



THE HANDBOOK OF THE

# BENTLEY S3

© Bentley Motors (1931) Ltd., (1962)

Price £2 2s 0d

**BENTLEY MOTORS** (1931) Limited  
*Derby, Crewe and Conduit Street, London, W.1*

Published by  
The Technical Publications Department  
Bentley Motors (1931) Limited,  
Pym's Lane,  
Crewe

(T.S.D. Publication 2002)

## *Preface*

The Bentley S3 is designed and built to very high standards of precision and quality and before leaving the factory, the car is thoroughly tested and adjusted by experts.

The information contained in this Handbook has been carefully compiled to enable the owner to enjoy the utmost satisfaction from his car. The life and reliability of the car depend to a large extent upon the care and attention it receives from the outset, therefore the instructions given in this Handbook should be fully observed.

It is important that the service operations called for are carried out at the mileage intervals specified. Arrangements can be made for servicing at any of the Officially Appointed Retailers or at the Service Departments in London or Crewe.

The illustrations provided in this book refer in many cases to left-hand drive cars, but the instructions apply equally to both right-hand and left-hand drive, unless the contrary is stated.

## **BENTLEY MOTORS (1931) LIMITED**

### *London Offices and Showrooms*

**14 & 15 Conduit Street, London, W1**

*Telegrams:* 'BENSPORT, PICCY, LONDON'

*Telephone:* MAYFAIR 6201 (7 lines)

*Codes Used:* ABC (5th Edition), BENTLEY'S, MARCONI,  
MOTOR TRADE, WESTERN UNION

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### *Factory and Crewe Repair Depot*

**Pym's Lane, Crewe**

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*Telephone:* CREWE 55155 (16 lines)

## *Data*

CHASSIS NUMBER.....

ENGINE NUMBER.....

COMPRESSION RATIO.....

BODY NUMBER.....

UPHOLSTERY.....

PAINTWORK.....

SPECIAL FEATURES.....

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## *After Sales Service*

It is our ambition that every Bentley owner shall be completely satisfied with his car. With this object in view, facilities have been provided to ensure an efficient after sales service.

The Officially Appointed Retailer, through whom the car was purchased, has a service department provided with special tools and equipment for maintaining Bentley cars, and has personnel specially trained to deal with all service matters.

Bentley service engineers, whose sole duty it is to maintain contact with Retailers, are available at all times for consultation on any matter concerning your car.

We invite you to take advantage of these service facilities by getting in touch with your nearest Retailer, who will be glad to place all his knowledge and facilities at your disposal. Arrangements can be made with him for carrying out Maintenance Schedules at the specified mileages as described in this Handbook.

When making an enquiry to Bentley Motors (1931) Limited or to an Officially Appointed Retailer, it will facilitate matters if the chassis number of the car is quoted.

### **Overseas touring spares kit**

Owners intending to take their cars to overseas countries are invited to contact the Service Promotion Department at Pym's Lane, Crewe, for advice and assistance concerning service facilities.

A kit of spare parts consisting of small units which might not be available in more remote areas can be obtained from your local Retailer or from the Spare Parts Department at Crewe or London. This kit is light and compact and is supplied in a box measuring 28" x 9½" x 4¾".

The cost of this kit will be refunded, less a small loan fee, if returned intact.





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Fig. 1 THE BENTLEY SJ STANDARD SALOON

## General Information

### Engine and chassis serial numbers

The engine serial number is stamped on the rear of the crankcase (see Fig. 2). The chassis serial number is stamped both on the title plate on the bulkhead (see Fig. 2) and on the left-hand side frame member just forward of the bulkhead.

The full chassis number must be quoted in all correspondence about the car; the engine number need not be quoted unless specifically requested.



Fig 2 ACCESS TO THE ENGINE AND CHASSIS NUMBERS

- 1 Chassis number plate on bulkhead
- 2 Engine number stamped on crankcase

### Dimensions

Wheelbase . . . . .	10' 3"	3.12 m.
Track—Front . . . . .	4' 10½"	1.48 m.
Rear . . . . .	5' 0"	1.52 m.
Road clearance . . . . .	7"	17.80 cm.
Turning circle . . . . .	41' 8"	12.70 m.
Overall length . . . . .	17' 7¾"	5.38 m.
Overall width . . . . .	6' 2¾"	1.90 m.
Weight (car unladen but complete with oil, water and a full tank of petrol)	41½ cwt. (4,640 lb.)	2100 kg.
One gallon of petrol weighs	7½ lb.	3.4 kg.

## General Information

### Engine

Bore	4.100"
Stroke	3.600"
Number of cylinders	8 in two banks of 4
Total capacity	6.23 litres
Compression ratio	9 : 1 or 8 : 1 according to the cars domicile.
Firing order	A1, B1, A4, B4, B2, A3, B3, A2 'A' bank is on the right when viewed from the driver's seat. Champion RN. 8.
Sparking plugs 9 : 1 compression ratio engines	Lodge CLNP Champion RN. 8 or RN. 13P
Sparking plugs 8 : 1 compression ratio engines	.024"-.027"
Sparking plug point gap	.014"-.016"
Distributor contact breaker gap	2° before T.D.C.
Ignition timing	Metalastic bonded rubber
Vibration damper	Overhead in line, push rod operated through self-adjusting hydraulic tappets
Valve gear	Full flow
Oil filtration	

### Fuel system

Fuel pump	Twin SU electric
Carburettors	Twin SU HD8, 2" bore, side draught Special automatic control for starting
Air silencer and cleaner	Acoustic silencer with paper or oil wetted wire mesh air filter (see Page 53)

The engine compression ratio of 9 : 1 requires 100 octane fuel to be used in order to obtain the most satisfactory performance; the engine compression ratio of 8 : 1 requires premium grade fuels.

### Automatic gearbox

The gearbox transmits the drive in four forward speeds and Reverse. Gear changes are made automatically and are obtained through a fluid coupling and three epicyclic gear trains; gear changes may still be promoted manually by means of the gear range selector lever and the 'kick-down' change arrangement (see Page 27).

The ratios are as follows :

Gear	Gearbox ratio	Rear axle ratio	Overall ratio
1st	3.82 : 1	3.08 : 1	11.75 : 1
2nd	2.63 : 1	3.08 : 1	8.10 : 1
3rd	1.45 : 1	3.08 : 1	4.46 : 1
4th	1 : 1	3.08 : 1	13.08 : 1
Reverse	4.30 : 1	3.08 : 1	13.25 : 1

An efficient parking lock is incorporated which is engaged when Reverse is selected with the engine 'off'.

### Front suspension

Independent coil spring arrangement with hydraulic shock dampers and anti-roll stabiliser bar.

### Rear suspension

Semi-elliptic leaf springs are fitted which are controlled by hydraulic shock dampers. The dampers provide a direct adjustment of the 'ride', having 'hard' and 'normal' settings controlled electrically by a switch on the steering column.

A special form of axle control rod is fitted which, together with the leaf springs, absorbs the brake reaction and torque.

### Brakes

The brakes are servo assisted and operate through two independent hydraulic systems plus a mechanical linkage to the rear wheels. Thus three systems are provided which are combined for normal use but which can operate independently if so required by the failure of one system or another.

The hand brake operates through the mechanical linkage and operates a warning lamp on the fascia when it is applied while the ignition is 'on'.

### Steering

Power assisted steering is provided having a ratio of 18.7 : 1

Turns, lock to lock	. . . . .	4½
Castor angle	. . . . .	1°
Camber	. . . . .	Vertical to ½° positive
Toe-in	. . . . .	⅛" to ⅜"

### Tyres

Tyres are under continuous development and reference should be made to an Officially Appointed Retailer for the latest recommendations;

Size	. . . . .	8.20 × 15
Pressures	. . . . .	Front 22 lb/sq. in. (1.55 kg/sq. cm.)
		Rear 27 lb/sq. in. (1.90 kg/sq. cm.)

Winter tyres (rear wheels only)

Size	. . . . .	8.00 × 15
Pressure	. . . . .	Rear 30 lb/sq. in. (2.11 kg/sq. cm.)

### Capacities

	<i>Imperial</i>	<i>U.S.</i>	<i>Metric</i>
Fuel tank	. . . . . 18 gal.	21.60 gal.	81.82 litres
Cooling system	. . . . . 21 pt.	25.21 pt.	11.93 litres
Engine oil sump	. . . . . 12 pt.	14.41 pt.	6.82 litres
Gearbox	. . . . . 20 pt.	24.00 pt.	11.36 litres
Rear axle	. . . . . 1½ pt.	1.95 pt.	0.92 litres
Steering (pump reservoir)	. . . . . 3 pt.	3.60 pt.	1.70 litres
Steering (transfer box)	. . . . . ½ pt.	0.75 pt.	0.355 litres

## *General Information*

### **Cooling system**

25% anti-freeze mixture used all the year round, circulated by centrifugal pump. System pressurised at 7 lb/sq. in. Temperature controlled by thermostat.

### **Electrical system**

12 volt system with negative earth. 67 ampere hour battery. Four 'sealed beam' headlamps.

### **Propeller shaft**

The shaft is divided into two sections, supported at the centre by a flexibly mounted ball race. Three universal joints are fitted; two needle roller joints and one of the ball and trunnion type.

### **Rear axle**

A semi-floating rear axle is fitted employing hypoid bevel gears and having a ratio of 13/40 (1 : 3.08)

Top gear speed per 1,000 engine r.p.m. : 27.8 m.p.h.

### **Radio**

Medium and long wave	Radiomobile 620T, all transistorised
Medium wave	Radiomobile 622T, all transistorised
Medium and short wave	Radiomobile 230R, seven valves

## *Controls, Instruments and Accessories*

### **DRIVER'S CONTROLS AND INSTRUMENTS**

Before driving the car for the first time, it is recommended that a careful study be made of the position and operation of the controls and instruments illustrated in Figures 3, 4, 5 and 6.

The use of the controls will in most cases be obvious, but the following notes will assist the driver to understand the function of the various accessories.

#### **Brake and accelerator pedals**

The brake and accelerator pedals are fitted in the standard positions and are operated in the normal way. 'Kick-down' of the accelerator pedal for gear changing is described in Page 29.

#### **Ignition and starter switch**

The ignition switch can be turned either to the left or to the right of the 'off' position.

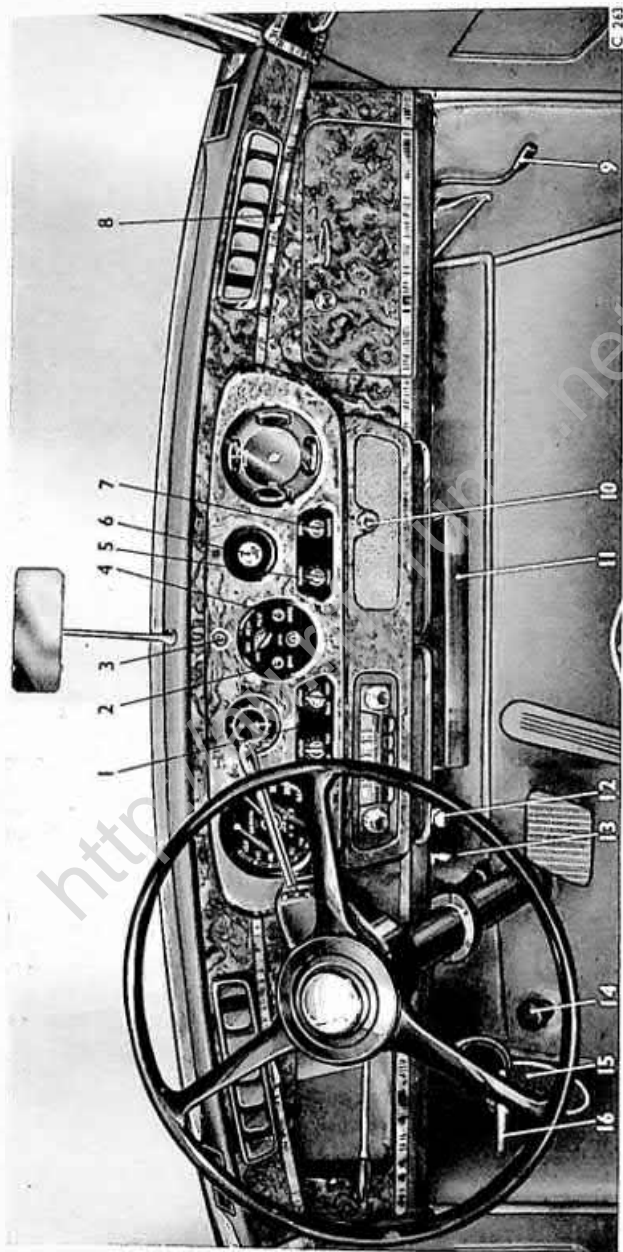
Turning the key to the left completes a circuit which allows the radio, windscreen wipers and cigar lighter to be used while the car is parked. The generator warning lamp is also illuminated when the switch is in this position but the engine ignition circuit is not energised. This position is ideal for picnicking for example, when it is required to use the electrical accessories without the ignition being in circuit.

Turning the key to the right energises the ignition circuit, fuel pumps, fuel gauge, oil pressure indicator, coolant temperature indicator, generator warning lamp, air conditioning system, rear window de-mister, horns, headlamp flashing, reversing lamp, flashers and 'ride' control as well as those accessories which are in circuit when the key is turned to the left. Turning the key to the left or right allows the fuel filler door to be operated.

Turning the key further to the right, against spring pressure, energises the starter motor. Immediately the engine starts, the key should be released. The starter is operable only when the gear range selector lever is in Neutral.

To withdraw the key from the switch, it must first be turned to the 'off' position.

To facilitate insertion of the key in conditions of darkness, the switch may be illuminated by a lamp in the capping rail. To operate the capping rail lamp, turn the main lighting switch to the 'S & T' position and withdraw the knob to its fullest extent.



**Fig 3 DRIVER'S CONTROLS (LEFT-HAND DRIVE CAR)**

- 1 Air conditioning panel
- 2 Generator warning lamp
- 3 Oil level indicator switch
- 4 Fuel warning lamp
- 5 Windscreen washer and wiper switch
- 6 Cigar lighter
- 7 Panel lamp switch
- 8 Airstream direction control
- 9 Bonnet lock control
- 10 Loudspeaker balance control

- 11 Picnic table
- 12 Auxiliary fresh air control
- 13 Speedometer trip release
- 14 Headlamp dipping switch
- 15 Auxiliary fresh air duct
- 16 Hand brake

**Fig 4 FACIA DETAILS  
(LEFT-HAND DRIVE  
CAR)**

- 1 Ash tray
- 2 Airstream direction control
- 3 Hand brake warning lamp
- 4 Inspection lamp/  
charging plug socket
- 5 Fuel filler door switch
- 6 Ride control switch
- 7 Rear window de-mister switch



Other accessories which can be used but which are not controlled by the ignition switch are as follows:

- Clock
- Roof lamp
- Companion lamps
- Boot lamp
- Charging plug and inspection lamp socket

### **Generator warning lamp**

The red warning lamp marked 'GEN' glows when the ignition switch is turned to the left or right. When the switch is turned to the right and the engine is running, the light is extinguished as generator voltage increases with engine speed.

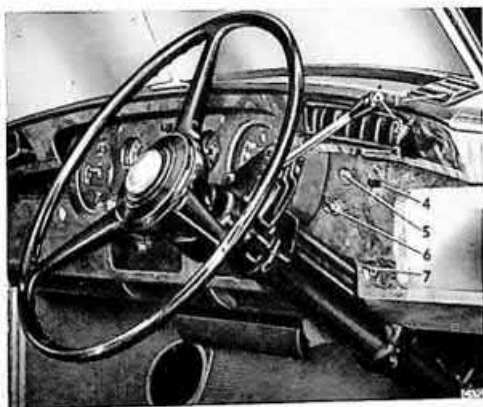
### **Ignition and master keys**

Two keys are provided with the car; one is the master key which has a square shaped head and will switch on the ignition and operate all the locks.

The other is the ignition key, which has a rounded head and will switch on the ignition and operate the front door locks only. Thus the cubby box and boot can be

**Fig 5 FACIA DETAILS  
(RIGHT-HAND  
DRIVE CARS)**

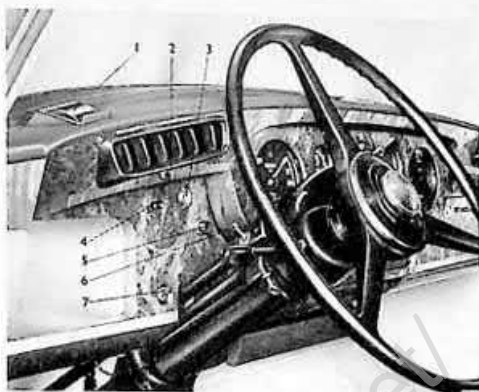
- 1 Ash tray
- 2 Gear range selector lever
- 3 Airstream direction control
- 4 Inspection lamp/  
charging plug socket
- 5 Hand brake warning lamp
- 6 Fuel filler door switch
- 7 Rear window de-mister switch





**Fig 4 FACIA DETAILS  
(LEFT-HAND DRIVE  
CAR)**

- 1 Ash tray
- 2 Airstream direction control
- 3 Hand brake warning lamp
- 4 Inspection lamp/  
charging plug socket
- 5 Fuel filler door switch
- 6 Ride control switch
- 7 Rear window de-mister switch



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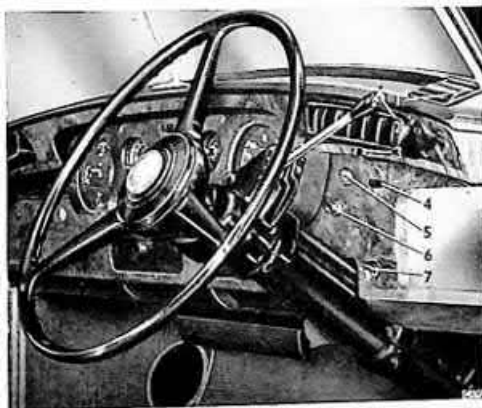
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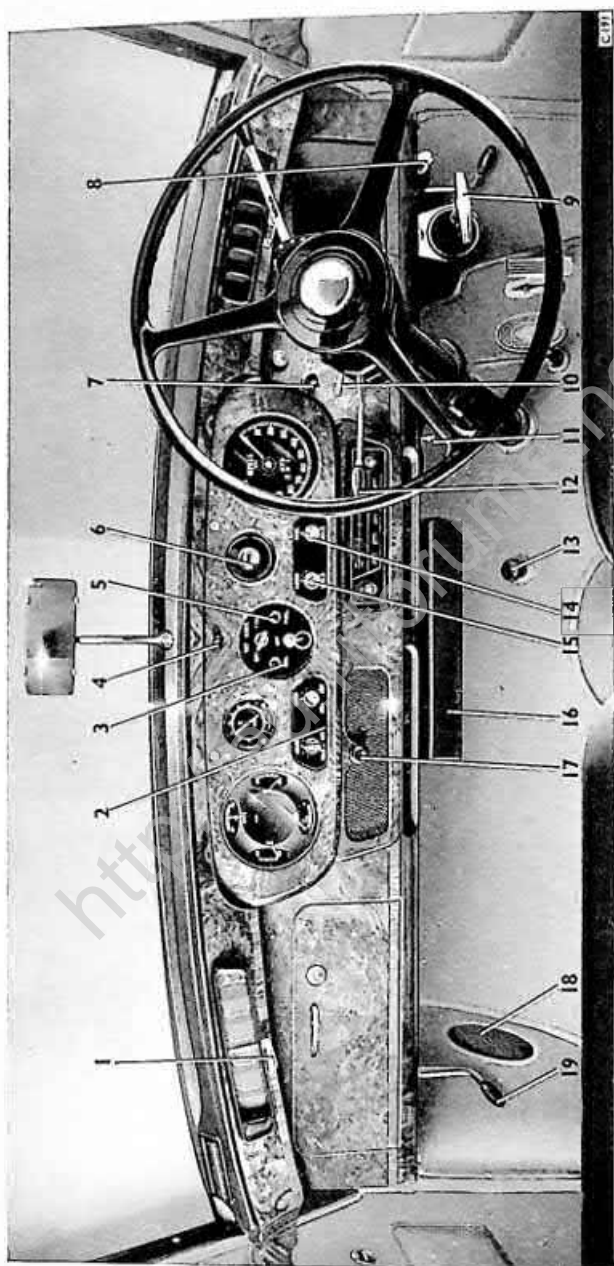
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**Fig 5 FACIA DETAILS  
(RIGHT-HAND  
DRIVE CARS)**

- 1 Ash tray
- 2 Gear range selector lever
- 3 Airstream direction control
- 4 Inspection lamp/  
charging plug socket
- 5 Hand brake warning lamp
- 6 Fuel filler door switch
- 7 Rear window de-mister switch





**Fig 6 DRIVER'S CONTROLS (RIGHT-HAND DRIVE CAR)**

- |   |                                   |
|---|-----------------------------------|
| 1 Airstream direction control                   | 13 Headlamp dipping switch        |
| 2 Air conditioning panel                        | 14 Panel lamp switch              |
| 3 Generator warning lamp                        | 15 Windscreen washer/wiper switch |
| 4 Oil level indicator switch                    | 16 Picnic tray                    |
| 5 Fuel warning lamp                             | 17 Loudspeaker balance control    |
| 6 Cigar lighter                                 | 18 Auxiliary fresh air duct       |
| 7 Fuel filler door switch                       | 19 Bonnet lock control            |
| 8 Auxiliary fresh air control                   |                                   |
| 9 Hand brake                                    |                                   |
| 10 "Ride" control switch                        |                                   |
| 11 Speedometer trip release                     |                                   |
| 12 Direction indicator/headlamp flashing switch |                                   |

safely locked and the ignition key left with the car if required when parking in a garage.

Both keys bear the same serial number; as this number is not stamped on the locks it is advisable to note the number of the keys immediately upon receipt of the car in case they are mislaid.

### **Horns**

The twin Windtone horns are operated by the push-button in the centre of the steering wheel. The horns are operable only when the ignition is 'on'.

### **Hand brake**

This is mounted in a convenient position under the facia and operates the mechanical linkage to the rear brakes.

To apply the brakes, the handle should be pulled towards the driver; turning the handle clockwise will free the ratchet and release the brakes.

A warning lamp is fitted to the facia to remind the driver that the hand brake is applied. The lamp is operable whenever the ignition circuit is switched on.

### **Gear range selector lever**

The gear range selector lever is mounted on the steering column as shown in Figure 5. The lever may be fitted on the left-hand side of the steering column at the owner's request. Operation of the lever is described in detail on Page 27.

### **Direction indicator and headlamp flashing switch**

On all cars except those for use in the U.S.A., the direction indicator switch on the steering column is designed also to flash the headlamp main beam and can be used simultaneously to perform both functions. The switch is operable only when the ignition is 'on'.

On cars to be used in the U.S.A., headlamp flashing is not obtainable. To indicate a turn to the right, move the switch lever up; for a turn to the left, move the lever down. The switch is self-cancelling when the steering wheel is returned to the straight-ahead position.

To flash the headlamps, draw the switch lever towards the steering wheel. Flashing is not obtainable when the headlamp main beams are already in use.

### **Speedometer**

The speedometer records both the total and trip mileages. By turning the trip release clockwise, the trip reading can be returned to zero; the trip release is shown in Figures 3 and 6.

### **Main lighting switch**

The lamps are controlled by means of a rotary switch situated above the ignition switch as shown in Figures 3 and 6; it has four positions clearly marked on the panel face as follows:—

OFF	.	.	.	All lamps off
S & T	.	.	.	Side and tail lamps on
H, S & T	.	.	.	Head, side and tail lamps on
F, S & T	.	.	.	Fog, side and tail lamps on

### **Headlamp dipping switch**

A plunger type dipping switch, which is foot operated, is mounted on the toe board adjacent to the steering column (see Figs. 3 and 6).

To dip the headlamp beam, press the switch, then release it; repeat this procedure to obtain the main beam.

A small red warning lamp, mounted in the speedometer, is illuminated whenever the headlamps are on the main beam.

### **Inspection lamp socket**

A two-pin plug socket is provided in the fascia for the inspection lamp. This socket can also be used for charging the battery with the aid of a trickle charger.

### **Fuel filler door switch**

The fuel filler door is released by a switch button mounted on the fascia (see Figs. 4 and 5). Operation of the switch automatically unlocks the filler door in the rear wing.

Should the solenoid fail, the catch can be freed manually by pulling the release ring in the luggage boot (see Fig. 7).

### **Fuel warning lamp**

A green lamp marked 'FUEL' is mounted in the switchbox and glows only when the level of fuel in the tank falls below three gallons.

### **Fuel and oil level indicator**

This instrument is situated in the instrument panel and indicates the reserve of fuel in the tank whenever the ignition is switched on.

The oil reserve in the engine sump can be indicated on the same instrument by depressing the push button on the fascia (see Figs. 3 and 6).

### **Oil pressure indicator**

This instrument is mounted in the instrument panel and operates only when the engine is running. Under normal operating conditions, the instrument needle should lie within the white band on the instrument scale, representing an oil pressure of approximately 40 lb/sq. in.



**Fig 7 MANUAL RELEASE  
FUEL FILLER DOOR**  
1 Release cable

### **Coolant temperature indicator**

This instrument, mounted in the instrument panel, only operates when the ignition is switched on. Under normal operating conditions, the needle should register a temperature within the broad white band on the instrument scale.

### **Ammeter**

The ammeter indicates the rate at which the battery is charged or discharged; under normal operating conditions, a charge rate is indicated.

On starting the engine, the ammeter will indicate a high rate of charging, which will remain for a short time before falling to suit the condition of the battery.

### **Clock**

The clock is electrically operated and is set in motion by depressing the knurled knob shown in Figure 8. The hands of the clock are set by pressing this knob and turning it in the required direction.

### **Instrument lamps and map lamp**

These lamps are controlled by a switch mounted on the fascia (see Figs. 3 and 6). The switch will only function if at the same time the main lighting switch is 'on'.

The clockwise positions of the switch correspond to dim and bright illumination of the instruments. In addition, the knob of the switch may be withdrawn to its fullest extent to operate the map lamp beneath the fascia capping rail on the passenger's side of the car.

### **Windscreen wipers and washer**

A dual purpose switch, mounted on the fascia, controls both the windscreen wipers and the washer (see Figs. 3 and 6).

To operate the wipers at normal speed, turn the switch knob clockwise to the first position; turning the switch to the second position increases the speed of the wipers.

The higher speed of wiping should only be used during heavy rain; it should not be used during snow or with a dry or drying windscreen, i.e. when the load on the motor is high.

A temperature control switch is incorporated in the windscreen wiper motor which automatically breaks the circuit and prevents the motor from overheating due to overloading. When this occurs, the windscreen wipers stop, but will restart if allowed to cool for a few minutes.

The wipers are self-parking when switched off.

The liquid for windscreen washing is emitted from two small jets on the scuttle; the liquid being sprayed onto the windscreen within the traversing arc of the wipers.

To operate the sprays, press the knob of the wiper switch; release the knob and switch on the wipers to complete the cleaning.

### **Bonnet lock controls**

The bonnet lock controls are situated beneath the fascia on the extreme right and left-hand sides.

To open the bonnet, push the control handle down to release the lock, then raise the bonnet which will remain supported by a self-locking device on the bonnet stay. To close the bonnet, release the stay and lock it by means of the control handle.

### 'Ride' control switch

A 'ride' control switch, mounted on the steering column, adjusts the rear dampers to one of two settings (see Fig. 4).

For normal driving conditions, the switch should be set to position 'N' (normal). Movement of the switch to position 'H' (hard) provides a much harder 'ride' which is suitable for faster motoring and cornering, particularly when the car is heavily laden or is moving over an undulating road.

### Radio loudspeaker balance control

A balance control, mounted immediately above the front loudspeaker, is provided to vary the proportion of volume between the front and rear loudspeakers.

The overall volume of sound is controlled by the left-hand knob of the radio panel.

The rear loudspeaker is mounted in the parcel shelf behind the rear seat.

### Fresh air ducts in the capping rail

A lever is mounted immediately beneath each of the fresh air ducts on the capping rail to control the position of the louvres.

### Additional fresh air duct

Fresh air at ambient temperature is ducted from an intake in the left-hand front wing to a grille in the left-hand scuttle wall. The grille is designed to discharge the air over as large an area as possible.

A flap is fitted in the ducting to control the air flow. This flap is operated by a control knob which, on right-hand drive cars, is fitted above the hand brake; on left-hand drive cars, the control is mounted immediately to the right of the steering column (see Figs. 3 and 6).

Air is forced into the ducting intake by the forward motion of the car and flows without assistance into the car interior. The volume of air entering the saloon thus

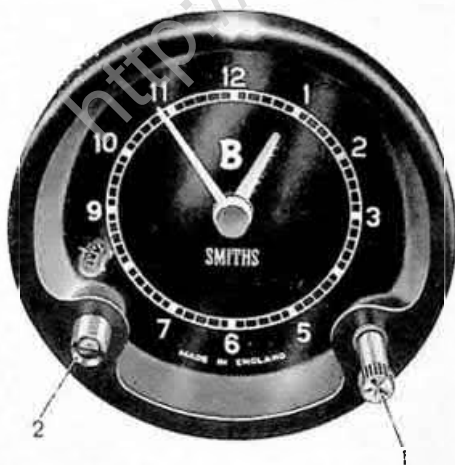


Fig 8 **ELECTRIC CLOCK**  
1 Setting control for hands of clock  
2 Regulator

depends on the speed of the car and position of the ducting flap. This arrangement discourages the entry of exhaust fumes when the car is moving slowly in heavy traffic.

## **BODY FITTINGS AND ACCESSORIES**

### **Front seat controls**

The front seats can be moved forward or backward after releasing the lever at the front of the seat frame.

The two front seat backs are individually adjustable for rake. A control handle is fitted at the outer ends of the seats and should be raised to release the catch (see Fig. 9). The backs can then be pushed back or allowed to move forward as desired. Releasing the handle locks the back in position. The individual rake adjustment makes it possible to adjust a bench seat (if fitted) to suit the requirements of both passenger and driver.

**Fig 9 FRONT SEAT ADJUSTMENT**  
1 Lever for rake adjustment



### **Door handles and locks**

The door catches are controlled from the outside of the car by means of press buttons and from the inside by remote control handles.

The rear doors can be locked only by means of the remote control handles. The front doors can be locked either by the remote control handles or by the private locks on the outside of each front door. In order to eliminate the possibility of locking the front doors with the keys on the inside, the door locks are self-cancelling and the act of closing a front door will automatically unlock it.

In order to lock the car when leaving from the right-hand front door, the left-hand door should first be locked by pushing the remote control handle forward. The right-hand door should then be locked from the outside by means of the private lock. When alighting from the left-hand side of the car, the procedure is reversed.

## *Controls, Instruments and Accessories*

The private locks are operated by inserting the key and turning it towards the front of the car; to unlock, the key must be turned towards the rear of the car. The key must be returned to the centre position to be removed.

### **Cubby boxes**

A locked compartment is provided on the fascia, the lock of which can be operated only by means of the master key.

A sliding panel covers the pocket in each front door. The panels are mounted upon plastic slides to ensure silence of operation.

### **Arm rests**

The arm rests fitted to the front doors can be adjusted to the most comfortable position. To adjust the height of the arm rest, lift the release catch and move the arm rest to the desired position; the release catch should then be returned to the locked position. The arm rest can be moved fore and aft as required.

### **Foot rests**

Sloping foot rests are fitted to the rear of the base of each front seat and are adjustable to permit the fitting of lambswool rugs to the car floor.

To adjust the foot rests, slacken the two bolts at either end of each rest, then move the rest to the required position and re-tighten the bolts.

### **Sun visors**

The sun visors can be moved to the side windows when the sun is in that direction.

A mirror is provided on the back of the front passenger's visor.

### **Cigar lighters**

The cigar lighters shown in Figures 3, 6 and 10, are of the normal push-in, automatic 'pop-out' type. The lighter must not be held by hand in the pushed-in position as this will cause overheating of the element and failure of the fuse. The cigar lighters are illuminated to facilitate their use in conditions of darkness whenever the instrument lamps are switched on.

### **Ash trays**

Two ash trays are provided in the fascia capping rail to serve the front seat passengers (see Figs. 4 and 5). Each tray is fitted with a lid requiring only light pressure to open or close it.

To empty an ash tray, open the lid and withdraw the inner well which is retained by spring clips.

The ash tray under the front picnic table can be removed for cleaning by depressing the lever at the back and sliding the tray forward.

The ash trays which are fitted above the picnic tables in the rear of the front seats require only light pressure on the catch to open the tray for use.

To remove the tray for cleaning, open it to its fullest extent and press the release catch once more; the ash tray may then be withdrawn from its spring-loaded hinge tongue. The tray must be withdrawn in an upward direction, otherwise damage to the hinge may result.





Fig 10 INTERIOR APPOINTMENTS

- |                 |                            |                |
|-----------------|----------------------------|----------------|
| 1 Hand strap    | 2 Recirculatory air intake | 5 Picnic table |
| 2 Cigar lighter | 4 Ash tray                 |                |

### Picnic tables

A picnic table is fitted on slides below the radio and can be pulled out for use as required (see Figs. 3 and 6). Picnic tables are also fitted into the backs of the front seats (see Fig. 10). The handle should be pulled outwards and down when a table is required for use.

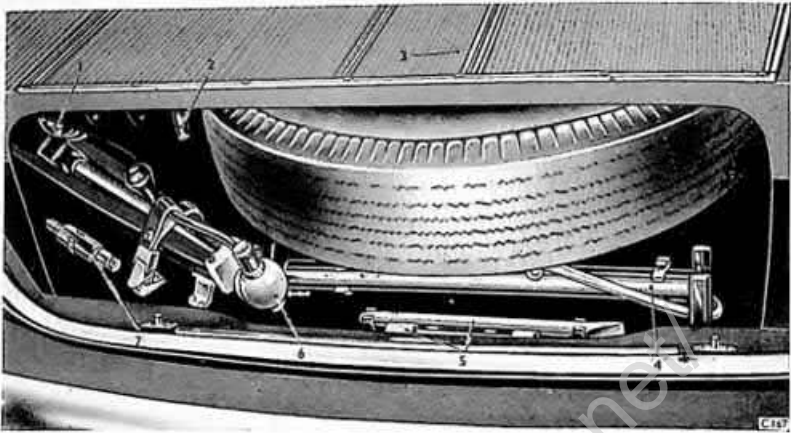
### Interior lamp

The interior lamp is controlled by means of a switch mounted in the door centre pillar. The lamp is also switched on and off automatically as a door is opened or closed.

### Rear window de-misting

The rear window de-mister is of the electric element type, the switch being mounted on the facia adjacent to the steering column.

It is recommended that during winter months, the switch on the facia be left 'on'; it will then come into operation whenever the ignition is switched on. During the summer, or if not required, the switch should be turned 'off'.



**Fig 11 ACCESS TO THE SPARE WHEEL AND HEAVY TOOLS**

- |   |                     |                              |
|---|---------------------|------------------------------|
| 1 Inspection lamp                                     | 2 Spare wheel clamp | 3 Spare wheel inflation trap |
| 4 Tyre pump   | 5 Wheel brace       | 6 Jack                       |
| 7 Gearbox front band setting gauge (export cars only) |                     |                              |

### The luggage boot

To gain access to the luggage boot, depress the button in the centre of the double handle below the number plate and raise the lid, which is spring counterbalanced to remain in the raised position.

The boot lid can be locked in the closed position with the master key.

### Spare wheel

The spare wheel is carried in a separate compartment below the floor of the luggage boot.

To remove the spare wheel, raise the boot lid and detach the cover from the spare wheel compartment. Press down the lever on the left-hand side of the wheel (see Fig. 11); the wheel can then be withdrawn.

## *Driving the Car*

### STARTING THE ENGINE

Fully depress and then release the accelerator pedal. This will allow the fast idle cam on the carburettor controls to position itself in relation to the engine temperature and thus set the throttle to the correct opening for starting.

Move the gear range selector lever to Neutral, quadrant position 'N'.

It is necessary to depress the lock button (if fitted), at the end of the selector lever, to enable the lever to be moved into or out of Neutral or Reverse.

The engine cannot be started unless the selector lever is in the Neutral position. A safety device is provided which prevents the starter motor being operated if a gear is selected.

It is essential that the hand brake be applied before starting the engine the automatic choke system will cause the engine to run at a fairly fast idling speed upon initial starting from cold and the car may move immediately a gear is selected if the hand brake is not firmly applied.

Insert the ignition key and switch on the ignition by turning the key clockwise to the first position.

Operate the starter motor by turning the ignition key further clockwise; release the key immediately the engine starts.

If the engine is allowed to warm-up before use, after a few minutes running the accelerator pedal should be lightly depressed and released; the engine speed will then again adjust itself relative to the engine temperature by setting the throttle for a slightly lower engine speed.

### GEARBOX OPERATION

The Automatic Gearbox is more than just a mechanism which automatically selects the gear ratios according to conditions of speed and load. An overriding control is provided which enables the driver to exercise his own judgement with regard to the gear ratios to be selected and an understanding of what is possible greatly enhances the pleasure to be derived from driving the car.

No automatic mechanism has the power of anticipation, but the driver can see ahead and has the means for overriding the automatic mechanism.

The gearbox provides three forward ranges, also Neutral and Reverse. The control quadrant is marked as follows: N 4 3 2 R.

The following indicates the gears obtainable in each range:

'4'—1st, 2nd, 3rd and 4th.

'3'—1st, 2nd and 3rd (safety change to 4th).

'2'—2nd; 1st gear obtainable should the speed and load on the engine require it.

'R'—Reverse with engine running. Parking pawl engaged with engine stationary.

## Driving technique

If the driver so desires, he can allow the gearbox to make gear changes which will automatically occur at the theoretically correct moment in terms of speed and load. Obviously, however, road or traffic conditions may be such that the theoretically correct moment of gear change may be undesirable, or may be unexpected or perhaps delayed. It is for this reason that the overriding controls are provided, enabling the driver to enforce a gear change whenever he so desires.

The driver should, therefore, first familiarise himself with the approximate speeds at which the automatic changes occur. These are as follows:

	Range 4	Gears	
	1—2	2—3	3—4
Light Throttle . . . . .	9 m.p.h.	16 m.p.h.	24 m.p.h.
Full Throttle . . . . .	26 m.p.h.	40 m.p.h.	78 m.p.h.

It will be noted that greater throttle openings cause the changes to be progressively delayed, therefore an up-change can be induced by the driver at any speed within these limits by easing the foot off the throttle pedal at the appropriate moment. With a little practice, a driver can, by judicious use of the throttle pedal, permit the automatic mechanism to make completely smooth and unobtrusive changes. A safety up-change to fourth gear is incorporated in range 3.

The driver who wishes occasionally to indulge in a very fast get-away will obtain maximum acceleration by allowing the automatic gearbox to make full throttle changes throughout the speed range.

The automatic down-change with light throttle will normally occur at the following speeds:

	Range 4	Gears	
	4—3	3—2	2—1
Light Throttle . . . . .	16 m.p.h.	10 m.p.h.	5 m.p.h.

The driver should recognise that the down-changes will always occur at approximately these speeds when slowing down and it will be found that the changes occur quite smoothly, although it is well to remember that as the speed falls to 10 m.p.h., the 3 to 2 change will occur; this involves an appreciable difference in gear ratio and the smoothest change will result if the throttle opening is kept to the minimum.

In traffic which enforces for any length of time speeds between 9 and 24 m.p.h., the driver can avoid the continual changes which might occur between gears 3 and 4 by placing the selector lever in range 3. Similarly, in traffic which enforces an even slower rate of progress, the selector lever can be placed in range 2, which will avoid undesirable changes to and from the higher ratios.

For normal cruising on the open road, the selector lever should be left in range 4, but the driver will discover that the smoothest and most satisfying changes between top and third gears can be made with extreme ease and rapidity by moving the selector lever between ranges 4 and 3. Completely imperceptible changes can be

made if the throttle is at the same time correspondingly adjusted, the smoothest changes occurring at light throttle openings. The driver is encouraged to make the fullest use of this gear change in exactly the same way as he would with a non-automatic gearbox. Overtaking other traffic can be accomplished at the desired throttle opening with the minimum amount of fuss and with the greatest ease.

For full throttle acceleration in an emergency, the driver can immediately obtain a lower gear by pressing the accelerator pedal hard down onto its stop. This is known as 'kick-down'. Full throttle down-changes are not usually required except in an emergency and the driver will, in most cases, prefer to make full use of the selector lever.

### **Second gear control**

It may sometimes be desirable to hold the car indefinitely in second gear, for example, when negotiating very slippery surfaces or very steep gradients. A device has been incorporated which holds the shift valves in second gear position whenever the selector lever is placed in range 2. In this case, the car will start from rest in second gear and will stay in second gear until the selector lever is moved to a higher range. The gearbox will however automatically change down if first gear is required due to extreme loading on the engine. The device is useful when descending very steep hills and it is desired to use the engine as a brake.

It must be remembered that in fixed second it is possible to 'over-rev' the engine if a speed of 50 miles per hour is exceeded, as in this range there is no safety up-change.

### **Manoeuvring**

The fluid coupling and gear ratios of First and Reverse may sometimes make it a little difficult to judge precisely the correct engine speed required to move the car a few inches and it will be found that manoeuvring in confined spaces is more easily accomplished if a little resistance is applied by light application of the hand brake.

### **Parking**

A most efficient lock is incorporated in the design of the gearbox. This operates when the selector lever is placed in position 'R' and the engine is switched off with the car stationary. The car will not move, even on the steepest gradients, but it is essential that the brakes be firmly applied when it is desired to start the engine; the engine will not start until the selector lever is moved to 'N' and no parking lock will then be available.

### **Tow starting**

Normally, the car should not be towed, as this can cause damage to the gearbox through lack of lubrication. However, should it be necessary, the car can be towed for a short distance for the purpose of starting. Before commencing to tow, move the selector lever to the Neutral position and when the car attains a speed of between 15 and 20 m.p.h. move the selector lever into position 4. **The car must not be towed if any mechanical damage is suspected or if the gearbox oil level is low.**

Should it be necessary to tow the car for any distance due to mechanical failure, the gearbox should be prepared for towing by slackening the rear band adjusting screw 4½ turns and re-locking the adjusting screw lock-nut. (Access to the adjusting

## *Driving the Car*

screws is gained by lifting the front carpet and removing the cover panel shown in Figure 29). When towing under these conditions, the selector lever should always be in the Neutral position.

An alternative method of preparing the car for towing is by disconnecting and removing the rear half of the propeller shaft. This method is permissible if facilities for transporting the car are not available. In this condition, the braking efficiency of the car is reduced.

### **Coasting**

Coasting must be avoided at all times, otherwise the gearbox may suffer serious damage due to lack of lubrication.

### **Tool storage**

An adequate set of tools is supplied with the car. The small tools are carried in a fitted tray in the left-hand corner of the luggage boot floor (see Fig. 12). The larger tools are mounted in the spare wheel compartment (see Fig. 11).

### **The jacking system**

The jacking system provided enables the jack to be placed in a convenient position with minimum effort and without the necessity of working underneath the car (see Fig. 13).

On each side of the car, a hollow jacking bracket is fitted under the sill, to the rear of the centre body pillar.

#### *To raise one side of the car:*

Ensure that the car is standing on a fairly level surface and that the hand brake is applied.

Press the jack spigot well home into the bracket, then open the jack legs and set them squarely on the ground (see Fig. 13).

Operate the handle until the road wheels are clear of the ground. To lower the car, reverse this procedure.

**Note:** The spigot is on the same side as the handle of the jack when the tool is removed from the boot, but can be turned to the correct side after separating the jack legs as far as the link allows. After changing the spigot over, the jack should be adjusted to a convenient height for normal use.

If it is desired to raise the car with means other than those supplied, suitable jacking points are as follows:

Front—The plate under the centre of the chassis front cross member.

Rear—The centre of the axle casing or the plates on the road spring 'U' bolts.

### **Wheel changing**

Wheel changing should present no difficulties as the spare wheel may be fitted either to the front or rear hubs as follows:

Remove the wheel disc by means of the tool provided (see Fig. 42), then

slacken the five wheel retaining nuts. Nuts on the left-hand wheels have left-hand threads; nuts on the right-hand wheels have right-hand threads.

Jack up the car as described in 'The Jacking System', then fully unscrew the nuts and remove the wheel.

Fit the spare wheel and screw on the wheel nuts until they just 'nip', then lower the car until the tyre touches the ground; the nuts should then be fully tightened.

Lower the car completely and remove the jack.

Refit the wheel disc, ensuring that the hole for the tyre valve is correctly aligned.

### **Anti-freeze**

The car is delivered with a 25 per cent anti-freeze mixture in the cooling system which will give protection against 20°F. of frost.

A 25 per cent mixture of a recommended anti-freeze should be used all the year round; this not only provides protection against frost during cold weather, but also prevents corrosion of the coolant passages.

In countries where more severe winter conditions are encountered, the percentage of anti-freeze in the mixture should be increased. An approximate indication of the protection against frost ensured by differing amounts of anti-freeze in the system is given below:—

Anti-freeze	3½ pints	5¼ pints	7½ pints	8¼ pints
Freezing point	22°F.	12°F.	2°F.	-3°F.
Degrees of frost	10°F.	20°F.	30°F.	35°F.

**Fig 12 ACCESS TO THE SMALL TOOLS**



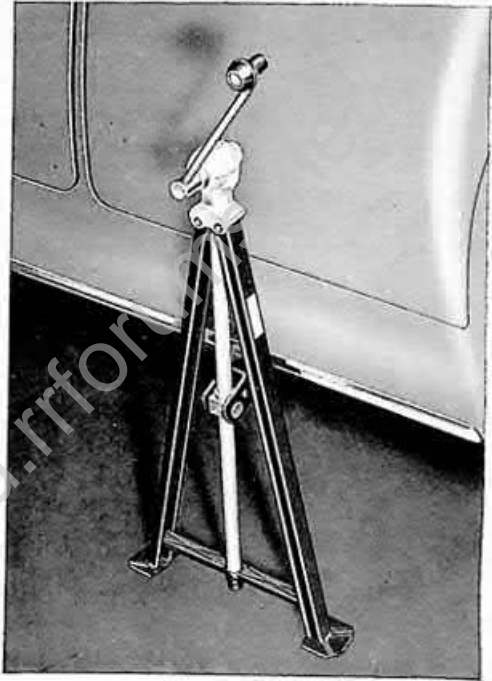
*Driving the Car*

Use only an anti-freeze mixture marketed by a reputable manufacturer. Anti-freeze mixtures conforming to British Standards Specification 3150:1959 are approved for these cars and can be identified by the specification number which will be marked on the container.

Do not mix different types of anti-freeze at any time.

The cooling system should be flushed out annually and refilled with an anti-freeze mixture to the above specification; the old coolant should be discarded.

**Fig 13 THE JACK IN POSITION**





## *Lubrication and Maintenance*

### **Periodic lubrication and maintenance**

Special attention should be paid to the following lubrication and maintenance schedules which can be implemented by an Officially Appointed Retailer or at one of the Service Stations in London or Crewe.

As climatic and operating conditions affect maintenance intervals to a large extent a regular systematic check should be made and attention given to the following points.

The engine crankcase should be drained and refilled at the completion of the car's first 3,000 miles, at which time the opportunity should be taken to have the car's first servicing carried out (see INITIAL SERVICING).

It is also recommended that when the car is operating under adverse conditions, such as are experienced with constant stopping and starting in busy towns and cities, the engine crankcase should be drained and refilled every 3,000 miles.

**Note:** A maintenance and lubrication diagram is provided in the pocket in the back cover.

### **REGULAR MAINTENANCE**

#### **Battery**

The level of the battery electrolyte should be checked weekly and topped-up with distilled water if necessary. During hot weather or when large distances are covered, the battery should be checked more frequently.

#### **Carburettors**

The level of oil in the reservoirs of the automatic air valve dampers should be checked monthly; top-up if necessary (see Page 51).

#### **Engine**

Check the oil level by means of the dipstick, weekly or every 500 miles whichever is the earlier; top-up if necessary (see Page 41).

#### **Radiator**

Check the coolant level weekly and, if necessary, top-up with the correct ant-freeze mixture (see Page 44).

#### **Tyres**

Check the tyre pressures regularly (see Page 70).

#### **Windscreen washer**

Top-up the reservoir as necessary (see Page 99).

## **INITIAL SERVICING**

This should be carried out by an Officially Appointed Retailer after the first 3,000 miles only.

### **Automatic gearbox**

Check for leaks, check the oil level and top-up if necessary (see Page 55).

### **Battery**

Check the level of the battery electrolyte and top-up if necessary.

### **Belt tensioning**

Check the tension of the belts driving the fan, steering pump, generator and refrigerant compressor (if fitted) and adjust them if necessary (see Page 47).

### **Brakes**

Check and if necessary adjust the rear brakes and servo (see Pages 59 and 61).

Check for leaks and check the level of fluid in the brake fluid reservoirs; replenish if necessary to maintain the fluid at the indicated level (see Page 62).

### **Carburettors**

Check the level of oil in the reservoirs of the automatic air valve dampers and top-up if necessary (see Page 51).

### **Engine**

Drain the crankcase and refill it with 12 Imperial pints of one of the recommended oils (see Pages 39 and 41).

### **Radiator**

Check the level of the coolant and, if necessary, top-up with the correct anti-freeze mixture (see Page 44).

### **Steering pump**

Check for leaks and if necessary, top-up the level of oil in the steering pump reservoir (see Page 66).

### **Tyres**

Check the tyre pressures (see Page 70).

### **Windscreen washer**

Check the windscreen washer reservoir and top-up if necessary (see Page 99).

### **Test**

Test the general performance of the car on the road.

## **EVERY 6,000 MILES**

In addition to the regular maintenance described above, carry out the following checks:

### **Air silencer**

Remove and clean the wire mesh filter element (if fitted) (see Page 53).

### **Automatic gearbox**

Check for leaks, check the oil level and if necessary top-up (see Page 55).

### **Belt tensioning**

Check the tension of the belts driving the fan, steering pump, generator and refrigerant compressor (if fitted) (see Page 47).

### **Brakes**

Remove the brake drums and inspect the brake linings for wear. The face of a lining should not be less than  $\frac{1}{16}$ " above the rivets.

Check the rear brake adjustment (see Page 59).

Check for leaks and check the level of fluid in the brake fluid reservoirs; replenish if necessary to maintain the fluid at the indicated level.

### **Brake linkage**

Lubricate the brake linkage clevis and fulcrum pins of the pull rods and intermediate levers (see Page 63).

### **Carburettors**

Clean the air valves in the carburettors. Check the level of oil in the air valve dampers and top-up if necessary to the correct level.

### **Control linkages**

Apply a few drops of oil to the gear range selector controls and accelerator linkage. DO NOT lubricate the automatic starting device controls.

### **Electrical system**

Check that all lights, trafficators, and instruments are operating satisfactorily.

### **Engine**

Drain the crankcase and refill it with the correct quantity of one of the recommended oils (see Pages 39 and 41).

Renew the element of the Full Flow oil filter (see Page 43).

### **Heater**

Check that the heater controls are operating satisfactorily.

### **Ignition distributor**

Remove the rotor arm. Inject two or three drops of clean engine oil into the distributor spindle (see Page 78).

Inject a few drops of thin machine oil through the hole in the contact breaker base plate to lubricate the automatic advance mechanism and shaft bearings. Lightly smear the contact breaker operating cam with grease.

### **Ignition distributor (contact breaker)**

Clean the contact breaker points, check the gap and apply one drop of engine oil to the pivot pin of each rocker arm (see Page 78).

Check and if necessary, re-set the ignition timing.

## *Lubrication and Maintenance*

### **Radiator**

Check the level and the specific gravity of the coolant (see Page 44). If necessary top it up with the correct anti-freeze mixture.

### **Refrigeration system (if fitted)**

Examine the condenser matrix and remove any foreign material from its external surface.

### **Servo**

Check and if necessary adjust the servo (see Page 61).

### **Sparking plugs**

Clean and test the plugs. Re-set the gaps (see Page 80).

### **Steering pump**

Check for leaks, and if necessary top-up the level of oil in the steering pump reservoir (see Page 66).

### **Wheels and tyres**

Interchange the wheels to minimise variations in tyre wear (see Page 70). Check and if necessary re-balance the wheels (see Page 71).

Check and if necessary adjust the tyre pressures.

## **EVERY 12,000 MILES**

In addition to regular maintenance and the 6,000 mile schedule, carry out the following:

### **Air silencer**

Renew the paper filter element (if fitted) (see Page 53).

### **Battery**

Clean the battery terminals and coat them with petroleum jelly.

### **Brake master cylinders**

Lubricate the grease nipple on the master cylinder balance lever (see Page 63).

### **Front suspension**

Lubricate the eight grease nipples with the recommended grease (see Page 64).

### **Fuel system—carburettors**

Disconnect the inlet unions, then remove and clean the filters (see Page 51).

### **Fuel system—fuel pumps**

Remove and clean the filters (see Page 50).

Check the functioning of the fuel pumps. Disconnect the electrical leads and check each pump independently. Clean the electrical contact points.

### **Fuel system—rear filter**

Remove the gauzes and clean them. Drain and clean the filter bowl (see Page 49).

### **Heater (recirculatory)**

Clean the filter gauze in the intake beneath the right-hand front seat (see Page 91).

### **Propeller shaft**

Lubricate the grease nipples in the centre and rear universal joints and the sliding joint (see Page 57).

### **Rear axle**

Check the oil level; top-up if necessary with one of the recommended oils (see Page 58).

### **Shock dampers**

Check for signs of leakage; if apparent, inspect the oil level and top-up if necessary with the recommended oil (see Page 69).

### **Sparking plugs**

Renew the plugs, setting the gaps to 0.025".

### **Steering mechanism**

Lubricate the thirteen grease nipples with the recommended grease (see Page 64).

### **Test**

Test the general performance of the car on the road.

## **EVERY 24,000 MILES**

In addition to regular maintenance and the 6,000 and 12,000 mile schedules, carry out the following:

### **Automatic gearbox**

Drain the gearbox and the fluid coupling; refill with the recommended fluid (see Page 55). Clean the breather in the top of the dipstick.

### **Engine**

Clean the flame traps in the crankcase breather tube (see Page 44).

### **Fuel tank**

Release—but do not remove—the drain plug, to allow any accumulated water to escape (see Page 49).

### **Generator**

Inspect the commutator and the brushes for wear and for freedom in their holders (see Page 76).

### **Rear axle**

Drain when warm and refill with one of the recommended oils (see Page 58).

### **Steering pump**

Renew the filter element in the steering pump reservoir (see Page 66).

### **Steering transfer box**

Check and if necessary top-up with one of the recommended oils to the level plug hole (see Page 65).

## **SEASONAL SCHEDULES EVERY 12 MONTHS**

### **Engine cooling system**

Drain the anti-freeze from the radiator and cylinder block. Thoroughly flush out the coolant passages with a continuous flow of water. This should be carried out just prior to the Autumn (in the U.K. prior to September 21st.).

Refill the system with the correct anti-freeze mixture.

### **Refrigeration system (if fitted)**

**These operations should only be carried out by an experienced refrigeration engineer.**

Check that the refrigeration system is functioning correctly and if necessary top-up the system with refrigerant. If loss of refrigerant is evident, check the system for leaks.

Check the level of oil in the refrigerant compressor.

Clean the filter gauze fitted over the evaporator air intake (boot units only).

## **EVERY 24 MONTHS**

In addition to the 12-monthly schedule:

### **Engine cooling system**

Renew all heater and coolant hoses.

## **SPECIAL PRECAUTIONS**

Should the car be used in constant temperatures of 0°F. and below:—

### **Carburettors**

Drain and refill the carburetter air valve dampers with oil of viscosity SAE 10.

### **Engine**

Drain the engine sump when thoroughly warm and refill it with oil of viscosity SAE 10.

RECOMMENDED LUBRICANTS

	B.P.	CASTROL	ESSO	MOBIL	SHELL
Engine—Winter Summer Multi-grade	Energol SAE 20/W Energol SAE 30 Energol Viscostatic (10W/30)	Castrolite Castrol XL Castrolite	Eso Extra Motor Oil 20W/30 Eso Uniflo	Mobiloil Arctic Mobiloil A Mobiloil Special (10W/30)	X-100 20/20W X-100 30 X-100 10W/30
Carburetor Dampers, Contact Breakers, Hand Oiling Points	Energol SAE 30/W	Castrolite	Eso Extra Motor Oil 20W/30	Mobiloil Arctic	X-100 20/20W
Automatic Gearbox, Shock Dampers, Steering Pump*	Energol ATF Type A	Castrol TQ	Automatic Trans- mission Fluid	Mobilfluid 200	Donax T6
Rear Axle Transfer Steering Box	Energol SAE 90EP	+ Castrol Hi-press S/C or Castrol Hypol	Eso Gear Oil GP 90	Mobilube GX 90	Spirax 90 EP
Propeller Shaft Centre Bearing, Front and Rear Hubs, Propeller Shaft, Sliding and Rear Universal Joints Master Cylinder Balance Lever	Energlease L2	Castrolase LM	Eso Multi-purpose Grease H	Mobilgrease MP	+ Retimax A
Propeller Shaft Front Ball and Trunnion Joint Refrigeration Compressor	—	—	—	Mobilgrease No. 2	—
	+ Regent Texaco Capellia E				
	—	Isomatic Heavy †	Norpol 50†	Gargolis Arctic 155 †	Clavus 33 †
Hydraulic Brakes	Castrol-Girlint Brake Fluid (6293) Crimson				
Steering Joints and Suspension Pivots	Rocol Molly Spring Grease 204 G or Shell Grease S 5466				

+ First recommendation \* Also recommended: General Motors—Hydraulic Fluid Type AQ ATF  
† Also recommended

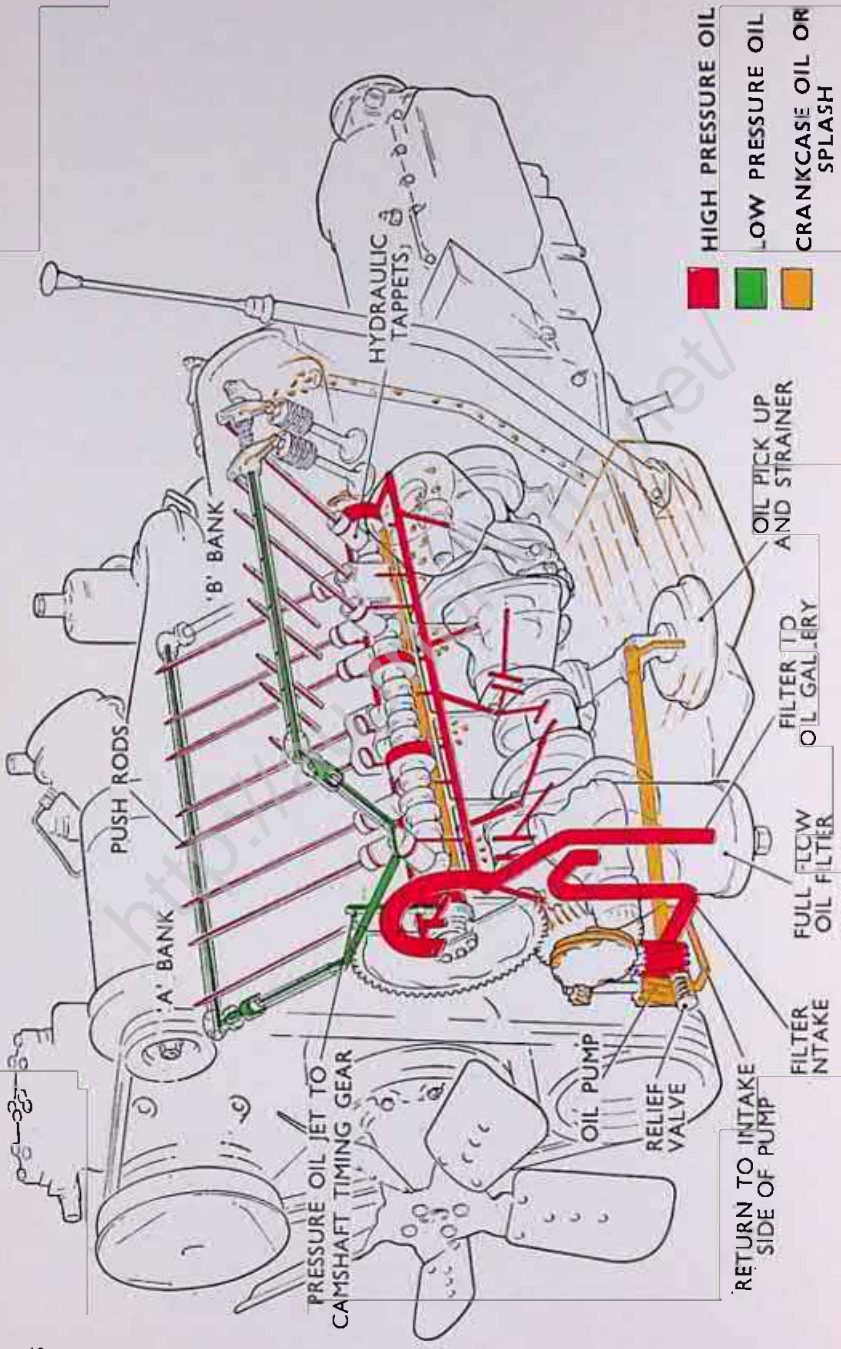


Fig 14 ENGINE LU BRICATION DIAGRAM



## *Engine*

The engine has eight cylinders arranged in two banks of four, inclined at  $90^\circ$  to one another. The crankcase and detachable cylinder heads are of cast aluminium alloy.

The crankshaft is dynamically balanced and is carried in five thin wall steel-backed bearings lined with copper-lead indium; similar bearings are fitted to the big-end of each connecting rod. The small-end bearings are lead-bronze bushes.

The overhead valve mechanism is operated by a single camshaft through push rods and self-adjusting hydraulic tappets.

### **ENGINE LUBRICATION SYSTEM**

The engine oil is circulated by a gear type pump mounted on the front of the crankcase and driven by the crankshaft through skew gears.

Oil is drawn from the sump through a fine mesh gauze strainer and is delivered under pressure to the bearings through a Full Flow filter. Uniform pressure delivery is maintained by means of a relief valve in the pump.

The tappets are lubricated through galleries beneath the tappet block by oil under high pressure. The push rods are fed with oil direct from the tappets (see Fig. 14) and the rocker arm bearings are lubricated under low pressure through the rocker shafts.

The camshaft runs in a trough of oil while the cylinder walls and piston gudgeon pins are 'splash' lubricated.

The engine lubrication system is shown diagrammatically in Figure 14.

### **Filling or topping-up**

It is essential that the oil in the engine sump is maintained at the correct level. In order to obtain an accurate indication of the oil level, ensure that the car is standing on level ground. Check the oil level by means of the dipstick which is situated on the left-hand side of the engine (see Fig. 17).

The oil level should preferably be checked when the engine is cold. If the engine is warm, sufficient time should be allowed, after stopping the engine, for the oil to drain back to the sump, otherwise a false reading will be obtained.

The oil filler is situated on the front face of 'B' bank cylinder head (see Fig. 17). Open the filler cap and add the fresh oil, then after allowing sufficient time for the oil to reach the sump, check that the level is up to the 'Max' mark on the dipstick.

### **To drain the sump**

The sump should be drained every 6,000 miles, preferably when the oil is warm after the car has completed a run. If the car is regularly used for town work and is subjected to a considerable amount of 'stop-start' operation, the sump should be drained and refilled every 3,000 miles.

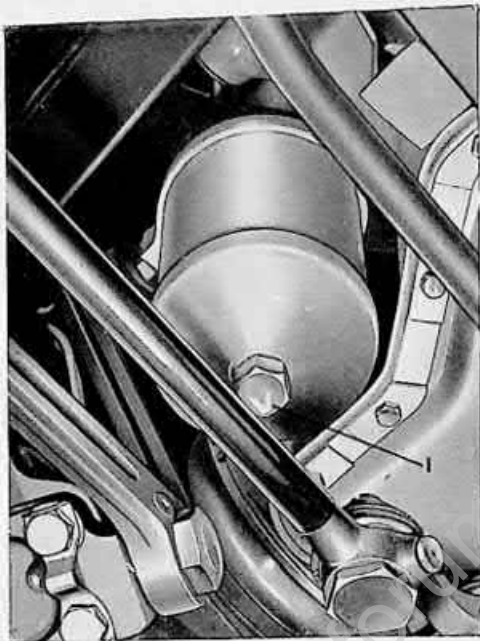


Fig 15 ACCESS TO THE OIL FILTER

1 Securing bolt

Place a suitable container in position and remove the drain plug which is situated in the well on the right-hand side of the sump; the plug should be removed by means of the adaptor in the tool kit.

Do not attempt to flush the sump with paraffin or petrol.

When refitting the drain plug, ensure that the washer is in position and in good condition.

### Oil pressure relief valve

A relief valve unit in the oil pump regulates the oil pressure so as to maintain it at approximately 40 lb/sq. in.

### Oil level indicator

In order that a quick check may be obtained, the fuel gauge on the instrument panel has been so designed that on depressing the button (see Figs. 3 and 6) it will register the approximate quantity of oil in the engine sump. This is only intended for use on a journey as a quick check.

A red line on the gauge indicates 'Minimum' and the engine should never be run with the oil below this mark. The dipstick should always be used when actually topping-up with oil.

When this check is carried out, the car should be standing on level ground with the engine switched off.

### Oil pressure indicator

An electrically operated oil pressure indicator is fitted in the instrument panel (see Figs. 3 and 6).

Under normal running conditions, the pointer should register a pressure within the white band on the instrument scale.

When the engine is idling, a reduced pressure will be indicated.

### Oil filter (see Fig. 15)

The Full Flow oil filter element should be renewed every 6,000 miles. It is not practicable to clean it and no attempt should be made to do so.

The front of the car should be placed over a pit or raised on jacks or upon ramps before proceeding to remove the filter bowl.

**Note:** To enable the filter bowl to be removed from a left-hand drive car, it is necessary to turn the wheels to full left-hand lock; it will also simplify removal of the bowl on right-hand drive cars if the wheels are turned to full left-hand lock.

Unscrew the set-bolt at the bottom of the filter whilst supporting the filter bowl by hand.

Remove the bowl, keeping it upright to avoid spilling the oil. Drain the oil and discard the element. The bowl should then be cleaned, ensuring also that the rim of the bowl is free from foreign matter.

Fit a new element and a new rubber sealing ring; lightly smear the rubber ring with grease to hold it in position. Fit a new joint washer to the bolt and refit the bowl. Run the engine and inspect the filter joint for oil leaks.

### Crankcase breather

The crankcase of the engine is ventilated through a breather tube connected to the carburettor air induction system.

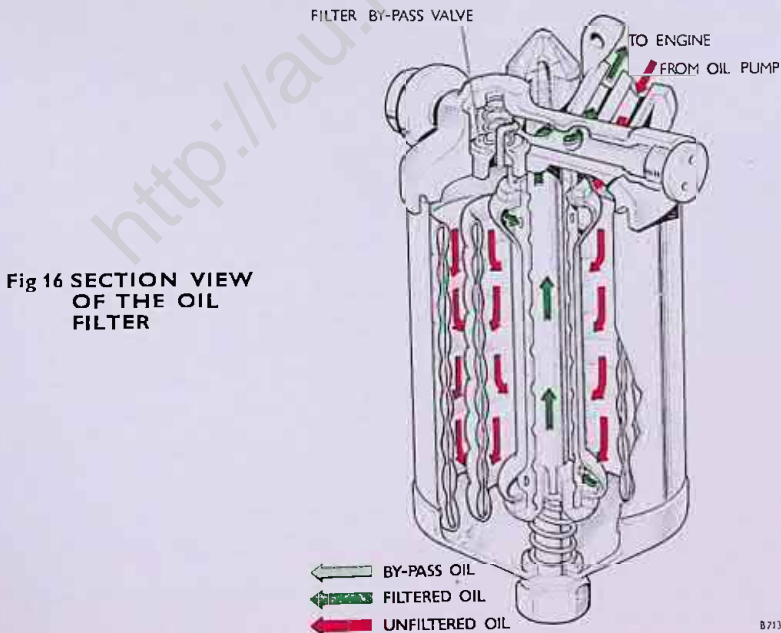


Fig 16 SECTION VIEW OF THE OIL FILTER

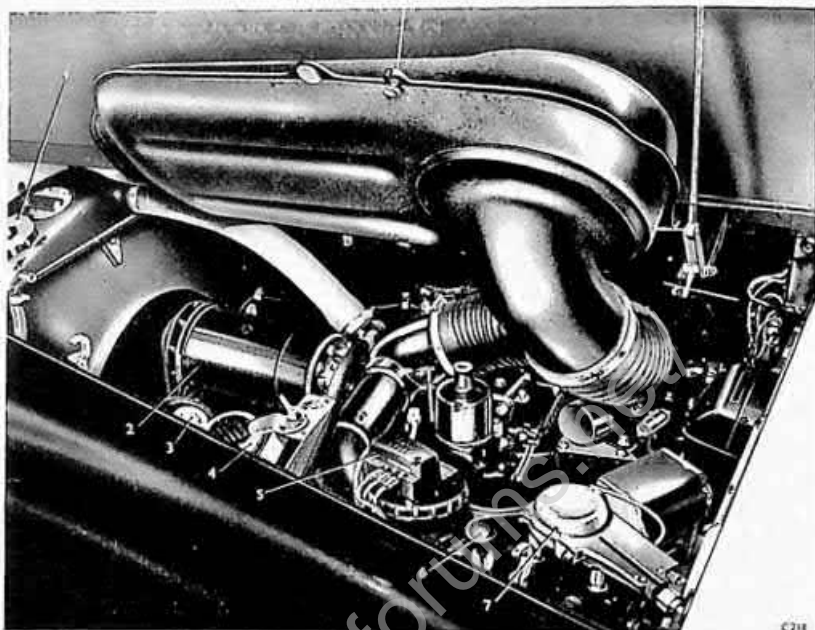


Fig 17 GENERAL VIEW OF THE LEFT-HAND SIDE OF THE ENGINE

- |                         |                           |
|-------------------------|---------------------------|
| 1 Radiator filler cap   | 5 Windscreen washer motor |
| 2 Generator             | 6 Engine dipstick         |
| 3 Steering pump         | 7 Windscreen wiper motor  |
| 4 Engine oil filler cap |                           |

A flame trap in the form of six gauze filters is fitted into the union on the oil filler tube. Every 24,000 miles, the filters in the flame trap should be removed and cleaned as follows:

Remove the setscrew securing the breather pipe union to the oil filler pedestal; disconnect the union from the pedestal (slight resistance may be felt owing to the rubber joint on the union). Remove the union from the pipe.

Wash the filters in clean petrol, then dry them with a high pressure air line.

Before refitting the union to the oil filter pedestal, check the condition of the rubber sealing rings and if necessary renew them.

## ENGINE COOLING SYSTEM

### Topping-up the radiator

The cooling system is pressurised; **under no circumstances should the filler cap be removed while the engine is running.** When removing the filler cap, unscrew it slowly to allow the pressure to drop.

The coolant level should be checked weekly and topped-up as necessary with the correct anti-freeze mixture (see Page 31).

Fig 18 RADIATOR  
DRAIN TAP



### Draining the system

Drain taps are provided at the bottom of the radiator and on either side of the engine. All three should be open when draining the system (see Figs. 18 and 19).

### Flushing the system

The coolant should be drained and the system 'reverse' flushed annually. This can be undertaken by an Officially Appointed Retailer or at one of the Service Stations in London or Crewe.

To drain the cooling system, remove the radiator filler cap and open the three drain taps positioned one at the bottom of the radiator and one on each side of the cylinder block (see Figs. 18 and 19). Switch on the ignition and turn fully clockwise the 'upper' and 'lower' air conditioning switches to assist drainage of the heater matrices.

Fig 19 CYLINDER BLOCK  
DRAIN TAP  
1 Drain Tap



R402

## Engine

To flush the radiator, disconnect the top and bottom hoses and apply water under pressure to the lower hose, fitting the upper hose to a waste pipe. Mains water pressure will remove all loose sediment in about half an hour's flushing.

Before flushing the engine coolant passages, remove the cylinder block drain taps and thermostat. Apply water under pressure to the drain tap apertures and flush through for approximately half an hour or until the water runs clear. Refit the taps and thermostat.

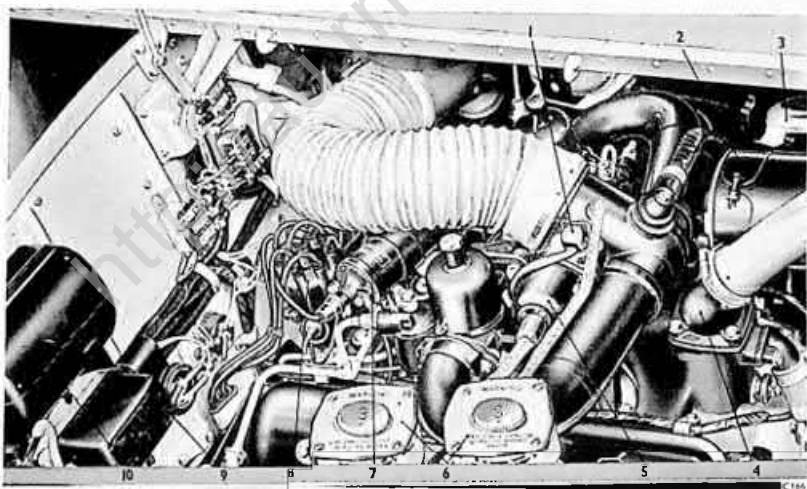
To flush the heater matrices, detach the matrix hoses at the electrically operated water taps and the coolant pump. Attach a waste pipe to the upper or inlet hose of each matrix and apply water under pressure to the outlet hoses. Flush each matrix for approximately half an hour.

Examine the coolant hoses and refit them only if they are serviceable.

Fill the system with a fresh anti-freeze mixture (see Page 31). The volume of concentrated anti-freeze specified for the frost protection required should initially be mixed with an equal volume of water. This mixture should then be poured into the radiator slowly to avoid air locks. Finally, the radiator should be topped-up with water to reduce the percentage concentration of anti-freeze to the required level.

To ensure uniform distribution of the anti-freeze throughout the system, the engine should be run until normal operating temperature is reached.

On no account must any strong alkaline compound or detergent be used to clean the cooling system. Several such compounds are available, but their use must be carefully avoided as they have a detrimental chemical action on aluminium alloys.



**Fig 20 GENERAL VIEW OF THE RIGHT-HAND SIDE OF THE ENGINE**

- |                            |                             |
|----------------------------|-----------------------------|
| 1 Automatic choke solenoid | 6 Brake fluid reservoirs    |
| 2 Generator                | 7 Ignition coil             |
| 3 Engine oil filler cap    | 8 Ignition distributor      |
| 4 Thermostat housing       | 9 Current/voltage regulator |
| 5 Choke thermocoil housing | 10 Main fuse box            |

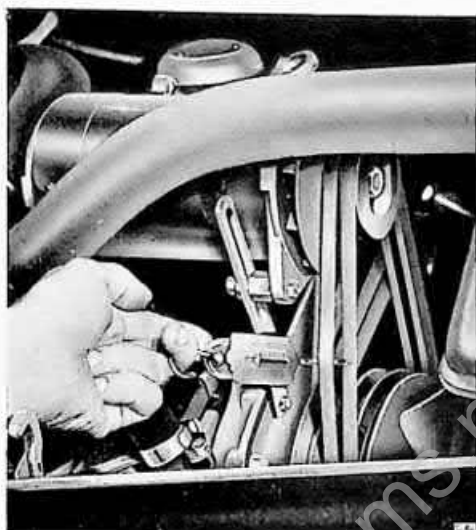


Fig. 21 CHECKING TENSION OF GENERATOR BELTS

### Coolant Pump

The coolant pump bearings are self-lubricating and require no attention.

### Engine thermostat

The thermostat is fitted in the coolant outlet pipe between the engine and the radiator header tank (see Fig. 20); this prevents the circulation of the coolant through the radiator until the engine has attained normal operating temperature.

The coolant by-passes the radiator when the thermostat valve is closed and thus ensures rapid warming-up of the engine and the car heating system.

### BELT ADJUSTMENT

Two matched pairs of belts are driven by the crankshaft pulley. One pair drives the coolant pump, fan and the power assisted steering pump; the other pair drives the generator and the refrigeration compressor (if fitted).

If the tension of one belt in a pair differs markedly from the other, a new matched pair of belts should be fitted.

### Generator and refrigeration compressor (if fitted)

The generator pivots upon a bracket on the inlet manifold and a strut on the coolant pump cover. It is secured in the desired position by means of a clamping bolt located in the adjusting slot of a swivel arm.

The belts are correctly adjusted when an applied force of 6 lb. at the centre of the run between the compressor and generator pulleys causes each belt to deflect  $\frac{3}{8}$ ".

### Coolant and steering pump

The steering pump is mounted upon a casting which is pivoted at its apex upon a stud located beside the engine oil filler cap. It is secured in the desired position by

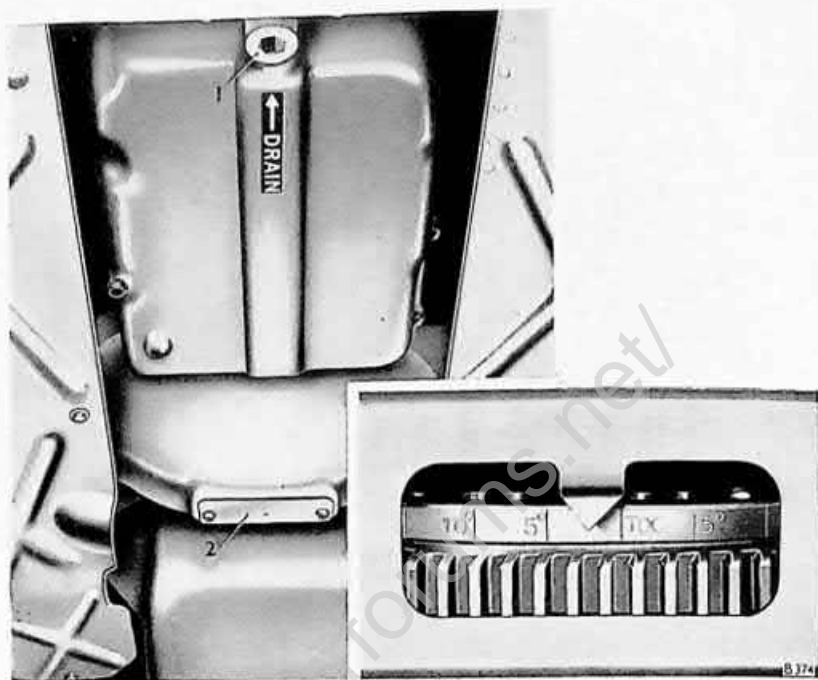


Fig 22 ACCESS TO FLYWHEEL TIMING MARKS

Inset Flywheel timing marks  
1 Gearbox drain plug

2 Timing inspection cover

a clamping bolt and an adjusting slot running along its curved lower edge.

An applied force of 8 lb. at the centre of the run between the coolant pump and power assisted steering pump pulleys should cause each belt to deflect  $\frac{3}{8}$ ".

## IGNITION TIMING

The normal static ignition timing is  $2^\circ$  before T.D.C. (see Fig. 22). A hand adjustment (the octane selector) is provided on the distributor to adjust the ignition timing (see Fig. 50). It is necessary to retard the ignition to provide smoother running when the only fuel available is of an inferior quality.

When the car leaves the factory this adjustment is fully advanced for use with the specified fuel (see Page 12). If fuel below this octane rating has to be used, the distributor will require retarding accordingly.

## TAPPETS

Hydraulic tappets are fitted, therefore no adjustment is necessary or possible.

The tappets are primed and fed by the high pressure oil system. A light tapping may be audible when first starting the engine and will be evident for a few seconds until the oil has circulated.



## Fuel System and Carburettors

### Fuel tank

A sediment trap is provided in the tank to facilitate the removal of any foreign material which may have accumulated in the tank.

Every 24,000 miles it is advisable to release the drain plug one or two turns to drain any accumulation of water or sediment from the tank. Always ensure that the plug is afterwards securely tightened.

### Rear filter

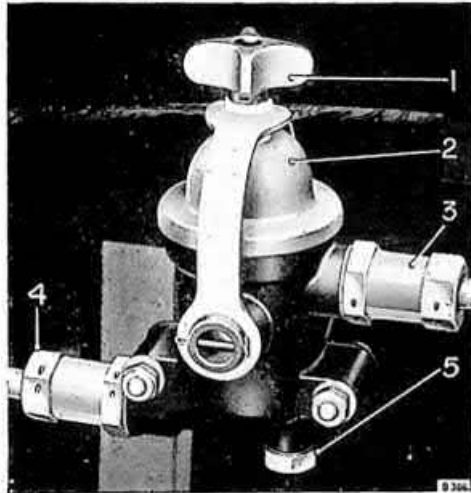
The rear filter shown in Figure 23 contains two circular gauzes. The fuel passes upwards through these gauzes and any dirt present settles in the bowl.

To remove the gauzes for cleaning, unscrew the yoke retaining nut and remove the cover. Lift out the gauzes by means of the centre knurled sleeve and clean them in petrol with a stiff brush.

When refitting the cover, ensure that the sealing washer is sound and correctly positioned and that the yoke is sufficiently tight. Care should be taken to ensure that the yoke is not over-tightened. Any leaks on the suction side of the pumps, although not apparent by the leakage of fuel, will impair the engine performance.

Fig 23 REAR FUEL FILTER

- 1 Yoke nut
- 2 Cover
- 3 Inlet pipe
- 4 Outlet pipe
- 5 Drain plug



### Fuel pumps

The electric fuel pumps are mounted on the right-hand side frame member, immediately forward of the jacking bracket (see Fig. 24); access to the pumps is gained from beneath the car. They are of the solenoid operated, diaphragm type which only operate when the ignition is switched on. The unit comprises two independent pumps delivering into a common chamber. Two filters are provided and can be removed by unscrewing the hexagon plugs fitted at the base of the common chamber. The filters should be removed and cleaned every 12,000 miles.

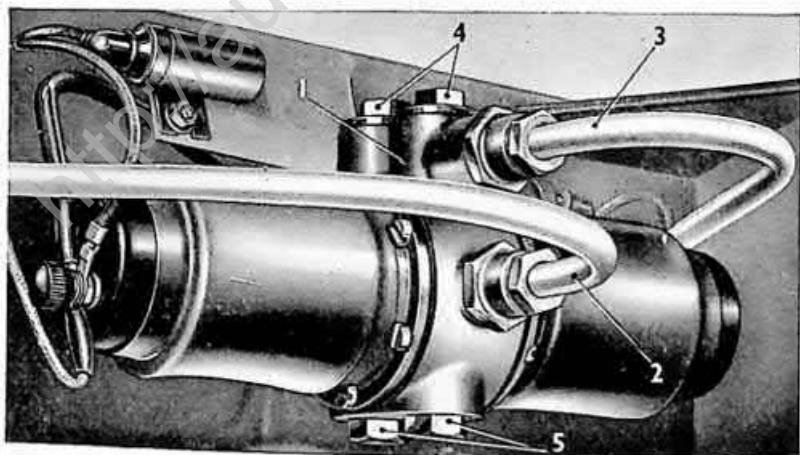
### CARBURETTERS

Twin S.U. HD.8 carburetters are mounted on an induction manifold which is common to both cylinder banks; each carburetter supplies four cylinders: two in each bank.

The degree of throttle opening, the speed of the engine and the load against which the engine is operating are all factors which govern the gas pressure in the induction manifold. The difference between atmospheric pressure and the pressure in the manifold is used automatically in each carburetter to adjust the position of an air valve piston which carries a tapered needle regulating fuel delivery through the main jet (see Fig. 26). A hydraulic damper plunger in the hollow stem of the piston guide retards the rising of the air valve piston during acceleration, so providing an enriched mixture during this period.

The air valve pistons should be removed and cleaned every 6,000 miles.

Both carburetters utilise air drawn through a common air filter and silencer (see Page 53).



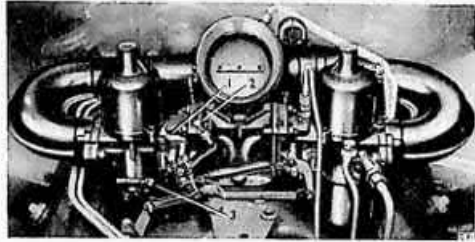
**Fig 24 FUEL PUMPS**

- 1 Fuel pump chamber
- 2 Inlet pipe
- 3 Outlet pipe

- 4 Suction and delivery valves
- 5 Filters

Fig 25 THE  
CARBURETTERS

- 1 Volume adjustment screw
- 2 Throttle stop screw
- 3 Jet adjustment screw



### Carburetter oil reservoirs

The guide spindle carrying the air valve piston in each carburetter is a hollow cylinder which is filled with S.A.E. 20 engine oil, and which surrounds a small piston damper containing a sleeve valve (see Fig. 26).

The damper piston is mounted on a rod integral with the damper filler plug and when the air valve piston rises under conditions of acceleration, the oil trapped in the lower portion of the damper cylinder forces the sleeve valve closed, so presenting a cushion of oil which opposes the rising action of the piston. Downward movement of the piston is unrestricted as the sleeve valve opens and permits oil to pass from the space above the damper plunger to the space below.

Every month, the filler plug and damper piston should be removed from the top of each carburetter and the damper reservoir topped-up to a point  $\frac{1}{2}$ " from the top of the tube.

### Cleaning the carburetter fuel filters

A gauze filter is fitted in the fuel inlet union of each carburetter and should be removed and cleaned every 12,000 miles. To gain access to the filter, disconnect the fuel pipe and remove the union and washer; the filter will then be pressed from its recess by the spring fitted behind it.

When refitting the filter, ensure that the open end of the filter cone faces outwards and that the copper washer for the union is correctly positioned.

### Carburetter adjustment

There should be no necessity for alteration of the control adjustments set by the manufacturer other than occasional attention to the slow running controls as described below.

The engine slow running speed is set by the throttle stop screw (see Fig. 25). However, the balance of the carburetters has a significant effect upon the slow running speed and must be adjusted by means of the volume screws shown in Figures 25 and 26; the volume screws control the restriction in a passage through which air is allowed to by-pass the carburetter throttle.

The mixture strength for slow running is set by the jet adjusting screw (see Figs. 25 and 26) on the side of the main body of each carburetter. The screw acts through a lever to raise or lower the jet tube which is attached to a rubberised diaphragm covering the main jet well. Turning the screw clockwise lowers the jet and enriches the mixture; turning the screw anti-clockwise raises the jet and weakens the mixture.

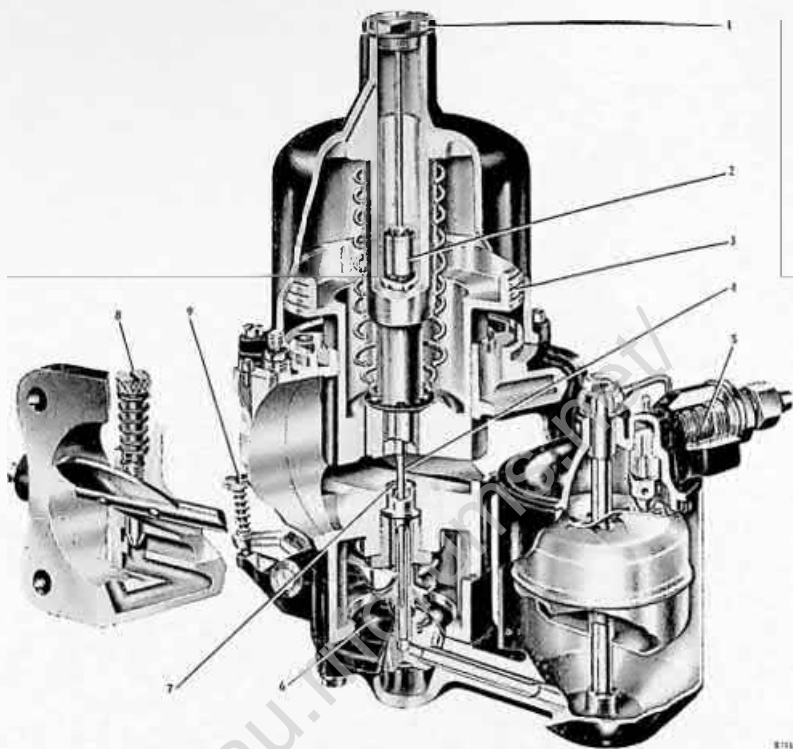


Fig 26 CUT-AWAY VIEW OF ONE CARBURETTER

- |                           |                           |
|---------------------------|---------------------------|
| 1 Oil reservoir cap       | 6 Diaphragm               |
| 2 Hydraulic damper piston | 7 Jet                     |
| 3 Air valve piston        | 8 Volume adjustment screw |
| 4 Needle                  | 9 Jet adjustment screw    |
| 5 Filter                  |                           |

### Adjustment procedure

*Each phase of this operation should be completed for both carburetters before the subsequent phase of the adjustment is undertaken.*

Run the engine until it reaches normal running temperature, then switch off the ignition.

Screw down the volume screw on each carburetter to the full extent of its travel, then unscrew  $1\frac{1}{2}$  turns.

Start the engine and engage the refrigeration compressor (if fitted). Manipulate the jet adjusting screw of each carburetter to obtain smooth running of the engine, then adjust the volume screws to obtain the maximum smoothest engine speed without causing the car to 'creep' when in gear. Use the volume screws to 'balance' the carburetters so that the hiss heard from each carburetter is of equal intensity.

The volume screws should not be unscrewed more than 2 complete turns from the fully closed position, otherwise an obtrusive whistle from the carburetters may

result. If 2 complete turns are insufficient, the slow running speed may further be raised by careful adjustment of the throttle stop screw shown in Figure 25; the screw must afterwards be locked by means of its lock-nut.

### **Locating a fuel supply failure**

1. Check that there is sufficient fuel in the tank. The green warning lamp on the instrument panel will light if the fuel reserve falls below three gallons. If the tank is empty, the fuel pumps will 'tick' continuously.
2. Disconnect the outlet pipe from the pumps and switch on the ignition.
  - (a) If a steady supply of fuel is emitted, refit the pipe. Check fuel delivery at the carburetter float chambers by slackening both the inlet unions. Examine the filters located in the float chamber bodies. Clear the carburetter feed pipe if necessary.
  - (b) In cases of little or no fuel delivery from the pumps, check and clean the rear filter and pump filters. Check that the pipe from the tank to the rear filter is not blocked. If the pumps fail to operate with the inlet pipe disconnected, check the electrical supply to the pumps. This can best be effected by connecting a 12 volt bulb between the supply lead and a good earth contact. If the pump fails to operate, remove the unit and return it to an Officially Appointed Retailer for renewal.

### **AIR FILTER AND SILENCER**

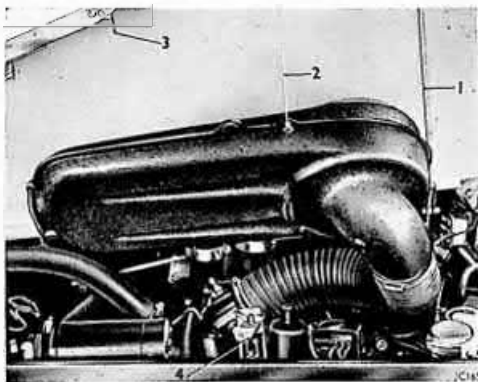
The air filter and silencer unit, which is hinged to the bonnet, is also secured to the left-hand valance plate by means of a clamp (see Fig. 27). To provide easy access to the engine when the bonnet is open, release the clamp and secure the silencer to the bonnet by means of the stay provided (see Fig. 27).

#### **Removing the filter from the silencer**

To remove the filter, unscrew the knurled nut on top of the unit (see Fig. 28). The cover, spider, locating ring and filter can then be withdrawn.

**Fig 27 AIR SILENCER  
AND FILTER  
UNIT IN RAISED  
POSITION**

- 1 Bonnet stay
- 2 Silencer stay
- 3 Silencer stay bracket
- 4 Silencer clamp



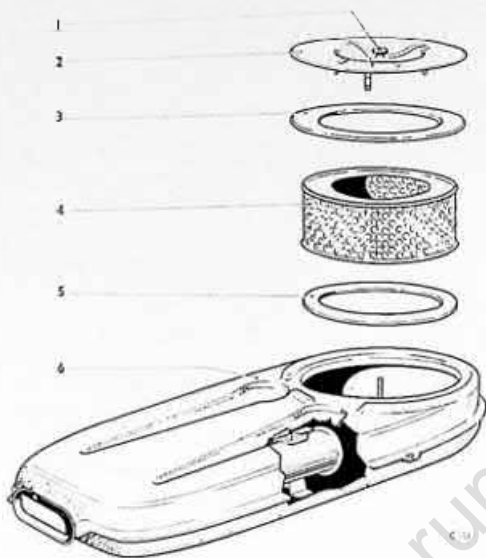


Fig 28 EXPLODED VIEW OF THE AIR FILTER

- 1 Knurled nut
- 2 Cover
- 3 Joint washer
- 4 Filter element
- 5 Joint washer
- 6 Silencer

All cars destined for the following countries are fitted with a paper air filter element: Africa (including Algeria, Egypt, Kenya, South Africa, Morocco, Sudan, Tunis, Madeira, Tangiers, Nigeria etc.) also Asia (including India, Turkey, Iran, Iraq, Syria, Lebanon, Israel, Jordan, Hong Kong etc.) also Australia, New Zealand, Spain, Portugal, Greece, Yugoslavia, Gibraltar, South America, Jamaica, Bahamas, Mexico.

The element of this filter should be renewed every 12,000 miles. Should the element require cleaning before this time, cleaning can be effected by applying a high pressure air line to the inside of the element. On no account must oil or petrol be allowed to come into contact with the element.

All cars destined for countries other than those above are fitted with an oil wetted wire mesh air filter element.

Every 6,000 miles the filter should be removed and washed thoroughly in petrol.

After washing, all surplus petrol should be removed by blowing through the filter from the inside with a high pressure air line.

The filter should then be completely immersed in engine oil and allowed to soak for a period of approximately 5 minutes and afterwards allowed to drain for a period of two hours.

The element should then be refitted to the silencer ensuring that the rubber seals are in good condition.

## Transmission

### THE GEARBOX

The Automatic Gearbox combines epicyclic gear trains with a fluid coupling and provides automatic control of gear changes. The epicyclic gear trains provide four forward ratios and Reverse.

It is essential for efficient operation of the gearbox that only an approved fluid be used and that the fluid level in the gearbox is regularly inspected and maintained.

In an emergency, if none of the approved fluids are available (see Page 39) top-up with S.A.E.,10 engine oil rather than drive with insufficient oil, but ensure that the gearbox is drained and refilled with the correct fluid at the earliest opportunity.

#### Topping-up the gearbox

The oil level can only be checked accurately when the engine is running. The recommended procedure is as follows:

1. Ensure that the selector lever is in the Neutral position 'N' and that the hand brake is applied. Start the engine and run it at idling speed for approximately three minutes.

**Fig 29 ACCESS TO THE GEARBOX DIPSTICK**

- 1 Band adjustment access plate



### Transmission

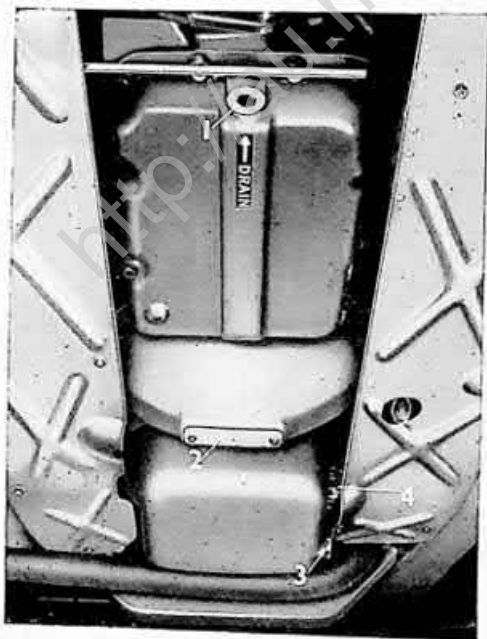
2. Remove the dipstick access cover, a rubber plug situated in the floor in front of the front seat (see Fig. 29) and thoroughly clean the area around the dipstick. With the engine still running, remove the dipstick and check the fluid level.
3. If topping-up is necessary, add the approved fluid in small quantities, checking frequently to make sure that the level does not exceed the "F" mark. Ensure when filling that the fluid and containers are absolutely clean.

If an oil leak is detected, report the matter to an Officially Appointed Retailer.

### Draining and refilling the gearbox

The gearbox should be completely drained and refilled with fresh Automatic Transmission Fluid every 24,000 miles:

1. Clean the area around the drain plug in the gearbox sump. Place a suitable container in position, then remove the plug together with its aluminium washer (see Fig. 30).
2. Remove the lower cover from the bell housing and turn the engine so that the fluid coupling drain plug is at its lowest point; place a suitable container in position, then remove the plug and drain the fluid.
3. Refit both plugs together with new washers and tighten them securely. It is important not to overstress the torus cover plug when tightening.



**Fig 30 ENGINE AND GEARBOX DRAIN PLUGS**

- 1 Gearbox drain plug
- 2 Timing inspection cover
- 3 Engine drain plug
- 4 Oil level indicator



4. Remove the dipstick and pour in 12 Imperial pints of the recommended fluid. The fluid coupling and the sump are filled through the same orifice.
5. With the selector lever in the Neutral position and the hand brake applied, start the engine and run it at fast idle for approximately five minutes.
6. Stop the engine and add a further 6 Imperial pints of fluid to the gearbox.
7. Restart the engine and whilst running it at slow idle, check the fluid level with the dipstick and add sufficient fluid to bring the level to the 'F' mark. Take care not to overfill.

## PROPELLER SHAFT

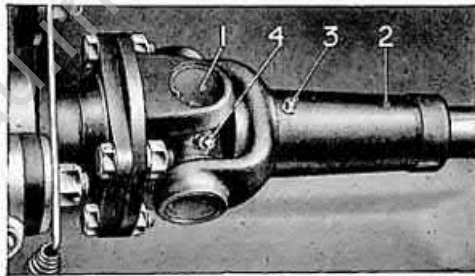
A divided propeller shaft incorporating resonance dampers is used to transmit engine torque to the rear axle.

The front shaft is connected to the gearbox output shaft by a ball and trunnion universal joint. The rear end of the front shaft is carried in a heavy ball race which is flexibly suspended from the frame and which compensates for variations in the alignment of the front and rear shafts and prevents any propeller shaft vibration being transmitted to the chassis.

The centre and rear universal joints are fitted with needle roller bearings and each joint is provided with a grease nipple located at the centre of the cross piece. The centre sliding universal joint is also provided with a grease nipple (see Fig. 31).

**Fig 31 PROPELLER  
SHAFT CENTRE  
JOINT**

- 1 Universal joint
- 2 Sliding joint
- 3 Grease nipple
- 4 Grease nipple



### Lubrication

The front ball and trunnion joint is packed with 1½ oz. Mobilgrease No. 2 on assembly. When the securing bolts are inspected, the condition of the rubber boot should also be checked.

The centre and rear universal joints and the sliding joint grease nipples should be lubricated every 12,000 miles. It is important that grease is seen to issue from all four trunnions of the centre and rear universal joints.

## THE REAR AXLE

The rear axle is of the semi-floating type with the final drive transferred through hypoid bevel gears. The axle shafts are forged integrally with the wheel hubs. The inner ends of the axle shafts are splined into the differential bevel wheels and the outer ends are supported in single row, sealed ball bearings mounted in housings bolted to the axle tubes.

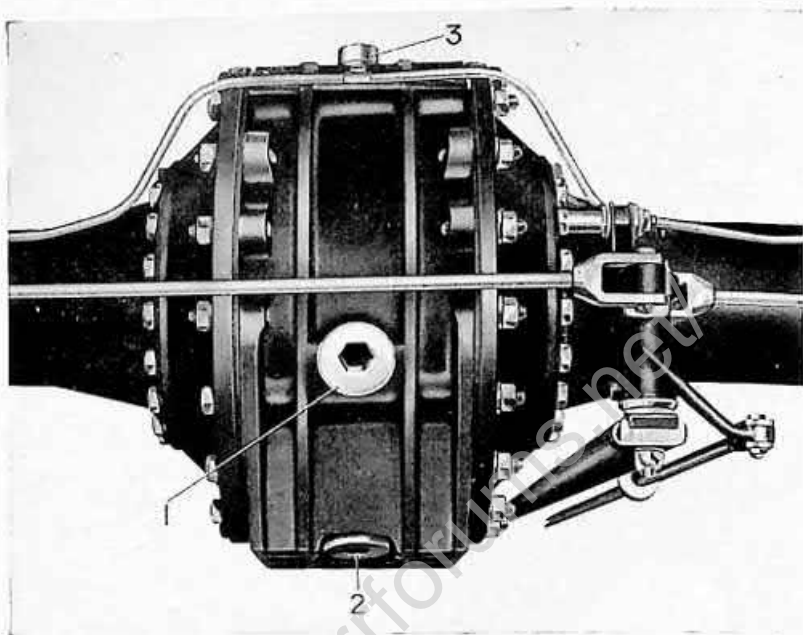


Fig 32 THE REAR AXLE

1 Level plug

2 Drain plug

3 Breather

### Lubrication

It is important that Castrol Hi-press S/C oil be used in the rear axle whenever it is available. In an emergency, when topping-up is extremely necessary and this oil is unobtainable, one of the other approved oils should be used. Existing oil must be drained from the axle, which should then be refilled with fresh lubricant: it is most unwise to mix even approved oils. As soon as is convenient, the rear axle should again be drained and refilled with Castrol Hi-press S/C oil.

Every 12,000 miles, check the level of the oil by removing the level plug in the rear axle casing (see Fig. 32) and if necessary top-up to the level plug orifice. An adaptor is provided in the tool kit to fit the plug centre.

Every 24,000 miles, when the axle casing is warm, drain and refill (by means of a syringe) with  $1\frac{1}{2}$  pints of oil.

**Note:** When refitting either plug, use a new joint washer and ensure that there is no leakage.

## *Braking System*

The braking system incorporating a mechanically operated servo, provides safe and efficient braking without undue pressure being applied to the brake pedal.

Pressure on the brake pedal actuates the servo to operate both the front and rear brakes hydraulically. In addition, the brake pedal is connected to the rear brakes by a mechanical linkage (see Fig. 33).

Each front brake comprises two trailing shoes operated individually by hydraulic cylinders. Each rear brake comprises a trailing and a leading shoe, interconnected and actuated by a combined hydraulic and mechanical expander.

The output from the servo is transmitted to two master cylinders and thereby to the wheel cylinders. The lower, smaller capacity master cylinder applies hydraulic pressure to the lower shoe in each front brake; the upper, larger master cylinder applies hydraulic pressure to the upper shoe in each front brake and to all shoes in the rear brakes.

The hand brake operates the rear brakes only.

This dual hydraulic and mechanical system effectively provides three braking systems capable of independent operation in the unlikely event of failure of any of the three systems (see Fig. 33).

### **ADJUSTING THE BRAKES**

#### **Front brakes**

The shoes of the front brakes are self-adjusting and wear is taken up automatically.

#### **Rear brakes**

Wear on the brakes has the effect of increasing the travel of the foot and hand brake controls, therefore check and if necessary adjust them every 6,000 miles.

To adjust the brakes, it is necessary to jack the rear wheels off the ground. Rotate each wheel a few degrees in each direction and then turn the adjuster clockwise until a solid resistance is felt (see Fig. 34). The adjuster should then be turned back two 'clicks'.

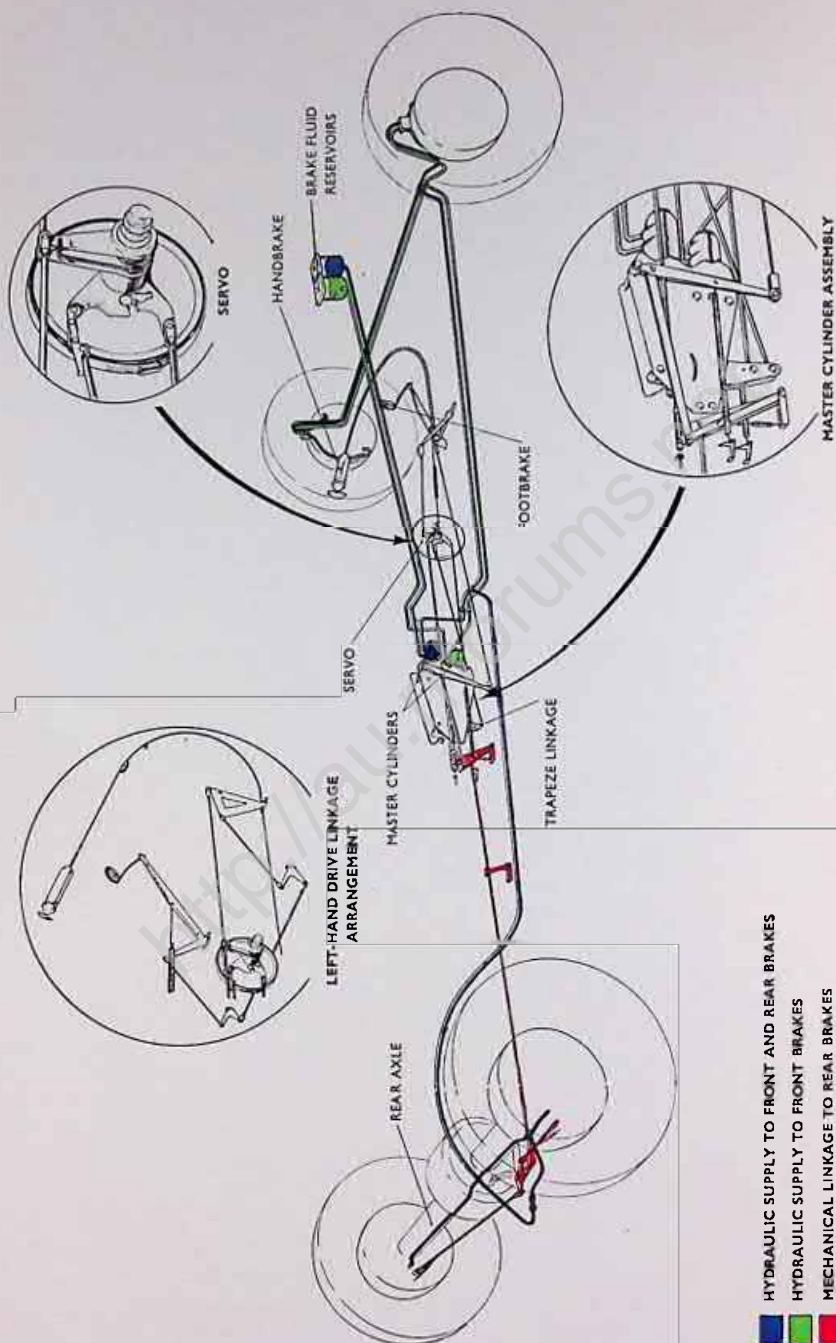
This will provide the correct brake setting.

When the brake adjuster is at the end of its travel, the rear linings require renewal.

Both adjusters have right-hand threads.

#### **Inspection**

An inspection of the brake linings should be made every 6,000 miles. Should it be necessary to remove the wheels before the end of this period, it is recommended that an inspection of the brake linings be carried out at the same time. The linings

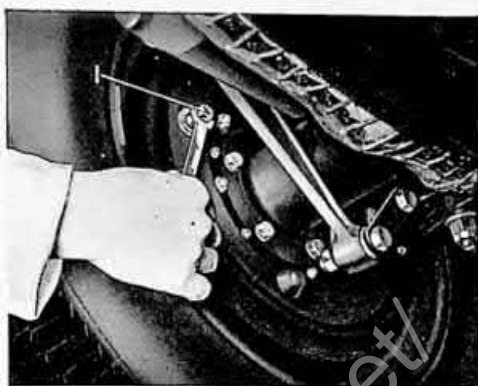


**Fig 33 THE BRAKING SYSTEM**

The colours shown for the hydraulic supply bear no relation to the colour of the fluid actually used. Note: the intermediate lever shown breaking the longest rod of the mechanical linkage to the rear brakes is fitted on Phantom V cars only.

**Fig 34 METHOD OF ADJUSTING THE REAR BRAKES**

- 1 Rear brake adjusting screw



should be suitable for further service unless they are worn to within  $\frac{1}{16}$ " of the rivets. Remove any lining dust which may have accumulated on the brake mechanism before refitting the drums. Push the shoes inwards and place the drums in position; the shoes should be in light contact with the drums after the brakes have once been applied and released.

Slight rubbing between shoes and drums is normal for both front and rear brakes.

### Adjusting the servo

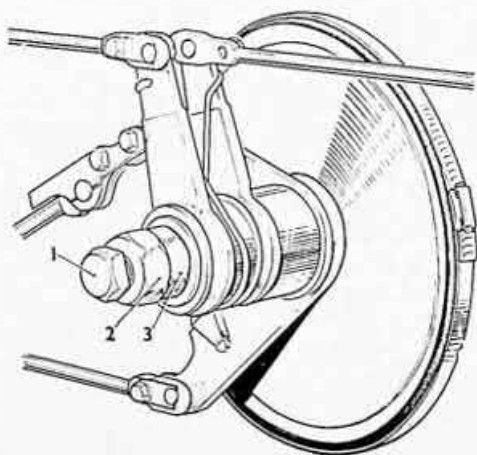
The servo adjustment should be checked every 6,000 miles. It is recommended that this operation be carried out by an Officially Appointed Retailer.

Under no circumstances should the centre securing bolt be disturbed during adjustment (see Fig. 35).

To adjust the servo, slacken the locking nut on the servo shaft, rock the servo and tighten the adjusting nut until drag between plates can just be felt (see Fig. 35). Unscrew the adjusting nut two flats (one third of a turn) to free the servo. Apply the pedal once to ensure that the outer servo lever has followed the adjusting nut. Hold the adjusting nut and tighten the locking nut.

**Fig 35 SERVO ADJUSTMENT**

- 1 Centre securing bolt
- 2 Locking nut
- 3 Adjusting nut



### **Hand brake**

Adjustment of the rear brakes takes up both pedal and hand brake clearance in the same operation. Cable adjustment is provided at the lower end of the outer Bowden cable.

A warning lamp is fitted to the fascia to remind the driver that the hand brake is applied. The lamp is situated adjacent to the steering column (see Figs. 4 and 5) and operates only when the ignition is on.

### **'Bleeding' the hydraulic system**

'Bleeding', for the purpose of expelling all air from the system should only be necessary when completely recharging the system with fluid following the removal of a component or the disconnection of a brake pipe.

It is recommended that this operation be carried out by an Officially Appointed Retailer; should this not be possible, the correct procedure is as follows:—

To 'bleed' the system two operators are necessary. It is important that the following method of 'bleeding' the hydraulic system is always employed as air can be introduced into the wheel cylinders past the screw threads of the 'bleed' screws, unless the screws are closed on the return stroke of the master cylinder.

1. Adjust the rear brakes if necessary.
2. Fit a rubber 'bleeding' tube to one of the front brake 'bleed' screws and immerse the free end in about one inch of fluid in a clean bottle.
3. Check that the reservoirs on the right-hand valance plate are full.
4. Slacken the 'bleed' screw while the second operator 'pumps' the trapeze linkage (this promotes displacement of fluid by the master cylinder pistons). Continue pumping until all bubbles cease, then tighten the 'bleed' screw on a forward stroke of the trapeze linkage, i.e., while fluid is flowing into the container.
5. This operation should be repeated at all wheel cylinders.

**Note:** One 'bleed' screw is provided for each of the two wheel cylinders fitted at each front wheel back-plate. If this operation has been carried out other than by an Officially Appointed Retailer, it should be noted that special equipment is required to check finally that all the air has been expelled from the system and it is recommended that a Retailer be consulted after such 'bleeding' has been carried out.

### **Hydraulic master cylinders**

Each master cylinder is fed from a separate supply reservoir, both of which are mounted on the right-hand valance (see Fig. 36). Check the level of the brake fluid in the reservoirs every 6,000 miles. Level marks are provided on the reservoir clamping straps. If frequent topping-up is necessary, check the system for leaks and consult one of the Officially Appointed Retailers.

**It is imperative that only an approved brake fluid be used (see Page 39). Under no circumstances should a mineral oil be substituted for the genuine fluid.**

As brake fluid absorbs water from the atmosphere, it is important that in order to minimise contamination, the fluid be stored in small sealed containers and that the covers of both the containers and the reservoirs be refitted immediately after replenishing the braking system.



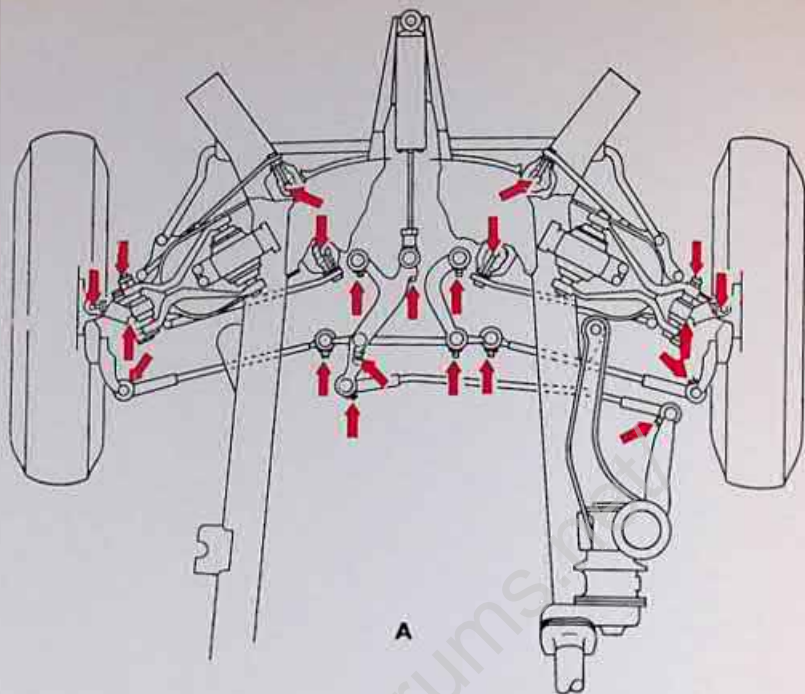
**Fig 36 BRAKE FLUID RESERVOIRS**

### **Lubrication**

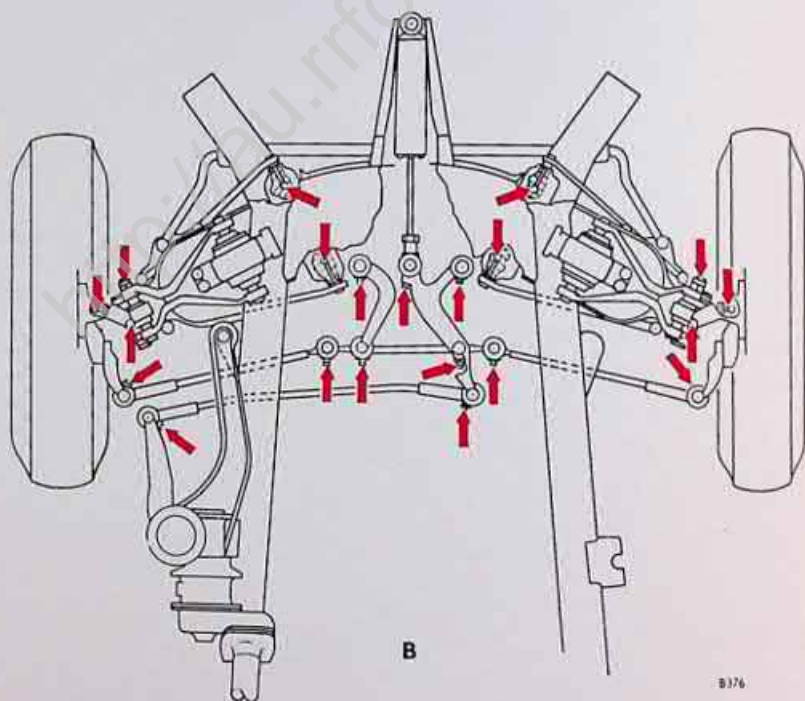
The brake rod linkages, clevis pins, fulcrum pins and intermediate levers should be lightly lubricated with oil every 6,000 miles.

The grease nipple on the master cylinder balance lever, which lubricates the needle roller bearings, should be charged with grease every 12,000 miles.

The servo motor bearings and actuating cams are packed with grease on initial assembly and require no attention.



A



B

B376

Fig 37 DIAGRAM OF STEERING AND FRONT SUSPENSION JOINT LUBRICATION

A Right-hand car drive

B Left-hand drive car



## *Steering, Suspension, Wheels and Tyres*

### **STEERING**

The steering mechanism is of cam and roller design. A transverse drag link connects the steering box to the steering lever; this lever is connected to a cross-beam to which an idler is also connected. Both levers pivot on the frame front cross-member. Track rods, fitted with grease lubricated ball joints, connect the cross-beam to the side steering levers (see Fig. 37).

A transfer box is provided to offset the drive from the steering column, which is positioned above the chassis frame side member, to the steering box, situated on the outboard side of the chassis.

#### **Power assistance**

The system of power assistance for the steering provides a variable degree of assistance, depending on the effort required to move the road wheels. Maximum assistance is required by the driver when slowly manoeuvring or parking the car; this is so achieved that while the maximum assistance is available under these conditions, power assistance is reduced to a minimum under normal straight ahead driving.

The system has also been designed to maintain a degree of 'feel' in the steering wheel. In this way the driver is not isolated from contact with the road wheels, although he is protected from any violent reaction or 'joggle' on bad roads.

The power assistance is applied hydraulically by an engine driven oil pump (see Fig. 38). The steering lever is operated simultaneously by a hydraulic cylinder which is fed by this pump, and a mechanical drag link connected to the cam and roller steering box.

It must be emphasised 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 still be steered in the normal way, the only effect being the greater effort required at the steering wheel.

#### **Lubrication**

##### **Steering box**

The steering box is not provided with a filler plug; topping-up is necessary as the box is lubricated under reduced pressure from the hydraulic pump.

##### **Steering transfer box**

Every 24,000 miles, the transfer box oil level should be checked, and if necessary topped-up with an approved oil to the level plug hole.

The filler plug is positioned on top of the driven gear casing; the oil level plug is positioned at the front of the driving gear casing, adjacent to the eccentric adjuster.

### **Steering pump**

The steering pump, driven by twin matched belts, operates whenever the engine is running.

Should the car be parked in such a position that there is extreme resistance at the road wheels, for example when the front wheels are on full lock against their stops, or when they are hard against the kerb, the pump will build up hydraulic pressure and will release excess pressure through the internal relief valve, producing a slight squeal which may be heard within the saloon.

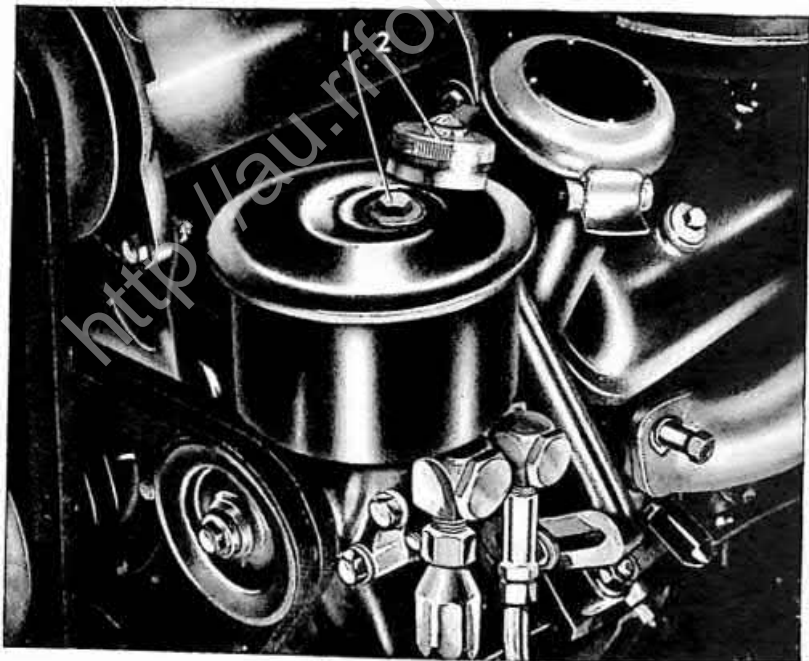
### **Topping-up the system**

Every 6,000 miles, the level of oil in the steering pump reservoir should be checked. If necessary, top-up with one of the recommended fluids until the level is just above the top of the filter. If this requires an appreciable amount of fluid, a leak should be suspected and one of the Officially Appointed Retailers consulted.

It is essential that the oil and the container used for topping-up are absolutely clean.

Every 24,000 miles, the reservoir filter should be renewed.

Unscrew the set-bolt securing the cover (see Fig. 38), remove the cover and spring, lift out the filter element and discard it. Fit a new element and refit the spring and cover. Check the cover seal for leaks when the pump is operating.



**Fig 38 STEERING PUMP AND RESERVOIR**

1 Reservoir cover set bolt

2 Reservoir filler cap

**Fig 39 CHECKING TENSION OF STEERING PUMP BELTS**



### **Belt adjustment**

Every 6,000 miles, the tension of each driving belt should be checked and adjusted if necessary.

If the tension of one belt in a pair differs markedly from the other, a new matched pair of belts should be fitted.

The belts are correctly adjusted when an applied force of 8 lb. causes each belt to deflect  $\frac{1}{8}$ ". This check should be made at the centre of the run between the coolant pump and the power assisted steering pump pulleys (see Fig. 39). If an adjustment is necessary, slacken the pump securing screws located in the slotted bracket, move the pump as required and then re-tighten the screws.

## **SUSPENSION**

### **Front suspension**

The independent front wheel suspension system consists of two upper and two lower triangle levers of different lengths, set at a trailing angle. Coil springs are mounted between the chassis frame and the lower triangle levers.

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

The yokes carrying the axle pivots are mounted between the outer ends of the triangle levers. Provision is made for adjustment of both the castor and the camber angles, the adjustments being carried out at the front shock damper rocking shafts and the upper triangle levers respectively.

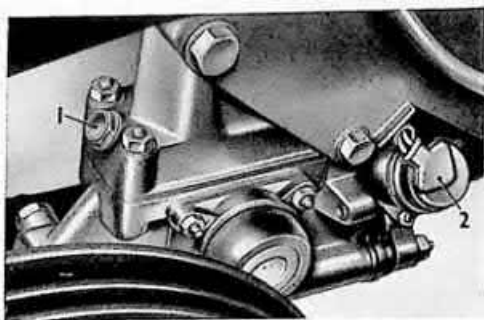
All bearings on the front suspension unit are grease lubricated (see Fig. 37).

No attempt should be made to remove the front suspension coil springs without the special tools necessary for this operation.

Any dismantling or adjustment of the suspension should be effected by an Officially Appointed Retailer.

### **Front stabiliser bar**

A transverse stabiliser bar, situated at the forward end of the chassis is mounted in rubber blocks and is connected to the lower triangle levers by means of links and rubber bushes. No attention to the stabiliser bar is necessary.



**Fig 40 REAR SHOCK DAMPER**

- 1 Filler plug
- 2 'Ride' control solenoid

### **Rear suspension**

The rear suspension utilises asymmetric semi-elliptic leaf springs. During initial assembly these springs are treated with an approved lubricant and should require no further attention until a general overhaul of the car is necessary. Two leather gaiters on each spring retain the lubricant and exclude dust and moisture.

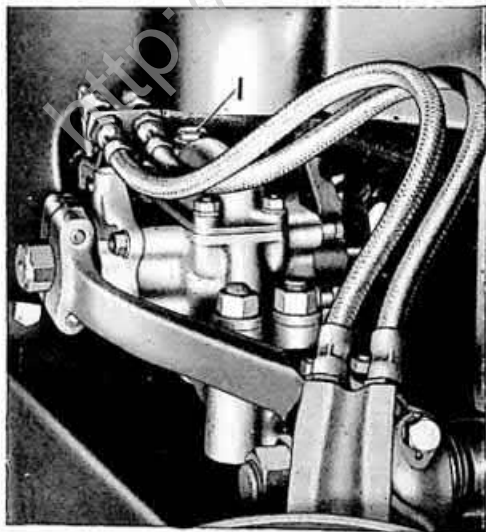
No attention to the spring eyes and rubber Silentbloc bushes is necessary.

### **Axle control rod**

A Silentbloc mounted axle control rod is fitted between the rear axle and the right-hand side of the chassis frame to control the torque and brake reaction. No attention to the control rod is necessary.

### **Shock dampers**

The front and rear shock dampers are similar in construction and operate on the same principle. A horizontal piston assembly, linked to the suspension, moves in a cylinder filled with oil. Movement of the piston displaces the oil from one end of the cylinder to the other through a drilling and a spring-loaded valve. A slow-leak



**Fig 41 FRONT SHOCK DAMPER**

- 1 Filler plug

passage by-passes the main valve and is controlled by the position of a slow-leak valve.

Solenoid operated valves are fitted to the rear shock dampers, so that when the switch on the steering column is operated, a harder 'ride' is obtained. On certain cars, solenoids are also fitted to the front shock dampers.

Every 12,000 miles, the external condition of the shock dampers should be inspected and if an oil leak is apparent, this should be rectified and the dampers topped-up as necessary.

Before topping-up a damper, thoroughly clean the unit and its filler plug. Remove the plug and replenish the oil to the edge of the filler plug hole (see Figs. 40 and 41).

It is most important that only perfectly clean fluid of the correct grade is used and this should first be strained through a fine gauze. The importance of this cannot be over-emphasized, as a very small particle of foreign matter lodged under one of the valves would impair the effectiveness of the damper.

## **W H E E L S**

The heavy gauge pressed steel wheels have well-base rims and are secured with five nuts. Right-hand wheel nuts have right-hand threads and left-hand wheel nuts have left-hand threads.

### **Front wheel bearings**

The wheel bearings are packed with grease on initial assembly and require no further attention.

### **Wheel disc**

The snap-on type wheel disc should be removed with the tommy bar provided in the tool kit (see Fig. 42).



**Fig 42 METHOD OF REMOVING THE WHEEL DISC**

## **T Y R E S**

The 8.20 x 15 tyres fitted have been specially developed in conjunction with the tyre manufacturers. They are of Rayon or Nylon carcass construction and are of tubeless design with synthetic treads to give maximum road adhesion consistent with good tyre life. Development work is always proceeding and when new tyres are required it is advisable to consult one of the Officially Appointed Retailers who will be in a position to give their latest recommendations.

New tyres require a short period of running-in. It is therefore recommended that after fitting a new tyre or tyres, sustained speeds of 90 m.p.h. and over should not be undertaken for at least the first 300 miles. During the running-in period, the 'ride' of the car may seem rather hard, but will improve as the tyre walls become more flexible.

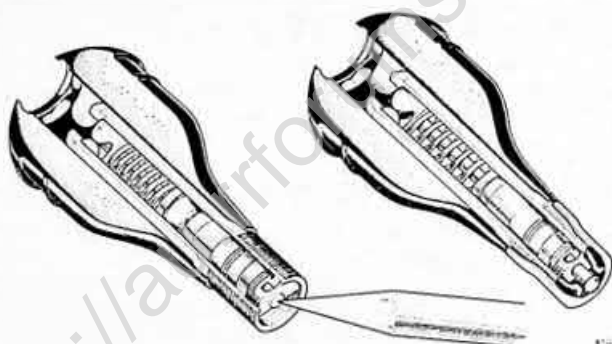
### **Tyre pressures**

The recommended tyre pressures are:

Front . . . . .	22 lb/sq. in. (1.55 kg/sq. cm.)	} Cold
Rear . . . . .	27 lb/sq. in. (1.90 kg/sq. cm.)	

Tyre pressures should only be checked when the tyres are cold, preferably in the morning or after standing in a cool place. Heat developed on fast runs or from hot roads increases the pressures, but they decrease again as the tyres cool. Under no circumstances should the tyre pressures be reduced to compensate for pressure increases during running.

A spare tyre valve is fitted in the hollow cylinder of the tyre pressure gauge provided in the tool kit.



**Fig 43 SECTION VIEWS OF A TYRE VALVE**

### **Tyre valves**

The tyre valves should give a long and trouble-free service provided that the following instructions are observed.

It is important that the valve caps be refitted after the tyre pressures have been checked. As shown in Figure 43, the caps not only protect the valve from the ingress of dirt and water, but also provide a valuable secondary air seal. The valve cap should be renewed if its rubber seal shows signs of wear.

Check the valve cores periodically and renew them if they tend to leak after moderate mileages or in extremes of climate.

### **Tyre service**

Normal tyre wear varies between the front and rear wheels and to minimise this variation it is recommended that the tyres be interchanged every 6,000 miles. This should be so arranged that the best tyres of the set are used on the front wheels. When tyres are interchanged, the balance of each wheel should be checked and corrected if necessary.

Unless otherwise requested, all cars are now equipped with tubeless tyres, which

have many advantages over tubed tyres. Should a puncture occur in a tubeless tyre as the result of penetration by a nail or other sharp object, provided that the object is left in the tyre it is usually possible to complete one's journey without having to effect a repair.

When a repair is necessary, it can be carried out with the aid of a Dunlop 'Reddi-plug' repair kit.

The 'Reddiplug' method of repair is extremely simple and can be carried out without removing the tyre from the rim. Briefly, it consists of forcing a rubber plug through the puncture with a threading needle, an operation which can be completed in a matter of minutes. Full directions are given with each kit.

### **Wheel and tyre balance**

Wheel and tyre units are dynamically and statically balanced on initial assembly with the aid of small weights clipped onto the inner and outer flanges of the road wheel. In view of the high road speeds attainable, it is recommended that wheel balance be checked every 6,000 miles.

As special equipment is required for checking and balancing wheels, this work should only be carried out by an Officially Appointed Retailer or at one of the of the Service Stations in London or Crewe.

### **Winter tyres**

Dunlop 'Weathermaster' or Firestone 'Town and Country' 8.00 x 15 tyres may be fitted to the rear wheels of the car for winter driving. These tyres allow fast driving over snow or ice covered roads, but owing to the heavier tread, car speeds should be limited and a sustained speed of 80 miles per hour never exceeded. The correct pressure for these tyres is 30 lb/sq. in. (2.11 kg/sq. cm.).

**Fig 44 THE SPARE TYRE INFLATION TRAP**



## LAMP UNITS

### Headlamps

Note: 1A lamp units are fitted to the inner two lamps.

2, 2A or EUROPEAN lamp units are fitted to the outer two lamps.

Location	Rating	Colour	Fitting
United Kingdom	1A 12V 37½W	Clear	Push-in two blade
	2A 12V 37½/50W	Clear	Push-in three blade
Europe, except France	1A 12V 37½W	Clear	Push-in two blade
	European 12V 45/40W	Clear	Push-in three blade
France	1A 12V 37½W	Yellow	Push-in two blade
	2A 12V 45/40W	Yellow	Push-in three blade
Middle and Far East Canada and South America U.S.A.	1A 12V 37½W	Clear	Push-in two blade
	2 or 2A 12V 37½/50W	Clear	Push-in three blade

## BULBS

### Foglamps

All countries except

U.S.A. and Canada	12V 48W	Yellow	B.P.F.
U.S.A. and Canada only	12V 48W	Clear	B.P.F.
Front side lamp	12V 6W	Clear	M.C.C. bayonet
Front flasher lamp	12V 21W	Clear	S.C.C. bayonet
Rear stop/tail lamp	12V 21/6W	Clear	S.B.C. bayonet
Rear flasher lamp	12V 21W	Clear	S.C.C. bayonet
Reversing lamps	12V 21W	Clear	S.C.C. bayonet
Number plate lamp	12V 6W	Clear	M.C.C. bayonet
Boot lamp	12V 6W	Clear	M.C.C. bayonet
Inspection lamp	12V 6W	Clear	M.C.C. bayonet
Companion lamps	12V 6W	Clear	M.C.C. bayonet
Map lamp	12V 6W	Clear	M.C.C. bayonet
Roof lamp	12V 6W	Clear	Double ended festoon
Capping rail	12V 3W	Clear	Double ended festoon
Speedometer			
Illumination	12V 2.2W	Clear	M.E.S. screw
Flasher warning lamps	12V 2.2W	Clear	M.E.S. screw
Headlamp main beam	12V 2.2W	Clear	M.E.S. screw
'4 in 1' instrument lamp	12V 2.2W	Clear	M.E.S. screw
Clock illumination	12V 2.2W	Clear	M.E.S. screw
Switchbox			
Generator warning lamp	16V 3W	Clear	M.E.S. screw
Fuel level warning lamp	16V 3W	Clear	M.E.S. screw



## The Electrical System

The electrical system is negatively earthed; the negative side of the battery is connected to the chassis frame and all switching is through the positive side of the system.

**Before commencing work involving the electrical system it is advisable to disconnect the negative lead from the battery terminal.**

A diagram of the wiring of this car is provided in the pocket in the rear cover of this Handbook.

### BATTERY

The battery is mounted at the rear of the car and is easily accessible for servicing or removal through the floor of the luggage boot (see Fig. 46).

The following batteries are approved for this car:

P. & R. Dagenite—6 HZP 11/9 GZF
Exide — 6 XTHZ 11/L

These batteries have 11 plates fitted into a 9 plate container, giving greater capacity and added reliability while remaining usefully compact. Both are 12 volt batteries and their normal charging current is 6 amperes.

### To check the condition of the battery

The condition of the battery can readily be checked by means of a hydrometer. The hydrometer is an instrument designed to measure the specific gravity of the electrolyte, and as the specific gravity varies according to the state of charge of the battery, the hydrometer provides a simple and rapid means of assessing the condition of the battery.

The hydrometer should be used as follows:

Remove the vent plug from each cell.

Squeeze the bulb of the hydrometer and insert the rubber tube of the instrument into the electrolyte of one cell (see Fig. 45). Release the bulb so as to draw sufficient liquid into the hydrometer to lift the internal float off its seating. Withdraw the hydrometer from the electrolyte.

The specific gravity of the electrolyte may then be read directly from the float at the point where the graduated scale cuts the surface of the liquid.

Squeeze the bulb once more to return the electrolyte to the cell from which it was withdrawn.

Repeat this procedure for each cell, then compare the figures obtained with the following table.

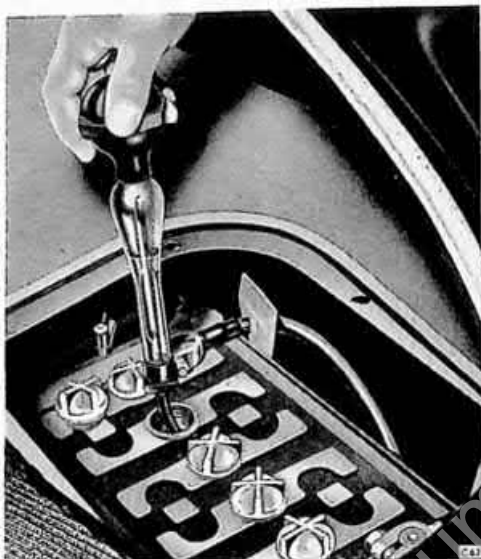


Fig 45 CHECKING THE BATTERY SPECIFIC GRAVITY

<i>Air temperature below 90° F (32° C)</i>	
<b>Specific Gravity</b>	<b>Condition of Battery</b>
1.270 to 1.285	Fully charged
1.160	Half discharged
1.030	Fully discharged

<i>Air temperature above 90° F (32° C)</i>	
<b>Specific Gravity</b>	<b>Condition of Battery</b>
1.225 to 1.240	Fully charged
1.125	Half discharged
1.020	Fully discharged

Should the electrolyte level be too low to obtain a reading it should be topped-up to the correct level with distilled water.

The battery should then be given a freshening charge before taking hydrometer readings.

If one cell differs markedly from the others, then a defect must be suspected in that cell and the battery should be returned to an Officially Appointed Retailer or to one of the Service Stations in London or Crewe.

### **Charging the battery**

If necessary, the battery may be charged whilst in position in the car by means of the two-pin plug socket provided on the fascia. To ensure that the current direction is correct, the sockets are marked + and — and in addition are of different sizes to indicate the plug fitting.

### **Maintenance**

The level of the battery electrolyte should be maintained at approximately  $\frac{1}{4}$ " above the top of the plates.

The battery should only be topped-up when in the fully charged condition. If it is topped-up whilst discharged, the electrolyte will rise during charging and possibly flood the battery.

Under normal operating conditions, the level of electrolyte in each cell will gradually fall owing to evaporation losses. A regular inspection should be made to see that the level of the electrolyte has not fallen so low as to expose the tops of the separators and plates. Never inspect the battery by the light of a naked flame as an inflammable gas is evolved from the cell. The battery should be topped-up by removing the vent plugs and adding distilled water to each cell until the level of the solution is approximately  $\frac{1}{4}$ " above the separators. The plug vents should be checked and cleared of any obstruction.

The top of the battery should always be kept clean and dry; attention should be given immediately to the slightest sign of corrosion of the terminals. Remove any corrosion with a rag moistened with a solution of ammonium carbonate. The terminals should then be liberally coated with petroleum jelly (not grease).

The battery must not be allowed to remain in a discharged condition. A battery not in service should be kept in good condition by fully charging it and then giving it a fresh charge at least once a month. It should be fully charged before being put back into service.

The battery must be properly secured in its cradle so that it cannot move.



**Fig 46 ACCESS TO THE BATTERY**

## GENERATOR

The generator is driven by the crankshaft pulley through two matched V belts which also drive the refrigeration compressor (if fitted). Any adjustment to these belts is carried out at the generator (see Page 47).

The output of the generator is automatically regulated relative to the condition of the battery by the current/voltage control system.

The generator has two external connections: the smaller (field) terminal is connected to the voltage regulator terminal marked 'F'. The larger terminal is similarly connected to terminal 'D' of the voltage regulator.

Every 24,000 miles (40,000 Kms.), the commutator and brushes should be inspected after slackening the clamping screw and sliding aside the brush assembly cover (see Fig. 47). Deposits of carbon dust and oil should be removed by means of a soft cloth moistened with petrol.

Note should be taken of any appreciable wear of the brushes. Under normal circumstances, the brushes should only require renewal after considerable running; premature failure or excessive wear of the brushes indicates a definite fault in the unit which should be returned to an Officially Appointed Retailer or to one of the Service Stations in London or Crewe.

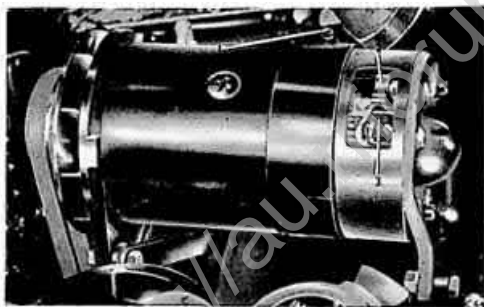


Fig 47 **ACCESS TO THE GENERATOR BRUSHES**

- 1 Cover
- 2 Brush tensioning spring
- 3 Brush

### Current/voltage regulator and cut-out

The regulator unit comprises a cut-out relay, a current regulator and a voltage regulator, all mounted on a single base and enclosed in a dust-proof cover; the complete unit is housed in the engine compartment as shown in Figure 48

The function of the cut-out is to disconnect the circuit between the battery and the generator when the generator voltage falls below that of the battery; this prevents battery discharge through the generator.

The current regulator limits the generator output to a safe value when the battery is in a low state of charge or when the load on the electrical system is high.

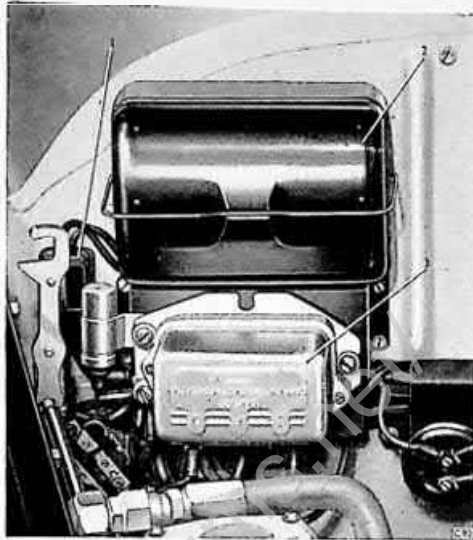
As the battery becomes fully charged, the regulator allows the charging current to drop to a 'trickle' charge rate.

## STARTER MOTOR AND CIRCUIT

Owing to the very heavy current required to operate the starter motor it has been necessary to fit a remotely controlled solenoid switch in the motor circuit. This is a heavy duty switch adjacent to the starter motor and is operated magnetically from the starter switch on the facia.

**Fig 48 FUSE BOXES,  
CURRENT/  
VOLTAGE  
REGULATOR AND  
CUT-OUT**

- 1 Horn/headlamp flashing fuse box
- 2 Main fuse box
- 3 Current/voltage regulator and cut-out

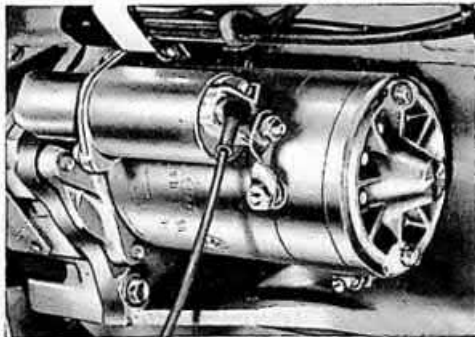


When the ignition key is turned fully clockwise, the main solenoid is energised and draws a plunger into the solenoid barrel against spring pressure; at the same time, an actuating lever causes the starter pinion to engage with the starter ring on the engine flywheel. As the plunger nears the end of its travel, the heavy duty moving contacts are closed and energise the starter motor.

If the starter motor seems to be sluggish in its action and the cause is traced to the battery and its connections, no further attempt should be made to use the starter until the battery and its connections have been checked. If the action is still sluggish, check the condition of the motor brushes and their holders; these should be cleaned with a rag moistened with petrol.

To prevent the engine being started whilst the car is in gear, a microswitch has been fitted which isolates the starter motor should the gear lever remain in any position other than Neutral.

**Fig 49 STARTER MOTOR**



## IGNITION SYSTEM

### Coil

The Lucas high tension ignition coil is mounted on the induction manifold as shown in Figure 20.

The coil terminals are marked 'S.W.' (switch wire) and 'C.B.' (contact breaker) to ensure that the wiring is correctly connected.

Should it be necessary to fit a new coil, it is most important that the replacement coil is of the correct polarity, i.e. suitable for 'negative earth return'. It is also important to ensure that the 1 mfd. condenser fitted to reduce electrical interference to the radio from the ignition system is connected to the correct terminal. This is the terminal marked 'S.W.'

The outside casing of the coil should be kept clean; misfiring can be caused by an accumulation of dirt around the terminals.

### Ignition distributor

The distributor contains twin contact breakers which are so arranged that their actions overlap. In this way, one set of contacts connects the low tension circuit, while the second set of contacts breaks the circuit once more to initiate the high tension spark.

The timing of the spark is controlled both centrifugally and by means of a vacuum operated diaphragm. This arrangement automatically advances the ignition as engine speed increases, but a manual adjustment is also provided to compensate for differences in the quality of the fuels used.

This device, which is known as the octane selector, comprises an eccentric pin which should be turned anti-clockwise to retard the ignition for inferior fuels (see Fig. 50). Before the car is delivered, the octane selector is fully advanced, which is the correct setting for the specified fuel (see Page 12).

In countries where only fuel of inferior quality is obtainable, slacken the lock-nut, then rotate the pin anti-clockwise by means of a screwdriver until a more satisfactory performance is obtained.

If at any time, the distributor has been disturbed, it is important that any check or adjustment of the timing be carried out with the octane selector fully advanced. All timing operations should be carried out on the contact breaker set furthest from the vacuum advance unit.

### Distributor maintenance

Every 6,000 miles, remove and clean the distributor cap. Use a soft dry cloth and pay particular attention to the areas between the terminals. Check that the carbon brush is present inside the cap and that it moves freely in its bore.

Withdraw the rotor arm and inject a few drops of clean engine oil into the distributor spindle. Do not remove or slacken the screw located in the spindle as a cavity is provided beneath it to lead the lubricant to the cam bearing. It is most important that the contact breaker points be kept clear of oil when lubricating the distributor.

Lightly smear the faces of the cam with clean engine oil.

Lubricate the centrifugal advance mechanism by injecting a few drops of thin machine oil through the contact breaker base plate.

Periodically examine the contact breaker points for burring, pitting or pile. If the points are found to be in poor condition, they should be carefully cleaned using a fine carborundum stone, ensuring that the face of each contact remains square with the other.

Every 6,000 miles, or after having cleaned the points, check the contact breaker gaps; these should lie between  $\cdot 014$ " and  $\cdot 016$ ".

Before adjusting the contacts, ensure that the ignition switch is 'off' and that the gear range selector lever is in the Neutral position. Turn the engine over by means of the starter switch until the fibre heel of a contact breaker rests on the highest point of a cam lobe.

Slacken the screw (2, Fig. 50) locking the stationary contact plate and re-position the plate by means of a screwdriver in the slot provided (3, Fig. 50). Adjust the plate until a gap of  $\cdot 014$ " to  $\cdot 016$ " is established between the contacts by means of feeler gauges.

Repeat this procedure with the second set of contacts, remembering first to turn the engine until the fibre heel of the second contact set rests on the highest point of a cam lobe.

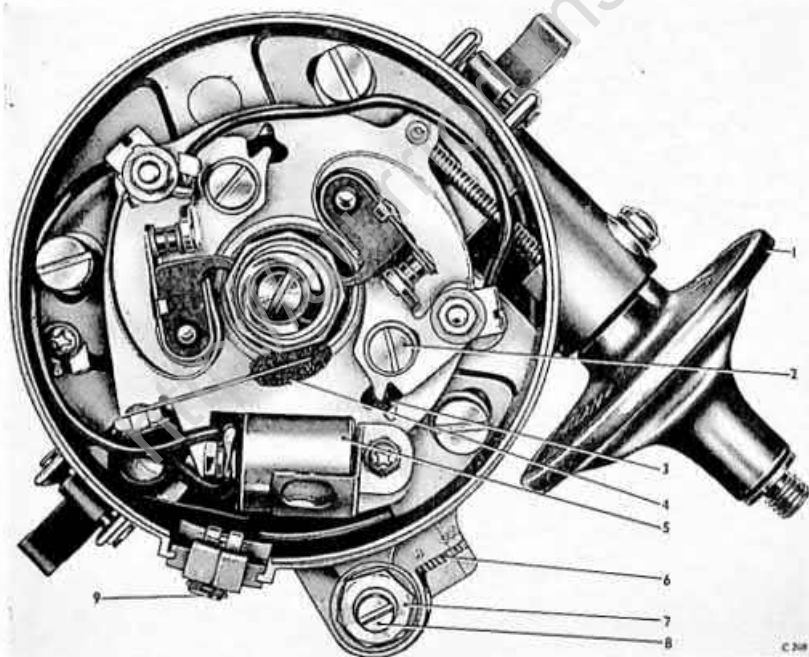


Fig 50 IGNITION DISTRIBUTOR

- |                       |                            |
|-----------------------|----------------------------|
| 1 Vacuum advance unit | 6 Octane selector scale    |
| 2 Locking screw       | 7 Octane adjuster lock-nut |
| 3 Adjusting slot      | 8 Octane adjuster          |
| 4 Cam lubricating pad | 9 Low tension terminal     |
| 5 Condenser           |                            |

## SPARKING PLUGS

The sparking plugs approved for this car are as follows:—

9 : 1 compression ratio engines: Champion RN. 8.

8 : 1 compression ratio engines: Champion RN. 13P, Champion RN. 8 and Lodge CLNP.

All the above sparking plugs are 14 mm. non-detachable plugs.

Every 6,000 miles, the plugs should be removed and cleaned. Before refitting the plugs, set the gaps by feeler gauge to .025".

Every 12,000 miles, the plugs should be renewed to maintain satisfactory performance of the engine.

### Sparking plug removal

To facilitate removal, time should be allowed for the exhaust manifolds to cool, owing to their proximity to the plugs; a longer cooling period will be achieved by removing the right-hand ('A' Bank) plugs first, as follows:

Using the jacking system provided, raise the right-hand side of the car and remove the front right-hand road wheel (see Page 30).

Unscrew the setscrews retaining the valance panel under the wheel arch and remove the panel.

Detach the plug leads and remove the four sparking plugs, using the box spanner and ring spanner supplied in the tool kit.

The plugs on the left-hand side of the engine are accessible from above and may be removed in the conventional manner.

After fitting the plugs, re-attach the plug leads and refit the panel and wheel.

## LIGHTING SYSTEM

### Headlamps

The headlamps are controlled by two switches: the master switch on the fascia and a foot-switch provided for beam selection. A small red warning lamp in the speedometer is illuminated whenever the headlamps are on main beam.

Four headlamps are fitted which are of the sealed beam type. The two inner lamps each contain a single filament placed at the focus of the reflector to provide long range illumination when switched to main beam. These lamps are off when the headlamps are dipped. The two outer lamps each contain two filaments; one of the filaments is placed at the focus of the reflector to provide illumination at intermediate range on the nearside of the road for driving with the headlamps dipped. The second filament is displaced from the focus to provide short range 'flood' illumination in conjunction with the long range inner lamps when the headlamps are on main beam.

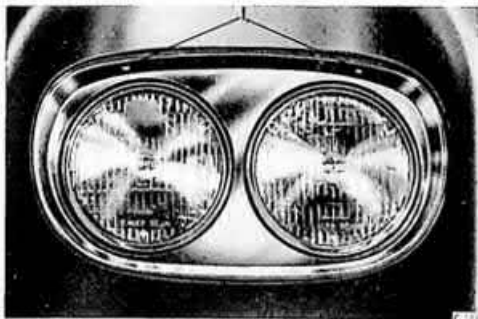
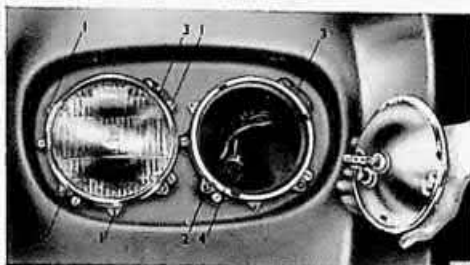


Fig 51 HEADLAMPS  
1 Securing screws



**Fig 52 ACCESS TO THE SEALED BEAM UNITS**

- 1 Sealed beam unit securing screws
- 2 Horizontal beam adjusting screw
- 3 Vertical beam adjusting screw
- 4 Lamp socket



### Travelling abroad

Regulations regarding headlamps and lighting vary considerably from one country to another and owners who intend travelling abroad are advised to consult their retailer concerning the regulations operating in the country they intend to visit.

Owners in the U.K. who intend travelling on the Continent of Europe are advised to have Continental type headlamp units fitted prior to departure.

In France yellow light units are the rule and although the regulations do not enforce motorists visiting the country to comply, it is nevertheless advisable as local motorists do not always appreciate that an offender is a tourist. Continental type headlamp units are available and owners should consult their retailer for details.

### Changing a 'sealed beam' headlamp unit

Remove the retaining screws and withdraw the chromium fairing from around the lamps.

Slacken by one half turn each of the three screws securing the headlamp bezel; turn the bezel so that the screw heads can pass through the enlarged end of the slots (see Fig. 52) and the bezel can be removed. Take care that the 'sealed beam' unit does not fall.

Withdraw the 'sealed beam' unit and detach the connecting plug from the terminals at the rear of the unit (see Fig. 52).

The replacement unit should then be fitted by reversing the procedure described above.

To ensure that the lamps are correctly paired, light units for the inner two lamps have '1' or '1A' inscribed on the lens. These are single filament units. Similarly, light units for the outer two lamps have '2', '2A' or 'EUROPEAN' inscribed on the lens and each contain two filaments.

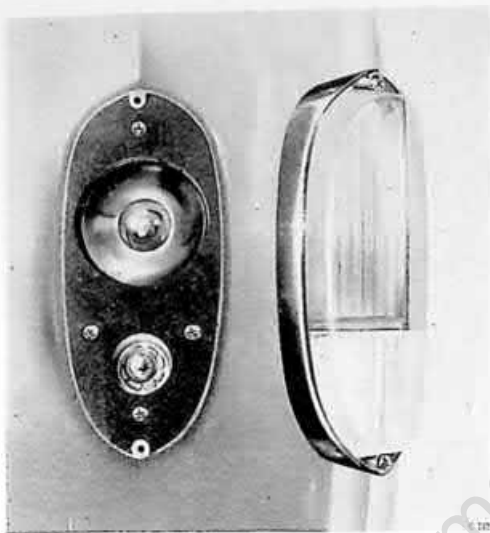
When the replacement unit has been fitted, no appreciable change should be apparent in the alignment of the headlamp beams. If in doubt, however, it is advisable to have the beams checked at the earliest opportunity by an Officially Appointed Retailer or one of the Service Stations in London or Crewe..

### Alignment and setting

Before the car leaves the factory, the headlamps are correctly aligned. However, should the carriage of extra weight at the rear of the car raise the beams, they can rapidly be adjusted as follows:

Remove the retaining screws and withdraw the chromium fairing from around the lamps; the beam adjusting screws are then exposed (see Fig. 52).

The vertical adjustment screw for each lamp unit is positioned high on the lamp surround (see Fig. 52). Turn the screw clockwise to raise the beam.



**Fig 53 ACCESS TO THE  
SIDE/FLASHER  
LAMP BULBS**

Should horizontal adjustment be necessary, it can be effected by means of the second adjusting screw, positioned at the side of the lamp. Turn the screw clockwise to move the beam towards the screw.

It is recommended that beam adjustment be carried out by an Officially Appointed Retailer who has specialised beam setting equipment at his disposal.

#### **Front side/flasher lamps**

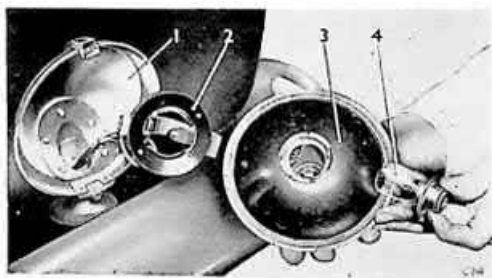
The front indicators are incorporated in the side lamps of the car. The two bulbs are screened from one another but are placed behind a common lens.

To gain access to the bulbs, unscrew the two lens retaining screws then withdraw the lens and rim (see Fig. 53). The bulbs are of standard bayonet fitting.

#### **Fog lamps**

Twin fog lamps are fitted and each contain single filament pre-focus bulbs.

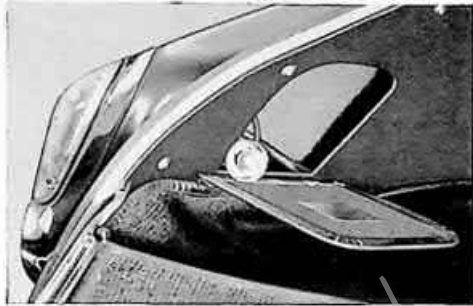
To change the bulb, remove the screw which retains the lens and lift out the complete light unit. Release the bakelite contact holder by turning it in the direction of the arrow, then remove the bulb. Fit the new bulb by reversing this procedure see Fig. 54).



**Fig 54 ACCESS TO THE  
FOG LAMP BULB**

- 1 Lamp body
- 2 Contact holder
- 3 Lens unit
- 4 Bulb

Fig 55 ACCESS TO THE STOP/TAIL LAMP BULBS



### Stop/tail and rear flasher lamps

Each lamp contains a rear flasher bulb, a stop tail lamp bulb and a rear reflector. The bulbs are accessible from within the luggage boot (see Fig. 55).

To renew one of these bulbs, turn the bulb socket anti-clockwise and withdraw it complete with the bulb. The bulbs and sockets are not interchangeable but the top of each socket is marked to show how it should be fitted.

The bulbs are of standard bayonet fitting, the flasher lamp having a single filament bulb and the stop/tail lamp a twin filament bulb.

### Reversing and number plate lamps

Access to the bulbs of these lamps is gained by removing the cover from the inner surface of the luggage boot lid; the cover is retained by spring clips. Remove the two screws (1 and 2, Fig. 56) and withdraw the lamp. The bulbs are of standard bayonet fitting.

The number plate is illuminated whenever the driving lights of the car are 'on'. The reversing lamp is automatically switched on when reverse gear is selected.

### Instrument and warning lamps

These lamps are fitted to the clock, speedometer, '4-in-1' instrument, cigar lighter, main lighting switch box and the facia itself. To renew a bulb, remove the facia panel and withdraw the unit concerned.

To operate the instrument lamps, turn clockwise the 'PANEL LIGHTS' switch on the facia. The first clockwise position provides dim illumination; the second position provides bright illumination of the instruments. The lamps are operative only when the side, head or fog lamps are switched on at the main lighting switch.

### Map lamp

The lamp is housed under the facia capping rail on the passenger's side of the car. To operate the lamp, withdraw the knob of the 'PANEL LIGHTS' switch. The lamp is operative only when the side, head or fog lamps are switched on at the main lighting switch.

The map lamp bulb is uncovered and is therefore directly accessible for renewal.



Fig 56 ACCESS TO THE BULBS OF THE REVERSING AND NUMBER PLATE LAMPS

1 and 2 Retaining screws

### **Interior lighting**

A lamp is provided in the roof of the car for general illumination of the car interior. To gain access to the bulb, turn the chromium ring anti-clockwise and remove the lens. The bulb is of the double-ended festoon type.

### **Ignition switch illumination**

A lamp is mounted in the capping rail immediately above the main switch box. In order to facilitate insertion of the ignition key in conditions of darkness, the lamp should be switched on by withdrawing the knob of the main lighting switch. The lamp is operative only when the side, head or fog lamps are switched on.

Access to the bulb is obtained by removing the securing screws and plastic cover. The bulb is of the double-ended festoon type.

### **Boot lamp**

This illuminates the interior of the luggage compartment and is automatically switched on by a mercury switch whenever the boot lid is raised.

To gain access to the bulb remove the lens of the lamp. The bulb is of the standard bayonet fitting.

### **Direction indicator signals**

When the direction indicator switch is operated, warning lamps in the speedometer flash in synchronism with the bulbs in the side and tail lamps. If the system is in order, the lamps flash approximately 90 times per minute. Should one of the flasher bulbs fail however, the warning lamp will flash once only and then remain extinguished. The flasher bulbs can be renewed as described previously for the side and tail lamps (see Pages 81 and 82).

The flasher units are sealed and are non-adjustable. The units are mounted high on the right-hand side of the radio frame, behind the facia.

### **Rear window de-mister**

The rear window is de-misted by means of an electric heating filament sandwiched between the layers of glass comprising the window. The de-mister is controlled by a switch on the facia, adjacent to the steering column (see Figs. 4 and 5).

If in doubt as to whether the de-mister is on or not, switch on the ignition without starting the engine, and operate the de-mister switch; the ammeter should then show a small discharge equivalent to the current flowing through the de-mister element.

### **Coolant temperature indicator**

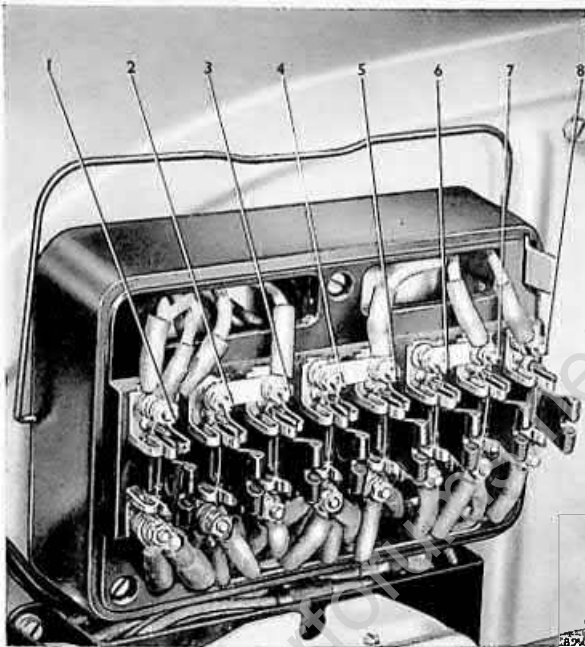
The engine coolant temperature indicator is mounted in the '4-in-1' instrument on the facia (see Figs. 3 and 6). The instrument is operated electrically by a semi-conductor transmitter unit fitted into the engine cooling system. The transmitter unit is sealed and is non-adjustable.

Under normal running conditions, the indicator needle should register a temperature within the broad white band on the instrument scale.

### **Oil pressure indicator**

The engine oil pressure indicator is mounted in the '4-in-1' instrument on the facia (see Figs. 3 and 6). The instrument is operated electrically by a semi-conductor transmitter unit fitted into the engine high pressure lubrication system. The transmitter unit is sealed and is non-adjustable.

Under normal running conditions, the indicator needle should register a pressure within the broad white band on the instrument scale.



**Fig 57 MAIN FUSE IDENTIFICATION**

- 1 Roof lamp, companion lamp, boot lamp, clock, inspection lamp socket
- 2 Windscreen wipers, windscreen washer, fuel filler door
- 3 Cigar lighters and accessories
- 4 Shock dampers, coolant temperature, fuel/oil levels and oil pressure indicator, rear window de-mister, air conditioning, stop lamps, flashers, reversing lamp
- 5 Ignition circuit
- 6 Foglamps, instrument lamps, map lamp
- 7 Side and tail lamps, number plate lamp
- 8 Headlamps

### Electric horns

The twin Windtone horns are operated through a sealed relay mounted on the engine bulkhead. No adjustment of the horns or relay is necessary or should be attempted. If servicing of these components seems to be required, consult an Officially Appointed Retailer or one of the Service Stations in London or Crewe.

A separate 20 ampere cartridge fuse for the horns is carried in the small fuse box adjacent to the main fuse box shown in Figure 48.

### Fuses

The main fuse box shown in Figure 57 contains the eight main circuit fuses. Each fuse consists of one strand of No. 28 S.W.G. (.0148" diameter) tinned copper wire of 30 ampere rating. Spare fuse wire is provided within the box.

## The Electrical System

The smaller fuse box shown in Figure 48 contains two cartridge fuses of 20 ampere rating; one fuse protects the horn circuit and the other protects the headlamp flashing relay.

The radio fuse is also of the cartridge type but of only 5 ampere rating. The fuse is housed in a separate container beneath the radio.

Care must be taken to ensure that all fuses are gripped firmly in their holders and that the contacts are clean and bright.

## ELECTRICAL FAULT LOCATION

In the event of a fault in the electrical system being suspected, investigate as follows:

### Fuses

Check the fuses; failure of any section of the system may be due to a 'blown' fuse. Spare fuse wire is provided within the main fuse box.

### Ignition

If, with the fuses intact and the lights in order, the ignition:

(a) misses:

- (i) Check the condition of the sparking plugs. If necessary clean them and adjust the gaps (see Page 80).
- (ii) Check the condition of the contact breaker points. If they are burnt or pitted, clean them and adjust the gaps (see Page 78).
- (iii) Check the condition of the H.T. ignition circuit, removing any grease or dust from inside the distributor cap and from the coil and cables.

(b) fails:

- (iv) Check as described above.
- (v) Check for battery voltage at the S.W. terminal of the coil. If no voltage is evident the wiring should be checked with the aid of the wiring diagram in the rear cover of this book. If there is adequate voltage at the S.W. terminal a check should be made at the C.B. side of the coil; if there is no voltage here *when the distributor contacts are open*, the coil should be renewed.

### Battery

If the battery will not retain its charge:

- (i) Check the condition of the battery electrolyte (see Page 73).
- (ii) Ensure that there is no short circuit in the system as follows:

Remove the clock/roof lamp fuse from the main fuse box and ensure that all switches are in the 'off' position. Disconnect the positive lead from the battery and connect a voltmeter between this lead and the battery terminal (connect the positive lead of the voltmeter to the positive terminal of the battery). Any reading thus obtained on the voltmeter will indicate a short circuit in the system and the car should be returned to an Officially Appointed Retailer or one of the Service Stations at London or Crewe for further investigation. Ensure that no circuit is switched on, or accessories in excessive use when the engine is not running.

### **Starter motor**

If, with the battery in a fully charged condition, the starter motor:

- (a) Is sluggish or fails to turn the engine, check the electrical connections for security.

Also check the condition of the motor brushes and their holders. If necessary clean the brushes and holders with a rag moistened with petrol.

- (b) Operates without turning the engine, check the electrical connections. If they are secure, the trouble lies in the starter drive; in this case consult an Officially Appointed Retailer or one of the Service Stations in London or Crewe.

### **Generator**

If the ammeter fails to show a 'charge' reading when the engine is running, check whether the ammeter shows a 'discharge' reading when the headlamps are switched on and the engine is stationary. If the ammeter shows no such deflection, the instrument or its wiring is at fault.

If the generator warning lamp is illuminated when the engine is running at more than idling speed, check the tension of the generator driving belts (see Page 47).

If a fault in the generator is suspected, consult an Officially Appointed Retailer or one of the Service Stations in London or Crewe.

### **Regulator**

If the generator is in order and the regulator is therefore suspect, no attempt should be made to adjust it. Consult an Officially Appointed Retailer or one of the Service Stations in London or Crewe.

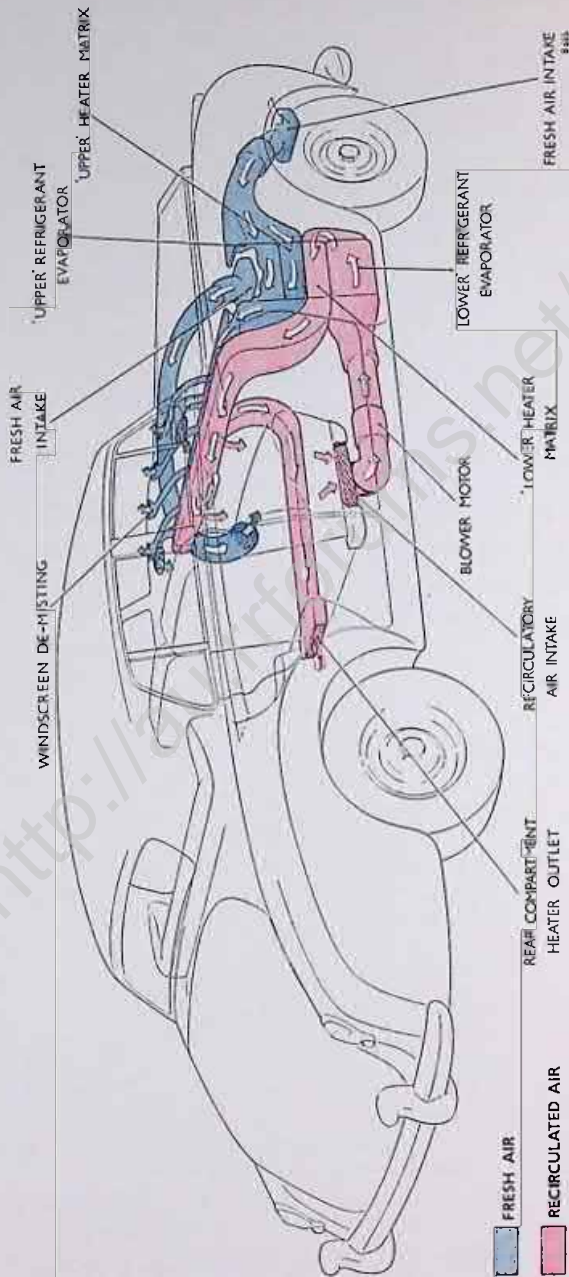


Fig 58 AIR CIRCULATION DIAGRAM



## *Air Conditioning*

An efficient de-misting, heating and ventilation system is a standard installation in this car, but either of two refrigeration systems may have been fitted as an 'extra' to cool the car interior.

These systems operate independently, but if so desired may be operated in conjunction with one another; in order that the owner may fully understand the operation of the system installed in his car, each system is described separately.

### **DE-MISTING, HEATING AND VENTILATION**

A heating and ventilation unit, mounted under the right-hand front wing of the car, delivers fresh or recirculated air in the desired temperature range through concealed ducting into the car interior.

The heating and ventilation system can itself be considered as two independent systems, one system conditioning fresh air drawn from outside the car and the second system conditioning air recirculated within the car interior. As the upper section of the air conditioning unit is devoted to one system and the lower section to the other (see Fig. 58), the systems are identified as 'Upper' and 'Lower'.

#### **'Upper' (fresh air) system**

In the 'Upper' system, fresh air is admitted through an intake in the right-hand front wing of the car and is filtered through a fine gauze. It is then boosted, if so required, by a blower motor through the upper heat exchange matrix in the main heating and ventilation unit (see Fig. 58). The air then passes along a cross-duct below the facia and is admitted to the front compartment through the windscreen de-misting slots and through the adjustable outlets in the facia capping rail.

De-misting of the windscreen is effected by the flow of heated fresh air across its inner surface. Rear window de-misting is obtained electrically by means of a heater element sandwiched between the layers of glass; the element is controlled by an independent switch on the facia (see Figs. 4 and 5).

#### **'Upper' switch**

The 'Upper' switch on the facia should be turned to the left to obtain unheated fresh air or to the right to obtain heated fresh air. In any of these positions, unless the knob of the switch is withdrawn, air enters the system only through the 'ram' effect induced by the forward movement of the car. When, however, the knob is withdrawn to its 1st or 2nd stop, air flow is increased by a blower motor operating at half or full speed respectively. Details of the effect of each position of the switch are given in Figure 59.

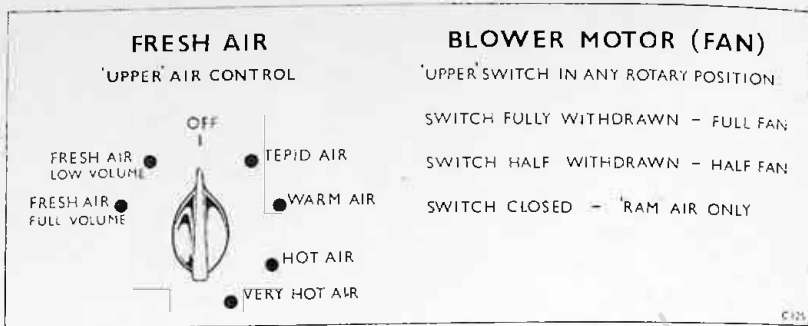


Fig 59 SWITCH POSITIONS FOR THE 'UPPER' SYSTEM (WITHOUT UNDERWING REFRIGERATION)

Additional unheated ventilation may be obtained through an auxiliary duct which leads fresh air into the car interior through a grille in the left-hand scuttle wall (see Figs. 3 and 6). Air flow through the auxiliary duct is controlled by a flap valve which is cable operated from an independent control on the fascia. The control is unmarked but is positioned adjacent to the steering column as shown in Figures 3 and 6. Withdraw the knob of the control to open the auxiliary duct.

**'Lower' (recirculatory) system**

Whenever the outside air is malodorous, the occupants of the car may prefer not to use the fresh air system but simply to recirculate and perhaps heat the air within the saloon. In this case, operation of the 'Lower' switch will provide the conditions they require.

The air intake grille for the recirculatory system is positioned beneath the right-hand front seat. Air is drawn through this grille by the action of a blower motor and is passed through the lower heater matrix where, if so required, it is heated. The air then enters the cross-duct behind the fascia where it becomes divided; part of it is admitted directly to the front compartment, while the remainder is led for the benefit of the rear passengers, to an outlet grille positioned between the front seats (see Fig. 58).

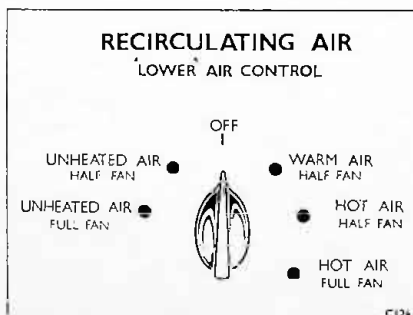


Fig 60 SWITCH POSITIONS FOR THE 'LOWER' SYSTEM (WITHOUT UNDERWING REFRIGERATION)

### **'Lower' switch**

The switch marked 'Lower' on the fascia panel has six rotary positions and should be turned to the left to obtain unheated air or to the right to obtain heated air. Full details of the effect of each position of the switch are given in Figure 60.

### **Maintenance**

Every 6,000 miles, check that the heater controls are operating satisfactorily over their entire range.

Every 12,000 miles, remove and clean the nylon filter gauze in the recirculatory air intake beneath the right-hand front seat of the car.

Every 24 months, renew all rubberised hoses in the heater and cooling systems. This should be carried out at the same time as the annual flushing of the engine cooling system (see Page 45).

### **REFRIGERATION (if fitted)**

Refrigeration ensures comfort for the occupants of the car in all climatic conditions. In addition to cooling the air, the refrigeration unit removes moisture by condensation in the cooling unit and it is therefore possible, for example, to obtain warm dry air in cold damp weather by operating the heater in conjunction with the refrigeration system.

Since cool air is available within the car interior, it is not necessary to open the windows during hot weather and passengers can travel free from wind, noise and the ingress of dust, etc. It is indeed recommended that the windows be kept closed to assist the refrigeration unit to function efficiently.

Either of two refrigeration systems may have been fitted to the car; these are identified as the 'Underwing Refrigeration Unit' and the 'Boot Refrigeration Unit'.

#### **'Underwing' refrigeration**

In this system, the cooling units (the evaporators) are incorporated in the main air conditioning unit beneath the right-hand front wing of the car (see Fig. 58). The ducting and air flow are common to both heating and refrigeration systems and are controlled by the same flap valves. The air to be conditioned passes through both an evaporator and a heater matrix and thus the temperature at which it is delivered into the saloon depends upon which system is operative.

As described above under 'De-misting, Heating and Ventilation', the air conditioning unit is divided into two systems which must be considered separately.

#### **'Upper' (fresh air) system—with refrigeration**

In the 'Upper' system, fresh air is drawn from outside the car and is conditioned before entry to the car interior. It should be appreciated therefore that in extremely hot climates, the refrigeration unit may in the 'Upper' system be required to continuously cool very warm air; this places a heavy load upon the system which may not be able to keep the temperature sufficiently low without the aid of the 'Lower' (recirculatory) system. In more extreme climates, it will be found more satisfactory to switch off the 'Upper' system altogether so as to exclude the hot fresh air and to use the 'Lower' (recirculatory) system alone. The cooling unit then has only to cool air which has in earlier cycles already been reduced to a lower temperature.

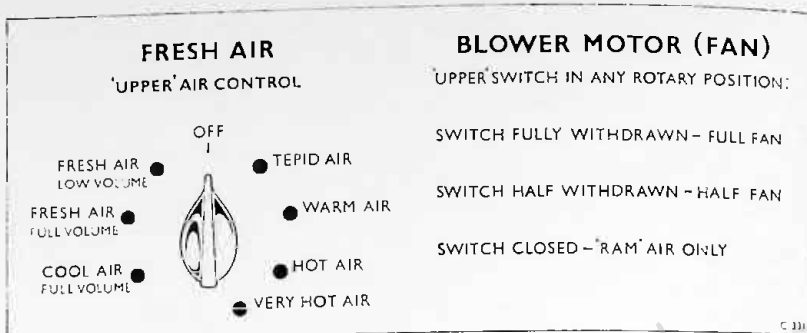


Fig 61 SWITCH POSITIONS FOR THE 'UPPER' SYSTEM (WITH UNDERWING REFRIGERATION)

**'Upper' switch**

The refrigerant compressor is driven by the engine; the engine must therefore be running before the refrigeration system can operate.

The 'Upper' switch on the facia should be turned to the left to obtain unheated fresh air, and when turned to its third position left, switches on the refrigeration unit to cool the incoming air. The switch can still be turned to the right to obtain heated air as described earlier in this Chapter (see Fig. 59).

In any of the rotary positions of the switch, unless the knob of the switch is withdrawn, air enters the system only through the 'ram' effect induced by the forward movement of the car. When, however, the knob is withdrawn to its 1st or 2nd stop, air flow is increased by a blower motor operating at half or full speed respectively. Details of the effect of each position of the switch are given in Figure 61.

**'Lower' (recirculatory) system—with refrigeration**

The recirculatory system is the most effective means of keeping the car interior cool in extremely hot weather. In more moderate conditions, it will probably be preferable to use the 'Upper' and 'Lower' systems together in order to introduce a certain amount of fresh air ventilation.

**'Lower' switch**

The refrigerant compressor is driven by the engine; the engine must therefore be running before the refrigeration system can operate.

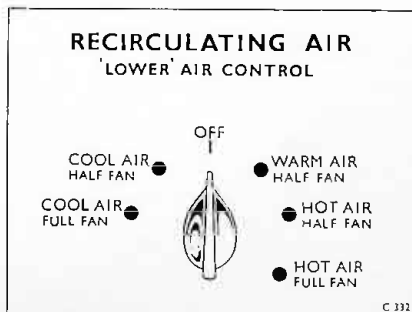


Fig 62 SWITCH POSITIONS FOR THE 'LOWER' SYSTEM (WITH UNDERWING REFRIGERATION)

When the 'Lower' switch on the facia is turned to the left, the refrigeration system is engaged and recirculates and cools air from the car interior at either of two rates (see Fig. 62). When the switch is turned to the right, the air is heated during recirculation. Full details of the effect of each position of the switch are given in Figure 62.

### **Maintenance**

Every 6,000 miles, check the tension of the belts driving the refrigerant compressor (see Page 47). If the tension of one belt in the pair differs markedly from the other, a new matched pair of belts should be fitted.

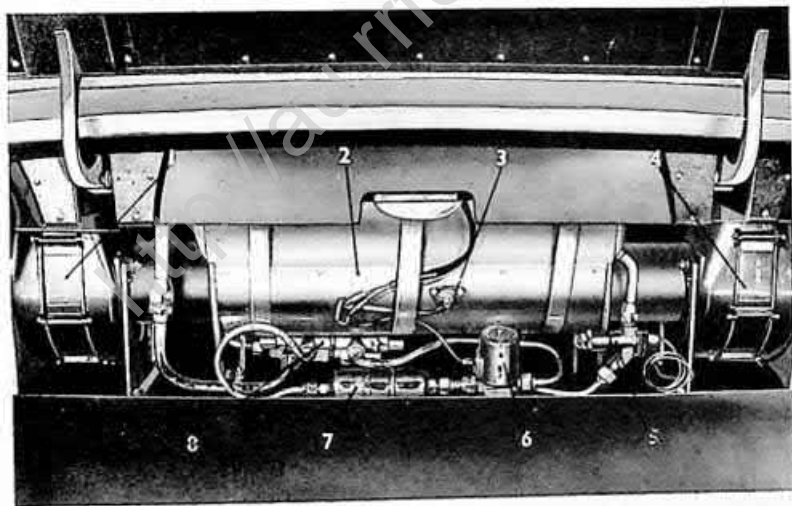
Examine the condenser matrix mounted immediately forward of the radiator. Remove any insects, paper, etc. which might impede the flow of air through the matrix.

The following operations should only be carried out by an experienced refrigeration engineer:

Every 12 months, check that the refrigeration system is functioning correctly and if necessary top-up the system with refrigerant. If loss of refrigerant is evident, check the system for leaks.

Check the level of oil in the refrigerant compressor.

A refrigeration wiring diagram is provided at the rear of this book.



**Fig 63 REFRIGERATION EQUIPMENT—BOOT UNIT**

- |                       |                          |
|-----------------------|--------------------------|
| 1 Blower motor        | 5 Expansion valve        |
| 2 Evaporator          | 6 Solenoid valve         |
| 3 Thermostatic switch | 7 Refrigerant drier      |
| 4 Blower motor        | 8 Service valve assembly |

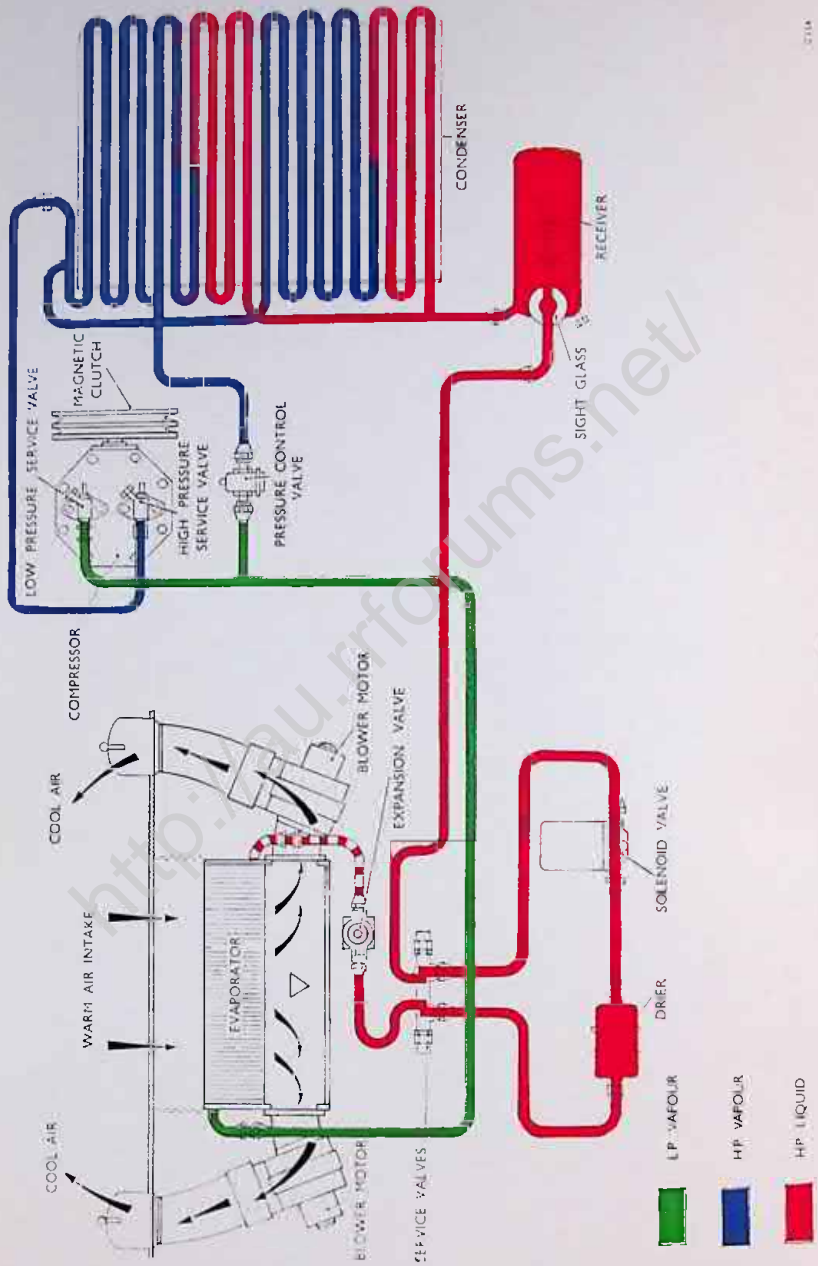


Fig 64 REFRIGERANT CIRCULATION—BOOT UNIT

### **'Boot' refrigeration**

As its name implies, the Boot Refrigeration Unit is installed in the luggage boot or trunk of the car (see Fig. 63). Air is drawn into the cooling unit through an intake in the centre of the parcel shelf beneath the rear window. Once cooled, the air is discharged by twin blower motors into the car interior through an outlet grille at each end of the shelf (see Fig. 64).

The unit is solely recirculatory, and as the luggage boot can accommodate a larger unit than would be practicable beneath one wing of the car, the result is a powerful unit which will remain effective anywhere in the world.

The unit is entirely independent of the heating and ventilation system described earlier in this Chapter, and is controlled separately. However, the unit serves also to extract moisture from the air by condensation during cooling, and the passengers may prefer to reduce the humidity within the saloon on a cold damp day by operating the refrigeration unit at low rate in conjunction with the car heater.

### **Controls**

*The refrigerant compressor is driven by the engine; the engine must therefore be running before the refrigeration system can operate.*

The system is controlled by a single rotary switch mounted on the fascia, adjacent to the steering column. The switch has four positions: Off (vertical), Low, Medium and High, corresponding to different speeds of the blower motors and thus to different rates of delivery of the cooled air. Turn the switch clockwise for increased air delivery.

A small lever is attached to each of the outlet grilles on the rear parcel shelf; the lever controls a deflector within the grille which enables the cool air stream to be directed around the car interior as required.

### **Maintenance**

Every 6,000 miles, check the tension of the belts driving the refrigerant compressor (see Page 47). If the tension of one belt in the pair differs markedly from the other, a new matched pair of belts should be fitted.

Examine the condenser matrix mounted immediately forward of the radiator. Remove any insects, paper, etc. which might impede the flow of air through the matrix.

Clean the filter gauze fitted over the evaporator air intake in the centre of the rear parcel shelf.

**The following operations should only be carried out by an experienced refrigeration engineer:**

Every 12 months, check that the refrigeration system is functioning correctly and if necessary top-up the system with refrigerant. If significant loss of refrigerant is evident, check the system for leaks.

Check the level of oil in the refrigerant compressor.

A refrigeration wiring diagram is provided at the rear of this book.

## Accessories

### RADIO

The following radio receivers are standard equipment.

#### Radiomobile 620T

**Medium and long wave radio suitable for the whole of Europe with the exception of Spain, Portugal and Italy.**

The set is designed for medium and long wave reception and an external aerial is normally fitted. Low voltage transistors are used and the output is from a transistorised amplifier, no conventional H.T. being required.

Mechanically pre-set push button tuning is provided in addition to the normal manual control (see Fig. 65).

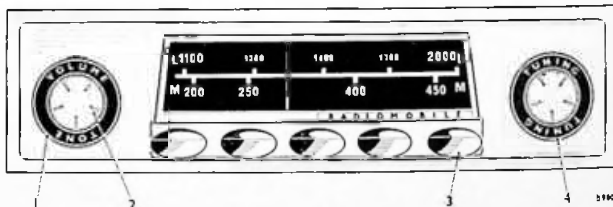
The combined 'on/off' switch and volume control is situated to the left of the five push buttons. To switch on the receiver, turn the control clockwise; further rotation of the control progressively increases the volume. Turning the control fully anti-clockwise will switch off the receiver.

The tone control is concentric with the volume control and 'on/off' switch and provides continuously variable tone correction.

With the tone control turned anti-clockwise, the amount of bass re-produced is reduced.

With the control in the central position, no correction is applied.

With the tone control turned clockwise, the amount of treble reproduction is reduced.



**Fig 65 RADIO CONTROLS—620T RECEIVER**

- 1 Tone control
- 2 Volume control and on/off switch
- 3 Tuning buttons
- 4 Manual tuning control



The manual tuning control is situated to the right of the push buttons and provides completely variable station selection. This control is permanently engaged.

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.

The five tuning buttons provide automatic tuning of five stations pre-selected from the medium and long wavebands. The right-hand button controls one station on the long waveband and the four remaining buttons control medium wave stations pre-selection. Wave-change switching for any pre-selected station is automatically effected when a button is pressed.

The tuning scale is divided into two sections, 'medium wave' and 'long wave', and is calibrated in wavelengths (metres). The wavelength indicator needle moves horizontally and the tuning scale is illuminated by 'edge-lighting'.

### To set up the tuning push buttons

1. Allow ten minutes for complete 'warming-up' after switching on the receiver.
2. Select the waveband required by pressing the appropriate button.
3. Tune in the required station by means of the manual tuning control (see Fig. 65).
4. With the station accurately tuned in, withdraw the button to its fullest 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 button is now set to tune the pre-selected station and when pressed, will 'bring-in' the station irrespective of the position to which the scale pointer has been previously adjusted. Proceed in the same manner with the remaining buttons.

### Radiomobile 230R

Medium and short wave radio suitable for Africa, Asia, South America, West Indies, Italy and Portugal.

The set covers one medium waveband and eight short wave ranges. The waveband change control switches from one waveband to another, the waveband in use being indicated by the position of a small pointer in a window below the main tuning scale (see Fig. 66).

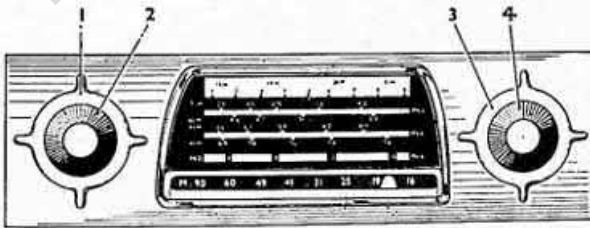


Fig 66 RADIO CONTROLS—230R RECEIVER

- 1 Tone control
- 2 Volume control and on/off switch
- 3 Wave band change control
- 4 Manual tuning control

## Accessories

The tuning scale is divided into five sections:

The single medium waveband is calibrated in both megacycles and metres and is selected when the waveband indicator below the tuning scale indicates 'M' (i.e. the waveband change control is fully anti-clockwise).

The figures above the waveband indicator window represent the eight short wavebands available and correspond in colour to the lines on the tuning scale representing the various broadcast bands.

The 'on/off' switch and volume control, tone control and manual tuning control operate in the same way as previously described for the 620 T receiver. It should however be noted that the 230R receiver is not transistorised and approximately 40 seconds should be allowed for the receiver to 'warm-up' after switching on.

### **Radiomobile 622T**

**Medium wave radio suitable for the United States of America, Canada, Australia, New Zealand, Spain and Japan.**

The set is designed only for medium wave reception and an external aerial is normally fitted.

Mechanically pre-set push button tuning is provided in addition to the normal manual control, but the five buttons all control stations on the medium waveband.

Setting of the tuning buttons and manipulation of the controls are carried out as previously described for the 620 T receiver.

### **Rear compartment loudspeaker**

In order to improve the quality of sound reproduction in the rear of the car an additional loudspeaker is fitted in the parcel shelf below the rear window.

A balance control, mounted immediately above the front loudspeaker is provided to vary the proportion of volume between the front and rear loudspeakers. The overall volume of sound is controlled from the radio panel as previously described.

### **Aerial**

The external aerial may either be mounted above the windscreen and raised by means of a control fitted between the sun visors, or may be mounted in the front wing and be electrically controlled by means of a switch on the fascia.

It is unlikely that the aerial will need attention, but to ensure the best reception, it should be kept clean.

### **Fuse**

A 5 amp. cartridge fuse is fitted in the radio supply lead and is housed in a plastic container clipped to the picnic tray support below the fascia.

If further advice or assistance in connection with the radio equipment is required, consult an Officially Appointed Retailer or one of the Service Stations in London or Crewe. If it is more convenient, consult a Radiomobile Service Depot.

## **WINDSCREEN WASHING**

An electrically operated windscreen washer enables the driver to wash the windscreen while the wipers are operating.

Twin jets are mounted on the centre of the scuttle, just forward of the windscreen. On pressing the windscreen wiper control knob, the electrically operated washer, situated under the bonnet, causes two jets of fluid to be directed onto the windscreen for a period of approximately six seconds. The windscreen wipers should be switched on to complete the cleaning.

If a jet becomes obstructed by foreign matter, it may readily be cleaned by slackening the knurled screw on the jet and operating the windscreen washer; the jet

consists of a small slot which becomes exposed when the screw is slackened and any obstruction is therefore easily washed away.

Adjustment of the angle of the jet is effected by turning the hexagon portion of the jet with a suitable spanner. Fluid from the jet should impinge on the windscreen towards the top of the arc traversed by the wiper blades.

The reservoir (see Fig. 67) should be filled with a special windscreen washing fluid, supplies of which are available in concentrated form from any Officially Appointed Retailer.

The liquid has a low surface tension and anti-freeze properties and should be diluted with distilled water as directed on the bottle of concentrate.

Fig 67 WINDSCREEN  
WASHER  
RESERVOIR  
1 Filler cap



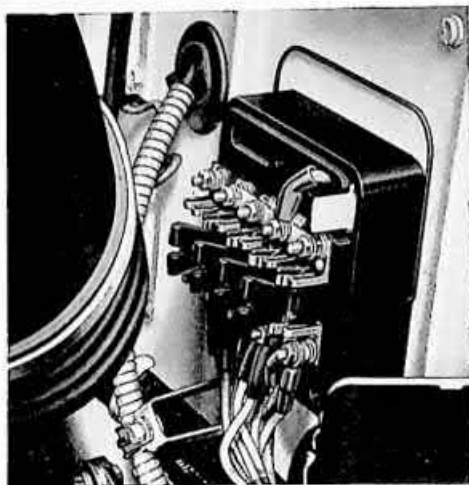
## ELECTRICALLY OPERATED WINDOWS

The electrically operated windows, which are an optional extra, are controlled by self-centering switches conveniently mounted on each door.

A single switch is mounted on each passenger door (see Fig. 69), but the driver's door is provided with switches enabling the driver to operate all the windows (see Fig. 70). To lower the window, press the top of the switch button; to raise the window press the underside of the button.

Movement of the glass will cease immediately the switch is released, thus any desired window position may be obtained.

Each window motor is provided with a thermostatically controlled cut-out which safeguards the motor against possible damage resulting from overheating. If the switch is held in the operating position for more than a few seconds after the window has reached the fully open or fully closed position, the cut-out will temporarily break the circuit. It is also possible that the driver and passenger may inadvertently operate their respective switches simultaneously in order to select opposite directions



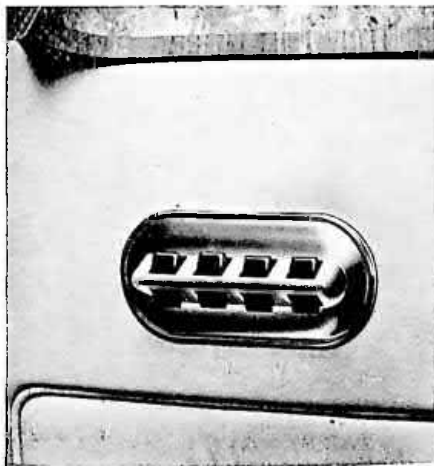
**Fig 68 FUSES FOR ELECTRICALLY OPERATED WINDOWS**

of travel for the same window; if this happens, the window will remain stationary and after a few seconds, the cut-out will break the circuit to protect the motor. After approximately 20 seconds, the cut-out will cool and the circuit will be automatically restored.

A set of four fuses is situated in a fuse box mounted on the left-hand side of the engine bulkhead; the fuses are 28 S.W.G. high conductivity tinned copper wire, .0143" diameter (see Fig. 68).



**Fig 69 PASSENGER'S SWITCH FOR ELECTRICALLY OPERATED WINDOW**



**Fig 70 DRIVER'S SWITCHES FOR ELECTRICALLY OPERATED WINDOWS**

## *Body and Coachwork*

The following instructions apply only to the Standard Pressed Steel Body; owners of coachbuilt cars should be guided by the special instructions issued with the car.

### **Paintwork**

Whilst great care is taken in the course of manufacture to ensure that the paintwork is durable and highly finished, in service the paintwork is subject to conditions which may cause deterioration. In order to maintain the finish in its original condition, the following procedures should be closely observed.

Always wash paintwork with clean cold water. **Under no circumstances should any attempt be made to remove dirt or mud when dry.** This practice can produce serious scratching requiring professional repair. Water should be applied with a sponge and removed with a chamois leather.

Tar can be removed by one of the many proprietary solvents available, or by gently rubbing with a soft cloth moistened with turpentine substitute.

Once a month, the paintwork should be polished with a good quality wax compound. Only a small area (about two square feet) should be treated at any one time. **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 atmospheric deposits, and the residual wax removed with a cleaning agent such as Belco No. 7 or Valentine's A1. The paintwork should then be polished once more with a good quality wax compound.

### **Leather upholstery**

Leather upholstery can best be cleaned by wiping over with a damp cloth. The occasional application of a little natural soap will remove more obstinate marks from the leather. Caustic soap, petrol or other similar cleaning agents should not be used. An occasional application of Connolly's Hide Food will preserve the upholstery; this compound should be applied evenly with a clean cloth, then polished with a second clean dry cloth.

### **Carpets and head cloth**

Carpets should periodically be removed from the car and swept with a vacuum cleaner.

Stains or grease marks may be removed from carpets and the head cloth by means of a suitable cleaning agent such as 'Drik'.

### **Interior woodwork**

Interior woodwork should periodically be treated in the same way as paintwork. It should be noted that water must never be allowed to lie upon interior woodwork for any length of time.

### **Door hinges and locks**

The door hinges incorporate Oilite bushes and stainless steel hinge pins and should not therefore be lubricated. The application of oil may result in damage by causing dirt to adhere to the working surfaces.

The door catches and striker plates should be wiped clean of dust and a small quantity of grease occasionally applied to the groove in the striker plate.

### **Bonnet fasteners**

After prolonged running the bonnet fasteners may become slightly stiff in operation due to dirt collecting on the mechanism. They should be cleaned occasionally and lightly oiled.

### **Picnic tray slides**

The occasional application of a little petroleum jelly will maintain ease of operation of the slides.

### **Plating**

Stainless steel and chromium plating should be wiped clean with a damp chamois leather, then polished with a soft cloth. Under no circumstances should a metal polish be applied. Where tarnishing has occurred, a dilute solution of ammonia will usually suffice to remove it. This solution must not be allowed to lie upon paintwork for any length of time.

## *Storage and Recommissioning*

The following instructions are relevant to storage periods not exceeding three months. Success depends upon correct initial preparation and regular subsequent inspection and maintenance. The storage building should preferably be heated but must be dry and well ventilated.

Run the car for sufficient distance to warm the oil in the engine, the gearbox and the rear axle.

If the cooling system contains anti-freeze, do not drain it. However, if the cooling system is unprotected, drain and refill the system with a recommended anti-freeze mixture (see Page 31). Never leave the cooling system dry.

In order to take the weight off the tyres, raise the car with a jack and place suitable supports under the centre of the rear springs and under the triangle levers, in line with the coil springs.

Remove the sparking plugs and inject two tablespoonsful of anti-oxident oil into each cylinder. Suitable oils are Energol Protective Oil 20 and Castrol Storage Oil. Using the starter motor, turn the engine to distribute the oil over the cylinder walls. Refit the sparking plugs.

Do not deflate the tyres but cover them to exclude light.

Top-up the gearbox with the recommended lubricant (see Page 55) and place the gear range selector lever in the Neutral position.

**For storage periods of more than six months, the following additional measures are recommended.**

To prevent the formation of deposits of gum in the fuel system, drain the fuel tank and run the engine until the fuel system is empty.

Remove the covers and floats from the carburettor float chambers, then wipe out the chambers; refit the floats and covers.

Remove the fuel pump filters, allow the pumps to drain and then refit the filters.

Pour two gallons of paraffin into the fuel tank, then switch on the ignition to energise the fuel pumps and fill the system with paraffin.

Drain the rear axle and the engine sump, then fill them to the normal levels with an anti-oxident oil (see above).

Remove and clean the battery. Top it up to the normal level with distilled water and fully charge it (see Page 74). Approximately once a month, re-charge the battery until the specific gravity of the electrolyte has remained constant for between ten and twelve hours on each occasion.

Inspect the rubber connections of the cooling system and renew any that are found to be unsound.

### *Storage and Re-commissioning*

Thoroughly wash the bodywork of the car and repair any paint blisters or patches of rust in order to prevent further deterioration. Apply a good quality wax polish but under no circumstances use a polishing compound which contains ammonia.

Clean all chromium plating and stainless steel and lightly smear them with petroleum jelly.

Thoroughly clean the carpets, upholstery and cushions. Dust them with anti-moth powder and store them in a dry place. Treat all leather upholstery with an application of 'Connolly's Hide Food'.

If the storage building is dry, leave the car windows slightly open. If there is any tendency towards dampness, close the car doors and windows and place an anti-moisture compound such as Calcium Chloride in an open metal container inside the car.

Cover the car with a dust sheet.

## **RECOMMISSIONING AFTER STORAGE**

Provided that the car has been stored in accordance with the recommended procedure, the following points only should require attention before using the car on the road.

Lower the car onto its tyres and check the tyre pressures.

Fully charge and refit the battery.

Drain the engine sump and rear axle and refill them with the recommended oils (see Page 39). Fit a new engine oil filter element.

Remove the sparking plugs and prime the cylinders with engine oil. Turn the engine by means of the starter motor to distribute the oil and to prevent a hydraulic lock. Check and if necessary adjust the sparking plug gaps, then refit the plugs.

It is advisable after prolonged storage to remove the induction manifold and to pour clean engine oil over the cams and tappets, filling the camshaft trough.

Check and if necessary adjust contact breaker points. Lightly grease the distributor cam and apply one drop of engine oil to each of the contact breaker points. Apply two or three drops of oil to the wick in the top of the distributor cam (see Fig. 50).

Drain all the paraffin from the fuel tank and disconnect the inlet pipes from the carburetters. Switch on the ignition to operate the fuel pumps and pump all the paraffin out of the system.

Remove the covers and floats from the carburetter float chambers, then wipe out the chambers; refit the floats, covers and inlet pipes.

Remove the fuel pump filters, then drain the pumps and refit the filters.

Check the generator brushes for freedom of movement in their holders and clean the commutator.

Lubricate all the chassis grease points.

Check the oil levels in the steering box, shock dampers and brake fluid reservoirs.

Adjust the brakes and oil the brake linkage clevis pins and fulcrum pins.

Fill the fuel tank and start the engine. Check the oil pressure and check for leaks of fuel, oil or coolant.

Finally, check the operation of all instruments, lamps and accessories.



## *Bentley School of Instruction*

The School of Instruction offers instructional courses on the maintenance of Bentley cars. Each course is of two weeks' duration and covers the mechanical features of the chassis with particular emphasis being laid on points requiring adjustment or lubrication. Suitable cars, used for instructional purposes, have been made available to and are maintained by the School.

The course is intended primarily for chauffeurs who are undertaking the care of Bentley cars for the first time. In the case of drivers who have had experience of previous models, arrangements can be made for a shorter course although it is recommended that the complete course be taken.

Owner-drivers and members of their families have frequently attended the School with beneficial results and arrangements to this end can be made on application to the Principle, School of Instruction, Bentley Motors (1931) Limited, Hythe Road, Willesden, N.W.10., (Telephone: LADbroke 2444).

## *Conversion Tables and Factors*

**KILOMETRES—MILES**

**LITRES—PINTS**

**KILOGRAMMES PER SQUARE CENTIMETRE—  
POUNDS PER SQUARE INCH**

# KILOMETRES—MILES

Kilometres		Miles
1.60934	1	0.62137
3.219	2	1.243
4.828	3	1.864
6.437	4	2.485
8.047	5	3.107
9.656	6	3.728
11.265	7	4.350
12.875	8	4.971
14.484	9	5.592
16.093	10	6.214
17.703	11	6.835
19.312	12	7.456
20.921	13	8.087
22.531	14	8.699
24.140	15	9.321
25.749	16	9.942
27.359	17	10.563
28.968	18	11.185
30.577	19	11.806
32.187	20	12.427
33.796	21	13.049
35.406	22	13.670
37.015	23	14.291
38.624	24	14.913
40.234	25	15.534
41.843	26	16.156
43.452	27	16.777
45.062	28	17.398
46.671	29	18.020
48.280	30	18.641
49.890	31	19.262
51.499	32	19.884
53.108	33	20.505
54.718	34	21.127
56.327	35	21.748
57.936	36	22.369
59.546	37	22.991
61.155	38	23.612
62.764	39	24.233
64.374	40	24.855
65.983	41	25.476
67.592	42	26.098
69.202	43	26.719
70.811	44	27.340
72.420	45	27.962
74.030	46	28.583
75.639	47	29.204
77.249	48	29.826
78.858	49	30.477
80.467	50	31.069

# KILOMETRES—MILES

Kilometres	Miles
82.077	31.690
83.686	32.311
85.295	32.933
86.905	33.554
88.514	34.175
90.123	34.797
91.733	35.418
93.342	36.039
94.951	36.661
96.561	37.282
98.170	37.904
99.779	38.525
101.380	39.146
102.998	39.786
104.607	40.389
106.217	41.011
107.826	41.632
109.435	42.253
111.045	42.875
112.654	43.496
114.263	44.117
115.873	44.739
117.482	45.360
119.091	45.981
120.701	46.603
122.310	47.224
123.919	47.846
125.529	48.467
127.138	49.088
128.748	49.710
130.357	50.331
131.966	50.952
133.576	51.574
135.185	52.195
136.794	52.817
138.404	53.438
140.013	54.059
141.622	54.681
143.232	55.302
144.841	55.923
146.450	56.545
148.060	57.166
149.669	57.788
151.278	58.409
152.888	59.030
154.497	59.652
156.106	60.273
157.716	60.894
159.325	61.516
160.934	62.137

# LITRES—PINTS

3.7854 Litres = 1 U.S. Gallon

Litres	Pints
0.5682454	1
1.1365	2
1.7047	3
2.2730	4
2.8412	5
3.4095	6
3.9777	7
4.5460	8
5.1142	9
5.6852	10
6.2507	11
6.8189	12
7.3872	13
7.9554	14
8.5237	15
9.0919	16
9.6602	17
10.2284	18
10.7967	19
11.3649	20
11.9332	21
12.5014	22
13.0696	23
13.6379	24
14.2061	25
14.7744	26
15.3426	27
15.9109	28
16.4791	29
17.0474	30
17.6156	31
18.1839	32
18.7521	33
19.3203	34
19.8886	35
20.4568	36
21.0251	37
21.5933	38
22.1616	39
22.7298	40
23.2981	41
23.8663	42
24.4346	43
25.0028	44
25.5710	45
26.1393	46
26.7075	47
27.2758	48
27.8440	49
28.4123	50
	1.7598
	3.5196
	5.2794
	7.0392
	8.7990
	10.5588
	12.3186
	14.0784
	15.8382
	17.5980
	19.3578
	21.1176
	22.8774
	24.6372
	26.3970
	28.1568
	29.9166
	31.6764
	33.4362
	35.1860
	36.9558
	38.7156
	40.4754
	42.2352
	43.9950
	45.7548
	47.5146
	49.2744
	51.0342
	52.7940
	54.5538
	56.3136
	58.0734
	59.8332
	61.5930
	63.3528
	65.1126
	66.8724
	68.6322
	70.3920
	72.1518
	73.9116
	75.6714
	77.4312
	79.1910
	80.9508
	82.7106
	84.4704
	86.2302
	87.9900

# LITRES—PINTS

8 pints = 1 Imperial Gallon

Litres	Pints
28.9805	89.7498
29.5488	91.5096
30.1170	93.2694
30.6853	95.0292
31.2535	96.7890
31.8217	98.5488
32.3900	100.3086
32.9582	102.0684
33.5265	103.8282
34.0947	105.5880
34.6630	107.3478
35.2312	109.1076
35.7995	110.8674
36.3677	112.6272
36.9360	114.3870
37.5042	116.1468
38.0724	117.9066
38.6407	119.6664
39.2089	121.4262
39.7772	123.1860
40.3454	124.9458
40.9137	126.7056
41.4819	128.4654
42.0502	130.2252
42.6184	131.9850
43.1867	133.7448
43.7549	135.5046
44.3231	137.2644
44.8914	139.0242
45.4596	140.7840
46.0279	142.5438
46.5961	144.3036
47.1644	146.0634
47.7326	147.8232
48.3009	149.5830
48.8691	151.3428
49.4373	153.1026
50.0056	154.8624
50.5738	156.6222
51.1421	158.3820
51.7103	160.1418
52.2786	161.9016
52.8468	163.6614
53.4151	165.4212
53.9833	167.1810
54.5516	168.9408
55.1198	170.7006
55.6880	172.4604
56.2563	174.2202
56.82454	175.9800
51	
52	
53	
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KG / S Q. CM. — LB/S Q. IN.

1016.05 Kilogrammes = 1 Ton (English)

Kg/sq. cm.		lb/sq. in
0.0703	1	14.2233
0.1406	2	28.45
0.2109	3	42.67
0.2812	4	56.89
0.3515	5	71.12
0.4218	6	85.34
0.4921	7	99.56
0.5625	8	113.79
0.6328	9	128.01
0.7031	10	142.23
0.7734	11	156.46
0.8437	12	170.68
0.9140	13	184.90
0.9843	14	199.13
1.0546	15	213.35
1.1249	16	227.57
1.1952	17	241.80
1.2655	18	256.02
1.3358	19	270.24
1.4061	20	284.47
1.4764	21	298.69
1.5467	22	312.91
1.6171	23	327.14
1.6874	24	341.36
1.7577	25	355.58
1.8280	26	369.81
1.8983	27	384.03
1.9686	28	398.25
2.0389	29	412.48
2.1092	30	426.70
2.1795	31	440.92
2.2498	32	455.15
2.3201	33	469.37
2.3904	34	483.59
2.4607	35	497.82
2.5310	36	512.04
2.6014	37	526.26
2.6717	38	540.49
2.7420	39	554.71
2.8123	40	568.93
2.8826	41	583.16
2.9529	42	597.38
3.0232	43	611.60
3.0935	44	625.83
3.1638	45	640.05
3.2341	46	654.27
3.3044	47	668.50
3.3747	48	682.72
3.4450	49	696.94
3.5153	50	711.17

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