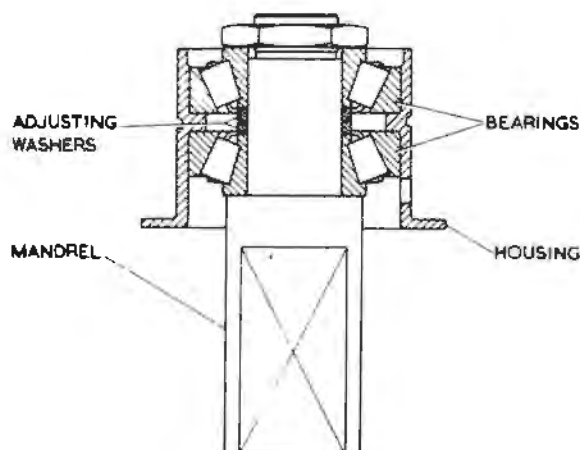


Fig. J.12.—Bearing Assembly on Mandrel.

bearing housing flange holes is approximately 2.00".

The adjusting washers may be paired so that a range of thickness from .352" to .387" in steps of .001" may be achieved. Different pairs of washers will have to be tried until the correct drag torque is achieved with the retaining nut fully tightened.

When assembling the bearings to the actual pinion, increase the thickness of the adjusting washers obtained on the mandrel by .002". This will allow for the expansion of the inner races when pressed onto the pinion. (Allowance is made for this expansion with the gauging tool STD.717 in that the true width of the knurled nut is 1.252" although it is marked 1.250".)

Lubricate the bearings. Fit a new felt oil seal in the cover and replace the driving flange. The new seal should be pressed firmly down into the recess.

Refit the pinion housing to the axle casing and check the oil level.

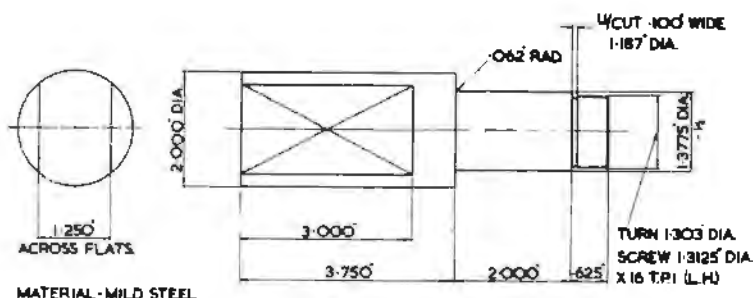


Fig. J.11.—Details of Mandrel.

CROWN WHEEL AND PINION

TO FIT A REPLACEMENT CROWN WHEEL AND PINION

The crown wheel and pinion are supplied in lapped pairs and must not be used independently.

Special tools required:—

- Pinion setting tool RH.366.
- Trial washer R.4575.
- Crown wheel checking distance pieces as shown in Fig. J.18.
(Local manufacture.)
- Backlash checking gauge 1649/G.1001 with adaptor RH.367.
- Castellated spanner 1649/T.1002.
- Holding block (as shown in Fig. J.7).
- Box spanner (1.478" across flats).
- Serrated box spanner RH.339.

In addition, a range of the following adjusting washers is required (see Spares Schedule):—

- Pinion depth adjusting washers.
- Crown wheel/pinion backlash adjusting washers.
- Differential pinion end float adjusting washers.
- Splined bevel wheel end float adjusting washers.

Replacement nose-bearing retaining bolts and nuts are also required.

PRELIMINARY DISMANTLING

Remove the axle assembly. Disconnect the axle tubes from the die cast centre casing and remove both tubes complete with shafts and brake drums.

Remove the nuts holding the pinion housing to the centre casing and withdraw the pinion.

Remove the locking wire on the left-hand side of the casing, and undo the castellated retaining nut with the special spanner 1649/T1002, first having marked its position relative to the side plate of the casing. This nut has a **LEFT-HAND THREAD** and will be found very tight. Remove the oil seal housing and adjusting washer.

Mark the position of both side plates relative to the centre casing and remove them. Withdraw the crown wheel and differential assembly from the left-hand side.

The right-hand side of the casing houses the three Belleville washers which apply the pre-load to the crown wheel bearings. Before undoing the nuts securing the housing, place the casing under a press

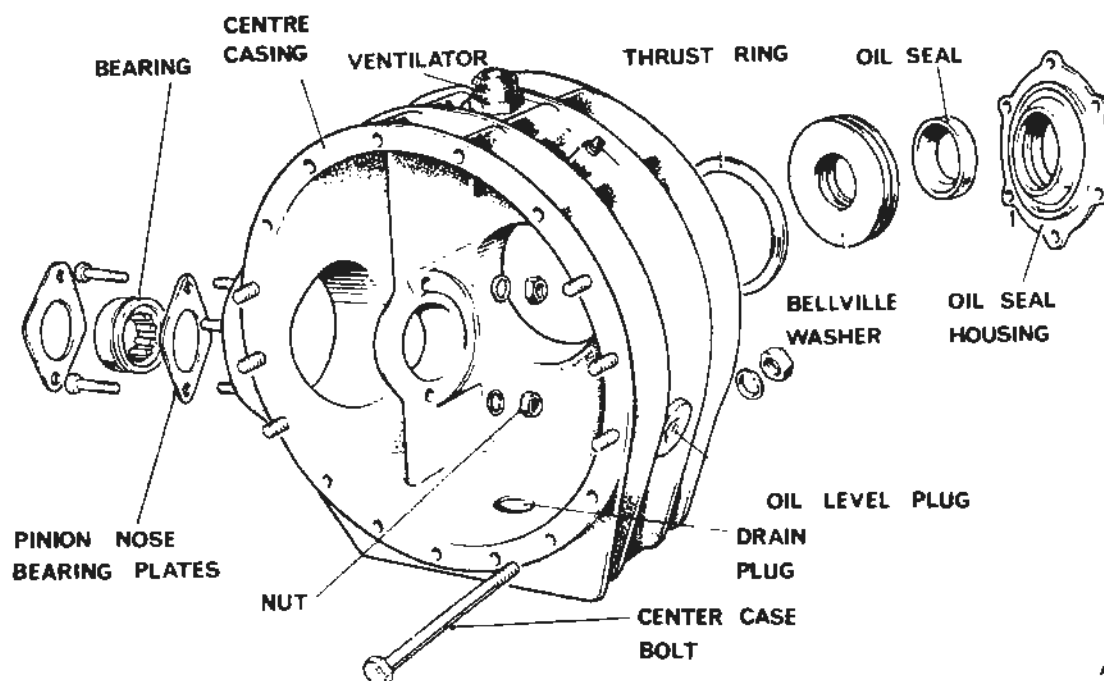


Fig. J.13.—Centre Casing.

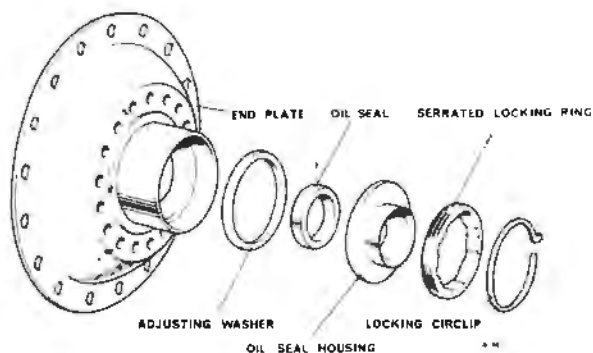


Fig. J.14.—End Plate.

with the housing uppermost, apply load and undo the nuts progressively, at the same time gradually releasing the load. Remove the cover, Belleville and thrust washers.

Remove the eight nuts securing the two halves of the differential casing and dismantle the assembly. The four bevel pinions are marked in relation to the trunnion bearings and the two splined bevel wheels are stamped "A" and "B". The wheel marked "A" is fitted to the left of the casing. All spacing washers should be wired to their respective gears, and on re-assembly all parts should be fitted in original positions, if they are to be used again, including the trunnion in relation to the casing and the two halves of the casing in relation to one another.

Remove the crown wheel from the differential casing.

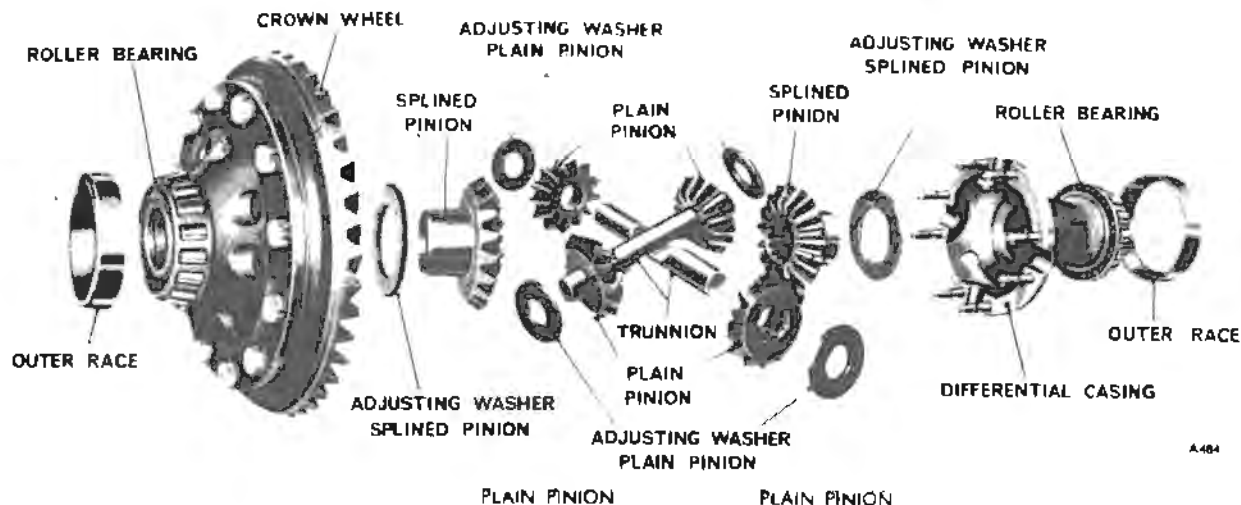


Fig. J.15.—Differential Assembly.

Remove the nose bearing, which is secured between two plates.

Remove the outer races of both taper roller bearings from their housings. Mark to their respective sides.

With the nose of the pinion in the holding block, undo the driving flange retaining nut with suitable box spanner 1.478" A F, and withdraw the flange with a suitable extractor.

Remove the pinion bearing retaining nut (Tool No. RH.339) and the oil seal. Place the housing, pinion downwards, in a supporting tube and press out the pinion.

RE-ASSEMBLY WITH NEW CROWN WHEEL AND PINION

Fit the replacement pinion into the pinion housing and check the bearing nip as described under "To Renew Taper-Roller Bearings". Refit the driving flange but do not lock up the nut.

Set the pinion depth in relation to the crown wheel as follows:—

- Subtract 1.00" from the dimensions etched on the pinion in the radius behind the nose bearing.
- Set the measuring piece shown in Fig. J.16 to the resultant dimension and lock up.
- Fit the left-hand side plate to the centre casing with packing pieces under the bolt heads and fully tighten up. The packing pieces must be equal to the thickness of the opposite side plate.
- Fit the pinion setting tool into the casing as shown in Fig. J.16 using the original adjusting washer

under the pinion housing flange (chamfer upwards).

- Tighten down gradually, using three equally spaced nuts. The correct pinion depth is achieved

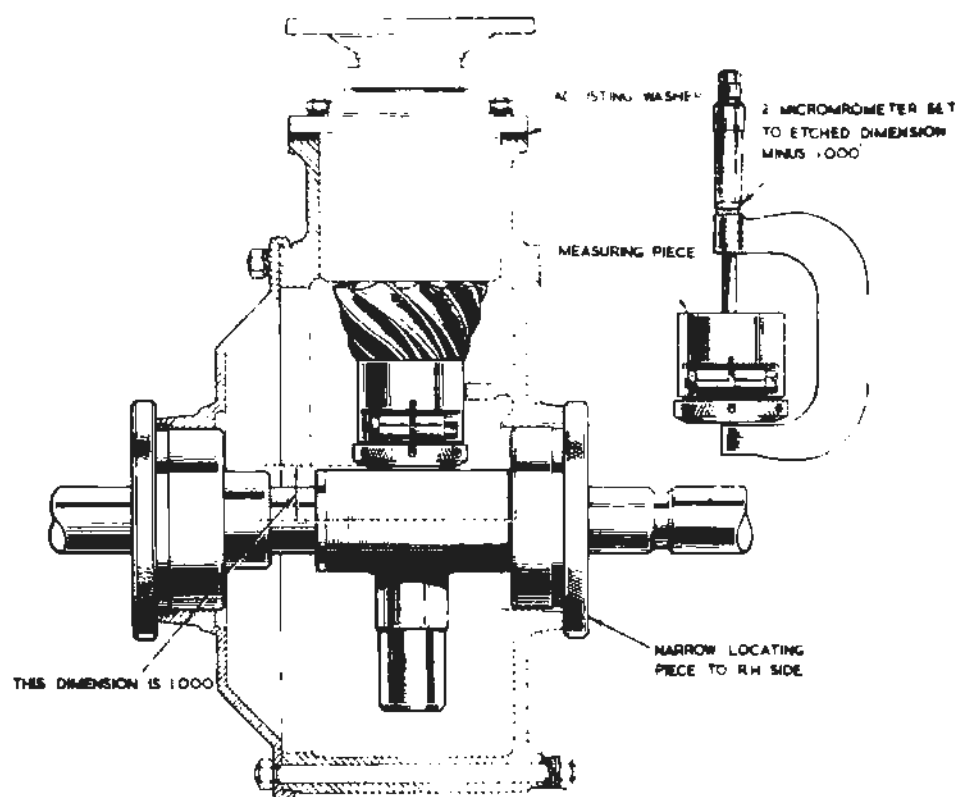


Fig. J.16.—Pinion Setting Tool in position

when there is exactly no end float at the measuring piece with the nuts fully tightened. The pinion will be slightly stiff to turn when tightened due to "nip" on the bearing; this may give the impression that the nose of the bearing is butting hard on the distance piece, but the actual clearance can be ascertained by moving the measuring piece itself while tightening up.

If the original spacing washer is not of suitable thickness, select one from the range provided. Fit the remaining nuts, tighten down and re-check. A slightly thicker washer may be required when all the nuts are fully tightened.

(f) Remove the pinion setting tool.

Fit the new crown wheel to the differential casing. Do not bend up the lock tabs.

Fit the four bevel pinions on their respective trunnion bearings and place the assembly in the right-hand half of the differential casing without washers behind the gears. Take the *left-hand* splined wheel and mesh it with the four pinions. Draw the four pinions up to it so that the mitres at the back all match exactly as shown at "A", Fig. J.17.

Measure the gap (B, Fig. 17), between the back of each bevel and the casing with feeler gauges or with the actual range of adjusting washers and fit washers to suit.

Lift out the trunnion assembly, first having marked its position relative to the casing, and fit the left-hand splined wheel into its casing with an adjusting washer of suitable thickness beneath it to give very slight backlash between the bevels and splined wheel.

Place the opposite splined wheel into its casing with a similar washer beneath it and bolt the two halves together. Check the backlash between the splined wheels and bevels when fully tightened down and select washers to give exactly zero backlash, with the whole assembly still free to turn.

Dismantle sufficiently to lubricate all moving parts, then re-assemble finally, taking care to replace each part in its original position.

TO CHECK THE TRUTH OF THE CROWN WHEEL

- Make up two distance pieces as shown in Fig. J.18.
- Place the crown wheel complete with roller bearings and outer races under a press with the

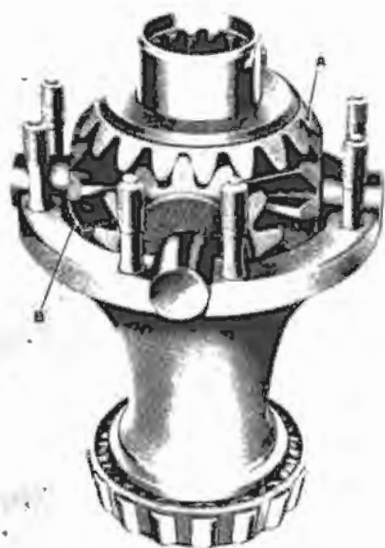


Fig. J.17.—Re-Mitring the Differential Pinions.

distance pieces at "C" and "D" as shown in Fig. J.19.

- (c) Apply light pressure and rotate the assembly slowly. The "run-out" should not exceed .002" (.051 m m.). If this figure is exceeded, other positions of the crown wheel relative to the differential casing should be tried until "run-out" is within limits.

Refit the outer race of the right-hand roller bearing to the casing.

Refit the pinion nose bearing—lock the nuts by centre punching.

Fit new axle shaft seals.

Refit the thrust washer, the three Belleville washers and housing to the casing. Ensure that the Belleville

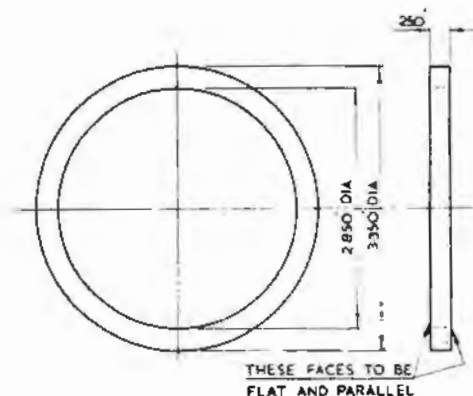


Fig. J.18. Distance Pieces for Crown Wheel Checking.

washers are fitted as shown in Fig. J.1 (i.e. convex side outwards).

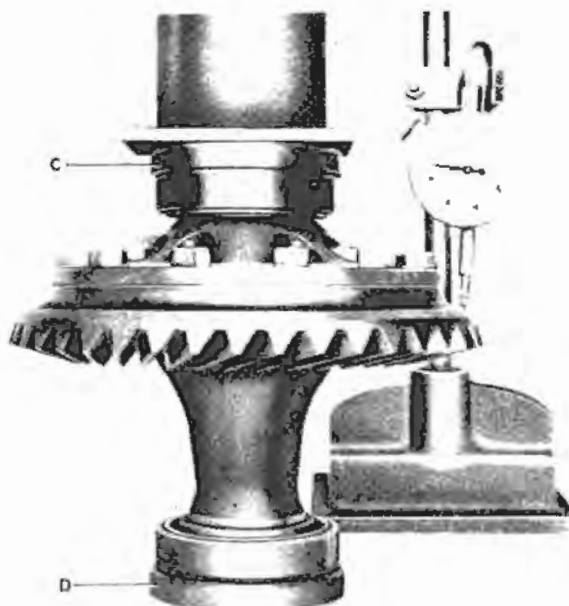


Fig. J.19.—Checking the Crown Wheel for Truth.

Take note of the crown wheel backlash dimension which is etched on the back of the wheel near the teeth. Place the crown wheel assembly with bearings in the housing and fit both side plates. The nuts should be to the right of the casing. Do not yet use jointing compound.

TO CHECK AND ADJUST THE CROWN WHEEL TO PINION BACKLASH

- Tap the left-hand outer race into position, select the thinnest adjusting washer, lightly grease one side and place this side against the outer race, fit the oil seal housing and gradually tighten up the retaining nut fully, at the same time checking that there is always backlash between the crown wheel and pinion.
- Remove the nut and lockwasher from the pinion driving flange and fit the adaptor and dial as shown in Fig. J.20. R.H.367 is used in conjunction with previous tool as supplied for Bentley Mk. VI. and "R" types, to suit unified threads. The lever attached to the adaptor can be rotated if the wing nut is released.
- Set the contact of the dial indicator exactly in the centre of the half ball on the lever.

- (d) Take backlash readings at 12 points round the crown wheel, add the readings together and divide by 12. This gives the average backlash.
- (e) To bring this average reading to the figure etched on the crown wheel, an adjusting washer of the correct thickness must be fitted in place of the original one behind the left-hand roller race. As an approximate guide to the final thickness required, the ratio of washer thickness to backlash is 1.1, i.e. if the backlash is .004" in excess of requirements, the correct washers will be about .004" thicker than the first washer fitted. The unhardened trial washer, R.4575, should be reduced by grinding until it is approximately .005" thicker than is required. Backlash should then be checked with this in position and the soft washer gradually reduced to size by careful hand filing until backlash is correct.
- (f) The adjusting washers supplied are hardened to a depth of .020"—.030". Select one which is nearest to the finished thickness of the unhardened washer and grind each side equally until the thickness is equal to the trial washer.
- (g) Assemble and fully tighten the retaining nut to the original mark. Fit the lock wire.

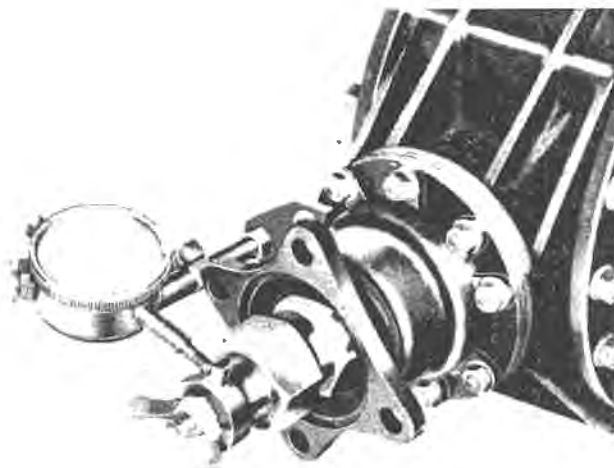


Fig. J.20.—Checking the Crown Wheel and Pinion Backlash.

Apply jointing compound to the axle tube faces and refit both tubes.

Fit the pinion driving flange and lock up.

FUEL SYSTEM AND CARBURETTORS

SECTION K

FUEL SYSTEM AND CARBURETTERS

SUB-SECTION

Description	Service	To Remove Fuel Tank	
The Rear Filter	K.1
The Fuel Pumps	K.2
The Carburetters	K.3
Air Cleaners	K.4
Throttle Control Linkage Settings	K.5

FUEL SYSTEM

DESCRIPTION

The fuel tank on both models is mounted in the frame with two metal straps, and it is removable from below with the minimum disturbance of other parts.

The wing cover giving access to the filler tube is normally released by operating a switch on the fascia board, but should the solenoid fail, the locking catch can be manually released from inside the boot.

An internally mounted rheostat in the fuel tank operates an electrical fuel level gauge on the dashboard. The gauge and the solenoid-operated wing cover are covered in the Electrical System, Section M.

The fuel line from the tank is carried first to the main filter mounted on the frame rear cross-member, and then along the right-hand side-member to the twin electric fuel pumps mounted on the outside of the frame.

From the pumps the fuel line extends along the frame and connects to the flexible feed pipe to the two S.U. carburetters.

SERVICE OPERATION

The rear filter and the gauzes at the carburetter unions and at the petrol pumps should be cleaned every 10,000 miles.

FUEL TANK

Capacity—18 gallons.

The tank is constructed of 16 S.W.G. (.064") gauge aluminium alloy. It is fitted with internal baffles to prevent surging, and an additional anti-surge tower surrounds the end of the outlet pipe.

The electric gauge mechanism is fitted at the front of the tank and the float is protected by further baffles.

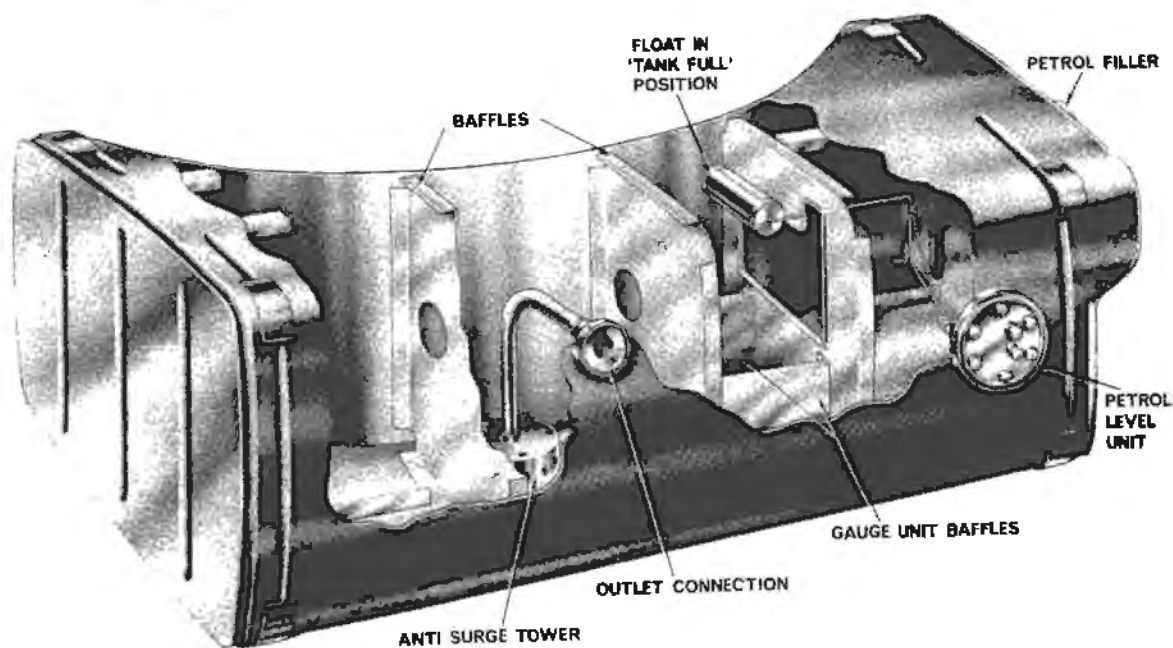


Fig. K.1. The Fuel Tank.

TO REMOVE FUEL TANK

Run car over pit, or alternatively, jack up rear portion and place on trestles.

Drain the fuel by releasing drain plug; use adaptor and spanner from tool kit.

Remove the carpet from the boot, and then remove the three securing screws holding the trim covering the tank filler tube, where it passes through the boot. Release the Jubilee clip securing the rubber tube connection to the filler tube.

Disconnect the fuel line from the suction pipe connection on the fuel tank. Remove the two .250" nuts from the tensioning bolts securing the tank straps (using a box spanner) together with the four .250" saddle bolts on each bracket.

Withdraw the tank, together with the fabric packing strips.

For re-assembly, reverse the dismantling procedure.

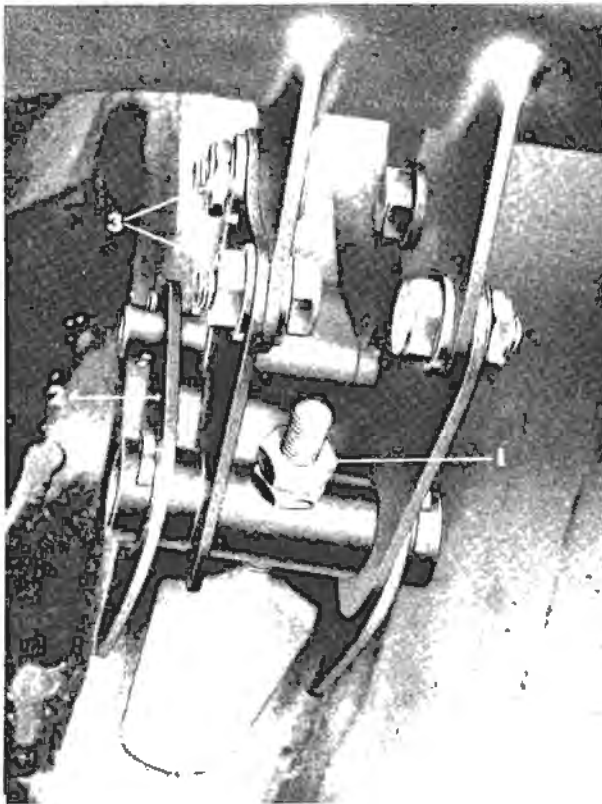


Fig. K.2. Fuel Tank Support Strap.

- 1.—Tensioning Bolt
- 2.—Intermediate Bracket
- 3.—Saddle Bolts

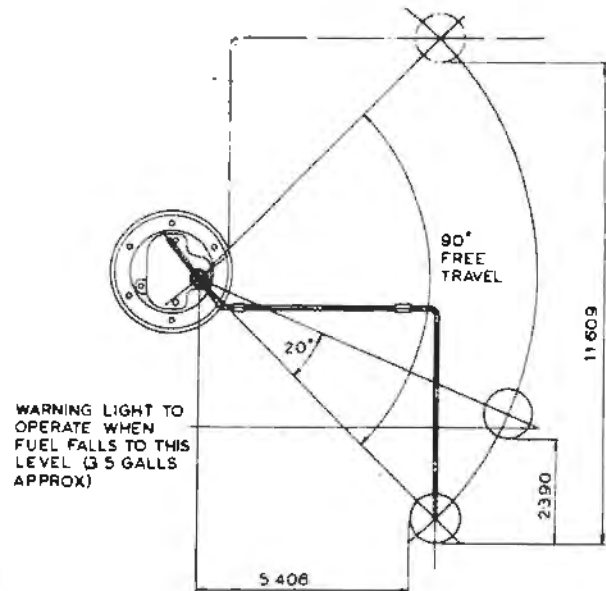


Fig. K.3.—Float Setting.

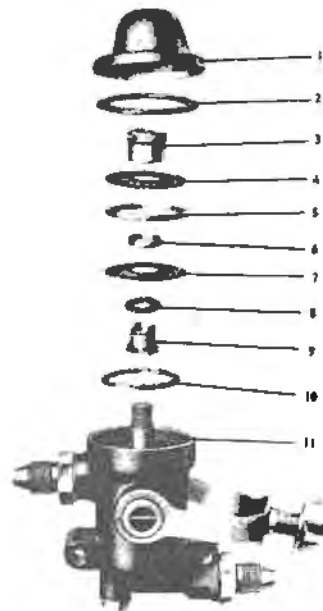


Fig. K.4.—The Rear Filter.

- 1.—Cover.
- 2.—Cover Seal.
- 3.—Knurled Nut.
- 4.—Filter Gauze.
- 5.—Distance Washer (outer)
- 6.—Distance Washer (inner)
- 7.—Filter Gauze.
- 8.—Rubber Washer
- 9.—Removal Sleeve.
- 10.—Rubber Washer
- 11.—Filter Body.

THE REAR FILTER

The rear filter is shown in Fig. K.4. Fuel passes upwards through two circular gauzes located above a settling sump. Dirt settles on the lower faces of the gauzes and in the sump.

To clean, release the yoke nut, swing the strapp

forward and remove the cover. Lift out the gauzes by means of the central sleeve.

Separate the gauzes and wash in petrol; remove the drain plug and wipe out sump.

When refitting after draining, ensure that the cork sealing washer is in good condition and that the yoke nut is securely tightened, as an air-tight seal is essential.

THE FUEL PUMPS

The fuel pump unit, mounted externally on the right-hand side of the chassis frame, consists of two electrically operated independent pumps, complete with diaphragms, solenoids, trip mechanisms, suction and delivery valves. Each pump works independently of the other, but both deliver fuel into a common delivery chamber.

FAILURE TO DELIVER FUEL

If the pump fails to operate, slacken the pump outlet union, and if petrol is then emitted, examine the filters in the carburettor inlets and check the operation of each float chamber needle valve.

If no petrol is emitted, check the electrical supply by connecting a 12-volt bulb between supply lead and pump body.

If the fault persists, remove the valve assemblies, shown in Fig. K.5, and check that the valves are clean and operate freely on their seatings. The valves are fitted with their smooth faces downwards.

If this does not effect a cure, disconnect the terminal at each end of the pump and remove the end covers. Examine each pumping unit in turn, ensuring that the points are in contact, and clean them by drawing a piece of fine glass paper backwards and forwards between them whilst pressing them together.

Check the current flow through the units by touching each end terminal with its respective supply wire. If a spark is not obtained at both end terminals, a defect in the pump electrical circuit is indicated and the pump should be changed.

If the pump ticks excessively but does not pump, either a shortage of fuel, an air leakage, or a defect in the pump is indicated. A hot pump indicates a restriction on the inlet side.

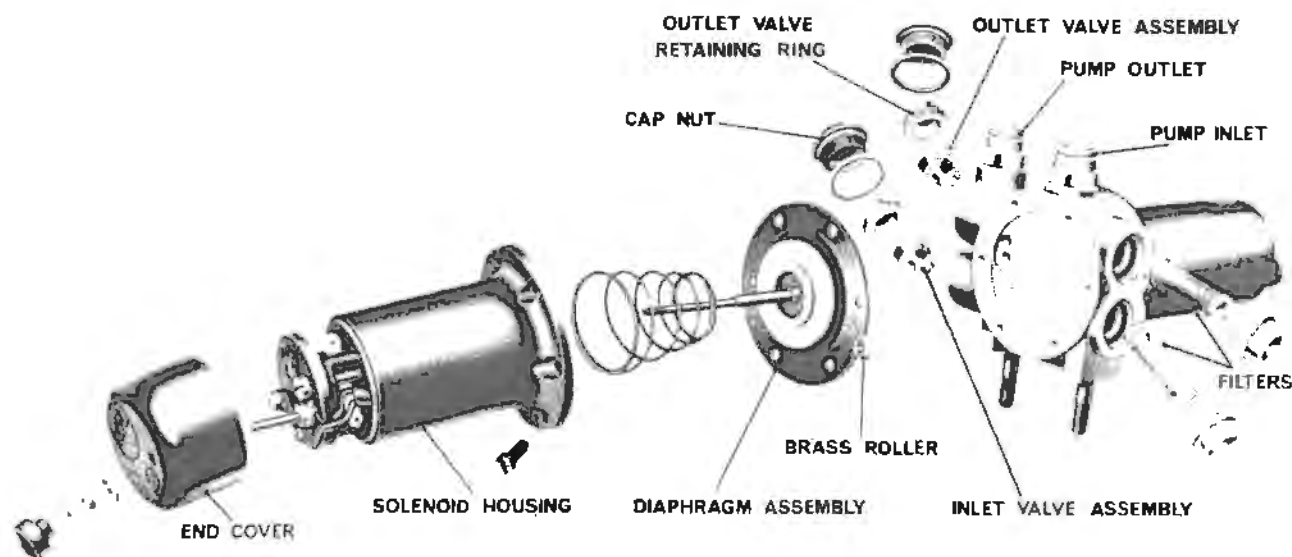
Ensure that the petrol tank is not empty, then check the pipe line and all unions and joints for leakage.

If no leakage is apparent, disconnect the fuel inlet pipe to the pump, after releasing cover of rear filter (see removal instructions), and replace it with a length of rubber tubing, the open end of which is immersed in a container of clean petrol. If the pump then operates satisfactorily, a defect in the inlet pipe or rear filter is indicated.

If the fault persists, remove the pump and examine the diaphragms.

TO REMOVE PUMP FROM CHASSIS

Before disconnecting the fuel pipes at the pump, release the cover of the rear filter. This will prevent loss of fuel by syphoning, as the level of the fuel in the tank is above the pump.



K.244

Disconnect the electrical supply wire from the terminal on the front pump, the radio interference suppressor wire and the connecting wire to the rear pump. Remove the suppressor wire from the rear pump terminal.

Disconnect the suction and delivery pipes at their unions on the pump body.

Remove the four nuts and spring washers retaining the pump to the mounting bracket.

To replace the fuel pump, reverse the above operations.

CHANGING THE DIAPHRAGMS

Remove the six screws securing the solenoid housing to the pump body and withdraw the housing complete with the diaphragm assembly. Release the membranes from the flange of the housing, unscrew the diaphragm assembly and remove the eleven brass rollers.

Thoroughly wash all parts in clean petrol and examine the brass rollers and diaphragm.

If the diaphragm membranes are swollen, warped or perforated, the diaphragm assembly must be changed.

Rollers on which flats are apparent on the spherical edges should be renewed.

Note.—Before re-assembling the pump, the spring blade retaining screw in the contact breaker must be released sufficiently to ensure that no pressure is exerted on the tungsten points and outer rocker. Any pressure at this point during assembly will prevent the diaphragm being correctly set.

To re-assemble the pump, place the large end of the spring in the solenoid housing, check that the impact washer is correctly located in the recess in the armature, insert the bronze rod through the hole in the solenoid core and screw it into the inner rocker trunnion, screwing it fully home.

Hold the solenoid housing flange uppermost and, lifting the edges of the diaphragm, insert the eleven brass rollers into the annular recess in the armature.

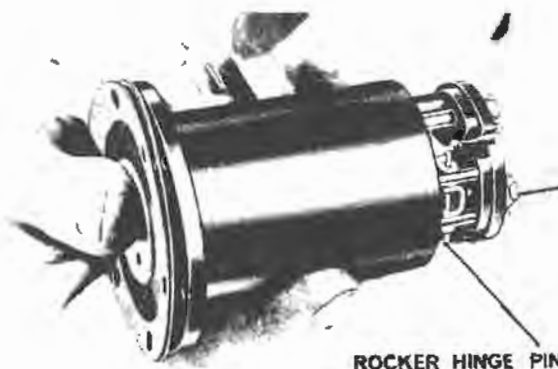


Fig. K.6.—Adjusting the Diaphragm.

Turn the solenoid housing to the horizontal position, as shown in Fig. K.6, and unscrew the diaphragm assembly in steps of one sixth of a turn, i.e. one hole at a time, simultaneously pressing and releasing the diaphragm with the thumb until the outer rocker will "toggle" over as the diaphragm is pressed in, then unscrew the assembly a further one complete turn.

Tighten the spring blade retaining screw in the contact breaker.

Fit the solenoid housing to the pump body, lightly securing it with the six setscrews and taking care not to trap the rollers.

Remove the rocker hinge pin to allow the armature spring to press the diaphragm assembly further back and stretch the diaphragm membranes, then tighten the setscrews, replace the hinge pin and the end cover.

TEST DATA

Both pumps operating together deliver 1 pint in 32 seconds with a suction lift of 3 ft., using paraffin. Mount the pump on a test rig 3 ft. above the paraffin level in a paraffin bath. Connect up an inlet pipe and a short outlet pipe and measure the pump outlet for a given time.

THE CARBURETTERS

DATA

Carburetter	...	S.U. HD.6 diaphragm type.
Choke size	...	1½".
Jet size	...	.100".
Jet needle	...	TA.—AC type cleaner. TC.—Oil bath cleaner.
Carburetter	...	S.U. HD.8 diaphragm type.
Choke size	...	2.00".
Jet size	...	.125".
Jet needle	...	UC.—Vokes silencer and cleaner.

DESCRIPTION

The carburetters fitted are S.U. diaphragm type. These retain the basic principles of the S.U. carburetter, but the jet glands are replaced by a flexible diaphragm, and the idling mixture is conducted through a passage to the engine side of the throttle butterfly. The jet is fed through its lower end and attached to a synthetic rubber diaphragm (see Fig. K.7) by means of the jet cup and the jet return spring cup, the centre of the diaphragm being compressed between these two parts. At its outer edge it is held between the diaphragm casing and the float chamber arm. The jet movement is controlled by the jet return spring and the jet actuating lever and adjusting screw, this lever raising or lowering the jet as desired.

The action of raising or lowering the jet controls the idling mixture—lowering the jet enriches the mixture and raising the jet weakens the mixture.

Idling with a warm engine the mixture, instead of passing under the throttle butterfly, is led along a passage connecting the choke space with the engine side of the throttle butterfly. The quantity of mixture passing through the passage, and therefore the idling speed of the engine, is controlled by the "slow running" valve, the quality, or richness of the mixture being determined by the jet adjusting screw, as also already mentioned.

Once the engine has reached its running temperature, the throttle butterfly is completely closed; but for "Fast Idle", when the engine is cold, the throttle is slightly open, the mixture passing under the butterfly as well as along the passage.

DEFECTS IN OPERATION

In the event of unsatisfactory running, before removal of the carburetter, ensure that the ignition system, sparking plugs and fuel pump are all in order. If it is established that the carburetter is at fault, proceed as

follows and examine for:—

STICKING PISTON

This can be recognised by stalling, bad slow running, lack of power, high fuel consumption. Remove the air cleaner by releasing the screws securing the two collars holding it in position, then remove the two jubilee clips retaining the rubber connection. A spring-loaded pin is provided on the right-hand side of the chamber for lifting the piston, but this can also be done with the finger or a small screwdriver. The piston should rest, when the engine is not running, upon the bridge. When raised to its highest position against the appreciable resistance of the damper piston, and then released, it should drop freely.

If downward movement is sluggish, or if it is reluctant to break away from its position at rest on the bridge when an attempt is made to raise it from this position, the jet should be lowered by means of the enrichment mechanism, and the test repeated.

If the previous symptoms persist it can be assumed that the enlarged diameter of the piston is making contact with the bore of the suction chamber, or that the piston rod is not sliding freely within its bush. There is also the possibility that the damper rod has become bent and is inducing friction between the damper piston and the bore of the main piston rod. Remove the oil cap and damper assembly; if the removal of the damper allows free downwards movement of the piston, the damper rod may then be straightened before re-assembly if this appears to be the cause of the trouble. If sticking has been eliminated by dropping the jet the indication is that contact and friction are taking place between the jet and the needle and that "centring of the jet" is required. (See to centralise the jet.)

DIRT BETWEEN THE PISTON AND SUCTION CHAMBER OR STICKING PISTON ROD IN BUSH

Remove the suction chamber, withdraw the piston and thoroughly clean both parts with petrol and a clean cloth. Apply a few drops of light oil to the piston rod, preferably diluted with paraffin if any signs of rust or corrosion are noticed on the rod. Replace the piston in the suction chamber and test for rotation and sliding freedom. On no account should any attempt be made to enlarge the bore of the suction chamber, or to reduce the diameter of the enlarged part of the piston, as the maintenance of a limited clearance between these parts is absolutely essential to the proper functioning of the carburetter.

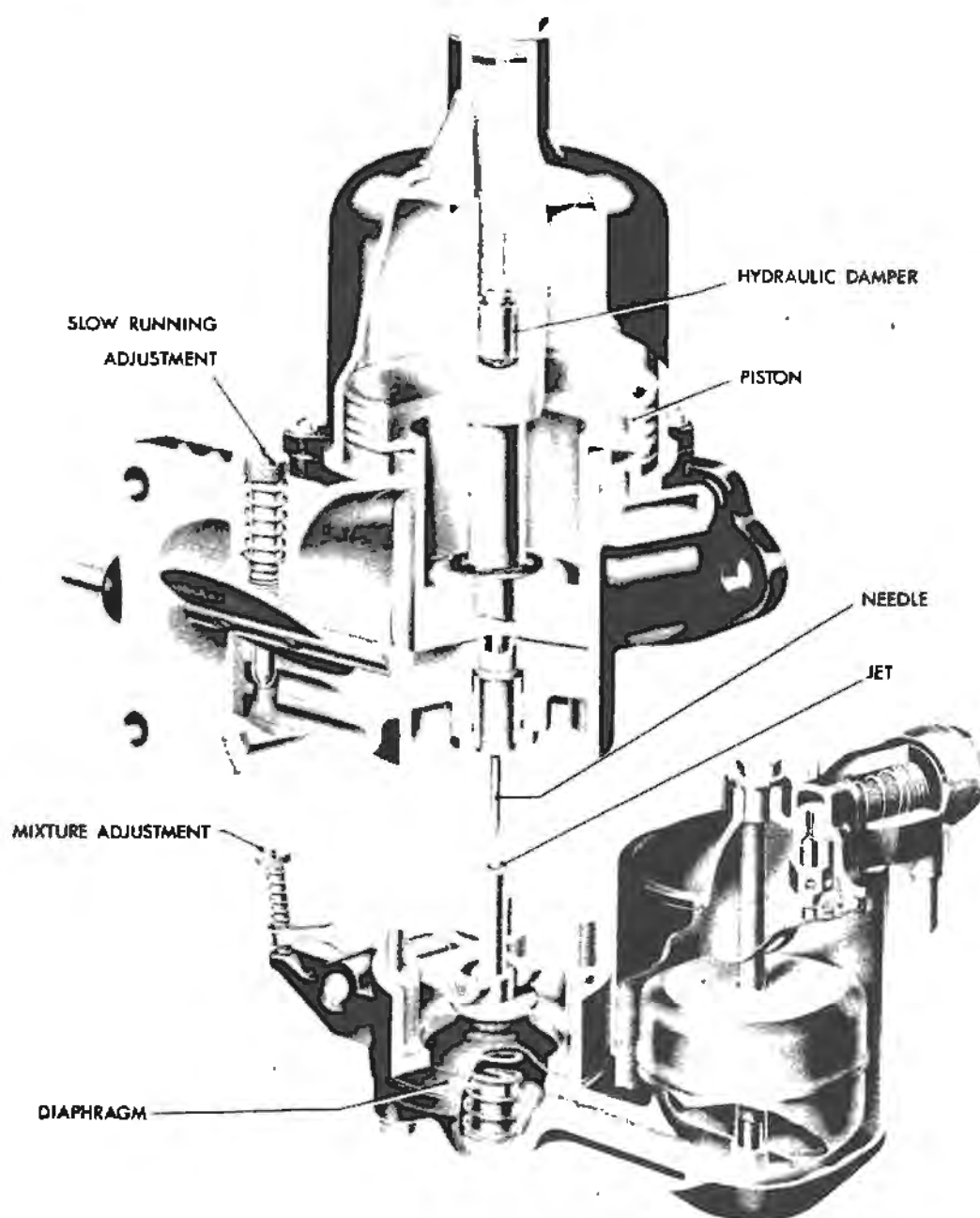


Fig. K.7.—The Carburetter.

FLOODING FROM FLOAT-CHAMBER OR JET

Flooding may occur due to a punctured float, or to dirt between the needle and seating. To remedy, the float chamber lid should be removed and the necessary cleaning or repair effected.

WATER AND FOREIGN MATTER IN FLOAT CHAMBER

Examine and clean out the float chamber and filters. It is possible that the jet has become choked but, before removing the jet assembly, the following procedure

should be tried:

- (i) Drop the jet to its lowest position by means of the adjusting screw.
- (ii) Remove the suction chamber and withdraw piston.
- (iii) Replace the suction chamber and cover air intake tightly.
- (iv) Turn engine over rapidly by hand or with the starter. This will in all probability draw out the water globules or dirt. If, however, this fails, the jet must be removed for cleaning.

CHECKING FUEL LEVEL IN FLOAT CHAMBER

The fuel level in the float chamber can be varied by bending the forked lever (Fig. K.8). The forked lever should be set so that when it is holding the needle against its seating, a $\frac{7}{16}$ " diameter rod can just be passed between the lever and the float chamber cover as illustrated in Fig. K.8. If needle and seating are worn, they must be replaced.

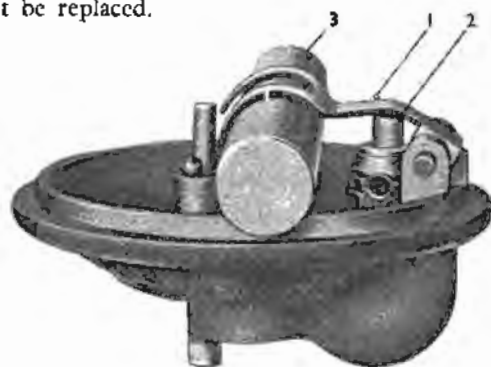


Fig. K.8.—Checking Fuel Level.

- 1 — Forked Lever
- 2 — Needle Valve
- 3 — Test Bar

FAILURE OF FUEL SUPPLY TO FLOAT CHAMBER

If the engine is found to stop under idling or light running conditions, notwithstanding the fact that a good supply of fuel is present at the float chamber inlet union (observable by momentarily disconnecting the union), it is possible that the needle has become stuck to its seating. This possibility arises from a gummy substance in the fuel system, resulting from the protracted storage of fuel in the tank.

After removal of the float chamber lid and float lever, the needle may be withdrawn, and its point thoroughly wiped with a rag dipped in alcohol. Similar treatment should also be applied to the needle seating, which can conveniently be cleaned by means of a matchstick and cloth dipped in alcohol. Persistent trouble of this nature can only be cured by complete dismantling and

mechanical cleansing of the tank and fuel system. If the engine is found to suffer from a serious lack of power, which becomes evident at higher speeds and loads, this is probably due to an inadequately sustained fuel supply, and the fuel pump should be investigated for inadequate delivery, and the filters in the system inspected and cleaned. (See "The Fuel Pumps", Sub-Section K.2.)

STICKING OF JET

Should the jet and its operating mechanism become unduly resistant to lowering and raising by means of the enrichment mechanism, the jet should be lowered to its fullest extent, and the lower part thus exposed should be smeared with petroleum jelly or similar lubricant, and the jet raised and lowered several times in order to promote the passage of the lubricant upwards between the jet and its surrounding parts.

TO REMOVE THE CARBURETTER

- (i) To remove the air cleaner, remove the two strap screws and the jubilee clips from the rubber joint.
- (ii) Disconnect windscreen washer pipe (rubber) from induction pipe and the electric connections from choke solenoid.
- (iii) Disconnect fuel pipe.
- (iv) Disconnect throttle control from accelerator pedal rod.
- (v) Remove nuts securing air intake pipe to carburetter air intake flanges.
- (vi) Remove the four .250" nuts retaining each carburetter and remove.

Note.—If required, both carburetters can be removed while attached to the air intake pipe.

TO DISMANTLE THE CARBURETTER

Having removed the carburetter (see Fig. K.7) remove the vacuum pipe and float chamber lid together with float, needle and filter. Unscrew the three screws securing the suction chamber to the carburetter body. Remove piston and needle. Remove hydraulic damper and cap from top of valve chamber. Unscrew and remove the four long bolts retaining the float chamber and diaphragm casing to the body, and remove the jet diaphragm assembly and spring.

To remove the jet needle unscrew the retaining grub screw in piston.

TO CENTRALISE THE JET

Remove the float chamber and hold the jet in the uppermost position by hand, the adjusting screw having first been undone sufficiently to allow the jet cup to make contact with the jet bearing, with a distinct clearance between the jet adjusting screw and its stop

It is important to keep the jet and the diaphragm in the same radial position in relation to the carburettor body throughout the operation, as the jet orifice is not necessarily concentric with its outside diameter, therefore turning may cause decentralisation. Mark one of the diaphragm and its corresponding jet casing screw holes with pencil.

TO OVERHAUL THE CARBURETTER

The suction chamber and piston are fitted in mated pairs and must be kept together.

Inspect jet and needle for wear. Should these require renewing, the same size jet and needle must be obtained; it should be noted when refitting the needle, the shoulder must be *flush with the underface of the piston*. Clean both piston and chamber with a clean cloth dipped in petrol. *No polishing paste or abrasive may be used.*

When inspecting the diaphragm and jet assembly, it should be remembered that the jet is fed through its centre and has no glands. Leakage can only occur by an insecure fit of the jet cup or bad sealing at the outer edge, where it is compressed between the float chamber and the diaphragm casing, or at its inner edge where it is fitted to the jet, or by tearing of the diaphragm.

Leakage at the outer edge may be cured by tightening the four float chamber screws. Leakage or tearing of the diaphragm require a new assembly.

THROTTLE SPINDLE GLANDS

Spindle glands are fitted to the throttle; these consist of the cork gland itself, a dished retaining washer, a spring and a shroud. This assembly does not require servicing and can only be removed by dismantling the throttle spindle and butterfly.

THE HYDRAULIC DAMPER

Inspect the hydraulic damper and ensure that it is not bent, and refill, if required, with SAE.20 oil.

JET ADJUSTING MECHANISM

Inspect and test for freedom of movement.

SETTING AND SYNCHRONISING THE THROTTLES

- (i) (a) A few cars were released with the original design of throttle lever incorporating a full throttle stop. These are to be set as follows:—
With the lever in the full open position (stop pin hard on the carburettor stop web) the pinch bolt to be tightened with the throttle at 90° to the flange face. In the full closed position the throttle lever stop lug should then clear the outrigger stop (retained by the float-chamber retention screws) by nothing less than .100".
(b) Cars having throttle levers with no full throttle stops, the procedure is:—

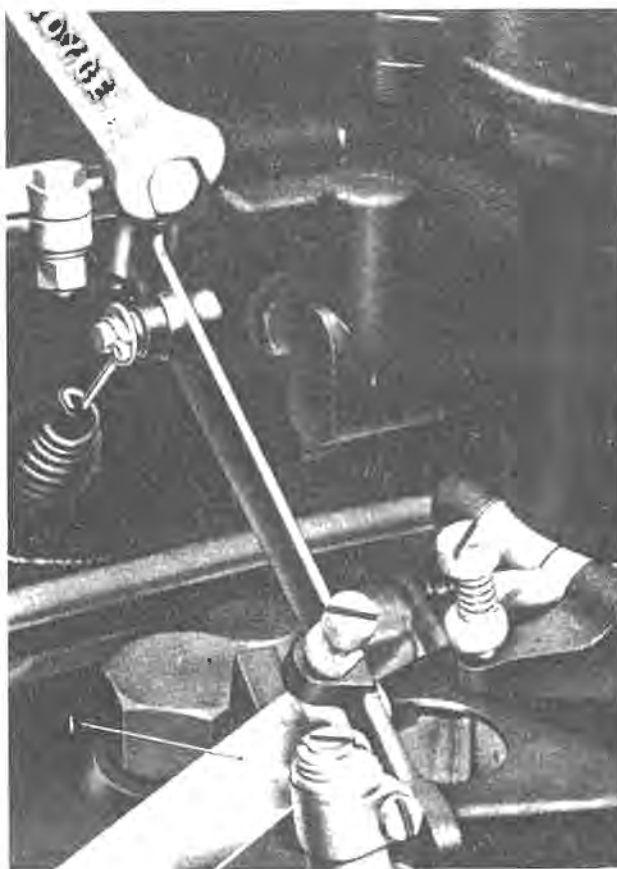


Fig. K.9.—Setting Throttle Lever.

1 —Feeler Gauge in Position

Throttle lever in the fully closed position and the outrigger stop screw of the lever screwed right back, and pinch bolt to be tightened, whereby .187"—.200" clearance is obtained between the underside of the lever stop boss and the plate mounted stop attached to the carburettor body (see Fig. K.9).

- (ii) Fit couplings to carburetters, arms horizontal with throttles closed. Rear carburettor coupling should have a minimum clearance .020" from body.
- (iii) Throttle stop screw, screwed back to allow throttle to close fully.
- (iv) Front coupling locked to give .080" clearance between fast idle cam and lever with throttle fully closed. The cam adjusting screw should lie central with cam face. Rear coupling locked on shaft with throttle closed (see Fig. K.10).

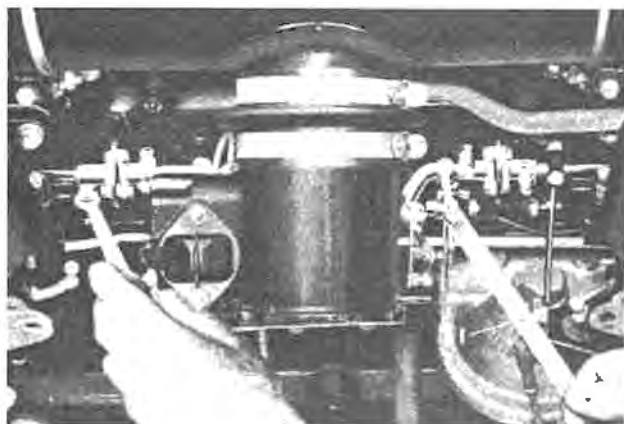


Fig. K.10.—Synchronising Throttles.
1 —Feeler Gauge in Position.

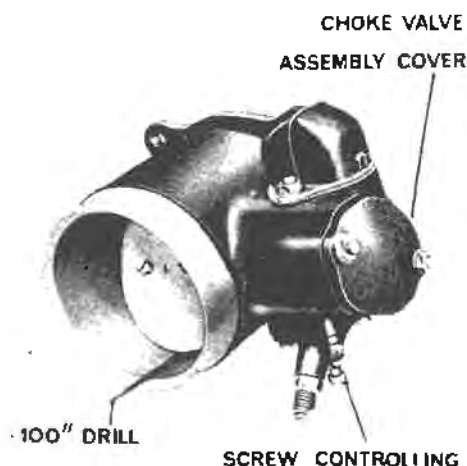


Fig. K.12.—Kick Diaphragm Adjustment.

SETTING THE AUTOMATIC CHOKE

- (i) Adjustment of kick diaphragm.—With choke valve closed, .010" clearance should be given between strangler spindle pin and pick-up, adjusted by washers on diaphragm spindle (see Fig. K.11).
- (ii) Kick action adjusted by stop screw to give .100" at top of choke valve (see Fig. K.12).
- (iii) Solenoid setting.—With the choke valve closed, solenoid gap should be set to be between .0005" and .004", preferably .0005" and adjusted by shims under the solenoid flange. The gap must be parallel (see Fig. K.13).
- (iv) With throttles fully closed, screw down stop

screw until throttles are just cracked off their seatings and tighten lock nut. On no account must this screw be used for idle speed adjustment.

- (v) Adjust fast idle stop screw on high step of cam to give .300" clearance at throttle stop screw for early series (with full throttle stop), .025" for later cars—1750-1800 r.p.m. hot engine all models (see Fig. K.14).
- (vi) Adjust fast idle link rod to position stop screw one-third on high step of cam. (Choke valve fully closed.)
- (vii) Adjust rod to thermostat to give .031" clearance between lever and stop screw. (Choke valve fully closed.) See Fig. K.15.

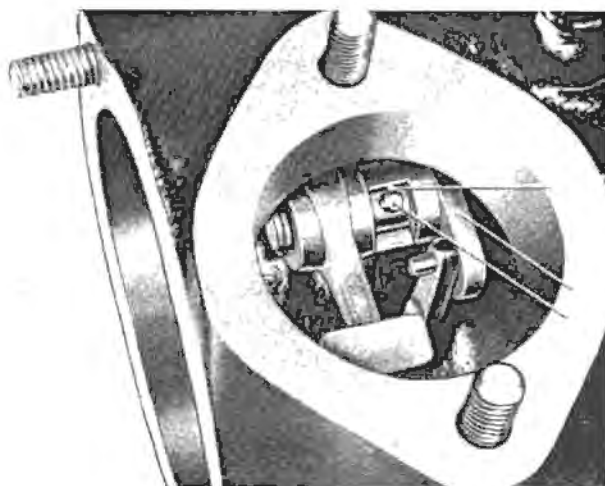


Fig. K.11.—Pick-up Lever Clearance
1 - Lever
2. Pin

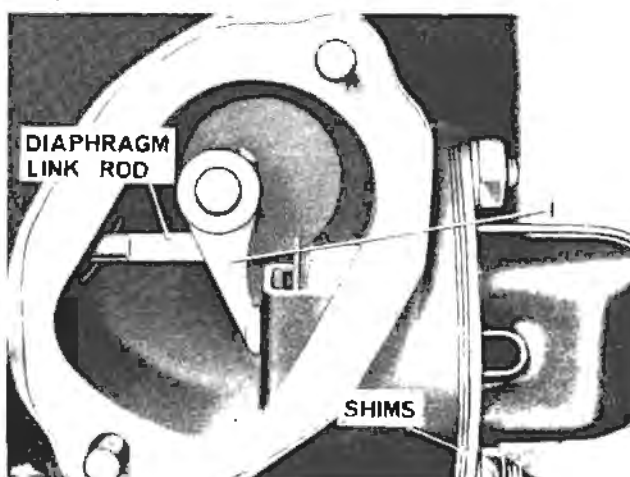


Fig. K.13.—Solenoid Yoke Adjustment.
1 —Butterfly Lever.



Fig. K.14.—Adjustment of Fast-Idle Stop Screw.
1.—Feeler Gauge in Position

SETTING THE SLOW RUNNING ADJUSTMENT

The throttle by-pass idle speed adjustment screws, one on each carburettor, are spring loaded adjacent to the throttle shaft bosses (Fig. K.7). These control the variable orifice for idle speed, as already mentioned, instead of the usual system of opening the throttles. For a mechanical setting, screw down (clockwise) until the conical nosed screw reaches the seating. Turn back each screw one complete turn. The idle speed when finally adjusted (400 r.p.m. drive—425 neutral) must be obtained by the use of these screws, turning each equally, clockwise to decrease, anti-clockwise to increase speed. Whilst a speed alteration can be effected by turning one screw only, *this method must not be used, or the carburettor synchronisation will be effected.*

FULL THROTTLE

Assessment of full throttle position on cars with carburettor stop deleted. Maximum throttle opening for the full depression of the accelerator pedal is not critical to 5° of throttle travel. On cars with no positive carburettor full throttle stop, however, the full throttle position is indicated by a measurement of 4.875" between the throttle lever abutment stop and the centre of the ball end pin on the throttle lever.

TO ADJUST THE JET

The strength of the mixture is regulated by means of the adjusting screws (Fig. K.16), which, as already mentioned, raises or lowers the jet by means of the rocking lever.

As a mechanical setting, one-and-a-half turns clockwise from when the screw begins to tighten on its boss will give a mixture from which a finer adjustment can be achieved. With the engine warm manipulate the

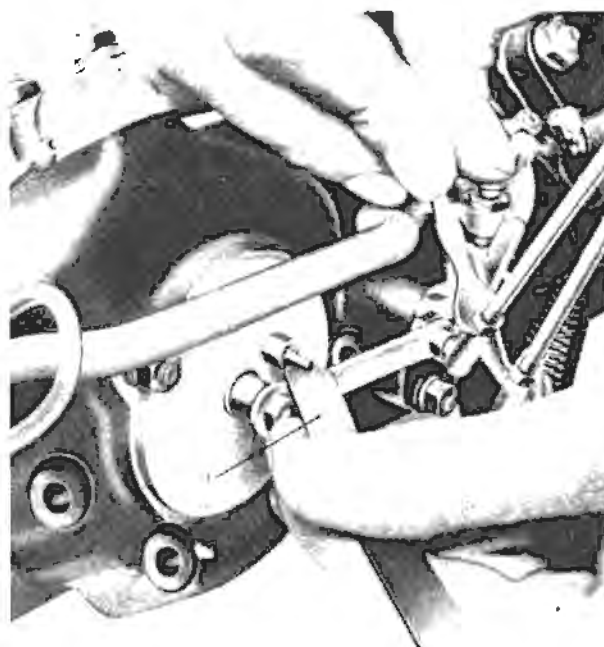


Fig. K.15.—Adjusting Thermostat Rod.
1.—Feeler Gauge in Position.

screws to give even running at approximately 400 r.p.m. turning the screw *clockwise* to lower the rocking lever and increase the mixture, or *anti-clockwise* to weaken it

TESTING

Having replaced the carburetters and air cleaners connect them in the reverse order of dismantling, and proceed as follows:—

- (i) Check that all settings and clearances are as laid down under the paragraphs "Setting".
- (ii) Start the engine.
- (iii) While engine is warming up, look for any leakage from float chamber or at the bottom of the carburettor body.
- (iv) When the engine has reached running temperature listen to the exhaust, and adjust accordingly.

TEMPERATURE CONTROLLED STARTING

A small electro-magnet, wired in parallel in the ignition circuit, holds the choke butterfly valve closed for cold starting. An oil pressure switch in this circuit is set to break when the engine oil pressure reaches



Fig. K.16.—Adjusting Mixture Control.

15 lb./sq. in., thus holding the choke closed approximately 5 to 7 seconds after the engine has started.

To prevent choking, the solenoid lever is spring loaded to the choke spindle, allowing the manifold depression to open the choke valve against the spring loading while the solenoid is in operation. The spring is adjusted to give a maximum choke opening of 5°, thereby

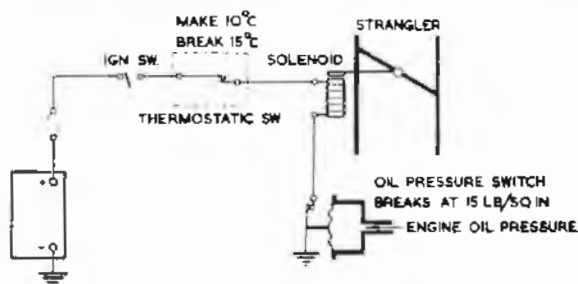


Fig. K.17.—Temperature Control Circuit.

ensuring starting and running. When the oil pressure switch breaks the solenoid circuit, the choke is opened a further 5° by the kick diaphragm operated by manifold depression.

In the event of flooding, the choke valve spindle pin is allowed 30° of free travel in the solenoid lever, therefore the choke can be opened 30° by fully depressing the accelerator pedal even though the solenoid is in operation.

As the positive closing of the choke is unnecessary when starting with a warm engine, a temperature sensitive, bi-metal switch mounted on the dashboard, and wired in series with the electro-magnet, disconnects this circuit when the under bonnet temperature is above 15°C.

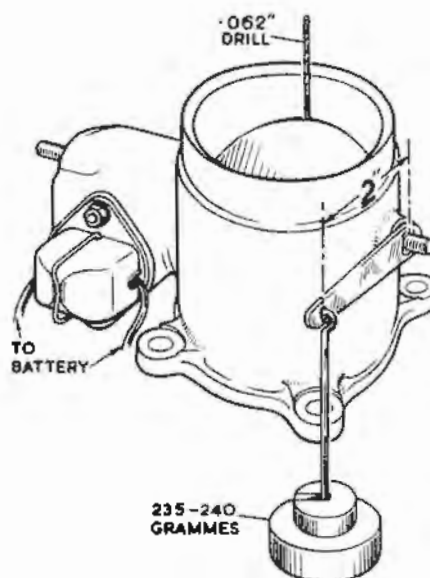


Fig. K.18.—Lever Spring Tension.

SOLENOID LEVER SPRING TENSION SETTING

The spring tension should be set so that a weight of 235—240 grammes acting on a 2" arm will just open the valve sufficiently to allow a .062" drill to be inserted between valve and body as shown in Fig. K.18.

Having set the kick diaphragm travel and solenoid air gap the housing should be mounted in a vice by two .250" bolts and nuts fitted to the retention flange holes. Connect up a 12-volt battery to energise the solenoid and adjust the spring tensioner on the spindle so that the weight opens the choke valve the required amount.

A single tool combining the lever and weight can be locally manufactured.

THE THERMOSTAT

When the engine is started under cold starting conditions and the kick diaphragm has operated to open the choke butterfly valve the predetermined amount, the further opening of the valve is then controlled by the thermostatic control unit housed in a recess in the water jacketing of the induction manifold.

The thermostat springs are extremely sensitive to variation of temperature, therefore any setting or checking must be done in a temperature of 68°F. The unit should be left for two hours in this temperature to stabilise with the lever horizontal.

The coils are pre-set so that a total weight of 120/125 grammes, acting at 'B', just moves the lever clear of the stop (see Fig. K.19).

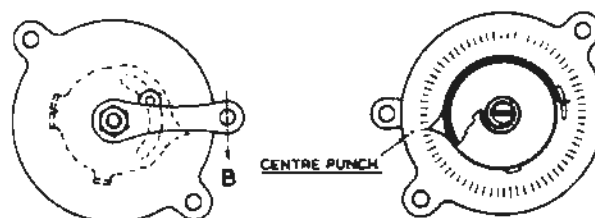
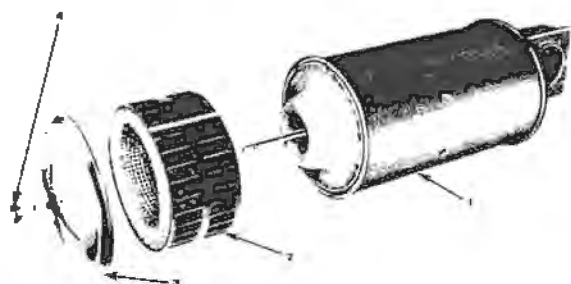


Fig. K.19.—Thermostat Setting.

As the coils are temperature sensitive, they must on no account be handled during adjustment.

After setting, the back plate should be marked with a centre punch as shown.

AIR CLEANERS**Fig. K.20.—A.C. Type Air Cleaner.**

- 1.—Body.
- 2.—Filter Element.
- 3.—End Cover.
- 4.—Wing Nut.

The air supply to the carburettors is thoroughly cleaned in passing through the combined air cleaner and intake silencer.

The standard air cleaner for "Home" use is the A.C. type, illustrated in Fig. K.20.

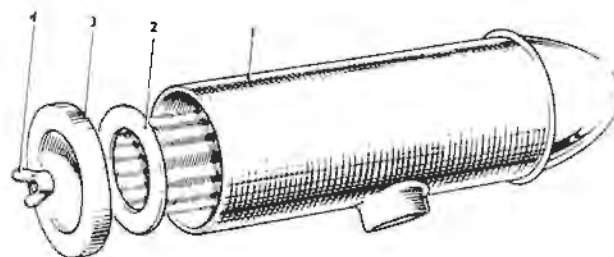
This cleaner should be serviced every 10,000 miles.

- (i) Remove the butterfly nut and end cover.
- (ii) Remove the filter element and wash in petrol or paraffin, and then oil with engine oil. Allow to thoroughly drain before refitting.

For export cars, and also available as an improvement to any car operating in dusty conditions, the "Oil Bath" type cleaner is fitted, as illustrated in Figs. K.22 and K.23.

This cleaner should be serviced every 1,000 miles, or more frequently if conditions warrant.

- (i) Support the filter bowl in one hand and unscrew

**Fig. K.21.—Vokes Type Air Cleaner.**

- 1.—Body.
- 2.—Filter Element.
- 3.—End Cover.
- 4.—Wing Nut.

the knurled nut.

- (ii) Remove the oil container, empty and clean. Wash the filter element in petrol and allow to dry.
- (iii) Replace the element, refill the filter bowl with S.A.E.20 oil to the indicated level, and refix in position.

The air cleaner fitted to the "Continental" model car is the "Vokes" type, illustrated in Fig. K.21.

This cleaner should be serviced every 5,000 miles.

- (i) Unscrew wing nut and remove end cover. Withdraw felt element.
- (ii) Blow off dust and grit with air line. It is necessary to clean each corrugation separately.
- (iii) Refix in position.

Every 20,000 miles the felt element should be discarded and a new one fitted.

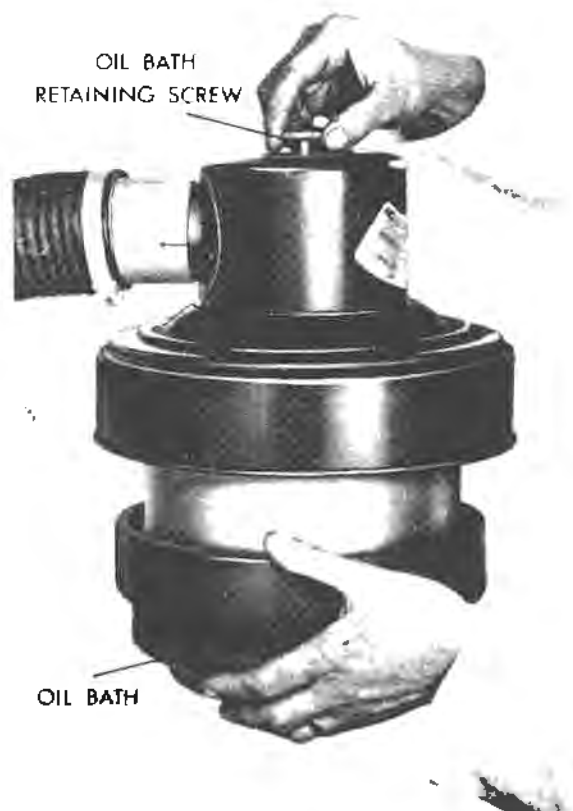


Fig. K.22.—Removing Oil Bath Air Cleaner.

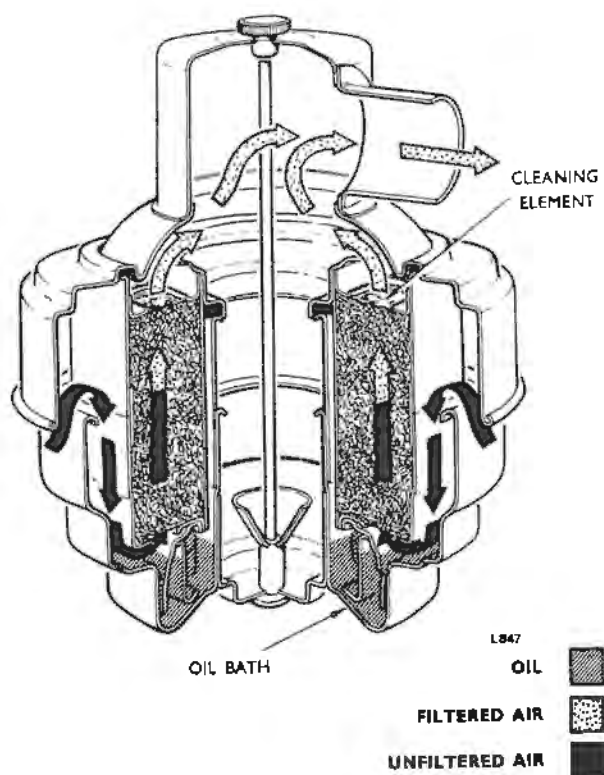


Fig. K.23.—Air Flow Through Oil Bath Cleaner.

THROTTLE VALVE CONTROL LINKAGE SETTINGS

For early series cars refer to Figs. K.24 and K.26; for later series cars, i.e. where "ON" stops are fitted, refer to Figs. K.25 and K.26.

EARLY SERIES CARS

- (i) Disconnect rods A and B.
- (ii) Check the distance of the hole in lever F from the rear face of the gearbox casing when the lever is held forward to the limit of its travel. This should be 8.375—60". If necessary, remove the lever, bend to suit, and replace.
- (iii) With the carburetters in the hot idle position (fast idle cam out of action), adjust rod C so that lever L hangs vertically or just rearwards of the vertical. It is sufficient to fix this position by eye.
- (iv) With lever F held forward to the limit of its travel, adjust rod B until it will just fit the hole in lever G.
- (v) Make rod B $1\frac{1}{2}$ turns longer.
- (vi) Adjust the pedal.

RIGHT-HAND CARS

Adjust rod A so that in the full throttle position the rubber stop or stops on the pedal stem just contact the toe board. Check that pedal lever K is clear of the toe board in the closed throttle position.

LEFT-HAND CARS

Select one of the three holes in lever K which gives the nearest approximation to the .375" clearance shown on Fig. K.26. Connect rod A (using the selected hole), and adjust to give the 1.750" dimension shown on Fig. K.26 in the closed throttle position. Adjust the pedal on-stop so that at full throttle it just contacts the pedal.

- (vii) Check the behaviour on the road and make further slight adjustment to rod B if necessary.

LATER SERIES CARS

- (i) Disconnect rods A and B.
- (ii) Check the distance of the hole in lever F from the rear face of the gearbox casing when the lever is held forward to the limit of its travel.

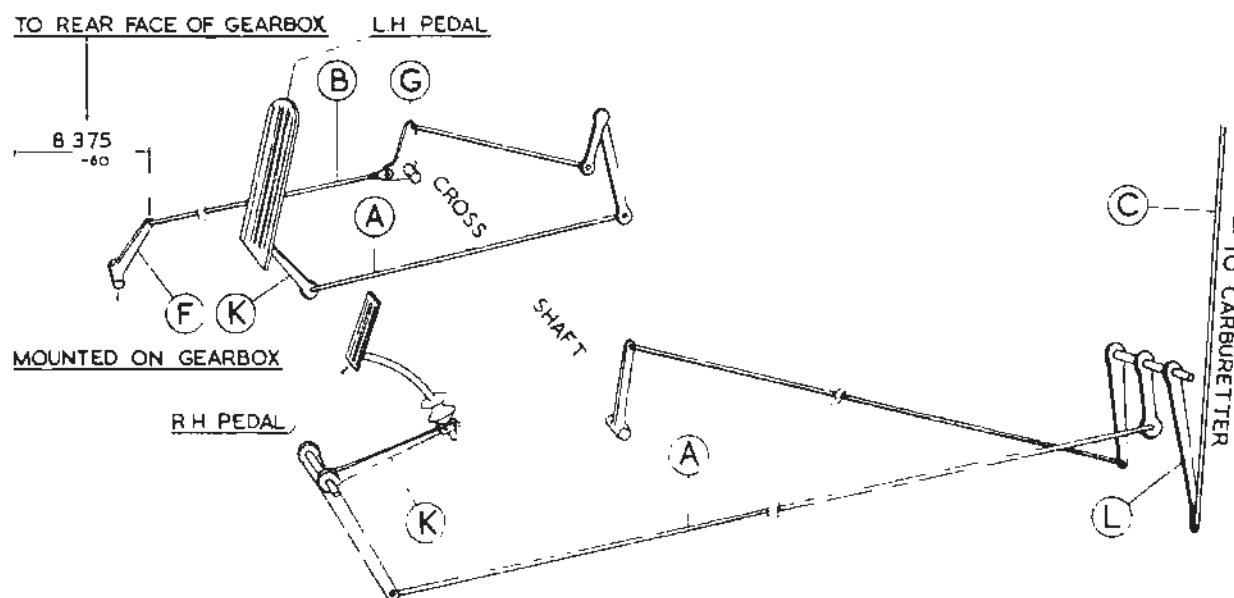


Fig. K.24.—Throttle Valve Linkage (Early Cars).

This should be $8.375-60^\circ$. If necessary, remove the lever, bend to suit, and replace.

- (iii) With the carburettors in the hot idle position (fast idle cam out of action), adjust rod C so that lever L hangs vertically.
- (iv) With lever F held forward to the limit of its travel, adjust rod B until it will just fit the hole in lever G.
- (v) Make rod B $1\frac{1}{2}$ turns longer.
- (vi) Adjust the pedal.

RIGHT-HAND CARS

With lever T contacting on-stop R (rod A pulled rearwards), and the pedal contacting on-stop S, adjust rod A until it will just fit the hole in the pedal lever. Make rod A $\frac{1}{4}$ " (8 turns) longer.

LEFT-HAND CARS

Select one of the three holes in lever K which gives the nearest approximation to the $.375^\circ$ clearance shown on Fig. K.26. Connect rod A (using the selected hole), and adjust to give the dimension shown on Fig. K.26 in the closed throttle position. Adjust the pedal on-stop S so that it contacts the pedal when countershaft lever T contacts on-stop R. Raise the pedal on-stop S $2\frac{1}{2}$ turns.

- (vii) Check the behaviour on the road. Make further slight adjustment to rod B if necessary to give the best shifts. If the ease of kick-down is then unsatisfactory correct by slightly shortening (for easier kick-down) or lengthening (for harder kick-down) rod A, right-hand cars; and lowering (for easier) or raising (for harder) the pedal on-stop S slightly, on left-hand cars.

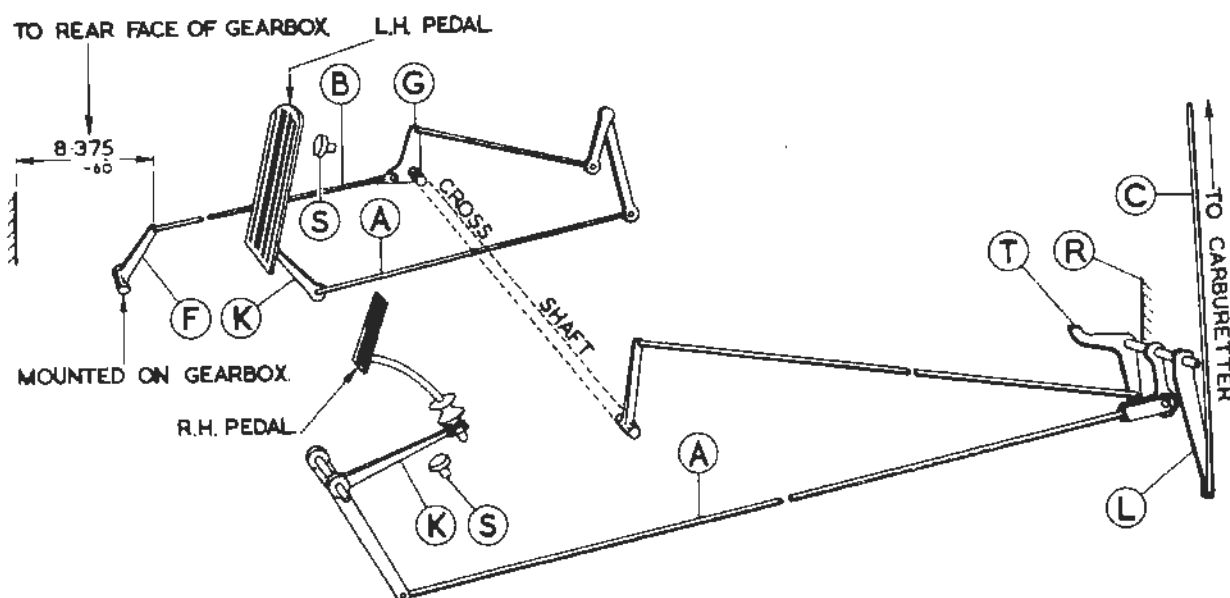


Fig. K.25.—Throttle Valve Linkage (Standard).

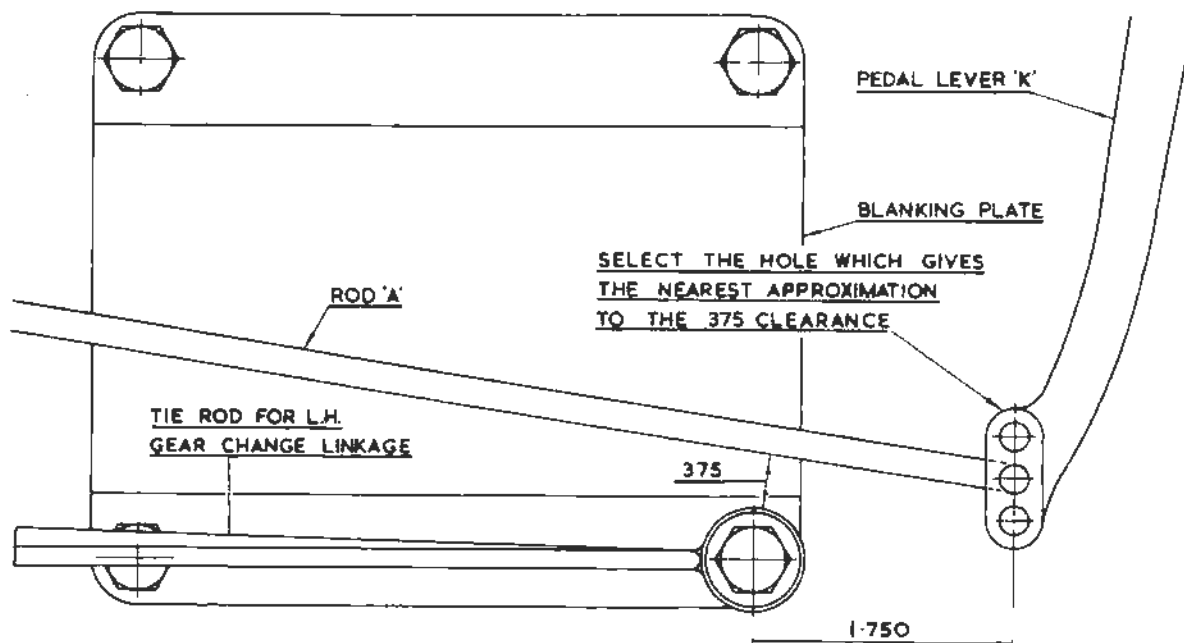


Fig. K.26.—Throttle Valve Linkage.

**COOLING SYSTEM,
CAR HEATING AND
DE-MISTING**

SECTION L**ENGINE COOLING SYSTEM, DE-MISTING,
CAR HEATING AND VENTILATION**

	SUB-SECTION
Engine Cooling System—Data—Description—Draining	... .. L.1
Radiator Matrix—Description—Removal—	
Flow Testing	... .. L.2
The Thermostat—Removing and Testing	... .. L.3
The Coolant Pump (Standard Type)—Description—	
Removal—Dismantling	... .. L.4
Anti-freeze Recommendations	... .. L.5
De-misting, Heating and Ventilation—Description—	
To Remove Motor and Fan—	
Dismantling—The Butterfly Valve—	
To Remove Matrix—Re-assembling—Vacuum	
Control Units—The Control Switch and Valve	... .. L.6

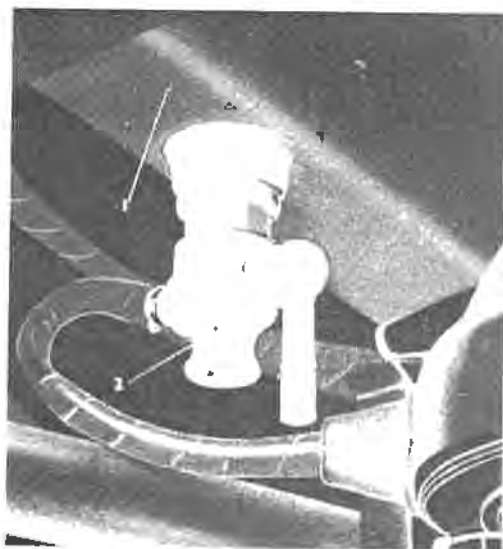
ENGINE COOLING SYSTEM

DATA

Capacity	...	3½ gallons.
Type	...	Pressure.
Pump	...	Centrifugal.
Pump Drive	...	"Vee" belt. Standard, single belt 47.750" x .625". Power assisted steering, twin belts, 46.25" x .625".
Fan	...	Five blade, 17.750" diameter.
Thermostat	...	"Summer" opens on coolant temperature of 75° - 77° C. "Winter", opens on coolant temperature of 84° - 86° C.
Radiator	...	Fixed shutters.

DESCRIPTION

The cooling system is composed of two principal components, a matrix of brass honeycomb section and a centrifugal pump, driven by a Ferodo "Vee" belt, or belts, from the crankshaft pulley. Twin belts are used on cars fitted with power-assisted steering. Attached to the pulley on the pump spindle is a balanced five-bladed fan.



L.1.—Radiator Drain Tap.

1. Radiator Bottom Tank.
2. Drain Tap—"Off" Position

Pressure in the cooling system is maintained at atmospheric pressure by a suitably designed steam valve incorporated in the matrix top tank.

On assembly, the system is filled with a 25% mixture of anti-freeze and 75% water, which is adequate for moderately cold weather but insufficiently strong for severe weather. Anti-freeze is recommended for all-the-year-round use, but due to deterioration of the inhibitors, it is advisable to drain and thoroughly flush the system annually.

One of the constituent inhibitors is NaMBT which is consumed during the first 1,500 miles of running. Small sachets containing a replacement of this chemical are available from Rolls-Royce Limited, and the contents of one of these sachets should always be added to the cooling system on the completion of the first 1,500 miles running after a complete change of coolant. No further action is necessary until the annual renewal of coolant.

The coolant from the pump is circulated through a water gallery, made of tinned brass, along the left hand or exhaust side of the cylinder block. The gallery has rectangular slots cut along its upper side, the slots all being .200" in width, but varying in length from .300" to .900", to ensure an even distribution of coolant around the exhaust valve seats.



L.2. Cylinder Drain Tap.

Coolant from the cylinder block also circulates round the carburettor choke bi-metal thermostat housing in the induction manifold and is returned to the system through a .500" pipe connected between the manifold and the pressure side of the pump.

A coolant temperature gauge on the fascia board is electrically operated by and connected to a bi-metal transmitter unit screwed into the thermostat housing and registers the coolant temperature when the ignition key is turned on. It always shows "Hot" when not in use. The unit is sealed and not repairable and, if suspect, it should be verified against a unit known to be in good order.

Fixed type radiator shutters are fitted to both models, and therefore have no effect on the function of the cooling system.

DRAINING THE SYSTEM

Two drain taps are provided for draining the system, one in the matrix bottom tank, and one screwed into the right-hand rear corner of the cylinder block, see Figs. 1 and 2.

If the coolant contains anti-freeze, collect it in clean containers for re-use.

THE RADIATOR MATRIX

DESCRIPTION

The matrix fitted to the Silver Cloud and Bentley "S" Type Saloon has a surface area of 449.675 sq. ins., and the approximate dimensions are 22.625" \times 19.250" \times 2.283".

The matrix fitted to the Continental "S" Type Bentley has a surface area of 420 sq. ins., and the approximate dimensions are 20.900" \times 19.250" \times 2.283".

The matrix assembly is mounted in a Silent Bloc bushed bracket, bolted by a single bolt to a bracket welded to the front cross member.

It is supported by four tubular struts, attached to weld nuts, spot welded to the matrix support straps, the straps being sweated to the top and bottom tanks. The struts are bolted to the Silent Bloc bushed bracket. A transverse tubular strut bolted between the upper ends of the longer struts increases stability at this point, also, stability struts are fitted between the central support and each valance.

An anti-surge valve is contained in a brass valve body, which is screwed and sweated to the top tank of the matrix.

An escape pipe is brazed to the valve body and clipped to the matrix support strap to vent the tank to atmosphere.

A flat valve disc of brass with a central hole is held against the seat in the valve body by a spring, wound from 23 S.W.G. phosphor bronze spring wire.

The spring has a free length of .900" and when compressed to .600" working length, exerts a pressure of 3 oz. on the valve disc.

A brass cap nut retains the spring in the counterbore, an aluminium washer being used between the cap and the body.

A feature of the matrix is the provision for direct return of the coolant from the car heater and de-mister systems. The coolant is returned direct to the *bottom* tank by brass pipes, which are brazed to blind adaptors brazed to the top tank. A negligible amount of coolant may enter the top tank, however, through a .062" bleed hole in the adaptors, which lessens the possibility of air locks in the return lines.

Rubber hoses of suitable shape are used between the matrix and engine, both hoses being of a specially corrugated design to absorb any movement between matrix and engine, and thus relieve any stress on the tank pipes. Both tank pipes are .048" brass and 1.250"

outside diameter. Jubilee clips are used to fasten all hoses in position.

A large bakelite cap, having coarse threads for quick removal, screws into the filler boss. The engine should always be stopped before this cap is removed.

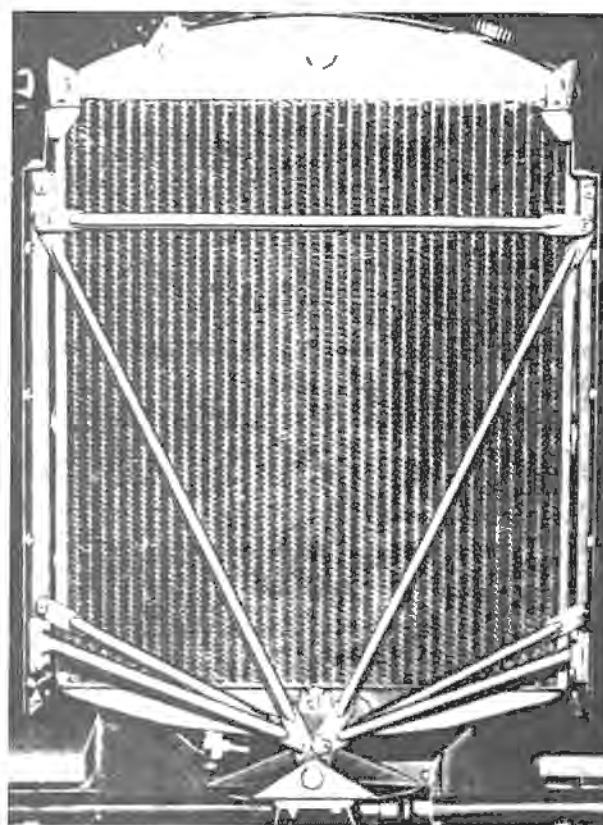
REMOVING THE RADIATOR MATRIX

Drain coolant into a clean receptacle.

Unlock bonnet on both sides, raise one side at a time, and remove two .250" bolts, nuts and lockwashers from each side of hinge. Remove bonnet assembly.

Loosen jubilee clips and remove top and bottom hoses from matrix tank spouts.

Remove heater and de-mister hoses from return pipes.



L.3.—Radiator Matrix Supports.

Remove front apron centre section and radiator shell together.

Remove ten .3125" bolts, nuts and flat washers from matrix tubular stays to valance.

Remove bolt, nut and washer from matrix Silent Bloc support while supporting matrix.

Lift matrix clear of support and remove the assembly.

Care must be taken against accidental scratching of chrome and paintwork.

Replacement is a reversal of the removal procedure.

FLOW TESTING THE RADIATOR MATRIX

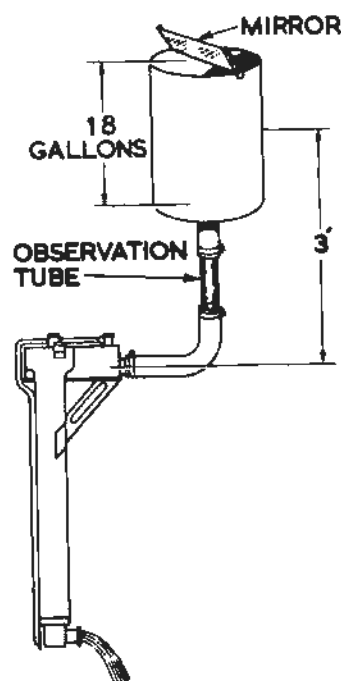
A flow test can be carried out with the matrix in position by means of a simply constructed unit. Particulars of construction and operation are given below.

An 18-gallon container is mounted on a suitably constructed stand which will allow the centre of the container to be 3' 0" above the inlet spout of the top tank. An 18-gallon oil drum from which the top has been cut will be satisfactory. Welded into the bottom of the container is a 1.000" bore outlet pipe of 2.000" approximate length, to which is attached a sight glass of the same bore and 4.000" approximate length. Attach a hose to the other end of the sight glass sufficient in length to fasten to the matrix inlet spout. Jubilee clips may be used to fasten the hose joints, and the hose must be free from kinks. Fit a suitable rubber cap or bung to the matrix outlet spout and similar caps, or bungs, to the heater and de-mister return pipes.

Fill the matrix through the container, until both the matrix and container are full.

Remove matrix outlet spout cap, or bung, and record the time taken for the *container only* to empty, by observing the cessation of flow through the sight glass.

A Silver Cloud or Bentley "S" type matrix in 100%



L.4.—Flow Testing Equipment.

condition requires 54 seconds to empty the 18-gallon container.

The "Continental" matrix being smaller, requires only 50 seconds to empty the 18-gallon container, and the flow times above should be adjusted to suit.

A flow time in excess of 25 per cent. of the above figures indicates a restriction in the matrix which requires removal.

THE THERMOSTAT

REMOVING AND TESTING

The thermostat consists of a sealed brass bellows, held by a locked adjusting screw to a bridge piece, fastened to the main body by four screws. Attached to the top end of the bellows and passing through the body is a spindle to which a dished valve is sweated. This valve, "A", Fig. L.7, incorporates a small vent hole and a jiggle pin, this vent allows the escape of air to avoid air locks when filling the system, but rises to seal the vent against the passage of water. The valve seats on the top of the main body. An increase in coolant temperature causes the expansion of the bellows and so opens the valve in relation to the temperature, a decrease in temperature permitting the residual spring of the bellows to close the valve proportionately and thus maintain a uniform coolant temperature. The valve has a minimum stroke of .275" and is 1.310" diameter, the bore of the coolant passage in the main body being 1.251".

The by-pass valve ("B", Fig. L.7) is fully open when the dished valve is closed, and allows the coolant to circulate through the .750" opening in the by-pass to the engine only, and not to the matrix.

No attempt should be made to adjust the opening temperatures of the thermostat, which has been accurately determined by the manufacturers. Thermostats are clearly stamped "Summer" or "Winter" on the main body and standard fitting in current models is a "Summer" thermostat.

The "Winter" thermostat is intended for use on cars in countries where severe winter conditions are encountered.

To remove the unit it is only necessary to drain about half the coolant into a clean receptacle and remove the four .3125" cadmium plated nuts and flat washers, securing the thermostat cover to the housing. The hose need not be removed as there is sufficient elasticity in the bellows section to permit the cover to be swung to one side. Two 3 BA holes are tapped in the thermostat body to allow bolts to be fitted for easy withdrawal. On no account must a screwdriver, or similar tool, be used under the valve for leverage.

A unit that is suspect may be tested by immersing in a container of clean water, which can be heated and the temperature checked with an accurate thermometer, while observing the point at which the valve begins to open. The opening and closing action should be smooth and not jerky.

On a "Summer" thermostat the valve should commence to pass water at 75°—77° C. (167°—170° F.) and the by-pass valve should be fully closed at, or



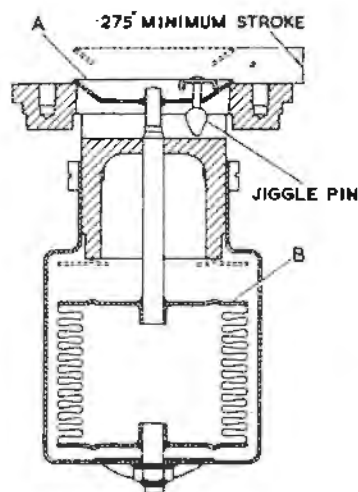
L.6.—Removing Thermostat.

below, 96° C. (203° F.).

The "Winter" thermostat should commence to pass water at 84°—86° C. (183.2°—186.8° F.) and the by-pass valve should be fully closed at, or below, 104° C. (219.2° F.).

A slot is cut in the thermostat body to register with a locating screw in the housing, to ensure correct positioning of the unit.

Use a new vellumoid joint, coated lightly with "Welseal", and replace the top cover, tightening down evenly on the four .3125" nuts.



L.7.—Section through Thermostat.

THE COOLANT PUMP (STANDARD TYPE)

DESCRIPTION

The coolant pump comprises a cast-iron body which carries a double ball race and spindle assembly, on the outer end of which is pressed an adaptor flange, to which a five-bladed balanced fan and fan pulley is fitted by four .3125" cadmium-plated setscrews and lock washers, whilst a six vane cast-iron rotor is pressed on the opposite end of the spindle, the interference fit being the only means of retaining both flange and rotor to the spindle. Between the rotor and the rotary seal ring is a coil spring, wound from 13 S.W.G. (.092") stainless steel wire, which exerts a 8—10 lbs. pressure on the "Flexibox" seal assembly, to form an effective seal against coolant leakage. A packing plate made from 9 S.W.G. (.144") carbon sheet steel and a "Klingerite" joint bolted between the plate and the body completes the assembly.

The pump rotor, which is driven 0.85 times engine speed, draws coolant from the matrix bottom tank and, by means of centrifugal force, distributes the coolant through an aperture $1.625" \times .750"$ in the backing plate, which lines up with the water gallery in the cylinder block, to re-enter the matrix top tank past the open thermostat, or by-pass the matrix through the thermostat by-pass, according to the coolant temperature. Pressure of the pump discharge to engine is 20 lbs./sq. in. at 3,200 pump r.p.m.

REMOVING THE PUMP

To remove pump, drain coolant into clean receptacle. Slacken dynamo bracket bolts and remove dynamo adjustable support .3125" bolt and lockwashers and nut at backing plate, push dynamo towards engine and remove fan belt. No attempt should be made to stretch belt over pulleys, which may result in belt fracture.

Remove four .3125" cadmium-plated setscrews and lockwashers, securing fan blade assembly and pulley to adaptor flange, and remove units to permit greater access to the four .3125" nuts on the cylinder block studs, holding the pump to the cylinder block adaptor.

Remove the two jubilee clips fastening by-pass hose between pump and thermostat housing and remove hose. Unscrew union nut joining induction manifold coolant return line to coolant pump and push line to one side.

Remove one jubilee clip fastening hose to pump inlet spout, and disconnect hose at this point.

Remove four .3125" cadmium-plated nuts and lock-

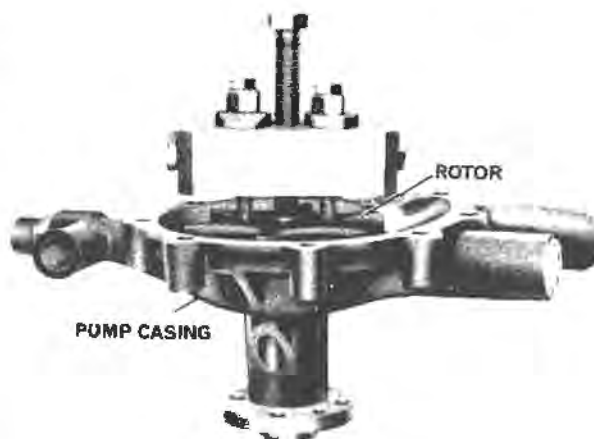
washers from cylinder block adaptor studs, retaining pump. Withdraw the pump assembly off the studs. Care must be taken when removing and replacing the pump to avoid damage to the matrix.

DISMANTLING COOLANT PUMP

Special tool required—RH.570 Universal Extractor.

Remove the four remaining .250" cadmium-plated bolts, nuts and lockwashers retaining the pump backing plate to the pump body. Discard the "Klingerite" joints found between the pump and cylinder block and pump case and backing plate.

Extract the rotor, using Special Tool No. RH.570. Two .3125" 24 T.P.I. U.N.F. R/H holes are provided in the rotor for extraction purposes.



L.8.—Extractor for Removing Rotor.

When the bolts have been withdrawn, remove the "Flexibox" seal pressure spring and stainless steel rotary seal ring, which contains a rubber shaft seal ring in its annular groove. Extract the adaptor flange from the spindle, using Special Tool No. RH.570 attached to any two opposite holes in the flange. These holes are tapped the same size as the rotor extraction holes.

Remove the spring ring from the end of the bearing housing of the body and tap out spindle and bearing assembly from the rotor end of the spindle, using a cylindrical hollow drift bearing on the shell of the bearing. A brass finger is pressed on the spindle, behind the bearing assembly and need not be removed.

The "Morganite" stationary seal with rubber cover seal attached, may then be pushed off the boss in the casing towards the rear.

If the spindle and ball race assembly is to be re-used, do not wash the assembly, otherwise the "Retinax" lubricant will be destroyed. A new flinger must always be used with a new spindle assembly, because of the fragility of the flinger. No re-facing tools are necessary for pumps equipped with the "Flexibox" seal, as the friction is confined between the rotary seal ring bearing on the stationary "Morganite" seal and no moving part is in contact with the pump body.

It is not advisable to use the old adaptor flange with a new spindle assembly as the interference fit between the components will be destroyed when spindle and flange are separated. It is recommended when replacing the spindle to use a complete unit, that is, one which includes the brass flingers.

The old rotor may be used on a new spindle if the rotor is in good order and the interference fit is within limits.

Chrome plating is used on the spindle for a distance of 1.350" from the rotor end to combat corrosion and wear, especially over the area where the spindle contacts the stationary "Morganite" seal. This area of approximately .600" is hard chrome-plated. Spindle diameter is .6267" \pm .0005" and is pressed on the rotor, or longer end of the shaft, for a distance of .300" from the outer end of the bearing.

The bore of both adaptor flange and rotor is .625" \pm .005" and a pressure of 800 lb./sq. in. is necessary to press the rotor on the spindle, a slightly greater pressure being necessary to press on the flange.

The "Flexibox" gland spring has a free length of 1.650" and is compressed to a working length of .738", to exert 8-10 lb. pressure on the gland. The "Morganite" stationary seal ring is .2362" thick and is bored to .7840", the bearing face being 1.0433" in width. The round rubber cover seal is .103" thick and has an outside diameter of 1.081" and inside diameter of .875" before being stretched over the .8855" boss on the stationary seal ring.

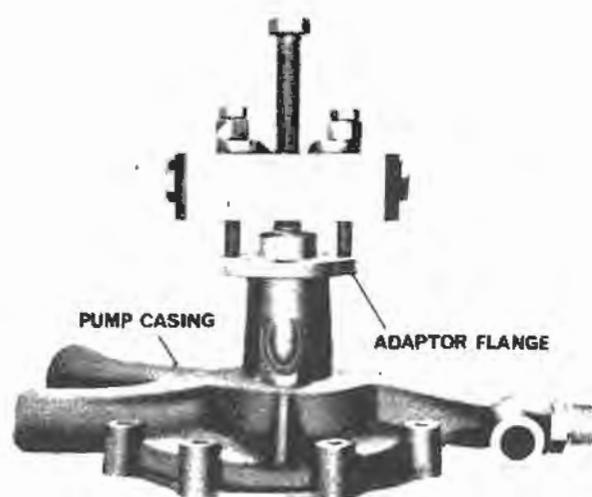
The stainless steel rotary seal is bored to .6299" \pm .002" and is .3149" in width, the diameter of the bearing face being 1.1811". It is of the utmost importance that the bearing faces of the rotary stationary seal are perfectly flat and square with the bore axis. The annular groove in the rotary seal is approximately .140" in width and .799" in diameter, while the shaft seal which fits in the groove is .831" outside diameter and .625" inside diameter before installation in the groove. Width of the seal is .103" and although of round section before installation, when placed in the groove and passed over the spindle, the shape of the section changes to fill the square groove of the rotary seal ring. Fit new seal ring.

A little lanolin applied to the shaft seal rubber and the cover seal rubber will facilitate assembly.

Before assembling the pump, the joint face should be cleaned and particular care should be paid to cleaning the cover seal landing.

Stretch the new cover seal ring over the appropriate end of the stationary seal ring and position the assembly in the landing of the pump body.

Using cylindrical hollow drift, tap the spindle assembly, longer end first, into the bearing housing of the casing and replace spring ring in groove. Press adaptor flange on spindle until .125" \pm or \pm .005" of the spindle protrudes through the outer end of the flange. Assemble rubber shaft seal in annular groove in stainless steel rotary seal ring and place assembly over the spindle, so that the wide sealing face presses against the sealing face of the "Morganite" stationary seal.



L.9.—Extractor for Removing Adaptor Flange.

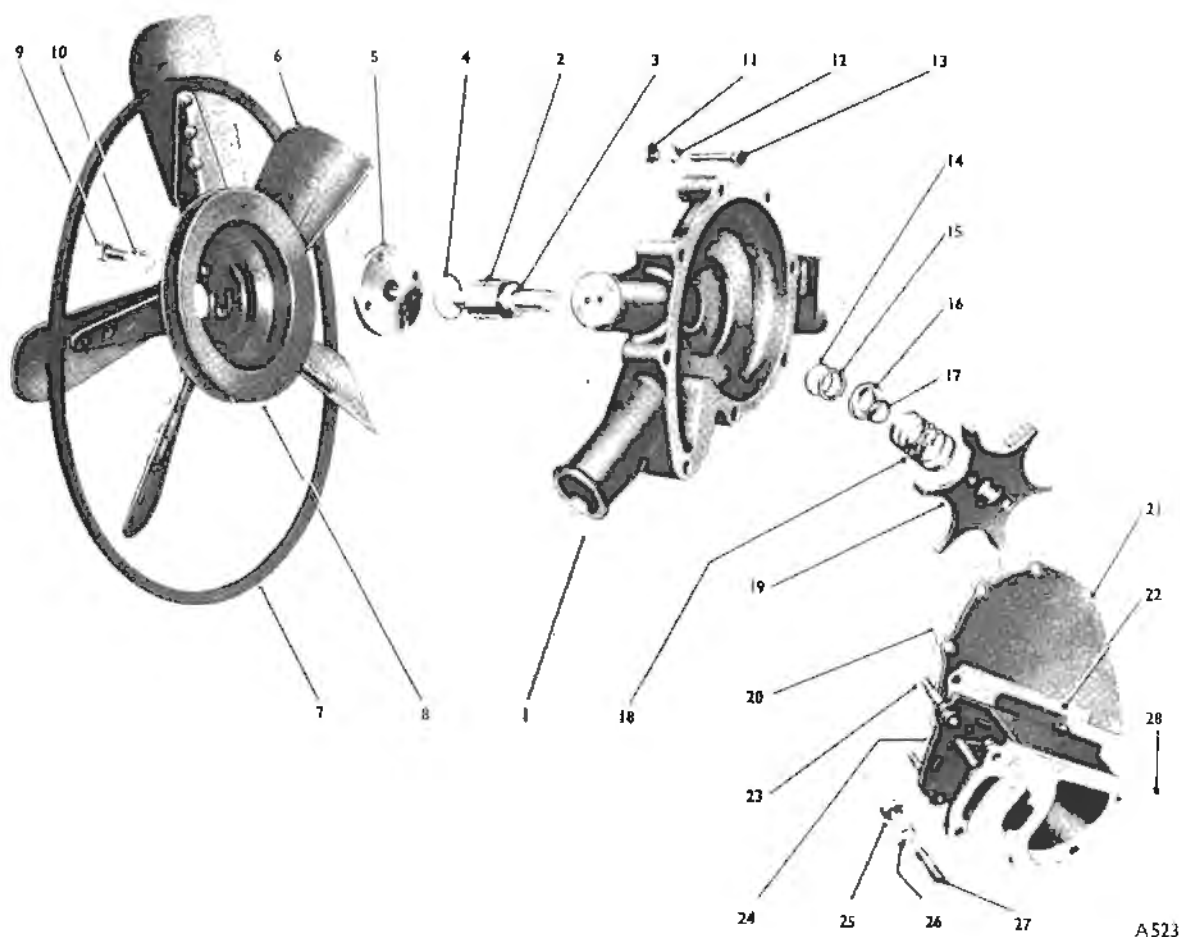
Place seal pressure spring against shoulder of rotary seal ring and press rotor squarely on spindle, until the end of the rotor is *just flush* with the end of the spindle.

The clearance between the end of the spindle shaft and the backing plate cover when bolted in position with joint fitted, should be .063" \pm .025" or \pm .015". The spring position may be checked by sighting through the casing inlet spout during pressing operations. Assemble the backing plate to the pump casing, using a new "Klingerite" joint coated with "Welscal", but do not fully tighten the four .250" bolts until the pump has been mounted on the studs, so that the plate can be evenly tightened down. A new "Klingerite" joint, similarly coated, must be used between the pump and the cylinder block adaptor.

Connect up hoses and induction manifold return pipe union nut. Replace fan pulley and blade assembly, tightening the setscrews evenly. Replace dynamo adjusting bracket and fit fan belt. Adjust the fan belt tension with the use of a spring balance midway between the dynamo and fan pulleys, so that an 18-lb. pull will give a $\frac{1}{2}$ " deflection of the belt. Too loose an adjustment

of the fan belt will cause the belt to slip at high speed, resulting in squealing and premature wear, also, more important, causing overheating and premature wear of dynamo and pump spindle bearings.

The cooling system can then be filled and carefully examined for leaks.



L.10.—Exploded View of Water Pump.

- | | | |
|----------------------------------|----------------------------|--------------------------------------|
| 1. Pump Casing. | 11. Nut. | 21. Cover plate. |
| 2. Spindle and Bearing assembly. | 12. Washer. | 22. Joint, pump to adaptor |
| 3. Brass Flinger. | 13. Retaining bolt. | 23. Stud, pump to adaptor. |
| 4. Circlip. | 14. Cover seal. | 24. Adaptor. |
| 5. Adaptor, fan pulley. | 15. Stationary seal ring. | 25. Nut. |
| 6. Fan blade assembly. | 16. Rotary seal. | 26. Washer. |
| 7. Fan belt. | 17. Shaft seal. | 27. Stud. |
| 8. Fan pulley. | 18. Spring, Flexibox seal. | 28. Joint, Adaptor to Cylinder Block |
| 9. Set screw. | 19. Rotor. | |
| 10. Washer. | 20. Joint, cover plate. | |

RECOMMENDED ANTI-FREEZE

TRADE NAME	MANUFACTURER
Bluecol DTD.779 ...	Smiths Motor Accessories Ltd.
Snowflake ...	Shell-Mex and B.P. Ltd.
Greenglow ...	Calder Oils Ltd.
Esso Antifreeze ...	Esso Petroleum Co. Ltd.
Polar Antifreeze ...	Germ Lubricants Ltd.
Lautol ...	James Light & Sons Ltd.
Syncol ...	Synthetic Ltd.

The following antifreezes are incompatible with the above:—

Sobenite ...	W. J. Bush & Co. Ltd.
Smiths Bluecol D...	Smiths Motor Accessories Ltd.
Syncol B ...	Synthetic Ltd.
Wingards Antifreeze	Wingard Ltd.

Percentage Concentration	25%	30%	35%	40%	45%	50%
Freezing Point						
Fahrenheit ...	10°	4°	-3°	-9	-22°	-35°
Degrees of Frost						
Fahrenheit ...	22°	28°	35°	41°	54°	67°
Degrees of Frost						
Centigrade ...	-12°	-15°	-19°	-23°	-30°	-37°
Quantity of Anti-freeze in Pints...	7.0	8.4	9.8	11.2	12.6	14.0

The above temperatures are those at which small ice crystals begin to form, a further reduction in temperature causing the solution to coagulate as the minimum safety limit is approached.

For example, a cooling system protected with 25% anti-freeze, will not begin to form ice crystals unless the temperature falls below 10° F. A test may be taken

of the anti-freeze percentage concentration by using a suitable hydrometer and comparing the specific gravity and temperature of the solution against the graph, Fig. L.11.

The degrees of temperature in the percentage concentration scale have been computed to the nearest round figure for more convenient workshop application.

Percentage concentration saturation point of glycol is approximately 58% which gives protection at temperatures of approximately -54.4° F., -48° C.

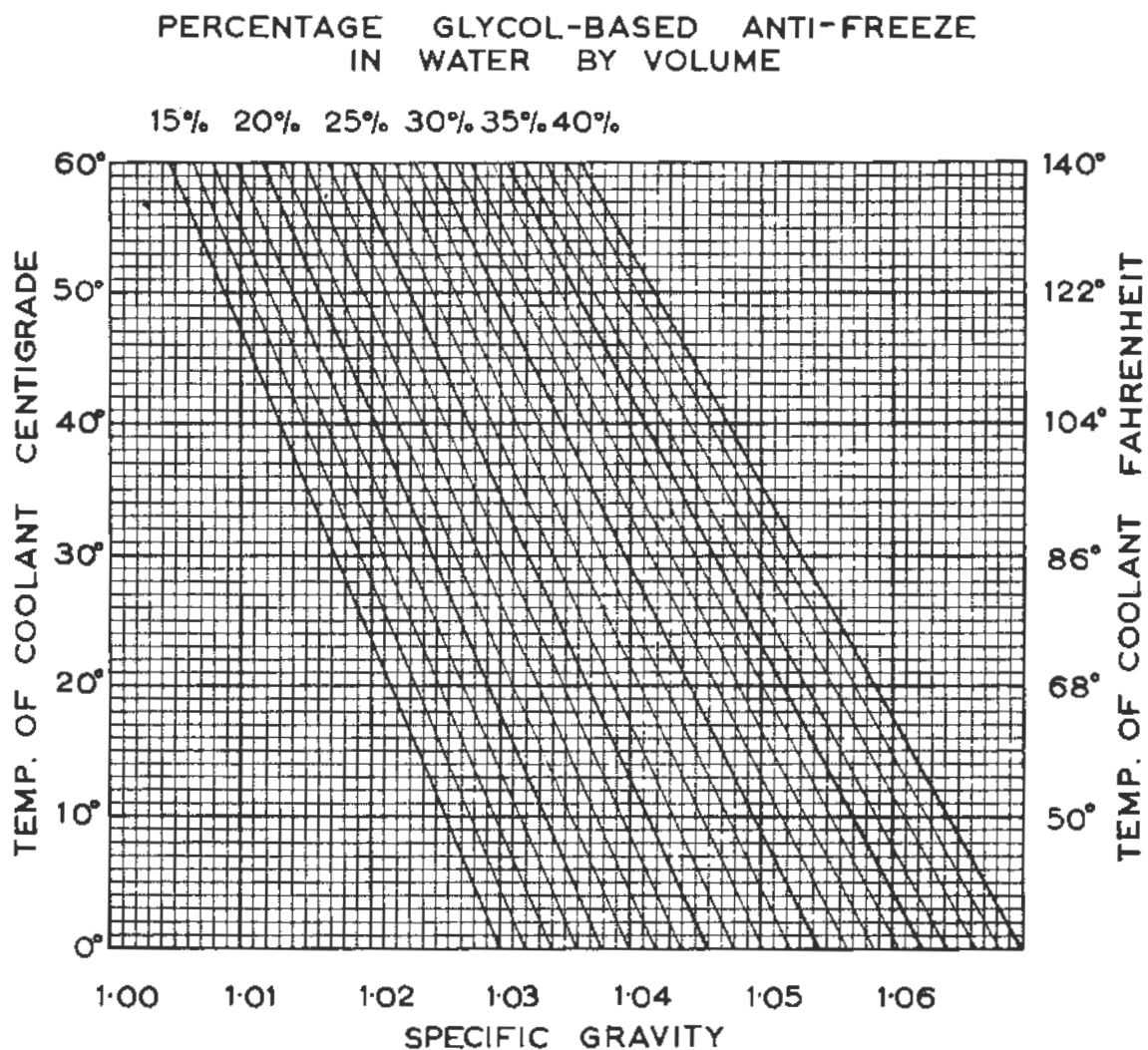
Although concentration percentages are unlikely to exceed 40% for U.K. requirements, the maximum percentages have been included for cars operating in more frigid climates.

A method of determining the solution percentage concentration by use of the graph is given below.

Test specific gravity and temperature of solution while engine is running and carefully note both specific gravity and temperature reading. Use an accurate thermometer for determining solution temperature, and not the fascia heat gauge.

For example, a specific gravity reading of 1.05 at a temperature of 95° F., 35° C., indicates the percentage of concentration is 40%, which gives protection against a temperature of -12.8° C. (-9° F.) or -23° C. (41° F.) of frost. A concentration of this percentage will stand "topping up" with water if the temperature is unlikely to reach those quoted, but only a 40% mixture should be used for "topping up" where temperatures demand such a concentration.

The correct coolant level is to the edge of the filler boss, and whenever adding anti-freeze to the cooling system, a careful check must be made for possible loss due to seepage, caused by the penetrating action of anti-freeze.



L.II. Anti-freeze Chart.

DE-MISTING, CAR HEATING AND VENTILATION

DESCRIPTION

Two separate systems are employed, and these can be used separately or conjointly to give the maximum driving comfort regardless of external conditions.

Fresh air at ambient temperature is ducted from gauze covered grilles in the front wings via booster fans and heat exchangers fitted under the wings to a longitudinally divided transverse duct under the fascia board, as shown in Fig. L.12. The left-hand side supplies the de-misting system and the right-hand side the car heating. An extension pipe from the heating system feeds air through a heat conserver to an aperture in the floor, behind the driver's seat, to ventilate the rear compartment.

The stale air finds its way out of the body via the rear parcel shelf and thence through filter covered holes in the boot floor, and also through the filter covered water drain holes in the door cavities.

The positioning and design of the air intakes is so that the ram effect from the forward motion of the car will cause a current of air to flow through the gauze covered intakes, the main volume passing out through the rear aperture. The angle of the ducting take-off carries a spill from this air flow and thus it is possible for fresh air to pass into the body of the car without the necessity for any assistance from the boost fans.

Situated at the inlet end of the ducting is a butterfly valve, which is opened and closed by means of a vacuum-operated valve. The butterfly valve on the de-mister side is drilled with a .375" diameter hole which allows a small current of air, with the valve closed, to flow over the windscreen whilst the car is in motion. When the butterfly valves are opened, the incoming air is passed through a two-speed booster fan, and then through a small heat exchanger matrix which is fed from the engine cooling system. The coolant is admitted to the matrix through a vacuum-operated tap.

Both the vacuum-operated valves and the vacuum-operated taps are operated by induction manifold depression, the control for these and the booster fan being by means of multi-purpose switches on the fascia board, one switch for each system.

On later series cars, the vacuum-operated taps are also fitted with a manually-operated by-pass valve which, when opened, allows a restricted flow of hot coolant through the matrix.

The operation of the dashboard control switch for both systems is similar and should be used conjointly for the best results, keeping the windows closed.

Pulling the dashboard control knob out to the first position operates the vacuum valve to open the butterfly valve in the air intake. Pulling out to the second position operates the vacuum-operated water tap to feed the hot coolant from the cylinder head through the heat exchanger.

It should be remembered that the vacuum taps will not operate unless the engine is running, because they depend upon inlet manifold depression.

Another point is that the cross duct under the fascia is the means of distributing both the heating and ventilation and demister air, and the construction of this tube is such that only a thin aluminium shield divides the two. It is arranged in this manner to give yet a further degree of heat control, which is achieved in the following manner.

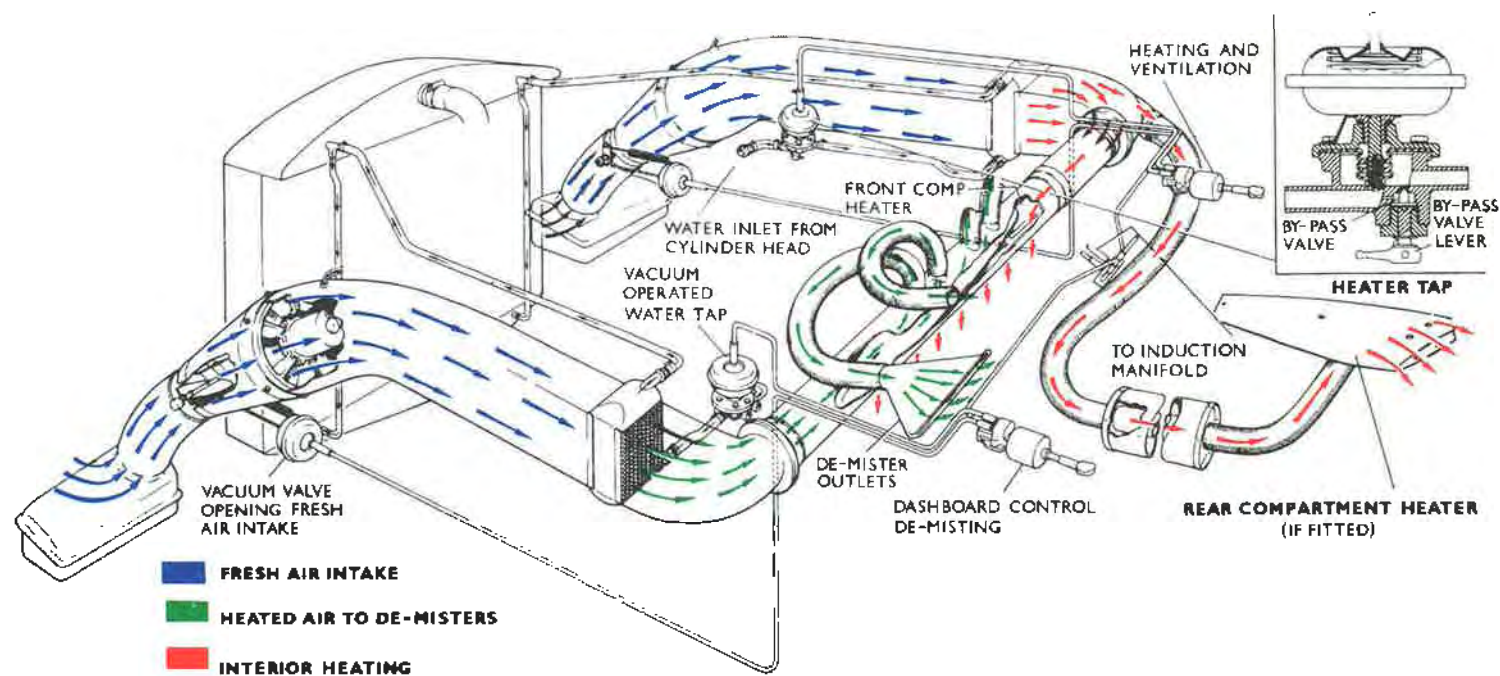
If the air on the heating and ventilation side is at a different temperature to that on the demister side of the dividing shield, then heat transference from one side to the other will take place, mainly by conduction. Thus, if it is desired to have the heating and ventilation fully on, it is possible for the demist air to be slightly increased in temperature by this means and vice versa.

Twisting the control knob to the right operates the fans either at half-speed or full-speed to boost the air supply.

The following summary gives a simple explanation:—

DEMISTER SYSTEM

Dashboard Control Knob Position	By-pass Bleed Tap	
	Closed	Open
OFF	Bleed of COLD air	Bleed of WARM air
1 OUT	Ram flow of COLD air	Ram flow of WARM air
2 OUT	Ram flow of HOT air	Ram flow of HOT air



L.12.—De-misting Heating and Ventilation Systems.

HEATING AND VENTILATION

Dashboard Control Knob Position	By-pass Bleed Tap	
	Closed	Open
OFF	No flow of air	No flow of air
1 OUT	Ram flow of COLD air	Ram flow of WARM air
2 OUT	Ram flow of HOT air	Ram flow of HOT air

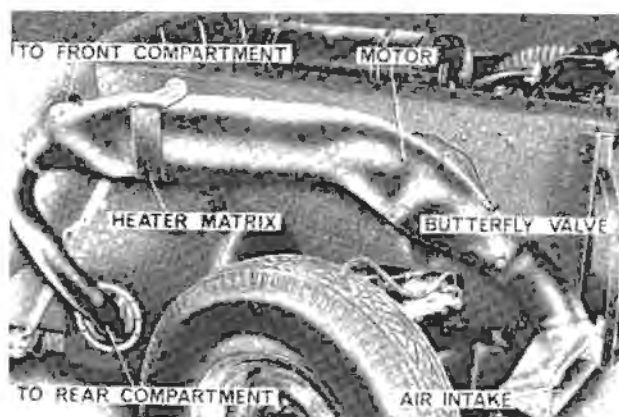
As a guide, the following settings are suggested:—

EXTERNAL CONDITIONS

Very Cold—De-mister on Hot Heater on Hot	} Fans off, or at half- speed or full-speed as required.
Cold—De-mister on Cold Heater on Hot	
Warm—De-mister on Cold Heater Off	
Hot—Demister on Cold- Heater on Cold	

TO REMOVE MOTOR AND FAN

The ducting is in three pieces connected together, and sealed against air leaks and external corrosion by a coating of "Bittac", or underseal compound. A short



L.13. -Under Wing Ducting.

piece of shaped rubber tubing 6.125" x 3.950" approximately, connects the forward end of the ducting to the intake grille.

Jack up the front of the car and remove the wheel on the desired side.

Disconnect the motor; the leads pass through the valance plate to a push-in connector. Disconnect the earth connection.

Disconnect from rubber tube connection to front grille.

Disconnect the butterfly valve actuating mechanism by removing the three 2 BA nuts and spindle setscrew at the back of the valance plate, also the spring from the vacuum valve.

Remove the two .250" nuts and bolts fastening the duct retaining bracket to the valance plate. The bracket is approximately 3" forward of the motor leads.

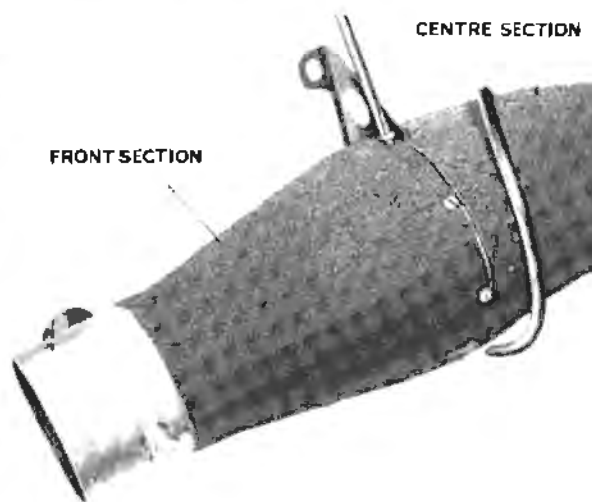
It is now possible to withdraw the section of the duct carrying the butterfly valve, motor and fan, up to the front edge of the matrix, this being a lap-joint. Collect rubber sealing band from joint.

To remove motor and fan from the ducting, slacken the seven 2 BA screws holding front section to centre section of duct. Slide out the front section, carrying the butterfly valve.

Remove the setscrews retaining the motor in the centre portion of the ducting, the sleeving from the motor leads, and rubber grommet, and lift out motor and fan as a unit.

TO DISMANTLE MOTOR AND FAN

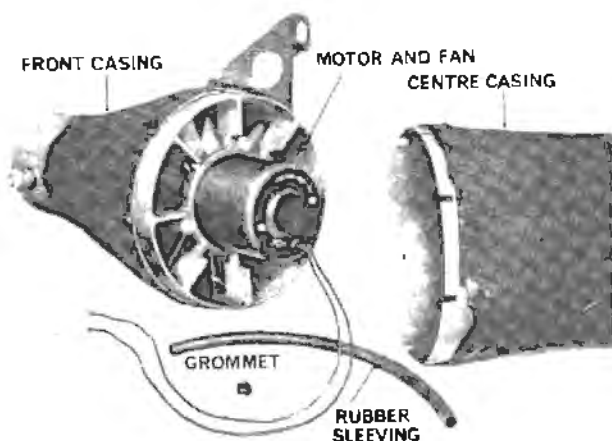
Remove the fan from the motor spindle by with-



L.14.—Disconnecting Front Ducting.

drawing the 7 BA setscrew and sliding fan hub off the spindle.

Remove screws and withdraw cover from motor, which is a Smiths Accessories Unit, Type CHS 720 '4, 12 volt.



L.15. Motor and Fan.

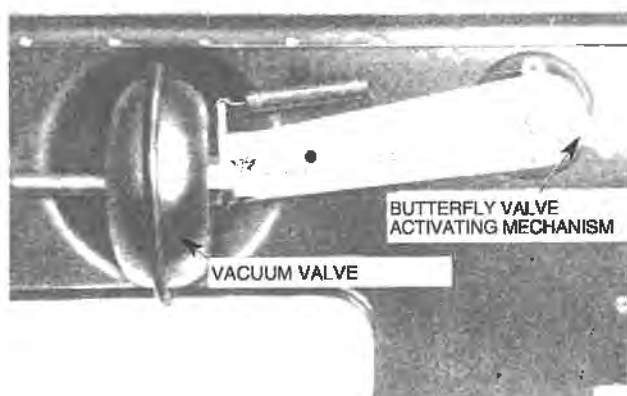
Inspect that brushes fit freely in holders; ease if necessary. If they are unduly worn, replace, using brushes C.M.3.H.

Check brush springs for tension; replace if weak.

Clean commutator if necessary; in the event of an internal fault, a replacement motor should be fitted.

THE BUTTERFLY VALVE

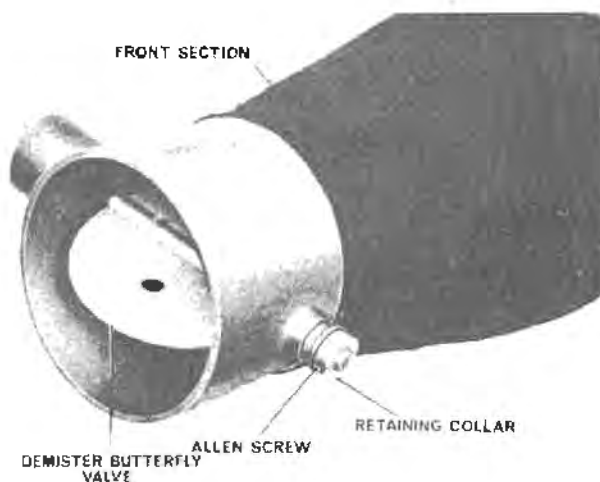
Check for free movement: the end float should not



L.16. -Butterfly-valve Actuating Mechanism.

exceed .006"; this is adjustable by movement of the end collar, held by an Allen screw.

It should be noted that the actuator bracket rotates slightly to take up any backlash in the mechanism.



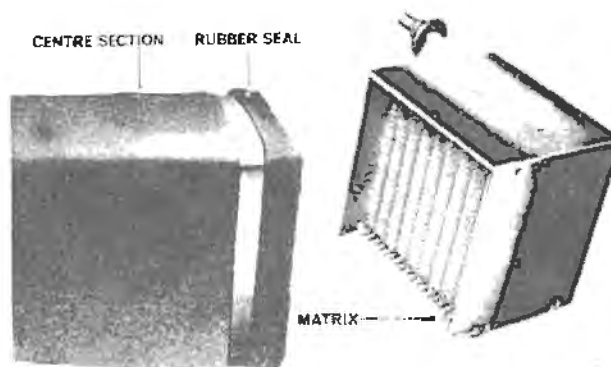
L.17. -Butterfly-valve.

TO REMOVE MATRIX

Remove section of ducting containing motor and fan as above.

Drain coolant, slack off clips and disconnect hoses from matrix.

Remove the two .750" nuts holding matrix to valance plate, these are screwed onto the inlet and outlet pipes. Remove the matrix; collect rubber sealing band from lap joint.



L.18. - Heater Matrix.

RE-ASSEMBLING

Re-assembling of the ducting and units is a reverse of dismantling. It is essential to ensure that all duct joints are rendered leak proof by a coating of "Bittac" or Underseal compound. Ensure that butterfly valve closes; check spring, also check that spindle is free and not binding due to bending.

THE VACUUM CONTROL UNITS

The construction of the coolant tap and vacuum valve control unit is shown in the diagram, Fig. L.19.

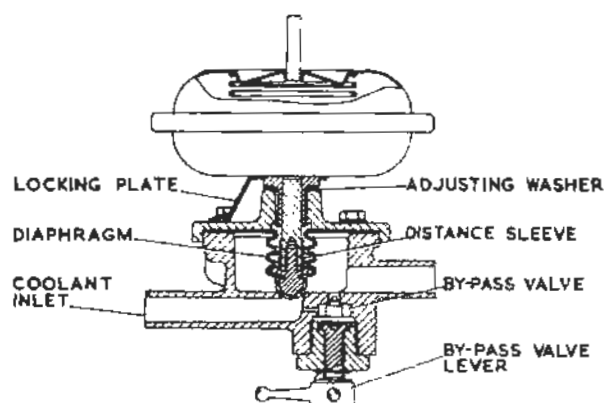
Vacuum valves operate the butterfly valves in the air intake ducts, Fig. L.17, and similar valves open the coolant taps, situated in the pipes between the engine and heater matrices. They are both operated by vacuum depression from the inlet manifold. The butterfly valve vacuum control unit and the tap control unit are not interchangeable. The butterfly valve unit has the necessary length of wire attached during manufacture.

In the event of unsatisfactory operation of the vacuum unit, it should be discarded and a new one fitted. Do not attempt to unscrew the vacuum unit from a tap, open by removing the six setscrews.

If a new tap is fitted, or a new vacuum valve to an existing tap, it is essential on re-assembling to replace the distance sleeve on the plunger. *Failure to do this destroys the water diaphragm.*

In assembling the parts, first screw the top half of the coolant tap casing onto the vacuum casing. Next, screw the rubber diaphragm onto its spindle until it is finger tight, line up the six screw holes, then offer up the bottom half of the coolant tap casing.

Without compressing the spring but with the valve on its seat, check that the gap between the flange of the bottom half casing and the lower surface of the diaphragm flange is between .050" and .100". If not, select an



L.19.—Vacuum Operated Tap.

aluminium washer to suit and insert it between the vacuum casing and the top half of the coolant tap casing; see Fig. L.19.

Insertion of this washer necessitates the removal of the top half coolant tap casing and so, before it is re-assembled, fit the lock plate on the hexagon of the vacuum casing and re-assemble as above.

To remove a vacuum operated tap, drain the coolant and proceed as follows:—

Disconnect the hose from the taps.

Disconnect the vacuum pipe by withdrawing it from the sleeve.

To remove the right hand tap it is necessary to remove the tap complete with bracket; to do this remove the four cheesehead screws, which screw into weld nuts on the valance plate.

To remove left hand tap remove the two screws securing the tap to bracket.

THE CONTROL SWITCH

It is most unlikely that the switch will give any cause for complaint.

Both electric and vacuum supplies are controlled by a single switch, the electric portion of which requires no attention except to ensure that the terminals are tight and clean.

If dismantled at any time, check reconections of motor wires to give correct sequence, i.e. "off", "half" and "full" speed.

In the event of a broken control knob, this can be removed for replacement by pressing the spring-loaded location peg.

THE CONTROL VALVE

Function

Basically the valve comprises two die castings, these are the body (A) and the seal housing (B) which slides longitudinally upon it.

The body has three separate ports which terminate on the flat face (C). The other ends of the ports are fitted with brass tubes (D) for connecting purposes.

The seal housing houses a recessed rubber seal (E) which is designed to slide with the housing to any one of three positions on the flat face (C) whilst maintaining a good seal.

To ensure positive location in the mid-way position, two spring loaded balls (F) are fitted in the seal housing, and in this position project through holes in a register plate (G).

The three positions are as follows:—

1. Seal housing inwards.

2. Seal housing midway.
3. Seal housing outwards.

The recesses in the rubber seal are so arranged that the three positions give the following combination of ports:—

1. Ports X and Z open to atmosphere. Port Y sealed.
2. Ports X and Y (in line) connected. Port Z open to atmosphere.
3. Ports, X, Y and Z connected.

Maintenance

No regular maintenance is necessary but if after considerable service leakage occurs between the moving parts, the rubber seal (E) may be suspect. Before disturbing the valve however, ensure that the leakage is not due to the two screws (H) having loosened.

Dismantling

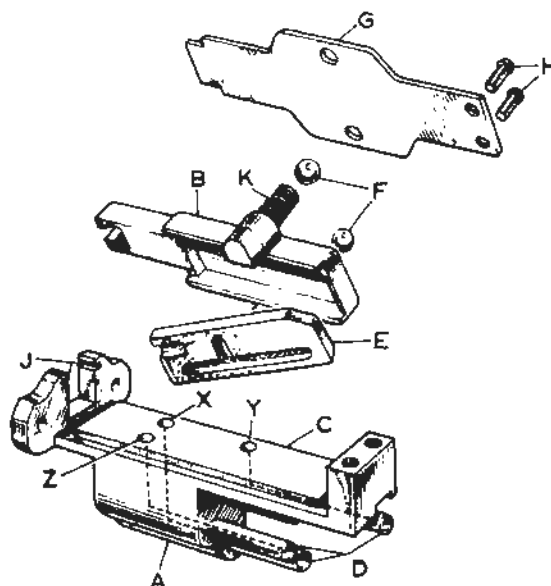
In the event of leakage at the rubber seal, this may be rectified by fitting a replacement. First slide the seal housing (B) into the midway position (2), i.e. so that the balls (F) are located in their holes in the register plate (G). Remove the two screws (H) which hold the end of the register plate in position, at the same time maintaining finger pressure on the plate. Slide the seal housing and the register plate towards the inner position (1), until the other end of the register plate is clear of its slots (J) in the body, when both components can be lifted off the body together. Then carefully separate them and remove the balls (F) and springs (K).

Assembly

Lift the old rubber seal out of its recess in the underside of the seal housing and fit a replacement. Check that it is not laterally compressed by the housing "B" otherwise the face may be distorted.

To facilitate correct fitting, one corner of the rubber seal (E) is chamfered to correspond with the shape of the recess.

Refit the seal housing to the body in the inner



L.20.—Control Switch Valves.

position (1), locate the spring (K) in it and place the balls (F) on top of the springs. Carefully align the register plate (G) on top of the balls so that they locate in its two holes. Pressing the register plate downwards against the seal housing, slide both components towards the mid-way position (2) until the end of the register plate is held in the slots (J) in the body.

Finally, replace and tighten the two screws (H) which hold the other end of the plate to the body.

Check correct refitting of vacuum pipes to valve.

Ensure that when refitting cross-duct under fascia that air from left-hand or "near side" goes to de-mister. Also that slots in cross-duct and extension piece are correctly lined up.

ELECTRICAL, IGNITION AND RADIO



SECTION M**ELECTRICAL, IGNITION AND RADIO**

	SUB-SECTION
The Battery	M.1
The Dynamo—Data—Belt Tension—Maintenance— Service and Overhaul	M.2
Control Box—Data—Electrical Settings—Mechanical Settings ...	M.3
Starter Motor and Drive —Maintenance—Removal— Service—Drive Unit—Micro-Switch—Solenoid Switch ...	M.4
Ignition System—Distributor Maintenance—Ignition Timing— Distributor Service—Ignition Coil—Sparking Plugs ...	M.5
Switchbox	M.6
Lights—Side—Fog—Tail—Reverse and Number Plate—Boot— Roof—Companion—Instrument and Warning Lights ...	M.7
Instruments and Accessories—Fuel Gauge—Temperature Indicator— Oil Pressure Indicator—Petrol Filler Door—Windscreen Wiper—Horns—Direction Indicators—Radio—Cigar Lighter—Clock—Rear Window Demister	M.8

BATTERY

SPECIFICATION

P & R Dagenite ...	6 HZP.9/GZ	} 12 volts, 57 ampere-hour capacity at 20 hour rating.
Exide ...	6 XCV.9/L	

SERVICE

The battery is mounted in a cradle attached to the rear of the right-hand frame member and is accessible through the floor of the boot. To gain access, remove carpet, plate and cover. (See Fig. M.1.)

The *Negative* terminal of the battery is earthed to the chassis frame.

In cases of corrosion and sulphation of terminals and posts, clean off with hot water and coat with a good quality electrical grease. Maintain an unbroken protective film of lubricant on these areas in order to reduce corrosion to a minimum.

CHARGING

The acid specific gravity figures (corrected to 60°F) given below apply to both makes of battery.



Fig. M.1.—Access to Battery.

Climate	Filling S.G. for First Charge	Condition of Battery	Specific Gravity
Temperate	1.260 (Charge rate: 4 amps)	Fully Charged	1.280 (1.270-1.285)
		Half Discharged	1.200
		Fully Discharged	1.110
Tropical (90°F. or over)	1.215 (Charge rate: 4 amps)	Fully Charged	1.235 (1.225-1.240)
		Half Discharged	1.170
		Fully Discharged	1.100

DYNAMO

DATA

Type	...	...	Lucas C.47PV, shunt wound, two-pole two-brush. Negative earth.
Cutting-in speed	...	900-1050 r.p.m. at 13 volts (dynamo).	
Maximum output	...	30 amps at 1550-1750 r.p.m. at 13.5 dynamo volts.	
Field resistance	...	5.9 ohms.	
Brush spring tension	...	20-25 ozs.	
Brush clearance in box			
End clearance	...	.018"-.024".	
Face clearance	...	.004"-.006".	
Suppressor Condenser	...	1.0 Mfd. (Internal).	
Direction of Rotation	...	Clockwise, from driving end.	

Belt Tension.

Every 5,000 miles, the driving belt should be checked for correct tension. Apply an 18 lbs. load mid-way between dynamo and coolant pump pulleys. Adjust belt tension to give $\frac{1}{2}$ " deflection. For twin belt drives, apply a 14 lbs. load to each in turn. (See Fig. M.2.)

MAINTENANCE

Lubrication.

Every 10,000 miles, inject a few drops of S.A.E.30 engine oil into the hole marked "OIL" in the end of the bearing housing, when the oil filter is removed for element replacement. (See Fig. M.3.)

SERVICE

Should it be necessary to change the dynamo due to failure, it is recommended that the regulator also is changed.

Testing in position to locate fault in charging circuit.

- (i) Inspect the driving belt and adjust if necessary. (See Fig. M.2.)
- (ii) Disconnect the cables from dynamo at control box. Connect and test as shown in Fig. M.4.

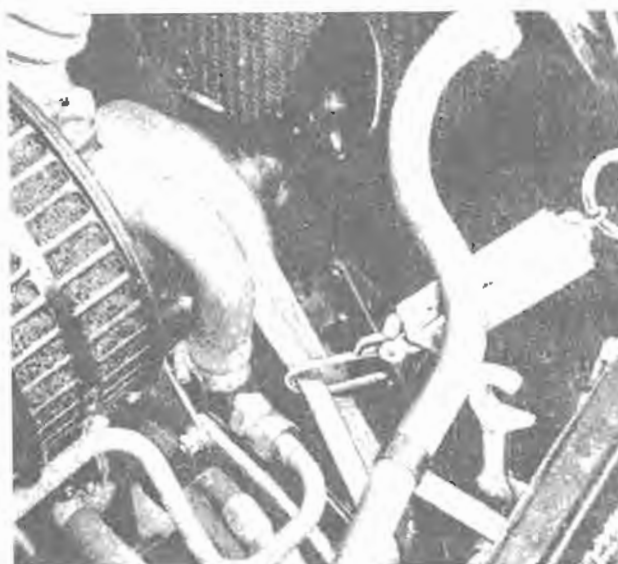


Fig. M.2.—Checking Fan Belt Tension.

Do not exceed an approximate dynamo speed of 1,000 r.p.m. If dynamo builds up normal voltage, check the control box, wiring, and battery connections. (See Sub-Section M.3.)

- (iii) If there is no voltage build-up, remove the machine and examine the brushes and commutator. Hold back each brush spring and

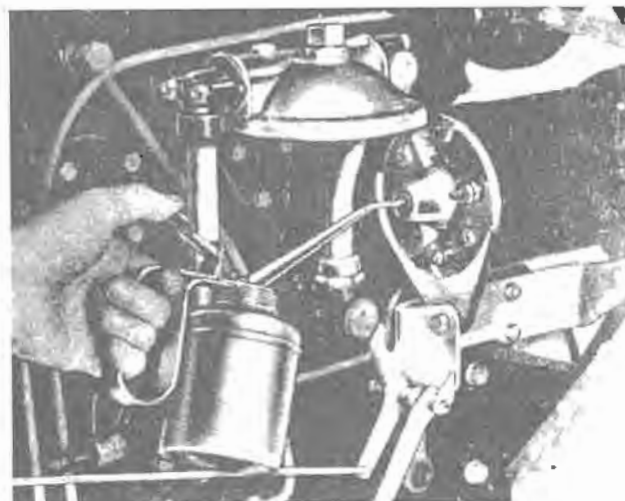


Fig. M.3.—Oiling Dynamo Commutator End Bearing.

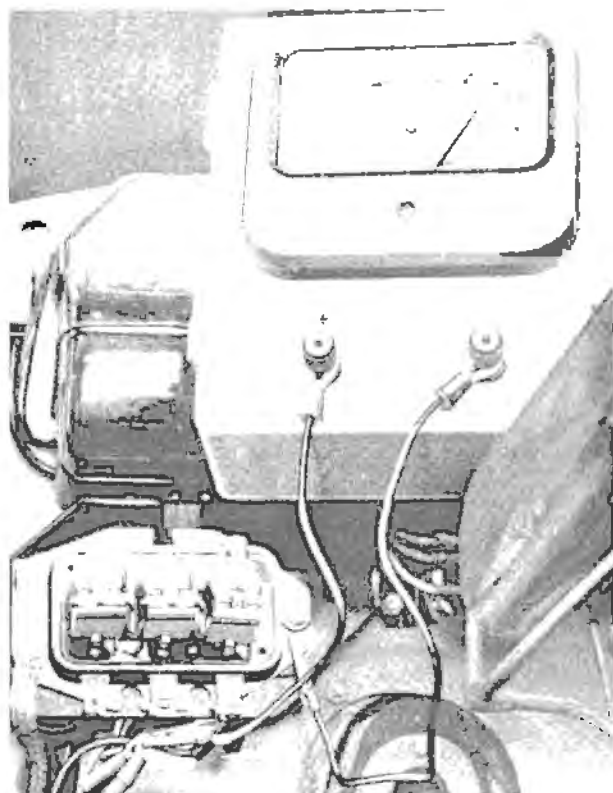


Fig. M.4.—Dynamo Voltage Test.

move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush from its holder and ease the sides by lightly polishing on a smooth file. Check clearances of brushes in boxes. Sticking of the brushes may occur in service if the clearances are inadequate. Always refit a brush in its original position.

Excessive brushwear can cause damage to the

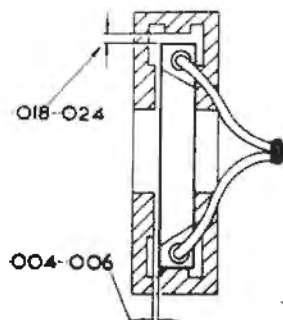


Fig. M.5.—Brush Clearances.

commutator by the brush flexibles becoming exposed at the running face. The minimum recommended length of brush is $\frac{5}{16}$ ". A brush *must* be replaced when it has worn down to this length.

Should the dynamo require further attention it is recommended that a replacement machine be fitted.

The following information is included to assist repair when replacement is impracticable.

Bench Testing.

- (i) Connect a 12 volt test lamp to 'D' terminal and to the dynamo body. Rotate armature slowly, when the lamp should remain alight. With an open-circuited dynamo the lamp will not light.
- (ii) Remove earthed brush. If the test lamp remains alight, the dynamo has a short-circuit to earth.
- (iii) With both brushes removed, transfer test lead from 'D' terminal to commutator. If lamp lights, the short is in the armature.
- (iv) Check the field coil with an ohm-meter, or with a voltmeter and ammeter. This should read 5.9 ohms, or approximately 2 amps at 12 volts.

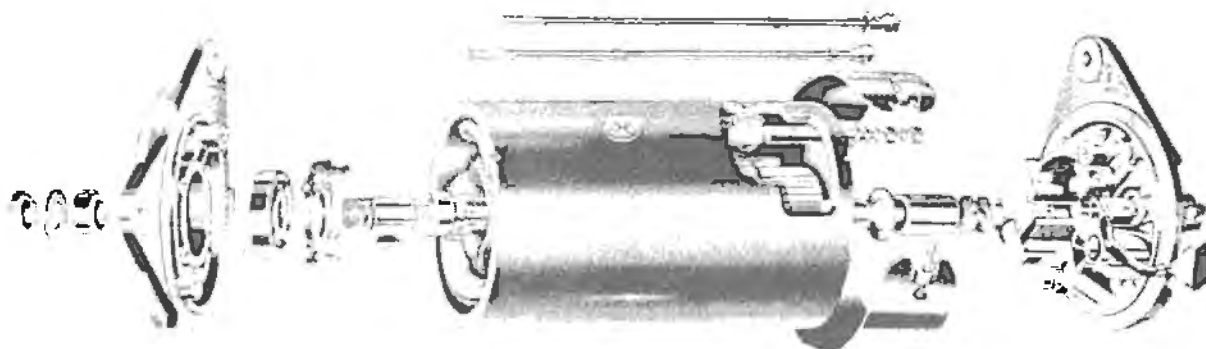


Fig. M.6.—Exploded View of Dynamo.

Overhaul.

With the brushes removed, withdraw the two body screws. This permits removal of the drive end bracket complete with armature. If it be necessary to remove the ball race from the drive end bracket, file off the peened end of the four retaining screws before attempting to remove. Pack the ball race with high melting point grease. When re-assembling, use new bearing plate securing screws and peen over.

The commutator end bearing is a porous bush. When renewing, immerse the new bush in engine oil for 24 hours before fitting.

The commutator may be cleaned with fine glass paper, if glazed, by passing a strip of paper round the commutator and holding taut. Rotate the armature in its normal direction of rotation. Do not attempt to clean individual bars, as this will produce flats on the commutator and induce burning. If necessary, the commutator may be skimmed in a lathe, taking a light high speed cut.

Undercut mica to a depth of .030".

Brush spring tension should be 20-25 ozs., but this may fall to 15 ozs. before affecting performance. When renewing brushes, it is important that only the correct brush is used and that a *minimum of 75% bedding is obtained on the face* before putting the dynamo into service. The bedding of the trailing edge is especially important.

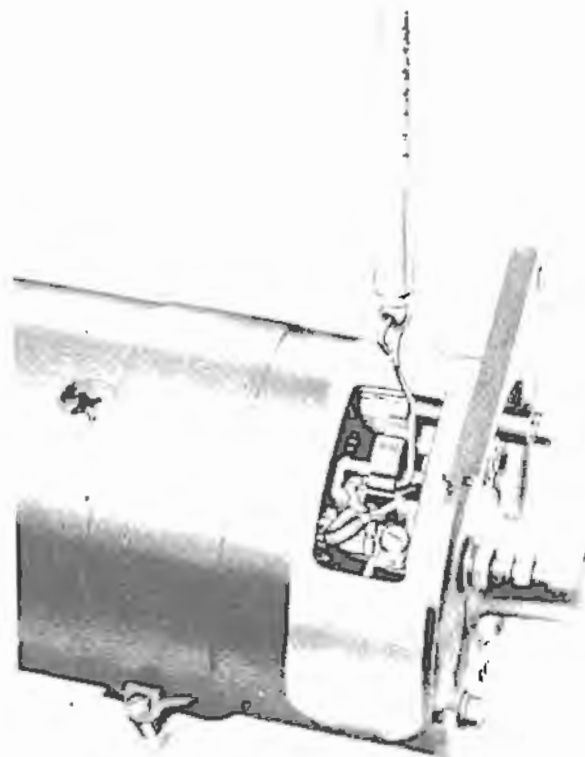


Fig. M.8.—Checking Brush Spring Tension.

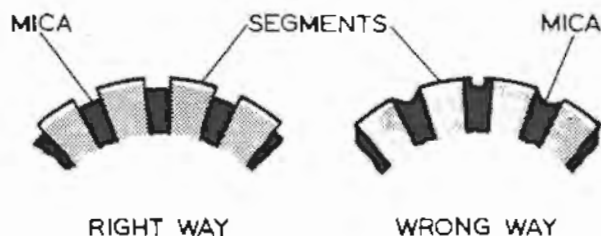


Fig. M.7.—View of Undercut Mica.

Bedding the Brushes.

Attach a strip of fine grade glass paper, which must be the full width of the commutator, by means of adhesive paper as illustrated in Fig. M.9. Assemble dynamo; rotate armature by hand in the normal direction of rotation until the whole face shows a continuous bedding. Remove paper and clean out the dynamo. Connect a 12 volt D.C. supply to the 'D' terminal and to the dynamo body. Inter-connect 'D' and 'F' terminals for a few seconds to start the machine and then allow to motor until brushes bed correctly on commutator.

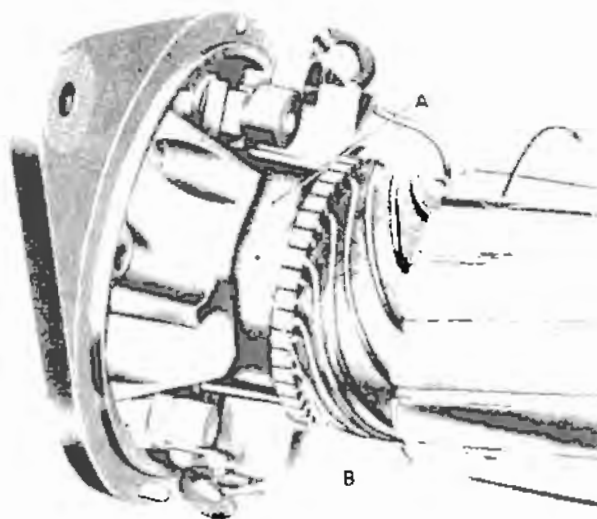


Fig. M.9.—Bedding Brushes.

(A) Abrasive Paper (B) Adhesive Paper

CONTROL BOX

DATA

Model	...	Lucas RB.310.
Cut-out	...	Cut-in voltage 12.7-13.3 volts. Drop-off voltage 9.5-10.5 volts. Reverse current 3-5 amps.
Voltage Regulator...		Open circuit setting at 20°C. (68°F.) and 1,500 dynamo r.p.m. 14.2-14.8 volts. Voltage must not rise above 16 volts at 3,000 dynamo r.p.m.

NOTE.—For every 10°C. (18°F.) above 20°C. (68°F.) subtract 0.3 volts, and for every 10°C. below, add 0.3 volts to this setting.

Current Regulator... 30 amps.

Three units are housed in the control box, the voltage regulator, the current regulator and the cut-out.

The cut-out is a high resistance winding connected in parallel with the dynamo. This unit disconnects the dynamo from the battery circuit and prevents the latter discharging whenever the generator voltage falls.

The voltage regulator has a high resistance operating coil which, connected in parallel with the dynamo, makes this unit responsive only to the system's voltage.

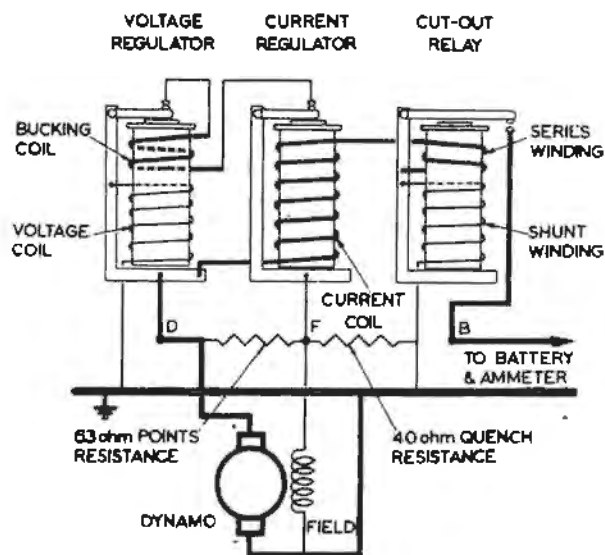


Fig. M.10.—Control Box Circuits.

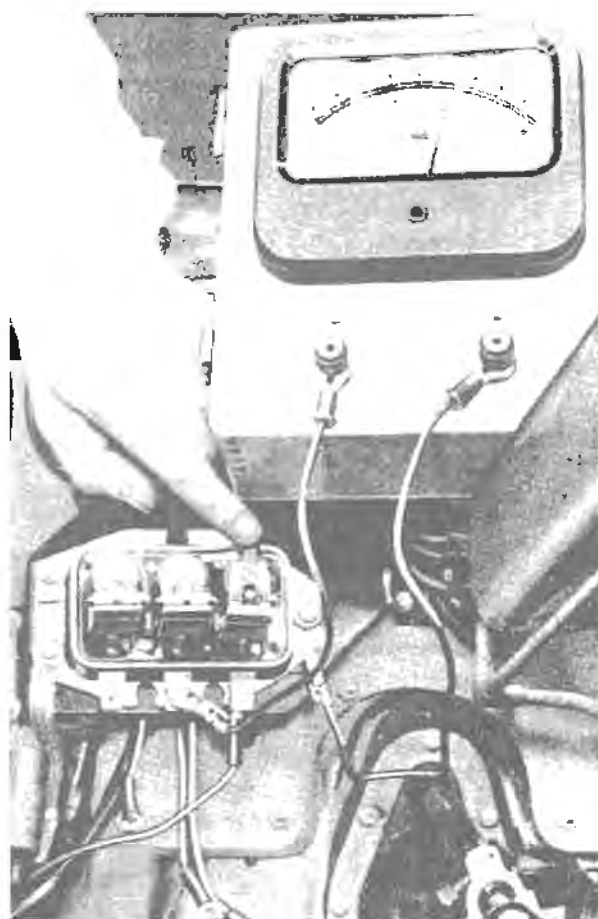


Fig. M.11.—Control Box Continuity Test.

The current regulator has a low resistance operating coil which, connected in series with the dynamo, makes this unit responsive only to current values. The contacts of both regulators are normally closed, and are connected in series with the dynamo field.

The armature tension spring of the voltage regulator is bi-metallic, giving a thermal compensation for battery variation due to temperature. On the regulator winding is a bucking coil which increases the frequency of armature vibration and acts as an output stabiliser.

Testing in Position.

To locate the source of a complete failure to charge, test as follows:—

- (i) Ensure that the dynamo is functioning as detailed in Sub-Section M.2.
- (ii) With 'D' and 'F' wires to dynamo disconnected, engine switched off, and cut-out points held closed, test as shown in Fig. M.11.
 - (a) A zero reading indicates a failure at the cut-out or regulator points. Transfer voltmeter lead to the 'D' terminal. A full battery reading here indicates that the failure is on the field circuit. If reading is zero, transfer lead to 'B' terminal.
 - (b) A zero reading at the 'B' terminal indicates a fault in wiring or battery connections. A normal voltage indicates a cut-out points failure.

When control box operation is incorrect, it is recommended that the unit be replaced, and the following information is given only to assist servicing where it is impracticable to obtain a replacement.

Electrical Settings.

Cut-out Relay.

Transfer voltmeter "+" lead to 'D' terminal, or to

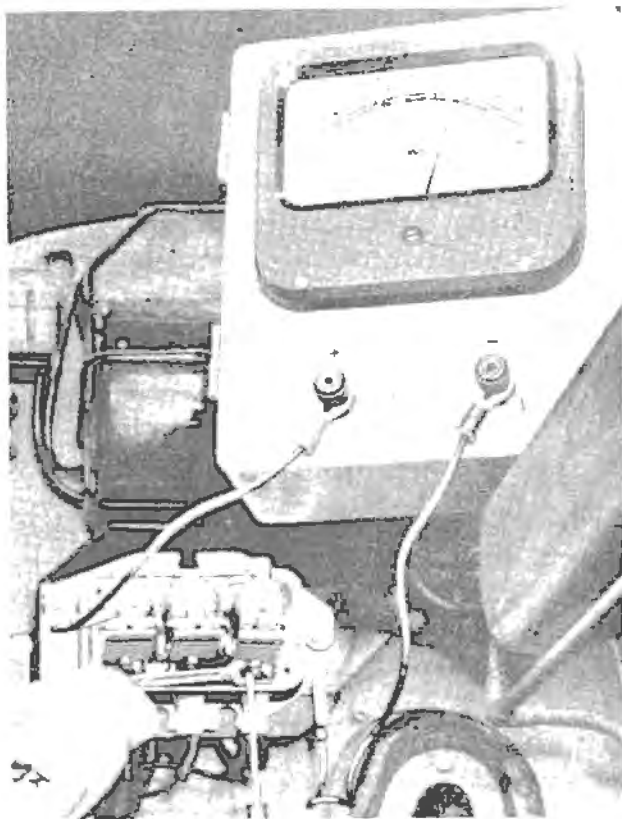


Fig. M.12.—Cut-in Voltage Adjustment.

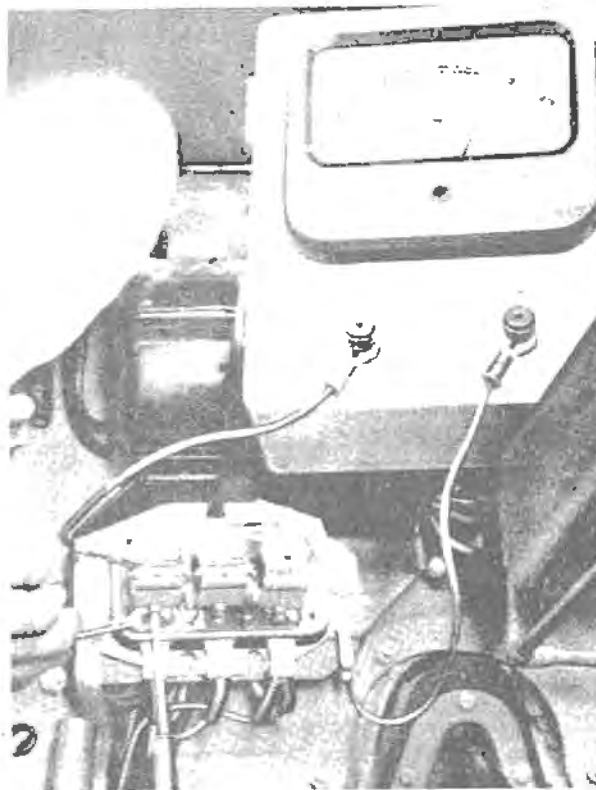


Fig. M.13.—Open Circuit Voltage Adjustment.

an armature securing screw, and adjust cutting-in voltage as shown in Fig. M.12. Adjust drop-off voltage by setting the neck of the fixed contact post.

Voltage Regulator Open Circuit Setting.

With connections unaltered insert a piece of paper between the cut-out points to isolate the dynamo from the battery circuit. (See Fig. M.13.) Slowly increase engine speed until the voltmeter flicks and steadies (1,500 dynamo r.p.m.). Set the voltage regulator by means of the adjustment screw. Check maximum voltage at approximately 3,000 dynamo r.p.m. The adjustment is sensitive and values must be re-checked after tightening the lock-nut.

Current Regulator Setting.

With connections as shown in Fig. M.14, switch on all lights to ensure maximum output and adjust at 2,000-2,500 dynamo r.p.m. Re-check after tightening lock-nut. Run up to 4,000 r.p.m. and ensure the output remains constant.

Mechanical Settings.

Where the electrical values are unobtainable, or the units have been disturbed, carry out the following setting:—

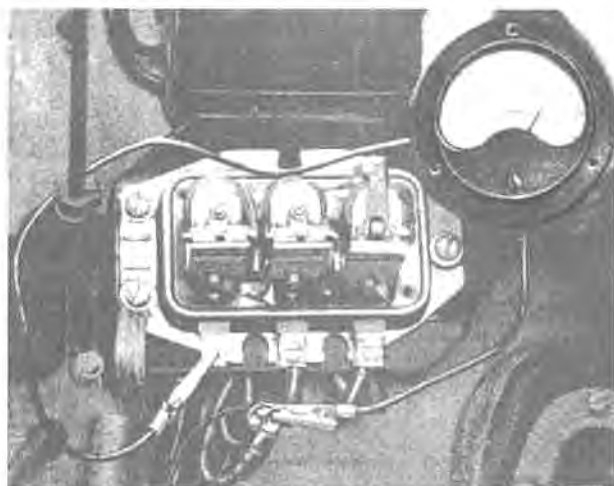


Fig. M.14.—Checking Current Regulator.

Cut-out Relay.

- (i) Slacken the two cheese headed armature assembly securing screws, and slacken adjusting screw until well clear of the armature tension spring.
- (ii) Press the armature *squarely* down against the core face and tighten the two armature assembly securing screws.
- (iii) Retaining the armature in this position, and using a pair of round-nosed pliers, adjust the armature backstop to give .018" clearance between backstop tip and contact blade, and then adjust the fixed contact post so that a follow through gap of approximately .010" is obtained between the moving contact blade and the front edge of the armature. (See Fig. M.15 and M.16.)

Carry out electrical settings as detailed.

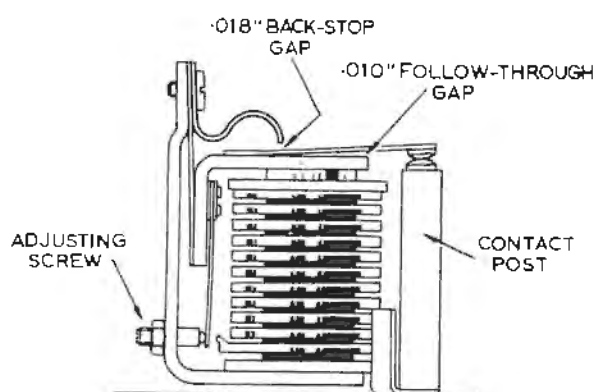


Fig. M.15.—Cut-out Relay Adjustments.

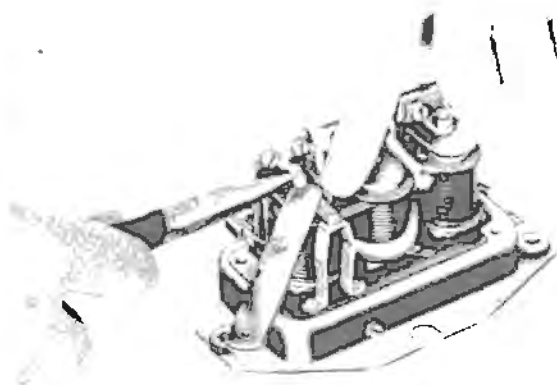


Fig. M.16.—Adjusting Cut-out Armature Back Stop.

Voltage and Current Regulator.

- (i) Slacken the two armature assembly securing screws, and slacken adjusting screw until well clear of the armature tension spring.
- (ii) Insert a .015" feeler gauge between armature and core shim. This feeler must be wide enough to cover completely the core face.
- (iii) Press the armature squarely against the gauge (see Fig. M.17), tighten the two assembly securing screws and screw in the fixed contact until it just touches the armature moving contact. Tighten the locking nut.

Carry out electrical settings as detailed.

NOTE.—When cleaning the voltage or current regulator contacts use Carborundum stone or fine emery cloth, washing off with methylated spirits (denatured alcohol). When cleaning the cut-out contacts use a strip of fine glass paper, never Carborundum or emery cloth.

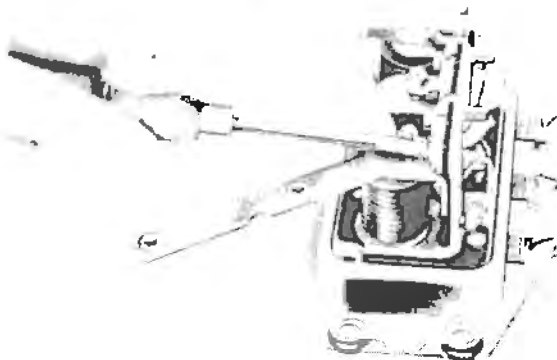


Fig. M.17.—Adjusting Armature Air Gap.

STARTER MOTOR AND DRIVE

The starter motor is a Lucas Model No. M45G, fitted with a Rolls-Royce reduction gear and drive unit. An overall reduction of 18.15:1 is obtained between motor and crankshaft.

Performance	Approximate Current Value
No-load condition, at 4.5 volts ... (terminal voltage)	... 30 amps
Loaded condition, at 8.5 volts ... (terminal voltage)	... 220 amps
Lock-torque test, at 7.6 volts ... (terminal voltage)	... 440 amps
Drive slip torque: 20—25 lbs.ft.	

Maintenance.

Every 10,000 miles, inject S.A.E.30 engine oil into the reduction gear casing up to filler plug level.

Testing in Position.

Check battery condition.

Connect a voltmeter between motor terminal and a good earth point on chassis frame. Remove ignition fuse (No. 11), turn ignition key to operate starter, and note voltage reading.

- (i) A full voltage indicates an open circuit in the starter motor. See below for removal instructions.
- (ii) 6—10 volts: motor functioning. Examine starter drive. (See below.)

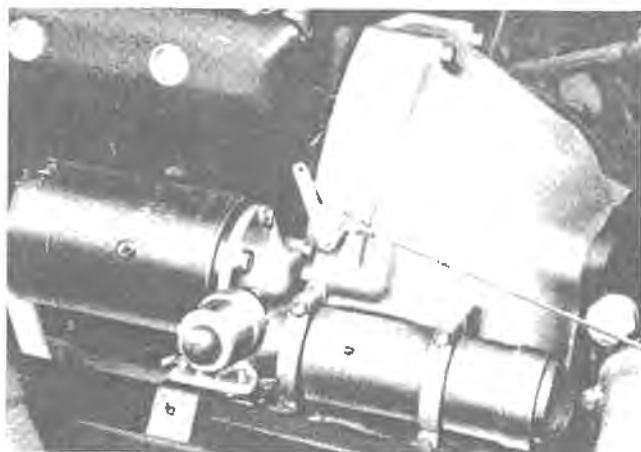


Fig. M.18.—Starter Motor and Relay.

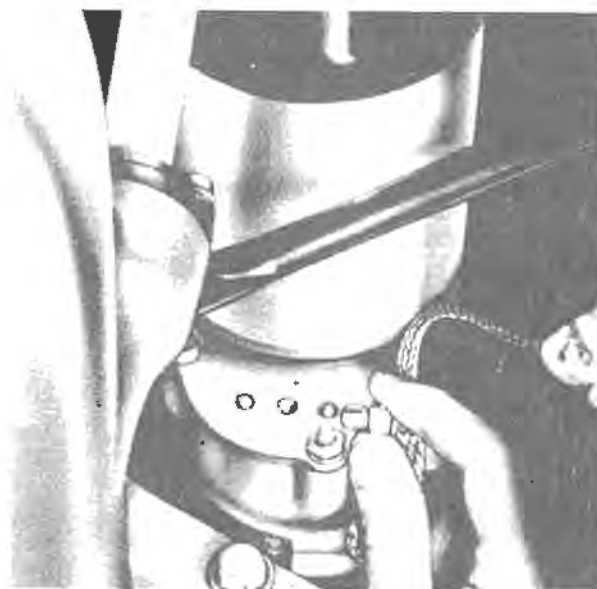


Fig. M.19.—Filling Starter Reduction Gear Casing.

- (iii) Low reading: poor connections, or a short circuit in motor. Check battery voltage while starter is operating. A very low reading here indicates a short circuit in motor.
- (iv) Zero reading: Disconnect starter motor and re-check at relay terminal. Check micro switch on steering column (automatic gearbox cars only); check starter relay operation, wiring and switch. (See appropriate paragraphs for test details.)

To Remove Starter Motor and Drive.

- (i) Disconnect the battery negative earthing lead.
- (ii) Disconnect the cable from starter motor. Remove motor and drive as one unit.
- (iii) Empty gear casing of oil and remove drive from motor.

When re-assembling, the gears must be remeshed in accordance with the teeth markings. Refill the gear case with oil after refitting to the engine.

STARTER MOTOR

Bench Testing.

- (i) Connect a test lamp to motor terminal and to body. Rotate armature slowly, when the

lamp should remain alight. With an open-circuited motor, the lamp will not light.

- (ii) Remove the pair of earthed brushes. If the test lamp remains alight, the motor has a short to earth.
- (iii) Remove the second pair of brushes. If the lamp remains alight, with all brushes clear of carriers and frame of machine, the fault is in the field circuit.
- (iv) If the lamp does not light in (iii), transfer test lamp lead from motor terminal to commutator. If the lamp lights, the fault is in the armature.

MOTOR OVERHAUL

With the brushes removed, withdraw the two body screws. This permits removal of the drive end bracket complete with armature.

The drive end bearing plate is secured by two nuts and studs which are peened over. File off after pressing out the armature shaft, when renewing the ball race. On re-assembly, pack with high melting point grease, and lock the nuts by centre-popping.

The commutator end bearing is a sintered bronze oil retaining bush. When renewing the bush, soak in engine oil for 24 hours before fitting.

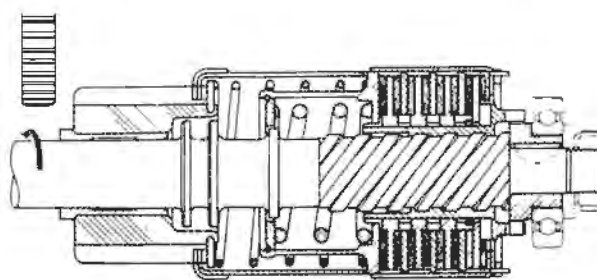


Fig. M.20.—Starter Drive Sectional View.

Brush spring tension should be 21-27 ozs. The spring tension check, brush fit and bedding, and commutator cleaning should be carried out in similar manner to the procedure detailed for the dynamo (see Sub-Section M.3), with the exception that the mica of the starter motor commutator must not be undercut.

DRIVE UNIT

The clutch incorporated in the drive unit reduces shock and eliminates motor overload.

When overhauling, the total thickness of the clutch discs must be maintained at 1.070"—1.080". The

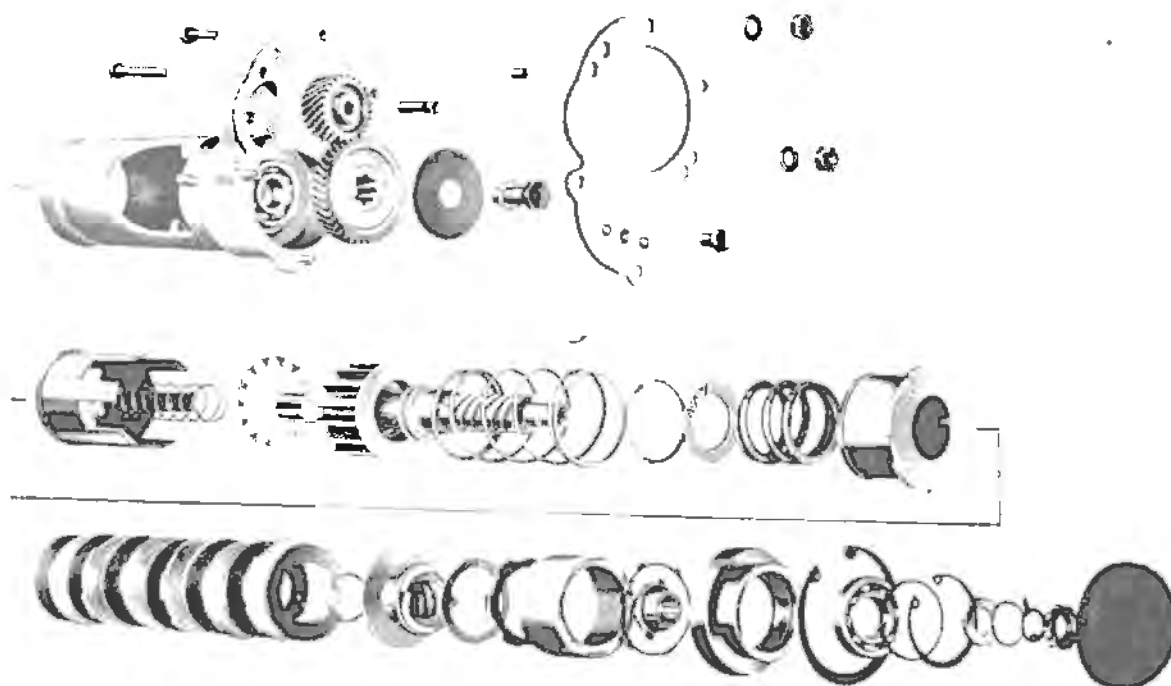


Fig. M.21.—Starter Drive Exploded view.

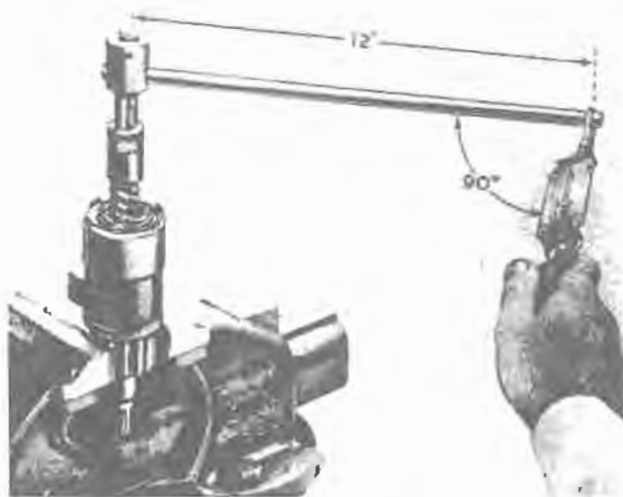


Fig. M.22.—Checking Slip Torque.

thickness of the Ferodo disc is .086"—.090"; selective assembly will usually permit the correct overall thickness to be obtained. If necessary, light rubbing on medium grade glass paper will reduce the disc thickness.

Soak the Ferodo discs in S.A.E.30 engine oil for 30 minutes before assembly. Take care to assemble in the precise order shown in the exploded view (see Fig. M.21) but do not lock the slotted ring nut before obtaining correct slip torque. Pack the ball race with high melting point grease.

The slip torque, which is that required to maintain steady slip, should be 20—25 lbs.ft. Ignore the high initial break-away figure. This test may be carried

out as illustrated in Fig. M.22 by substituting a standard nut in place of the slotted ring nut, and utilising a spring balance, box spanner and bar.

Take several readings and finally adjust the clutch disc overall thickness to obtain the correct values.

MICRO SWITCH

On cars fitted with the Automatic Gearbox, a small micro-switch, fitted at the base of the steering column, is inserted in the starter motor circuit. This switch is operated by the gear range selector lever, to ensure that the engine can only be started with the gearbox in Neutral.

In cases of failure of the starter motor to operate, inspection should be made that the gear range lever is definitely operating the toggle lever on the switch. If necessary, move switch to reposition correctly on steering column. Ensure that correct operation of reversing lights is not disturbed.

SOLENOID SWITCH

The starter motor solenoid switch is mounted on the chassis on the left-hand side of the engine, beside the starter. The solenoid is energised through the key operated switch in the switch box on the instrument board.

To test switch in position, inter-connect the grub screw terminal and the main battery feed terminal.

If the relay is working, it will be heard to operate every time circuit is completed. If not, ensure that feed and earth circuits are satisfactory.

For emergency use or testing, the Solenoid may be manually operated by pressing in the rubber cap, which covers an extension of the switch movement.

IGNITION SYSTEM

DATA

Distributor.

Firing Order ...	1, 4, 2, 6, 3, 5.
Timing ...	2° B.T.D.C.
Contact Gap ...	.019"—.021"
Dwell Angle ...	44° at .020" gap.
Contact arm spring tension ...	15—17 ozs.
Condenser capacity ...	.18—.25 mfd.
(A spare condenser is mounted on distributor)	
Radio interference suppressor — resistor in rotor arm ...	5000—6500 ohms (approx.)

Coil.

Insulation resistance to case ...	20 meg. at 500 volts.
Primary winding resistance ...	4.25—4.65 ohms at 75°F.
Secondary winding resistance ...	5500—7100 ohms at 75°F.
Radio interference suppressor—capacitor on "+" terminal ..	1 mfd.

Plugs.

Gap ..	.025"
--------	-------

MAINTENANCE

Lubrication.

Screw down the distributor grease cap two turns every 1000 miles. When replenishing, use high melting point grease. Every 5000 miles apply a drop of oil to each contact arm pivot; apply a few drops to the felt in top of shaft, and to the cam felt. Check condition and setting of points

Cleaning and Adjusting Contacts.

Clean the contact points with a fine carborundum stone. Renew the points if badly pitted. When replaced, correctly aligned and adjusted, the points must make full face contact.

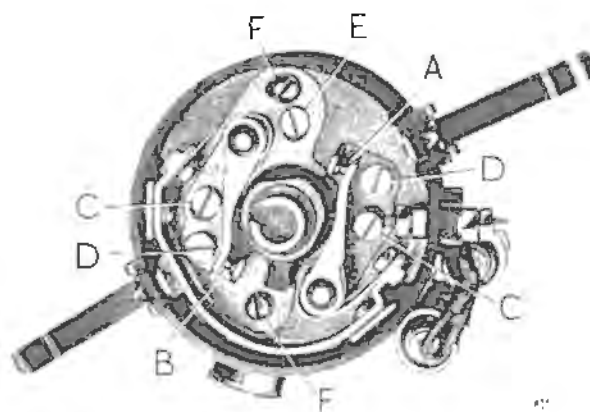


Fig. M.23.—Contact Points Adjustment.

- | | |
|---|---|
| (A) Fixed Points, feeding 1, 2 and 3 cylinders | (D) Locking Screws. |
| (B) Synchronising Points, feeding 4, 5 and 6 cylinders. | (E) Synchronisation Adjusting Eccentric |
| (C) Gap Adjusting Eccentrics. | (F) Synchronisation Locking Screws |

Set both pairs of contacts to .019"—.021" maximum gap by means of the two eccentrics "C" (Fig. M.23). The locking screws are marked "D". Do not disturb "E" and "F", except when synchronising (see below), which must be carried out whenever the points are removed.

IGNITION TIMING

Remove the sparking plugs. Press the rubber button on end of starter relay, to turn over the engine until No. 1 cylinder ignition position is approached. Remove flywheel housing inspection cover and turn by hand to the correct timing setting, rotating the flywheel *only in the normal direction of rotation*. Any reversal of rotation during this operation may give an inaccurate timing setting due to relative movement in the timing gear spring drive, and backlash.

The nominal setting is 2° B.T.D.C.

On 8:1 compression ratio engines, a micrometer type octane selector is fitted in order to permit retarding of ignition timing to suit low grade fuels. This must be set to the fully advanced position when carrying out ignition timing.

Release the distributor clamping screw and rotate until the contacts "A" (Fig. M.23) are just breaking. These contacts control the ignition of Nos. 1, 2 and 3

cylinders. During this operation, hold the top of the distributor shaft in the fully retarded (anti-clockwise) position to take up any backlash in the centrifugal advance mechanism. Anti-clockwise rotation of the distributor body will advance the timing. Do not over-tighten the clamping screw when locking in position.

Rotate the crankshaft one full turn and check the contact synchronisation. Contacts "B", which feed Nos. 4, 5 and 6 cylinders, must break at the same flywheel setting for No. 6 cylinder as the "A" contacts break for No. 1 cylinder. Adjust as necessary by means of the eccentric "E". The locking screws are marked "F" in Fig. M.23.

DISTRIBUTOR OVERHAUL

Before withdrawing distributor, note position of rotor arm.

Remove rotor arm, terminal block and base plate assembly. Remove the driving sleeve tapered retaining pin, and sleeve. Withdraw shaft assembly.

Before re-bushing and reaming, check the shaft for parallelism and wear.

The centrifugal advance mechanism seldom requires attention, but should the springs have to be disturbed, note the position of the heavier and the lighter tension spring. Take care not to distort these, since the correct advance curve cannot be obtained unless the

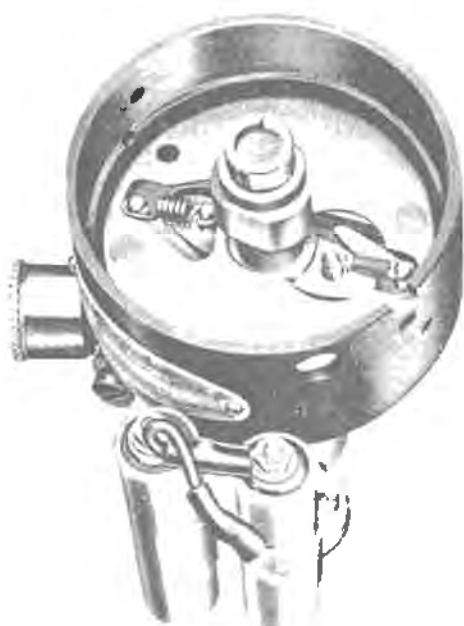


Fig. M.24.—Centrifugal Advance Mechanism.

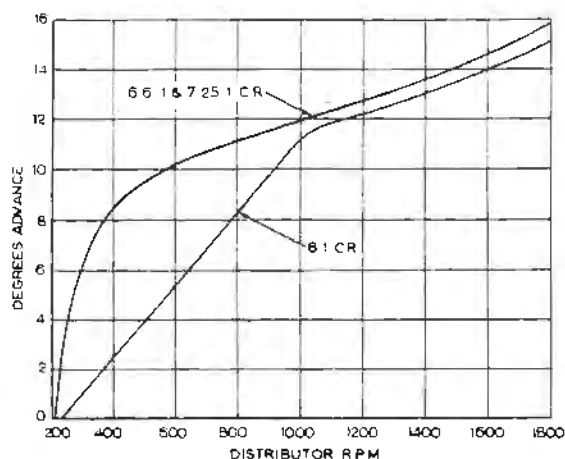


Fig. M.25.—Ignition Advance Curves.

tensioning is accurate. Where this is the only attention required, the springs can be changed without removing the distributor from the engine.

IGNITION COIL

Complaints of weak and erratic operation are usually attributable to incorrect low-tension connections. Check and ensure that the coil negative ("—") terminal is connected to the distributor. On coils marked "For use on negative earth systems only", this is the "CB" terminal.

Check voltage at the "+" ("SW") terminal.

Remove HT lead from coil and insert a temporary HT cable. Hold the end about $\frac{1}{2}$ " from a good earth point, and operate contact breaker by hand. Coil should spark regularly. Heavy arcing at distributor indicates the need for attention to points and, possibly, condenser.

SPARKING PLUGS

The standard sparking plug servicing and sand-blasting machines should be used for cleaning and testing plugs. This should be carried out every 5000 miles, and the points set to .025", except where the Lodge CLNP plug is fitted.

The platinum tipped points of the CLNP plug are less susceptible to burning and permit a longer period of service before gap adjustment is necessary. Clean and adjust at 10,000-mile intervals. The centre electrode insulation must be treated with care, and heavy sand-blasting avoided.

THE SWITCHBOX

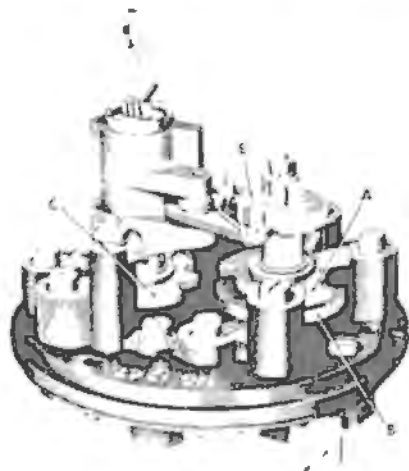
The switchbox, mounted on the instrument panel, incorporates the lights switch, the ignition switch and the ignition and fuel warning lights.

The lights control, a rotary four-position switch, will select side and tail lights only, head, side and tail lights, or fog, side and tail lights.

The key-operated ignition switch will lock the lights switch in the "OFF" position or the "S & T" position for parking. This key switch is the master control. Rotation anti-clockwise permits the use of radio, wind-screen wiper, cigar lighter and interior lights, while parked. Rotation clockwise to the normal running position permits the use of all circuits. Further clockwise rotation against the action of the spring return, energises the starter relay.

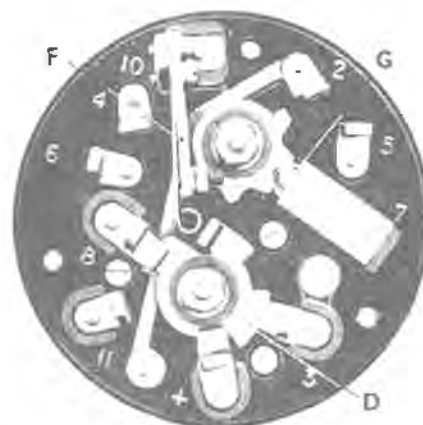
TO DISMANTLE THE SWITCHBOX

Remove facia board; remove the switchbox mounting setscrews and draw out the box. Remove the cover and disconnect wiring. Remove the three retaining nuts and withdraw the switchbox base plate. Figs. M.26 and M.27 show the mechanical and electrical arrangement of the switches. When re-assembling, coat all sliding contacts with a good quality electrical contact grease.



(A) H, S & T Lights Contact.
(B) Fog Lights Contact.
(C) Ignition Contact.
(E) Lights Switch Locking Pawl.

Fig. M.26.—Switchbox Contacts. Internal View.



(D) Accessories and Starter Relay Contact.
(F) Starter Contact Arm.
(G) Lights Switch Positioning Ball and Cam.

Fig. M.27.—Switchbox Contacts. External View.

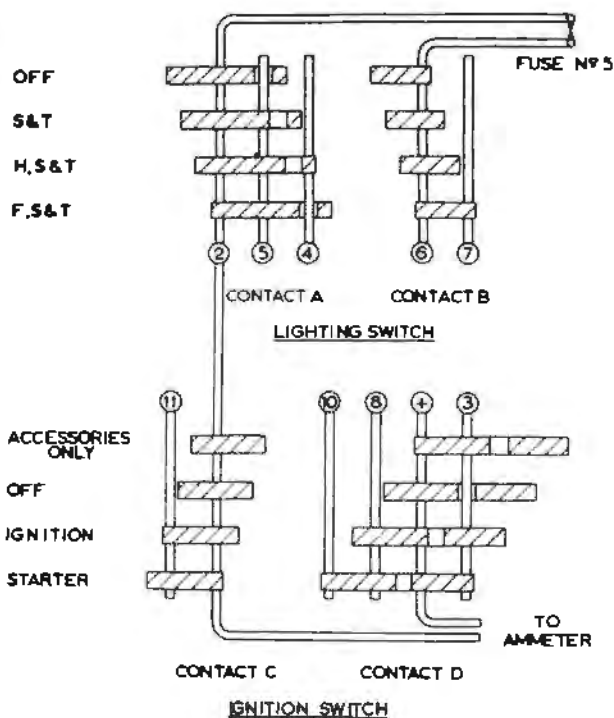
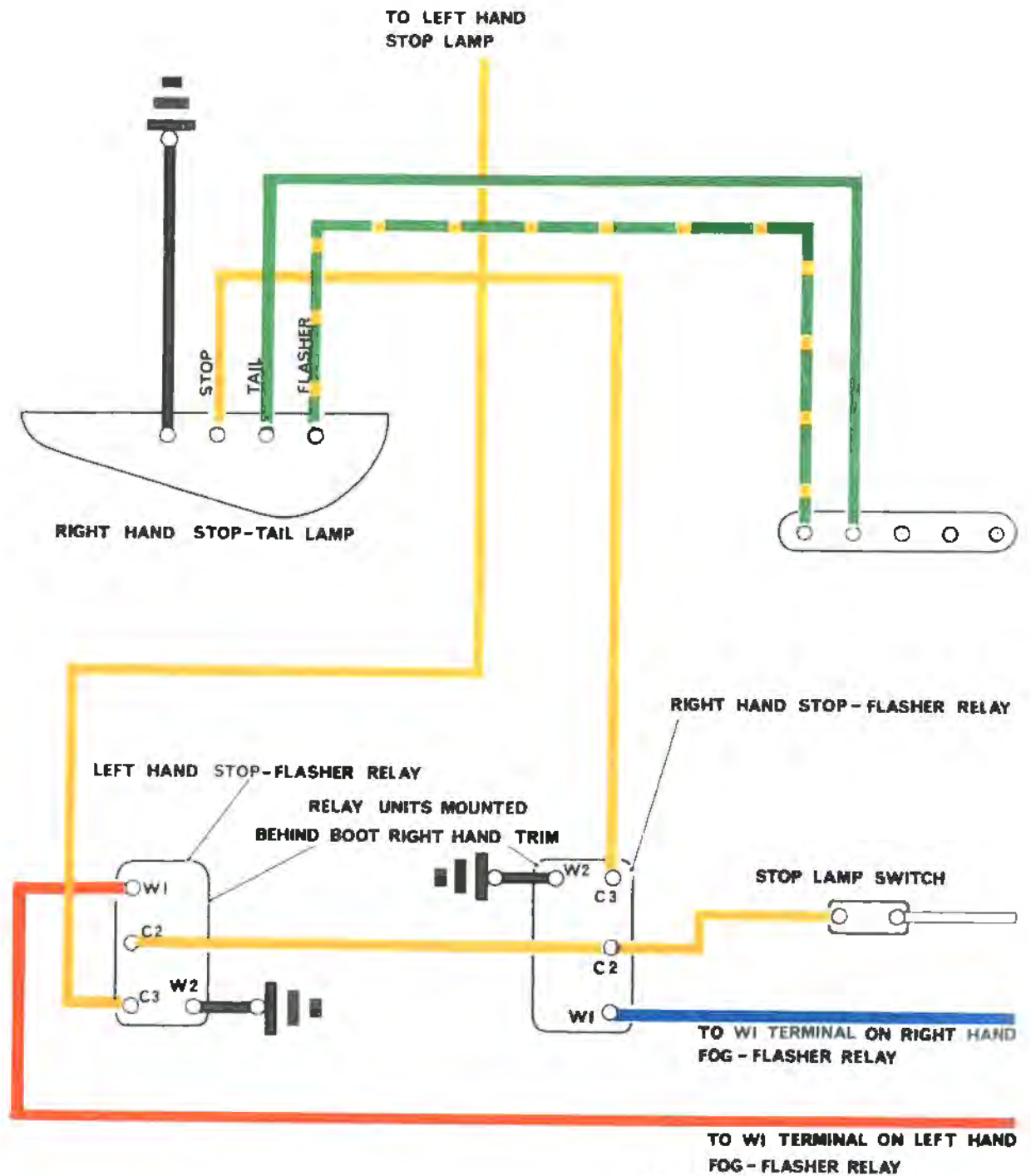


Fig. M.28.—Switchbox Circuits.



APPLICABLE TO THE FOLLOWING CHASSIS NOS AND ONWARDS
B 155 AP BC 40 AF S WA 72

LIGHTS

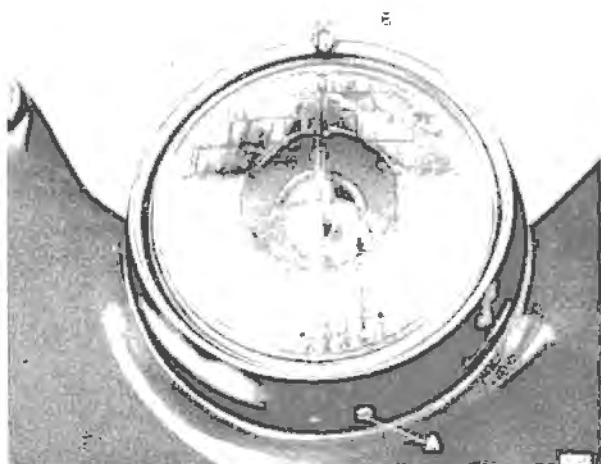


Fig. M.30.—Headlamp.

- (A) Rim Retaining Screw
- (B) Beam Vertical Adjuster

HEADLIGHTS

A foot-operated switch selects "main" or "dip" filaments in the double-filament bulbs of the twin headlamps. A small red warning light in the speedometer indicates when the "main" beam is in use.

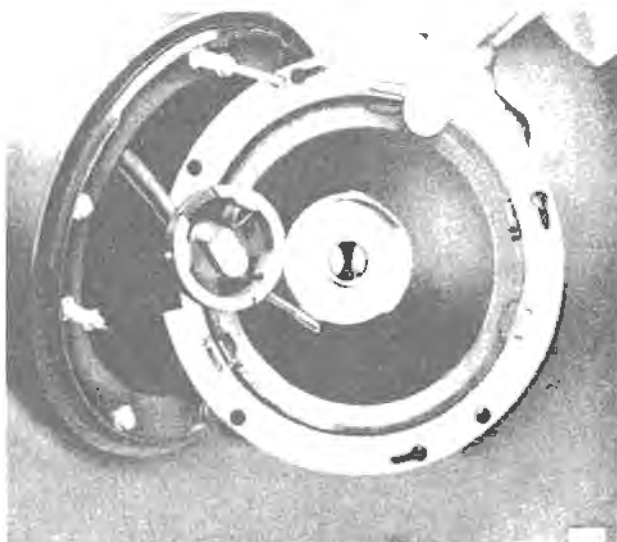


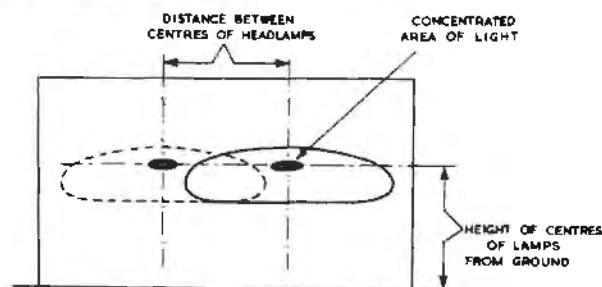
Fig. M.31.—Headlamp Bulb Access.

The reflector and glass form one unit, in which is carried a pre-focused bulb. No focusing or cleaning of reflector should be attempted, and when handling, care must be taken not to touch the reflector surface.

In cases of complaint of dipper switch operation, ensure that the carpet does not restrict the plunger travel.

The only lamp servicing required is bulb replacement and headlight alignment.

To replace a bulb, remove the rim screw (Fig. M.30), rim and rubber seal. Press in and turn unit anti-clockwise until the screwheads can pass through the enlarged ends of the slots in the mounting plate. The bakelite contact carrier is a bayonet type fitting; the bulb is retained in its carrier plate by means of a circlip (Fig. M.31).



- (A) FRONT OF CAR TO BE SQUARE WITH SCREEN
- (B) CAR TO BE LOADED AND STANDING ON LEVEL GROUND
- (C) RECOMMENDED DISTANCE FOR SETTING IS AT LEAST 25 FT
- (D) FOR EASE OF SETTING ONE HEADLAMP SHOULD BE COVERED

Fig. M.32.—Main Beam Setting.

The headlight beams should be parallel with the car's centre-line and with each other. (See Fig. M.32.) With the rim removed, adjust by means of screws shown in Fig. M.33.

Vertical adjustment is by the single screw shown in Figs. M.30 and M.33, and may be carried out with the rim in position. A thin coin may be used for road-side adjustment by the driver, to compensate for variation of load.

SIDELIGHTS

To replace a bulb, remove securing screw immediately below bezel. Remove lamp and pull out bulb carrier. (See Fig. M.34.)

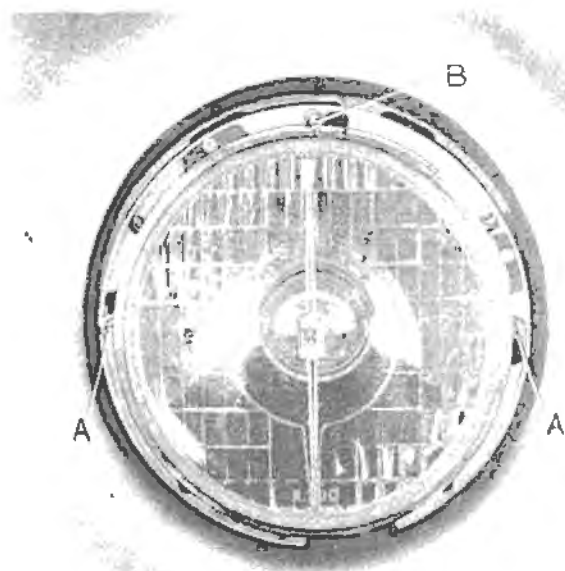


Fig. M.33.—Headlight Beam Adjuster.

(A) Horizontal Adjusters.
(B) Vertical Adjuster.

FOG LIGHTS

A double filament pre-focus bulb is used in the fog lamp. The secondary filament is used only as a "flasher" direction indicator. Fig. M.35. illustrates bulb replacement:



Fig. M.35.—Fog Lamp Bulb Access.

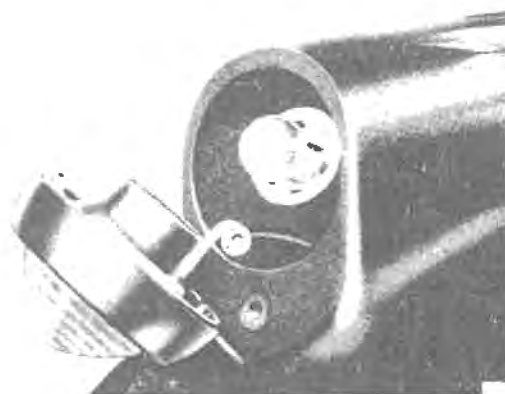


Fig. M.34.—Sidelamp Bulb Access.

TAIL LIGHTS

The unit consists of the rear flasher light, stop and rear light, and the reflector.

Access for bulb replacement is from inside the boot (see Fig. M.36). Twist carrier anti-clockwise and pull out complete with bulb.

REVERSE AND NUMBER PLATE LIGHT

Access for bulb replacement is from inside the boot lid. Remove trim panel, which is retained by spring clips; release screws and remove bulb carrier plate. (See Fig. M.37.)

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Fig. M.36.—Tail Lamp Bulb Access.

The reverse light is controlled by a micro switch at the base of the steering column, operated by the gear selector. In cases of complaint, check and re-adjust the positioning of this switch as necessary.

BOOT LIGHT

This light is controlled by a mercury switch, the angular positioning of which is such that the mercury covers two contacts in the capsule when the boot lid is opened approximately a quarter of its travel. Access for replacement is by removal of the boot lid trim pad, which is retained by spring clips.

To obtain access to the bulb, remove the lamp plate and glass.

ROOF LIGHT

Automatic control is effected by door-operated switches; manual control is by the switch on the left-hand centre door pillar.



Fig. M.37.—Switch and Lights in Boot Lid.

- (A) Boot Light Mercury Switch.
- (B) Boot Light.
- (C) Access Plate—Number Plate and Reverse Lamp.

Unscrew the ring and remove the domed glass to gain access to the bulb.

COMPANION LIGHTS

These are in circuit only when the main switch is on, and are controlled by the switches adjacent to the lights. The bulbs can be renewed without any dismantling.

INSTRUMENT AND WARNING LIGHTS

These are fitted to speedometer, instrument patch and the switchbox. Bulb holders are a push fit in their sockets. To gain access, remove the facia board and draw out the unit concerned.

INSTRUMENTS AND ACCESSORIES

FUEL GAUGE

The Gauge is controlled by a float operated rheostat unit in the petrol tank.

Complaints of the operation of this gauge may be due to wiring and connections. Where a gauge constantly reads "empty", check wiring and connections on the feed wire; when a gauge reads "full" constantly, check the earth connection of gauge body, the fuel-oil changeover switch, connections, and wiring to the tank unit. Check earthing of petrol tank. Inaccurate readings are usually caused by a distorted tank unit float arm. Care must be taken not to foul the baffles in the petrol tank when fitting a unit. (See Figs. K.1 and K.3, Sub-Section K.1.)

The tank unit rheostat may be checked with an ohm meter, the resistance varying from 0—82 ohms over the range of arm travel.

At approximately 3½ gallons, the fuel warning light circuit is completed by an earth switch contact in the tank unit.

TEMPERATURE INDICATOR

The coolant temperature indicator needle operation is by deflection of an electrically heated bi-metal strip. The transmitter unit, located in the thermostat housing, incorporates a second heater coil and bi-metal strip the oscillation of which allows intermittent earth contact through a resistor. The bi-metal strip is biased by the coolant temperature, and the indicator needle deflection is a measure of the electrical heat in the circuit.

No attempt should be made to carry out repairs to the indicator or transmitter other than to straighten or re-engage the needle. Any electrical overload is liable to render the indicator inaccurate, and if after renewing the transmitter only, the readings are incorrect, the indicator should be renewed.

OIL PRESSURE INDICATOR

This thermal type indicator is similar to the temperature unit, but in this case, the transmitter is biased by an oil pressure operated diaphragm.

PETROL FILLER DOOR

The solenoid operated release of the petrol filler door bolt is provided with a manual release wire in the boot. Grease the bolt occasionally with Retinax

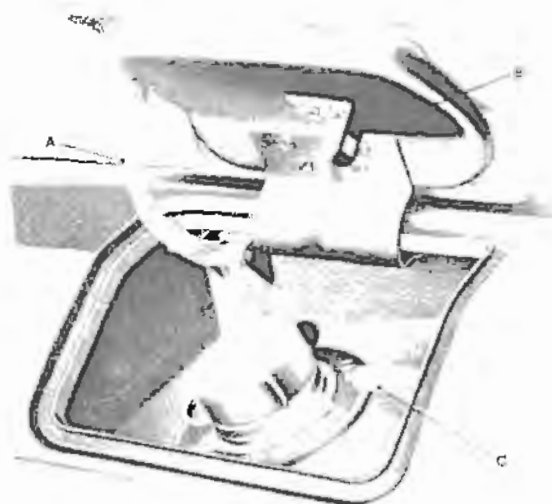


Fig. M.38.—Petrol Filler Door.

- (A) Spring Arm
- (B) Engagement Tag.
- (C) Bolt.

"A" Grease, while working the bolt by means of the wire.

Operational failure is sometimes encountered due to excessive door loadings, or engagement tag distortion. Check the door and the rubber seal (see Section S). The solenoid operation may be checked visually with the door open.

Access to the solenoid unit is through the boot side panelling. When removing the unit, the mounting plate need not be disturbed.

WINDSCREEN WIPERS

The Lucas windscreen wiper motor drives a flexible reciprocating rack by means of an eccentric. The rack operates the twin wheelboxes which carry the wiper arms.

A thermostatic cut-out switch safeguards the motor against overheating due to overloading. After cooling, this will permit continued operation for a further period. The overloading may be caused by selecting the high speed on an incompletely wetted screen, but where it occurs during normal operation, the cause should be ascertained and corrected as soon as possible. (See under Service.)

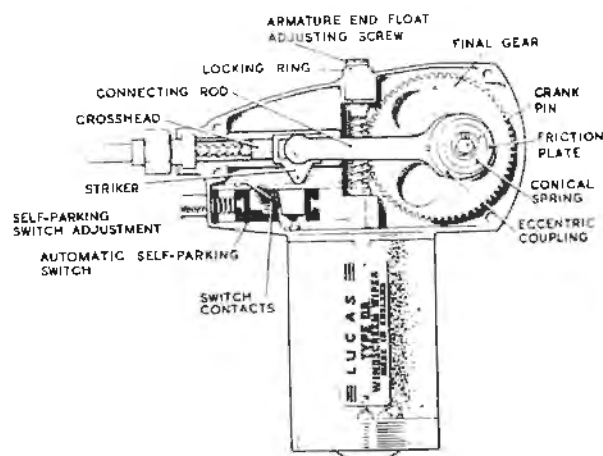


Fig. M.39.—Wiper Motor Details.

No maintenance is required, but the wiper blades should be inspected for deterioration of the rubber. It is recommended that replacements be obtained from the Service Dept., Hythe Road, Willesden, London, N.W.10. These replacements are specially treated to obtain anti-friction qualities.

Self-Parking Adjustment

When switched to "Park" the direction of rotation of the motor is reversed, and the motor is switched off by the striker block illustrated in Fig. M.39. Reversing the block will give parking at the opposite end of stroke. Adjustment is by the knurled adjuster shown.

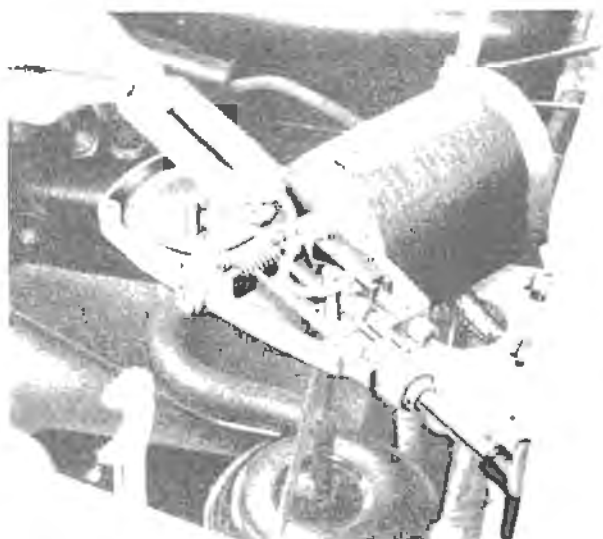


Fig. M.40.—Wiper Load Test.

Service

Complaints of noisy operation are usually due to the run of the drive tubing. A metal-to-metal contact will permit high transference and the car body will act as a sounding board to accentuate the noise. Felt or rubber packing will eliminate this.

Complaints of failure on a drying screen are sometimes encountered due to high-friction blade rubbers. Sprinkle the screen with a few drops of water, remove blade and wipe across by hand a number of times. When the glass is almost dry, a high friction blade will offer considerable resistance.

Motor overloading may also be caused by slight kinking of the "Bundy" tubing. Fig. M.40 shows a method of testing for overloading. The following figures are quoted for guidance:—

Average Values

Arms and Blades removed ...	4½—6 lbs.
With Blades, on dry screen ...	20—24 lbs.

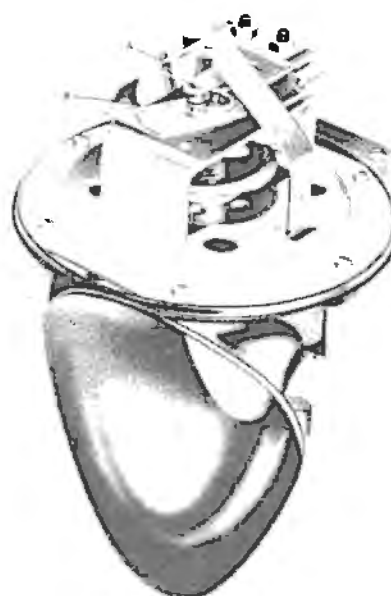


Fig. M.41.—Windtone Horn.

- (A) Vibrating Contact.
- (B) Adjustable Contact.

HORNS

Wind-Tone

A matched pair of Lucas Model WT618/1 horns are fitted, operated by a relay on the LH side of the dashboard. A separate fuse-box is provided on the RH side of the dashboard.

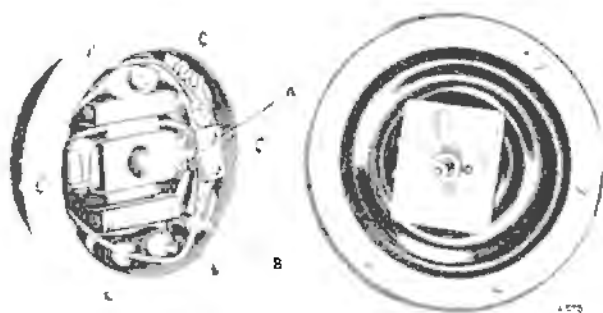


Fig. M.42.—High Frequency Horn.

- (A) Contact Points
(B) Contact Adjuster.

There is no adjustment to alter the pitch, but a complaint of a poor note may be due to the contact points' condition, or arm tension. Clean the contact points, remove fuse and disconnect one horn. Insert an ammeter across fuse terminals. Screw in the adjustable contact until the horn just fails to sound. Unscrew half a turn and lock. Slight re-adjustment may be necessary to limit the current consumption to a maximum of 6.5 amps.

High-Frequency Horns

Fig. M.42 illustrates the adjustment, which is externally accessible from the rear. This is carried out in similar manner to the wind-tone horn. Maximum current permissible is 4 amps.

Testing Horn Circuit

- (i) Connect horn relay terminal "C.1" to the main battery terminal of the starter relay. If horns do not operate, the fault is forward of the relay. If the note is poor, check the voltage at this terminal, with the horn operating. The minimum value to give satisfactory operation is 10 volts.
- (ii) To isolate a failure not reproduced in test (i), short "W.1" to earth. Horn operation indicates a failure in the push button, lead or earth connector on steering column.

Failure to operate indicates a defective relay.

DIRECTION INDICATORS

Warning lights in the speedometer head flash when the indicators are operating. The duration of operation is controlled by the switch at 8-10 secs. The rate of flash is controlled by the two flasher units mounted on the transverse heater duct under the fascia board.

The warning lights will operate only when the indicators are functioning.

Two relays are mounted on the front of the dashboard, their function being to extinguish the appropriate fog light, should these be in use when the indicators are operated.

RADIO

"His Master's Voice" automobile radio equipment is fitted as standard equipment, the receiver consisting basically of a high sensitivity permeability tuned super-heterodyne circuit incorporating one stage of R.F. amplification prior to the frequency changer. Mechanically pre-set push-button tuning is provided in addition to the normal manual control.

The amplifier/power unit provides push/pull output, the high tension supply being by means of a non-synchronous vibrator rectified conventionally by a compact metal rectifier. The set is designed for medium and long wave reception.

The combined volume control and "On/Off" switch is on the left of the five push-buttons. This control switches the receiver on when turned clockwise, and progressive rotation of the control increases the volume. Turning the control fully anti-clockwise will switch off the receiver. Allow about 40 seconds for the receiver to "warm-up" after switching on.

The tone control is concentric with the volume control and "On/Off" switch and provides selective tone correction for reproduction of either speech or music, by three separate tone settings.

- (i) Turned fully anti-clockwise, the amount of bass reproduction is reduced.
- (ii) In the centre position, the bass is restored.
- (iii) Turned fully clockwise, the amount of treble reproduction is reduced.

Position (i) is normally used for speech, and position (ii) and (iii) for music.

The manual tuning control is on the right of the push-buttons and provides completely variable station selection.

To switch to the long waveband when tuning manually, press the extreme right-hand push-button. To switch to the medium waveband, press any of the four remaining push-buttons.

This control is permanently engaged.

The five tuning push-buttons provide automatic tuning of five stations pre-selected from the medium and long wavebands. The right-hand button provides for one station on the long waveband, the four remaining buttons being employed for medium wave pre-selection. Wave-change switching is automatically effected when a button is pressed for any pre-selected station.

The tuning scale is divided into two sections—

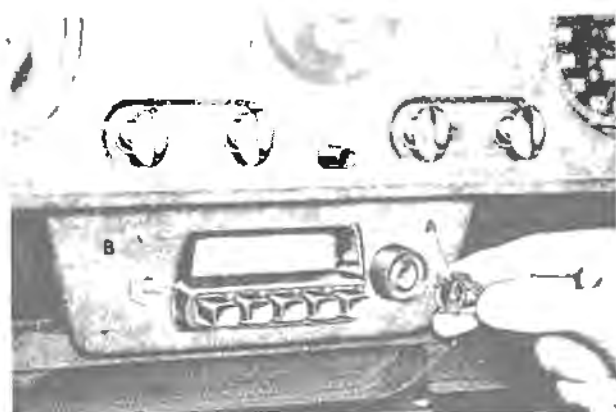


Fig. M.43.—Radio Controls.

- (A) Control Knobs.
(B) Stop Nut.

“medium wave” and “long wave”—and is calibrated in wavelengths (metres). The tuning pointer has a horizontal traverse, and illumination of the tuning scale is by means of “edge-lighting”.

To Set Up the Tuning Push-Button

- (i) Allow 10 minutes for receiver to warm up thoroughly.
- (ii) Select the waveband required by pressing the appropriate push-button.
- (iii) Tune-in desired station by means of the manual tuning control as described previously.
- (iv) With the station accurately tuned-in, pull the push-button outward to full extent ($\frac{1}{4}$ movement) to release the locking mechanism, then push the button firmly home, thus locking the mechanism in the required position. The push-button is now set to tune the station required, and when pressed will “bring-in” the station irrespective of the position to which the scale pointer may have been adjusted previously. Proceed in the same manner for the remaining push-buttons.

The aerial is normally mounted above the windscreen on the outside of the car, and is operated from the inside by a bakelite knob. An engraved arrow indicates the position of the aerial, vertical being for normal use and horizontal for when parked and not in use.

Removing the Control Unit

Remove the control knobs “A” by pulling them off (Fig. M.43). Undo the stop nuts “B” (Fig. M.43) under the control knobs and remove the finisher.

Free the clock winder, and trip recorder controls. Remove the 2BA screws securing the mounting box. Disconnect the radio connecting link by pulling out the

plug, and remove the aerial plug connections. Disconnect the feed cable at the fuse capsule.

Remove the four hexagon headed screws retaining the control unit to its brackets, slide the control unit gently towards the rear of the car and remove, taking care not to trap the battery lead.

To Remove the Amplifier

On right-hand drive cars, remove the cubby box held in position by three 2BA screws at the top and three 2BA screws at the bottom.

On left-hand drive cars, remove the carpet covering the heater ducting. Remove the two Jubilee clips at either end of the heater and demister transverse duct at the lower rear of the dashboard. Push this to the right, drop the L.H. and pull gently, when it will come away.

The amplifier unit can then be readily removed. Disconnect the loudspeaker lead and connector link. Remove the two hexagon headed 2BA screws each side of the unit, and remove the unit.

Re-assembly is a reversal of dismantling.

CIGAR LIGHTER

The lighter should click out 4-6 seconds after being pressed in, from cold. If necessary, the three bi-metal clips may be adjusted to increase or decrease the time lag by setting inwards or outwards respectively. While adjusting, do not permit more than 8 seconds engagement, after which the element will be approaching its fusion point.

CLOCKS

There are two types of clock fitted, one of which is regulated from the rear (Fig. M.44) and is fitted to standard steel cars, and the other (Fig. M.45)

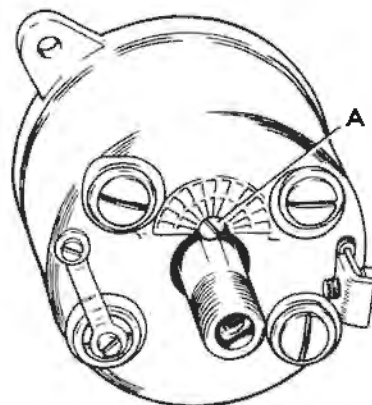


Fig. M.44.—Standard Clock.

- (A) Regulator.

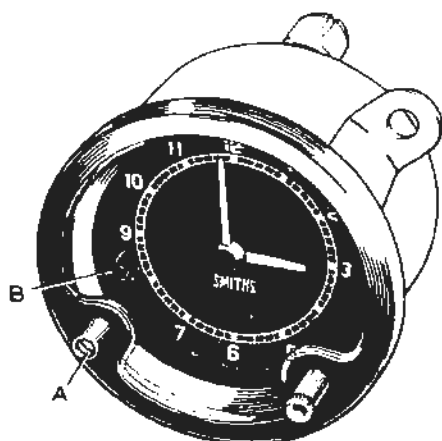


Fig. M.45.—Coachbuilt Car Clock.

- (A) Regulator.
- (B) Indicator.

which can be regulated from the front and is fitted to coachbuilt cars.

A complaint of poor timekeeping is usually due to incorrect regulation.

"A" (Fig. M.44.) and "A" (Fig. M.45.) show the adjusters.

REAR WINDOW DEMISTER

The rear window is demisted electrically, by fine heater wires sandwiched between the two glass layers, and controlled by a toggle switch on the parcel shelf.

A complaint of misted patches under severe conditions may be due to formation of an oxide film between heater wires and bus-bars. This will give a low current consumption. Where a check shows this to be 5 amps or less, disconnect completely from the car wiring system, and burn off oxide by applying 40-60 volts until the glass is thoroughly warmed (usually about one minute). When cold, re-test at 12 volts for consumption and cold patches. If necessary, the boost voltage may be repeated.

Complete failure is occasionally encountered due to fracture of the flexible connectors adjacent to the glass. This may be repaired by soldering provided care is taken not to apply heat direct on the glass.

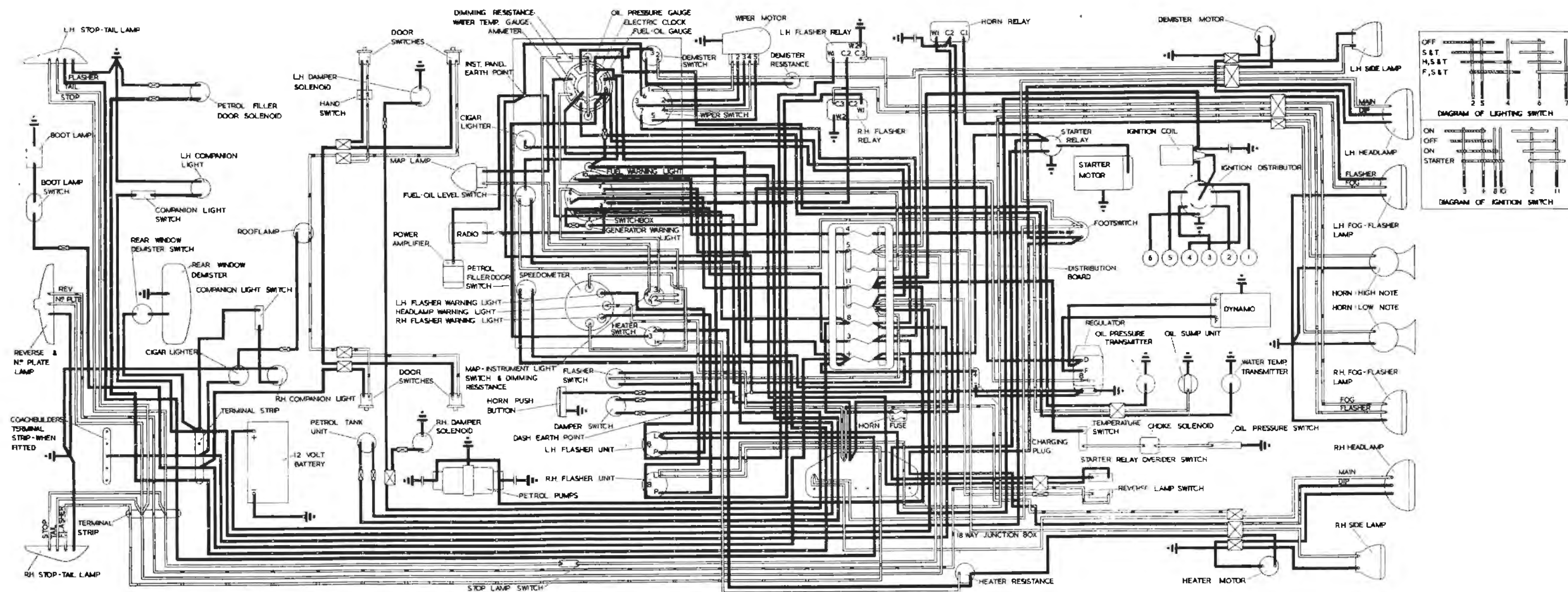
For removal and replacement instructions, see Section S.

WIRING DIAGRAM

SILVER CLOUD

and

BENTLEY S



WIRING DIAGRAM—SILVER CLOUD AND BENTLEY S

STEERING

N

SECTION N

STEERING

SUB-SECTION

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	To Fit a New Cam Roller Assembly—To Fit a New				
	Cam to Cam Tube—Setting Rocking Shaft Bearings				
	Pre-load—Setting the Cam and Roller Bearing Pre-load—				
	Adjusting Cam to Roller Mesh and Centralising Cam to				
	Roller.	N.2
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	Rebushing Idler and Operating Lever Arms.		N.3
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	The Power Cylinder—The Centre Steering Lever—				
	The Hoses—Priming and Filling System.		N.4

STEERING

Steering wheel diameter ...	18 in.
Steering box gear ratio—	
Standard ...	20.6:1
Bentley Continental ...	18.7:1
Power Assisted ...	18.7:1
Number of turns of steering wheel, lock to lock—	
Standard ...	4½
Bentley Continental ...	4
Power assisted ...	4

A cam and roller type steering gear is used. The cam, which is a modified worm type, engages in a double-toothed follower roller carried on ball bearings between the rocking shaft jaws. Upper and lower tapered roller bearings support the cam in the steering box.

The rocking shaft is supported in a similar manner in the steering box detachable rocker shaft housing, and provision is made for adjustments to all bearings. Tapered splines are cut on the lower end of the rocking shaft, to which the pendulum lever is attached by a

special nut. The cam, roller and bearings are submerged in oil.

It will be noted that the bracket attaching the steering box to the frame has been placed as far forward as possible towards the pendulum lever ball joint centre, to reduce the possibility of steering wander.

On the standard type, the steering box oil level should be checked every 5,000 miles, and replenished if necessary, using S.A.E.30 oil. Before removing filler plug, all grit should be brushed away from the vicinity of the filler orifice. The power-assisted steering box does not need replenishing, see Sub-Section N.4.

A transverse drag link connects the pendulum lever to the steering centre lever, the ends of the drag link being off-set in relation to the ball joints to create "sponge", thus reducing the possibility of joggle and road shock being transmitted to the steering wheel.

The centre steering lever forms part of a cross beam idler assembly, pivoted on the rear of the frame front cross member. The idler arms are pivoted at these

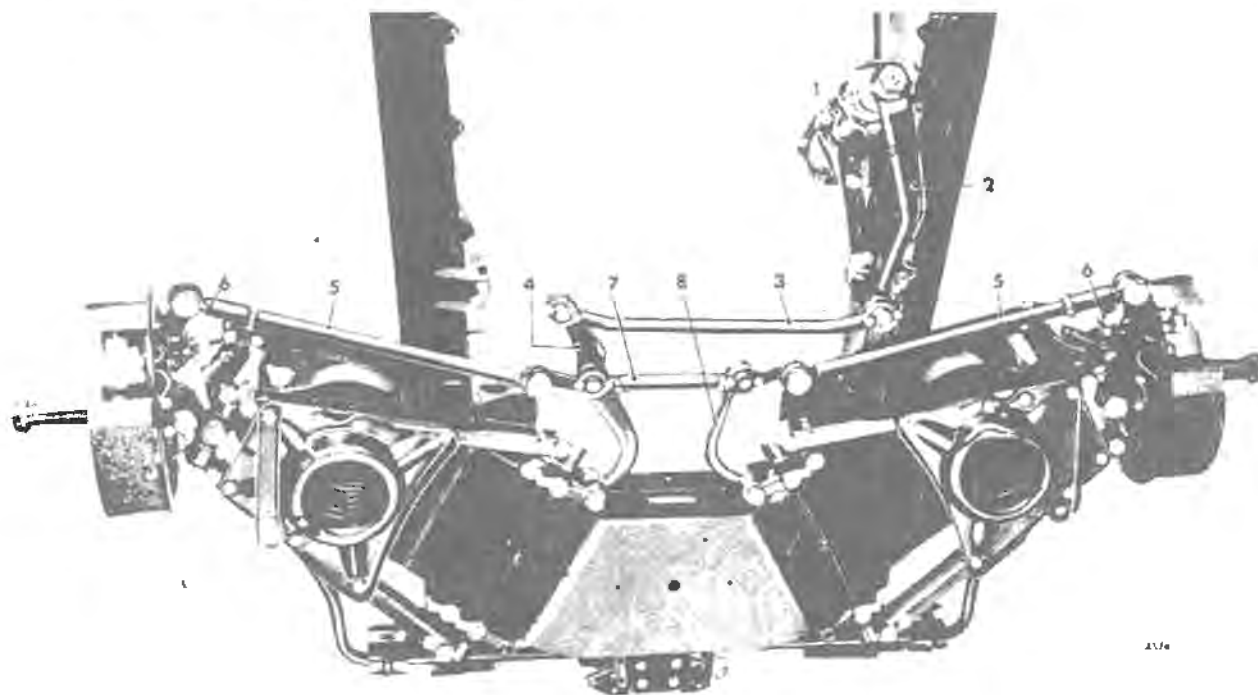


Fig. N.1.—Steering Linkage Details.

- | | | | |
|--------------------|---------------------------|------------------------|----------------|
| 1. Steering Box. | 3. Drag Link. | 5. Track Rod. | 7. Cross Beam. |
| 2. Pendulum Lever. | 4. Centre Steering Lever. | 6. Side Steering Lever | 8. Idler. |

points by pins 4.400" in length and .472" in diameter within a hardened sleeve, which is free to rotate in the bronze bushed idler arm eyes. End float is kept within a .000" to .003" limit on the idler levers, by means of a hardened and ground adjusting washer, ranging from .050" to .075" in steps of .003" thicknesses. Oil-resisting rubber seals are fitted top and bottom of the eye, the lubricant being conveyed to all moving parts from the Central Chassis Lubrication System by medium of brass pipes, attached by unions to the lever pins which are drilled and undercut sufficiently to allow a restricted oil flow.

Track rods fitted with ball joints connect the cross beam arms to the steering side levers, which are held to the stub axles by set screws.

Ball joints are used at all other pivot points, the lubricant being conveyed to these points through brass pipes, which are brazed to the lever eyes, the flow restriction to the ball joints being dependent upon the fit of the ball in its seat.

Spring-loaded oil-resisting rubber seals are used on all ball joints. The ball joints are non-adjustable and any abnormal wear of the ball in its socket is corrected by pressing in a new bronze seat in the socket and replacing the ball, spring and spring seat. The bronze seat requires a pressure of 175 lbs. to 400 lbs. to seat the bush against the shoulder in the ball joint socket. Whenever the ball joint sockets are overhauled, the spring loaded oil seals must be replaced and similarly the oil seals on the idler arm eyes.

STEERING COLUMN AND GEARBOX (Manual Type)

Special Tools Required:—

RH.321—Pendulum Lever Extractor.
RH.593—Steering Wheel Extractor.
RH.640—Rocker Shaft Spanners (2).
Spring Balance Graduated in Ounces.

REMOVING STEERING COLUMN AND GEARBOX

Place the master switch in the "OFF" position.

Remove pendulum lever from splined rocking shaft, using extractor RH. 321, having first marked the relative position of lever to shaft for correct re-assembly.

Disconnect and remove coiled oil pipe from rocking shaft. Remove split pinned bolt holding the silentbloc bushed rocking shaft body bracket to the frame bracket.

Disconnect horn and ride control solenoid wires at the junctions, along valance.

Remove both micro switches from the steering column without detaching the wires.

Remove gear control rod from the ball pin on the gear lever arm mounted on the steering column.

Remove the front carpet. Remove brake pedal from brake pedal shaft. Remove the flexible hoses from heater and de-mister ducting, and then remove the ducting assembly.



Fig. N.2.—Removing Pendulum Lever.

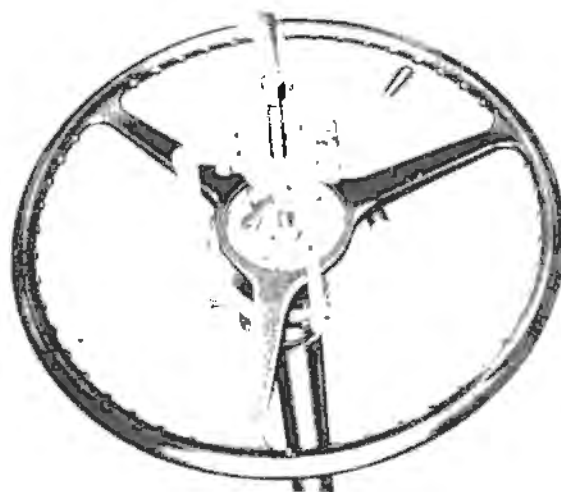


Fig. N.3—Removing Steering Wheel.

Remove the sound insulator panel from the dash panel. Remove gas seal and plate covering the large aperture in the dash. Support the steering column while removing the bracket holding steering column to rear of fascia board. The plate and gas seal is left assembled to the steering column.

The assembly may be withdrawn through the right-hand front door, care being taken not to damage the enamelled column or the upholstery. The rocking shaft nut should be screwed on the end of the shaft to prevent accidental damage to threads.

DISMANTLING THE STEERING GEAR

Clamp the steering gear rocking shaft body bracket in a vice but do not over-tighten, first having drained off the oil from the steering box.

Remove the three screws retaining horn push plate assembly to steering wheel and withdraw the assembly.

Unlock and remove steering wheel retaining nut and lock washer and draw steering wheel from shaft, using the special puller RH. 593 for this operation. Replace

loosely steering column nut to obviate any damage to tube when breaking seal on taper.

A scribed line or a centre punch dot should be used to mark the wheel hub to shaft position for convenient re-assembly. Mark position of rocking shaft end thrust cover and remove cover with tapered roller bearing and adjusting washer.

Mark position and remove shaft lower cover, containing oil seal, tapered roller bearing and adjusting washer. Push rocking shaft out by hand. A piece of scotch tape, wound round the splined threaded end of the rocking shaft, will prevent the oil seal leather being damaged when the shaft is removed.

Remove nuts holding steering column to steering box and pull off the column, no marking being necessary.

Mark and remove cam tube lower thrust cover with tapered roller bearing and adjusting washer. To ensure a reliable horn earth contact, a coil spring is fitted between the lower end of the cam and the lower cover of the steering box. A hollow "Bakelite" tube .625" in diameter is pressed into the lower cover and extends approximately 10.500" up the hollow cam tube to protect the horn wire insulation from the detrimental effects of oil.

Using an aluminium drift, tap the bottom of the cam, at the same time pulling upwards by hand.

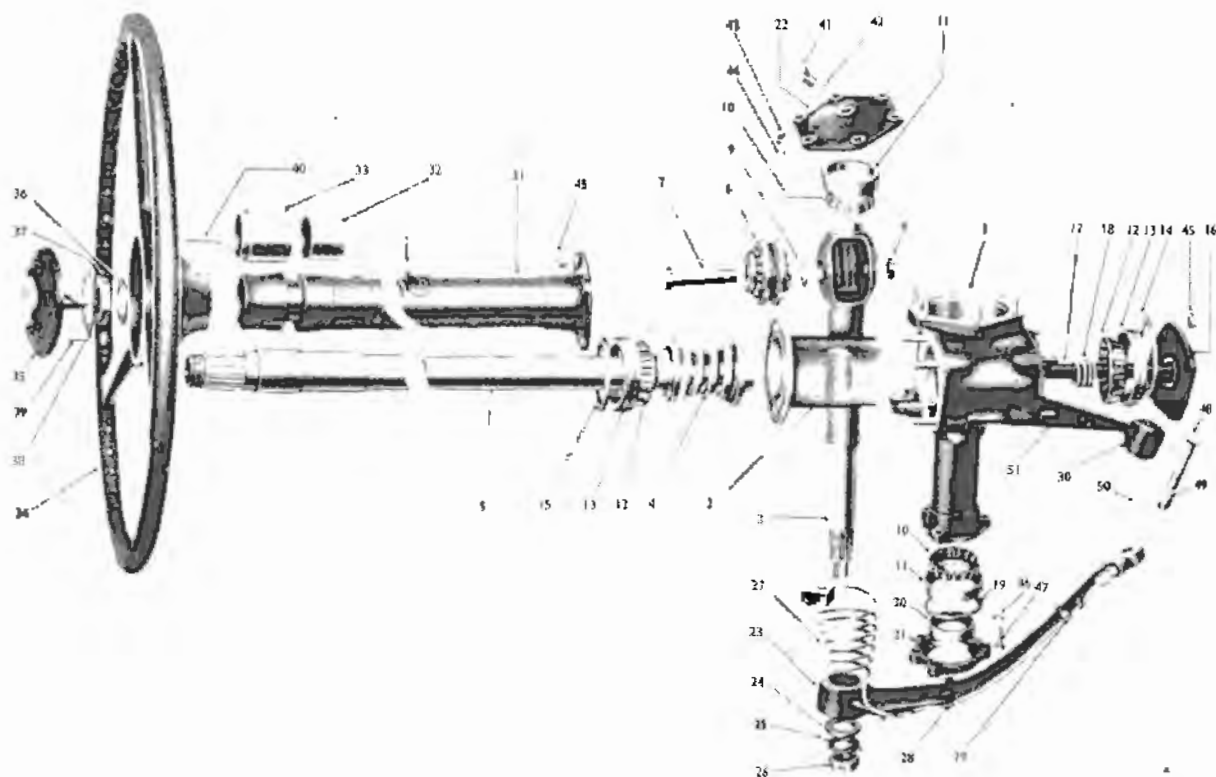


Fig. N.4.—Steering Column Details.

- | | | | |
|------------------------------|-------------------------------|--------------------------------|-----------------------------------|
| 1. Steering Box. | 14. Adjusting Washer (Lower). | 26. Nut, Pendulum Lever. | 39. Screw, S B.A. |
| 2. Eccentric Sleeve. | 15. Adjusting Washer (Upper). | 27. Oil Line Assembly. | 40. Screw, Retaining Horn Switch. |
| 3. Rocking Shaft. | 16. End Cover, Cam Tube. | 28. Clip. | 41. Filler Plug. |
| 4. Cam. | 17. Oil Level Tube. | 29. Clip. | 42. Washer, Aluminium. |
| 5. Cam Tube. | 18. Spring, Horn Earth. | 30. Bush, Silentbloc. | 43. Nut, Top Cover. |
| 6. Cam Roller-Assembly. | 19. Adjusting Washer. | 31. Tube, Outer. | 44. Washer, Plain. |
| 7. Bolt, Cam Roller. | 20. Oil Seal. | 32. Bush, "Oilite". | 45. Nut, End Plate. |
| 8. Nut, Cam Roller Bolt. | 21. End Cover, Rocking Shaft. | 33. Sleeve. | 46. Washer, Plain. |
| 9. Adjusting Washer. | 22. Top Cover, Rocking Shaft. | 34. Steering Wheel. | 47. Setscrew, End Cover. |
| 10. Bearings, Rocking Shaft. | 23. Pendulum Lever. | 35. Horn Switch Assembly. | 48. Bolt, Mounting. |
| 11. Outer Races. | 24. Washer, Plain. | 36. Washer, Plain. | 49. Nut, Castle. |
| 12. Bearings, Camshaft. | 25. Washer, Tab. | 37. Nut, Steering Wheel. | 50. Split-pin. |
| 13. Outer Races. | | 38. Lockplate, Steering Wheel. | 51. Mounting Bracket. |

An adjusting sleeve, tapered roller bearing and adjusting washer will come away with the cam tube, but if the adjusting sleeve remains in the box, a light tap will dislodge it. It will be noted that the cut-away section of the sleeve fits towards the cam roller and thus no position marks are necessary.

The rocking shaft assembly should only be dismantled if there is evidence of roughness in the ball bearings and races, or where it is desired to correct excessive float.

A special lug-headed bolt carries the cam roller in the rocking shaft, the bolt end being lightly peened around the nut. An adjusting washer is used to adjust the end float, these washers being supplied in a range of thicknesses. A retainer ring holds the inner races of the cam assembly together.

Thoroughly clean all parts for examination.

TO FIT A NEW CAM ROLLER ASSEMBLY

Before the new cam roller assembly is fitted into the rocking shaft it is necessary to determine the thickness of the adjusting washer.

Using a new bolt and nut, fit a suitable distance piece, or sufficient flat washers so that when the nut is tightened the outer race tightens the balls against the race of the roller, when the nut is fully tightened on the roller bolt.

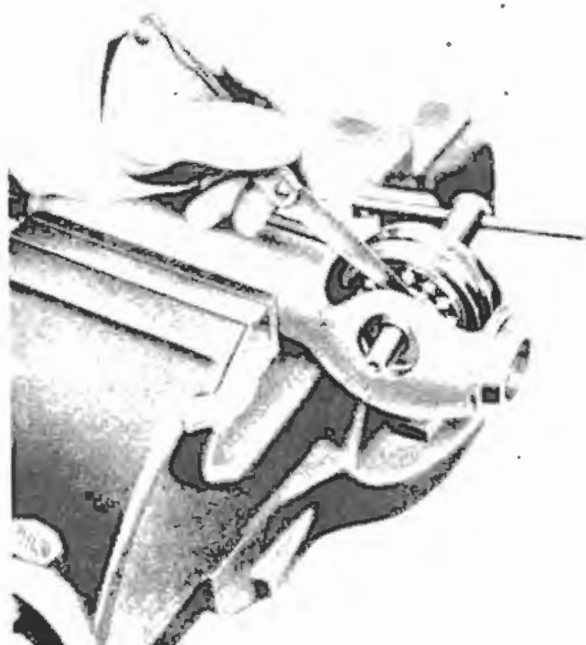


Fig. N.5.—Determining Washer Thickness.
(For Pre-load on Roller Bearing.)



Fig. N.6.—Inserting Pre-loading Washers.

When the races are in contact, the roller has a pre-load of from 9 ozs. to 13 ozs. at a 4" radius and will feel quite stiff to turn by hand.

This pre-load is determined in manufacture and is not adjustable.

A measurement can then be taken of the overall width across the outer faces of the inner races of the roller assembly. This measurement should be approximately 1.490" \pm .004".

The width across the inner machined faces of the rocking shaft jaws is 1.495" \pm .005".

The variation between the two measurements indicates the thickness of the washer required. After the measurement has been taken, remove the distance piece or washers and install the roller assembly and washer in position in the rocking shaft, placing the adjusting washer away from the head of the bolt.

If the correct thickness washer is being used, it will be noted that it requires a good hard push to position the cam assembly in the rocking shaft.

Tighten the nut on the roller bolt, but before locking by lightly peening the end of the bolt, be sure that a satisfactory "feel" is present.

If the roller spins freely, the adjusting washer is too thin and above-described procedure of determining the washer thickness must be repeated.

The washers, see Spares Schedule, are 1.000" diameter, and have a hole diameter of .515"; they are available

in eight thicknesses from .002" to .010", excepting .004" which is not supplied in the range.

While it is desirable to use only one washer to give the desired adjustment, any combination of the range may be used as required.

TO FIT A NEW CAM TO CAM TUBE

A suitable hydraulic press must be used for this operation, as it requires a load of from 6 to 8 tons.

Before removing the old cam, a measurement should be taken of the distance the cam is proud of the end of the cam tube. It should be approximately .3125" and it is important to be accurate with this measurement, because if the cam is pressed on too far, the steering wheel hub will bind on the Oilite bush in the top of the steering column.

When the old cam has been removed, all burrs should be dressed from the cam tube with a smooth file, special attention being given to the keyway in the cam tube.

To facilitate the installation of the cam, a lubricant such as tallow should be applied to the tube. Under no circumstances should the cam be shrunk on to the cam tube.

The bottom of the cam carries the part number, but to relieve any doubt about top and bottom ends of the cam, it will be noted that the splines on the top end begin at approximately 1.025" from the end of the cam race track, while at the lower end of the cam, the splines begin at a distance of .462" from the bottom cam race track.

Be sure that the key, or master spline of the cam is lined up with the keyway in the cam tube before any attempt is made to press the cam on.

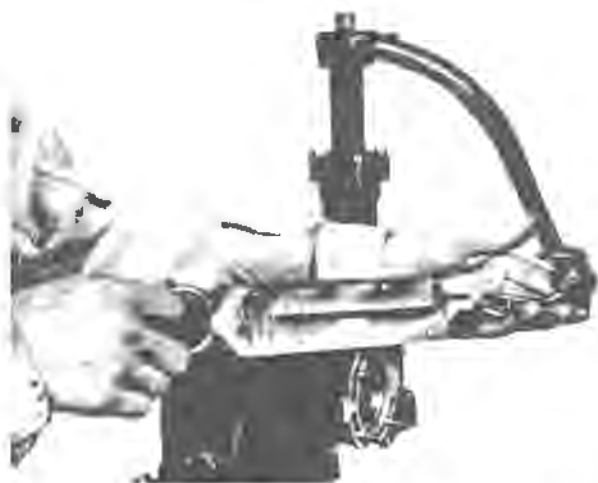


Fig. N.7.—Checking Rocking Shaft Bearing Pre-load.

Care must be taken to ensure that the cam does not "cant" during the initial stage of pressing-on and so ruin the cam tube. As a precaution against accidental damage to the cam tube thread, the steering wheel retaining nut should be screwed on the cam tube.

RE-ASSEMBLING STEERING BOX

Pre-loads.

Two sets of figures are quoted below, for manual steering, one for use when using new parts, and the others for use when rebuilding a steering box after overhaul and refitting the original parts. It should be noted that after a period of running-in the pre-load settings of production steering boxes will drop, and should a steering box be reset after this running-in period and without any new parts having been used, the settings quoted for use with new parts would prove too tight.

Rocking Shaft Bearings—

Manual Steering ...	6-12 ozs.—Using new parts.— 3-12 ozs.—Refitting original parts.
Power Assisted ...	6-10 ozs. Effort applied to pendulum lever in vertical position.

Steering Cam Bearings—

Manual Steering ...	14-22 ozs.—Using new parts. 6-14 ozs.—Refitting original parts.
Power Assisted ...	No pre-load. Effort applied at rim of steering wheel.

Mesh Adjustment—

Manual Steering ...	14 ozs. increase at tight spot, using new parts. 8 ozs. increase at tight spot, refitting original parts.
Power Assisted ...	Total friction in box at central position on wheel 16-20 ozs. Effort applied at rim of steering wheel.

Setting Rocking Shaft Bearings Pre-load.

The setting of the rocking shaft bearings pre-load should be carried out before the oil seal is replaced in the rocking shaft housing. A more accurate setting can be reached without the possibility of interference from the snug fit of the oil seal on the rocking shaft.

Bolt the lower cover on the rocker shaft housing with the adjusting washer in place and tighten the three setscrews. Place lower tapered roller bearing and rocking shaft in position. Place tapered roller bearings on upper face of rocking shaft and adjusting washer in spigot in upper end of rocking shaft housing. Position top end cover as per markings and tighten down the six setscrews evenly.

Fit pendulum lever to rocking shaft in marked position, tightening nut just sufficiently to hold lever firmly in place. The rocking shaft must be in a vertical position during the pre-load setting.

Attach a suitably calibrated spring balance to pendulum lever eye, and note the pull in ounces required to move rocking shaft through an arc of about 92° , which is approximately the rotation of the shaft required to move the steering geometry from lock to lock.

A pre-load of from 6 to 12 ozs. or 3 to 12 ozs. (see table) is permissible and any reading lower than the minimum calls for a thicker washer, while a reading in excess of the maximum similarly demands a thinner washer. These washers, see Spares Schedule, are available in a range of thicknesses and when an alteration to pre-load is required, it can be calculated by reckoning a difference of .001" in the thickness of the washer will alter the pre-load by approximately 8 ozs. On completion of pre-loading, remove pendulum lever and top end cover, together with adjusting washer and bearing. Remove rocking shaft, leaving lower cover adjusting washer and bearing in position.

Setting the Cam Roller Bearing Pre-load.

Fit the cam lower end cover with bearings and adjusting washer to the steering box, as per markings. The horn contact earthing spring should be left out until pre-loading has been carried out.

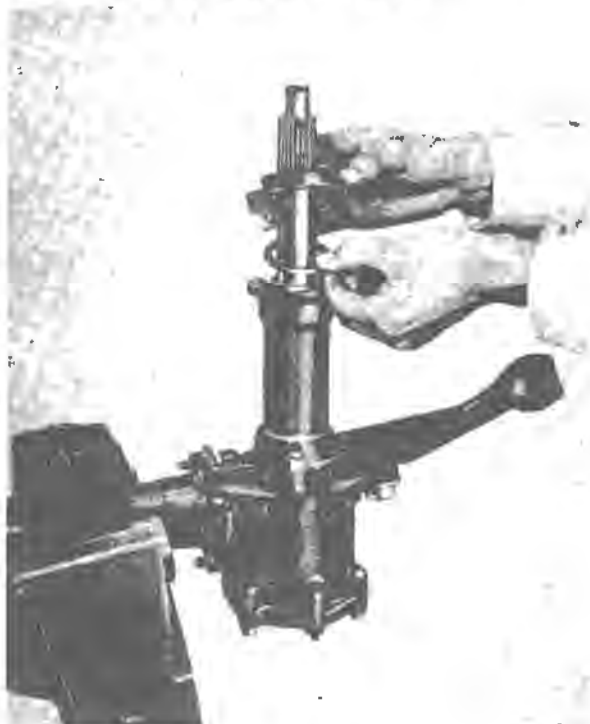


Fig. N.8.—Rocking Shaft Adjusting Washer.



Fig. N.9.—Lower Adjusting Washer.
(For Pre-load on Cam Bearing.)

Assemble eccentric sleeve, bearing and adjusting washer on cam tube and place in position. The adjusting lug on the eccentric bush will be at right angles, facing towards the rocking shaft. Place the steering column in position, and tighten down evenly on the four nuts.

Attach suitably calibrated spring balance to the rim of the steering wheel and note "pull" required to turn wheel. The pre-load should read between 14 and 22 ozs. or 6 and 14 ozs. (see table). A reading less than the minimum calls for a thicker adjusting washer and similarly a reading in excess of the maximum indicates that a thinner washer is required. The washers, see Spares Schedule, are supplied in a range of thicknesses, and as a guide to selection, a variation of .001" will alter the pre-load by approximately 8 ozs.

When the pre-load has been set the lower cover may be removed, the horn contact earthing spring installed and the cover tightened down evenly, first having applied "Wellseal" to the joint faces.

An Oilite bush is pressed in the top of the steering column sleeve which is slightly tapered at the bottom. When renewing the Oilite bush, care must be taken to leave the bush .125" proud of the top of the sleeve. Any tight spots on the bush should be relieved by burnishing. No lubrication is required for this bush.

Adjusting Cam to Roller Mesh and Centralising Cam to Roller.

This adjustment is obtained by rotating the eccentric sleeve, which is provided with elongated holes, about the four steering column studs. A lug is provided on the sleeve for this purpose. Turning the sleeve in an anti-clockwise direction, when viewed from the steering wheel end, shifts the cam closer to the roller and so reduces the mesh and vice versa.

Before the mesh adjustment can be undertaken, the cam and roller must be centralised, that is the keyway in the cam should be 180° from the top and the roller meshed at right angles to the cam. In this position, it will be possible to turn the steering wheel 2½ or 2 turns depending on steering type, towards either lock.

Correct cam to roller centralisation is most important, in order that the "high spot" in the steering may be maintained with the steering in the straight ahead position, thereby preventing steering wheel "joggle". When on either lock, a small amount of backlash will be felt which is normal, due to the cam formation. Replace rocking shaft housing oil seal and coiled oil line.

Replace rocking shaft end cover using a little

"Wellseal". Fit and lock pendulum lever in marked position. Slacken the four steering column stud nuts and turn the eccentric sleeve to the position where the backlash has *just* been eliminated. A vigorous movement back and forth on the pendulum lever will indicate when this point has been reached.

An increase of 14 ozs. or 8 ozs. load (see table) will be noticed when the mesh spot is correctly adjusted.

Tighten all nuts and fill steering gear with the recommended lubricant, checking carefully for oil leaks.

Tighten and lock steering wheel retaining nut.

Assemble horn button assembly to steering wheel. Install steering gear assembly, reversing the steps taken to remove the assembly.

STEERING LEVERS

Special Tool Required:—
RH.320—Ball Pin Extractor.

REPLACING THE BALL PINS AND SEATS IN THE DRAG LINK ASSEMBLY

The ball pins and their bronze seats are of uniform size, which makes them interchangeable. It should be noted however, that the outer ball socket pins in the track rods may be either .100" or .200" longer than the others; in such case, it is essential that these are correctly replaced.

To facilitate the removal of the drag link assembly, the car may be placed over a pit, or the front of the car raised, whichever is more convenient.

Remove castellated nuts from ball pin ends and use special tool, RH. 320, to extract ball pin from the eye of the lever. Remove the ball pin from the opposite lever eye in a similar manner. It will be noted that the drag link ends are off-set at an angle of 18° towards the steering box and care must be taken to replace the assembly in this position, in order to retain the desired steering "sponge".

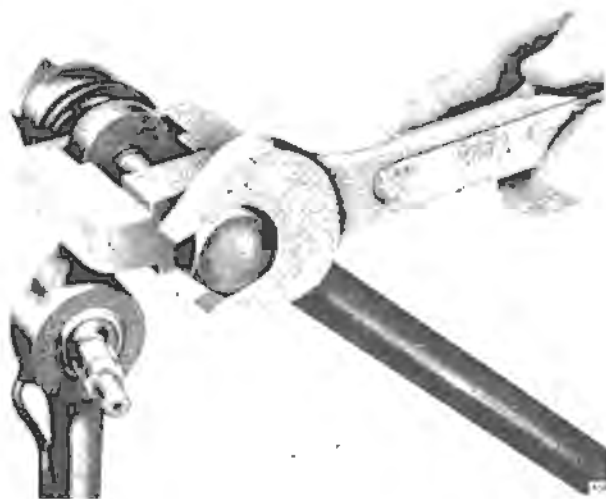


Fig. N.10.—Removing Ball Pin.

Mark the relative position of ball joint end cover to socket, and remove the two 2 BA setscrews and lock washers retaining the end cover. A spring, spring seat and steel ball, can then be removed with the ball pin. The spring loaded oil-resisting rubber seals and

washer found between the socket and lever eyes should always be renewed when the joints have been disturbed. The washers used on the outer track rod ball joints are supplied in two thicknesses of .100" and .200", to correspond to the length of ball pin used as mentioned in the first paragraph of this Sub-Section.

A press must be used to remove and replace the ball pin bronze seat in the socket, which is pressed squarely into position against the shoulder in the socket, under a pressure from 175 lbs. to 400 lbs. It is important not to damage the chamfered top end of the bronze seat during the operation, otherwise the oil sealing feature of the seat will be destroyed.

When the seat has been squarely pressed home against the socket shoulder, the ball pin should be lightly lubricated and placed in position, then the steel ball followed by the spring seat and spring. Apply a coating of "Wellseal" to the joint faces before replacing the end cover in the marked position and tightening down evenly on the 2 BA setscrews.

When the ball pins have been correctly assembled, no endwise movement should be present. It will be noted however, that lateral movement will feel quite stiff which is normal, because the necessary restriction to the lubrication supply to the ball joint depends upon the fit of the ball pin in its seat.

Replace the drag link in the correct manner, that is with the 18° off-set ends sweeping towards the rear, using new oil seals and sealing washers, then tightening and locking the ball pin castellated nuts.

Although the above-described operation specifies the drag link, the remainder of the ball joint assemblies may be serviced in a similar manner.

Particular attention should be given to the placing of the adjustable ends of the track rods. The adjustable ends must *always* be placed outwards, towards the pivot pins, to eliminate possible fouling between the pendulum end of the drag link and the adjustable end of the track rod. This fouling can occur when the steering gear is on the extreme right lock on R.H. control cars and the opposite lock on L.H. control cars.

If it should be necessary to reverse the track rod ends to correct an assembly error, it will of course be necessary to change the ball pins in their sockets, due to the outer ball pin having an extension threaded neck for connecting to the lubrication pipe from the stub axle lower flange.

As a precaution against damage to the joint face of the ball joint socket, a smooth block of hardwood should be used as a base during pressing operations.

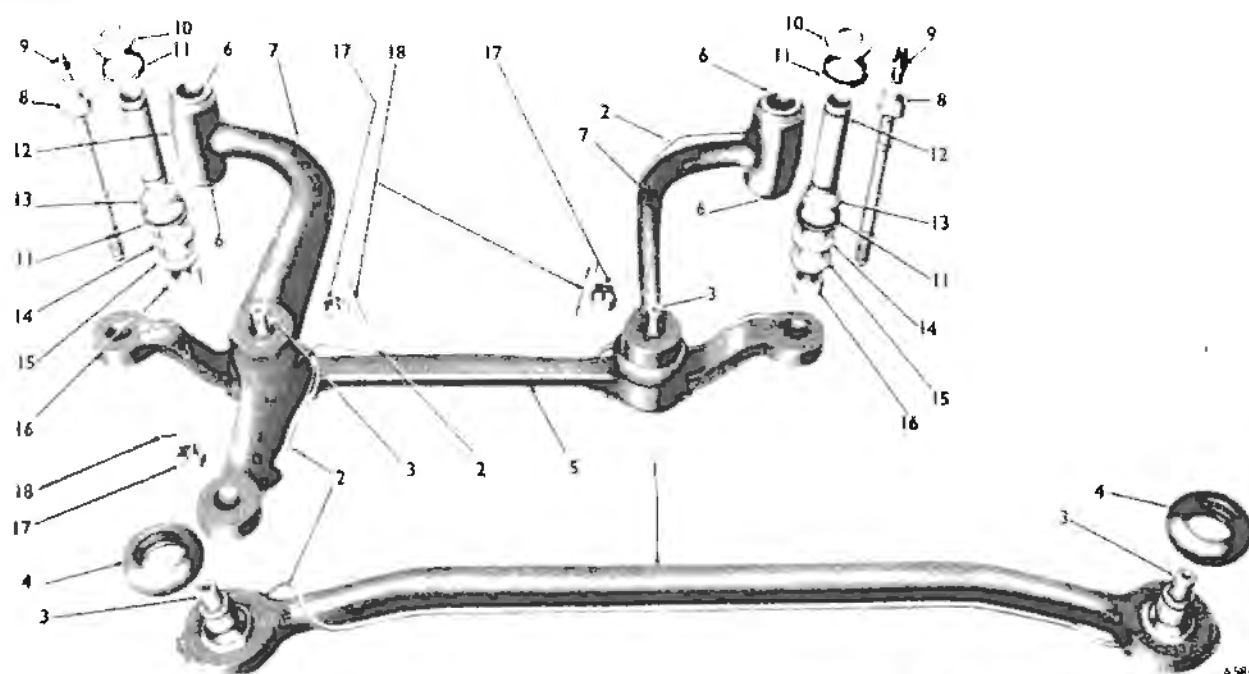


Fig. N.11.—Centre Steering Levers and Drag Link Details.

- | | | | |
|---------------------------|-------------------------|-----------------------|-------------------------|
| 1. Drag Link. | 6. Bush. | 11. Ring, Sealing. | 15. Washer, Plain. |
| 2. Oil Line. | 7. Idler Arm. | 12. Distance Sleeve. | 16. Nut, Idler Arm Pin. |
| 3. Ball Pin. | 8. Pin, Idler Arm. | 13. Adjusting Washer. | 17. Nut, Ball Pin. |
| 4. Oil Seal. | 9. Connection, "Bijur". | 14. Bevel Washer. | 18. Split-pin. |
| 5. Idler Lever Crossbeam. | 10. Washer, Plain. | | |

Both the adjustable ends of the track rods are right hand threaded for the adjustment of toe-in and verification of this adjustment must always be undertaken whenever any replacements have been made to the track rods.

REBUSHING THE IDLER AND OPERATING LEVER ARMS

The method of removal and servicing these arms is identical, except that in the case of the operating lever, it is necessary to remove two ball ends, as previously described, and this should be the first step taken in the removal operation.

Remove oil line to elbow screwed into the lever pivot pin. Remove nut and lockwasher retaining pin to lower fulcrum bracket eye and tap out jaw.

Fitted between the fulcrum bracket eye and the thrust face of the lower bronze bush is a hardened washer, the chamfered edge of which presses an oil resisting rubber seal against the chamfered edge of the lever eye to form an oil and dust seal.

A floating distance piece will fall out when this washer is removed. A hole is drilled through this piece for lubrication purposes.

Between the frame bracket and the top bush is a plain washer which presses a similar oil seal against the chamfer on the top end of the lever eye. Between this plain washer and the thrust face of the bush is a hardened adjusting washer of smaller diameter than the plain washer, but bored large enough to pass over the floating distance piece.

It will be noted that the pin is under-cut for a depth of approximately .022" for a distance of approximately 1.275" to allow circulation of the lubricant which enters the pin through a hole .125" in diameter from the pipe connected to the Central Chassis Lubrication System.

The bronze bushes should be removed by placing the lever eye over a hollow mandrel, through which the bush can be driven by means of a suitable drift.

The bushes, which have an outside diameter of .752" are pressed squarely into the lever eyes, which are bored to .750". After pressing, the bushes must be reamed to .625" \pm .0005" diameter to give the correct tolerance to the distance piece, the outside diameter of which is .6245" \pm .0005" and the bore of which is .474" \pm .003". The bearing surfaces of the pin are .472" \pm .0005".

On completion of fitting and reaming these bushes,

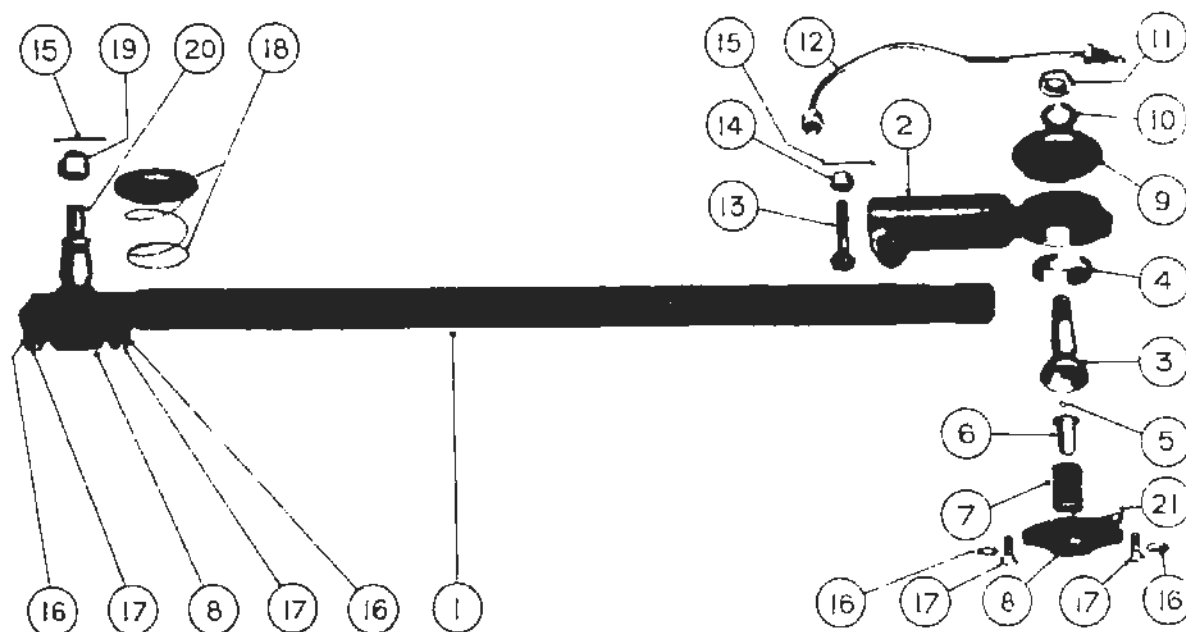


Fig. N.12.—Track Rod and Ball Joint Details.

- | | | | |
|---------------------|-----------------------|------------------------|--------------------------|
| 1. Track Rod. | 7. Spring. | 12. Oil Pipe Assembly. | 17. Setscrew, End Cover. |
| 2. End, Adjustable. | 8. End Cover. | 13. Pinch-bolt. | 18. Oil Seal—Exploded. |
| 3. Ball Pin, Outer. | 9. Oil Seal Assembly. | 14. Nut, Pinch-bolt. | 19. Nut, Castle. |
| 4. Seat, Ball Pin. | 10. Washer, Spring. | 15. Split-Pin. | 20. Ball Pin, Inner. |
| 5. Steel Ball. | 11. Nut, Ball Pin. | 16. Washer, Plain. | 21. Gasket. |
| 6. Seating, Spring. | | | |

care must be taken to remove all sharp edges to prevent damage being caused to the oil seals.

The lever should be temporarily positioned, minus the oil seals, and a measurement taken of the end float by inserting a feeler gauge between the plain washers and the hardened adjusting washer. This measurement must be within the limits of .000" to .003". A range of washers from .050" to .075" in .003" steps, see Spares Schedule, is the means provided to obtain the desired limits.

The oil seals are left off during the trial stages to

ensure a more accurate measurement of this adjustment.

When assembling the levers in position, new seals must be used and a little oil applied to the moving parts.

The spring-loaded oil seals on the ball joint sockets should also be renewed.

The brass elbows which were removed from the old pins may be used in the new pins.

Assembly is merely a careful reversal of the removal procedure and unless a reason exists to suspect the accuracy of the toe-in setting, normally this measurement does not require verification.

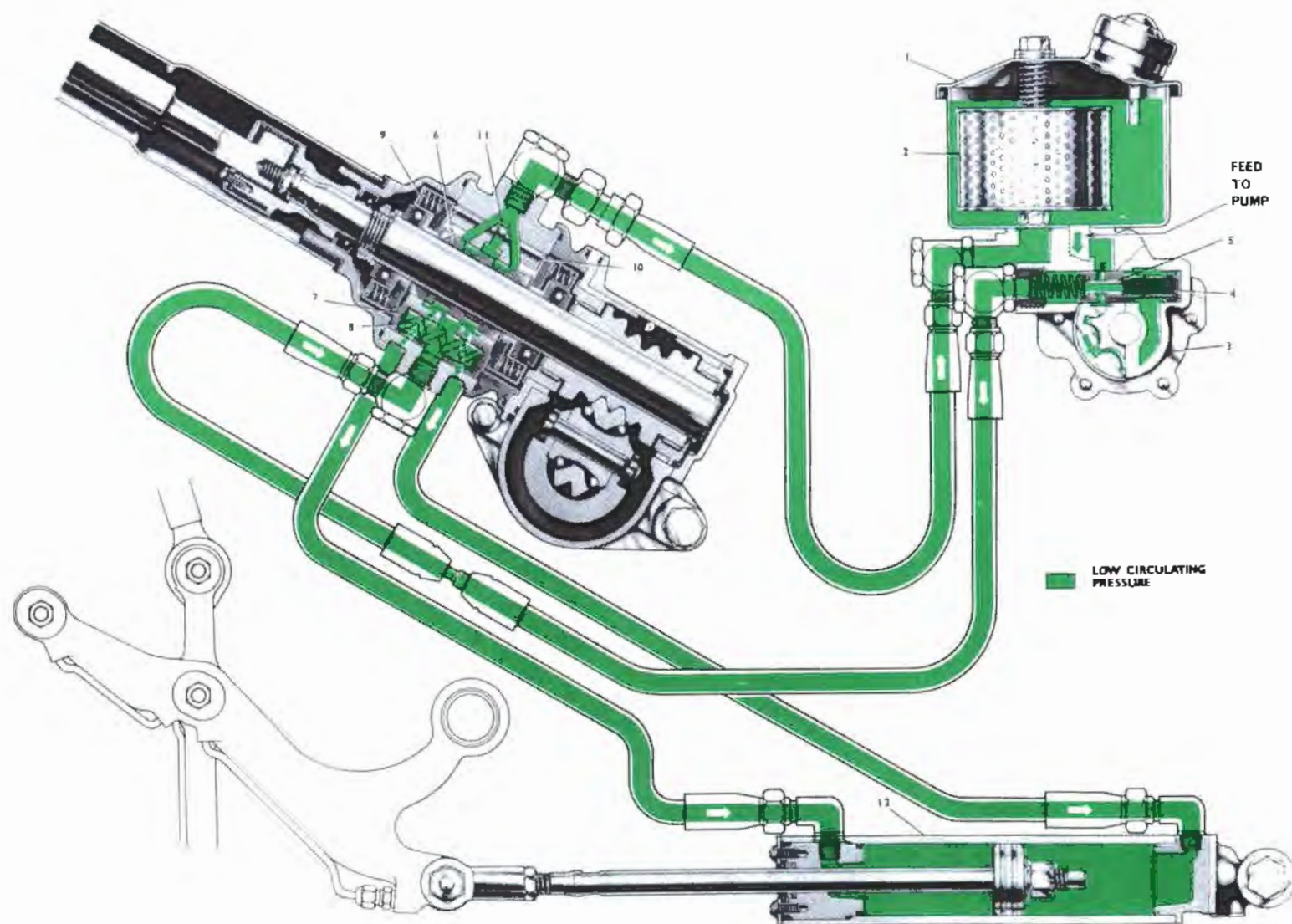


Fig. N.13. Steering straight ahead condition — no load

1. RESERVOIR
2. FILTER ELEMENT
3. HYDRAULIC PUMP

4. FLOW CONTROL VALVE
5. PRESSURE RELIEF VALVE
6. SPOOL VALVE

7. REACTION PLUNGER
8. PRIMARY SPRING
9. SECONDARY SPRING

10. SPACING PIN
11. NON-RETURN VALVE
12. POWER CYLINDER

C100

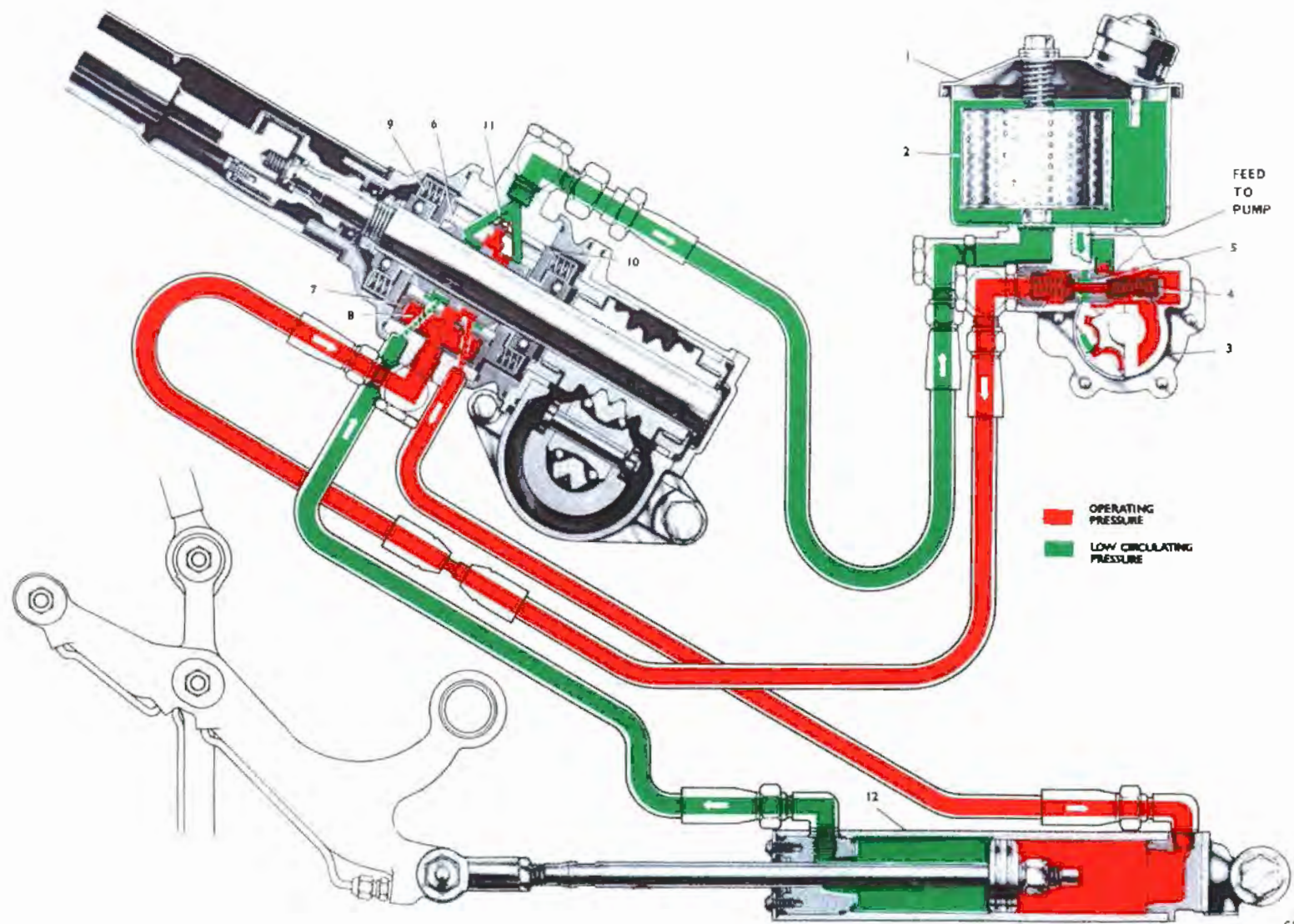


Fig. N.14. Normal turning condition — right-hand lock — light load

- 1. RESERVOIR
- 2. FILTER ELEMENT
- 3. HYDRAULIC PUMP

- 4. FLOW CONTROL VALVE
- 5. PRESSURE RELIEF VALVE
- 6. SPOOL VALVE

- 7. REACTION PLUNGER
- 8. PRIMARY SPRING
- 9. SECONDARY SPRING

- 10. SPACING PIN
- 11. NON-RETURN VALVE
- 12. POWER CYLINDER

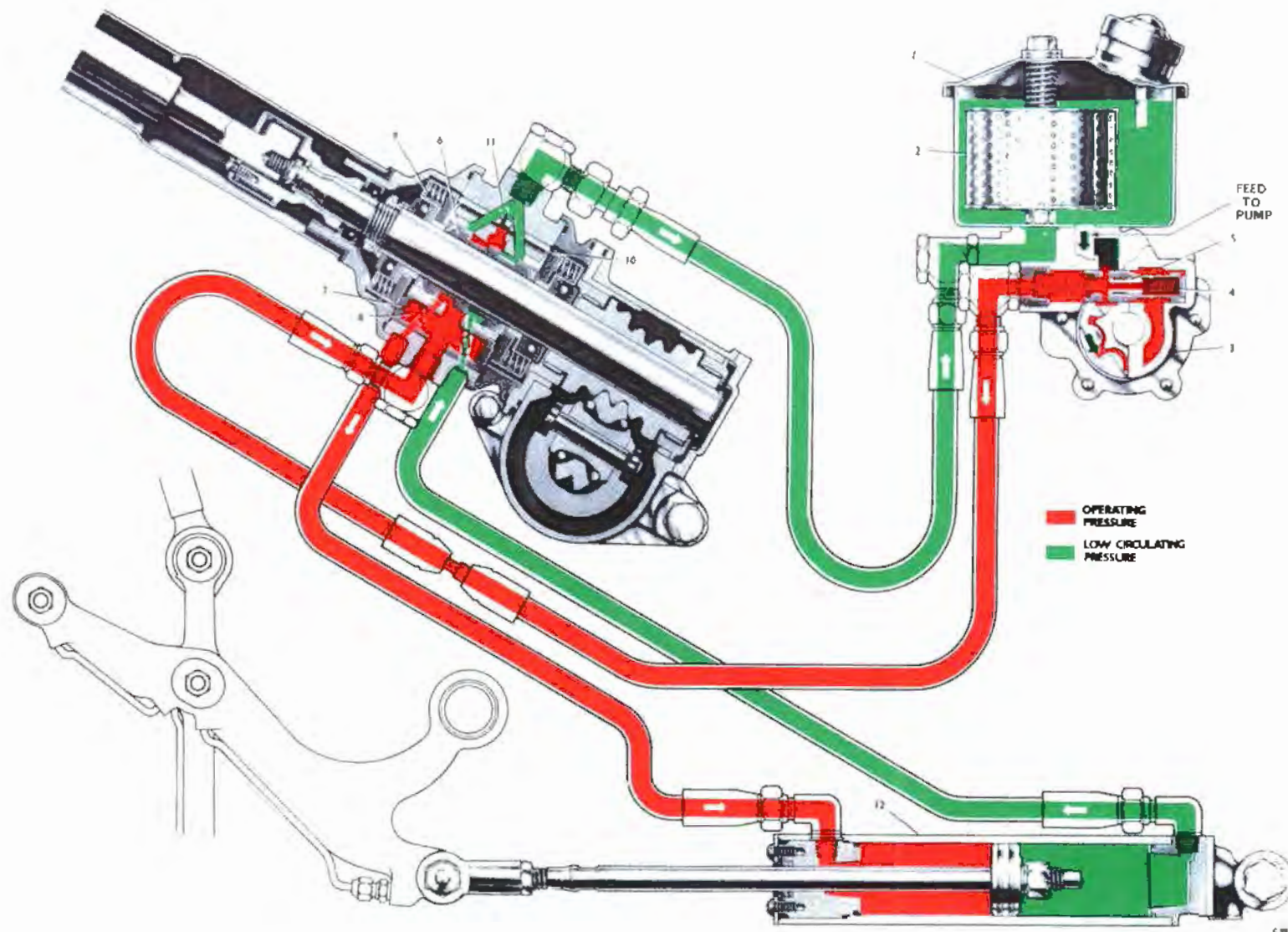


Fig. N.15. Parking condition — left-hand lock — heavy load

- 1 RESERVOIR
- 2 FILTER ELEMENT
- 3 HYDRAULIC PUMP

- 4 FLOW CONTROL VALVE
- 5 PRESSURE RELIEF VALVE
- 6 SPOOL VALVE

- 7 REACTION PLUNGER
- 8 PRIMARY SPRING
- 9 SECONDARY SPRING

- 10 SPACING PIN
- 11 NON-RETURN VALVE
- 12 POWER CYLINDER

POWER-ASSISTED STEERING

The Rolls-Royce system of power assistance for the steering is designed to provide a variable degree of assistance depending on the effort required to move the steering wheel. Naturally, the maximum assistance is required by the driver when shunting or parking the car, and in the Rolls-Royce system this is automatically achieved in such a way that, whilst the maximum assistance is available under these conditions, the power assistance is reduced to only 48 per cent under normal straight ahead driving.

The system has also been designed to maintain a degree of 'feel' in the steering wheel, so that the driver is not isolated from contact with the road wheels, although automatically he is protected from any violent reaction or joggle on bad roads.

It is emphasized that the steering is not operated through the medium of the power assistance; the assistance is superimposed on the normal steering mechanism, so that in the unlikely event of the power assistance failing, the car can be steered in the normal way, the only effect being a reduction in lightness of the steering.

The power assistance is derived from hydraulic pressure supplied by an engine-driven internal gear type pump, which operates a hydraulic ram connected to the centre steering lever to which also is connected the normal steering drag link.

The direction of oil under pressure to either side of the ram, and the pressure at which it is delivered, is controlled in two ways:—

1. By movement axially of a spool valve in the steering box, which causes annular grooves in the valve to communicate with other passages to direct oil to the appropriate side of the hydraulic ram. The movement of the spool valve in the desired direction is derived from the reaction of the normal steering cam against the roller when the steering wheel is turned. The spool valve is normally held in the central or neutral position by two sets of four reaction plungers, which are exposed to oil pressure from the inside, and are also pushed outwards by four springs called 'primary' springs (8). The valve is therefore constrained from axial movement by the pressure of the primary springs and by additional oil pressure when this is generated as described later. A load of 1 lb. applied at the steering wheel is sufficient to displace the valve against the pressure of the primary springs.

2. The hydraulic pump is provided with a special design of flow control valve which maintains a constant output flow of $1\frac{1}{2}$ to $1\frac{3}{4}$ gallons per minute irrespective

of the pressure, which may vary from 15 p.s.i. at idling speed to the controlled maximum of 500 p.s.i. in the case of the Silver Cloud and Bentley 'S' Type, or 600 p.s.i. in the case of the Silver Wraith. The pressure at which oil is delivered is dependent on the resistance at the ram, and as oil at the same pressure is delivered to the reaction plungers to resist endwise movement of the spool valve, it follows that the hydraulic assistance is proportional to the applied pressure at the steering wheel. This results in a constant assistance of 48 per cent up to an applied load of 5-6 lbs. at the steering wheel. When this load is reached, which occurs when parking or shunting, it necessarily follows that there must be a heavy resistance at the road wheels and consequently at the ram; the pump, therefore, proceeds to build up hydraulic pressure, and at a predetermined point, the pressure, which is also applied to the reaction plungers, causes these to collapse secondary springs (9), which prevent the load on the steering wheel increasing any further and the maximum controlled pressure of the pump is then applied, if required, to turn the front wheels.

Fig. N.13.—Shows the oil circulating system with the steering in the straight ahead or neutral position. The pressure in the system is only that due to fluid friction and restrictions in the various passages.

Fig. N.14.—Shows the condition when commencing a normal right turn on the open road. The pressure is automatically regulated to provide 48 per cent power assistance.

Fig. N.15.—Shows the condition when parking on left-hand lock. The pressure relief valve allows maximum pressure to be developed, and this pressure has collapsed the secondary springs to alter the ratio of power assistance to the maximum.

The Flow Control Valve and Pressure Relief Valve.

The flow control valve is situated in the outlet bore of the hydraulic pump body, and its function is to control the volume of oil leaving the pump. The oil leaving the pump passes through two metering holes in the valve body, which will allow oil to pass at the rate of $1\frac{1}{2}$ gallons per minute. As the output of the pump increases, the volume of oil will be too great to pass through these holes. This causes oil from the pump to build up pressure on the end of the control valve and pushes it forward against its spring at the same time uncovering an annular passage in the valve housing through which oil in excess of $1\frac{1}{2}$ gallons per minute is directed back to the suction side of the pump.

A pressure relief valve is situated inside the flow control valve. When the pressure in the system exceeds 500 or 600 p.s.i., oil from the pump builds up pressure against the end of the relief valve and pushes it back compressing its spring, at the same time uncovering a bore through which oil in excess of this pressure is directed back to the suction side of the pump.

SERVICING

Oil ... Automatic Transmission Fluid.
(See Section D.)
Capacity ... 4 pints.

Only scrupulously clean fluid should be used, and care must be taken to see that any containers, etc., that may be used are also as clean.

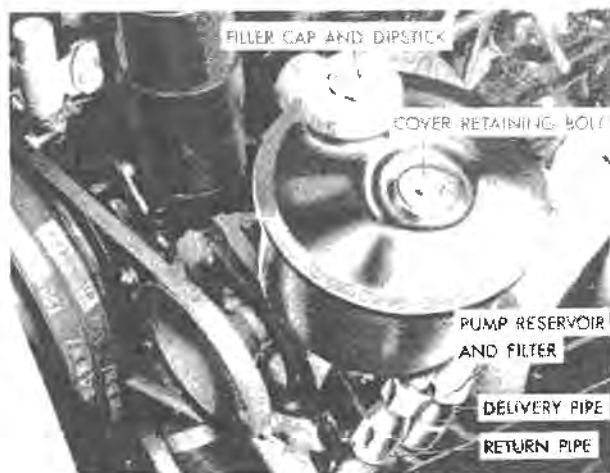


Fig. N.16.—Oil Pump Reservoir and Filler Cap.

For technical reasons it is necessary for the filter to be placed in the return flow to the reservoir and any foreign matter which is passed in can find its way through the whole system before it is filtered.

There is no provision made on the steering box for topping up the lubricant to the cam and roller assembly. The whole system is both lubricated and hydraulically operated under pressure from the pump and topping up of the pump reservoir with the correct automatic transmission fluid is all that is necessary.

Check level of oil in hydraulic pump reservoir; top up if necessary with Automatic Transmission Fluid AQ/ATF at weekly intervals when checking engine oil.



Fig. N.17.—Checking Fan-belt Tension.

EVERY 5,000 MILES

1. Check tension of fan driving belts. Belt tension to be checked by noting the deflection due to a 14 lb. load applied to each belt at the mid-point of the driveside run. This deflection to be $\frac{1}{2}$ ".
2. Check tension of pump driving belt. Belt tension to be checked by noting the deflection due to a 6 lb. load applied to the belt at the mid-point of the driveside run. This deflection to be $\frac{3}{4}$ ".

EVERY 20,000 MILES

1. Renew filter element in pump reservoir.

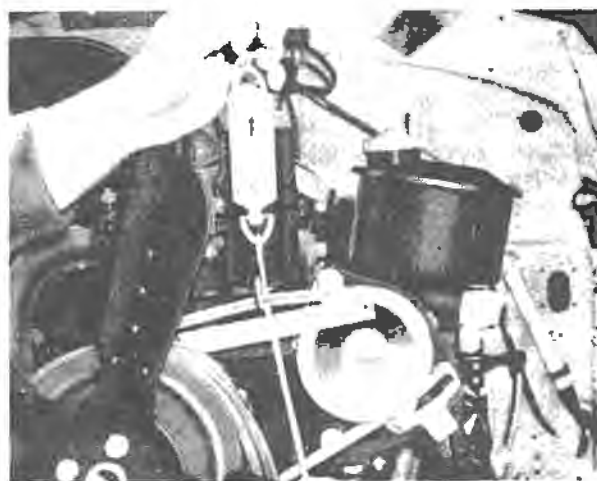


Fig. N.18.—Checking Pump-belt Tension.

FAULT DIAGNOSIS

HIGH STEERING EFFORT

1. Check oil level in reservoir; top-up if necessary.
2. Check driving belt tension; adjust if necessary.
3. Check pump delivery pressure. Insert pressure gauge in discharge line as close to pump as possible. Pump delivery pressure should be 500/550 p.s.i. for the Silver Cloud and Bentley 'S' Type and 600/650 p.s.i. for the Silver Wraith, with the engine idling and the wheels against stops. If the pump is not delivering correct pressure dismantle and check as below.

NOISE

1. Some noise may be expected when the front wheels are on full lock against the stops, or when they are caught against a kerb if further effort is applied to the steering wheel. This noise is caused by the oil discharge occurring through the relief valve.
2. Should the installation be noisy when the engine is at idling speed whilst the steering wheel is being turned, check for and isolate hoses rubbing or touching against the chassis.
3. **Entrapped air in the system.** If juddering of the steering at slow speeds is experienced, it is probably caused by the presence of air in the system which can only be removed by running the car for between 30 and 40 miles, whilst ensuring that the reservoir is kept topped up to the correct level.
4. If the oil level is low some noise may be caused on starting up during cold weather, by funnelling of the oil, thus allowing air to be drawn into the inlet; this noise will cease when the oil warms up, but the reservoir should be topped up to the correct level. The symptoms discussed in Paragraph 3 may pertain in this case.

OIL LEAKS

1. Shaft seal leakage; replace oil seal. It may be found necessary to coat the housing of the shaft oil seal with a suitable jointing compound before pressing in the oil seal. The jointing compound must not be soluble in the Automatic Transmission Fluid

OVERHAUL

Special Tools Required:—

- RH.641—Spanner.
RH.642—Locking Bar.
RH.643—Pin Retaining Plates (2).

THE OIL PUMP

To Remove Pump from Engine.

Remove filler cap and with syringe remove as much

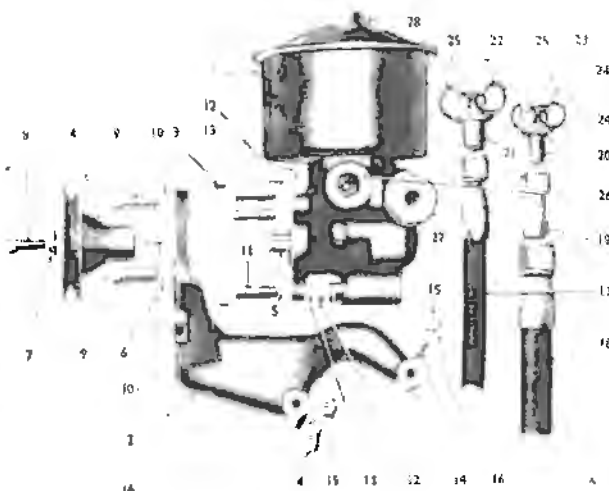


Fig. N.19.—Oil Pump Mounting Details.

- | | |
|-------------------------------|---------------------------------------|
| 1. Pump Assembly. | 15. Nut. |
| 2. Mounting Bracket. | 16. Washer, Spring. |
| 3. Adaptor, Pump to Bracket. | 17. Hose, Return to Reservoir. |
| 4. Pulley, Pump. | 18. Hose, Pressure from Pump. |
| 5. Spindle, Pump. | 19. Adaptor. |
| 6. Key. | 20. Banjo, Pressure Hose. |
| 7. Washer, Plain. | 21. Banjo, Return Hose. |
| 8. Setscrew, Pulley. | 22. Bolt, Banjo. |
| 9. Setscrew, Pump to Bracket. | 23. Bolt, Banjo. |
| 10. Washer, Spring. | 24. "O" Ring. |
| 11. Stud, Adaptor to Pump. | 25. "O" Ring. |
| 12. Nut. | 26. Pump, Return. |
| 13. Washer, Spring. | 27. Pump, Pressure. |
| 14. Stud, Bracket to Block. | 28. Filler Cap and Dipstick Assembly. |

oil as possible from reservoir. Disconnect the hoses at the unions; mask ends to prevent drainage of oil.

Slacken belt tension and remove belt.

Remove unit from engine bracket.

Dismantling.

Clamp mounting bracket of assembly in vice.

1. Remove reservoir cover and filter.
2. Refer to Fig. N.20. Remove setscrews (31) and plate (29). Remove reservoir body, collecting seals (22 and 23) from top face of pump.
3. Remove pump pulley. Remove five screws (32) and separate pump body from cover. Collect seal ring (4).
4. Remove rotor assembly (6 and 7) and key from shaft (2). Using pin-nosed pliers remove circlip securing ball bearing and shaft assembly. Carefully tap out from pump housing.
5. Remove valve cap adaptor (15) and seal (14) from pump cover and remove flow control valve assembly. Using pin-nosed pliers, remove circlip from flow control valve (12) and remove relief valve (11) and spring (10).

Inspection.

Inspect ball bearing; renew if worn or damaged. Check pump cover and body for wear caused by rotors; replace if surfaces scored or worn.

Inspect rotors; replace if worn or scored. These are serviced in matched sets.

Check clearance of rotors mounted on shaft in pump body; replace rotors if clearance exceeds .008".

Check side clearance of rotors in body; if side clearance exceeds .0025" replace pump body.

Check clearance between driven rotor and bush in pump body. Replace body if clearance exceeds .003".

2. Increase engine speed to 1,000 r.p.m. and operate steering to turn wheels from right to left five or six times. Re-check for leaks.
3. Check oil level and refill as required.

THE STEERING COLUMN

The assembly of the steering column is shown in Fig. N.21. The steering column cam tube is in two sections, joined together, just above the spool valve, by a star type rubber coupling. This flexible coupling isolates the reaction movement of the lower cam tube from the steering wheel.

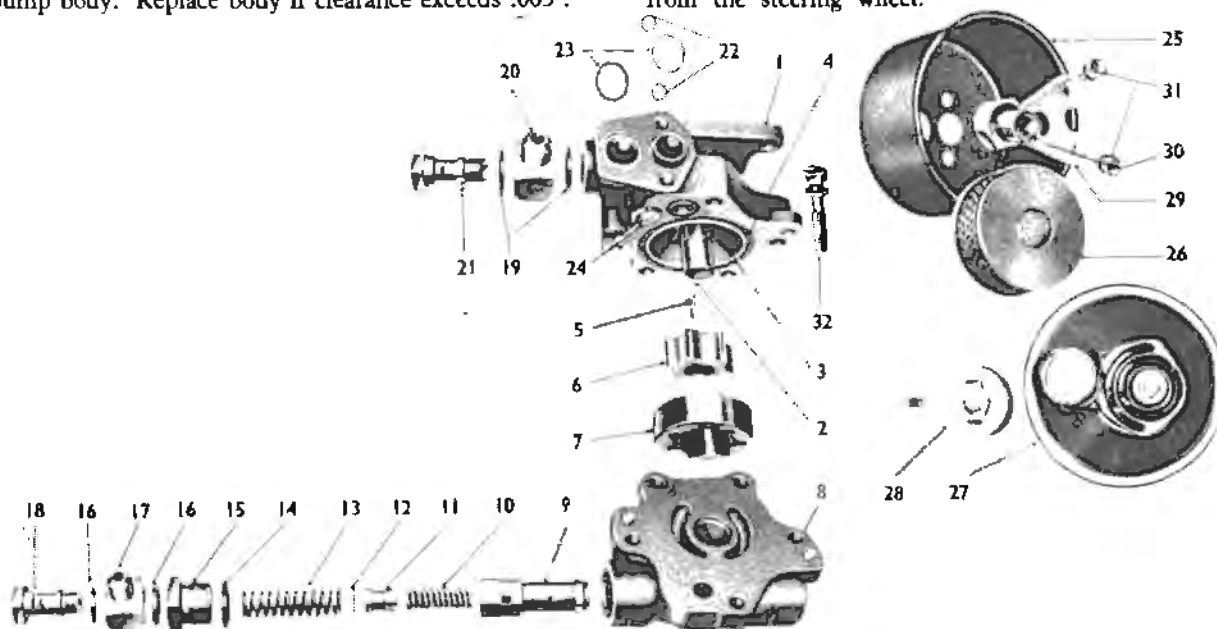


Fig. N.20.—Steering Pump Details.

- | | | | |
|---------------------------------|----------------------------|------------------|--------------------------------|
| 1. Body, Pump. | 9. Control Valve. | 18. Bolt, Banjo. | 26. Filter Element. |
| 2. Spindle. | 10. Spring, Relief Valve. | 19. "O" Ring. | 27. Cover Reservoir. |
| 3. Bush, "Babbit". | 11. Relief Valve. | 20. Banjo. | 28. Dipstick and Cap Assembly. |
| 4. Oil Seal. | 12. Circlip. | 21. Bolt, Banjo. | 29. Plate. |
| 5. Key. | 13. Spring, Control Valve. | 22. Seal. | 30. Adaptor. |
| 6. Rotor, Inner. | 14. "O" Ring. | 23. Seal. | 31. Setscrew, Reservoir. |
| 7. Rotor, Outer. | 15. Cap, Control Valve. | 24. "O" Ring. | 32. Setscrew, Pump Body. |
| 8. End Cover and Valve Housing. | 16. "O" Ring. | 25. Reservoir. | |
| | 17. Banjo. | | |

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Re-assembling.

Re-assembly is reverse of dismantling, check relief valve is not sticking.

Renew all gaskets and oil seals. Check freeness of shaft rotation.

Install pump on engine and fill reservoir with correct oil. Bleed system as follows:—

1. Start engine and run at idling speed for two minutes. Re-check fluid level and inspect hose connections for leaks.

The assembly of the steering box is similar to the manual steering and is described in Sub-Section N.2.

The Spool Valve

The spool valve body, comprising an adaptor piece, valve body and cover, is mounted on the upper face and is an integral part of the steering box. See Fig. N.21.

The adaptor piece and cover contain the housings, secondary springs and thrust washers.

Mounted in the body are the spring-loaded reaction plungers which press on the opposite faces of the thrust washers, also the four spacing pins which hold any excessive load on the thrust washers off the valve spool.

The valve spool itself is mounted between spacing washers and bronze spherical seating washers which allow the valve to be self-aligning. The valve fits over the upper end of the lower steering cam tube and is locked against axial movement. It has an overall lateral movement of .016", produced by the reaction force imposed by the roller on the cam in the steering box.

The oil which circulates through the spool valve also lubricates the steering box and suitable "O" ring oil seals are fitted at all junction points. In order to avoid a back pressure in the spool valve a relief hole is drilled through the spool valve housing connecting both sides with the feed back to the oil pump reservoir, this also providing the lubrication to the steering box.

Dismantling.

The removal procedure is straightforward and is similar to that described in Sub-Section N.2 except for disconnection of hoses and horn wire.

After removal, disconnect and remove the steering wheel and outer steering tube. Disconnect and remove inner tube from rubber coupling.

Remove the setscrew and washer from the centre and withdraw the coupling dog; this is a slide fit. Remove the cap nuts and washers and the end cap from the valve body.

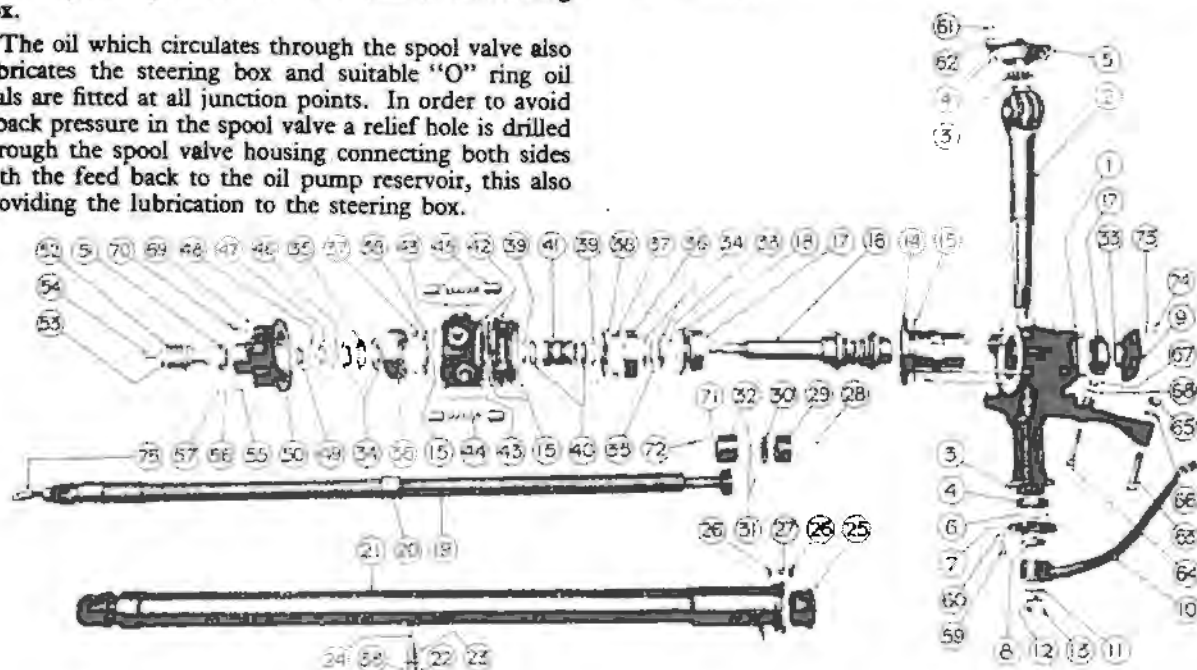


Fig. N 21.—Steering Column Details.

- | | | | |
|-------------------------------------|--|---|-----------------------------|
| 1. Steering Box Assembly. | 20. Horn Slip Ring and Bush Assembly. | 38. Thrust Washer—2 off. | 56. Plain Washer. |
| 2. Rocking Shaft Assembly. | 21. Outer Steering Tube. | 39. Adjusting Washer—2 off. | 57. Nut. |
| 3. Bearings—Rocking Shaft. | 22. Housing—Brush Bush. | 40. Spherical Washers—2 off. | 58. 5 B.A. Screw. |
| 4. Bearing Cups. | 23. Bush—Brush. | 41. Spool Valve. | 59. Setscrew. |
| 5. Top Cover. | 24. Bush—Horn. | 42. Valve Body and Distance Piece. | 60. Plain Washer. |
| 6. Adjusting Washer. | 25. Bush. | 43. Spacing Pin—4 off. | 61. Nut—250"—6 off. |
| 7. End Cover—Rocking Shaft Housing. | 26. Bush—Outer Tube Mounting—8 off. | 44. Spring—Primary—4 off. | 62. Plain Washer—6 off. |
| 8. Oil Seal. | 27. Sleeve, Outer Tube Mounting—4 off. | 45. Plunger—Upper and Lower—4 off each. | 63. Mounting Bolt—500" |
| 9. End Cover. | 28. Spring—Horn Earthing. | 46. Distance Washer. | 64. Mounting Bolt—375" |
| 10. Pendulum Lever. | 29. Rubber Coupling. | 47. Adjusting Nut. | 65. Nut. |
| 11. Recessed Washer. | 30. Rubberised Disc. | 48. Tab Washer. | 66. Plain Washer. |
| 12. Tab Washer. | 31. Split Washer—Coupling. | 49. Lock Nut. | 67. Nut. |
| 13. Nut—Pendulum Lever. | 32. Cover—Coupling. | 50. End Cover—Valve Body. | 68. Plain Washer. |
| 14. Adjusting Sleeve. | 33. Adjusting Washer. | 51. Oil Seal. | 69. Plain Washer—Aluminium. |
| 15. Oil Seal Rings—4 off. | 34. Thrust Race—4 off. | 52. Coupling Dog. | 70. Cap Nut. |
| 16. Lower Cam to Tube Assembly. | 35. Thrust Bearing—2 off. | 53. Plain Washer. | 71. Plain Washer—4 off. |
| 17. Cam Roller Race Assembly. | 36. Housing—Secondary Springs—2 off. | 54. Setscrew—Coupling Dog. | 72. Setscrew—4 off—2 B.A. |
| 18. Retainer. | 37. Secondary Springs—24 off. | 55. Stud—Tube Mounting—4 off. | 73. Washer—4 off. |
| | | | 74. Nut—3125"—4 off. |
| | | | 75. Horn Wire. |

Unlock and remove the serrated nut from the shaft and then the spool valve and associated parts can be removed. The servicing of the cam and roller gearbox is then similar to as described in Sub-Section N.2.

Dismantle the spool valve and take particular note of the positions of reaction plungers, these are of different sizes and compensate for the greater effective area of the piston in the pivoted end of the power cylinder. The larger plungers are fitted on the control side to the pivoted end.

Before re-assembling, ensure that all parts are perfectly clean, then oil parts with Automatic Transmission Fluid.

Having assembled the steering box, see Sub-Section N.2.

Check fit of spool valve in valve housing. When the valve is inserted in the housing with its axis vertical, the valve must drop through the housing under an applied load of $\frac{1}{2}$ lb.

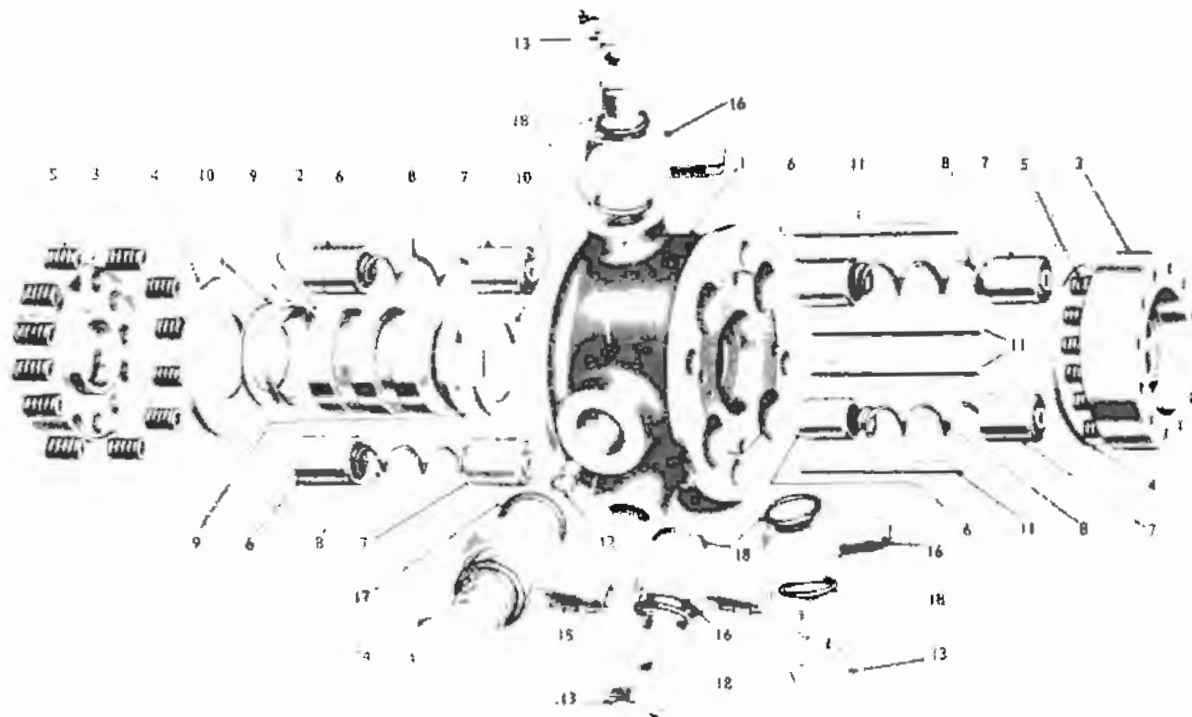


Fig. N.22.—Spool Valve Details.

- | | | | |
|------------------------------|------------------------------|---------------------------|----------------------------|
| 1. Valve Body. | 7. Plunger, Primary Springs. | 13. Bolt, Banjo. | 16B. Banjo, Pipe to Piston |
| 2. Valve. | 8. Primary Spring. | 14. Bolt, Banjo. | End of Cylinder. |
| 3. Housing, Secondary | 9. Spherical Seating. | 15. Banjo, Return to | 16C. Banjo, Pipe to Pivot |
| Springs. | 10. Washer, Valve Adjusting. | Reservoir. | End of Cylinder. |
| 4. Thrust Washer. | 11. Spacing Pin. | 16A. Banjo, Pressure from | 17. "O" Ring. |
| 5. Secondary Springs. | 12. Non-Return Valve. | Pump. | 18. "O" Ring. |
| 6. Plunger, Primary Springs. | | | |

Re-assembling

On dismantling the spool valve and gearbox it will have been noted that there are five adjusting washers and that those at the bottom and top of the cam are etched "1C" and "2C", and also that the adjusting washers and seatings at the bottom and top of the valve housing are etched "3V" and "4V" and the distance washer at the top of the cam tube is etched "No. 5". It is essential that these are re-assembled in the correct order. See Fig. N.23.

Next, assemble on the cam tube: No. 3V thrust race, secondary spring housing, adjusting washer and spherical washer, spool valve, No. 4V spherical washer, adjusting washer, secondary spring housing and thrust race, and the No. 5 adjusting washer and lock-up. Tighten lock-nut down onto shoulder on cam tube.

Check the cross-loading required to move the spool, see Fig. N.24, this should be 2-3 lbs. If this is not obtained, the bronze seatings and thrust washers should be examined, and if signs of wear are apparent, it

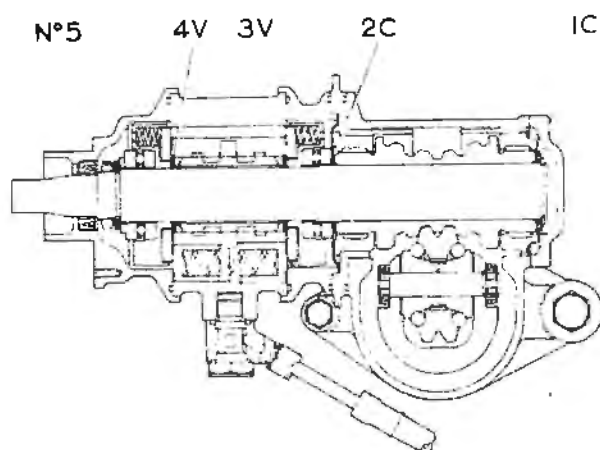


Fig. N.23.—Position of Adjusting Washers.

will be necessary to renew the spool valve assembly.

Should the cross loading be in order, a check should then be made by assembling the cam tube as above but together with the twenty-four secondary springs, two thrust washers and four spacing pins, which must be located by means of a suitable jig, i.e. Tool No. RH.643, two locating plates, and ensure that the cross loading required to move the spool valve does not decrease nor increase by more than 1 lb.

In a case of increase, the length of the spacing pins should be checked and they should be replaced if they are not at least .0005" longer than the valve body. The distance between the outer diameters of Nos. 3V and 4V bearing housings respectively should be $2.416" + .004"$.

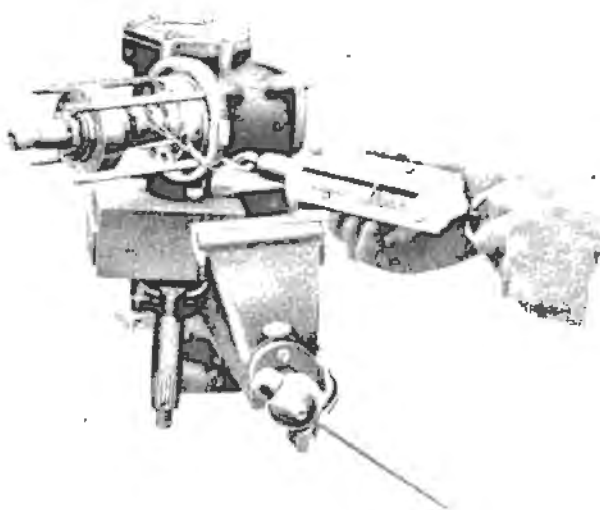


Fig. N.24.—Checking Cross-load on Valve.

The valve spool must be movable in its spherical seatings as easily as it can be moved across. If this is not the case, the finish on the spherical radii of the spool should be inspected.

New spool valve units are supplied which consist of the valve body, primary springs and plungers, spacing pins, valve, seatings and adjusting washers. These units have been rig tested and the adjusting washers carefully selected to give the correct centralisation of the valve in the body and it is essential that these parts are kept as a unit.

Should a new spool valve assembly have been fitted, the required "nip" to obtain the cross-loading is adjusted by selection of a suitable new No. 5 washer, that will give the required cross-load of 1-3 lbs., to move the spool, when the retaining nut is tightened onto its shoulder on the cam tube.

The re-assembly of the remaining parts are a reversal of the dismantling procedure.

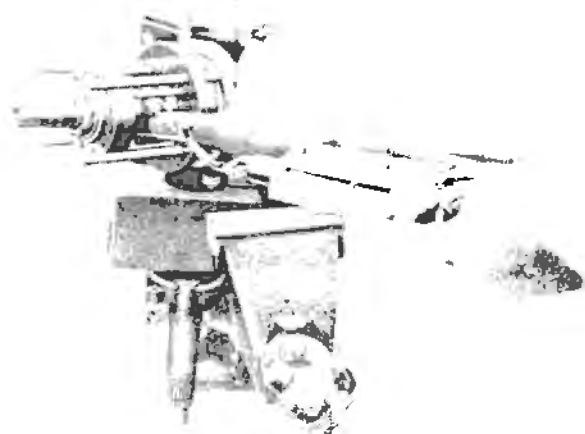


Fig. N.25.—Re-checking Cross-load on Valve.

THE POWER CYLINDER

The power or operating cylinder is pivoted to a bracket on the front of the frame and the piston rod is connected to the centre steering lever. In the steering straight ahead position, the piston is central in the cylinder.

When connected to the centre steering lever, a "sponge" allowance of .150" is necessary at the extreme lock on either side to prevent fouling between the power piston and cylinder end covers. This "sponge" limit may vary in some cases, but the *minimum limit* is .100".

The front wheels must be placed in the "straight ahead" position, and the piston rod travel centralised. Nominal stroke of the power cylinder is 5.312", or 5.612" when the .300" total "sponge" (.150" each end) is included.

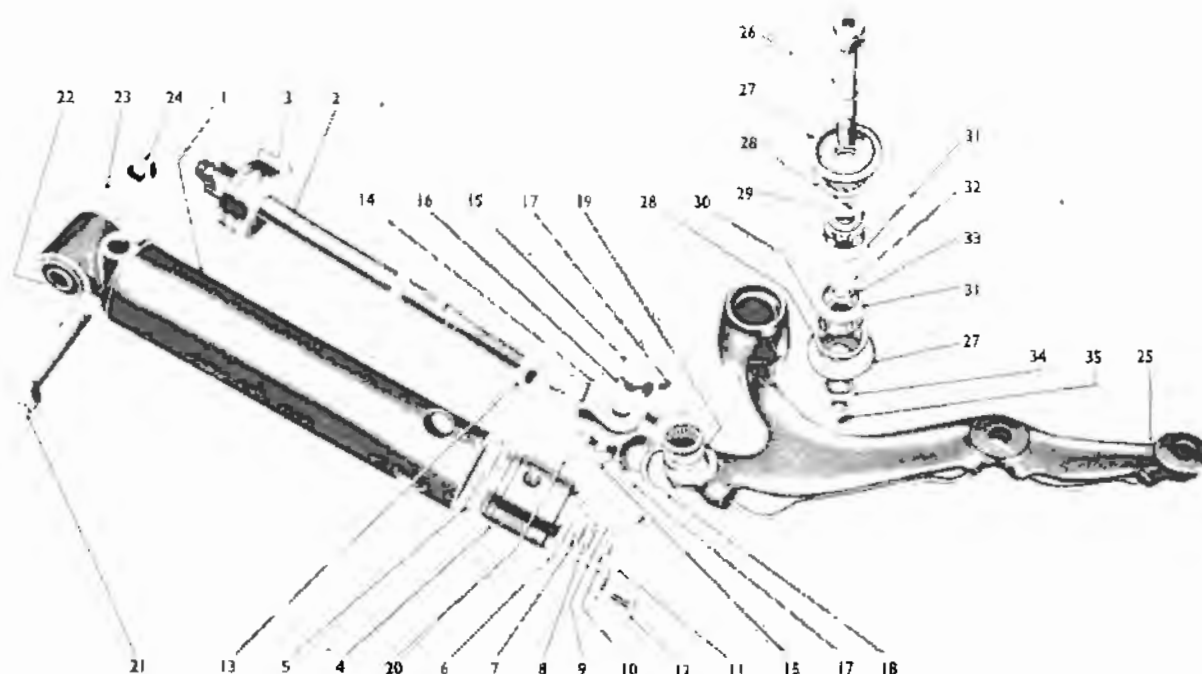


Fig. N.26.—Power Cylinder and Centre Lever Details.

- | | | | |
|---------------------|------------------------|----------------------------|-------------------------------|
| 1. Cylinder. | 10. Ring. | 19. Needle Race. | 28. Seal. |
| 2. Piston Rod. | 11. End Plate. | 20. Rivet, Tubular. | 29. Washer, Oil Transfer. |
| 3. Piston Assembly. | 12. Screw, End Plate. | 21. Bolt, Mounting. | 30. Bearing, Tapered Roller. |
| 4. Bush. | 13. Lock-nut. | 22. Bush, "Silentbloc" | 31. Cup, Roller Bearing. |
| 5. Sealing Ring. | 14. Jaw. | 23. Washer, Spring. | 32. Sleeve, Distance. |
| 6. Circlip. | 15. Washer, Retaining. | 24. Nut. | 33. Washer, Adjusting. |
| 7. Seal. | 16. Sleeve. | 25. Centre Steering Lever. | 34. Washer, Adjusting, Lower. |
| 8. Seal. | 17. Washer, Spacing. | 26. Pin, Steering Lever. | 35. Nut. |
| 9. Washer. | 18. Oil Seal. | 27. Retainer, Seal. | |

Pull the piston outwards for the extreme travel (5.612") then push piston back .150" ("sponge" allowance). Push the piston in the *same direction* for a further distance of 2.656", and take a measurement from the cylinder end plate to the chamfered edge of the piston rod, or any convenient place on the piston rod. Record the measurement and screw piston rod into the yoke, or jaw on the steering lever. Do not tighten lock nut until "sponge" has been verified on *each* lock. This may be determined by turning steering on full lock and observing if the rod can be screwed in or out of the yoke (depending on which lock) for the "sponge" allowance (.150").

A test must be carried out on each full lock and "sponge" carefully checked, to prevent damage to the power cylinder.

When the desired adjustment has been carefully verified, the lock nut must be *fully tightened*. A "sponge"

of .100" on *each* lock is acceptable if the specified .150" is not obtainable.

THE CENTRE STEERING LEVER

The centre steering lever is fitted with Timken tapered roller bearings.

When installing a new centre lever it may be necessary to grind the adjusting washer to level up the lever in relation to the idler lever, and thus ensure proper alignment of the power cylinder adjusting jaw to prevent binding.

Bearing pre-load of the lever Timken bearings is set 12-30 ounce inch torque to turn lever *before* the rubber sealing rings are fitted in place. The pre-load is obtained by grinding the hardened steel adjusting washer.

When assembling the operating lever the oil transfer



Fig. N.27.—Showing Run of Hoses.

washer must be placed between the upper seal retainer and the Timken bearing.

THE HOSES

The hoses to the power cylinder are attached by union nuts to a 90° elbow on the front of the cylinder and a straight adaptor on the rear end.

The delivery and return hoses from pump to valve body are passed over the wheelcase housing and below the water pump adaptor, to be secured by a clip fastened to the fixed end of the dynamo swivel arm and finally clipped to the valance. This applies to R.H. cars only. Power cylinder front and rear hoses are swept upwards behind the front sway bar and over the front pan and then clipped together at a convenient point along the valance. When the hoses are clipped and bolted in position, it will be noted the run of the hoses is free from any kinks and sharp bends which would be conducive to pressure noise, or "squeal". No sealing compound should be used on the banjo fittings, but it is recommended that a light coating of "Osotite" or "Wellseal" be used on the cylinder elbow and adaptor, before being screwed into the cylinder ends. No compound should be used on the union ends of the hoses.

Hose connections sequence is as follows:—

The hose from the front or pivot end of the power cylinder is connected to the right hand port of the valve body (away from the engine on R.H. cars, and nearest the engine on L.H. cars).

The hose from the rear or jaw end of the power cylinder is connected to the diametrically opposite side of the valve body (nearest the engine on R.H. cars, and away from the engine on L.H. cars).

The expansible hose connects between the pressure side, or rear end of the pump to the pressure port of the valve body. This port is easily identified by having a longer boss and is adjacent to the return port. The return port is tapped .750" and contains a non-return valve. A further hose is connected between this port and the return, or front end of the pump.

The connecting sequence applies to both L.H. and R.H. installations.

PRIMING AND FILLING THE SYSTEM

The pump is filled and the engine allowed to idle while operating the steering from lock to lock, and keeping the oil supply in the pump reservoir topped up. A considerable amount of noise will be present during the initial priming period, also "frothing" of the oil in the reservoir, which indicates that air is being expelled from the system. All joints must be carefully checked for oil leaks during the initial running and, of course, rectified if found to be leaking.

Capacity of the system is approximately 2 quarts of the recommended automatic gearbox oil. Fill reservoir to the "Full" mark on the dipstick (attached to the bayonet fitting filler cap only and avoid overfilling and spilling, especially on the pump drive belt).

On completion of filling and priming operations, the belts should be checked for correct tension and, if necessary, adjusted to the specification given. The pump drive belt must be adjusted to give no more than three-eighths of an inch deflection, midway between the fan and pump pulleys, to avoid slip. A slipping pump drive belt will result in a "jerky" feel on the steering wheel, especially as each lock is approached. No dressing of any kind is to be applied to any of the belts.

CHASSIS FRAME

SECTION P
THE CHASSIS FRAME

SUB-SECTION

Description	P.1
-------------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

THE CHASSIS FRAME

GENERAL DESCRIPTION

On both models the chassis frame is of exceptionally rigid construction, yet light in weight.

A notable feature of this newly designed frame is the use of lighter gauge steel sub-assemblies, arc welded into a box section assembly. The general thickness of the steel used for the sub-assemblies is 16 S.W.G. (.064") and the angle stiffeners is 14 S.W.G. (.080").

It is composed of two side-members, a front cross-member or pan, an "X" shaped cruciform or sub-frame, a rear cross-member and a transverse tubular member to which the rear spring shackle fixed eyes are arc welded.

The side members are made up of two halves of channel plate, reinforced on the inside and arc welded along the seams to form an air tight box section assembly. An angle stiffener plate is spot welded inside the front half of each side-member, from ahead of the front cross-member to the point where the cruciform assembly is arc welded to the inner sides of the side members.

The front pan, or cross-member, is of similar construction to the side members, in that it is of arc welded box section, the same method being used to form the rear cross-member.

A tubular bar of 1.500" outside diameter passes through both side members approximately 20.500" from the rear extremity. This bar is arc welded to the inner and outer sides of the side members, blank discs being welded over the hollow ends of the bar.

Construction of the cruciform is again generally similar to the side members. The point of intersection

of the members of the cruciform is reinforced top and bottom by plates shaped like a Maltese Cross, which are arc welded along their edges.

A bracket of similar construction bolts to welded lugs on the inner sides of the cruciform to support the rear end of the gearbox. Jacking brackets are welded on each side member.

Fifteen body mounting brackets are welded to the frame, ten of these mounts being adjustable. Particulars of these adjustable mounts are given in Section S, covering the body. A feature of these mounts is the detachable rubber mounted cushions, which insulate the body from frame noises.

Special attention has been paid to bumper bar mountings at both extremities of the frame. In order to prevent side member collapse at these points, which would be possible should the mounting bolts be over-tightened, steel tubes pass through the side members and are arc welded in position. Six such tubes are used for the front mounting and four tubes are used for the rear. Rubber bump stops are fitted to the rear of the side members to check extreme travel limits of the rear suspension, while similar stops are bolted to the front cross member to check extreme front suspension compression, the rebound travel stop being bolted to the upper triangle levers.

Suitable brackets are arc welded to the frame at required points to carry the heavier components such as the steering gear, gearbox and shock dampers, etc. Pipes and cables are held by clips, in some cases insulated, to welded bolts or nuts at necessary points. On completion, the frame is finished in a special black enamel which contains anti-rust ingredients.

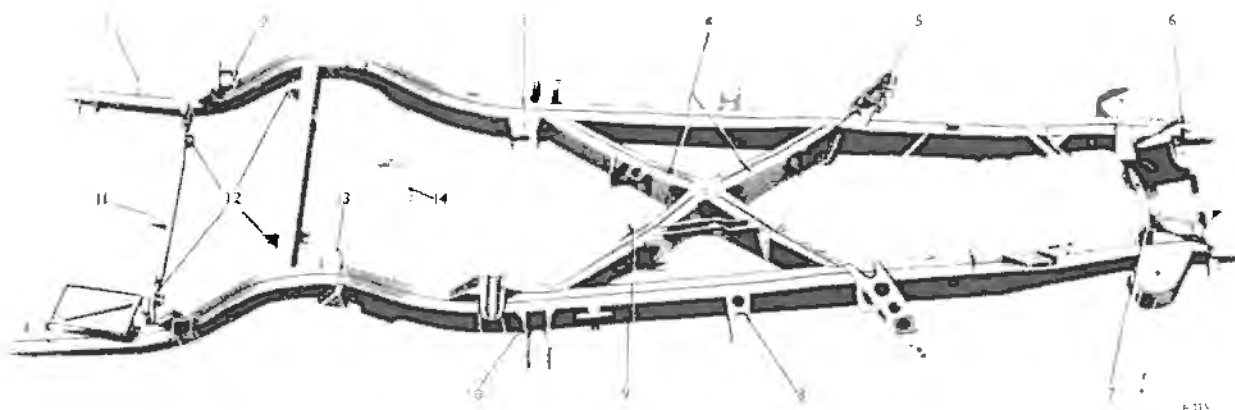


Fig. P1 S1 chassis frame (early)

- | | | | |
|---------------------------|---------------------------|---------------------------------------|---|
| 1. TAIL PIPE SUPPORT | 5. BODY MOUNTING BRACKET | 9. BODY MOUNTING BRACKET | 12. FUEL TANK MOUNTING |
| 2. BODY MOUNTING BRACKET | 6. STABILISER ROD BRACKET | 10. BODY MOUNTING AND JACKING SUPPORT | 13. BODY MOUNTING BRACKET |
| 3. REAR SHACKLE ANCHORAGE | 7. ENGINE MOUNTING | 11. BODY MOUNTING BRACKET | 14. INSET SHOWING REINFORCED 'BOX' CONSTRUCTION |
| 4. CRUCIFORM | 8. BODY MOUNTING BRACKET | | |

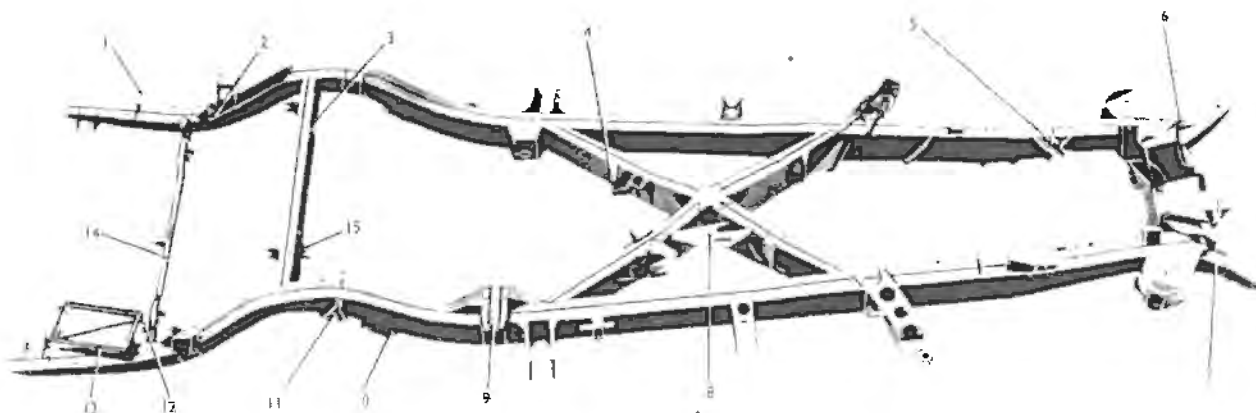


Fig. P2 S1 chassis frame (late)

- | | | |
|---------------------------------------|--------------------------------|--------------------------|
| 1. TAIL PIPE SUPPORT | 6. FRONT SHOCK DAMPER MOUNTING | 11. BUMP STOP BRACKET |
| 2. REBOUND BRACKET | 7. RADIATOR SUPPORT | 12. REAR SHACKLE EYE |
| 3. REAR SILENCER MOUNTING | 8. MASTER CYLINDER BRACKET | 13. BATTERY CARRIER |
| 4. DRIVE SHAFT CENTRE BEARING SUPPORT | 9. 'Z' BAR BRACKET | 14. TUBULAR MEMBER |
| 5. STEERING MOUNTING | 10. REAR SHOCK DAMPER | 15. FUEL FILTER MOUNTING |

EXHAUST SYSTEM

SECTION Q
EXHAUST SYSTEM

SUB-SECTION

Description and Operation	...	...	...	...	...	Q1
Removal and Replacement —Replacing Exhaust Manifold or Cylinder Block Joints—Replacing a Silencer or Exhaust Pipe Assembly	...	...	...	...	...	Q2

THE EXHAUST SYSTEM

DESCRIPTION AND OPERATION

The exhaust system is the semi-acoustic type. The exhaust gases are conveyed from the engine by two identical cast iron manifolds and two down pipes to enter a single pipe through a welded breeches piece. The down pipes are 1.875" outside diameter and the single pipe is 2.500" outside diameter.

The exhaust pipe passes along the outside of the frame to the front silencer.

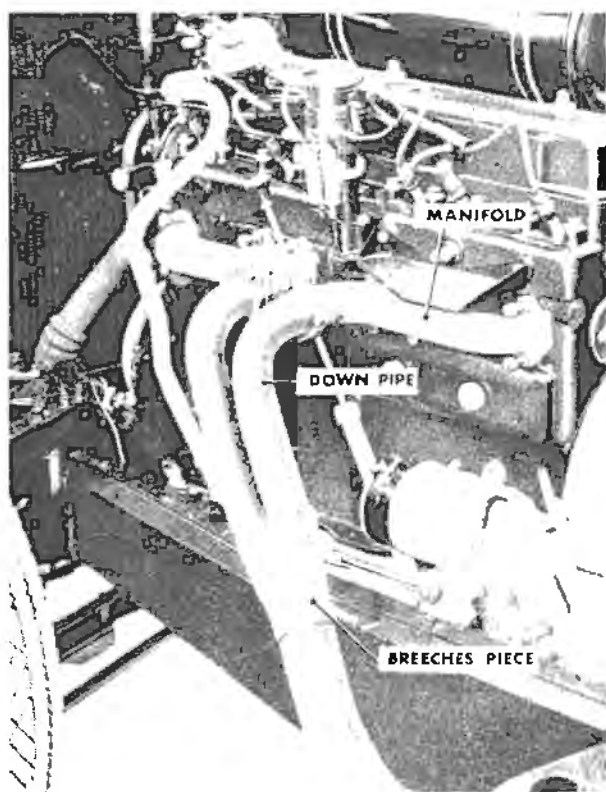


Fig. Q.1. Exhaust Manifolds, Down Pipes and Breeches Piece.

The front silencer is comprised basically of three perforated tubes; the main gas flow passes along the inlet tube to the rear compartment of the silencer, back along the intermediate tube into the front compartment and out along the third pipe. The silencer is almost rectangular in shape and is 21.500" long by 7.875" in width. The sub-assemblies of the silencer are "Stone Clad" before assembly as a protection from condensation corrosion.

Asbestos sheet .125" thick, enclosed within welded aluminium covers, is fitted to the outside of the shell, this being the only lagged silencer in the system.

An aluminium asbestos shield is fitted on the under side of the floor above the front silencer for protection against heat.

The gas then passes along the intermediate pipe 2.375" diameter to the rear silencer, which is a tuned resonator, tuned to 20 c.p.s.

The rear silencer is fitted inside the frame forward of the rear axle and is approximately cylindrical in shape, 12.00" long by 8.00" diameter.

Finally the exhaust gases pass through a high frequency damper, which is packed in the annular space formed between the inner perforated tube and the outer shell, with 1 lb. 10 ozs. of "Stillite" mineral wool. This damper is cylindrical in construction, 8.00" long by 4.00" diameter, and is "Stone Clad" before assembly.

The exhaust system is fastened to the chassis in four places with suspension strips of rubberised fabric, moulded to shape. A tubular strut 9.750" long, is attached between a lug on the breeches piece and a lug on the crankcase, to reduce bending loads on the manifold to breeches pipe joints.

Copper asbestos joints are used between the manifolds and the cylinder block, the manifolds being secured by .3125" diameter brass extension nuts. All flange joints are of corrugated cupro-nickel.

An aluminium asbestos heat shield is fitted below the rear compartment floor to deflect the heat of the rear silencer.

REMOVAL AND REPLACEMENT

REPLACING EXHAUST MANIFOLD OR CYLINDER BLOCK JOINTS

Remove oil level dipstick to prevent accidental damage or breakage, while working on manifold.

Remove the special bolt holding breather pipe to valve rocker cover and slacken the clip pinch bolt, so that breather pipe may be pulled to one side to allow better access to front extension nuts on front manifold. Do not misplace the aluminium washer used on the special bolt.

Disconnect down pipe flanges from manifold flanges, by removing the three .3125" cadmium plated bolts and nuts, and flat steel washers. Discard the cupro-nickel joints used between the flanges. These joints should not be re-used.

Remove the .3125" bolt and nut holding the tubular stay to the breeches piece. The down pipes can then be pulled away from the manifold.

Remove two 2 BA nuts retaining heat shield to cylinder head, above rear manifold. This shield is so placed to deflect the heat from the rear manifold away from the inlet rubber hose line to the under-wing heat exchanger.

When the twelve .3125" brass extension nuts and flat steel washers have been removed, the manifold may be lifted off the steel studs screwed into the cylinder block.

Discard the six copper asbestos joints found between the manifold and block and scrape all traces of carbon from the ports and faces of the block and manifold.

Check the manifold for "warp" by using a straight edge across the joint faces.

It will be noted that the four holes farthest away from the flanged face of each manifold are slotted for a length of .500", to permit normal expansion and contraction of the manifolds without "warping". The bolt holes at all points, including the slotted holes, are .3248" in diameter, or width in the case of the slotted holes, which permit the manifolds to be easily removed or replaced.

If on checking the truth of the manifold faces a small irregularity is evident, any suitable surface grinder may be judiciously used for trueing up the faces, or if such a grinder is not available, the manifold may be refaced by placing a sheet of medium grade emery cloth on a flat surface, and passing the manifold back and forth across the emery cloth.

Finish the surfaces in the same manner, but use fine emery cloth. A medium cut file may be used to square up the flanged face of the manifold, a smooth file being used to finally smooth the face when the truth has been restored.

A hard scale may be encountered on the faces of the



Fig. Q.2. Exhaust Line Suspended Outside Frame.

manifold, which can be removed with a coarse cut file, prior to surfacing faces without the use of a suitable surface grinder.

The use of emery cloth placed on a flat surface, rather than the use of a file for trueing up the block faces of the manifold, is more desirable, as the three faces may be ground in one operation over their entire area, which is not practical when using a file, and the importance of these faces being perfectly flat over their entire length, cannot be over emphasised.

No jointing compounds are to be used on any of the joints, but the nuts may be oiled to ensure there is no thread binding before installation.

Assembling is the reversal of the operation used for removal, the last step being the connecting of the tubular stay to the breeches piece. This will require the loosening of the bolt holding the stay to the lug bolted to the crankcase, in order to insert the bolt in the breeches piece lug, without straining the stay.

All bolts and nuts should be evenly tightened and retightened after the engine has been running a sufficient time for the manifolds to have reached operating temperature.



Fig. Q.3. Rear Silencer and Damper.

REPLACING A SILENCER OR EXHAUST PIPE ASSEMBLY

The front silencer and exhaust pipe is replaced as an assembly, which includes the down pipes and breeches piece.

Removal of the assembly is a comparatively simple procedure, when the undermentioned instructions are followed:—

Remove oil level dipstick, to prevent accidental damage or breakage while disconnecting down pipe from exhaust manifold.

Disconnect the down pipes from the exhaust manifold flanges by removing six .3125" bolts, nuts, and cadmium plated flat steel washers.

Remove the .3125" bolt, nut and flat washer, securing the tubular stay to the breeches piece lug.

Disconnect front silencer outlet pipe at flange, by removing the three .3125" cadmium plated bolts, nuts and flat washers.

Remove six .375" bolts, nuts and flat washers retaining the jacking bracket to the body support, to allow the silencer assembly to be lowered down.

Remove the five screws holding curved plate over aperture in valance. When the curved plate is removed, the aperture is large enough to permit easy withdrawal of the down pipes, without removal of the valance.

Support the silencer while removing the two .3125" cadmium bolts, nuts and flat washers, connecting the moulded rubberised fabric strip to the exhaust pipe. The assembly may then be lowered down, at the same time guiding the down take pipes through the aperture in the valance.

A tinned flexible copper earthing, or bonding strip, is used at all suspension points and when replacing any exhaust line components, care must be taken to ensure that these strips are installed directly between the two metal points and never between the bolt and fabric suspension strip.

The cupro-nickel joints must always be renewed whenever the flanges are separated.

It will not be necessary to replace the fabric suspension strips, unless torn or perished.

Installation procedure for the front exhaust pipe and silencer assembly is a reversal of the steps taken for removal. Ensure that the assembly is in its correct position before tightening any nuts.

Renewal of the rear silencer or damper box is a comparatively simple operation if the car is first placed over a pit or on a hoist. To remove the rear silencer, disconnect the two flanges fore and aft of the silencer, which can then be lowered to the ground.

To disconnect the damper box and tail pipe, it will be necessary to release the suspension strips on the rear cross member and the rear side member, after disconnecting the flange aft of the rear silencer.

Replacement is the reverse of removal, care being taken to ensure that the bonding strips are correctly located.

WHEELS AND TYRES

SECTION R
WHEELS AND TYRES

SUB-SECTION

Data Wheels Wheel Balancing—Tyres—Tyre Pressures—
Snow or Winter Tyres— Tyre Service R.1

WHEELS AND TYRES

DATA

Wheel

Rim diameter	...	...	15.00
Rim width	...	...	6.00

Tyre size

Silver Cloud	...	...	8.20 by 15"
Bentley 'S' Type	...	...	8.20" by 15"
Bentley Continental	...	...	7.60" by 15"

WHEELS

The wheels are Dunlop or Sankey well-base type, being held in position by aluminium bronze dome-shaped nuts, tapped .500" by 20 t.p.i. UNF right- or left-hand thread. The crowns of these nuts are drilled with a .062" diameter hole to prevent air pocketing during tightening. The inner ends of the nuts are spherically radiused to register with spherical counter-sinking in the centre plate. An arrow is stamped on the crown of the nuts, indicating left- or right-hand thread, and care must be taken not to damage the spherical radii of the nuts.

A coating of light grease may be applied to the nuts for easy servicing. The nuts are .820" across the flats and should only be removed and replaced with the special box spanner and tommy bar provided in the tool kit.

A wheel disc assembly, made up of three separate units, presses on the wheel, and as well as embellishing the wheel appearance, obscures the wheel balance weights from view. A hole is pressed in the disc assembly to accommodate the valve stem. The assembly is composed of a 20 S.W.G. (.036") soft tempered steel disc pressed to suit the contours of the wheel itself, with an octagonal hub cap bearing the applicable monogram pressed and formed in the centre of the disc assembly. A claw ring of 19 S.W.G. (.040") soft tempered steel is spot welded to the disc and has six equidistant holes, to which an outer painted ring is attached by spire spring nuts.

Both disc and claw are chrome plated against rust, the outer side of the disc being highly polished over the entire area. The painted ring is spray painted over the visible outer area to harmonise with the car colour scheme.

The disc assembly is prised off the wheel by inserting the flattened edge of the wheel spanner tommy bar between the edge of the disc and the wall of the tyre. To install the disc, first locate the valve stem in the hole

of the disc and press against the octagonal hub cap with one hand, while tapping the edge of the disc with a hide mallet. Whenever discs are being removed and replaced, care must be taken to avoid accidental damage to chrome and painted surfaces.

WHEEL BALANCING

The wheels are both statically and dynamically balanced before the car leaves the factory, and it is advisable to make a periodic check at intervals of 5,000 miles.

It is essential that when the wheels are to be re-balanced, that the weight of the car is removed from the tyres as soon as the car comes in. If this is not done, temporary flats form on the tyres which will alter the static balance by as much as 10 in./oz. Re-balancing under these conditions is a waste of time.

Specialised equipment is necessary to carry out this important operation, as well as an assortment of specially designed Dunlop or Hoffmann lead balance weights, and only these must be used.

These weights range from .5 oz. to 3.0 oz. in steps of .5 oz. in the Dunlop range, while Hoffmann weights are from .7 oz. to 2.8 oz. in steps ranging from .3 oz. to .7 oz. The weights are cast with a spring clip which snaps on the rim edge and are removed and replaced with a special tool supplied by the manufacturer of the wheel balancing machine.

When installing the weights on the rim, only sufficient force or hammering should be used to get the weights in place. If the weight spring is struck smartly after the weights are right home, loosening may result.

Whenever wheels are balanced on these machines the maker's instructions must be fully understood before proceeding with the operation.

TYRES

Service Bulletins are issued from time to time detailing the latest information regarding tyres approved for use on these cars.

Reference should be made to the latest Bulletin when the fitment of new tyre equipment is being contemplated.

An exception is made in the case of the Bentley 'S' Type Continental, which is equipped only with Dunlop Road Speed Tyres.

For new tyres, other than those approved by Rolls-Royce Ltd., four-ply tyres, having a six-ply rating,

are recommended in preference to six-ply tyres, which give a considerably harder ride. After new tyres have been installed, the speed of the car must not exceed 90 m.p.h. for the first 100 miles, as the heat generated by a new tyre until it has been correctly flexed makes it unsafe for really high-speed driving.

After fitting a new tyre, it is imperative that the wheel is re-balanced.

TYRE PRESSURE

The recommended tyre pressures are:—

8.20" by 15" Tyres—Silver Cloud and Bentley Saloon.

Front 19 lbs./sq. in. (1.33 kg./cm²) } Cold.
Rear 26 lbs./sq. in. (1.83 kg./cm²) }

or
Front 22-23 lbs./sq. in. (1.55—1.61 kg./cm²) } Hot
Rear 32-34 lbs./sq. in. (2.25—2.40 kg./cm²) }

Tyre pressures should always be checked when the tyres are cold, and should the pressures need to be adjusted after a run, then the pressures quoted for "Hot" should be used. On no account should a hot tyre be deflated to the cold pressure, for as the tyre cools the pressure decreases.

7.60" by 15" Tyres—Bentley Continental 'S' Type.

For all normal English running, with maximum speed for intermittent periods:—

Front 22 lbs./sq. in. (1.55 kg./cm²) } Cold.
Rear 24 lbs./sq. in. (1.7 kg./cm²) }

For continuous high-speed running on straight roads under light traffic conditions:—

Front 27 lbs./sq. in. (1.9 kg./cm²) } Cold.
Rear 30 lbs./sq. in. (2.1 kg./cm²) }

For sustained maximum speeds:—

Front 30 lbs./sq. in. (2.1 kg./cm²) } Cold.
Rear 35 lbs./sq. in. (2.46 kg./cm²) }

SNOW OR WINTER TYRES

India "Winter" or Dunlop "Wintergrip" tyres should be fitted to the rear wheels only.

Owing to the heavier tread, the speed on these tyres should be limited to 75 miles per hour.

TYRE SERVICE

"Butyl" inner tubes, although manufactured from

synthetic rubber, may be repaired in the same manner as tubes of natural rubber.

When installing, care must be taken to see that the tubes are free from kinks when placed inside the tyre cover. These tubes retain their extended size when deflated and do not contract to normal shape as do the natural rubber inner tubes.

Before any service is done on tubeless tyres, dealers should make certain the appropriate tools are available and personnel are familiar with mounting and demounting procedure.

A specially designed Schrader air valve is pressed into the rim valve hole for use with tubeless tyres. This valve is of similar manufacture to the valve stem in a conventional inner tube. Dimensions of this special valve are 1.675" in length and the principal diameters are .670" and .950". This valve has an interference fit in the rim of approximately .037".

The valve may be easily installed if smeared with a solution of household soap and water, and pushed through from the inside of the rim by pulling from side to side on the outer end of the valve, while pressing on the spherical end with a flat piece of wood. The Dunlop Rubber Co. provide a special tool for fitting and removing. The valve may be easily removed by first applying a little of the soap solution around the outer shoulder and gently forcing a thin pointed screwdriver between the shoulder of the valve and the hole in the rim, at the same time pushing the valve inwards. Care must be taken to remove all burrs and rough edges from rims which mount tubeless tyres.

Periodic rotation of the tyres is recommended to equalise wear between front and rear tyres. This should be performed at 5,000 mile intervals, and is carried out by changing the front wheels to the rear, and vice versa, on the same side. The opportunity of checking the wheel balance should also be taken during this operation.

During the tyre rotation operation the tyre treads should be carefully examined for evidence of uneven wear, due to a steering geometry fault such as incorrect toe-in adjustment, etc., and the appropriate action taken to check and rectify any such fault. Excessive wear on the outside of the nearside front tyre indicates too much toe-in, similarly excessive wear on the inside of the off-side front tyre indicates too little toe-in.

Flint and pebbles should be removed where found embedded in the tread, as their presence creates a definite hazard to personnel during wheel balancing.

BODY

SECTION S**BODY****SUB-SECTION**

Description and General Maintenance	...	...	...	...	S. 1
Front Doors	...	...	...	...	S. 2
Rear Doors	...	...	...	...	S. 3
Doors and Luggage Boot Lid Sealing	...	...	...	...	S. 4
Luggage Boot	...	...	...	...	S. 5
Vibrations and Rattles	...	...	...	...	S. 6
Windscreen and Rearlight Glass	...	...	...	...	S. 7
Front and Rear Seats	...	...	...	...	S. 8
Accessories	...	...	...	...	S. 9
Radiator Grille	...	...	...	...	S.10
Electrically Operated Windows	...	...	...	...	S.11
Electrically Operated Glass Division	...	...	...	...	S.12
Body Mounting	...	...	...	...	S.13
Accident Repairs	...	...	...	...	S.14

BODY DESCRIPTION AND GENERAL MAINTENANCE

DESCRIPTION

The standard saloon body, fitted to Rolls-Royce Silver Cloud and Bentley 'S' type cars, is constructed of pressed steel and supported on the chassis frame by means of rubber mountings.

The doors, bonnet and luggage boot are made of Birmabright alloy, the salient features of which are lightness combined with strength and rigidity.

Large front and rear doors are hinged to the front and centre pillars respectively and permit easy access to the front and rear seats.

Due to the ample proportions of the doors and the boot lid, assistors are provided to minimise the effort required to open and maintain them in an open position.

The front doors are provided with self-cancelling type locks and the action of closing either front door automatically releases the lock, this eliminates the possibility of being inadvertently locked outside the car whilst the key is still inside.

To enable the front doors to be locked from the outside, a lock is provided below each external door handle; the key for operating these locks is also used to turn the ignition switch.

The locks on the rear doors are not the self-cancelling type, therefore they can be locked by means of the remote control handles on the inside of the doors.

Bench type front seats have individual backs and are provided with adjustment for rake.

A rear luggage boot provides ample space for luggage and also has a separate compartment for stowing the spare wheel.

GENERAL MAINTENANCE

Whilst great care is taken in the course of manufacture to ensure that the paintwork is durable and as highly finished as possible, in service the paintwork is subjected to conditions which may cause deterioration,

therefore in order to obtain the best results the following procedure should be carried out.

Always remove dirt and mud by means of a liberal supply of clean water; tar can be removed by means of one of the many special proprietary solutions available, or by gently rubbing with a soft cloth moistened with turpentine substitute.

Under no circumstances should an attempt be made to dry clean the car; this practice can produce scratches which can only be removed by subsequent levelling down and polishing.

After thoroughly washing and drying the paintwork, it should be polished with a good quality wax polish.

It is essential that under no circumstances should a polishing compound be used which contains ammonia.

Every third month, the paintwork should be thoroughly washed to remove traffic film and other atmospheric deposits, then remove all residual wax polish by means of a suitable cleaning compound such as Belco No. 7 and finally polish with a good quality wax polish.

Leather Upholstery

The leather upholstery can be maintained in a clean and preserved condition if lightly washed with a good quality soap, such as toilet soap, then thoroughly dried with a clean cloth.

An occasional application of Connolly's Hide Food will preserve the upholstery; this compound should be applied evenly with a clean soft cloth, then polished with a second clean cloth.

Floor Carpets and Head Cloth

Floor carpets should be removed from the car and cleaned with a vacuum cleaner.

Stains or grease marks may be removed from the carpets by means of a suitable cleaning solvent such as DRIK, this solvent can also be used to clean the head cloth.

FRONT DOORS

TO REMOVE AND DISMANTLE

Remove the split pin and withdraw the clevis pin from the check-strap.

Support the door and remove the screws securing the upper and lower hinges to the front pillar; the door can then be lifted off together with its hinges.

Arm rest and slide

To remove the arm rest, lift the release lever and slide the rest upwards.

Unscrew the two screws securing the arm rest slide and remove the slide from the door; retain the screws together with the distance washers.

"Trim" and finisher

Note the angular position of the handle on the interior of the door to ensure that the handle is returned to its original position when refitting.

Unscrew the escutcheon with a 'C' spanner and remove the handle by drawing it off its splines.

Using a screwdriver, carefully ease the "trim" from the door, taking care not to damage the "trim", the paintwork or the concealed spring fasteners (see Fig. S.1).

Slightly open the ventilating window and lower the drop window, then remove the retaining screws and carefully ease off the finisher and plate (see Fig. S.2).

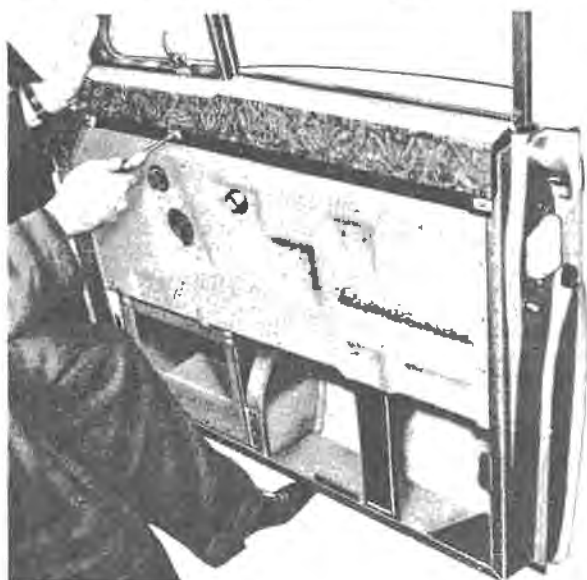


Fig. S.2.—Removing finisher from the front door.

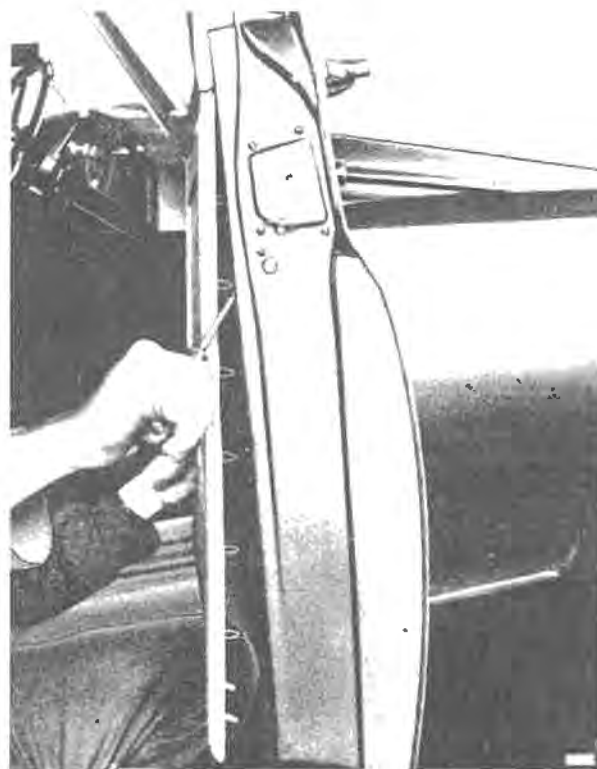


Fig. S.1.—Removing "trim" from the front door.

Ventilating window

Having removed the door finisher and plate, the lower pivot and friction device of the ventilating window will then be exposed (see Fig. S.3).

Unscrew the nuts from the lower pivot then withdraw the washers, discs and spring (see Fig. S.4), then withdraw the ventilating window stop pin to enable the window to be lifted off the upper pivot; retain the $\frac{1}{2}$ in. diameter steel ball.

Drop window and winder mechanism

It will assist disengagement of the runner if the window winder mechanism is in the fully raised position.

Unscrew the screws marked 8 and 9 shown in Figure S.5, then withdraw the winder mechanism.

If a new window is to be fitted, it is not necessary to remove the winder mechanism; in this case proceed as follows.

Remove the five screws marked 11 shown in Figure S.5 and withdraw the stop bracket.

Remove the two screws at the lower end of the forward channel and withdraw the channel, leaving the felt on the glass.

To permit disengagement and removal of the rubber, lower the glass to its fullest extent.

Window frame

Should it be necessary to remove the window frame, note the position of the packing pieces in order that they are refitted correctly and thus avoid upsetting the frame adjustment in relation to the body sealing.

To withdraw the window frame remove the screws marked 5 and 7 in Figure S.5, also the screws securing the window frame at the rear (these screws are not illustrated in Figure S.5) then drill out the rivets marked 1, shown in Figure S.5; a $\frac{1}{8}$ " drill should be used for drilling out the rivets.

Chromium plated finishing strip

The waist finisher strips are retained by spring clips and can be removed without further dismantling being necessary.

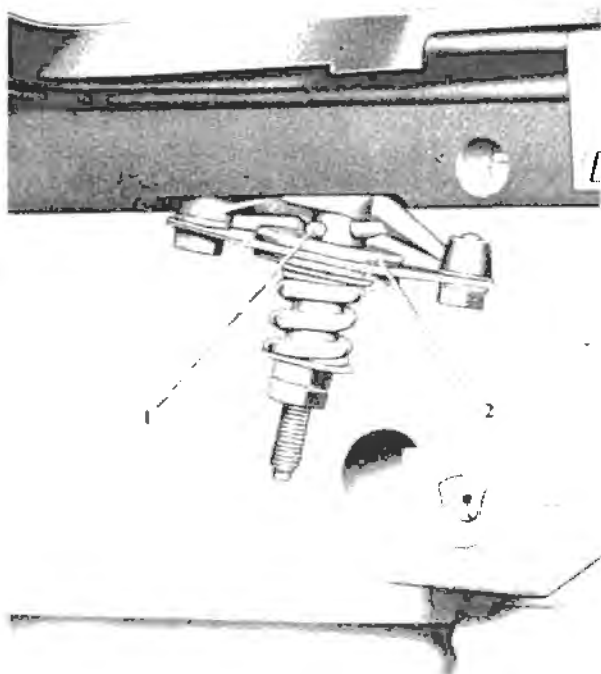


Fig. S.4.—Ventilating window bottom pivot.

1. Stainless steel stop pin.
2. Friction discs.

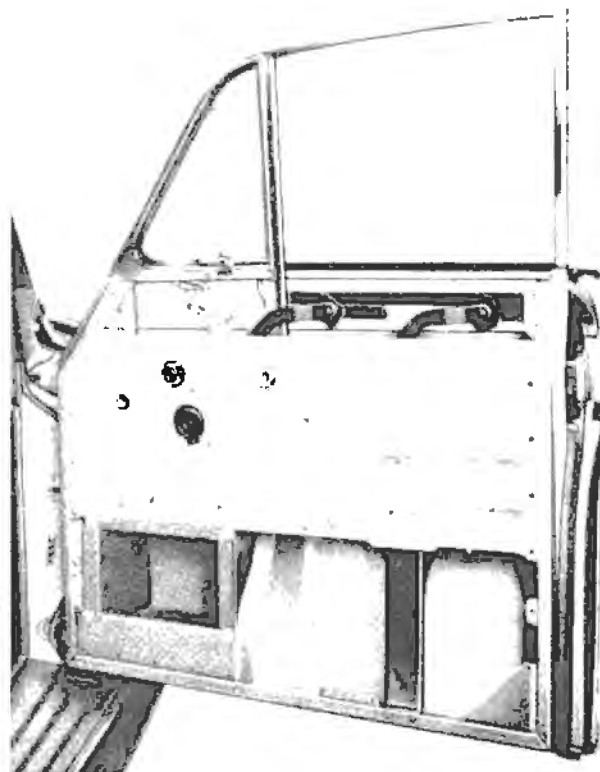


Fig. S.3.—Front door with "trim" and finisher removed.

Door locks and locking mechanism

To remove the external lock, detach the lock clip (fitted to later type only), screw back the locking nut as far as possible, then insert the key and rotate the lock a few times; it should then be possible to remove the nut.

The door locking mechanism should be removed by unscrewing the screws marked 12 in Figure S.5.

Door assistor

Before removing the front door assistor, it will be necessary to detach the glove compartment (see Fig. S.3).

On early cars it is necessary to drill out the rivets securing the glove compartment, using a $\frac{1}{8}$ " drill, before removing the compartment.

Remove the clevis pin and unscrew the retaining screws, then withdraw the assistor through the glove compartment aperture.

TO ASSEMBLE AND FIT

To assemble and fit the front doors, reverse the procedure given for removal and dismantling. Whilst carrying out this procedure ensure that reference is made to Sub-section S.6 and that particular note is made of the following points.

Ventilating window

When reassembling the lower pivot, the nut should be tightened until the distance piece is securely clamped otherwise the friction discs will not operate effectively.

Complaints of water leaks on early cars may be due to pressure build-up at the rear corner of the ventilating window.

If necessary this can be relieved by providing a drain 1" forward of the rear lower corner as illustrated in Figure S.6.

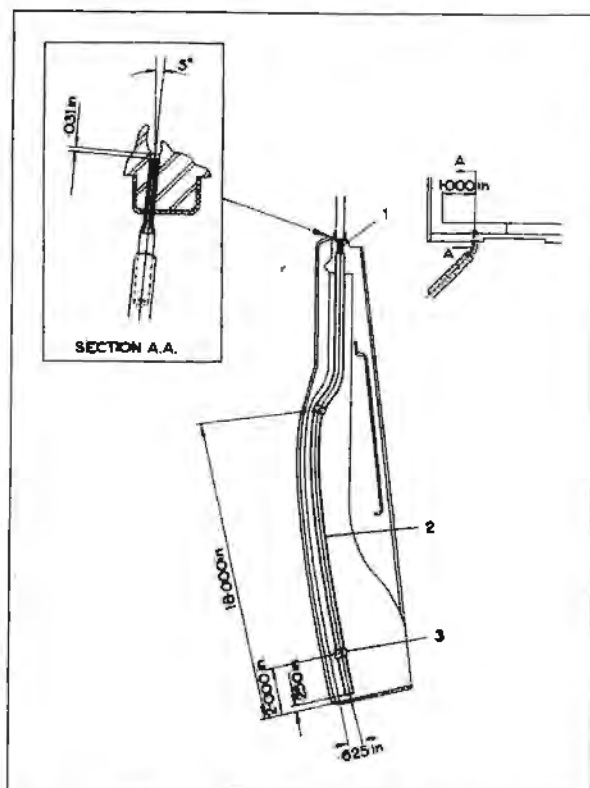


Fig. S.6.—Method of fitting drain to ventilating window.

1. Copper tube.
2. Rubber tube.
3. Fixing clips.

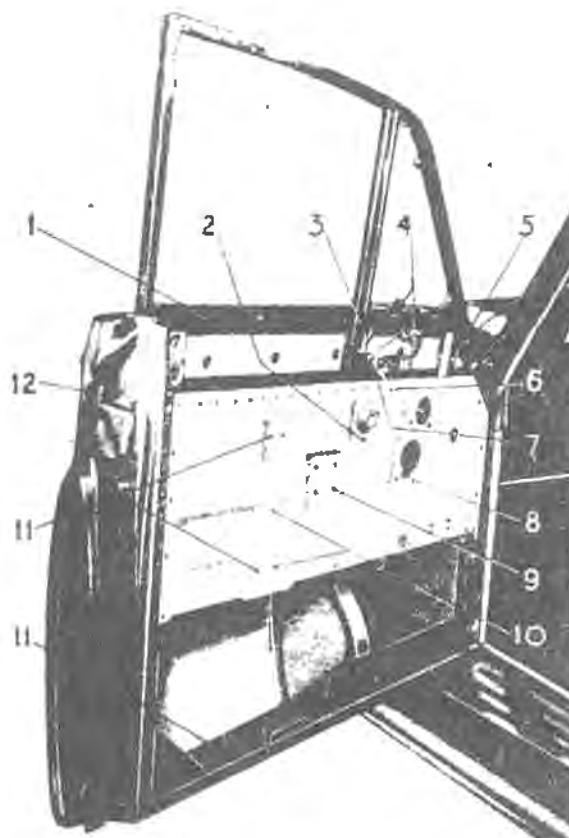


Fig. S.5.—Front door dismantled showing bolt holes.

- | | |
|---|---|
| 1. Window frame rivets. | 7. Window frame bolts. |
| 2. Door lock remote control bolt holes. | 8. Window winder bolt holes. |
| 3. Ventilating window drain pipe. | 9. Window winder centre bracket bolt holes. |
| 4. Ventilating window lower pivot. | 10. Arm rest slide bolt holes. |
| 5. Window frame bolts. | 11. Window stop bracket bolt holes. |
| 6. Door inner panel stiffener bracket bolt. | 12. Door lock screws. |

Drill a hole $\frac{1}{4}$ " diameter, through the rubber seal and the door frame, then enlarge the hole in the door frame to $\frac{5}{16}$ " diameter to give clearance for a 3" length of copper tube, $\frac{1}{4}$ " outside diameter.

Slightly flatten one end of the copper tube to avoid bulging the rubber seal, then attach a 2' length of $\frac{1}{4}$ " diameter rubber tube to the other end and secure it with Bostik adhesive No. 1261.

Insert the flattened end of the copper tube into the rubber seal so that it is 0.031" below the sealing face, then secure the tube with Bostik adhesive No. 1261.

Attach the rubber hose to the door at the points shown in Figure S.6.

When carrying out the above modification, ensure that the drain holes in the bottom of the door are clear.

Drop window and winder mechanism

When reassembling the drop window and winder mechanism, all working parts should be lubricated with Molytone 265 Grease.

On some early cars failures have occurred due to fracture of the lower channel lugs, later type channels have therefore been strengthened accordingly.

However, if replacements are not available, a fractured channel may be repaired in the manner shown in Figures S.7 and S.8.

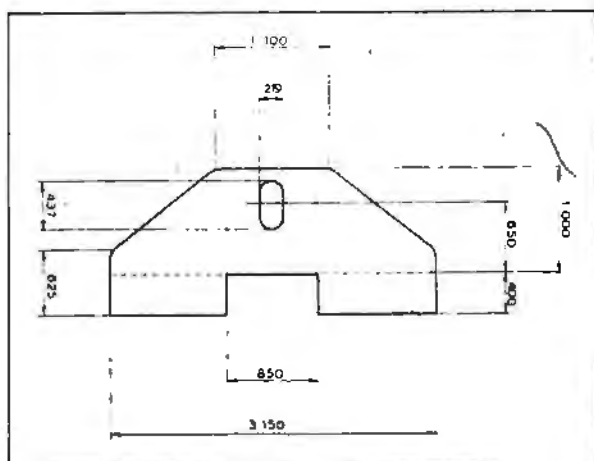


Fig. S.8.—Dimensions for new window channel brackets.
"Bend up along dotted lines"

Door locks and locking mechanism

When refitting the lock, make certain to position the lock in order that the same amount of movement is obtained when the key is turned either clockwise or anti-clockwise; this should be ascertained before "togging" the intermediate lever.

Before refitting the winder mechanism, lubricate all working parts with Molytone 265 Grease.

Refit the mechanism but do not yet tighten the remote control assembly, which is operated by the interior handle.

Insert the handle and move it to the locked position; slide the control assembly back until the bellcrank lever on the lock contacts the backplate, then tighten the screws securing the remote control assembly.

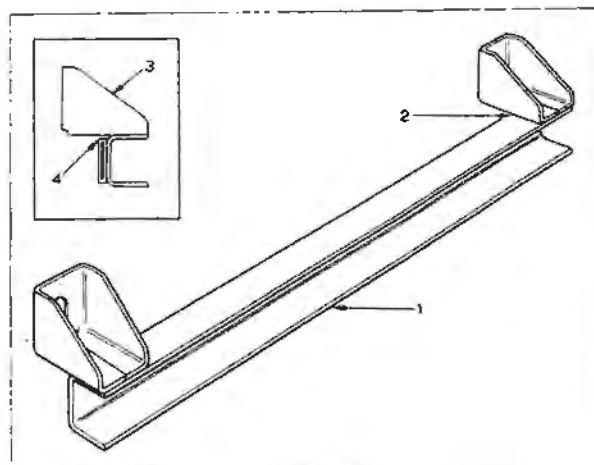


Fig. S.7.—Method of repairing window channel.

1. Window channel with 3. Scrap view of new new brackets welded on. bracket.
2. Weld all around at this 4. Existing bracket to be point on both brackets. cut off here.

If adjusted correctly, the push button should have $\frac{1}{32}$ " free movement before it strikes the contactor and the adjusting screw tongue should be set horizontally rearwards.

Before refitting the "trim", check the locking and releasing action by operating both the interior and the exterior controls.

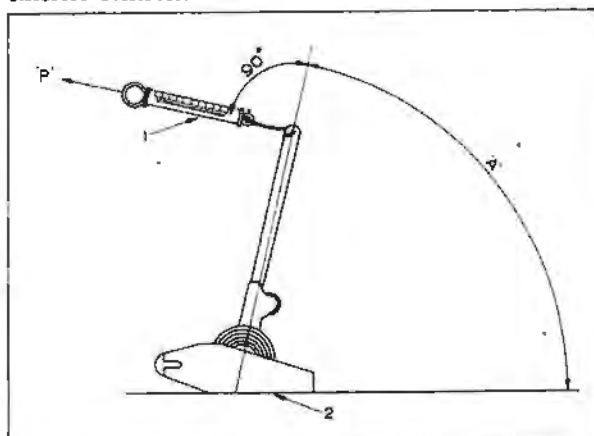


Fig. S.9.—Method of checking door assistor poundage.

1. Spring balance.
2. Body of assistor clamped in position.

Front doors.

'A' = Angle 10.5°
'P' Pull 7.25 lb.
Angle 74.0°
Pull 12.25 lb.

Rear doors.

Angle 10.5°
Angle 80.0°
Pull 4.0 lb.
Pull 10.75 lb.

Striker plate

Should adjustment to the striker plate be necessary, slacken the three retaining screws and reposition the plate to obtain the desired result.

The striker plate should be first adjusted horizontally to provide satisfactory door closure and then adjusted for striker pin relationship, if correct adjustment has been obtained the striker pin should travel along the centre line of the striker plate slot.

Check whether the optimum adjustment has been obtained by closing the door whilst depressing the button in the door handle.

Lubricate the spring for the dovetail wedge with Molytone 265 Grease.

Front door assistor

To check the assistor poundage for opening the door, ensure that the car is standing on level ground then attach a spring balance to the door handle when the door is in the open position, a load of approximately 5 lb. should then be required to close the door.

Checking the assistor poundage on the bench should be carried out at angles equivalent to the door being in both the open and the closed position as shown in Figure S.9.

A positive door stop is incorporated in the upper hinge and a cushioned stop is provided by the assistor when opening the door, under normal operating conditions the positive stop does not operate, as the load is absorbed by the cushioned stop of the assistor.

It should be noted that the door must be initially opened at least 10° before the assistor commences to operate.

When checking the door stop adjustment, the door should be allowed to open and come to rest, **only by the action of the assistor.**

If the adjustment is correct, there should be a clearance of 0.025" between the faces of the positive stop when the door is in the open position as stated above.

Should it be necessary to adjust the clearance between the faces of the positive stop, remove the door "trim", then slacken the assistor retaining screws and reposition them to obtain the desired result.

Having made the necessary adjustment and before refitting the door "trim", lubricate the door assistor with Molytone 265 Grease, at the points shown in Figure S.10.

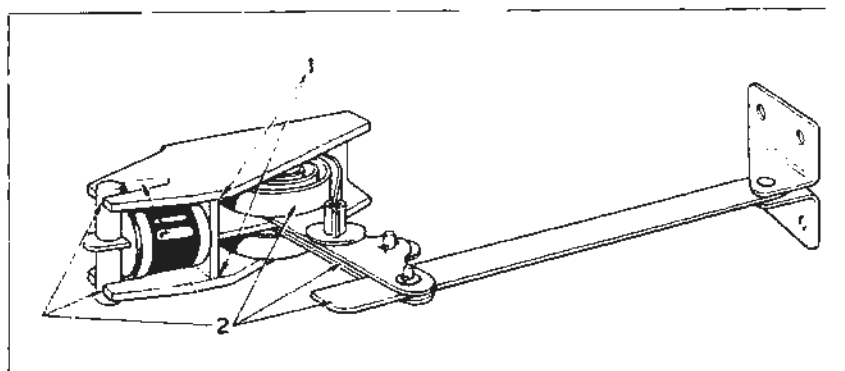


Fig. S.10.—Lubrication of door assistors.

1. File Fillets here.
2. Lubricate at these points.

REAR DOORS

(See Fig. S.11)

TO REMOVE AND DISMANTLE

The procedure for removing and dismantling the rear door is similar to that adopted for the front door, however, the following points should be noted.

Drop window

To enable the drop window to be removed from the rear door, withdraw the rear channel and window stop, this allows the window to be lowered to enable it to clear the channels, then raised again and lifted out.

Quarter light glass

To remove the quarter light glass, withdraw the frame, then remove the felts from the upper and rear channels, this allows access to the screws securing the

quarter-light channel. Remove the screws and draw the channel downwards to enable the glass to be withdrawn.

TO ASSEMBLE AND FIT

The procedure for assembling and fitting the rear door is similar to that adopted for the front door, therefore reverse the procedure given for removal and dismantling but note the following.

Door assistor

The rear door assistor is not intended to open the door entirely on its own, therefore when checking the assistor poundage, with the door in the open position, a spring balance reading of 4 lb. is adequate to close the door.

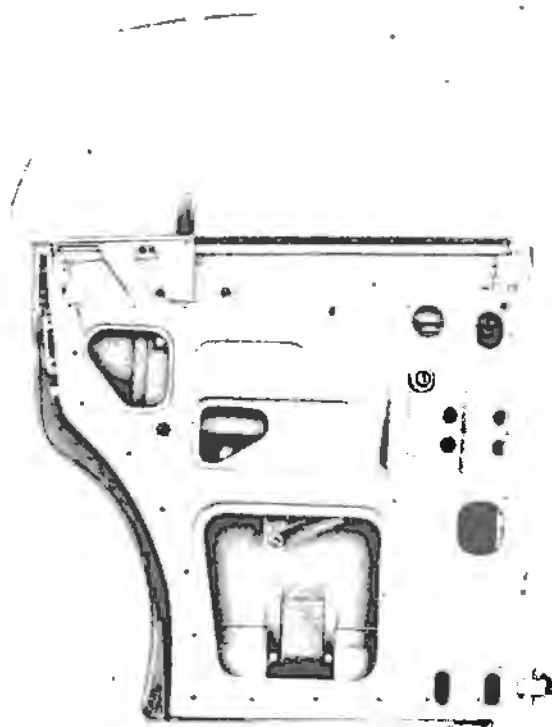


Fig. S.11.—Rear door with "trim" and finisher removed.

DOORS AND LUGGAGE BOOT LID SEALING

(See Fig. S.12)

Should it be necessary to renew the door seals, it is most important that great care is taken to ensure satisfactory adhesion; this is only possible providing the contact faces of the seals and the body are perfectly clean.

Bostik adhesive No. 1261 is recommended for securing the seals, but as the seals are not supplied already prepared they should be thoroughly cleaned with Bostik cleaner two hours before it is necessary to apply the adhesive.

When the contact faces have been prepared, apply the adhesive to both surfaces and allow it to "air-dry" for 15 minutes before fitting the seals.

The seals should be pressed firmly into position so that any trapped air may be excluded, the correct seals for use throughout are shown in Figure S.12.

When fitting seal UB.2230, ensure that it is fitted to the sill with the lip downwards and NOT towards the door as is the case elsewhere; this rubber section has a wedge-shaped base which renders the lip invisible when the door is closed.

Sponge cord is used for reinforcing on the front pillar for a distance of 2" to 3" at the waistline.

In order to follow the body contour, twist the seal on the forward edge of both front and rear doors immediately above the waist rail.

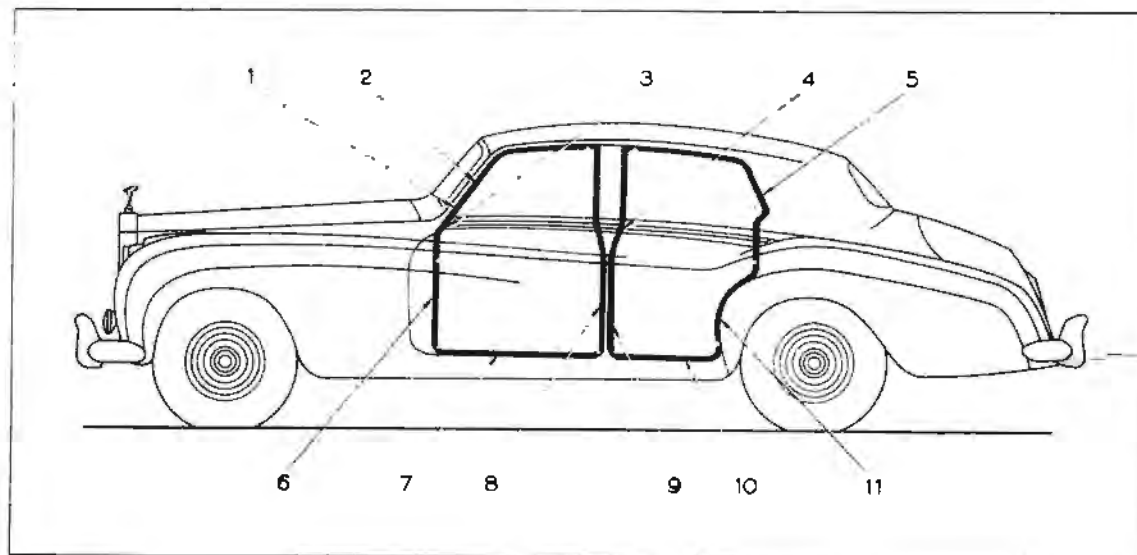


Fig. S.12.—Method of fitting door seals.

- | | | |
|--|--|---|
| 1. Seal reinforced by sponge rubber UB.2595. | 5. Right-hand seal UB.2225, left-hand seal UB.2226 | 9. Front right-hand and rear left-hand seals UB.2227. |
| 2. Right-hand and left-hand seals UB.2229. | 6. Portion of seal UB.2229 | 10. Right-hand and left-hand seals UB.2230. |
| 3. Twist the seal at this point. | 7. Right-hand and left-hand seals UB.2230 | 11. Right-hand seal UB.2594, left-hand seal UB.2593. |
| 4. Twist the seal at this point. | 8. Front left-hand and rear right-hand seals UB.2228 | |

When attaching the seal to the front pillar, cut the rubber obliquely at the base to ensure complete seating of the seal to the body.

If the car is constantly used on dusty roads it may be necessary to fit additional seals to the bottom corners of the door posts 'A' and 'C', this is provided for by means of moulded rubber seals as shown in Figure S.13.

When fitting these corner seals, trim the existing seals fitted to posts 'A' and 'C' and along the sills, so that they butt against the corner seals (see Fig. S.13).

In order to obtain optimum results it may be necessary to trim the back edge of the corner seals, which should be secured in position by means of Bostik adhesive No. 1261.

To check whether the seals are effective; place a piece of paper against the seal and close the door or boot lid, if the sealing is efficient the paper should be firmly held by the seals; this check should be made around the complete seal.

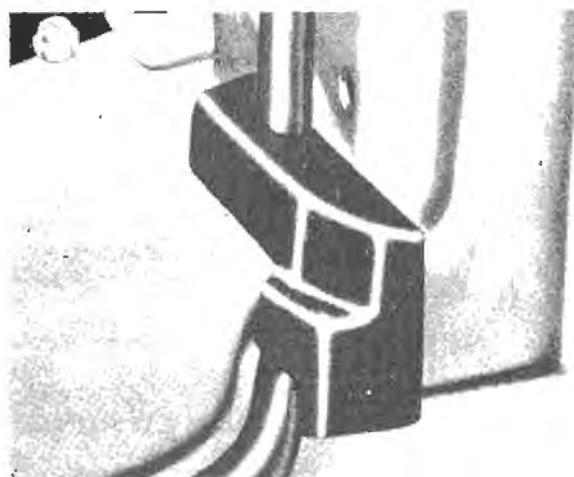


Fig. S.13.—Corner seal shown in position.

Front seals.		Rear seals.	
Left-hand..	UB.2670.	Left-hand.	UB.2672.
Right-hand.	UB.2671.	Right-hand.	UB.2673.

LUGGAGE BOOT

Boot lid assistors

When checking the load required to operate the boot lid assistors, attach a spring balance to the luggage strap rail, then a pull of approximately 7 lb. should be required to move the lid from the fully open position.

If it is necessary to adjust the assistors, remove the "trim" and re-set each assistor an equal amount until the desired result is obtained.

In the case of a boot lid having been removed, the assistors may be checked individually as shown in Figure S.14; the pull on the spring balance should then be between 57 and 60 lb.

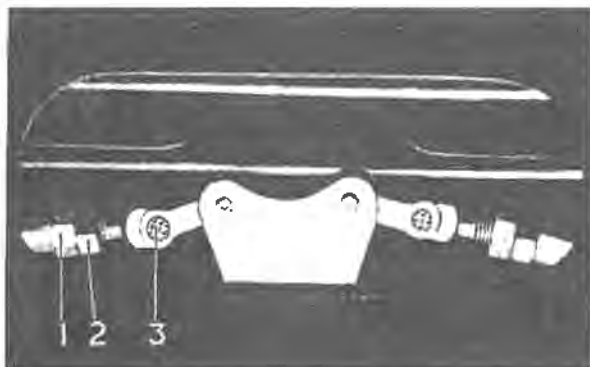


Fig. S.15.—Cable adjusters for luggage boot lock.

1. Adjusting nut.
2. Locknut.
3. Pivot.

Boot lock

Necessary adjustment of the striker pin is effected by slackening and repositioning the retaining screws.

If this does not provide sufficient adjustment, a further range of adjustment can be obtained by reversing the striker.

Adjustment can then be obtained by the off-set positioning of the pin on its mounting plate.

Check the operating cables to ensure that there is neither slackness or too much tension, then with the boot lid open, turn the rotors to the locked position and slowly depress the push button, when both rotors should be released simultaneously; means of adjustment for the cable is illustrated in Figure S.15.



Fig. S.14.—Checking luggage boot lid assistor poundage.

Complaints concerning stiff operation of the push rod button may be due to the toggle lever pivots being corroded (see Fig. S.15). In this case remove the corrosion to free the joints then lubricate the pivots with Molytone 265 Grease.

If corrosion has reached an advanced stage, the assembly should be renewed.

The private lock fitted to the luggage boot lid operates in a similar manner to the private locks fitted to the front doors; to remove the handle, which also contains the lock, proceed as follows.

Remove the "trim" from inside the boot lid, unscrew the two retaining nuts and remove the handle assembly from the lid (see Fig. S.16).



Fig. S.16.—Luggage boot lock and handle assembly.

VIBRATIONS AND RATTLES

Provision has been made on current production cars to stop body rattles and creaks, but on early cars where no such provision was made, rattles and creaks may develop during service.

The following information deals with the method of overcoming this trouble and the list provided at the end of this Sub-section quotes sizes and Part Numbers of anti-rattle felts available.

RATTLES FROM DOORS

Arm rest and slide

In the event of rattle from the arm rest or slide, this fault may be due to the arm rest not being securely attached to the door "trim".

If this is the case, the fault may be rectified by reducing the length of the distance pieces and the retaining screws which secure the arm rest slide to the door "trim".

Door check strap

Creaking noises from the check straps during opening or closing of the doors may be caused by the spiral spring in the check strap assistor fouling the fillet welds on the check strap body; in this case sufficient clearance for the spring should be obtained by filing the fillet welding.

File the fillet welding sufficiently to ensure that a minimum clearance of 0.050" is obtained around the periphery of the spring, when the check arm is at any point of its travel (see Fig. S.10).

When this operation is completed and before re-assembling the check strap, the spiral spring should be lubricated, while in its free state, with Molytone 265 Grease (see Fig. S.10).

Window regulator arm

To prevent the window regulator arm from rattling against the window channel, felt washers should be fitted between the regulator and the button.

These washers should be cut from $\frac{1}{8}$ " thick black art felt and should be 2" square with a central cut $\frac{3}{4}$ " long to enable it to fit over the regulator arm buttons.

Care should be taken to ensure that each window regulator is fitted with 3 "wave" washers and that the regulator is adequately lubricated with Molytone 265 Grease, particularly at points where the "wave" washers are fitted.

It is also necessary to ensure that the fit between the regulator buttons and their slides is of a reasonable standard.

Front door glove boxes

On early cars the front door glove boxes are secured by four countersunk headed screws, but as these have a tendency to work loose, later cars have had the countersinking deleted and binding head screws fitted in place of the countersunk headed screws.

Therefore on early cars, in order to replace the countersunk headed screws, binding head screws should be fitted, together with plain washers.

Garnish rail

Rattle may be caused by the garnish rail contacting the window frame.

In this case, ensure that the garnish rail does not foul the ventilator window striker plate, then attach small pieces of headcloth to the back of the garnish rails on the front and rear doors, using Bostik 'A' adhesive.

Door "trim" panel

In order to stop the "trim" panel vibrating between the waist finisher and the garnish rail, a strip of Aeroprene $1\frac{1}{2}$ " wide should be fitted to the door "trim" panel.

Fit the Aeroprene over the top edge of the door "trim" panel and fold it under the leather.

Door lock remote control links

Rattles caused by the door lock remote control links may be overcome by attaching black art felt, $\frac{1}{4}$ " thick, to the inner panels of the door; the felt should be secured by means of Bostik 'A' adhesive.

To avoid bending the control bar whilst fitting, it is advisable that this modification be carried out before the door lock is fitted.

Door inner panel stiffener bracket (see Fig. S.5)

The door inner panel stiffener brackets on early cars are secured by means of countersunk headed screws; these have a tendency to work loose and on later cars the countersinking has been deleted and binding head screws fitted in place of the countersunk headed screws.

In order to replace the countersunk headed screws on early cars it is necessary to fit plain washers with the binding head screws.

RATTLES FROM BEHIND FACIA

Before proceeding to fit the felts it will be necessary to remove the dashboard assembly, and in order to simplify location when refitting it is advisable that it should be removed complete with its fixing brackets.

Cubby boxes

Felt should be attached to the cubby boxes by means of Bostik 'A' adhesive, so that the top, back and bottom of the boxes are covered as shown in Figure S.17.

Instrument panel side plates

Before attaching the felts to the side plates, cut a hole in the centre of each felt, leaving sufficient of the material to turn over and cover the sharp edge of the side plate (see Fig. S.18).

Attach the felt to the side plate and secure it with Bostik 'A' adhesive.



Fig. S.18.—Method of attaching anti-rattle felts to instrument panel side plates and radio loudspeaker duct.

It is important that the felt completely covers the sharp edge, particularly at the bottom of the hole, as the speedometer trip has a tendency to contact the side plate at this point, therefore if the edge is not covered, it is liable to cause rattle or even cut through the felt covering the speedometer trip (see Fig. S.20).

Radio loudspeaker duct

The radio need not be removed in order to fit the felt to the loudspeaker duct; fit the felt by sliding it over the top of the duct as shown in Figure S.18.

Care must be taken to ensure that the felt is fitted well to the rear of the loudspeaker duct, in order to prevent the various wires and cables from knocking against the back edge of the duct.

Demister ducts

In order to simplify the removal of the demister ducts, it is essential that the demister cross-tube be



Fig. S.17.—Method of attaching anti-rattle felt to cubby box.

dismantled.

The demister duct felts should be sewn together in order to produce four sleeves, these should then be fitted by sliding them into position over the ducts (see Fig. S.19).

Speedometer cable, trip winder and clock winder

In order to attach the felt sleeve to the speedometer cable, after detaching it from the gearbox, unclip the cable from the bulkhead and draw it into the saloon.

To permit easy fitting of the sleeves, they should be cut down the length of the sleeve wrapped around the cable or trip, then sewn up again (see Fig. S.20).

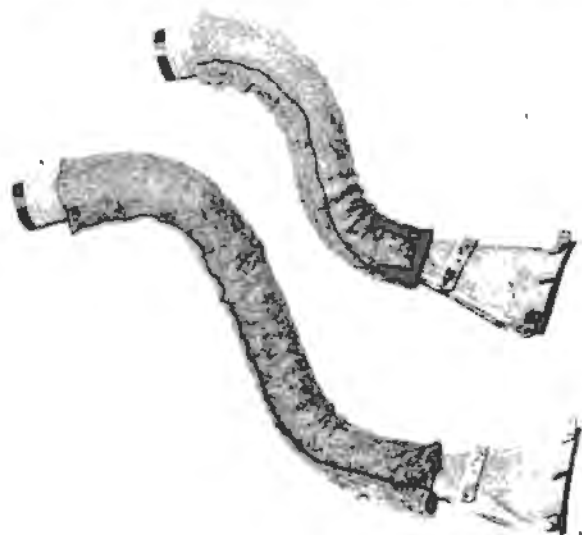


Fig. S.19.—Method of attaching anti-rattle felts to demister ducts.

Dimensions and Part Numbers of anti-rattle felts

All felts are 0.125" thick.

		Part No.
Cubby box—R.H.	16.000" × 7.500"	UW.1928
Cubby box—L.H.	19.000" × 7.500"	UW.1929
Instrument panel side plates	8.500" × 5.500"	UW.1930
Demister ducts	24.00" × 2.250"	UW.1924
Demister ducts	15.500" × 2.250"	UW.1926
Radio loudspeaker duct	22.000" × 10.500"	UW.1923
Speedometer cable trip winder and clock winder	13.000" × 0.500"	UW.1933



Fig. 5.20.—Method of attaching anti-rattle felts to speedometer cable and trip winder.

WINDSCREEN AND REARLIGHT GLASS

(See Figs. S.21, S.22, S.23, S.24 and S.25)

TO REMOVE THE WINDSCREEN

Before attempting to remove the windscreen, it is necessary to carry out the following procedure.

Cover the bonnet in the vicinity of the windscreen with thick felt to ensure against possible damage to the paintwork when removing the windscreen.

Remove the instrument panel by unscrewing the four retaining screws situated two at the top and two under the bottom edge of the panel.

Detach the trafficator switch and unscrew the serrated nut at the rear of the capping rail.

Remove the retaining screws and detach the upper and side windscreen finishers.

Remove the "trim" pads from beneath the capping rail at each end; each "trim" pad is secured by three 2 B.A. screws and four P.K. screws.

Remove the grab handles which are secured by two $\frac{1}{4}$ " UNF. nuts.

Unscrew the four 2 B.A. nuts from each end of the capping rail; these are located at the rear of the capping rail.

Remove the two 2 B.A. setscrews securing the interior mirror support; these are situated underneath the capping rail, then withdraw the capping rail with the mirror attached.

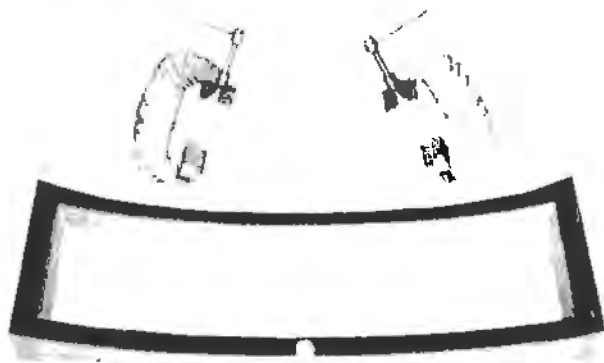


Fig. S.21.—Special jig for pressing in windscreen.

Note:—Special care must be taken to ensure that the packing behind the capping rail is maintained in its original position to ensure correct adjustment when refitting.

Slacken the screws and bolts which secure the polished metal strip at the base of the windscreen aperture.

Ensure that the wiper blades are clear of the windscreen so that they do not obstruct the removal of the windscreen.

The windscreen, together with the chromium plated finisher, is held in position by the rubber seal and should be pressed out of its aperture in the body by two operators, working one each end of the screen from the outside of the car.

TO FIT NEW WINDSCREEN

The radio aerial should be removed from the car to enable the special jig to be placed correctly in position.

Clean off all traces of the old sealing compound from the windscreen aperture, then apply a thin coating of Secomastic sealing compound about $\frac{1}{8}$ " thick to the outer edge of the aperture; this is to prevent the ingress of water into the saloon.

Examine the rubber seal and if in a serviceable condition it can be used with the new screen; if it is not serviceable, a new seal should be fitted.

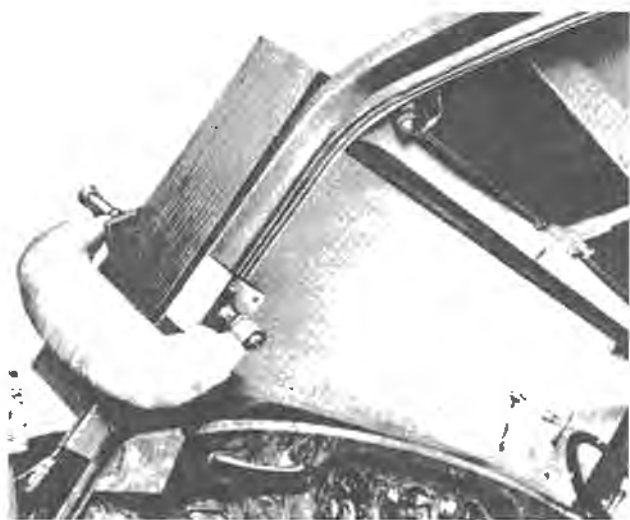


Fig. S.22.—Method of fitting clamps for special jig.

If the original seal is to be fitted, ensure that it is perfectly clean and free from old sealing compound.

Before fitting the seal to the glass, apply a thin coating of sealing compound in the channel of the seal, into which the glass is to fit.

Examine the chromium plated finisher and if in a serviceable condition, fit it into the seal; if the finisher is distorted, it should be renewed.

It is essential that the finisher is fitted to the seal before the windscreen is fitted to the car.

Fit a length of cord around the inside lip of the rubber seal, leaving the two ends free at the top of the windscreen (see Fig. S.24).

Working from the outside of the car carefully ease the windscreen assembly squarely into position as far as possible by hand, ensuring that the ends of the cord are inside the car and not trapped.

Fit the jig (RH.345) shown in Figure S.21 and clamp it into position by means of the clamps and blocks, as shown in Figures S.22 and S.23.

Care should be taken when tightening the clamps to ensure that an even pressure is exerted on the wooden frame; an uneven pressure may dislodge the chromium plated finisher or even break the glass.

When the windscreen is firmly in position carefully pull one end of the cord at an angle to the windscreen so that the lip of the rubber seal is drawn into position.

Continue this operation around the screen to the bottom corner, then repeat the procedure for the opposite side of the screen. Pull both ends of the cord together to guide the rubber lip into position at the bottom of the screen.



Fig. S.24.—View of windscreen showing cord in position for fitting rubber seal.



Fig. S.23.—Special jig clamped in position.

Remove the jig and check that the screen assembly is flush with the body at the front; if not, refit the jig and apply further pressure until the desired result is obtained.

Test the windscreen for leaks by means of water applied under pressure.

Parts removed to enable the windscreen to be renewed should be fitted by reversing the procedure for their removal.

TO REMOVE THE REARLIGHT GLASS

Unscrew the retaining screws and withdraw the finisher.

Remove the upper front "trim" from the luggage boot, then disconnect the two demister cables; one leads to the demister switch and the other to earth.

The glass should be pressed evenly towards the interior of the car by one operator so that a second operator working inside the car may remove the glass.

TO FIT A NEW REARLIGHT GLASS

Clean off all traces of the old sealing compound from the rearlight aperture, then apply a thin coating of sealing compound, approximately $\frac{1}{8}$ " thick, to the inner edge of the aperture; this is to prevent the ingress of water into the saloon.

Examine the rubber seal and if in a serviceable condition it may be used with the new rearlight glass; if it is not in a serviceable condition a new seal should be fitted.

Before fitting the seal to the glass, apply a thin coating of sealing compound to the channel of the seal into which the glass is to be fitted.

Fit a length of cord around the inside lip of the rubber seal, leaving the ends free at the top of the rearlight glass.

Carefully ease the rearlight glass assembly into its aperture from inside the car, then fit the four wooden fixing blocks as shown in Figure S.25; care should be taken to ensure that the cord or the demister cables are not trapped during this operation.

Working from the centre towards the ends of the glass, screw up the adjusting nut on each block evenly and in succession, until slight pressure is exerted on the lip of the seal.

Pressure on the seal should be evenly applied around the complete inner edge of the aperture; uneven pressure may result in a broken glass.

Carefully pull one end of the cord at an angle to the glass so that the lip of the rubber seal is drawn into position, continue this operation around the glass to the bottom corner, then repeat the procedure with the other end of the cord for the opposite side of the glass.

Pull both ends of the cord together to guide the rubber lip into position at the bottom of the glass.

Make certain that the lip of the rubber seal is in position completely around the aperture, then carefully apply further pressure by means of the blocks until the glass is fully registered in the aperture.

Remove the wooden blocks and fit the finisher to the rearlight.

Connect the demister leads and refit the "trim" to the luggage boot.

Remove all traces of superfluous sealing compound, then test the rearlight for leaks by means of water applied under pressure.



Fig. S.25.—Method of fitting clamps for pressing in rearlight glass.

FRONT AND REAR SEATS

FRONT SEAT—TO REMOVE

Depress the catch in the centre of the front seat valance and slide the seat forward.

Remove the Allen screws from the rear end of each slide, then move the seat back and unscrew the Allen screws from the front end of each slide.

It will then be possible to remove the front seat from the car.

Care should be taken to ensure that the distance pieces from each end of the slides are retained.

FRONT SEAT—TO FIT

To fit the front seat, reverse the procedure for removal, but noting the following points.

On early cars, complaints of front seat rattles may be due to one or both of the following causes.

- (i) Shrinkage of the hardboard mounting which causes the woodscrews and setscrews to become loose.

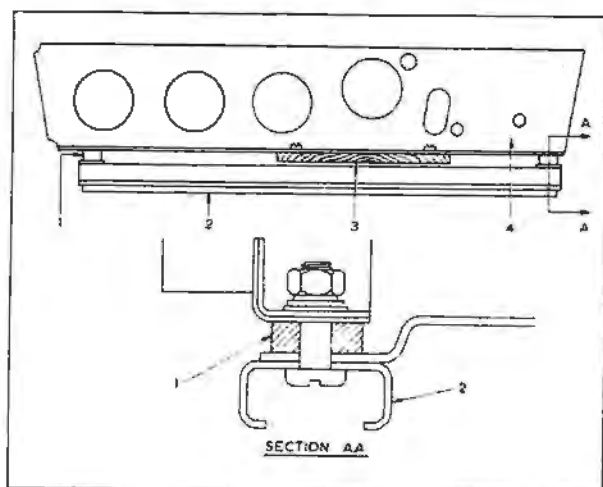


Fig. S.27.—Method of fitting hardwood block to eliminate front seat rattles.

1. Aluminium distance piece.
2. Seat runner.
3. Short hardwood mounting block (UW.1634).
4. Seat.

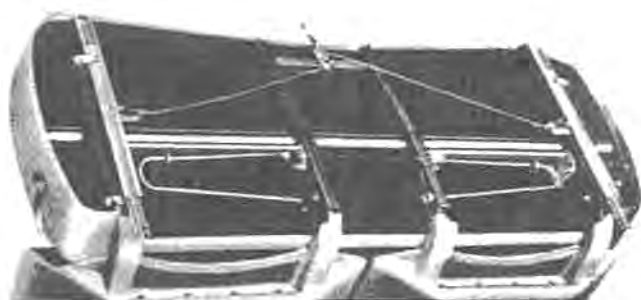


Fig. S.26.—Front seat showing slide release and individual back rest rake.

- (ii) Settling of the leather trim around the screw holes in the hardwood blocks, which causes the setscrews, securing the slides to the floor, to become loose.

To rectify these faults proceed as follows.

- (i) Remove the existing mount and in its place fit a short hardwood block and aluminium distance pieces as shown in Figure S.27, then refit the runners.
- (ii) Open out the holes in the existing hardboard mounting to $\frac{1}{2}$ " diameter, then press mild steel bushes into the holes, so that when the floor slides are tightened down they bear on the bushes instead of the leather-trimmed hardboard (see Fig. S.28).
When refitting the seat slides, use $\frac{1}{4}$ " diameter UNF. Allen screws in place of the existing setscrews.

Rattles may also be detected from the spring-loaded locking bolts in the slides; in this case the fault can be rectified by building up to obtain a sliding fit in the bracket and the slide.

The slide release and the individual back-rest rake adjusters are illustrated in Figure S.26.

It is seldom possible to cure internal rattles from the slides and, in such cases, it is recommended that a replacement unit be fitted.

Should it be necessary to adjust the front seat catch, reposition the 2 B.A. bolts and the nipples situated on the seat slide cables to obtain the desired result.

REAR SEATS AND SQUABS—TO REMOVE

The rear seat is secured by eight Philip screws, situated four at the top and four at the bottom. Working from inside the luggage boot, remove these screws to enable the seat to be lifted from the car.

Each head squab is secured by three screws; these also should be removed from inside the luggage boot, to enable the squab to be removed.

REAR SEATS AND SQUABS—TO FIT

To fit the rear seat and squabs, reverse the procedure for removal.

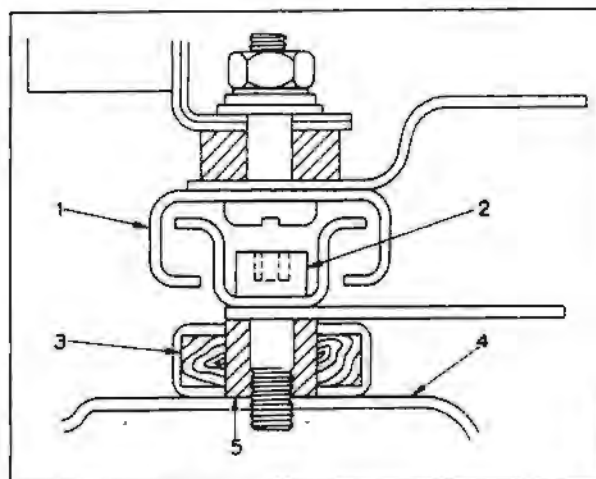


Fig. S.28.—Method of fitting bushes in hardwood blocks for fixing front seat to floor.

- | | |
|-----------------------------|-------------------------------|
| 1. Seat runner. | 4. Car floor. |
| 2. Allen screw (UG.1422). | 5. Mild steel bush (UB.1935). |
| 3. Hardwood mounting block. | |

ACCESSORIES

SUN VISORS

Inaccurate setting of "friction-loading" on the sun visor pivot should be corrected by fitting a wave washer in the place of the Belleville washer at present fitted to the pivot pin.

Care should be taken when dismantling the pivot assembly to note how the parts are fitted, as correct assembly and adjustment is most important.

Remove the sun visor from the car and dismantle the pivot assembly, discard the Belleville washer and in its place fit a wave washer and a plain washer as

shown in Figure S.29.

Using Molytone or Retinax "A" Grease, liberally smear the pivot assembly and lightly smear the Ferodo friction pad to prevent surface chafing, then assemble the unit as shown in Figure S.29.

Conveniently hold the sun visor bracket in a vice and attach a spring balance to the edge of the blade, then measure the pull required to move the visor blade; the correct load on the spring balance should be $2\frac{1}{2}$ lb.

Tighten the adjusting nut until the spring balance reads approximately 2 lb., then further tighten the adjusting nut until the correct loading is obtained.

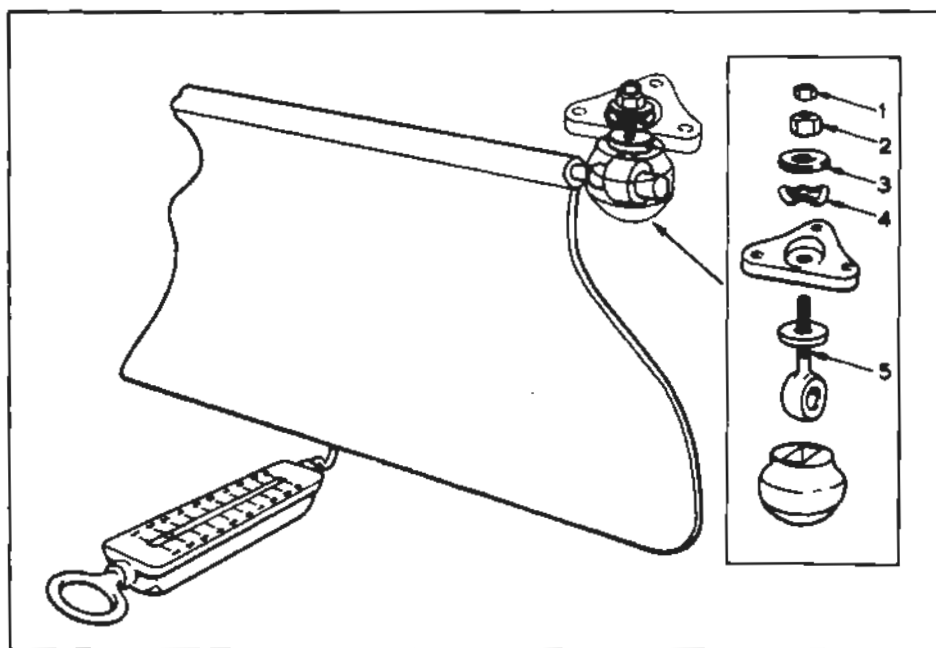


Fig. S.29.—Sun visor assembly and method of checking poundage.

- | | |
|---------------------------|------------------|
| 1. Adjusting nut locknut. | 3. Plain washer. |
| 2. Adjusting nut. | 4. Wave washer. |
| 5. Eyebolt | |

COMPANION SET MIRRORS—TO REMOVE

Before proceeding to remove the mirrors, remove the light bulb from each box and from the right-hand box remove also the cigar lighter, then proceed as follows.

Unscrew the three screws securing each head squab and remove the head squabs; access to these screws is obtained via the luggage boot.

Detach the door sealing sufficiently to expose the three screws which secure the "trim" pad, then remove the screws.

Remove the strap, then carefully ease off the "trim" which is also secured by panel pins.

The three screws securing the box will then be visible; remove these screws, which are situated in the forward, rear and upper faces of the box, then withdraw the box.

COMPANION SET MIRRORS—TO FIT

To fit the mirror and box, reverse the procedure for removal, noting the following points.

Paint around the edge of the glass with matt black enamel, then bind the back with black adhesive tape; this will provide a soft bed for the mirror and will reduce reflections of the surrounding woodwork.

Before clamping the mirror to the woodwork, seal all round with 1" wide masking tape.

Complaints are occasionally received concerning oxidation of the silver and this is usually due to the "dum-dum" which is used for dust sealing purposes; it is important that this should not be used adjacent to the mirror.

PETROL FILLER DOOR (See Fig. S.30)

When fitting a new rubber seal under the petrol filler door, it may be necessary either to trim the seal or to fit packing under it, to enable the door to fit flush with the wing.

Failures are usually attributed to heavy loading on the electrically operated bolt.

To ensure correct operation of the bolt, check the alignment of the filler door, then slowly close the door to ascertain what pressure should be applied in order to compress the rubber seal before the bolt engages the tag.

Check the alignment of the engagement tag and if necessary reposition the bolt aperture.

This should be done either by packing out the tag or by elongating the aperture by filing.

Information regarding electrical actuation of the petrol filler door is contained in Section M.

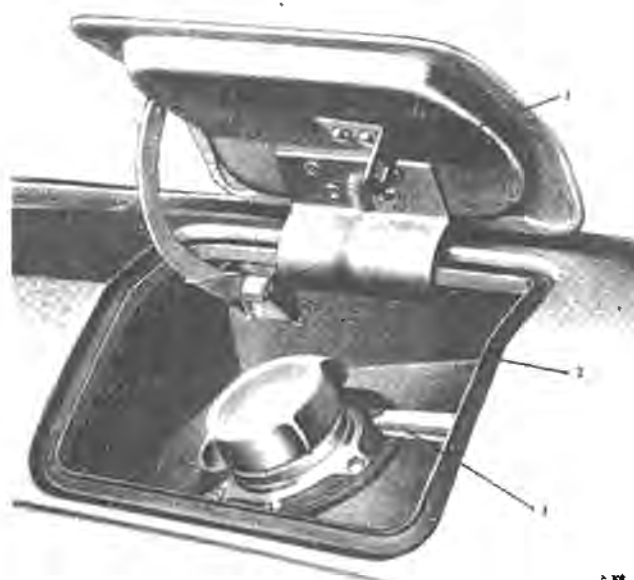


Fig. S.30.—Petrol filler door.

1. Engagement tag.
2. Rubber seal.
3. Electrically operated bolt.

RADIATOR GRILLE

TO REMOVE

Should it be necessary to remove the radiator grille, proceed as follows.

Remove the bonnet top, then remove the nuts and bolts which secure the grille to the radiator header tank and to the top edge of the wing valance.

Detach the front bumper from the outrigger brackets.

Unscrew the retaining screws and bolts, then remove the front apron.

Remove the retaining screws and detach the stone-guard situated at the rear of the front apron, then remove the grille from the car.

TO FIT

When refitting the grille to the car, reverse the procedure given for its removal.

ELECTRICALLY OPERATED WINDOWS

The electrically operated windows, introduced on Rolls-Royce and Bentley cars, enable the windows to be raised or lowered, by both the passengers and the driver, with the minimum amount of effort.

This new feature is offered as an optional extra and can be installed if specified when ordering, but it cannot be fitted retrospectively.

Control

Self-centering toggle switches, which are conveniently mounted on each door, control the up and down movement of the windows (see Fig. S.37); any desired window position may be obtained, as movement

of the window will cease immediately on releasing the switch.

To enable all windows to be operated from the driving position, four switches are mounted on the driver's door (see Fig. S.38).

Raising or lowering the window normally takes 2 to 3 seconds, but this time may vary slightly due to prevailing conditions of the window channel felt, when the window reaches the end of its travel it is stopped by "stalling" against the special rubber buffers; the top buffer is incorporated in the window seal and the lower buffers are bolted to the chain casing.

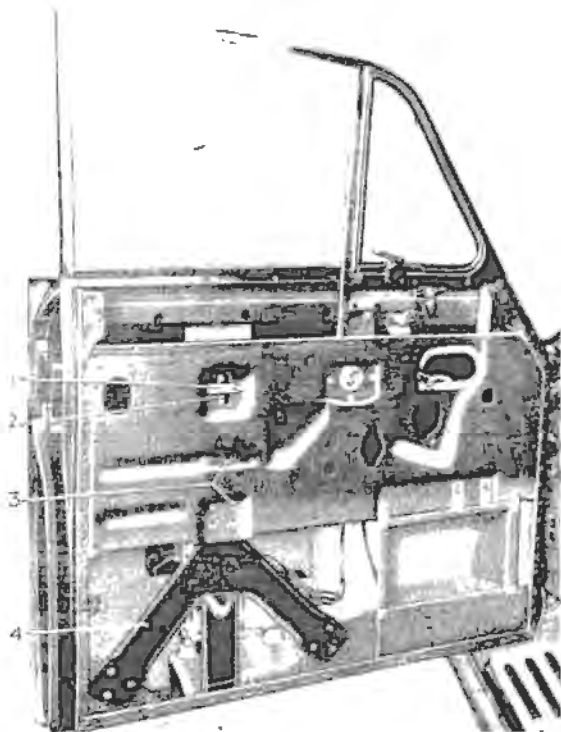


Fig. S.31.—Left-hand front door with "trim" removed.

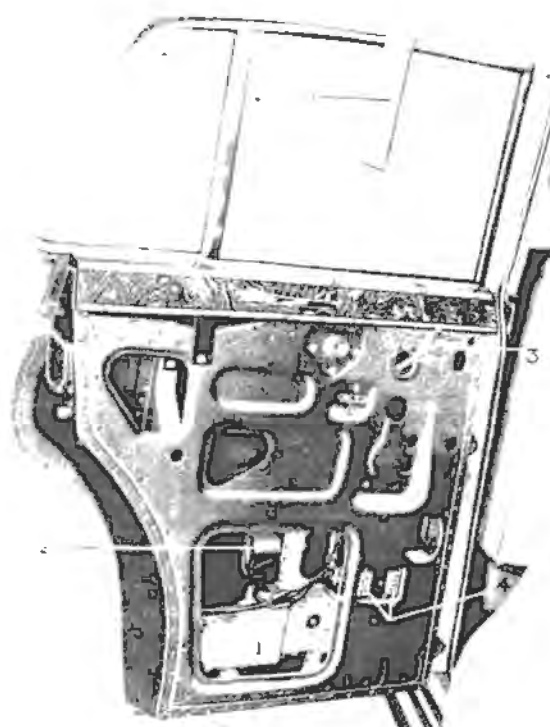


Fig. S.32.—Left-hand rear door with "trim" removed.

1. Mechanism stop.
2. Mechanism stop tongue.
3. Screw holes for arm rest slide.
4. Door brace.

1. Masking tape for securing window.
2. Lower buffer stop.
3. Cables for switch.
4. Retaining nuts for check strap.

Electric motor

The window mechanism is actuated by means of an electric motor which is enclosed together with the drive and the brake mechanism inside a protective casing.

The electric motor is a reversible type unit, the direction of rotation being provided by dual field windings; incorporated in the motor is a thermostatically controlled cut-out.

This cut-out is provided to safeguard the motor against possible damage due to overloading should a window switch be held in the operating position after the window has reached the fully open, or fully closed position.

The motor will heat up and the thermostatically controlled cut-out will break the circuit; after a wait

of several seconds the circuit is automatically restored and the switch may again be effectively operated.

Further protection for the motors is provided by four fuses situated in a fuse box which is mounted on the left-hand side of the dashboard.

No relay is necessary in the electrical circuit as the current for the motor is taken directly by the switches (see Fig. S.45).

Transmission

The drive from the motor is transmitted to the mechanism through a flexible coupling which in turn drives a steel worm and nylon reduction gear.

A driving sprocket attached to the reduction gear spindle and an idler sprocket mounted on the upper end of the chain casing carries an endless chain; the

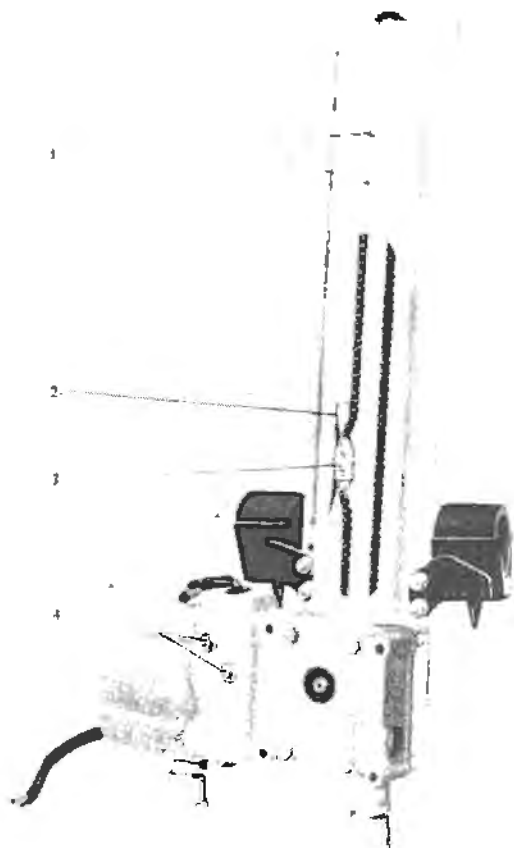


Fig. S.33.—Motor and mechanism assembly for rear door.

1. Studs for upper flexible mounting.
2. Chain tension spring.
3. Special pick-up link.
4. Solenoid retaining nuts.

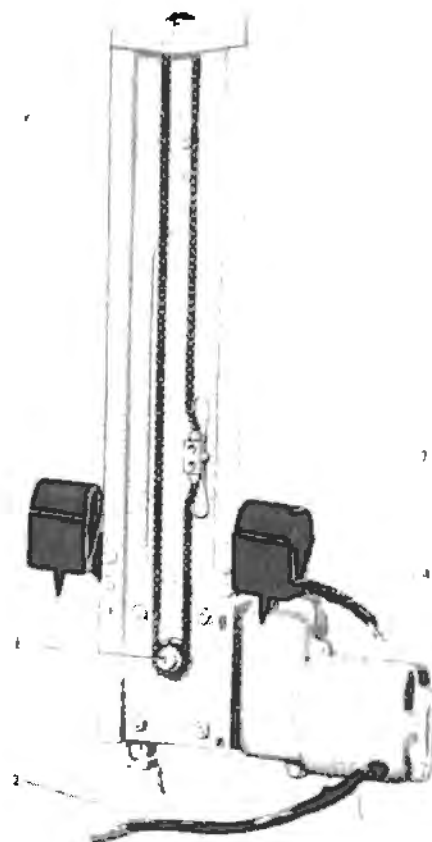


Fig. S.34.—Motor and mechanism assembly reverse side L.H. rear door.

1. Lower buffer stop.
2. Cables to solenoid.
3. Cables to electric motor.
4. Chain driving sprocket.

chain is secured by means of a special "pick-up" link which is bolted to the window support channel; this link forms part of the chain and is secured by two special 90° links (see Fig. S.34).

A tensioning spring is secured to the "pick-up" link in order to take up any slackness in the chain and to prevent chain rattle.

Brake

A brake which is built into the motor assembly is provided to prevent the window moving once the operating switch has been released.

The brake mechanism consists of a solenoid, a coil spring and plunger and a brake drum; the brake drum forms an integral part of the flexible coupling.

When a switch is applied and the motor is operating, the solenoid, which is connected in parallel with the motor, becomes energised and the brake is released; on releasing the switch, the solenoid becomes de-energised and the brake is applied by means of the coil spring and plunger which contacts the brake drum (see Fig. S.43).

TO REMOVE THE MOTOR AND MECHANISM ASSEMBLY

Should it be necessary to remove the motor and mechanism assembly from the car, it is advisable before proceeding with this operation to remove the fuses or disconnect the leads from the battery.

Front Doors

Remove the arm rest from the door and detach the arm rest slide by removing the two retaining screws.

Note the angular position of the handle on the interior of the door to ensure that it is returned to its original position when refitting, then unscrew the escutcheon with a 'C' spanner and draw the handle from its splines.

Using a screwdriver, carefully ease the "trim" from the door, taking care not to damage the "trim", paintwork or the concealed spring fasteners, then disconnect the cables from the switch and remove the "trim".

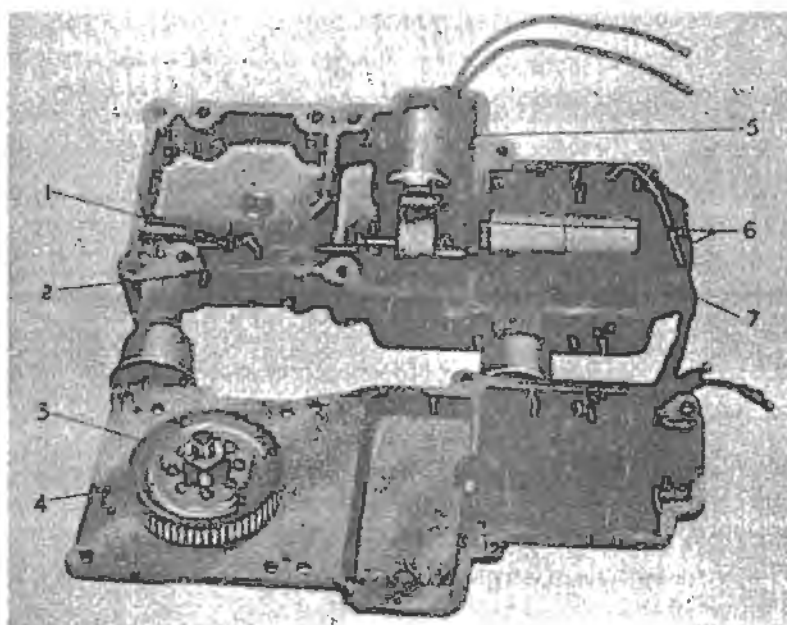


Fig. S.35.—Electric motor and drive assembly with cover removed.

- | | |
|--------------------------------------|-------------------------------------|
| 1. Worm drive | 4. Nylon worm wheel reduction gear. |
| 2. Flexible coupling and brake drum. | 5. Brake solenoid. |
| 3. Plain washer. | 6. Rubber shock washers. |
| | 7. Electric Motor |

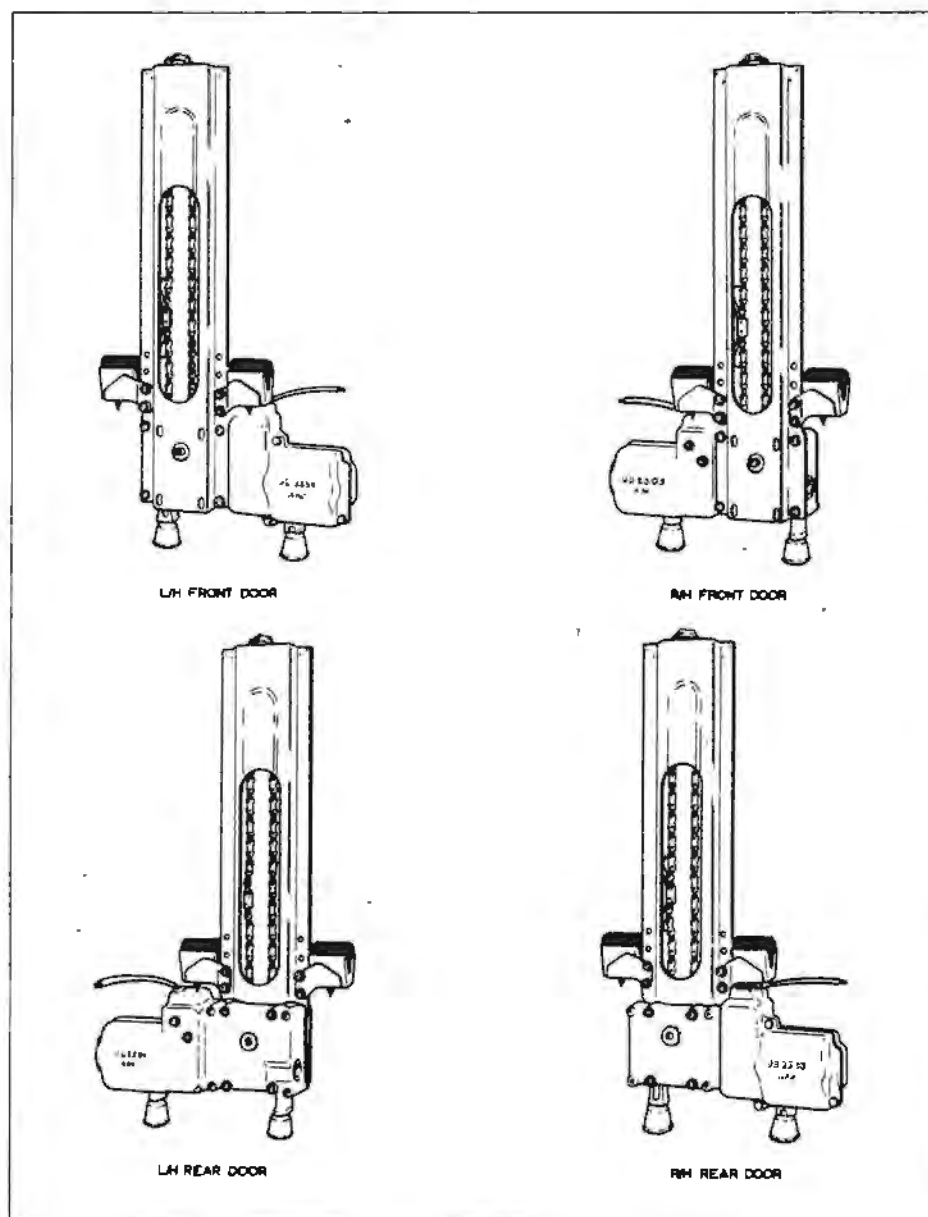


Fig. S.36.—Four positions for fitting chain casing to motor assembly.

Remove the retaining screws and carefully ease off the finisher and its plate.

Carefully remove the plastic cover from the door inner panel.

By means of the snap connectors, disconnect the cables to the motor and the solenoid, then ensure that all cables are placed where they are not liable to impede the removal of the motor and mechanism assembly.

Unscrew the two $\frac{3}{16}$ " Allen screws which secure the chain "pick-up" link to the window support channel; these screws are located behind the mechanism (see Fig. S.48).

If not supported, the window will then be free to drop on to the lower buffer stops, therefore it should be secured to the window frame by means of masking tape as shown in Figure S.32.

Unscrew the two 2 B.A. nuts and the two 2 B.A. setscrews, then remove the rubber mounting and stop tongue; ensure that note is made of the number and position of the packing washers (see Fig. S.47).

Remove the retaining screws and detach the brace from the door (see Fig. S.31).

To facilitate removal of the assembly, it will be necessary to remove one of the lower buffer stops from the chain casing as shown in Figure S.39.

When working on the **front left-hand door**, remove the **right-hand** buffer stop, and if working on the **front right-hand door**, remove the **left-hand** buffer stop, as seen when viewing the door from inside the car.

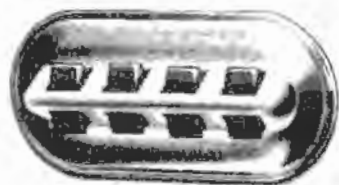


Fig. S.38.—Driver's switches for electrically operated windows.



Fig. S.37.—Passenger switch for electrically operated window.

Remove the motor and mechanism assembly from the door in the manner shown in Figure S.39.

Rear Doors

The procedure for removing the motor and mechanism assembly from the rear doors is similar to that adopted for the front doors, but it is important that the following points are noted in order to facilitate removal of the assembly.

Detach the clip securing the electric cables to the door and place the cables in a position where they will not impede the removal of the assembly.

Disconnect and remove the check strap assembly from the door.

When working on the **rear left-hand door**, remove the **left-hand** buffer stop from the chain casing and if working on the **rear right-hand door**, remove the **right-hand** buffer stop, as seen when viewing the door from inside the car.

The assembly should then be removed from the door in the manner shown in Figure 40.

ELECTRIC MOTOR ASSEMBLY

In the event of failure, it may be necessary to dismantle the motor assembly and should the fault be in the motor unit or the brake solenoid, the faulty unit should be returned for overhaul to Rolls-Royce Service Department, Hythe Road, Willesden, London, N.W.10.



Fig. 5.40.—Method of removing mechanism assembly from L.H. rear door.

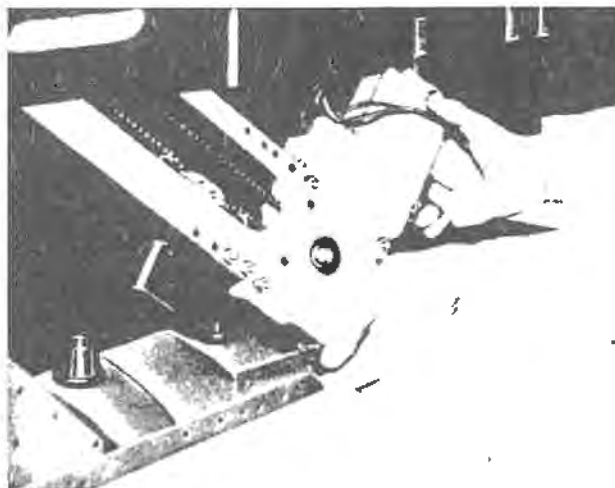


Fig. 5.39.—Method of removing mechanism assembly from L.H. front door.

The procedure for dismantling the motor assembly is as follows.

Remove the retaining bolts and detach the motor casing from the chain casing, then remove the remaining bolts which secure the cover to the casing and separate the casing and cover as shown in Figure S.35.

Withdraw the motor unit from the casing by tilting it upwards while at the same time drawing it from the flexible coupling as shown in Figure S.41; ensure that the rubber shock washers are retained.

If the flexible coupling is to be removed, ensure that the brake plunger and coil spring are not mislaid.

To remove the brake solenoid from the casing, unscrew the two nuts which secure it to the casing (see Fig. S.33).

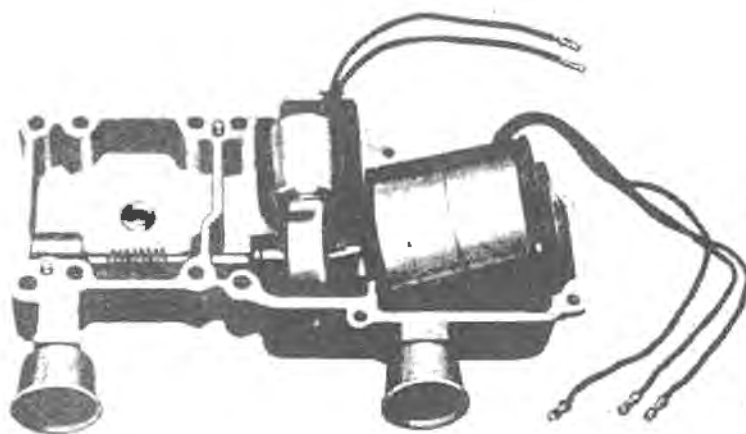


Fig. 5.41.—Method of removing electric motor from casing.

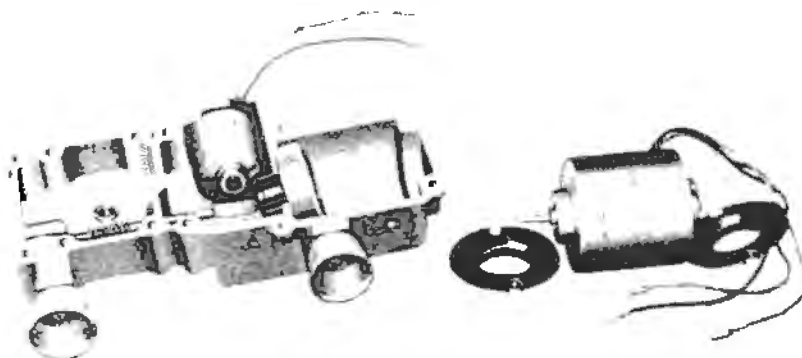
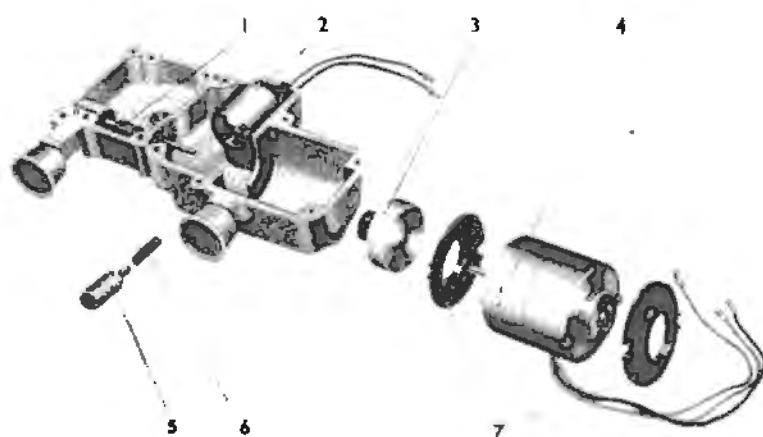


Fig. S.42.—Method of removing flexible coupling from casing.



1. Worm drive.
2. Brake solenoid.
3. Flexible coupling and brake drum.
4. Electric Motor.
5. Brake plunger.
6. Brake plunger spring.
7. Rubber shock washers.

Fig. S.43.—Exploded view of motor and drive assembly.



Fig. S.44.—Electric motor with cover removed.

1. Cut-out.
2. Brushes.

TO ASSEMBLE AND FIT THE MOTOR AND MECHANISM ASSEMBLY

Reverse the procedure for removing and dismantling, noting the following points.

Lubricate the worm and reduction gear with Molytone 265 Grease.

The joint faces of the motor casing should be smeared with jointing compound prior to bolting the halves together.

The motor casing is bolted to the chain casing to form a unit which is mounted on rubber mountings to ensure quietness during operation; the motor casing may be attached to the chain casing in four different positions depending to which door the assembly is to be fitted (see Fig. S.36).



Fig. S.47.—Mechanism stop adjustment.

Adjust stop tongue to obtain a gap at 'A' of between 0.015" and 0.030" with the window in the position as illustrated.

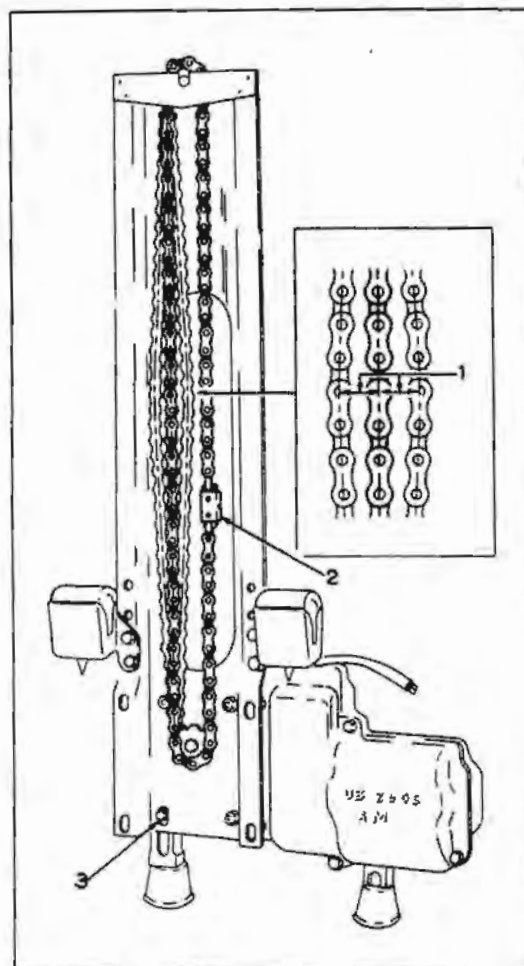


Fig. S.46.—Chain adjustment for electrically operated windows.

1. Slack movement (maximum of 0.500").
2. Pick-up link with chain tension spring removed.
3. Elongated hole for obtaining adjustment.

When attaching the motor assembly to the chain casing ensure that the chain is adjusted so that it has a slack movement of 0.500" each side of the chain centre line (see Fig. S.46).

Remove the tension spring from the "pick-up" link and adjust the chain tension by means of the elongated bolt holes in the chain casing as described in Figure S.46, then refit the chain tension spring.

Adjust the mechanism stop tongue, by means of the elongated fixing holes, to obtain a gap at 'A' of between 0.015" and 0.030" with the window in the halfway position as shown in Figure S.47.

Ensure that the switch cables do not foul the edges of the hole in the door inner panel, otherwise they may become damaged and result in 'shorting'.

Check that the correct gauge fuse wire is fitted in the fuse box, the specification for the fuse wire is 30 S.W.G. high conductivity tinned copper wire, diameter 0.0124". For stocks of fuse wire in America, 28 American or Brown and Sharps gauge, diameter 0.0126", is satisfactory.

Should further attention to the wiring be necessary, a wiring diagram is provided in Figure S.45.

Before fitting the door "trim", ensure that the plastic cover is fitted and secured with upholsterers' solution.

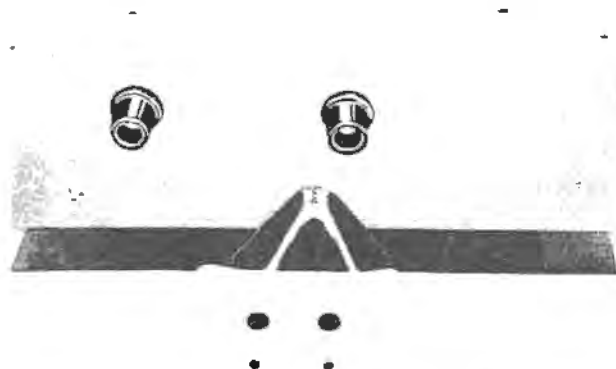


Fig. S.48.—Lower rubber mountings for mechanism and connection for chain "pick-up" link.

ELECTRICALLY OPERATED GLASS DIVISION

(Fitted to Silver Cloud Long Wheelbase Cars)

The glass division is situated immediately behind the front seats and is operated by means of a Piper electric motor and relay, the motor being mounted on a channel section panel fitted to the front face of the division structure.

Assistance for the motor is provided on initial starting, by means of a spring-loaded roller on which a nylon cord is wound, the cord also being attached to two hooks fitted to the glass bottom channel.

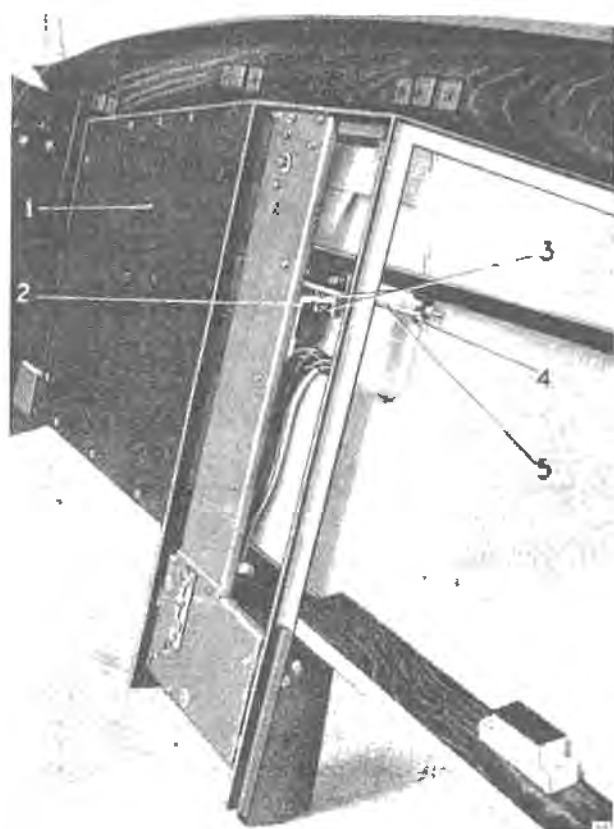


Fig. S.50.—View of electrically operated division with panel removed.

1. Plywood panel.
2. Actuating tongue.
3. Tongue rollers.
4. Hooks for nylon cord.
5. Nylon cord.

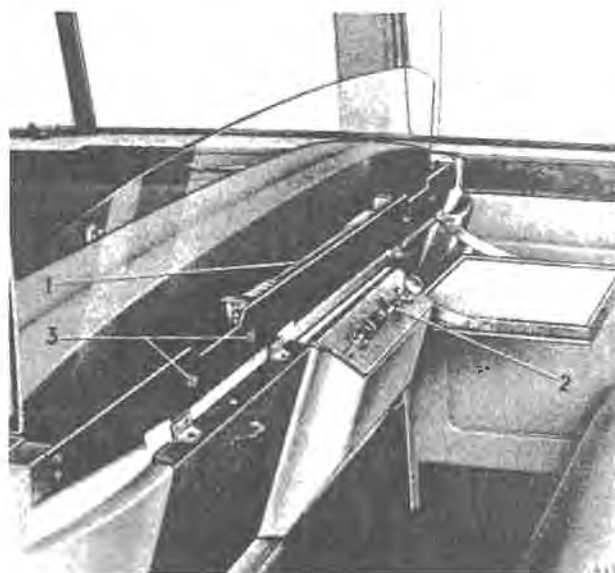


Fig. S.49.—Electrically operated division.

1. Spring-loaded roller and nylon cord.
2. Single type operating switch.
3. Captive retaining nuts for grab handles.

An endless chain, driven by the motor, is carried on two sprockets and attached to the chain is a tongue which moves up and down a guide rail (see Figs. S.50 and S.51).

This tongue is located between two rollers attached to the glass channel, thus when the motor is operated the division will move up or down, depending on which switch is operated.

Up and down movement of the division is controlled by means of two push-button switches or a single switch, as shown in Figure S.49, which are mounted on the instrument panel in the rear compartment.

No trip switches are provided as the motor is designed to withstand stalling when the division reaches the end of its travel, until the operating switch is released.

The design and construction of the division and motor is such that no maintenance is required, but should it be necessary to remove the motor assembly or the glass, proceed as follows.

TO REMOVE THE MOTOR ASSEMBLY

To facilitate removal of the motor assembly, it will be necessary to remove the front seats.

Remove the felt covered panel by unscrewing the four wood screws, then disconnect the cables from the relay.

Remove the four bolts securing the plate at the base of the motor assembly; the top two bolts also locate the motor assembly.

Unscrew the two P.K. screws securing the assembly at the top, then withdraw the tongue from between the rollers and remove the motor assembly (see Fig. S.50).

To Remove the Glass

Ensure that the division is lowered and remove one of the plywood panels as shown in Figure S.50.

To remove the finisher and capping rail it will be necessary to first remove the grab handles from the finisher as the concealed captive nuts which retain the grab handles also secure the finisher; access to the $\frac{1}{4}$ " UNF. concealed nuts is obtained from behind the picnic trays as shown in Figure S.52.

Unscrew the concealed nuts to remove the grab handles and remove the wood screw from each end of the capping rail, then withdraw the finisher and capping rail.

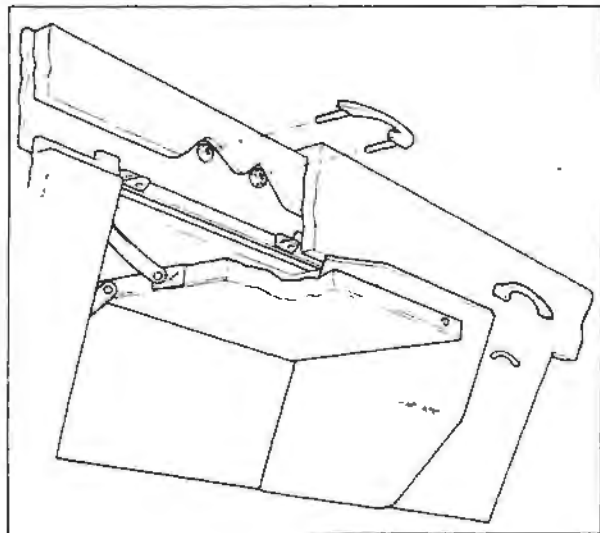


Fig. S.52.—View showing access to grab handle concealed screws.

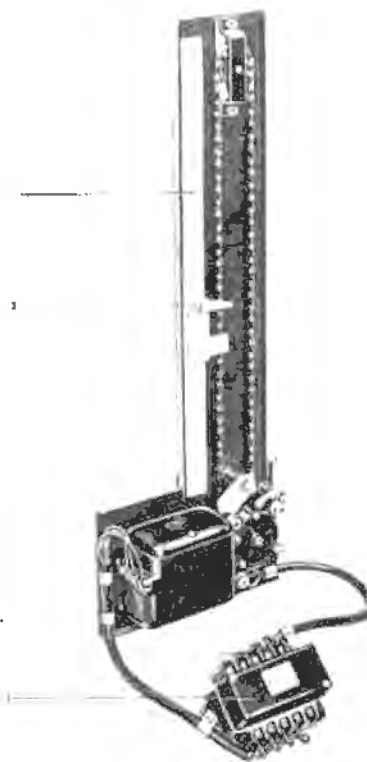


Fig. S.51.—Electrically operated division motor.

- | | |
|--------------------------------|--------------------------|
| 1. Guide for actuating tongue. | 2. Actuating tongue. |
| | 3. Electric motor relay. |

To remove the perspex side windows, ease away the "trim" from the top of each side window also remove the "trim" from the side pillars; it should then be possible to remove the perspex windows.

Remove the wood screws securing the top half of each window channel at the top and bottom, then detach the channels.

To remove the spring-loaded roller, attach a length of string to the nylon cord at a point between the two hooks, then whilst holding the string taut, remove the nylon cord from the two hooks and allow the cord and the string to wind on to the roller until all spring tension is released; remove the roller assembly from the division.

Should it be necessary to renew the nylon cord, note the manner in which the cord is wound on to the roller before detaching it.

Before withdrawing the division glass, ascertain whether it is necessary to remove the centre roof light in order to avoid damaging it, then withdraw the glass whilst tilting it slightly in the process.

TO REFIT THE GLASS DIVISION AND MOTOR

When refitting the glass division and electric motor, reverse the procedure for removal noting the following points.

Care should be taken when connecting the cables from the motor to the relay and reference should be made to the wiring diagram shown in Figure S.54.

If it is necessary to rewind the nylon cord on to the roller, it should be wound fourteen turns in the manner shown in Figure S.53.

Insert the roller into the slots in the division and engage the ratchet so that to fit the cord over the hooks in the channel it is necessary to stretch the cord.

When the correct tension is obtained it should be possible for the glass division to be raised 4" by means of the spring-loaded roller alone.



Fig. S.53.—Spring-loaded roller and nylon cord.

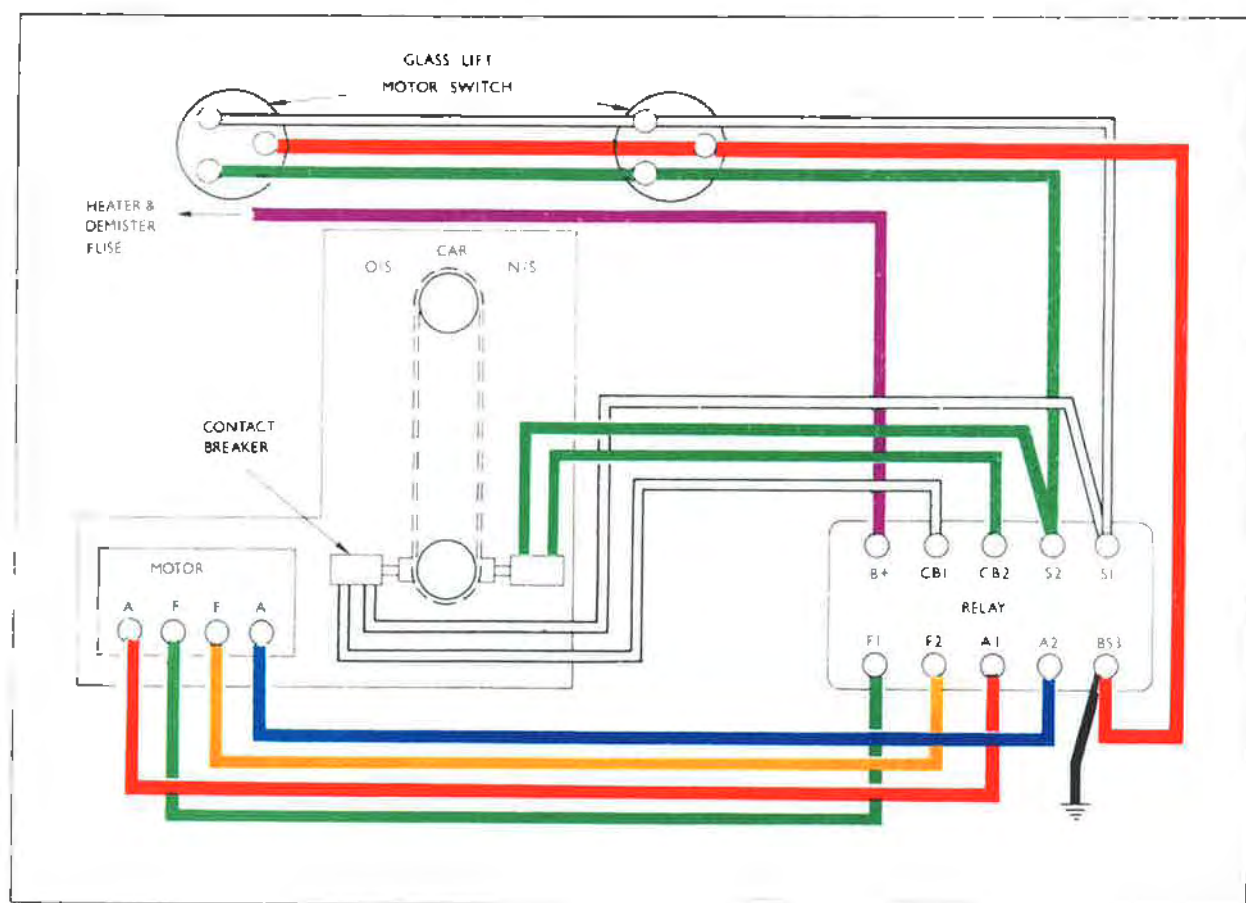


Fig. S.54.—Wiring diagram for electrically operated division.

BODY MOUNTING

Each fully floating rubber mounting, on which the standard saloon body is supported, should carry the proportion of weight for which it is designed.

A body mounting carrying more than its share of weight is liable to give a metal-to-metal effect, while an underloaded body mounting causes additional weight to be carried by the other mountings.

Incorrect body mounting will result in noise and vibration, therefore in order to obtain satisfactory results it is essential that the body is correctly mounted and that care is taken to ensure that lubricant does not contact the rubbers at any time, otherwise the mechanical properties of the rubber will be destroyed.

On some earlier cars when doors have not fitted correctly, it has been necessary to adjust the body mounting below the door pillar, however on current production cars it is most important that the body mounting must not be disturbed, unless the complete mounting procedure is carried out.

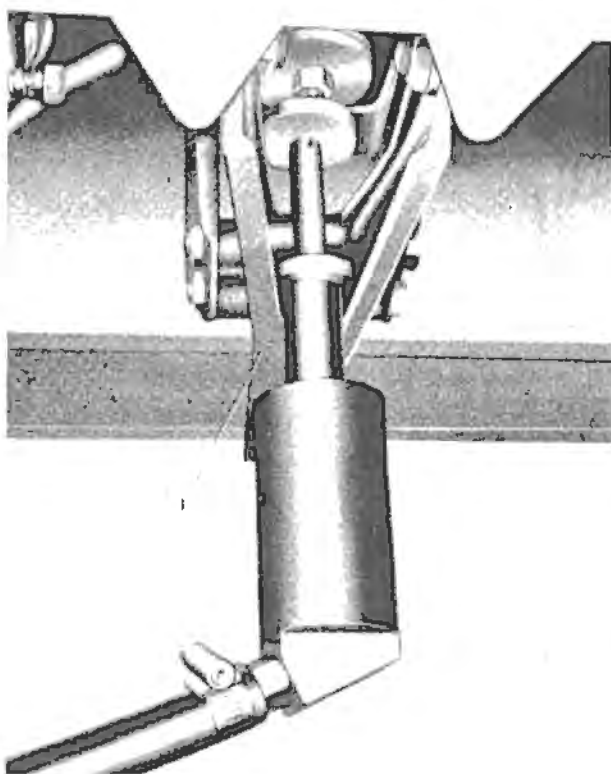


Fig. S.56.—Body mounting ram jacking slide.

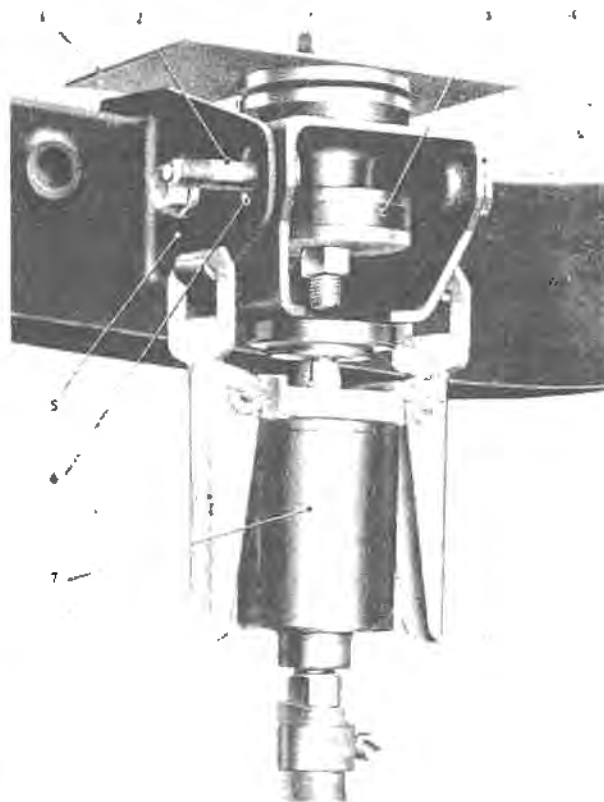


Fig. S.55.—Body mounting ram in position.

1. Body floor.
2. Indicator stud.
3. Body mounting rubber.
4. Cradle.
5. Frame mounting.
6. Elongated slot.
7. Pneumatic ram.

The mounting procedure consists mainly of attaching pneumatic rams and ensuring that the body is free to pivot axially about No. 1 mounting.

The pneumatic rams are connected in series to a compressed air supply, thereby ensuring that an equal load is applied to each body mounting, thus enabling it to assume its correct position within the vertical limits of the slots in the chassis brackets.

The mountings are then locked in position by means of setscrews, the rams removed and the centre mounting bolts tightened.

THE PROCEDURE FOR MOUNTING THE BODY IS AS FOLLOWS

Attach the rubber mounting assemblies to the frame, using only three setscrews for each unit, but do not tighten the setscrews.

In place of the fourth setscrew insert a short stud to serve as an indicator as shown in Figure S.55 item (2).

Ensure that the cradles are free to move in the chassis brackets, then lower the body on to the frame so that the pedal gap plate is centralised with the steering column.

When mounting an untrimmed body, ballast should be used to bring the body to its final unladen weight; the ballast should be arranged to resemble the final load pattern as closely as possible.

For the standard saloon completely without trim, the ballast should be arranged as follows.

Junction of floor and toe board 2 @ 56 lb. weights.

In line between centre pillars 4 @ 56 lb. weights.

In line along the front edge of rear seat pan 4 @ 56 lb. weights.

On luggage boot floor immediately forward of battery and tool tray aperture 2 @ 56 lb. weights.

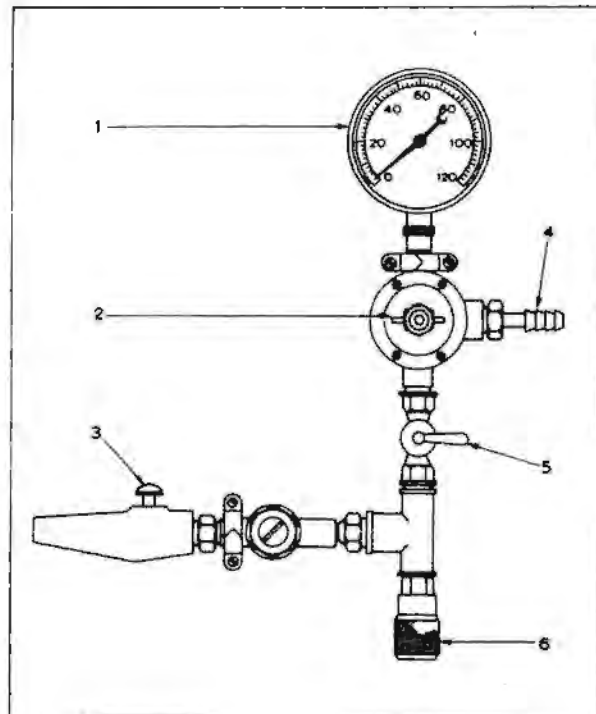


Fig. S.57.—Pneumatic ram regulator.

- | | |
|------------------------|------------------------------|
| 1. Pressure gauge. | 4. Inlet from supply. |
| 2. Pressure regulator. | 5. Stop valve. |
| 3. Air release button. | 6. Outlet to pneumatic rams. |

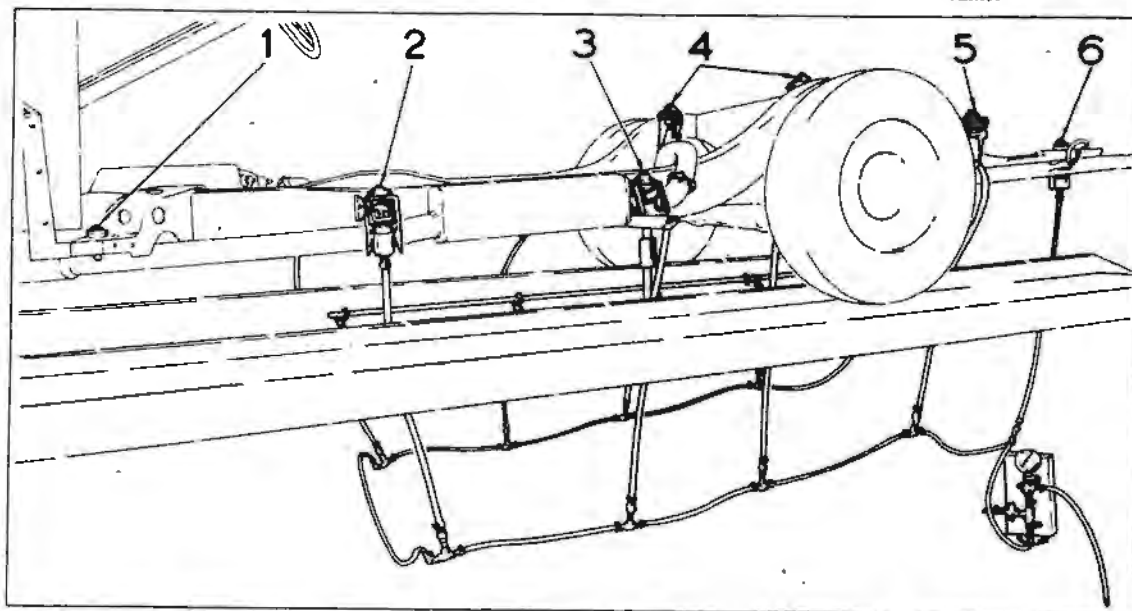
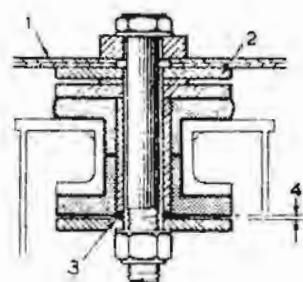
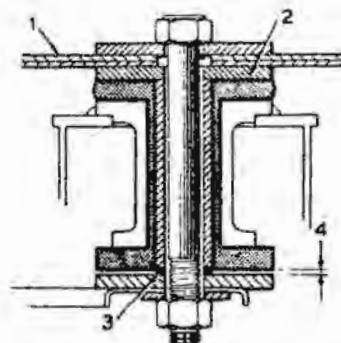


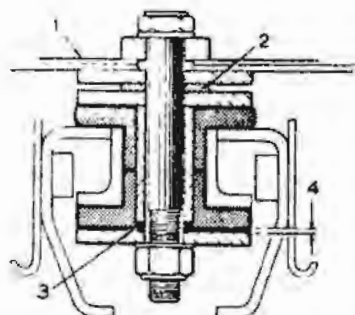
Fig. S.58.—Pneumatic rams in position.



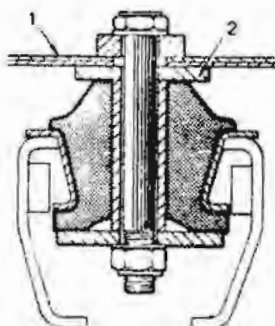
No 1 (EARLY TYPE)



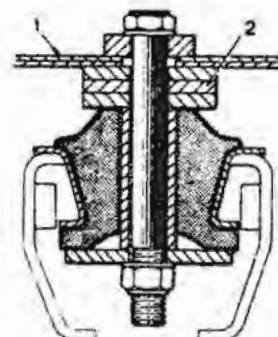
No 1 (LATE TYPE)



Nos 2 & 4



Nos 3 & 5



No 6

Fig. S.59.—Body mountings for standard steel body.

- | | |
|-------------|-------------------------------|
| 1. Body. | 3. Shim. |
| 2. Washers. | 4. Vertical freedom 0.010 in. |

Bodies which are trimmed do not require ballast, but if the car is complete and remounting is necessary the following parts should be disconnected from the body.

Remove the front doors and unscrew the setscrews which retain the wings to the body at the front door post.

Disconnect the bonnet, front wings and valances by slackening the bolts securing it at the scuttle.

Disconnect the steering column from the body and chassis frame.

The body can then be raised and pivoted freely about No. 1 body mounting as necessary.

Fit the centre bolts to No. 1 mounting, but do not yet tighten them, then if necessary fit sufficient washers to obtain approximately $\frac{3}{8}$ " clearance between the body and the frame brackets.

Should the clearance between body and frame be greater on one side than the other, initial correction should be made at No. 1 mounting.

Assemble the remainder of the side mountings and fit the rams in position under the mountings as shown in Figures S.55 and S.58.

Operate the pressure release valve and check whether the rams deflate smoothly; adjust the restrictor if necessary.

Inflate and deflate the rams several times to ensure that the body will rise and lower freely and evenly, whilst pivoting about the No. 1 mounts.

Greater movement will be noted at the rear than at the front.

Turn the stop valve tap, on the pneumatic ram regulator, to the open (vertical) position, then adjust the air pressure by means of the regulator, to read 80 lb. per sq. in. on the pressure gauge; check the system for air leaks.

Note:—Should attention be required to only one body mounting, it is not necessary to deflate all the rams, as each ram is provided with an air valve.

After having made an adjustment it is not necessary to alter the controls in order to compensate for loss of pressure, because air losses are automatically replaced by means of the pressure release valve.

Adjustment should be made to obtain a general clearance of $\frac{3}{8}$ " between the body and the frame.

It is of particular importance that the clearance over the gearbox bell housing is not less than $\frac{1}{4}$ ".

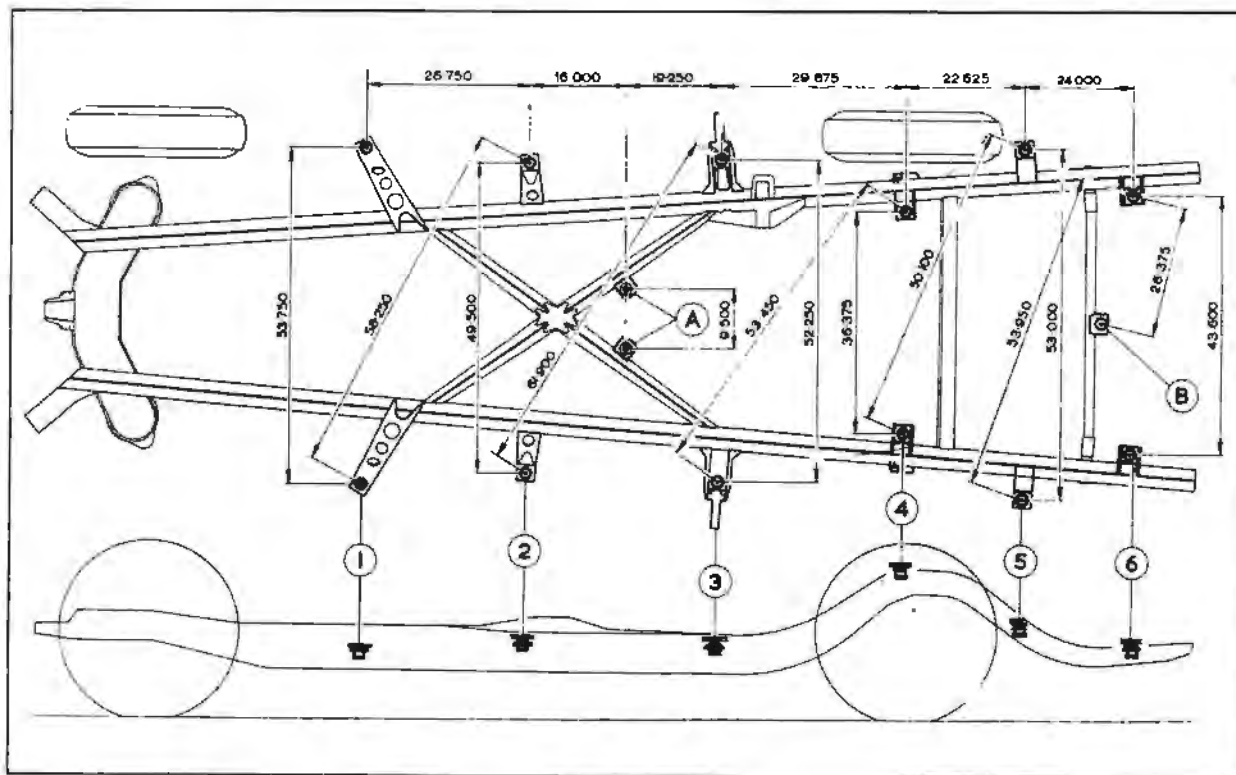


Fig. S.40.—Diagram showing position of body mountings.

Packing washers should be used between the body and the mounting to position the indicator studs approximately in the centre of the slot in the frame bracket (see Fig. S.55).

Should the indicator stud bear on the top of the slot, further adjusting washers are required; if the stud bears on the bottom of the slot, adjusting washers should be removed to obtain the desired result.

With the air pressure maintained at 80 lb. per sq. in., tighten the three setscrews in each mounting assembly, then remove the indicator stud and replace it with a setscrew.

Release the air pressure and remove the rams.

Tighten the centre bolts of all mountings and check that the vertical clearance of Nos. 1, 2 and 4 rubbers is between 0.000" and 0.010" (see Fig. S.59).

Adjustment should be made if necessary by means of shim washers.

Fit the three centre mountings as shown in Figure S.60, item A and B, using packing washers as necessary, but when the centre bolt is finally secured the rubbers should not be under compression.

Finally, if ballast weights have been used, these should be removed.

COUPE BODY

The mounting procedure for coupe bodies is the same as for standard bodies, but instead of rubber mountings solid mountings are fitted (see Fig. S.61).

Note:—Should damage occur as the result of an accident, which is not sufficient to necessitate removal of the body, the body mounting brackets both on the chassis and the body should be corrected to the dimensions shown in Figure S.60 and the body mounted as previously described.

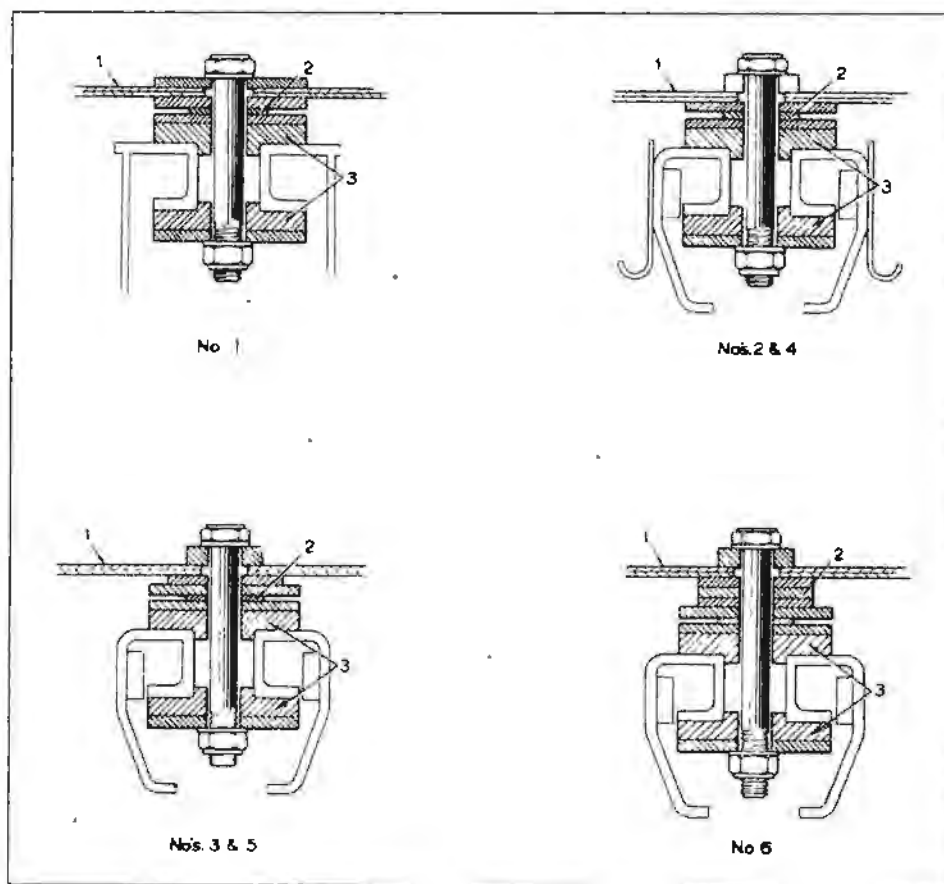


Fig. S.61.—Body mountings for coupe body.

1. Body. 2. Adjusting washers. 3. Steel spacing flanges.

ACCIDENT REPAIRS

Birmabright Aluminium Alloy

The luggage boot lid, doors and bonnet of the standard saloon are all manufactured from Birmal Sheet BB-3.

This is a light, non-corrosive aluminium alloy which contains magnesium.

Small welds and fillings may be carried out with excellent results, but care should be taken when applying heat, as prolonged heating is apt to cause surface distortion which cannot be beaten out satisfactorily.

Therefore, when damage is extensive a new panel should be fitted.

Should it be necessary to carry out small welding repairs, the following materials are required:—

Welding rod—Birmabright No. 2.

Flux —Welding flux for aluminium and its alloys.

Filler —Birmetal Filzall.

Lubricant —Aluminium Powder.

These materials can be obtained from Messrs. Birmabright Ltd., who also offer a complete kit con-

taining a S.I.F. welding torch, three wooden paddles, an electric paddle and a supply of consumable materials.

Welding

The welding procedure employed closely resembles that used for pure aluminium, but the welding rod specified above must be used.

The "leftwards" technique should be adopted and after initial tacking, the weld should be completed as quickly as possible in one run.

Using cellulose stripper, remove the paint where necessary, then clean the edges to be welded with wire wool, for a width of not less than $\frac{1}{2}$ " on each side of the metal.

Mix a small quantity of flux with water until a smooth paste is obtained, then brush it on to the cleaned edges on both sides of the metal.

Clean the welding rod with wire wool and brush on the flux paste.

If a British Oxygen Company or a S.I.F. torch is to be used, fit a No. 2 nozzle or its equivalent if another make is to be used.

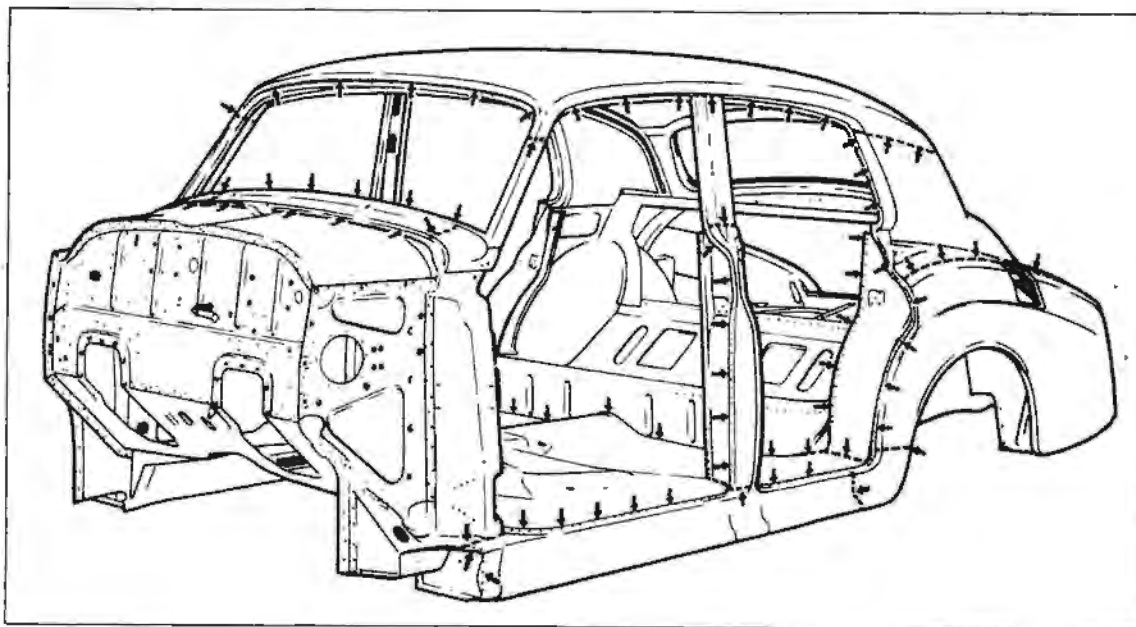


Fig. 5.42.—Body cutting diagram—three-quarter front view.

Adjust the flame so that it is slightly reducing; that is, so that it has a slight excess of acetylene. The flame should also be smooth and quiet.

At intervals of 2" to 4" tack weld the edges then working from right to left, complete the weld in one run.

Do not quench the weld to cool, it should be allowed to cool naturally.

When cool, wash off any surplus flux using hot water and a scrubbing brush; owing to the strong corrosive nature of the flux, it is essential that all traces are removed.

Dress the repaired part with a dreadnought file, then rub down and paint in the normal way.

Filling

"Birmetal Filzall" is a thermal plastic resin containing 75% aluminium powder and 25% synthetic resin and has a melting point of approximately 120°C.

It should be applied in a similar manner to that of normal metallic solders and little heat is required.

If heat is applied by means of an oxyacetylene flame, it should be neutral and soft; only the tip of the outer flame should contact the metal.

In order to provide a rough surface to enable the filler to adhere, remove the paint where necessary using a cellulose stripper, then thoroughly clean the surface with coarse glasspaper; cleaning with a wire brush is not sufficient.

Apply a thin coat of filler over the whole of the working surface; to ensure good adhesion, heat the surface then allow the Filzall stick to melt by contact with the heated surface. Do not apply the flame directly on to the Filzall stick.

Build up the surface with filler whilst playing the flame over the coated area and on the end of the stick if necessary.

Care should be taken not to overheat the filler, otherwise it will turn brown and small holes will appear on the surface.

Level off the filler with a wooden paddle, after covering the paddle with aluminium powder to prevent the filler sticking to it.

When the filler is cold, feather the edges with a "Dreadnought" file and rub down in the usual way.

If a sanding disc is used for rubbing down, use the reverse face of the disc and apply light pressure with the edge of the disc to produce a glaze by friction.

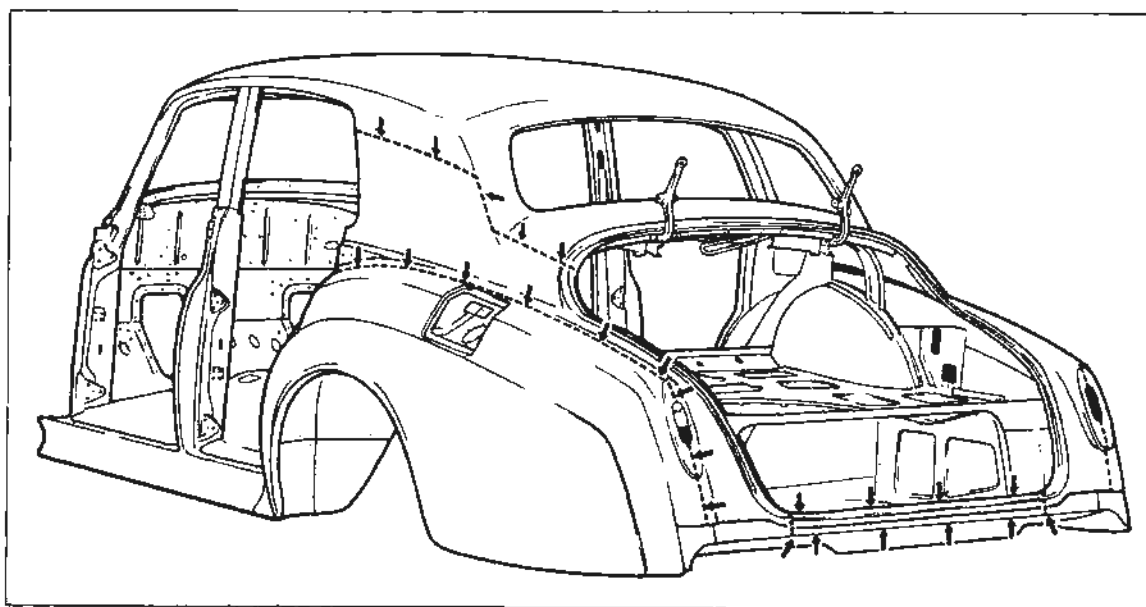


Fig. 5.63.—Body cutting diagram—three-quarter rear view.

Repainting

The first two coats of priming should be applied as mist coats, using the minimum quantity of thinners.

Cellulose thinners will soften the filler, but as the thinners evaporates the filler will harden.

The use of stopper is not recommended but if it is necessary, it should be applied as stiff as possible.

After the two mist coats have been applied continue spraying in the usual way.

The electric paddle enables the filling to be applied without the aid of a flame and requires no aluminium powder as a lubricant. It is possible to obtain a smooth surface which requires only a little hand dress-

ing before painting.

Replacement body sections

Damage of the body shell is frequently of a localised nature and in such cases, a replacement of the appropriate section will be more satisfactory than extensive re-shaping.

Figures S.62 and S.63 illustrate typical cutting lines and available replacements; the broken lines indicate spot welding which may be drilled or cut away.

In all cases of accident damage, the chassis frame and body mountings should be checked dimensionally and for truth. For body mounting details see Sub-section S.13